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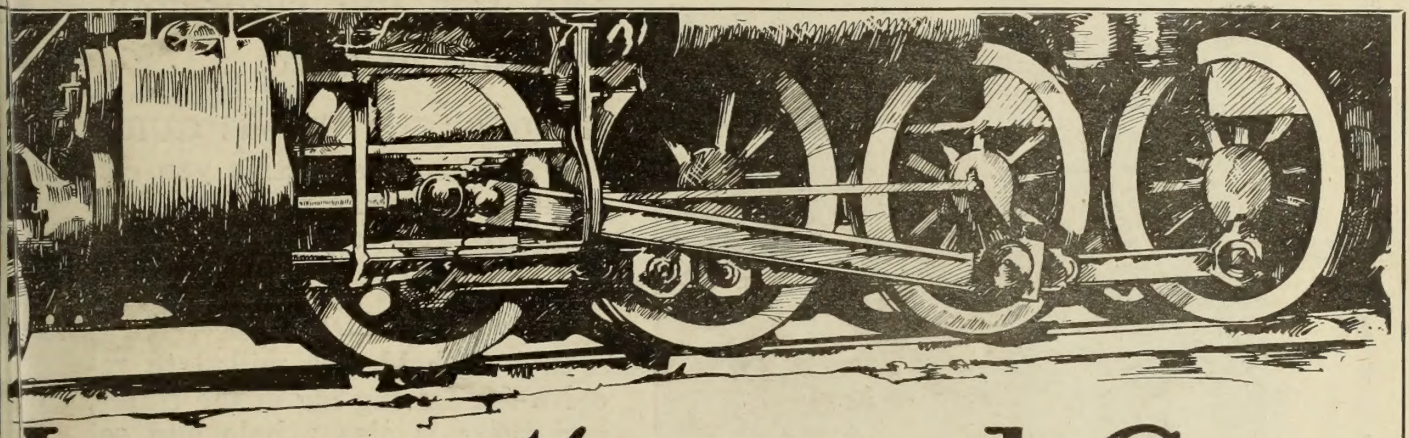
CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII. No. 1. Publication Office: Toronto, July 3, 1919 Subscription Price $3.00 per Year



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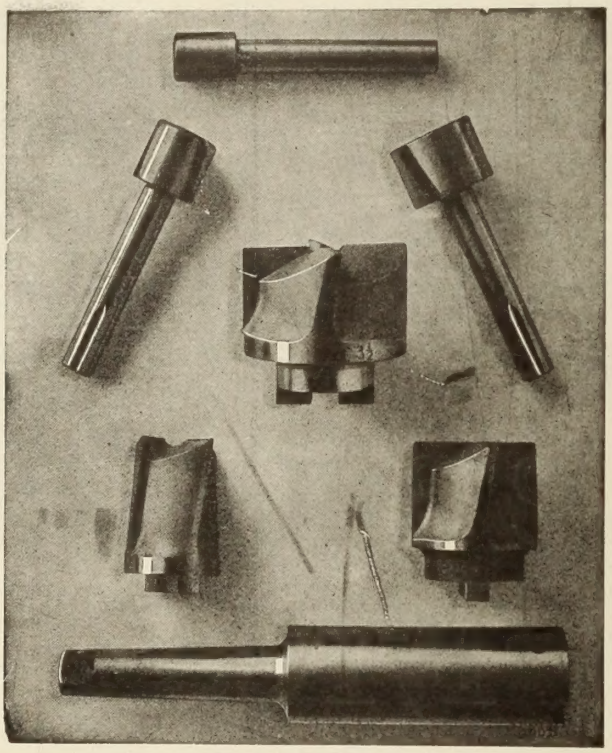

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With this combination you can immediately make the right combination for every counterboring job.

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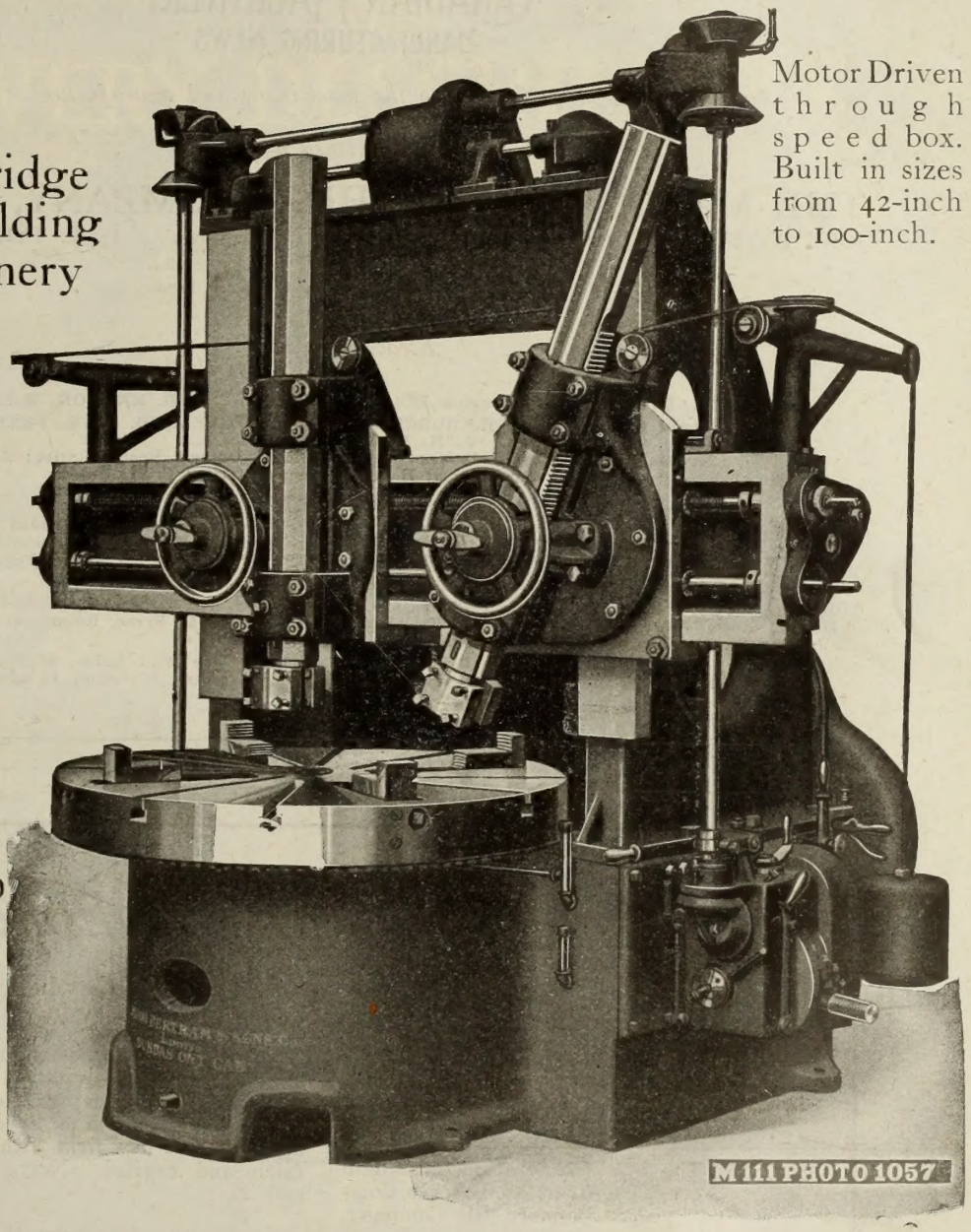

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The Publisher's Page

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A weekly newspaper devoted to the machinery and manufacturing interests.

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Vol. XXII. TORONTO, JULY 3, 1919. No. 1

Competition and Volume

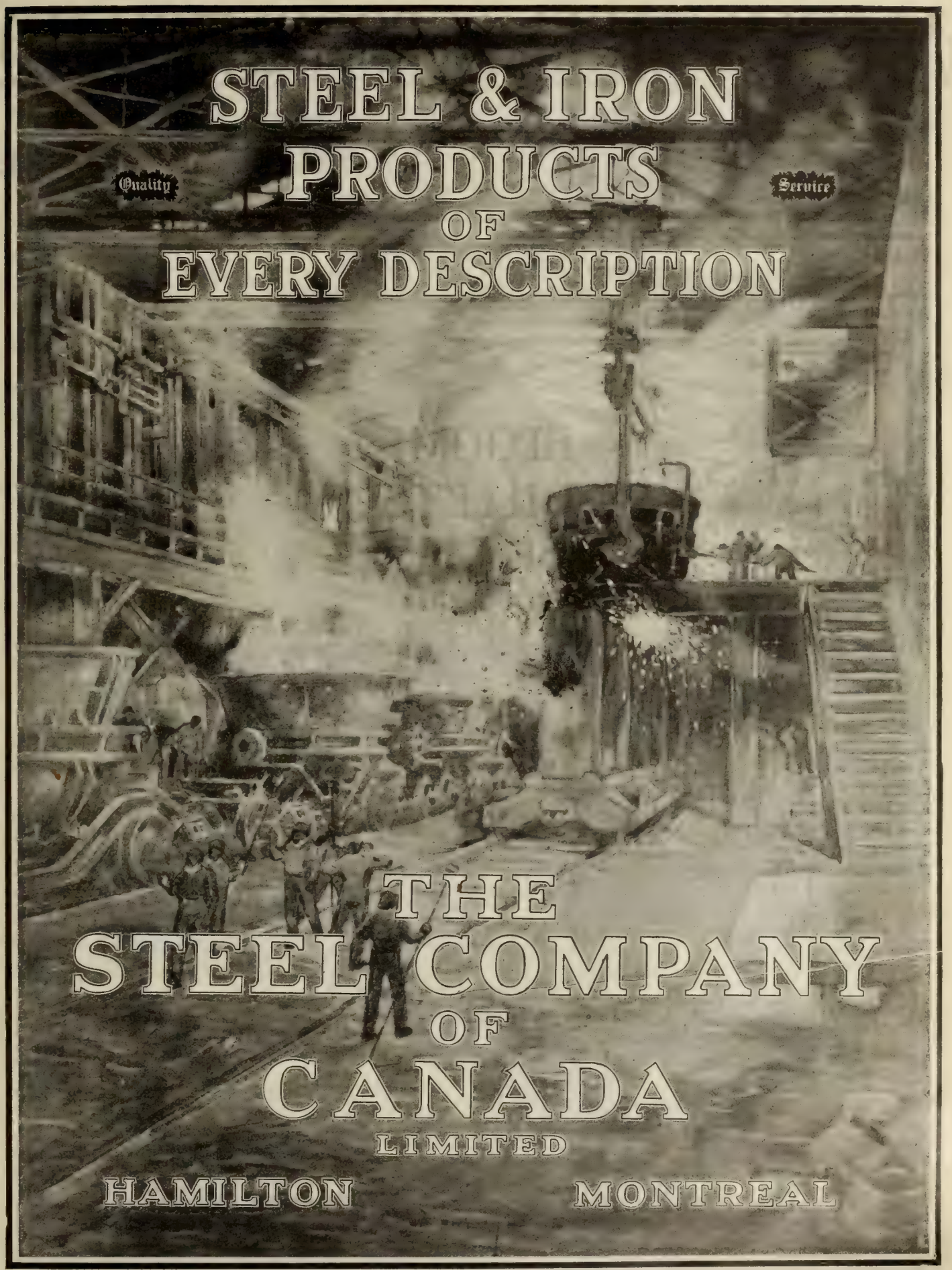
THE big four of thirty years ago in the packing industry is not the same big four of to-day. A new firm took the place of one of the old. Yet at the time the big four were supposed to be a monopoly.

The Steel Corporation, the Chain Store, The American Tobacco Company, The Standard Oil Company, all were supposed to be dangerous because combination would allow them to advance prices, make big profits and throttle competition. The dire results predicted never followed. In each field competitors have profited by volume of trade, and a small profit has proved better business economics than small volume and big margin.

In this transformation of business, advertising has played a most important part. Increased demand increases volume and lowers the unit cost. A new firm with vision, faith and capital, always has a look in.

Competition has been theoretically killed many a time in the fears of some people by monopoly. Nothing can kill it in practice except state socialism or the new and better theory of co-operative advertising and lowering the unit cost.—"Printers' Ink."

Canadian Machinery and Manufacturing News, July 3rd, 1919. Vol. 22, No. 1. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3.00: United States, $3.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office at Buffalo, under the act of March 3rd, 1879.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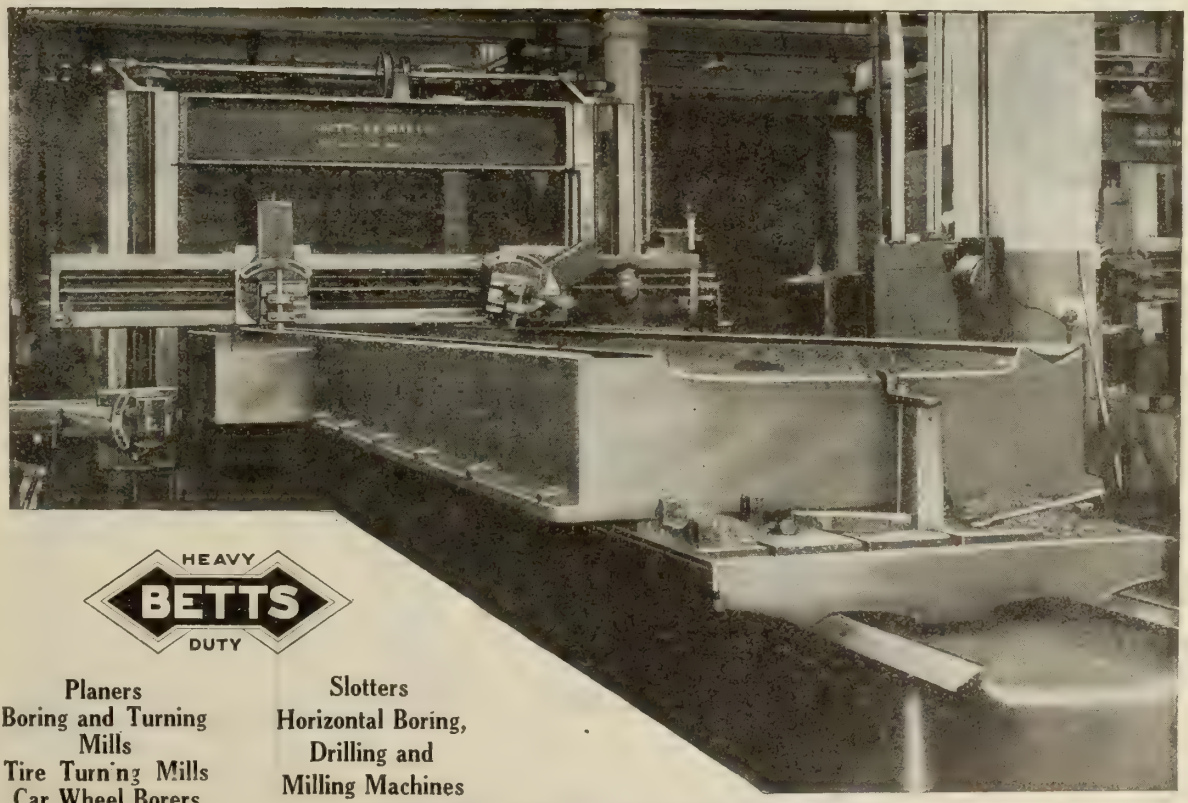

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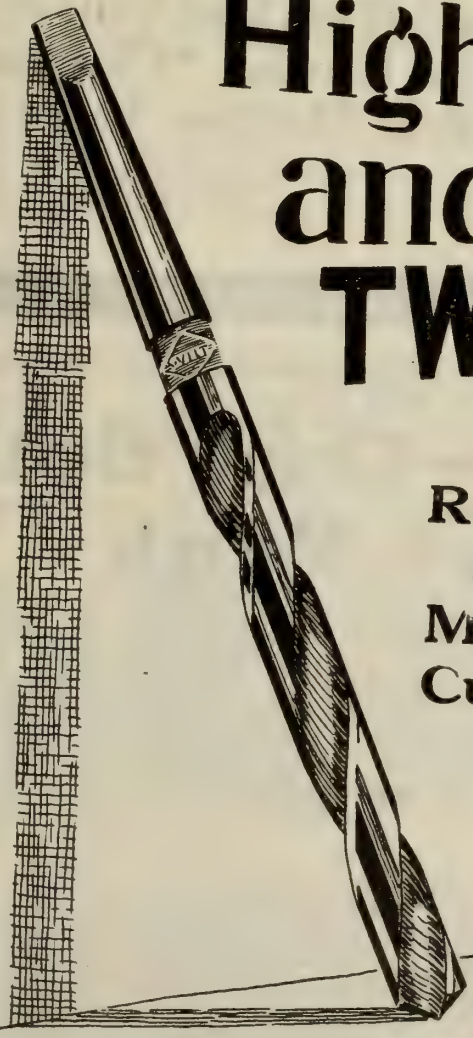

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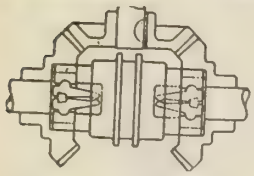
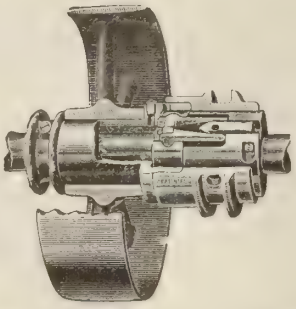
THE JOHNSON FRICTION CLUTCH

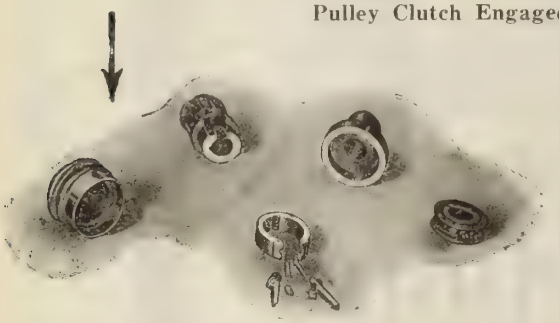


DOUBLE CLUTCH
IN NEST OF GEARING

Note the Parts of This Clutch



STANDARD CLUTCH with Pulley Clutch Engaged



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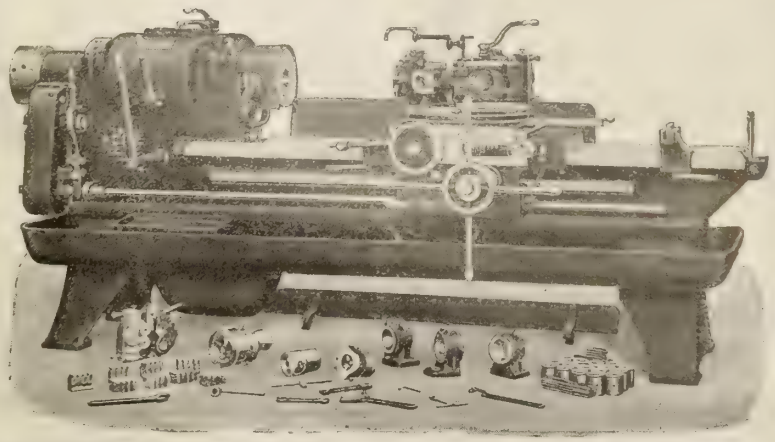

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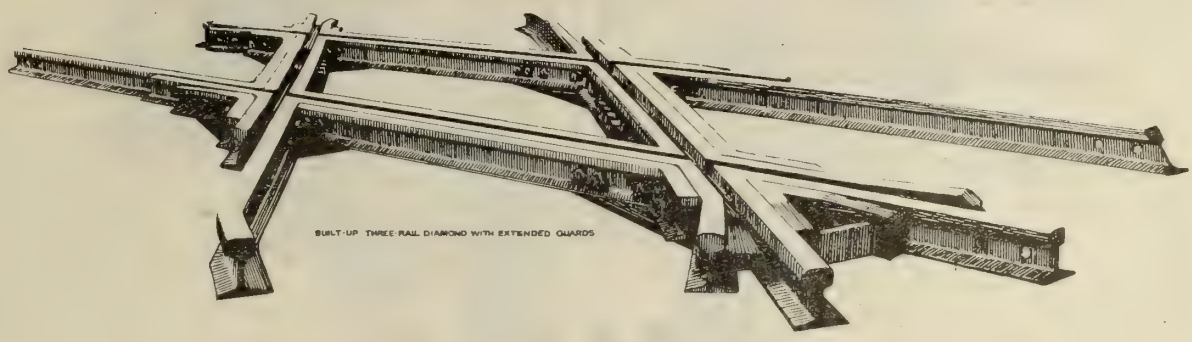

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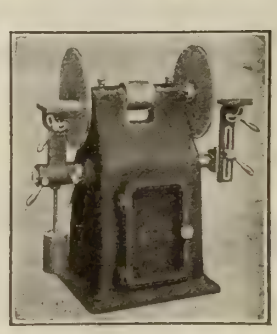

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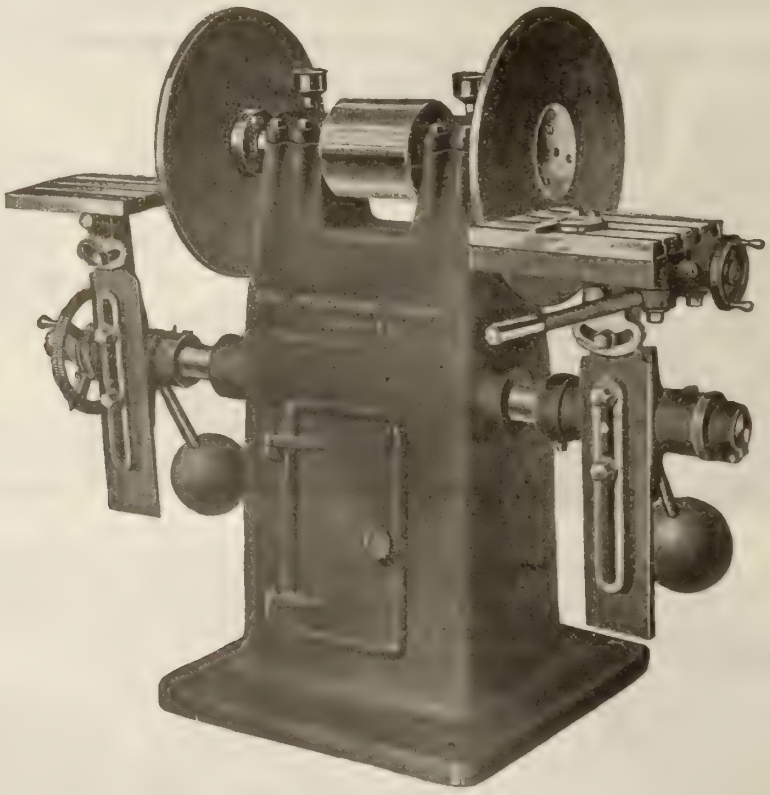

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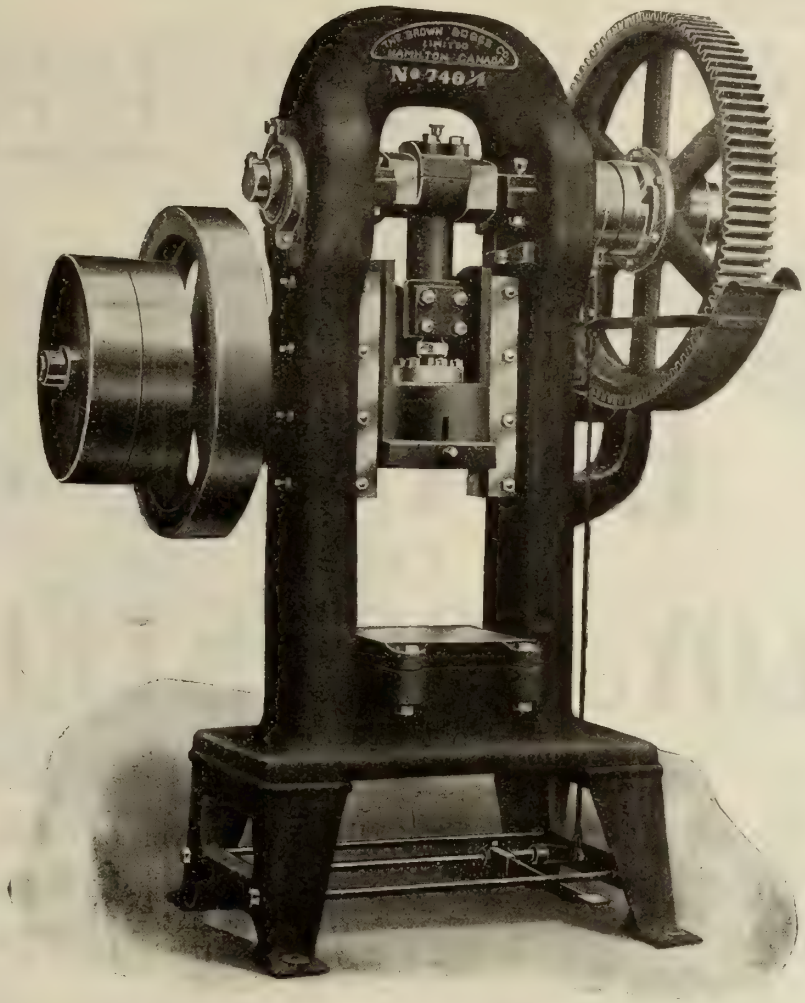

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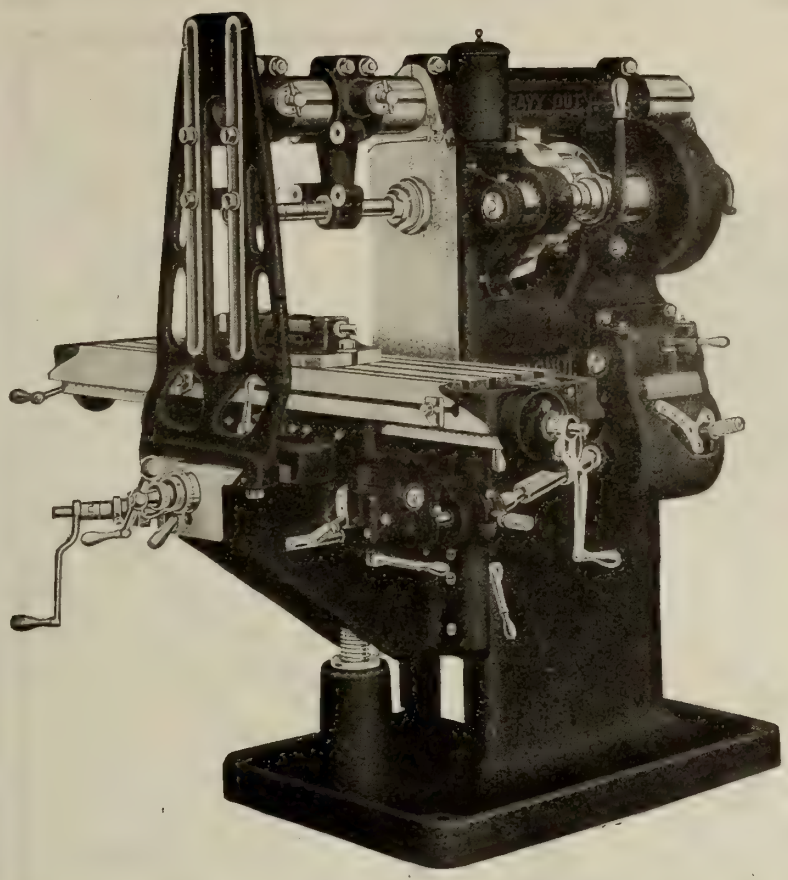

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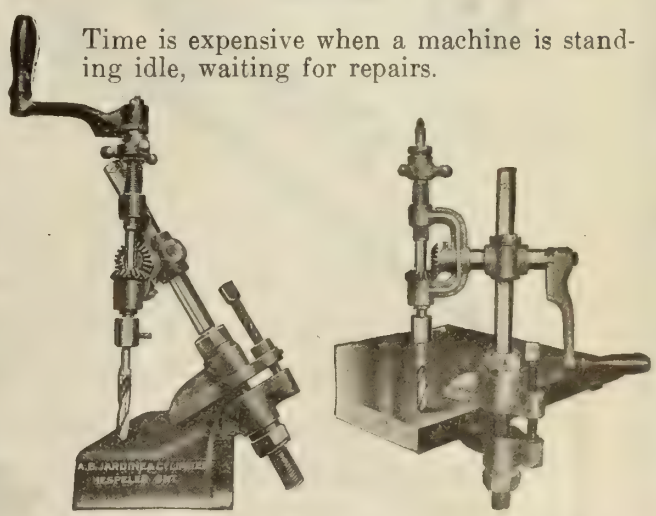

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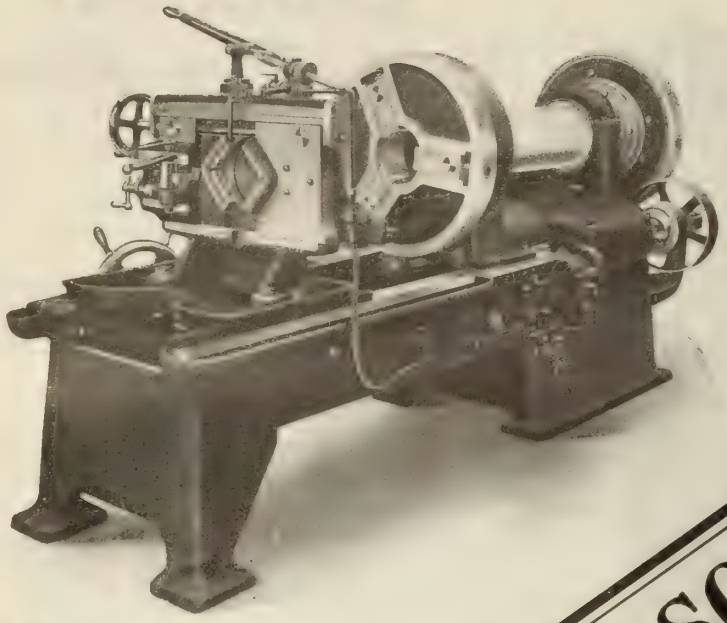

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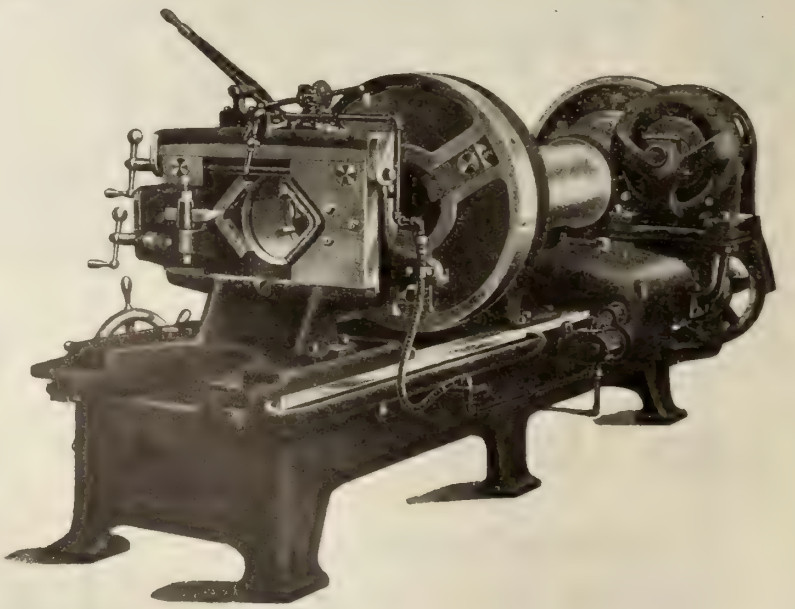

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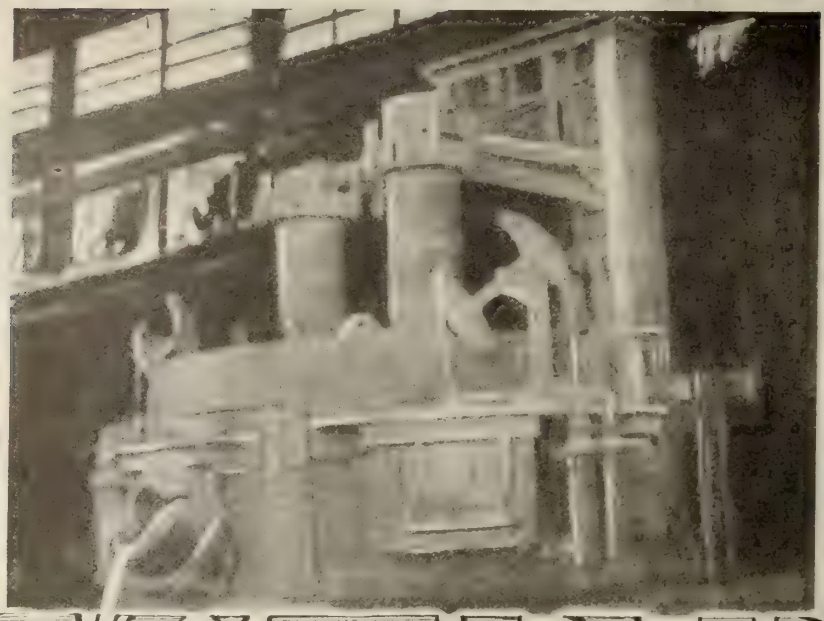

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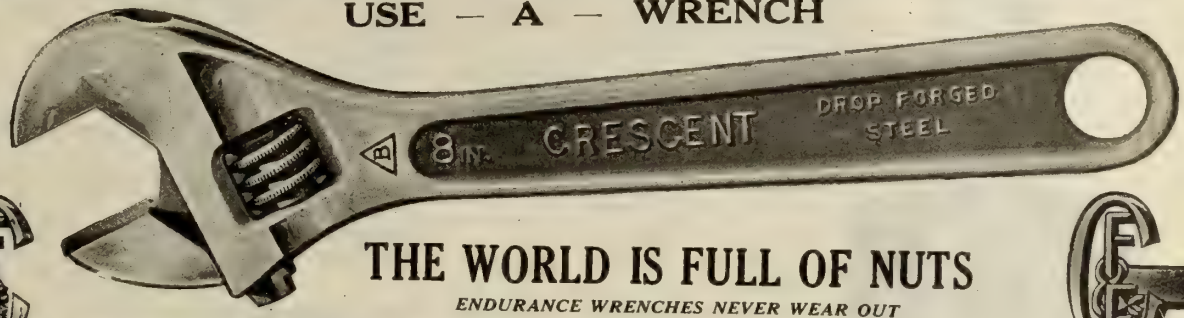
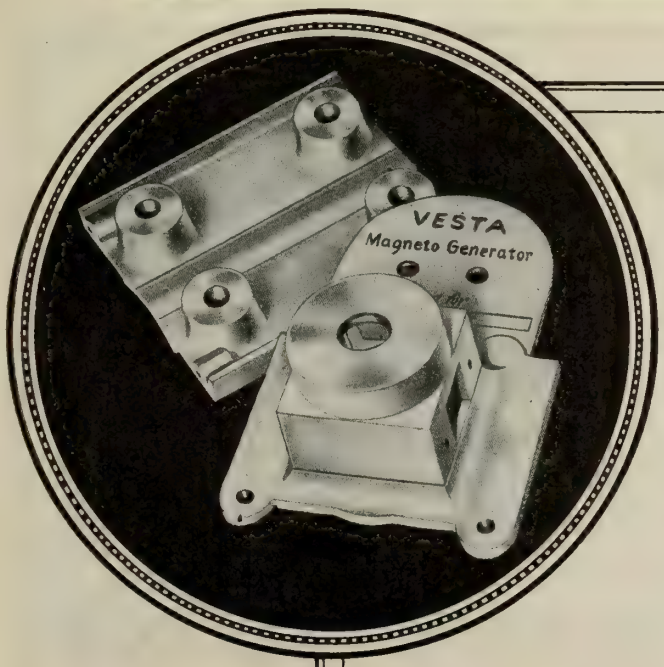


THE WORLD IS FULL OF NUTS

ENDURANCE WRENCHES NEVER WEAR OUT

CANADIAN BILLINGS & SPENCER PLANT - Welland, Canada



FRANKLIN
DIE-CASTINGS

The Safest Way To Save

A machined part may be perfect mechanically for your purpose—but too expensive.

Franklin Die-Castings have, in many instances, taken the place of machined parts —and not only served as well mechanically, but have the advantage of being absolutely uniform, and also much more easily adapted to quantity production.

Twenty-seven years' experience in the matter of supplying Franklin Die-Castings gives our engineers exceptional judgment in their application.

Booklet "C" will tell you interesting data. It is furnished on request.

Send a sample, or blue print of machined parts and we will furnish special report. Or, better still, let us send an engineer to consult with you.

Franklin Mfg. Company
746 Gifford St., SYRACUSE, N.Y., U.S.A.

VULCAN

NON-SHRINKABLE OIL HARDENING

DIE STEEL

was used to make these Government Gauges

Gauge No. 1		Gauge No. 2
2.506	Outside Diameter	2.016
2.433	Pitch Diameter	1.951
8	Threads per inch R. H.	12
1 in.	Length of Gauge	$1\frac{1}{8}$

TOLERANCES

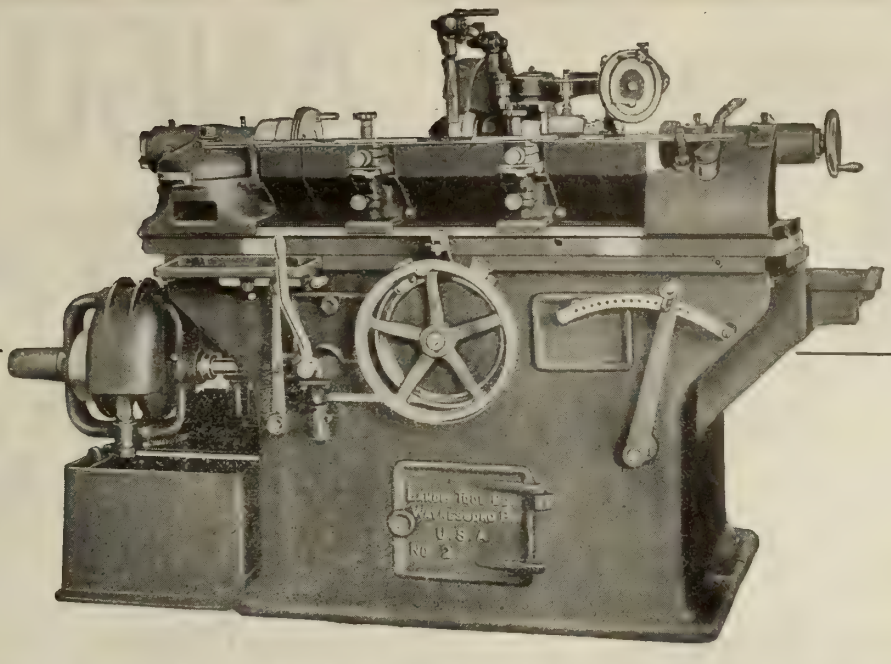
Pitch Diameter—Plus or minus .0002
Lead—Plus or minus .00025 per inch of length
Angle—Plus or minus 5 minutes

Allowance on pitch diameter for grinding .003 to .005, depending on diameter of gauge.

Change in Hardening { Lead not over plus or minus .001 per inch of length. Diameter not over plus or minus .001 per inch of diameter.

Name of manufacturer of gauges furnished on request.

LANDIS



"You Can Do It On The LANDIS Universal"

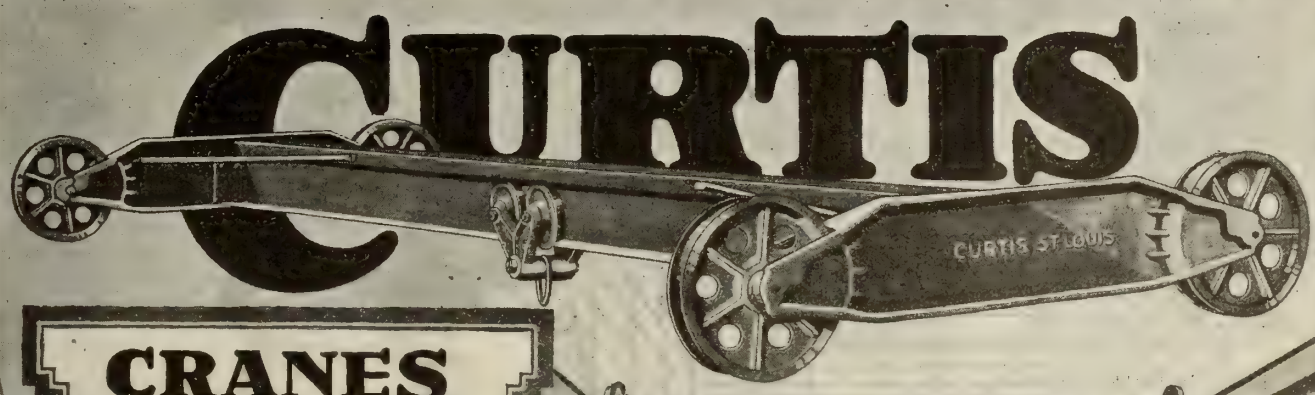
That's the answer to every query as to big production and the grinding possibilities on accurate or unusual work in hundreds of America's foremost shops.
The Landis Universal is particularly adaptable for every type of gauge making.

The widest range of work is handled by this machine with ease because of the simplicity of design of its various features.

Write for further details.

LANDIS TOOL COMPANY, Waynesboro, Pennsylvania, U. S. A.
New York City: 50 Church Street

CURTIS



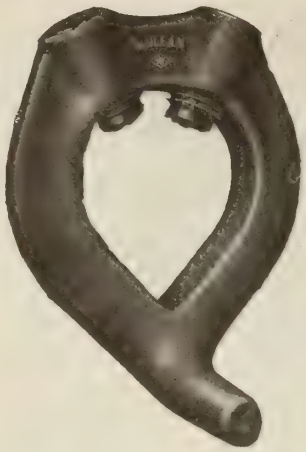
CRANES

Have an enviable reputation for safety and ease of operation. Preferred in many leading industrial plants for their simplicity of design, being quick and easy to erect and therefore very low in cost of installation. Strong, rigid, dependable. Right in every detail. "They move the load with minimum energy." Hyatt Roller Bearings throughout.

Various types, hand and pneumatic, up to 20,000 lbs. capacity. *Write for illustrated descriptive literature.*

Curtis Pneumatic Machinery Co.
1585 Kienlen Ave., St. Louis, U. S. A.
Branch Office:
532-A Hudson Terminal, New York City

Sectional view of Curtis Crane Wheel showing Hyatt Flexible Roller Bearings.



Williams' "Vulcan" Drop-Forged Safety Lathe Dogs

DESIGNED to insure the maximum of safety, care was taken to provide a form as close to a circle as possible —no bunching or extension of the head portion, no "sleeve-catchers" to cause injury to the unwary operator.

They provide safety complete and automatic and, with this assured safety, better balance on the lathe and every whit of utility obtainable in this class of tool.

The price is the same as for the dangerous kind.

Bent and Straight Tail, 1 or 2 Screws, 16 Sixes, 3/8 to 6-inch Capacities.

Ask for Machinists' Tools Booklet

J. H. Williams & Co.

"The Drop-Forging People"

45 Richards St. Brooklyn, New York

THE A. G. LOW CO., LIMITED

45 Pacific Ave., Saskatoon, Sask.

Agents for Manitoba, Saskatchewan, Alberta and British Columbia

ANGULAR GRIT

Saves Labor Saves Time Saves Costs

One ton of Angular Grit equals carloads of sand

Quicker and Better

ANGULAR GRIT offers you the most advanced and economical method of cleaning castings, etc. Its angular and irregular cutting points clean raw castings and forgings more thoroughly and with greater speed than either sand or shot.

ANGULAR GRIT dispenses with sand bins and sand dryers, and there is no dust nuisance where it is used.

If you are using sand, think of the labor you can save by adopting ANGULAR GRIT in its place.

Used for all kinds of cleaning operations. Prove its superiority by giving it a trial.

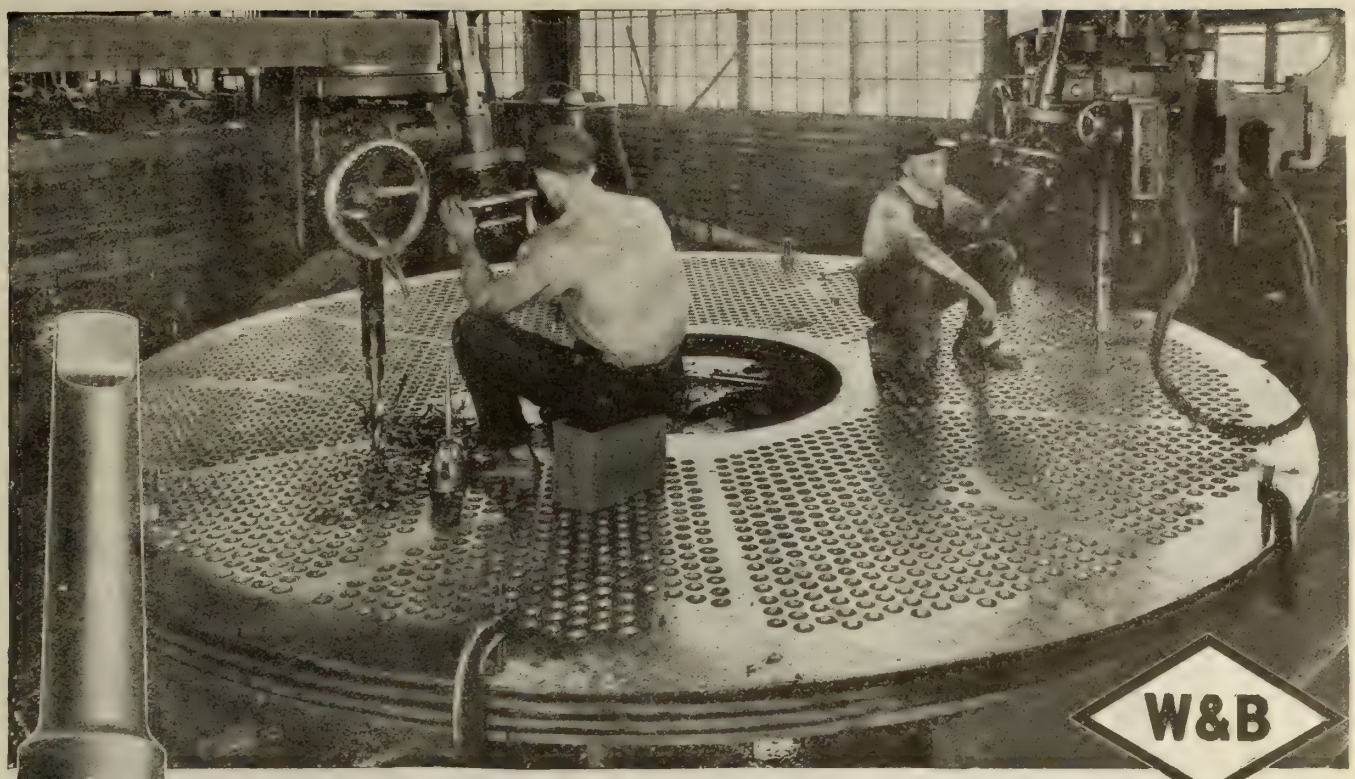
Pittsburgh Crushed Steel Co.

Established 1888

Pittsburgh, Pa., U.S.A.

Canadian Representatives:

Williams and Wilson Ltd., Montreal, P.Q.



The 12,408 holes in these Four Sugar Evaporator plates were drilled 1-47 64" with "W. & B" "Hercules" High Speed Drills and reamed to 1-49 64" with "W & B" High Speed Rose Shell Reamers.

Trade Mark Registered

12,408 Holes—Quick!

THE best drill presses and the most skilled mechanics on earth cannot drill accurate holes without good Twist Drills. Every Drill job requires speed, whether it is a rush order or not. Speed makes profits, conserves machine tool investment, cuts overhead, raises production and increases employees' income. Speed depends on Drill quality.

"W & B" Twist Drills as Speed Factors

Most makers of high grade machine tools invariably use "W & B" Twist Drills to demonstrate hole cutting capacity.

A "W & B" Twist Drill will test the machine where many other drills would break.

"W & B" Twist Drills retain their temper and cutting edge. They do not overheat. Less time is consumed in sharpening and grinding.

Manufacturers in all lines can reach a new production limit by using "W & B" Twist Drills and Reamers in their regular equipment.

"W & B" Twist Drills as Profit Factors

Your investment in machine tool equipment yields the greatest profits when "W & B" Twist Drills and Reamers are used.

"W & B" Twist Drills and Reamers stay on the work more hours, cut more accurately in more kinds of metals, produce more holes, more profits.

"W & B" Carbon and High Speed Twist Drills and Reamers are right for **every industry.** The "W & B" Diamond trademark has international recognition as a mark of achievement, capacity, extreme accuracy, ability to deliver and reasonable cost.

The Whitman & Barnes Manufacturing Co.

Office and Factory: St. Catharines, Ont. London: 139 Queen Victoria St., London, E. C.

Established 65 Years

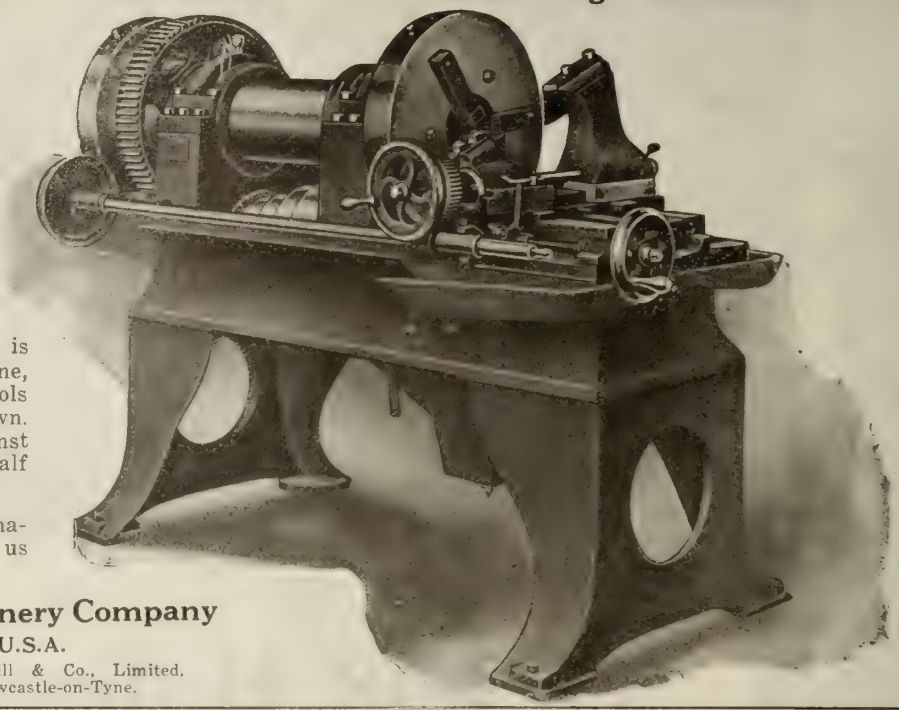
Whitman & Barnes

TWIST DRILLS — REAMERS — WRENCHES — HAMMERS

Cut Your Cutting-off Costs in HALF

HURLBUT'S

Patent Cutting-off and Centering Machines



TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.

Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

The Hurlbut, Rogers Machinery Company

South Sudbury, Mass., U.S.A.

Foreign Agents—England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.

IMPERIAL GENUINE BABBITT METAL

The Highest Grade Manufactured

Made specially for all HIGH SPEED, HEAVY ENGINES and EXTRAORDINARY HARD WORK

Manufactured and guaranteed to give excellent service by

THE CANADA METAL COMPANY, Limited, FRASER AVENUE TORONTO, Hamilton, Montreal Winnipeg, Vancouver

THE

TRADE K–T MARK

FOUNDRY

GALT - ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

GEAR GRINDING

The Heald No. 70 Internal is rapidly becoming known as "the gear grinder." Its unit heads which are easily interchangeable, together with the standard "draw in" collet holds the gears securely and can be readily equipped with special jaws, making it an ideal machine for grinding a hole in all sizes of spur, bevel and worm gears.

At the plant of the Albaugh-Dover Company, Chicago, Illinois, are three Heald Internal Grinding Machines finishing the holes in various types of gears of hardened steel.

They are using the standard draw-in collet regularly furnished with the machine as a fixture with the following results:

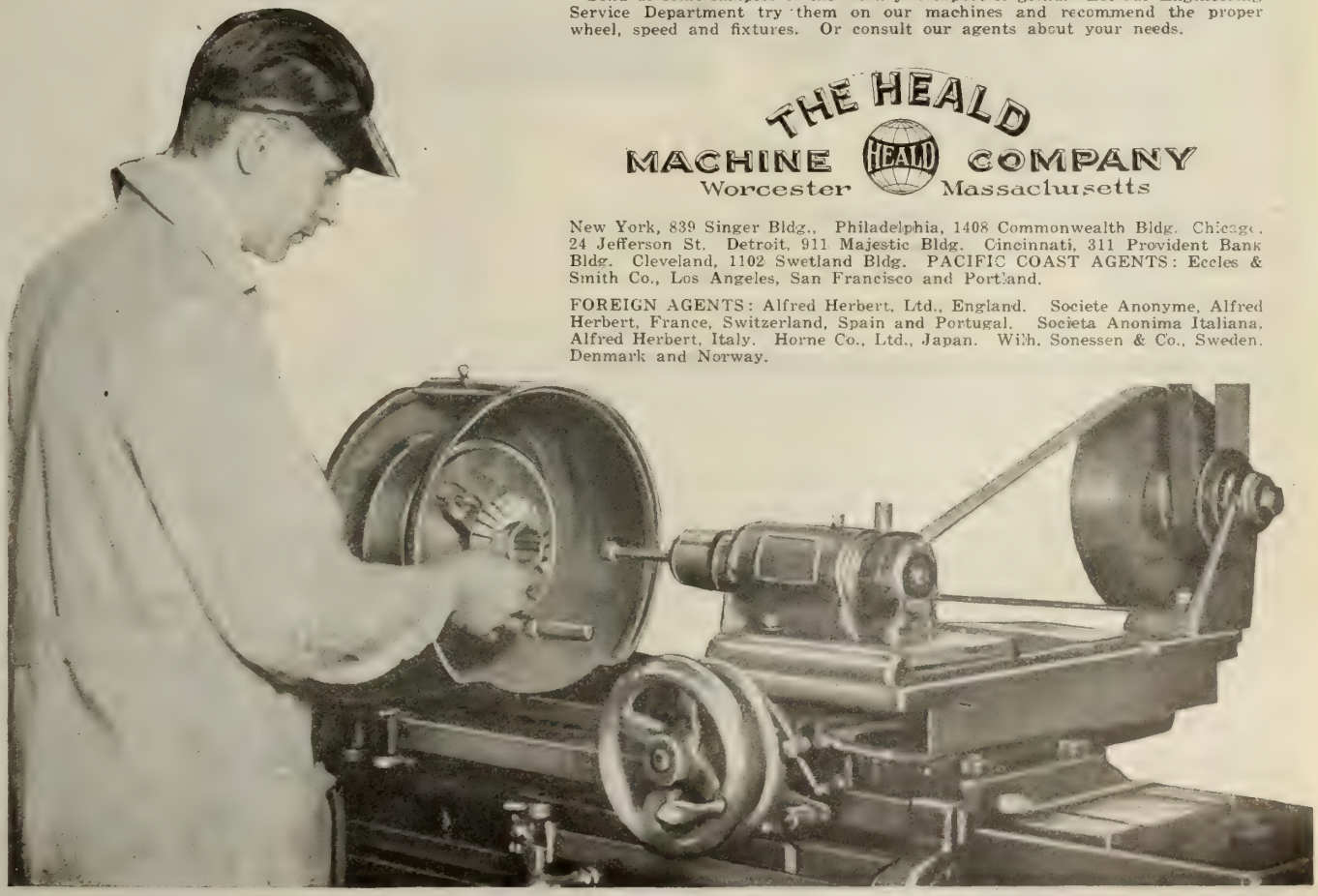
No. of Part	Dia.	Length	Limit	Removed	No. per hr.
Differential gear	1⅝″	2½″	.001	.011	13
Miter gear	⅞″	2¼″	.001	.010	20
Bevel gear	1⅜″	3″	.001	.015	12

Send us some samples of the work you expect to grind. Let our Engineering Service Department try them on our machines and recommend the proper wheel, speed and fixtures. Or consult our agents about your needs.

THE HEALD MACHINE COMPANY
Worcester Massachusetts

New York, 839 Singer Bldg., Philadelphia, 1408 Commonwealth Bldg. Chicago, 24 Jefferson St. Detroit, 911 Majestic Bldg. Cincinnati, 311 Provident Bank Bldg. Cleveland, 1102 Swetland Bldg. PACIFIC COAST AGENTS: Eccles & Smith Co., Los Angeles, San Francisco and Portland.

FOREIGN AGENTS: Alfred Herbert, Ltd., England. Societe Anonyme, Alfred Herbert, France, Switzerland, Spain and Portugal. Societa Anonima Italiana, Alfred Herbert, Italy. Horne Co., Ltd., Japan. Wilh. Sonessen & Co., Sweden, Denmark and Norway.



WAR is destructive. Peace is constructive, War has taught us many things, chief of which is the great value of Time. Time is the essence of your life and mine. Whatever saves Time, saves Life.

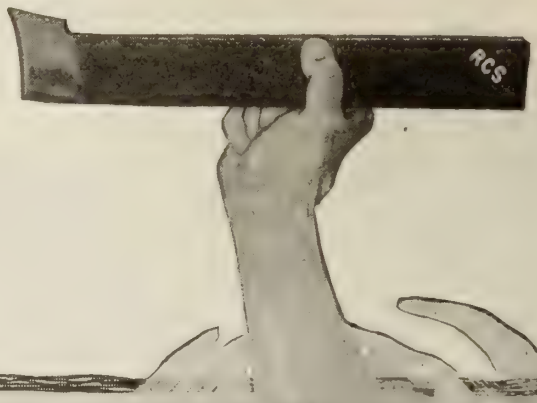
"RedCut Superior"

The Nationally Known **FIRST QUALITY**

HIGH SPEED STEEL

Is the Avowed Enemy of Waste and Inefficiency, and is Allied with Life

Save Time, Save Life. Are your Tools made of RedCut?



VANADIUM-ALLOYS STEEL CO.

General Sales Offices, PITTSBURGH, PA.
Works, LATROBE, PA.

This Time It's Register Frames

The Egry Register Co. of Dayton, Ohio, has been using this particular NATCO Multi-Driller for four and a half years—"no trouble and no repairs."

At the left is one of their register frames—cast iron 3/8 inches thick. The NATCO drills 16 holes—ranging from No. 48 to 5/16 in. diameter at the rate of 216 frames a day.

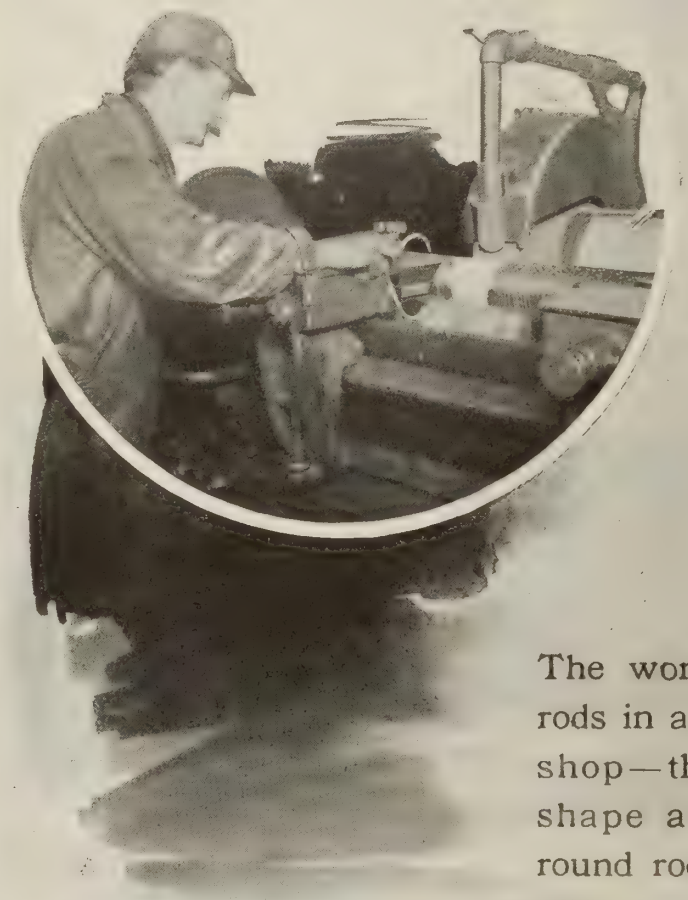
THE NATCO patented feature—Independent Change of Speed for Each Spindle—makes this possible, for the NATCO is the only machine that will drill, ream, tap, counterbore or spotface different sized holes in one operation with each tool driven at its approximately correct cutting speed.

Let us make you production estimates

The National Automatic Tool Co. Richmond, Ind.

FOREIGN AGENTS

Burton, Griffiths & Co., British Isles
Allied Machinery Co. of America, Italy
Spain, Portugal and Switzerland
Aux Forges De Vulcain, France
E. Isbecque & Co., Belgium



JUST ONE OF THE MANY PRECISION GRINDING JOBS ON WHICH

ALOXITE WHEELS

HAVE MADE POSSIBLE A GREATER ACCURACY; A GREATER PRODUCTION AND A GREATER SAVING IN TIME AND IN GRINDING COSTS

The work is grinding piston rods in an Eastern New York shop—the wheel holds its shape assuring a perfectly round rod, cuts free and fast without chattering, leaving a splendid commercial finish—and it shows a real economy in increasing production and in its long life.

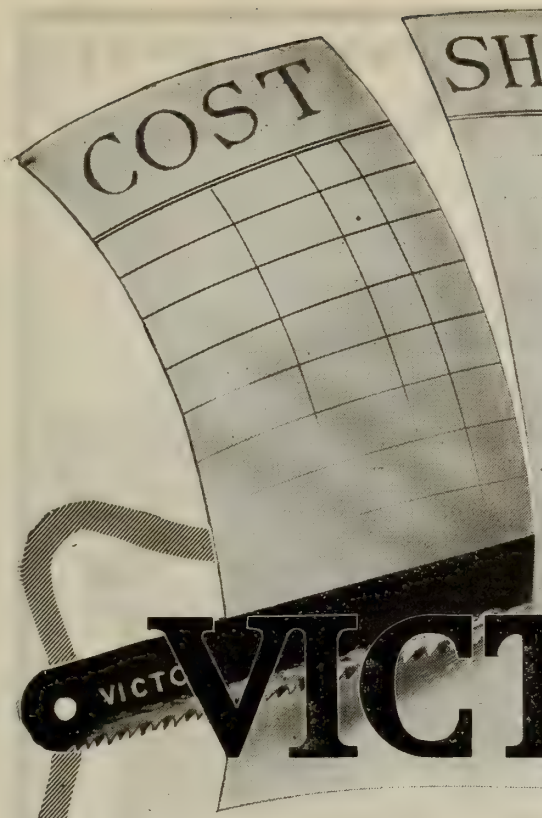
.....

Suppose you put some of your grinding work up to our service department.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI PITTSBURGH MILWAUKEE GRAND RAPIDS



CUT YOUR CUTTING COST WITH VICTOR Flexibles

The high cost of tools should emphasize more than ever the importance of quality.

The high cost of hack saw blades ought to drive every hand blade user over to the saw that does not break in ordinary hand work.

VICTOR FLEXIBLE HACK SAW BLADES have exactly the same cutting power as the finest All-Hard on the market, and that they cannot be broken in use except by intentional abuse is an undisputable fact—which will represent a saving from twenty-five percent to thirty-three and one-third percent in breakage alone.

Seventy-five percent of the All-Hard blades used in hand frames break before they are worn out. Watch the All-Hard blades in your own shop and see the enormous amount of breakage—then use VICTOR FLEXIBLES and note the economy.

VICTOR SAW WORKS LTD - HAMILTON, CANADA

"THE RACINE"

High Speed Metal Cutting Machine

Standard the World Over

This is the only machine in the World that has an ABSOLUTELY POSITIVE AUTOMATIC LIFTING DEVICE, a feature secured by patents. Another feature is the rigid saw frame guide. These two assets combine to give long life to the cutting blades and save a lot of money.

"THE RACINE" minimizes wastage, cuts accurately and with great speed. Then they are easy and cheap to operate. These features are appreciated by the best shops everywhere and that's why "THE RACINE" sets the "Standard the World Over." Write for full particulars.

Use "RACINE" H.S. Tungsten-Power Blades.

RACINE TOOL & MACHINE COMPANY

Melbourne Ave. ∴ RACINE, WIS., U.S.A.

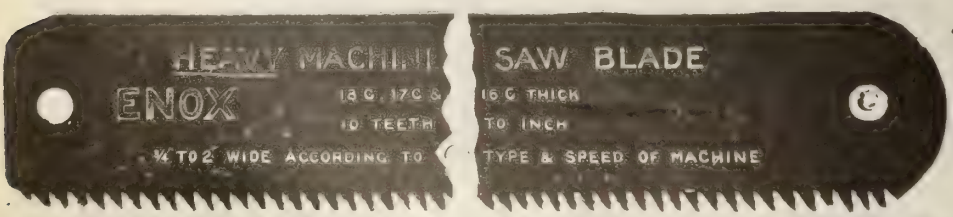
SIMONDS

HACK SAW BLADES

UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited

ST. JOHN MONTREAL VANCOUVER



ENOX

Hacksaw Blades

ARE THE BEST

AGENTS IN CANADIAN TOWNS WANTED

Liberal Terms offered to firms willing to carry stocks and act as sole agents for the district.

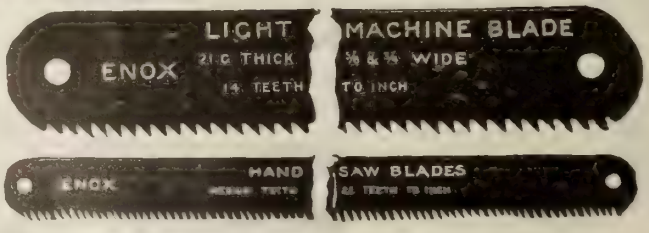
Makers:

FRY'S (LONDON) LIMITED

AN ENTIRELY BRITISH COMPANY

46 Upper Thames St., London, E.C. 4, England. Works: Greenwich, S.E. 10

Agents for Canada, East of Fort William



THE STANDARD MACHINERY & SUPPLIES, LIMITED, 261 Notre Dame St. West, MONTREAL, QUE.

Agents for British Columbia—The A. R. Williams Machinery Co., Limited, 495 Railway St., Vancouver, B.C.

Starrett Hack Saw Charts
Belong In Every Tool Room

THAT MAN ISN'T GUESSING

He knows he is giving out the right blade for the job because he looked in the Starrett Hack Saw Chart when the machinist told him what he wanted to cut.

For any but the most unusual conditions, a Starrett Hack Saw Chart in the tool-room is almost as good as having a service man in the factory—and it's always there when you want it.

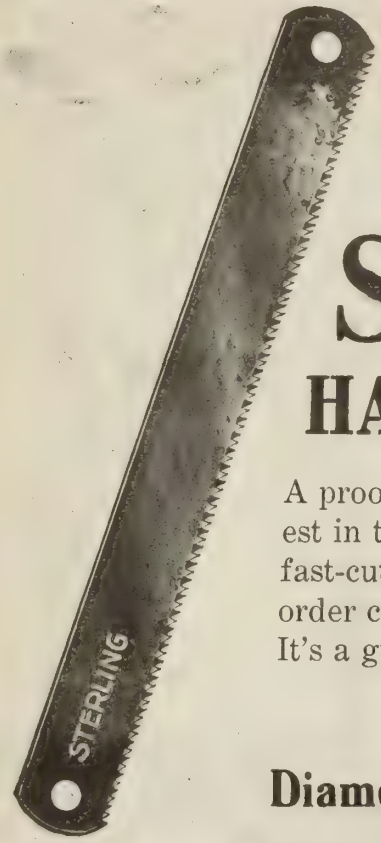
A copy of the Chart or the Starrett Catalog No. 213 sent free upon request.

The L. S. Starrett Co., Athol, Mass.

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

42-947

STARRETT HACK SAWS CUT QUICKER LAST LONGER



TRADE Sterling MARK

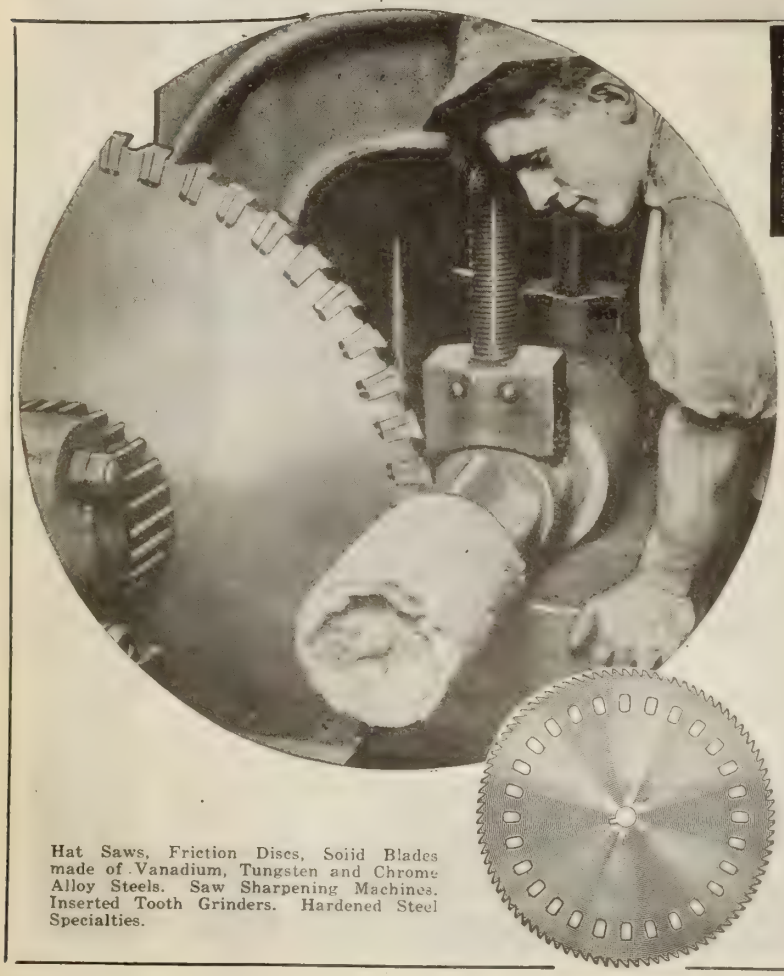
STERLING
HACK SAW BLADES

A proof of the fact that quality is always cheapest in the end. If you want durable hack saws, fast-cutting, keen and tough, then be sure your order calls for "STERLING" Hack Saw Blades. It's a guarantee of satisfaction.

Manufactured by

Diamond Saw & Stamping Works

BUFFALO, N.Y., U.S.A.



HUNTER
Duplex Saws

The selection of many of the best and largest companies in the country for cutting ingots, bars, forgings, castings, rails and structural shapes.

Their fast cutting qualities mean a saving of time and power, plus increased production.

Teeth are accurately formed, ground and set for highest speed and greatest endurance. Made in sizes up to 90 in. in diameter.

Write for price list and full particulars

Hat Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel Specialties.

HUNTER SAW & MACHINE CO.
Pittsburgh, Pa.

BROWN'S

Beaver Brand Metals

Copper, Brass, Bronze, Canada Silver, and Gilding Metal in sheets, rolls, plates and rods. Naval Bronze, Yellow Metal and Muntz Metal in sheets and rods for shipbuilding requirements. Specify Beaver Brass Rod for drilling and free cutting. Extruded shapes.

Guaranteed Ingot Metals—Yellow, Red and Composition Ingots.
We are Purchasers of Copper Bearing Material.

Link up with Beaver Brand Products—you'll like the quality, price and service.

Brown's Copper & Brass Rolling Mills, Limited

New Toronto, Ont., Can.

COPPER & BRASS BROWN'S QUALITY ROLLING MILLS

MALLEABLE AND CAST IRON PIPE FITTINGS

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

When ordering from your jobber be sure you buy---"the brand that has the quality." They are different. A trial order will convince.

International
Malleable Iron Company, Limited
Guelph, Ontario, Canada

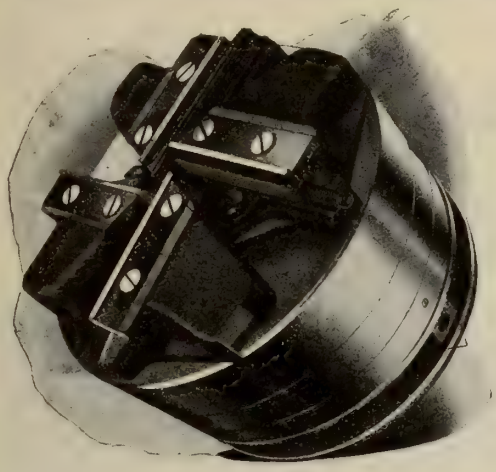
How Many Threads in a Dollar?

That is the all-engrossing question of the manufacturer to-day, whether cutting threads on a production basis or as a maintenance proposition.

Landis Threading Die Heads and Machines insure profitable threading because:—

The chaser like a lathe tool is tangentially disposed to the work, eliminating all unnecessary friction.

The chasers are interchangeable in that any one or more may be replaced without renewing the entire die.



The chaser has a variable cutting angle which may be ground to suit the material being threaded.

The chasers never require recutting but when dull are given a slight grinding.

The chaser is 4 inches long, giving a life twenty times that of other dies.

Your money invested in the Landis Die will yield big returns in best quality threads.

Catalogue 24 tells the whole story.

LANDIS MACHINE COMPANY

WAYNESBORO, PA.

POWER -- BENDERS

THREE NEW MODELS

"Wonder" Pipe Bending Machines (pat.)

Electrically operated to bend from 1/8" to 20". Send for printed matter. We also manufacture TEN other sizes, hand operated benders.

American Pipe Bending Machine Company

52 Pearl Street **Boston, Mass., U.S.A.**

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.

Annual sales over $5,000,000.

Hoyt Metal Co., Toronto

New York, N.Y. **London, Eng.** **St. Louis, Mo.**

FIRE ANNOUNCEMENT

We are pleased to say that the fire which occurred in our plant on Saturday, June 21st, will not have very serious results.

Machine shop and foundry were uninjured and patterns are being rapidly replaced.

Drawings, part lists and all records enable us to go right along with the minimum of delay.

Parts of machines in stock are uninjured as no fire was anywhere near them.

We can offer Lathes, Shapers, Drills and Pipe Machines for immediate delivery.

THE R. McDOUGALL CO., LIMITED
GALT, ONTARIO, CANADA
CANADIAN FAIRBANKS MORSE CO., LIMITED, SALES AGENTS

Swedish Steel & Importing Co., Limited
Montreal Toronto
New York Denver

Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK SS DOUBLE ESS

PROMPT SHIPMENTS from large stock

MacKINNON STEEL CO., LTD.

Engineers, Manufacturers and Erectors of Steel Structures

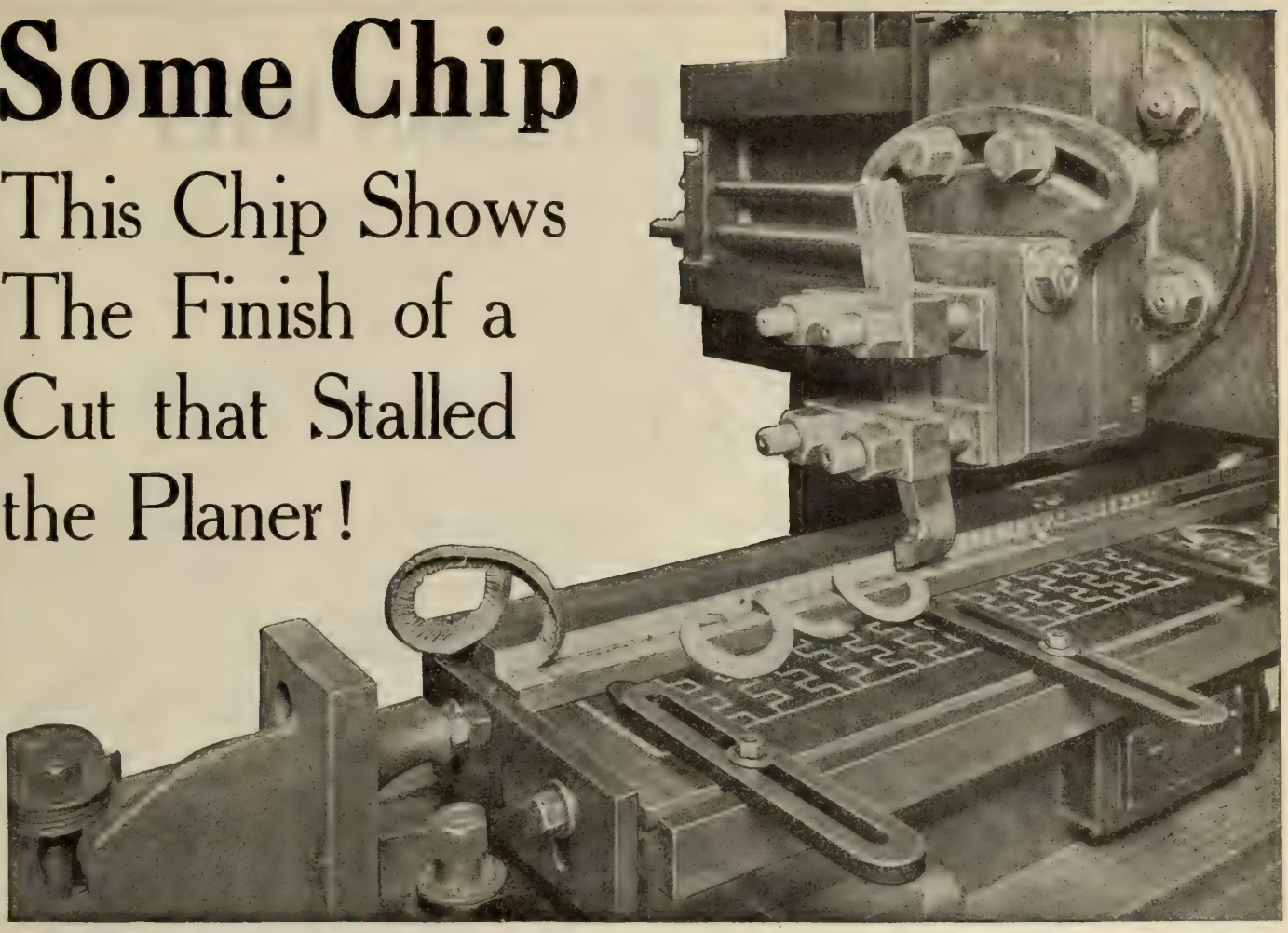
Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.
Structural Steel and Steel Plate Work, and a combination of the two lines.

Prompt Deliveries Assured.

MacKINNON STEEL CO., LIMITED
Sherbrooke, Quebec
Montreal Office: 404 New Birks Building

Some Chip

This Chip Shows The Finish of a Cut that Stalled the Planer!



The cut was started at the far end of the piece and the work never budged.

Some of the factors that contribute to the holding power and reliability of the SIMMONS UNIT-POLE MAGNETIC CHUCK are

1—Effective utilization of the space on the face of the chuck;
2—Use of unit magnetic pole pieces of forged iron placed adjacent to each other with no neutral poles or neutral spaces between them;
3—Gaps between poles uniform throughout because adjacent edges are machined to definite dimensions;
4—Complete magnetic circuit insulated from the body of the chuck —a patented construction.
5—Machine wound coils assure uniform quality and equal ampere turns in all;
6—Interlocking pole pieces offer transverse as well as longitudinal resistance to the work;
7—Watertight construction.

DETAILS OF TEST

The test here shown was made on a 30-inch Gray planer equipped with a 31 x 10¼ inch T-slot Simmons Unit-Pole Magnetic Chuck. The cut was taken on a cold rolled steel bar 31 inches long, 4 inches wide and ¾ inch thick. The chip was ⅝ inch deep and 3-16 inch thick. It stalled the machine.

The Simmons unit-pole magnetic chuck works where others fail, because it is designed in accordance with the principles of correct magnetic practice and gets the maximum pulling power that can be obtained in a given space. Catalog 105E will be mailed on request.

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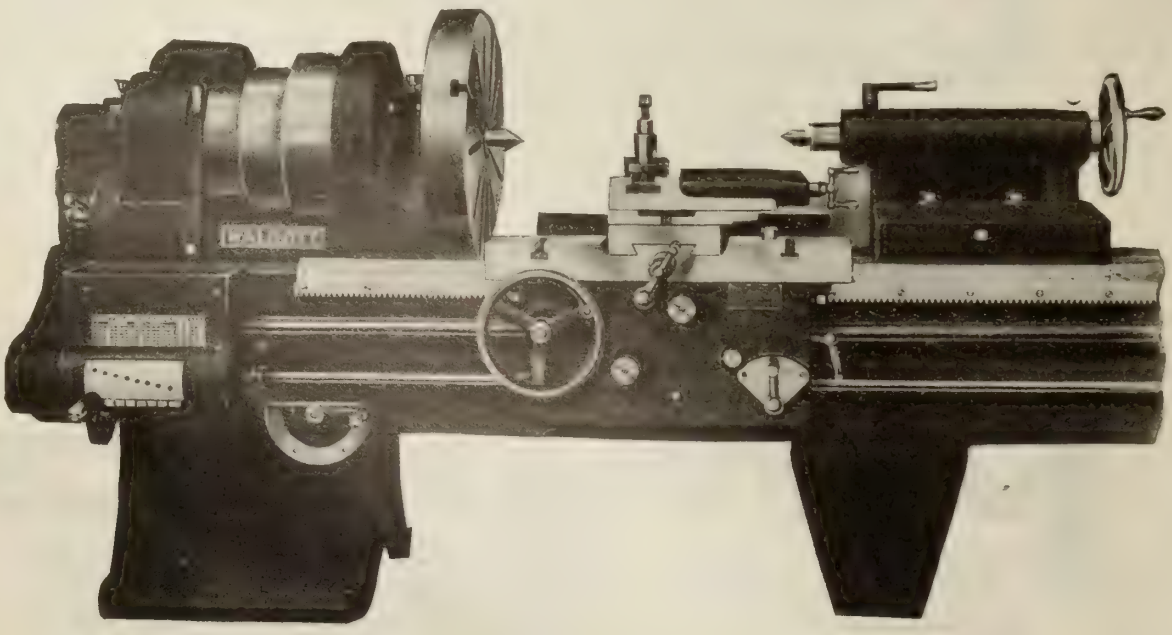

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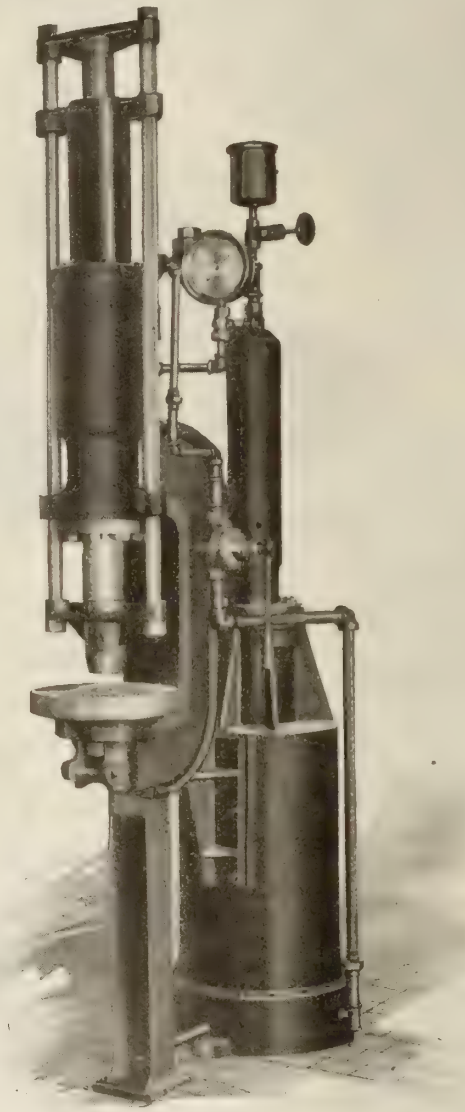

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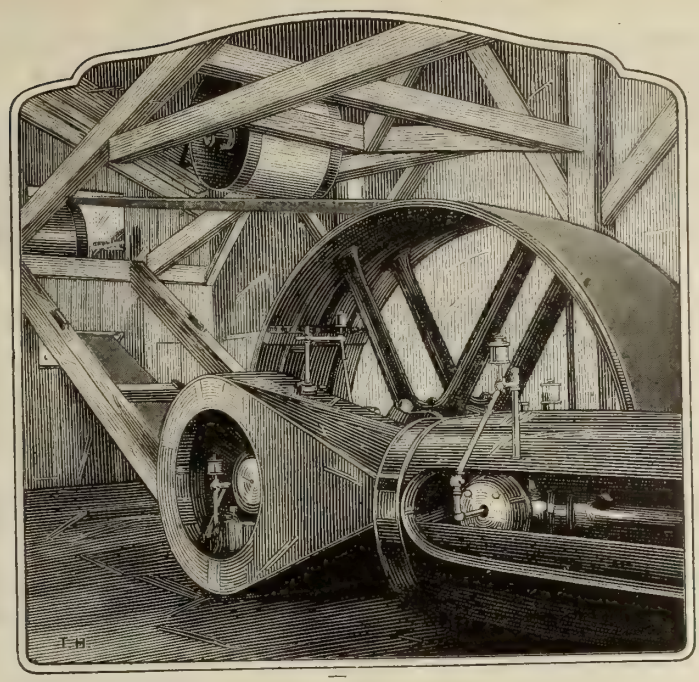

48" Heart 3-ply Belt, 86 feet long, installed in 1911 in the mill of the C. A. Smith Lumber Company, Baypoint, Cal. Driving Pulley, 14 feet, 101 R.P.M. Driven Pulley, 4 feet. Belt Speed, 4400 F. P. M. Theoretical horse-power, 600. Actual horse-power transmitted, 850 to 900. Cost of Belt, 1-5 of 1c per horse-power per week.

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Leather Belting

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Notes On Grinding
NORTON COMPANY WORCESTER, MASS.

No. 59A

Judging the Grinding Action

Because of so many unavoidable variations in the size and structure of the casting or billet it is a difficult task to determine the relative merits of snagging wheels. But the only reliable factors for judging of the suitability of an abrasive structure are the rate of cutting and the amount of abrasive material worn away per unit of volume of metal ground. Any other basis of selection is an approximation for these two quantities, and experience has shown that even the opinion of expert grinding operators is subject to many uncertainties unless supported by actual data on the rate of cutting and grinding capacity.

IMPORTANCE OF OPERATING CONDITIONS

In fact if these data were daily collected for a long period of time, it would be seen that the action of a snagging wheel is very sensitive to any variation of the following conditions:

1. The manner in which the grinding wheel is applied.
2. The speed of rotation.
3. The daily changes in structure of the metal, "chill" and amount of metal to be removed.
4. The method of grinding employed by the operator, whether the work is done with the edge of the wheel or the face, and the amount of traverse of the work with respect to the wheel.
5. The rigidity with which the work is held while being ground.
6. The condition of the grinding machine with especial reference to the bearings, tension, and width of belts, and amount of power available.

Each of these factors may have more effect upon the grinding action than a change of grit or grade of the abrasive structure. That is why no one can reliably foretell the grit and grade of snagging wheel best suited for a particular set of operating conditions. Foundries of the same concern and making the same product will select grinding wheels of different structure.

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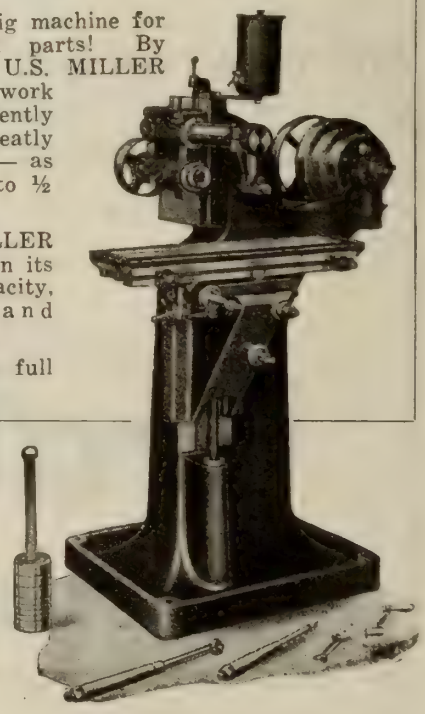

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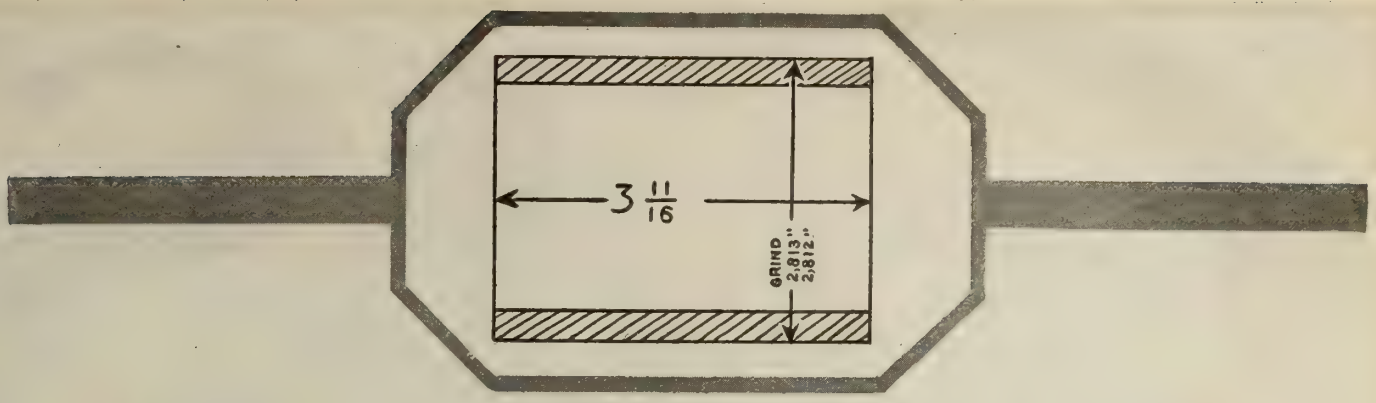

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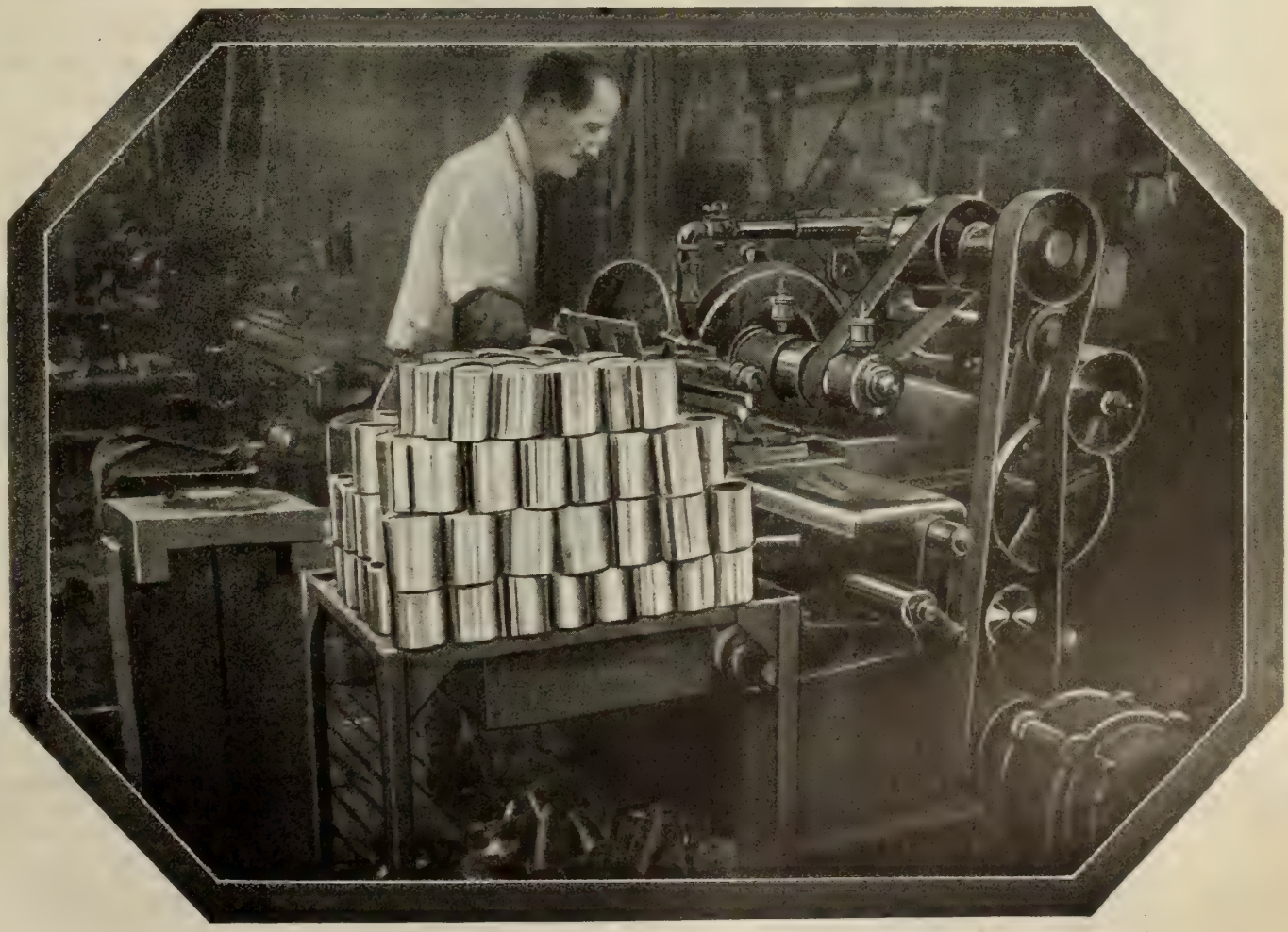

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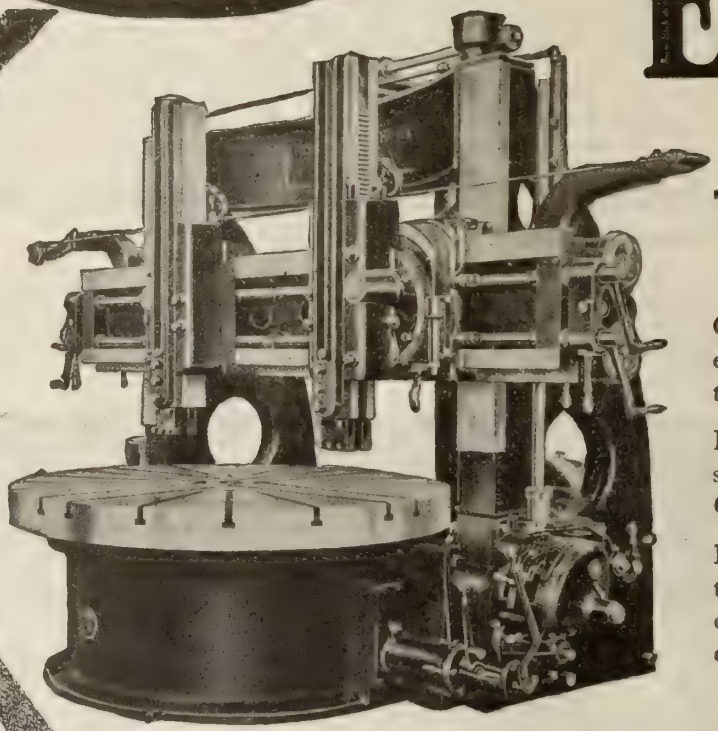

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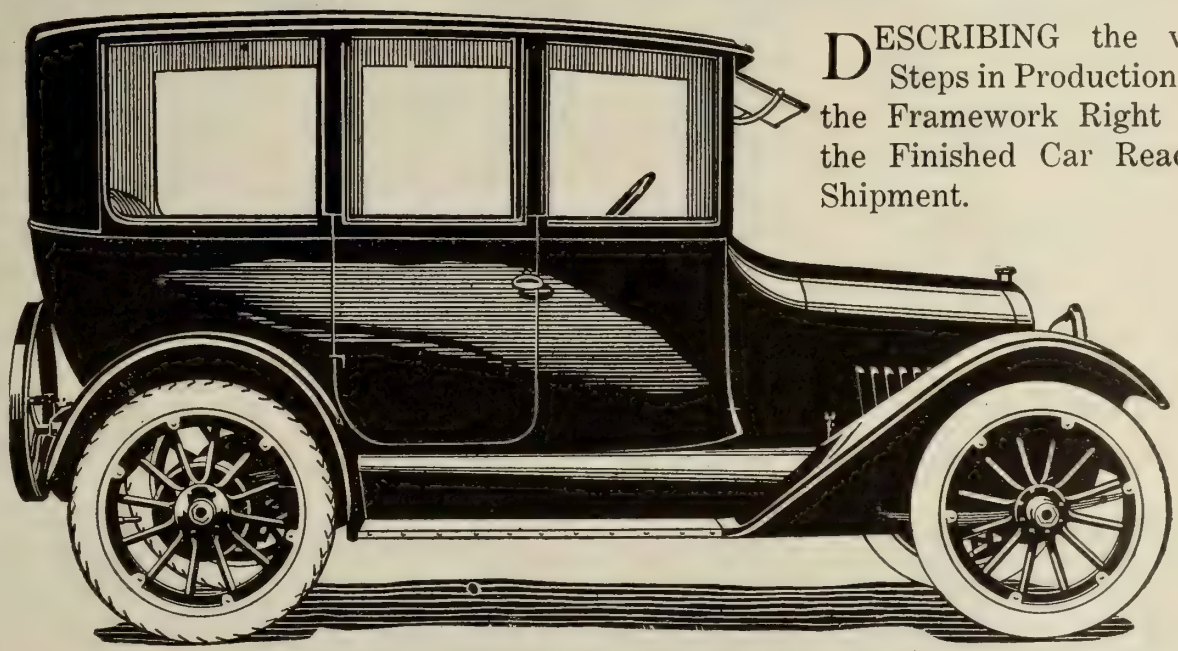
CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 1. Toronto, July 3, 1919

Manufacturing the Chevrolet Motor Car



DESCRIBING the various Steps in Production, From the Framework Right Up to the Finished Car Ready for Shipment.

By J. H. MOORE, Associate Editor Canadian Machinery

IT is a well-known fact that in some cases where an article on some particular machine or subject is to be prepared, the first customary step is to describe the product itself before going on to its manufacture. In this case in point, however, such a description would be superfluous, for where is the man or woman, yes, even the kid (as we generally term them), who cannot tell you what an automobile is. What's more, even the children can proudly say as a car whizzes past, "That's a ——," as the case may be.

But how does it come that even the kiddies can pick out a certain type of car from amongst so many different types? If the writer is allowed to answer his own question, here is at least his humble opinion. The child overhears its parents or some other party of older years discussing the various cars on the market, together with their records, price, etc., etc. A child's mind is very fertile, and, naturally, the information falls in good soil, so we later hear them exclaim as the car goes past, "There goes a ——."

Now, since we've reached this point, let us ask readers another question. How often have we heard a kid saying, "There goes a Chev." (which is their favorite pet name for the Chevrolet car).

Quite often, no doubt, which proves the writer's previous theory, that the kids soon learn to know of the car whose price, performance, and record, are well known. In other words, they soon get to know the name of the popular car, which in common parlance, means the Chevrolet, for this car has been discussed by no doubt half the population of Canada.

CANADIAN MACHINERY figured it out this way: People in general are interested in this automobile, so why not the mechanic? No doubt he will be even more interested. Arrangements were made to secure such an article with the result to follow. In as far as possible we will describe the various processes throughout, but naturally readers can understand that there must be certain operations which cannot be gone into in detail for obvious reasons.

As readers no doubt already know, the Chevrolet Motor Car Company of Canada, Ltd., have their plant located at Oshawa, Ont. These quarters are spacious, to say the least, and some idea of their exterior appearance can be gleaned from the photograph at Fig. 1, showing a general view as we approach the plant.

To the extreme right of this picture will be noticed a portion of the main office, while on the extreme left is shown the production and cost department office building. Further in the rear readers will notice a portion of the plant building, with the covered bridge going from one building to another.

Referring for a moment to the office staff. Here we find some 100 workers, busily engaged in carrying on the different departments of office routine, which gives readers a slight conception of the vast volume of business which passes

FIG. 1—GENERAL VIEW OF A PORTION OF THE PLANT AS IT APPEARS FROM THE STREET.

through their hands. But we will not dwell on the office problems, for this article is chiefly intended as a manufacturing study.

It will not be amiss at this point to first of all describe the various models of cars which this firm turns out. They have what is known as their Model 490, a serviceable car of lighter weight than their next, Model F.B., or, as it is better known, their Baby Grand Model. This latter car is a larger and heavier model than the former one spoken of.

To allow readers to compare these cars from a photographic standpoint, the writer has illustrated this article with photographs of both models spoken of. A study of the specifications, which follow later in this article, will further allow comparison between these two cars.

In addition to these models, they also manufacture a light delivery waggon, also a one-ton truck.

So now that we have mentioned these different types, let us go into the actual manufacture of the Model 490 and F. B. cars.

The various operations on these models are similar, so that for the purpose of this article one description will suffice for both cases, but underneath each photograph readers will find a description of the type portrayed.

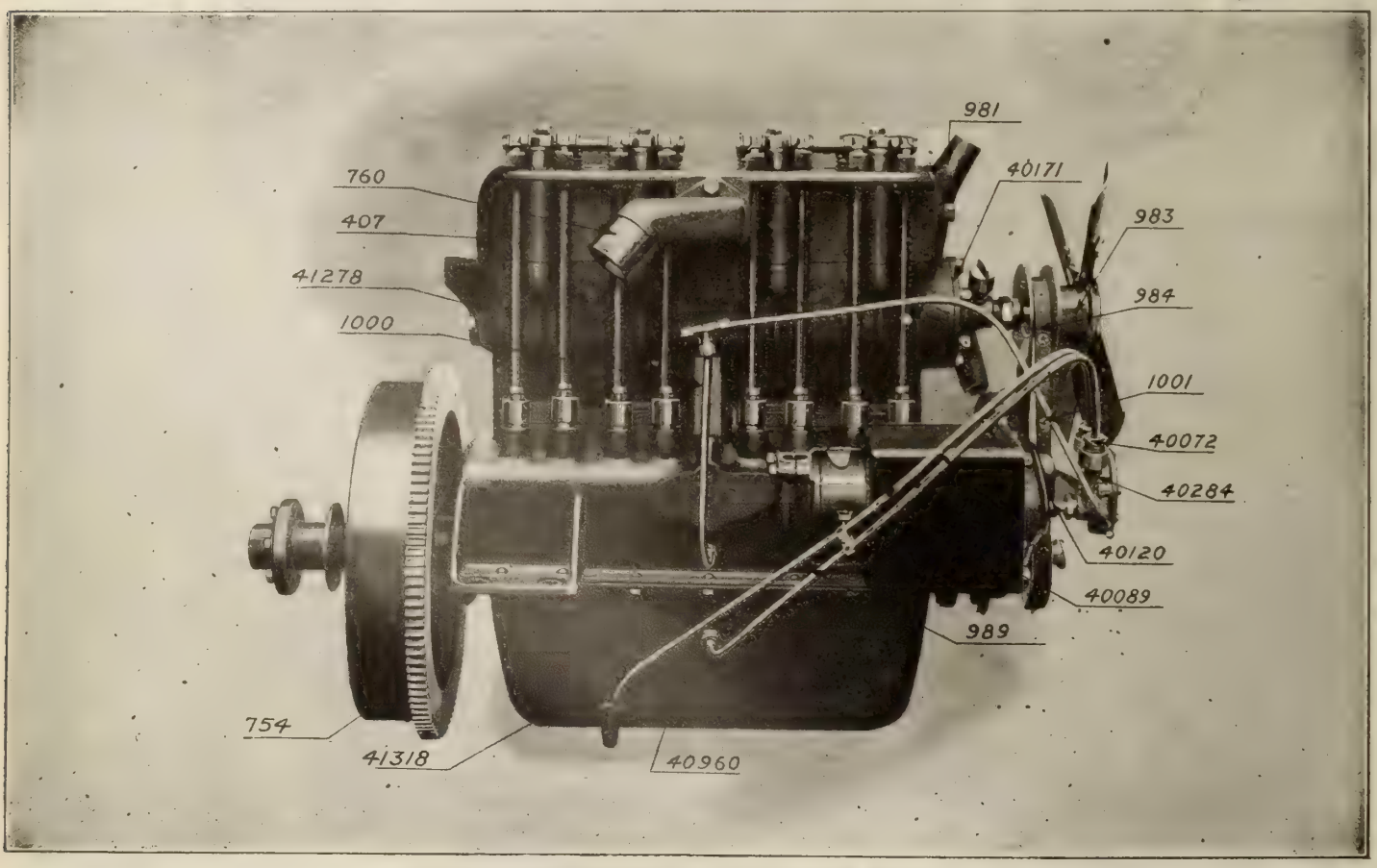
The Frame

To commence with, let us consider the frame. This portion consists of some twenty parts, not to speak of the rivets used on the same. This frame is first of all drilled, and later assembled, the various pieces being riveted together. This latter operation is a very interesting one to watch. Air hammers are used for this purpose throughout, speed being the big factor. Air hoists are also employed to lower these frames to the trucks on which they from now on rest, until their completion. These trucks are of course specially constructed to accommodate the frame, being of correct length, shape, etc., so that it is but the matter of a moment to place the frames firmly on same.

GENERAL APPEARANCE OF CAR MODEL 490.

The springs and axles are now assembled to the frame, after which they are transferred to the department where the motor is assembled to the frame.

Before going on to this operation, however, let us see what has been happening while the frame has been passing



1918-1919 MOTOR WATER PUMP COOLING SYSTEM, MODEL 490 CAR.

FIG. 2—ASSEMBLING THE MODEL 490 ENGINE.

through its various stages of manufacture.

Directly across the floor from the frame riveting department, the "490" model motor is assembled. Fig. 2 illustrates clearly an assembler at work on one of these engines. The motor is assembled with great care, and is carefully inspected at a later stage of manufacture.

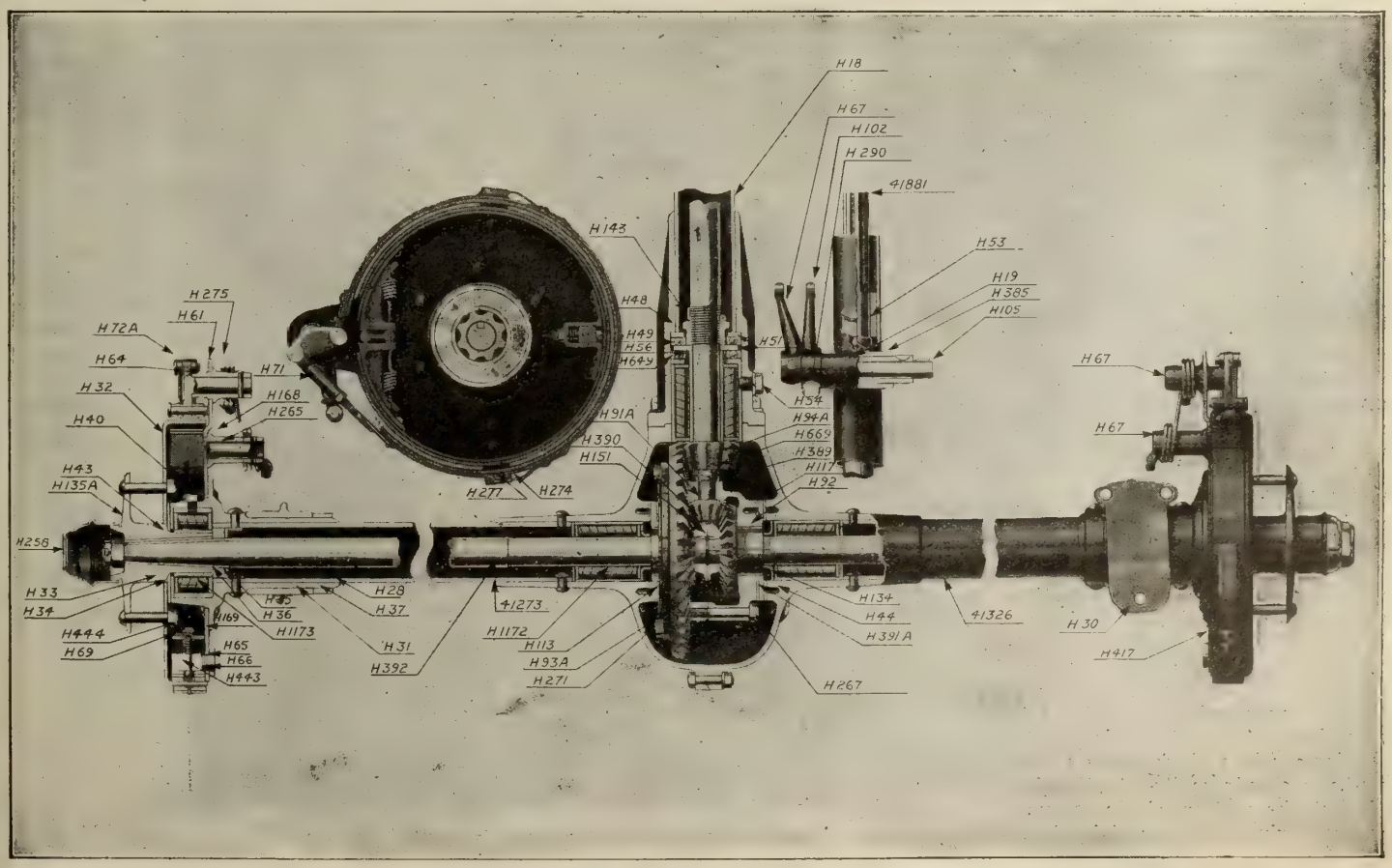
These motors now go to the same department as the frames, where the motor is assembled to the frame. They now pass on a little further (in fact merely a distance of the length of the truck).

Motion Study

It will be noticed that while speaking of these various steps, the words "pass on" are used quite a bit. In reality this is what actually happens, for each assembler right down the line has his particular portion to assemble, after which he gives the truck a push one length ahead to the next assembler, and so on. Each movement is carefully thought out in order to reduce lost motion to the minimum. In this way better work is accomplished, for each man becomes a specialist in his own particular operation, and his work is likewise more speedy the longer he stays at it.

Production soars by the adoption of this modern method of manufacture, in fact a car of such a standard as the one described could never be turned out for the money they now sell at were it not for this study of motion and operations.

The muffler, starting gear, underpan, drip pan, radiator, coil distribution tank, tire carrier, etc., are now assembled, after which the frame is inspected, and all necessary parts filled with oils and grease. The framework, or chassis, as it is often called, now looks like the view shown at Fig. 3.



DETAILED VIEW OF REAR AXLE ON THE MODEL 490 CAR.

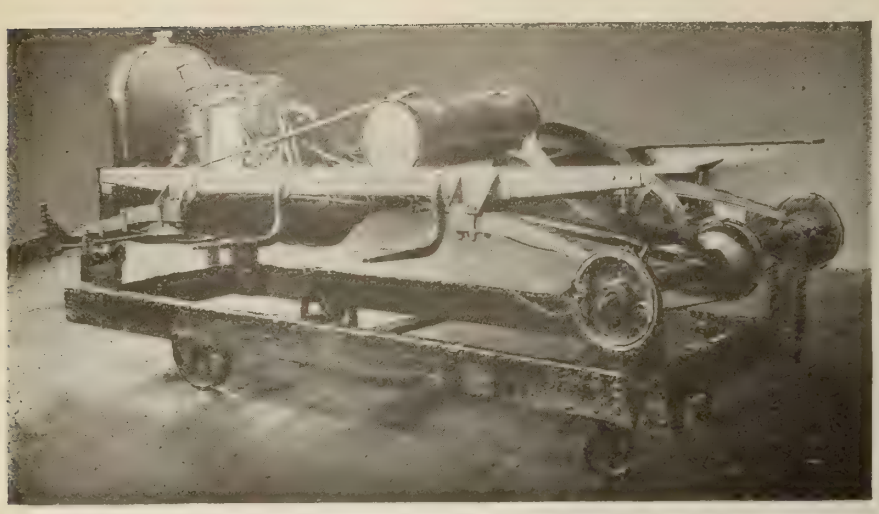


FIG. 3—MODEL 490 CHASSIS JUST BEFORE IT ENTERS THE AIR GUN PAINTING CHAMBER

Air Gun Painting

The chassis now goes into a special painting chamber, where it is painted by means of an Aeron air gun. This method produces a good, even, penetrating coat of paint, at the same time speeds up the work. When we mention that the operator takes only 10 minutes to paint one of these chassis, readers can get some idea of the speedy work. The photograph at Fig. 4 gives one a good conception of this operation. The doors marked A and B in this photograph swing open after the chassis is painted, when the operator pushes the truck through these doors into the drying oven. Here they go through a drying process, which takes approximately 45 minutes for the frame to pass from one end of the oven to the other.

The Mounting Department

As they come from the other end of this oven the frames enter into what is termed the mounting department. Here they go through various steps of assembly as follows: the bodies are lowered through an aperture in the floor above on to the chassis, when both body and frame are carefully assembled. These bodies are lowered through the floor in a finished condition, having been previously assembled in another department.

Later in this article we shall describe how these bodies are assembled, but for the present we will stick to the routine of operations of the car on its way to completion.

Let us, however, just for a moment, describe the novel way these bodies are lowered.

At certain distances along the second floor there is built areaways or openings through the floor. Of course they are protected from the danger of falling through by means of a built-up partition all around the openings. At each opening is placed two one-quarter ton Morris air hoists, which are so arranged that they will swing even more than the limits of these openings, a hoist being placed at both sides of the hole. In this way bodies can be picked up from either sides of the opening without difficulty.

It is but the matter of a moment to pick up a body, for a special sling is constructed from ordinary pipe, and arranged with quick action catches, so that the description really takes longer than the actual operation of picking up a body, swinging it over the opening, and lowering on to the frame. Next the fenders, running boards, aprons, or skirts as they are sometimes called, are assembled. After this has been completed the car appears as shown at Fig. 5. (Note: This photograph illustrates the F. B. model.)

Final Assembly

The final assemblers now get to work, and go all through and around the car, putting everything in proper shape. The wheels, with tires in place, are now assembled, after which the car is run up on a raised runway as shown at Fig. 6 (also the F. B. model).

Here various other adjustments are made, when the now nearly completed car passes on to still another step. The cover is next placed on the body, after which a final assembly inspection of the now completed car is gone through.

From this point the cars are taken to the test department, where every car undergoes an actual road test before being passed as O. K. Should a defect of any nature show up, the same is remedied at once, and another road test is gone through. In other words, the car must prove on its road test that it is in first-class condition, otherwise the inspector will not pass it for shipment.

It is now forwarded to the shipping department, where it is later placed in the box cars (if the distance warrants such a procedure) and carefully packed and fastened in place. Should the destination of the cars be within a radius of say 100 miles, the cars are usually driven over the road, in place of sending by train. Of course readers can understand that this is a matter which varies, depending on conditions.

As we have now, so to speak, completed the process of assembly, let us consider various other points of interest in the manufacture of different portions of this car.

The Bodies

It is an extremely interesting trip for one to pass through the body assembling building, for here we see various shaped pieces of wood, which, in their raw state, look very unlike automobile bodies indeed. But in a re-

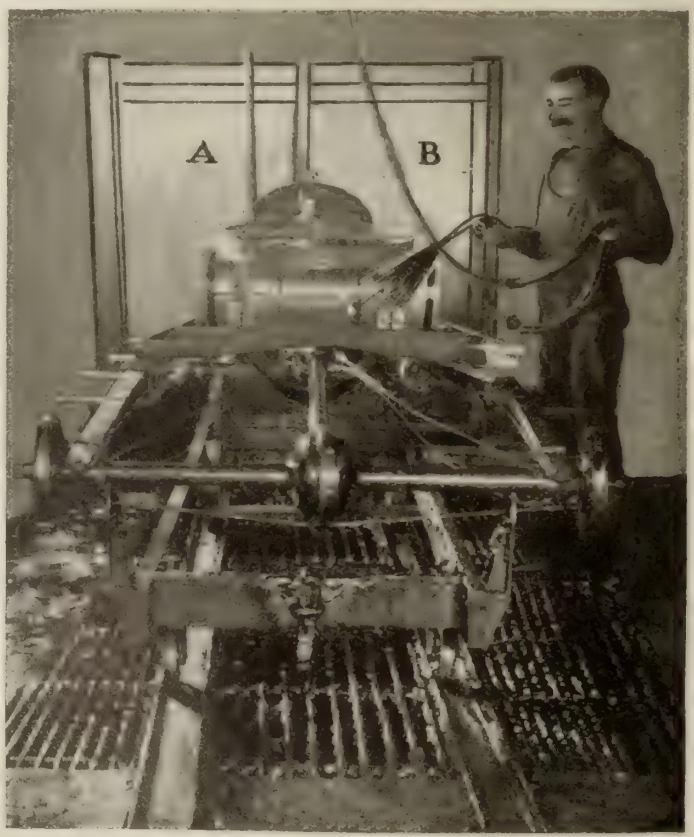


FIG. 4—THE MODEL 490 CHASSIS BEING PAINTED BY THE AIR GUN PROCESS.

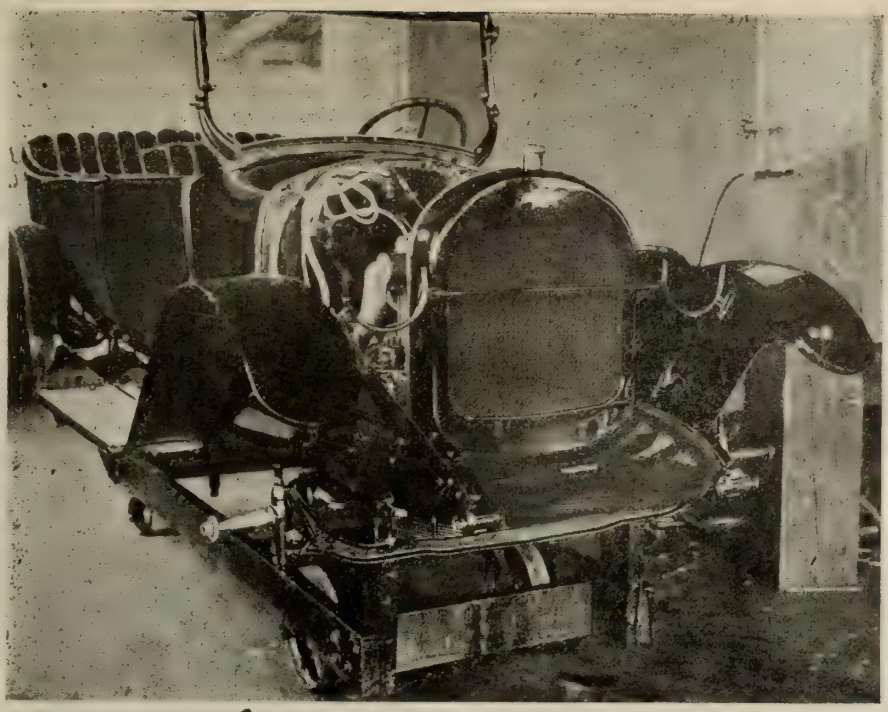
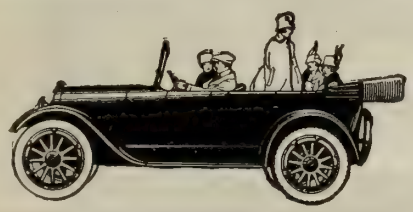


FIG. 5—THE MODEL F.B. CAR IN FURTHER PROCESS OF ASSEMBLY.

markably short time, what a change is seen! Pieces match together almost like magic, and before very long we have a



GENERAL APPEARANCE OF CAR MODEL F.B.

complete wooden framework, of which even the novice could safely venture to say, "That's going to be a body for an automobile."

The next stage is the metaling of the framework, that is the sheet steel coating or covering is carefully nailed on in place. Every stage now improves the body's appearance. The latches, and all other little attachments, doors, etc., are next added.

The upholstery is later installed, and Fig. 7 will give readers a sort of general idea of a small portion of this department.

Welding the Body

Before passing on to any further operations on the body, the writer feels that special mention should be made of the photograph shown at Fig. 8 which illustrates the worker busy welding together the back portion of the body to the side wings, that is the side portions covering the rear seat portion of the car. A special holding jig, as shown, has been made for this purpose, and this scheme has increased production of this work to a wonderful extent. Readers will notice that the photo shows the torch in actual operation.

Painting the Bodies

While it will be impossible to go into the painting in detail, we can at least touch on the various steps of operation, which will illustrate the care that is put on these bodies in order to produce a finish that will stand up under the various weather conditions and rough usage, such as practically all automobile bodies must go through.

First the body is washed with benzine and rubbed down with emery paper, after which a coat of oxide primer is applied. They are now sanded, next colored, then once more re-sanded.

A coat of outside body color varnish is now applied, after which they go through what is termed the Floco process. This Floco, as it is called, is a sort of hollow brush (if one can use such a term) which, on being operated, produces a steady flow of whatever material is being used. On the operation spoken of, the body is Flocoed with green varnish.

They now go to the drying ovens, after which they go to the trimming shop where the black line is painted on at the top of the body, which, to use the shop term, is called "cut-off." They are also striped at this department. To those familiar with the painted appearance of this car, the above remark is self-explanatory, but for the benefit of others it might be best to explain that there is a thin white line carried all around the body portion of the car. This is what is termed striping.

They now go to the finishing room, where they are washed with a mixture of gasoline and water, and lastly, Flocoed once more with a finish coat of varnish.

The advantage of this method is self-apparent, for no brush marks can result from such a finish coating. The bodies for this operation are placed over a huge tray, which catches the overflow material, for to watch the steady flow of varnish which is run carefully all over the body, readers can readily understand the excess material is bound to drip off. For this reason the tray spoken of is absolutely essential.

After being allowed ample time for dripping they are placed in the drying ovens, after which they are complete for the final assembling of the body.

Building the Top

Referring to Fig. 9, which illustrates

FIG. 6—THE MODEL F.B. CAR NEARING COMPLETION.

FIG. 7—A VIEW OF A SMALL PORTION OF THE ULPHOLSTERY DEPARTMENT.

one of the Baby Grand covers in process of assembly, it will be noticed that these tops are built on a specially constructed framework. The design, as shown, is exceedingly simple, yet such a stand speeds up production to a wonderful extent.

First the bows, as they are called, are assembled, then the Vizor pads, both right and left. Next come the stringers, back curtains, deck, front and back, then the finishing of the raw edge, that is, the complete appearance of the top when finished is in keeping with the rest of the car.

Assembling the F. B. Model

In order to give readers an idea of the motor and transmission assembling for the F. B. car, we illustrate at Fig. 10 two assemblers at work putting this engine together. This photo is practically self-explanatory.

Before closing this description of the Chevrolet plant, perhaps readers would be interested in reviewing the specifications on both the 490 and F. B. models in order to draw a comparison between their sizes, etc., so the following are their chief specifications, which will at least point out the other details of construction which were hardly practical for the writer to touch upon.

Specifications for Model 490 Touring

Motor: Four-cylinder, valve-in-head type, 3 11/16″ bore, 4″ stroke.
Cylinders: Cast en-bloc (including upper half of crank case). Head detachable.
Valves: 1½″ diameter.
Connecting Rod Bearings: 1⅜″ diameter. 1⅞″ long.
Crankshaft Bearings: Front, 1⅜″ diameter, 2 5/16″ long; Center, 1 21/32″ diameter, 1½″ long; Rear, 1¾″ diameter, 2 11/16″ long.
Camshaft Bearings: Front, 1 5/16″ diameter, 2⅜″ long; Center, 1 9/32″ diameter, 2″ long; Rear, 1¼″ diameter, 1 7/16″ long.
Oiling System: Splash, gear pump and individual oil pockets. Oil pressure gauge.
Carburetor: Zenith improved double jet.

FIG. 8—A CLOSE-UP VIEW OF THE WELDING FIXTURE FOR BODIES.

Ignition: New improved Remy.
Clutch: Cone type with adjustable compensating springs.
Transmission: Selective type, sliding gear; three speeds forward and reverse.
Cooling: Water pump; radiator extra size.
Front Axle: Drop-forged I-beam.
Rear Axle: Three-quarter floating, wheel bearing carried on the wheel-hub and in axle housing, not on axle shaft. Hyatt roller bearings.
Brakes: Emergency, internal expanding type; service, external contracting type 10″ brake drums. Foot control.
Wheels: Wood, artillery type, demountable rims, large hub flanges.
Tires: 30″ x 3½″, non-skid on rear.
Drive: Left side; center control; spark and throttle under steering wheel. Foot accelerator.
Steering Gear: Spur and gear, adjustable for wear. 15″ steering wheel.
Springs: Semi-cantilever, front and rear.
Body: Five-passenger Touring Car.
Wheelbase: 102″.
Equipment: Electric lights and starter, highest type two-unit system, single wiring used. Complete lamp equipment, mohair tailored one-man top, top cover and side curtains; tilted windshield; speedometer; electric horn; extra rim and carrier on rear; complete tool equipment, including pump and jack. Foot rest, robe rail, pockets in each door.

Specifications of Model F. B.

Motor: Four-cylinder, valve-in-head type, 3 11/16″ bore, 5¼″ stroke.
Cylinders: Cast en-bloc with upper half of crank case. Head detachable.

FIG. 9—ASSEMBLING THE MODEL F.B. TOP.

Valves: 1½", enclosed.
Connecting Rod Bearings: 2⅛" x 1½".
Crankshaft Bearings: Front, 2 11/16 x 1½"; Center, 2" x 1 31/32"; Rear, 3½" x 2".
Center Main Bearings: Doehler bronze black.
Crankshaft Bearings: Front, 2¼" x 1 9/16"; Center, 2" x 1½"; Rear, 2" x 1 15/32".
Oiling System: Gear pump. Oil pressure gauge on dash.
Carburetor: Zenith improved double jet.
Electric System: Auto-Lite generator, starting motor, and lighting system. Two-unit type.
Ignition: New improved Remy system.
Clutch: Cone, leather faced, with adjustable compensating springs.
Transmission: Selective type, three speeds forward and reverse.
Front Axle: Drop-forged I-beam with integral yokes. Wheels fitted with New Departure ball bearings.
Rear Axle: Three-quarter floating type. Shafts run on Hyatt roller bearings.
Cooling: Water pump; radiator extra size.
Brakes: Service, external contracting; emergency, internal expanding (hand-controlled); 12" brake drums.
Springs: Front, semi-elliptic; rear, semi-cantilever.
Tires: 33" x 4", non-skid on rear. Plain tread on front.
Drive: Left side, center control.
Steering Gear: Worm and gear wheel, 17" steering wheel with inserted spider.
Gasoline Supply: Seventeen-gallon tank hung on rear, with gauge. Stewart vacuum system.
Wheelbase: 110".
Equipment: Electric lights and starter; highest type two-unit system, single wiring used. Complete lamp equipment, including headlight dimmers; electric horn; speedometer; demountable rims, with extra rim; tire carrier; license holder.

In conclusion, let us for a moment consider production figures. A year's production at this plant means twenty thousand completed automobiles, which give one a real idea of the splendid system and routine which has been installed. The gentleman who accompanied the writer on his trip through this plant remarked: "Yes—and we will no doubt do still better as time goes on," which shows clearly, that although this plant is run on a good systematic basis, still the watchword is "Increased production" all the time.

Perhaps at a later date CANADIAN MACHINERY may be able to secure valuable material for their readers in regards to the cost and production system as employed by this up-to-the-minute concern.

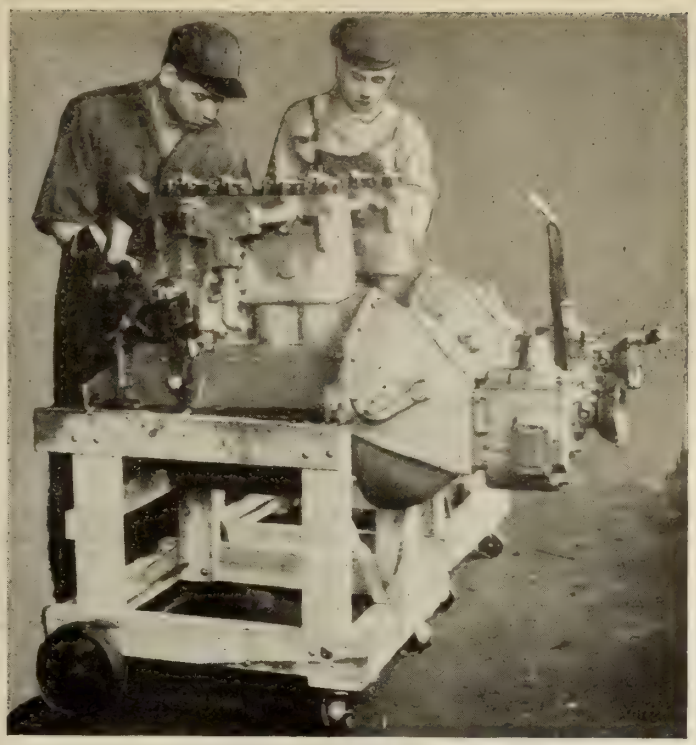


FIG. 10—ASSEMBLING THE MODEL F.B. ENGINE.

The Electric Furnace and the Non-Ferrous Metals

The Following Paper Was Read by the Author Before the Cleveland Engineering Society on March 11. The Utility of the Electric Furnace for the Melting of Non-Ferrous Metals and Their Alloys is Clearly Developed

By E. F. COLLINS, General Electric Co.

Continued from June 19th issue

IN fact even though melted under a charcoal cover and CO blanket, copper needs a deoxidizer to free it completely from oxygen. The above troubles should not appear in connection with electric melting, since the furnace chamber may be kept uncontaminated and free from oxygen and injurious gases.

Fifth Source of Melting Loss

Loss of zinc is proportional to the temperature and length of time a metal is held at the high temperature. This statement means that if you melt one charge at the rate of 100 lbs. per hr., and the second charge at the rate of 200 lbs. per hr., then, all else being the same, the melting loss of second charge will be less than the first charge. Electric methods of melting lend themselves to much quicker melting or higher melting rates than with fuel fired furnaces, viz., melting rate electric, 1,500 lbs. per hr.; fuel fired, 1,500 in 2¼ hrs.; 600 lbs. electric in ½ hr.; fuel fired, 600 lbs. in 3 hrs.

Determination and Measurement of Metal Loss

Metal loss in melting is ordinarily best judged from chemical analysis of metal charged. This test eliminates errors arising from furnace wall absorption or the reverse, also losses in pouring.

To show the inconsistency of actual recovery methods of loss test, the following results of comparative tests on coal fired crucible furnace and electric furnace (crucible capacity 250 lbs., electric furnace capacity 1,500 lbs.) are presented. Metal was poured from crucible direct, whereas auxiliary ladle was used to pour 1,500 lbs. electric furnace, giving chance for more loss in pouring.

METAL RECOVERY TEST
(Actual test on Red Brass.)

Metal Charged	Metal recovered	% Loss	Type Furnace
1 heat 1500 lbs.	1465 lbs.	2.33	Electric Tilting
1 heat 1500 lbs.	1484 lbs.	1.07	Electric Tilting
4 heats 250 lbs.	980 lbs.	2.00	Coal fired crble.
4 heats 250 lbs.	990 lbs.	.85	Coal fired crble.

Chemical analysis for melting loss on the same electric furnace, and same metal showed approximately .4% Zn. loss.

Analysis of metal charged:—

S.N.	Pb.	Cu.	Zn.	Fe.
4.30	6.55	80.80	8.02	.25
4.29	6.60	81.46	7.61	.25
(Poured ele.)		(No charcoal.)		

ACTUAL TEST (YELLOW BRASS) ELECTRIC FURNACE.

Metal Recovery Test.

Metal Charged	Metal poured	Loss
600 lbs.	590 lbs.	1.6 %

Analysis Metal Loss.

Charged Cu. 70	Zn. 30	
Poured Cu. 71.3	Zn. 28.6	1.4 %

ELECTRIC FURNACE MELTING PHOSPHOR BRONZE.

Metal Recovery Test (Actual)—
Metal charged, 2696 lbs.; metal poured at 1100° C, 2656 lbs. Loss, 1.4%.
Metal charged, 3727 lbs.; metal poured at 1200° C, 3678 lbs. Loss 1.3%.

Physical Test of Metal—
Open flame oil furnace and electric furnace melting same brass.

	Elec. Furnace	Oil Furnace
Ten. Strength	27900	24969
Yield Point	10844	9850
Elas. Limit	7300	7000
Elong. in 2"	19.4%	16.9%
Elong. in 8"	17.2%	14.9%
Red. Area	21.4%	19.7%
	Crucible Furn.	Elec. Furn.
Ten. Strength	30250	30820
Elas. Limit	17833	18000
Elong.	16.14%	19.37%
Red. of Area	16.1%	22%

Tables 3, 4 and 5 show performance on the average to be expected from the use of the electric furnace with the furnace charge in different physical form, etc. Table 6 shows like results for fuel fired furnaces.

TABLE NO. 6.
Average Melting Results, Realized in the Average Foundry with Fuel Fired Furnaces.

Type	Furnace Draught	Fuel Kind	Per Ton.	Metal Loss	Red Brass Low Zn. 10% Yellow " High Zn. 10% above
Pit	Nat.	Coke	1400 lbs.	3.5	Red Brass.
			1000 lbs.	5	Yellow Brass.
Pit	Forced	Coke	700 lbs.	1.5	Red Brass.
			600 lbs.	2	Yellow Brass.
Tilting	Forced	Coke	600 lbs.	1.5	Red Brass.
			400 lbs.	2.5	Yellow Brass.
Pit	Nat.	Coal	1200 lbs.	3.5	Red Brass.
			700 lbs.	5	Yellow Brass.
Reverb.	Nat.	Coal	900 lbs.	6.2	Red Brass.
			400 lbs.	10	Yellow Brass.
Pit	Bumers Tangentail	Oil	50 gal.	1.5	Red Brass.
			40 gal.	3	Yellow Brass.
Tilting	Open Flame. Atomizing Bumer.	Oil	60 gal.	3.2	Red Brass.
			45 gal.	3.5	Yellow Brass.
Tilting	Bumers.	Nat. Gas	4800 cu. ft.	2.75	Yellow Brass.
Crucible	Tangentail.				
Tilting	Bumers.	City	7000 cu. ft.	2.75	Yellow Brass.
Crucible	Tangentail.				

TABLE NO. 3.
Nonferrous Metals Melted in Electric Furnace.

Metal	Condition of Metal Charged.	State of Metal After Melting.	KW. hrs per Ton to melt.	Metal loss in melting.
Copper	Electrolytic Cathode Pig Scrap—Heavy. Scrap—Light. Scrap—Dirty. Chips—Oily. Chips—Clean.	Pig at pitch without rabbling or poling Wire bar. Foundry Castings.	300 to 500	No oxidation; a certain amount of copper oxide is reduced.
Zinc	Electrolytic Cathode Pig. Punchings. Chips. Heavy scrap	Pig. Foundry castings. Billets for rolling. Battery electrodes.	90 to 120	Dross and Oxidation under 2%.
Nickel	Shot. Bar. Scrap.	Pig. Foundry castings. Billets for rolling.	500 to 750	No oxidation loss.
Alum.	Pig. Scrap. Punchings. Turnings.	Pig. Foundry castings. Billets for rolling.	400 to 750	Less than 1% oxidation.
Tin	Bar. Pig. Scrap.	Bar. Pig. Wire.	40 to 60	No oxidation.
Lead	Pig. Scrap. Sheet.	Billets for rolling. Casting. Pig.	20 to 40	No oxidation.

TABLE NO. 4.
Nonferrous Alloys Made in Electric Furnace.

Metals	Condition of metal charge.	State of Alloy after melting.	KW. hrs. per Ton.	Metal Loss.
Red Brass— Cu. 80 Zn. 10 Sn. 6 Pb. 4	Scrap pig, electro. cathodes. Scrap—bar. Scrap—pig.	Foundry castings. Wire bar. Billets.	250 to 400	.25 to .7, depending upon manipulation of furnace.
Yellow Brass— Cu. 60 Zn. 39.5 Pb. 00.5	Scrap, Pig, Electro. cathodes. Scrap, Pig.	Foundry castings. Wire bar. Billets for rolling.	220 to 350	.50 to 1.5.

TABLE NO. 5.

Alloy.	Condition of alloy charged.	State of alloy after melting.	KW. hrs. per Ton.	Alloy Loss	Temp.
Red Brass	Yellow brass and copper or Red Brass and Zinc Pig Scrap and sprues, turnings and chips.	Foundry castings. Wire bar. Billets.	225 to 300	.15 to .50	1300°
Yellow Brass	Red Brass and Zinc or Yellow Brass and Zinc Pig Scrap and sprues, turnings and chips.	Foundry casting. Wire bar. Billets.	200 to 275	.40 to 1.00	1100° C.
Monel					
Copper Nickel	Scrap and billets.	Foundry casting. Billets.	500 to 750	No oxidation.	1600° C.
Aterite Cu.	Sprues, Scrap. Ni. Virgin metal. Zn.	Foundry casting. Billets for Drawing Rolling.	500 to 750	2% zn. loss	1650° C. Out of 32%.

The results given in tables 1 to 4 are average figures and will be influenced to meet any particular foundry by (a) promptness of pouring, (b) temperature (since pyrometers are seldom used), (c) local conditions such as physical condition of metal charged, its cleanliness, volume of air and products of combustion which pass through the furnace in natural draught furnaces. This varies from day to day, depending on the weather, (d) design of furnace, (e) manipulation of furnace, (f) size of crucible, (g) percentage of composition, (h) length of working day, (i) whether observations are based on hot furnace and hot crucibles or whether first heat of the day is excluded, (j) pouring light castings require hot metal, and heavy ones metal at lower temperature, (k) whether results are from careful tests or whether they represent actual foundry or rolling mill practice and extend over a considerable period.

Chart 4 illustrates how a furnace able to turn out metals for 300 kw. hr. per ton, due to foundry handicap, averages only 350.

Cost of Melting Brass in Fuel Fired and Electric Furnaces

The speaker presents table as a resume of that which precedes it in the paper, relating to cost of melting brass per ton with the various typical fuel fired furnaces, and also with the electric brass melting furnace. This table is an average table and results for individual foundries may be readily found by substituting in the itemized costs those which obtain there, i.e., .5 cents per kw. hr. has been used as electricity or power cost, if this is 1 cent in plant under consideration then this figure should be substituted. Likewise other values may be converted to actual ones for an actual local condition. It is believed that the values used in this table are fair and represent well averaged conditions, and they may be considered directly without substituting for local conditions, in fact, in their direct form they allow of judging correctly of the general problem of electric vs. fuel fired furnaces.

Final

In conclusion permit me to present chart No. 1, made up from the other curves and tables. Here I have assumed that all the brass in the country is melted (1) in fuel fired furnaces, all types being employed equally, (2) that the same work is done in the electric furnace.

Four conditions are shown, viz.:

10-hr. day (1) melting yellow brass, (2) red brass, 24 hr. day, (3) melting yellow brass, (4) red brass.

The shaded portion of each wedge

Continued on page 12

Various Examples in the Art of Gauge Making

To Make a Good Gauge Necessitates Considerable Skill. Herein is Shown Various Examples of This Interesting Branch of the Machine Tool Industry

By H. G. ROBSON, A.M.I. Mech. E.

GAUGE-MAKING, the most highly skilled branch of engineering, should be a very interesting study to all students of engineering. It reveals an interesting amount of geometrical and mathematical knowledge, and a skilled worker, having acquired the latter, must necessarily possess an advantage when undertaking the design or construction of difficult types of gauges.

The following examples of gauge-making are more or less of a straightforward kind, and they have been chosen to reveal the modus operandi of the gauge-maker rather than the extent of calculations required. Nevertheless, these examples show many neat devices for executing work that may be generally regarded as difficult. In Fig. 1 a plate gauge is shown with a limit of ± .0005 in. In order to appreciate the beautiful principles of "limits," the nominal sizes, as given, should be worked to. The first step is to make a hob, as in Fig. 2, by which the gauges can be gashed or roughed out. To allow for distortion during the hardening and tempering of the hob all the diameters of it must be made so as to make the depths of the semi-circular parts of the gauge greater, and the width of the slots less than the nominal figure. A small plate gauge would have to be made, as in Fig. 3, for making the semi-circular portions of the hob. The hob is made hollow, and the outer ends of the hole are tapped for securing to a suitable holder. A portion is then ground away, so as to leave a face F radially, as in Fig. 2. If the hob is correctly made the cutting face will be a section plane passing through the centre.

The check piece must now be made to finish the gauges by. It is shown in Fig. 4, marked C, and its application to a gauge G is shown. When the gauge is finished, the surfaces of the check and gauge should be light tight. This test is made by placing the two parts in Fig 4 against a piece of glass, holding them to the light. The check has two pieces, marked 1, fitted into two slots, and securely held in the same plane to the body of the check by a cover plate. The two curved pieces must project above the body by $.082 + \frac{.15}{2} = .157$ in. The body of the check must therefore be made parallel to a measurement, say, 1 in. By measuring from the lower edge the micrometer should read 1.157 in. as shown. Considerable skill is required to make a check of this type. It is very rigid, and by modifying the cover plate with slots, the pieces 1 could be raised to give various heights above the top edge. The check should be a good fit to the gauges before they are hardened, otherwise it will be found difficult to secure that the surfaces are light tight.

The gauge in Fig. 5 reveals exceptionally interesting work. The check will appear as in Fig. 6. There are two pieces A and a third piece B securely held in the body of the check. Having decided upon the design of the check, the first step will be to find the breadth b, Fig. 6, of the piece B. In Fig. 7 the particulars are set out. We have

$1.05^2 = .689^2 + w^2$,

$\therefore w = \sqrt{1.05^2 - .689^2}$,

$\therefore w = .792$ in., and breadth $b = 1.584$ in.

It will now be necessary to make piece B, and it is important to have the two sides equidistant from the dotted centre line in Fig. 6. A disc—Fig. 8—is bored and lapped to 1.05 in. radius. A circular plate is then turned and lapped to 1.05 in. radius. A segment is then made from this disc so that its height, 1.739 in., corresponds to the one edge of piece B of the check. By applying a straight-edge to the faces in Fig. 8 observations may be made for final testing of these faces. The piece B is cut from the disc, and its width 1.548 in. is worked up from the true face first determined. It will now be necessary to true the bottom face square with the sides. The heights of pieces A of the check must correspond to the height A in Fig. 9. There is danger in working from this sharp edge, and the actual height of A is best found by finding B. By holding a lapped pin, as shown, the height C is given, and from it B is found. Assume $B = 1.14$ in., then $A = 1.14 + .361$ in. (Fig. 7) $= 1.501$ in., which is the measurement for the two pieces A in Fig. 6. Finally the overall heights in Fig. 6 must be checked from the base, because the inner face of the check is .4 in. and parallel to base. The top face, marked by measurements D, is then made so as to permit pieces A to project by .55 in. These pieces must be rectangular and fit tightly in the body of the check.

Interesting principles are embodied in the gauge shown in Fig. 10, which represents a plate gauge of three sizes, having the .43 in. measurement out of centre by .0015 in. The plate should be made parallel as in Fig. 11, so that A C and B D are 1.235 in. The faces shown by the dotted lines are then parallel to A B. The first measurement will be

$\frac{1.235 - .721}{2} = .257$ added to $.721 = .978$ in. The last size is $\frac{1.235}{2} + .0015 + \frac{.43}{2} = .834$ in.

The widths, .721 in. and .43 are then made from the true faces. As distortion may follow the hardening process, a check must be made so as to secure centrality of the first two sizes, and the amount of eccentricity of the .43 in. width. The check is shown in Fig. 12 applied to one side of the gauge. By making a parallel piece of plate, say, .704 in. wide, the other size can be found to give the correct position of the faces. This check cannot be used for the opposite faces, but they may now be tested by using the micrometer to determine finally the respective widths.

The gauge shown by Fig. 13 includes much work that is typical of the tool room. It is no simple piece of work, and requires a great deal of skilful manipulation. The work, when released from the drill jig, will be near to what is required, and the allowance upon the diameters of the .122 in. holes will then permit them to be worked up to their size, pitch and amount off the centre line. There are two .122 in. holes at right angles, having a pitch of .36 in., and situated .004 in. off the centre line of gauge, and .331 and .691 in. respectively from one end face. It is proposed to use a jig for drilling purposes, as in Fig. 14. There are two bushes, A and B, for drilling in from one side, and two others for meeting these holes in the centre. The hole in the block should be gauge size, so that the gauges will be securely held by fitting tightly. The first step will be to make the faces C D, D E, E F, F C at right angles to each other and true and square with one end face. It will be necessary to have the edge of the square for testing in good condition, and it may be necessary to finish it off by oil-stoning. One face for measuring from is made at right angles to the axis of the hole by securing a gauge mandril in the jig block, as in Fig. 15, and testing. The next step is to find the position of the centre punch marks for drilling holes for bushes B. The block is lettered to show clearly the method adopted. First the height of the centre of the hole for gauges above the base F E is found. By using small plate gauges with a slight taper under the parallel mandril, as in Fig. 16, and adding the radius of the mandril to that measurement, the position of the axis is located. A counter check of this position should be made, as in Fig. 17. Place a small lapped pin in the hole, and by the micrometer ascertain measurement B. From this deduct the diameter of pin, and height A is found. This height added to the radius of the mandril should agree with the previous measurement. Let us assume that this height comes to 1.238 in., as in Fig. 16. As the hole is .004 in. off centre in

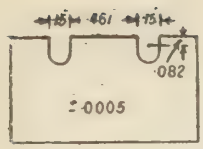


Fig. 1.

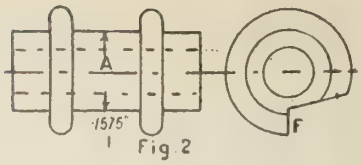


Fig. 2

Fig. 3

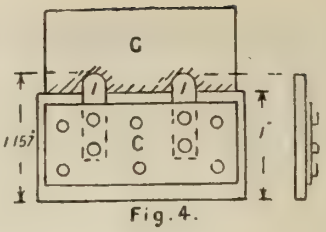


Fig. 4.

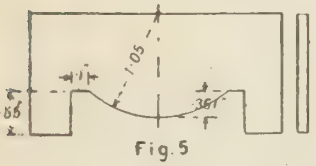


Fig. 5

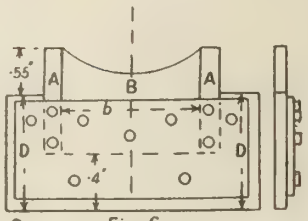


Fig. 6.

Fig. 7.

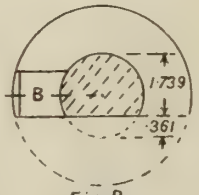


Fig. 8.

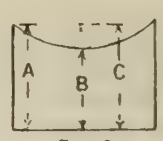


Fig. 9.

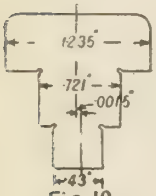
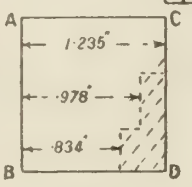


Fig. 10.



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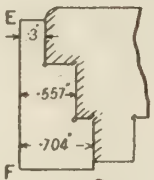


Fig. 12.

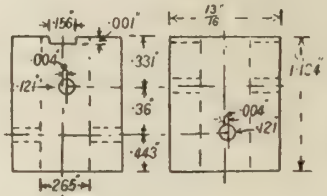


Fig. 13

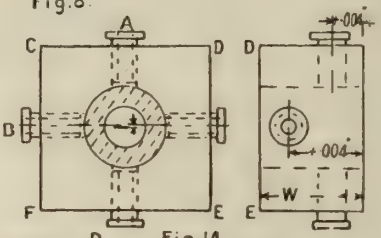


Fig. 14.

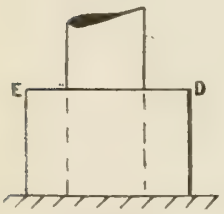


Fig. 15.

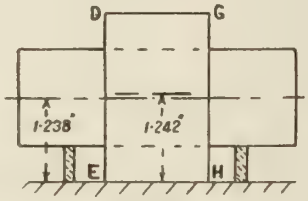


Fig. 16.

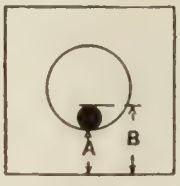


Fig. 17.

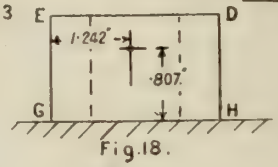


Fig. 18.

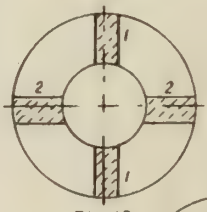


Fig. 19.

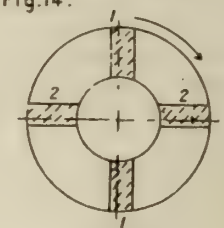
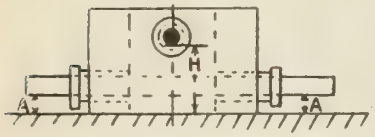


Fig. 20



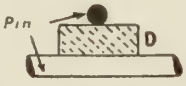


Fig. 22.

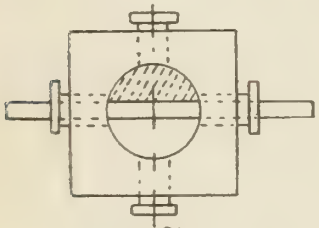


Fig. 21.

Fig. 24.

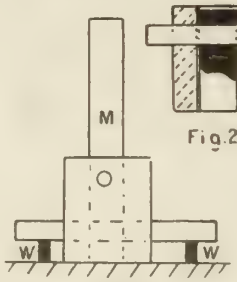


Fig. 23.

Fig. 25.

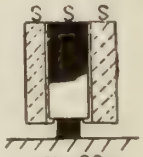
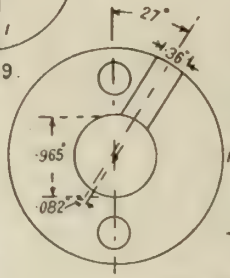


Fig. 26.



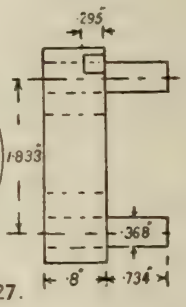


Fig. 27.

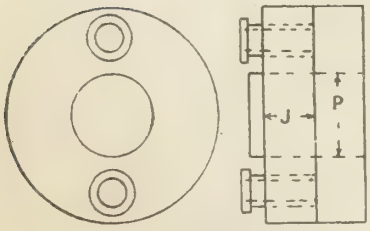


Fig. 28.

Fig. 32.

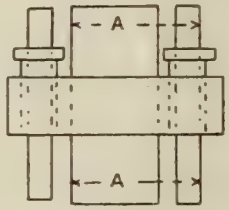


Fig. 29.

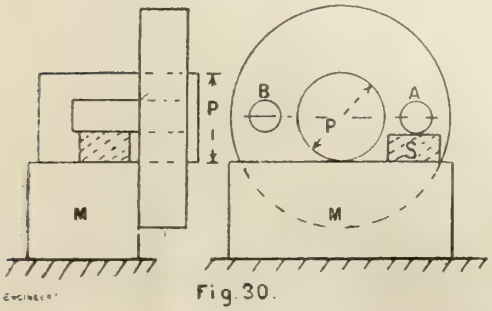


Fig. 30.

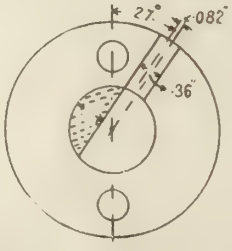


Fig. 31.

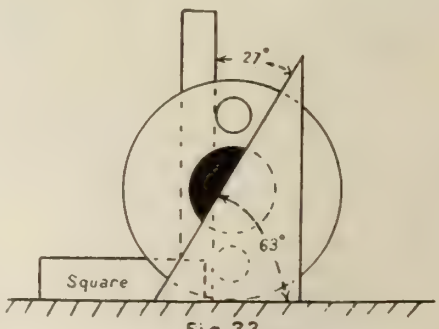


Fig. 33.

SKETCH SHOWING FIGS 1 TO 33.

Fig. 13, the height in Fig. 16 will correspond to 1.238+.004=1 242 in.

By the aid of a magnifying glass, and using a scribing block and steel rule, a line is marked at this height upon the end faces—that is, D E and C F. The position of the centre punch along this line in Fig. 16 is .443 + .36 = .803 in. from line G H. In Fig. 14 .004 in. are being allowed for finishing the end faces of the gauges, therefore the measurement becomes .807 in., and is marked off as in Fig. 18, but upon the two faces opposite each other. Here again a magnifying glass and a rule divided into hundredths of an inch should be used. Whilst the block is in the position shown in Fig. 18, a line for the pitch of the holes should be marked. The holes are .36 in. apart, therefore the next line will be .807 in. —.36 in. = .447 in. This height can now be marked off, but upon the faces C D and E F, at right angles to the faces, already marked. The face C D should then rest upon the face plate, because the holes now being dealt with are shown .004 in. off centre line in the plan of Fig. 13. This is important, for it is possible to secure that the .121 in. holes shall be .004 in from the centre lines, but by a slip the relative position of the slot may be incorrect. This effect can be better understood by reference to Figs. 19 and 20. Fig. 19 shows a plan of the gauge where the holes should be. In Fig. 20 hole 2 is shown drilled the other side of the centre line. If Fig. 20 is turned 90 deg. in a clockwise direction, the position will correspond with Fig. 19, but hole 2 for that position must be near the end where the slot is. If the gauges were not corrected at once they could not be saved, even if the ends, as it were, were changed over. The intersection of the marked lines having been marked by a centre punch, the mark should be re-examined by a glass to see its position more clearly, and any adjustment, if necessary, made. Four holes can now be drilled in from the positions on the faces. The diameter should be about .004 in. less than the finished size., viz., .117 in. The holes should now be enlarged by a pilot drill, so that there is about .1 in. of metal at the bottom of the enlarged hole. Bushes are turned as shown, their holes being .117 in. diameter. A slight lead upon the diameters of bushes is helpful. There is sure to be some adjustment necessary, even though accuracy has been the aim of the jig worker. By applying ground pins .117 in. diameter. it will be seen how the axes of the bushes are situated, and, finally. the pins should point correctly, be parallel to base as at A and H—Fig. 21—and be correctly set off centre .004 in. The gauges are 13-16 in. external diameter, but owing to precision required they are turned .8125 in. diameter. A segment piece about 2 in. long is then made to the shape shown in section in Fig. 21. Its thickness varies by .0005 in. throughout its length. Its mid-thickness will be.

$$\frac{.8125}{2} - \frac{.117}{2} + .004 = .40625 - .0625 = .34375 \text{ in}$$

This is the radius of the hole in the jig less radius of pin plus amount off centre. It will be found a little difficult to arrange the bushes so that their positions are properly situated, although in Fig. 21 the method shows that the bushes are located for position by measuring a reasonable distance from the centre of the jig. After all, it is the position of the pins in the centre hole—.8125—that really matters. So, while it is practically convenient to measure outside the jig, yet the pitch of the pins can be tried near the centre by placing in the jig a disc made the measurement between the inner surfaces of the pins. In Fig. 22 this disc D is shown resting between the pins.

Having made the jig correctly, it will be very necessary to turn the gauges carefully so that the .263 in. hole is concentric with the outside surface. As a matter of fact, one mandril for turning the gauges upon it is not sufficient. It is found during the roughing stage that the mandril springs, and often, if not hardened, take a permanent deflection It is therefore the better plan to remove th final .01 in. by using another mandril. It should be remembered that there are so many points that should finally agree when the gauges are finished that any small errors in the jig or in the preparatory stage of the gauge should be at once corrected. It is the cumulative effect of several little errors that often makes a straightforward piece of work an exceedingly difficult one.

The drilling will have to be executed by specially turned drills. A flattening drill is first used, a centre drill then follows, and then the drill .005 in. less in diameter than the centring drill makes the holes in the gauges. A series of pins, ranging from .004 in. less than the finished-size holes, by one-thousandth to .12 in., is now required. During the drilling stage the .263 in. hole should be plugged in all cases. After the gauge is drilled, one of the series of pins should be placed in the gauge. Then by means of the rimers the position of the holes are determined, as regards pitch and amount off centre. The distance of the end of gauge from pin is finally made by working the end face up, so that mandril M in Fig. 23 is square with base and the heights W agree. Having made one gauge carefully, a centre plug should be made so as to fit in the gauge upon one pin. The end face of this plug should be lapped so as to be level with the end face, as shown in Fig. 24. The end faces can then be determined by this plug more correctly than from the outside of the gauge. When one face is determined, the length of 1.134 in. can be made. With regard to the slot, it is necessary that the centre line of the .263 in. hole should coincide with centre line of slot, and the slot be parallel to the hole near it. By using the segment piece—as in Fig. 25—it can be calculated how wide the slip S will have to be so as to come to one side of the slot and fit in position. As soon as one side is finished, the slot is then made .156 in. wide by another slip. This arrangement also secures the slot being parallel to the hole near it. The slot is .011 in. deep. A gap gauge to fit over the slot and bottom of gauge is not a neat enough check. A better plan is to make a plug to fit inside the gauge so that it is (1.134 —.011) = 1.123 in. long. By inverting the gauge and supporting it so that the plug rests upon a level with slot—as in Fig. 26—the depth of slot can then be tested. The slot is .011 in. deep when the three surfaces S are level. The gap gauge mentioned would be 1.123 in. wide, and could advantageously be employed to test parallelism, whilst the depth is being worked up.

A different type of gauge is shown in Fig. 27. Here there are two .368 in. pins projecting .734 in. above the face of the disc. They are situated upon a centre line of the .965 in. hole. A groove .36 in. × .295 in. deep has its axis inclined at 27 deg. to the axis passing through the pins. The centre line of the slot is .082 in. off the centre of the .965 in. hole. The jig will consist of a ring—as in Fig. 28—having a .965 in. hole. When in use a .965 in. plug secures the jig and gauge for alignment. In making the jig, the holes are carefully marked off, enlarged and then bushed. By placing pins in the bushes —as in Fig. 29—the radial distance of centres can be tested by finding the measurement A. In addition, tests must be made for determining that the centre line of the pins passes through the centre of the .955 in. hole. The arrangement shown in Fig. 30, although used for testing the pin holes after drilling, can be used also for testing the holes in the bushes. Here the gauge is supported up against the true block M by a .925 plug and the face of gauge. The slip piece S is made to its correct size. viz.,

$$\frac{.965}{2} - \frac{.368}{2} = .2985 \text{ in.}$$

When the pin B is correctly situated on the centre line, another slip, the same size, must just fit—as is shown for pin A. In order, therefore, to determine correctly the position of the pin holes, the holes must first be drilled .004 in. smaller than finished size. This is not a large amount, since the gauge is .8 in. thick, and if the holes are not square it is possible this allowance may be used up without assuring that the holes are square to the face. In addition to this, the measurement corresponding to A in Fig. 29 must be noted, as the pin hole is gradually enlarged to its final size. The enlargement is done in steps by using pins varying by .001 in. The position of the slot must now be determined. We first require the depth of the segment in Fig. 31 included between the .965 in. hole and one face of the slot. This will be

$$\frac{.965}{2} - \left(\frac{.36}{2} + .082 \right) = .4825 - .262 = .2205 \text{ in}$$

This segment must fit solid with a .965 in. plug shown in Fig. 32, by removing the metal as indicated. By this means the segment will occupy its position in a better way than if it were

separate. To use the segmental check piece, first place the two pins in the gauge projecting from the other face, and set them square—as illustrated in Fig. 33. The gauge should then be rigidly fixed, whilst the plug with the segment piece is placed in and twisted until the face of segment is parallel and touching the 63 deg. face of a set-square. Lines should then be marked on the face of the gauge, each side of the .965 in. hole. This enables direction of the face of slot to be easily found. The width .36 in. of the slot can now be marked off. The slot can be milled and finally ground, the face for the segment piece being finished first. The depth .295 in. can be found by making the depth of metal under slot .8—.295 = .505 in. by the micrometer. The height of the pins, .734 in., is found by making a washer to slip over the pins, and .734 in. thick. The end of the pins must be level with the washer face.

WOMEN AND STEEL ROLLING

By L. P.

The introduction of female labor in the Clay Wheel Rolling Mill at Wadsley Bridge has created some interest in industrial circles because it has always been held that the tasks in the mills are beyond the capacity of women, besides being unfit for them to do in many ways. The work done at the Clay Wheel Mill is of an exceptional nature, and far from being typical of general rolling such as is carried on in the Sheffield district. Consequently the experiment, however successful, does not possess much significance, and is not likely to be extended. We learn that the women are merely assisting in rolling 50 lb. billets into rods, and the work changes but little. Moreover, it is light, and comparatively simple. The conditions, in fact, are quite unusual. The work at the other mills, on the contrary, is not only extremely laborious for the most part, but highly varied, being often complicated, difficult, and dangerous, whilst a good deal of it requires a great amount of skill. It necessitates the handling of heavy pieces of red hot steel—a task which no girl could perform, nor should be allowed to do so if she were able. Such conditions necessitate the employment of a staff capable of dealing with the heaviest jobs. People in the rolling trade do not admit the practicability of diluting labor in the mills with women, and, indeed, few of the shops could be adapted so as to enable women to work in them in decency, safety and comfort. Moreover, no one having respect for our womanhood would care to see females working alongside men in rolling mills, where the coarseness of the prevailing manners and habits is notorious. Where the conditions resemble those at Wadsley, however, women may be employed without evil results, but authorities on the subject declare that such application does not come within the range of practical politics. Steel rolling is essentially men's work, and some people even think it is scarcely white men's work.

DRIVING BELTS

By M. E.

Many lose power and waste fuel because their driving belts travel far too slowly. This is readily appreciated by observing that the power transmitted by a driving belt (in h.p.) is found by multiplying the speed of the belt by the working tension, and dividing the result by 33,000. In other words, double the speed will give twice the driving power, and three times the speed will give three times the driving power, and so on.

For heavy drives, such as those used in brickworks, for all the main machinery the belts should run at an average speed of between 3,000 and 4,000 feet per minute, the higher figure being regarded as high by many engineers, yet satisfactory if the pulleys are properly aligned and the belt is cut truly and well made. In any case, the makers of the belt will usually advise as to the best speed at which it will run, and this speed should be made use of in planning or altering the machinery. If this is attempted it will be noticed how far short some of the well-known brickmaking machines are in this respect. For instance, a grinding pan will usually do its work most efficiently when the upright shaft with the runners makes about 25 revolutions per minute. With crown and pinion ratio of 8.1 this means that the driving shaft or pulley carrying the pinion must make 200 revolutions per minute. Assuming that this machine is belt-driven, with a 4 ft. pulley, the belt speed would be only 2,500 ft. per minute, so that to get the best results from the belt a pulley 6 ft. in diameter would be required.

In driving some brick machines of the ordinary wire-cut type, it is customary to use 3 ft. driving pulleys which make 18 revolutions per minute, lamentable waste of power being thus lost by the belt being run at far below its most efficient speed.

The main drive is often correspondingly faulty, particularly if a rope drive is used. Under ordinary conditions a rope works best at 4,800 feet per minute, which, on a 20 ft. driving pulley corresponds to 76 revolutions per minute, other sizes of pulley requiring equivalent revolutions.

The speed of belts is easily tested by making a chalk line about an inch wide across the belt and noting how many times in a minute the line passes a given spot, which can be readily seen at the same time as the belt. The number of revolutions multiplied by its length will give the velocity of the belt. Another method is to count the number of revolutions made in a minute by one of the pulleys carrying the belt and multiply by three and one-seventh times the diameter of the pulley in feet; this method is, however, open to the objection that the belt may slip on one or other pulley so that the speed of the belt and the pulley do not coincide as they should do.

It will be seen that a study of the speeds of the different belts in a works is well worth very careful attention, and where the speed can be increased to between 3,000 and 4,000 feet per minute without undue alteration in plant the change will be well worth while. It should be noted, however, that merely to increase the speed may be undesirable as it may result in speeding up some of the machines, and this may lead to disaster. As far as possible the standard rates of running the various machines should be retained, the increased belt speed being used chiefly in reducing the coal bill.

It sometimes happens that a belt is run slowly because at a higher rate it would run off the pulleys; in such a case the machines should be put into proper alignment by adjusting the bearings carrying them and the relative shafting. To run a belt slowly merely because it runs off the pulleys is unwarranted waste in these difficult times, and it ought to be stopped at once, especially as the adjustment is usually neither difficult nor costly.

The use of too narrow a pulley or too small a belt, or the improper position of the pulleys relative to each other, may also cause serious loss of power and therefore need periodic attention, and a little time spent in checking the sizes of the belts and the speeds at which they run, as compared with the really best dimensions and speeds will be well repaid, because it will show clearly wherein money is unexpectedly lost.

THE ELECTRIC FURNACE

Continued from page 8

shows the saving in total cost between melting with fuel and with electricity.

This chart stated in words and figures is as follows:

Furnace	Alloy	Length Melting day	Working day	Per cent. savings over fuel fired
Electric	Yellow Brass	10 hours		100%
Electric	Red Brass	10 hours		80%
Electric	Yellow Brass	24 hours		110%
Electric	Red Brass	24 hours		700%

These margins of savings are of such magnitude that we cannot longer doubt that the electric furnace is destined to dominate the brass melting field.

ANOTHER DRYDOCK FOR THE ST. LAWRENCE

The Leclair Shipbuilding Company, of Sorel, Quebec, are about to commence the construction of a floating drydock that will have a capacity of seven thousand tons. This will be large enough to float most of the vessels using the St. Lawrence River.

The company is busy at present on the construction of six steel trawlers and six 1,300 ton capacity wooden schooners, fitted with auxiliary engines.

WELDING AND CUTTING

Various Jigs as Applied to the Welding Trade

Some Examples of Welding Jigs and Methods for Overcoming Distortion Are Taken Up by the Author, Who Presented This Paper Before the British Acetylene and Welding Association.

By B. S. MILNE

AS I have, during the past ten years, been responsible for the manufacture and repair of innumerable articles by the oxy-acetylene welding process, I felt it to be my duty, as a member of this association, to respond to our president's call at the last meeting, and volunteer to write this paper relating some of my experiences regarding these operations. I have also written it with the hope that I may be imparting some useful information to the members, and that it may produce a great deal of useful discussion upon these matters.

I have chosen as my subject "Some examples of welding jigs and methods for overcoming distortion."

In my opinion the questions of jigging and overcoming distortion are, so far as new work is concerned, so intimately connected with what I shall call "design suitable for welding" that I shall endeavor in my examples to point out what I consider are, and what are not, "designs suitable for welding."

In repair work the question of design does not arise; that has already been settled by the maker of the article. All the welder is concerned with is the problem of overcoming distortion, or rather fracture, sometimes a very difficult problems. In repair work every job must be taken separately, on its merits, and here the ability of the individual welder to foresee his troubles, and take the necessary precautions, plays a great part, whereas I contend that, to obtain cheap and efficient production, in new work, the draughtsman is the man who should do most of the thinking, and he should produce a design, which, if properly jigged, can be welded by any operator capable of handling the blowpipe.

Prior to the war most Government departments looked upon oxy-acetylene welding as still in a somewhat experimental stage, only to be used on work of minor importance.

A number of engineers also looked upon it with considerable skepticism. The exigencies of war have wrought a miraculous conversion, and some of these reformed sceptics have recently let their zeal, for having everything welded, outrun their knowledge of "design suitable for welding."

In this matter of design, a great deal of education is still required by designer and draughtsman before welding can attain its full scope of usefulness. The vast majority of draughtsmen have not served their apprenticeship as engineers in shops where oxy-acetylene welding was used, so that they do not know the most rudimentary principles of welding, and, therefore, when setting out to design an article which is to be welded, they produce a design which makes the article unnecessarily liable to distortion, difficult to weld, expensive to produce, and infinitely less efficient as regards strength than it might easily be.

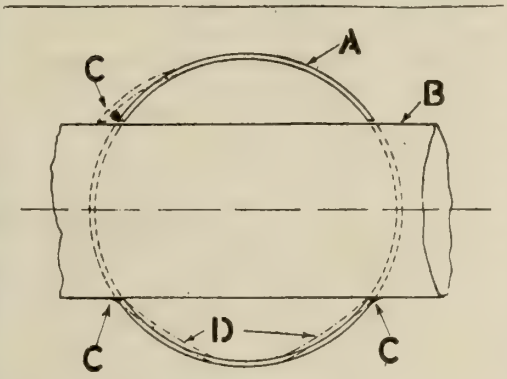


FIG. 1.

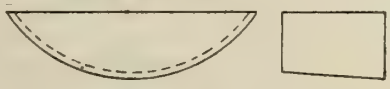


FIG. 2.

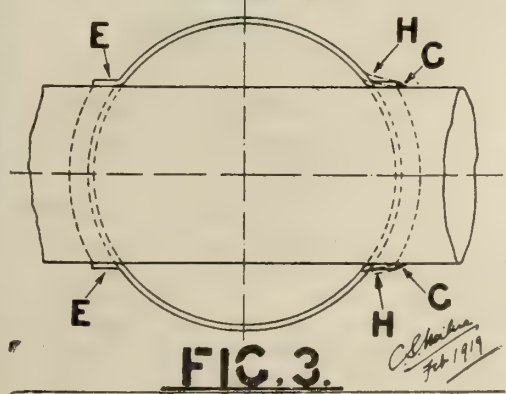


FIG. 3.

It is not my desire to try to absolve all welders from blame in the matter of failures in welded work, but in the manufacture of welded articles, in any ordinary commercial way, it is unfair to the welder to design an article which will require 100 per cent. efficiency at the weld, in order that it may have a reasonable chance of successfully withstanding the stresses which will be put upon it in prolonged use.

It is also unfair to produce a design which, in the very nature of things, must distort badly in the process of manufacture and then slang the welder for turning out an article which looks like nothing but a piece of scrap iron.

There is nothing so disheartening to the welder, or so likely to make him careless in the production of his work, as the feeling that, however much care he may exercise, he cannot possibly produce a really sound or nice looking job, because the design is such that distortion must take place.

Much can be done by jigs, but a jig which holds the article to shape at the expense of the strength of the weld is only meeting the trouble half-way, and producing an article, which, even if sound when leaving the shop, is likely to give way after a short life, owing to internal strains.

The function of the jig should be to hold the parts in the proper position for welding and at the same time to allow expansion and contraction to take place. It should not hold the parts in position by sheer force.

In repetition work I am convinced that money spent on jigs is money well spent,

and the design of simple and efficient jigs, in order to produce accurate work, often affords food for much thought, and is worthy of more attention than is usually given to the subject.

It is interesting to note, and augurs well for the future of the welding industry, that this association is not the only place where the merits of welding are being discussed.

Since our last meeting, and since I wrote the foregoing remarks, no less than four papers dealing with welding have been read before the Institute of Mechanical Engineers, three dealing exclusively with the oxy-acetylene system and the fourth with electric welding, the last by Mr. Thomas Heaton, of the Uxbridge Barrel Co., who probably has as wide a knowledge of the application of all modern methods of welding as any man in the country.

Two quotations are, I think, very apposite, one showing that, even when discussing electric welding, the large sphere of usefulness of the oxy-acetylene process, in which we are specially interested, has to be recognized. He says: "The author holds no brief for any given system of welding, and in confining this paper to electric welding he does not intend to imply that gas welding produces inferior welds. Indeed, he is of the opinion that each known system of welding has its proper sphere, and that probably any given method may be best in its respectively most suitable application. The author uses oxy-acetylene welding, and has done so for many years before the war with satisfactory results."

Again, when discussing one of the arc welding systems, he says, "The work, however, must be designed to suit the process, and the process regulated to suit the work in order to be successful. Distortion due to the heat, or the effect of contraction, must be allowed for, especially on flat surfaces, and anyone requiring welded joints would do well to consult the welding expert before definitely deciding on the details of his design."

This entirely confirms my own views, but I have frequently heard the statement made that with arc welding no allowance need be made for contraction and distortion, so I am very glad to see this statement made by one who has employed electric welding for about twenty-five years.

The spheres of usefulness for oxy-acetylene welding are, I consider, larger than those of other methods, and can be increased and perfected if careful attention is paid to correct design, in order to overcome distortion.

In dealing with light sheet or plate welding, it is not possible to overcome distortion by heating the whole job during welding. This cure would probably be worse than the disease. It is, therefore, necessary to look to other methods.

In the early days of oxy-acetylene welding, owing to the distortion difficulty, even makers of oxy-acetylene welding apparatus, who were out to boom this process, continued to produce their generators with riveted seams. I well remember one of my own difficulties with the first generator which I produced welded throughout, and which will serve to illustrate my point as regards "design to overcome distortion."

Fig. 1 is a tube passing through a larger tube. The holes in plate "A" were cut about ⅛ inch larger than the tube, "B", which was to pass through in order that it might be easy to get it into place. The weld was made as shown at "C", with the almost inevitable result that on cooling, after welding, the contraction put a buckle in plate "A", as indicated by the dotted line "D". This was partly caused by the fact that "A", when heated, expanded outwards, and, instead of being welded in its true position at "C", was really welded on as shown at dotted line "C".

Now had I been sending this design out broadcast, ordering thousands off, I should have been in a fair way to causing brain fever among those dealing with the job.

The same example will serve to illustrate my point regarding the unfairness of expecting 100 per cent. efficiency in the weld.

The makers would, in all probability, have said we must make a jig, something like Fig. 2, to wedge in and stop this buckling, with the result that the weld would be put in severe tension while cooling. The probable outcome would be that a number of the articles under test would show porosity in the weld, or cracks in or just alongside, the weld. The design is, therefore, undoubtedly effective and must be modified if good work is to be produced.

After various trials the design shown in Fig. 3 was adopted. Plate "A" was flanged, as shown at "E", and the weld made at "G". Dotted line "H" shows how the contraction after welding is taken up. This overcomes the difficulty of buckling and so entirely eliminates the strain that no buckling takes place, and jigs are not required. It is, therefore, I consider, a sound design.

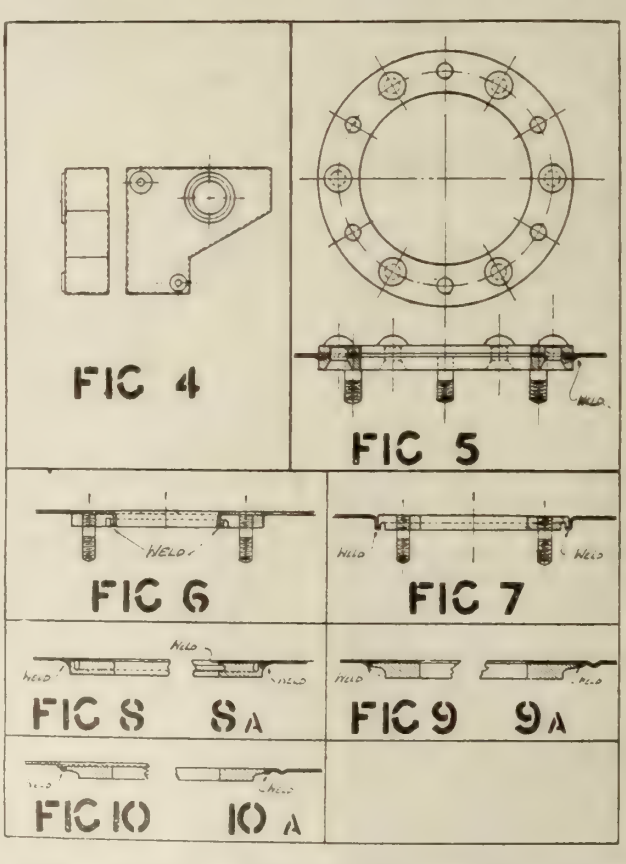
Fig. 4 is an instance of a type of design one frequently meets, a tank of ⅛ inch plate with flat sides having several pads for pipe connections, hand holes, etc. In this case it was specified that these pads were to be riveted and welded on. The weld was indicated as in Fig. 5. Now my objections to this are:

1. That I consider it bad practice to weld and rivet the same joint. If riveting will make a sound joint why weld? On the other hand, if it is necessary to weld to obtain a tight joint, why put in rivets, which will, in all probability, leak sooner or later?

2. I defy any welder to make such a weld as that shown in Fig. 5, because the penetration under the flange is shown about ⅝ inch deep, and the width of the "V" at the top, 3-16 inch.

3. The design of the flange is quite unsuitable for welding to a flat surface and must be greatly modified if successful work is to be obtained.

The weld could, in my opinion, only be made at all by employing a second blowpipe of large size to heat the thick flange while one man did the welding; otherwise the ⅛ inch plate would be burnt



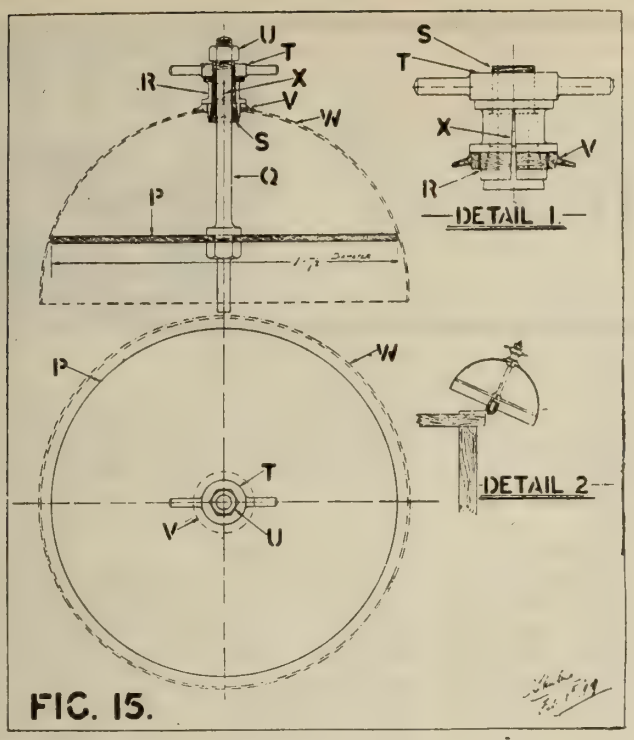


FIG. 15.

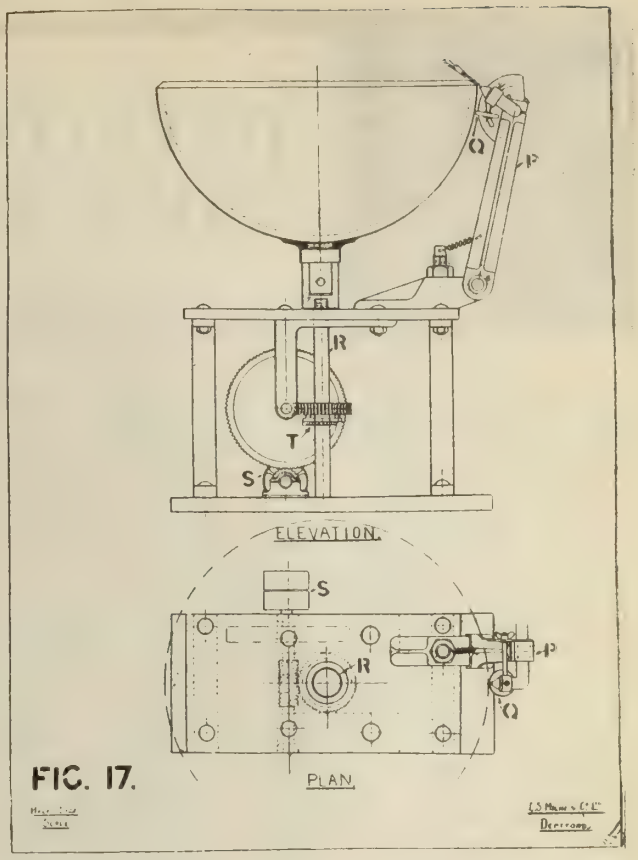


FIG. 17.

before the thick flange became hot. In any case the result would be an enormous strain on the weld, and the flat side of the tank would be distorted, so as to look like nothing on earth. This would not be due to any fault of the welder.

Several better methods, which might have been substituted, are shown in Figs. 6, 7, 8, 9 and 10. I am sure one of these could have been used, and would have been quite suitable, for the purposes for which the tank was required.

It may be urged that by riveting the plate between two rings, as in Fig. 5, greater strength is obtained than by the welding only, but I contend that the weld on the outside of the heavy flange would put such internal strains on the plate that if fracture were to occur it would be at this point, so that ring rivets would all come away together.

By flanging the plate and grooving the ring, as shown in Fig. 6, the edges to be welded are of equal thickness and a good weld can be easily made. No distortion of the thin plate takes place and no stresses are set up by welding. The studs can be taken right through the ring without fear of leakage. It has, however, the disadvantage that if a faulty weld be made it is almost impossible under test to locate the position of the leak. Fig. 7 overcomes this last objection and is stronger still, owing to the greater area of the weld, but there is danger of leaking at the studs if these are taken right through the ring.

By grooving the outside edge of the flange, as shown in Fig. 8, a weld of similar appearance to Fig. 5 is obtained while the stresses in the flat plate are to some extent reduced. By also grooving the inner edge, as shown in Fig. 8a, a seal is obtained if studs are taken through the ring.

By thinning the edge of the flange, as shown in Fig. 9, the welding is simplified, but will leave considerable stresses in the weld and surrounding plate. If, however, a corrugation can be stamped in the plate round the flange, as shown in Fig. 9a, it relieves the stresses and makes quite a sound method, and it can be combined with an inside weld, as in Fig. 8a, if desired.

For some purposes the methods shown in Figs. 10 and 10a are preferable. The radius (Fig. 10) or corrugation (Fig. 10a) relieve the cooling stresses, but careful jigging is required to keep the edge of the thin plate from buckling in or out during the actual welding.

The type of flange shown in Fig. 9, is very suitable for welding to spherical work or dished ends of vessels, as in this case the spherical end gives to the contraction by flattening.

I recently had to weld on to hemispheres a large number of screwed bosses. The method of welding is again as shown in Fig. 9. The difficulty experienced in this case was that the thread which had to pass fine limit gauges, distorted and required retapping. The heat slightly scaled the surface of the top threads and the life of the taps cutting this scaly surface was short.

Fig. 15 shows the jig used. In this job, I may mention, it was also essential that the thread should be kept concentric with the axis of the hemisphere. This makes this jig more complicated than would be required for merely preventing distortion of the thread.

The screwed boss "V" had to be welded to hemisphere "W." "P" is a circular plate with a pillar "Q" at the centre. "R" is a screwed bush bored taper inside and split, as shown at "X", so that it can be expanded. "S" is a tapered plug to fit "R" and bored a sliding fit to pin "Q." "T" is a fly-nut for drawing up the plug "S" in bush "R." "U" is a nut for holding the whole on to pin "Q." The hemisphere "W" is dropped over the pin "Q" and finds its own bearing on plate "P." The boss "V" is screwed on to the expanding bush "R" and this is then expanded by inserting plug "S" and tightening up nut "T," as shown in Detail 1. Several sets of these parts (Detail 1) are provided to each set of parts "P" and "Q."

The whole of Detail 1 is dropped on pin "Q" which ensures the thread being true with the axis of the sphere; nut "U" is tightened down lightly to keep the whole in position during welding.

After welding, by merely removing nut "U," the whole expanding device is removed bodily with the boss and hemisphere, and is left to cool while another part is put on pin "Q" for welding.

After welding, by merely removing nut "U," the whole expanding device is removed bodily with the boss and hemisphere, and is left to cool while another part is put on pin "Q" for welding.

The lower extension of "Q" fits in a socket on the welding bench, as shown in Detail 2, which holds the work at a convenient angle for the welder, and makes the whole easy to swing round as welding proceeds. This is very useful, as, in the case referred to, the jig and job weighed something well over one cwt.

It was found that, if the expanding bush is left in position till the work is cold, the thread is prevented from distorting and will pass fine limit gauges after welding.

(To be continued)

DEVELOPMENTS IN SHOP EQUIPMENT

INDEPENDENT-FEED RAIL DRILL

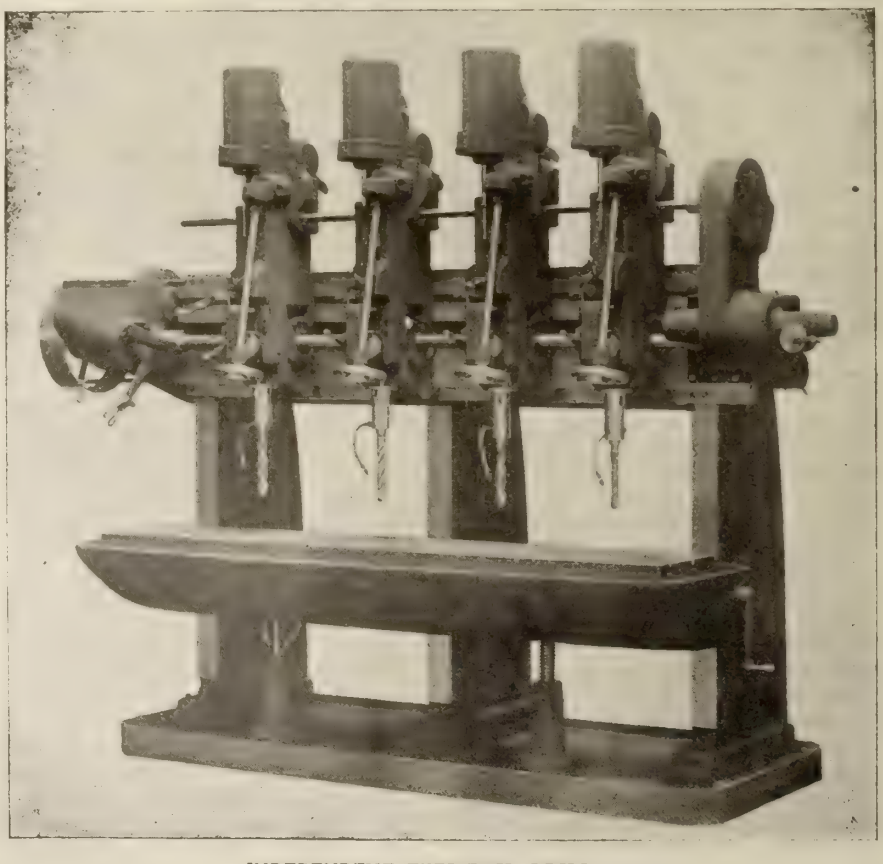
THE independent-feed rail drill, with independent heads, as shown in the illustration, is a heavy service production tool, and, though especially intended for use in locomotive and railway shops, gas engine and automobile factories, it will also serve efficiently in all kinds of general machine shops where the work includes heavy gang drilling or heavy jigged drilling. When used on jigged work, the compactness of this drill enables one operator to keep a greater number of spindles—either singly or in groups—continually in operation, and, as a result, the operator is kept constantly reloading the jigs, while a group of drills is kept constantly producing. Only the most modern methods of machine tool practice are incorporated in the design and construction of this machine. The speed mechanism, feed mechanism, and each spindle head are of unit construction, and each unit is readily accessible without disturbing mechanism other than that contained in itself.

The speed mechanism is attached to the upper end of the upright at the left end of the frame. It consists of two cones of hardened steel gears, back gears, and a hardened roll-in gear. There are three gears on each of the two cones, which provide three sets of gears of a different ratio, and these three sets of gears, when used in conjunction with the back gears, allow six speed changes, which are selected by rolling the roll-in gear into mesh with the various sets of gears on the cones. The shafts in the speed box rotate in Hyatt roller bearings, and the drive shaft, which transmits the power from the speed mechanism to the spindles, rotates in combined radial and thrust ball bearings. Power is applied to the speed box through a constant speed pulley, and transmitted through a Johnson friction clutch, which is used to select the backgear.

The feed mechanism is tightly encased, and is fastened to the upper end of the upright at the extreme right end of the frame. The feed changes are obtained through two cones of gears which are driven by the spindle drive shaft. Each of the two cones is fitted with three gears of a different ratio, which allows three changes of feed for each spindle speed. The feed changes are affected by a slip key method, which is operated by an indexed hand lever. The feed is transmitted from the two cones of gears to the feed shaft through mitre gears and a worm and worm gear, with end thrusts taken by high grade ball bearings. A hand wheel is also provided for quickly advancing or returning each spindle.

The spindle heads are gibbed to a heavy cross-rail by a dovetail method. Each head is a self-contained unit, and is adjustable longitudinally along the rail by means of a crank handle which operates a rack and pinion mechanism. The spindles are made of a high carbon forged steel, and are driven by spiral gears with two keys extending from the gear through the sleeve and into ways in the spindle. The end thrust on these keys and spiral gear is taken by a large ball bearing, while the spindle thrust is taken by S.K.F. ball bearings. This smooth and powerful drive is located at the lower end of the head, which reduces torque in the spindle to a minimum. Each spindle is counterbalanced, and can be driven and fed independently of the others. The levers used to apply the feed and drive to each spindle are interlocking so that the power feed cannot be engaged when the spindle is not being driven. Adjustable stops are provided to automatically disengage the feed when the holes have been drilled to a given depth.

The table is a substantial box type casting which is adjusted vertically by means of a crank handle which actuates two jack screws through a worm and worm gear mechanism. These jack screws support the table and maintain its original true alignment by receiving the thrust of the cutting tools on a direct centre line with the spindles. A cored section of the tables serves as a reservoir for the cutting compound, and the table casting is shaped on all four sides so as to form a trough in which the cutting compound flows back to the reservoir. The pump, which forces the cutting compound to the work, is fastened to the upright at the left of the frame and is driven directly from the countershaft.



INDEPENDENT FEED-RAIL DRILL.

The oiling method, which consists of a force feed, gravity flow and splash system combined, is made possible by the all-enclosed unit construction. The speed mechanism, feed mechanism, and each of the spindle heads are provided with independent and self-contained oiling systems which eliminate the human factor in the care of this machine, insure positive lubrication and economical maintenance. The contents of each unit is partially submerged in a bath of oil, while the bearings are lubricated by a force feed through individual leads which carry a sufficient flow of oil to flush all enclosed parts on its return to the reservoir.

This machine described is manufactured by the Defiance Machine Works, Defiance, Ohio, and following are its principal specifications:

Specifications

Capacity in solid steel, 2 in.; maximum distance nose of spindle to top of table, 32 in.; centre of spindle to face of column, 12.2615 in.; minimum centre to centre of spindles, 8 in.; maximum centre to centre outside spindles, 78 in.; length of power feed, 12 in.; table, working surface, 20x98 in.; table, vertical adjustment, 12 in.; speed changes, six, 25, 38, 58, 80, 122, 186 r.p.m.; feed changes, 3, .006 in., .009 in., .014 in.; diameter of spindle nose, 3 in.; diameter at driving point, 3 in.; diameter of spindle sleeve, 4 in.; morse taper in spindle, No. 5; drive pulley, face and diameter, 20 in. x 5¼ in.; drive pulley, speed, 350 r.p.m.

DAVENPORT NO. 2-B PLAIN MILLING MACHINE

The Davenport Manufacturing Co., of Meadville, Pa., has recently placed on the market a new type of plain milling machine, listed as No. 2-B. It is furnished with back gear drive, thus offering great efficiency under maximum load. The machine is pleasing in design, compact and rigid when in operation. The table has a surface of 38x10 inches, with a working range over its entire length and breadth. The longitudinal movement of 23 inches is automatic, and is obtained through gears and a feed screw of 4 threads per inch. Provision is made for a quick return of 1¼ inches per turn of crank. The cross movement of the table is 9 inches, and a vertical adjustment of 19 inches is provided.

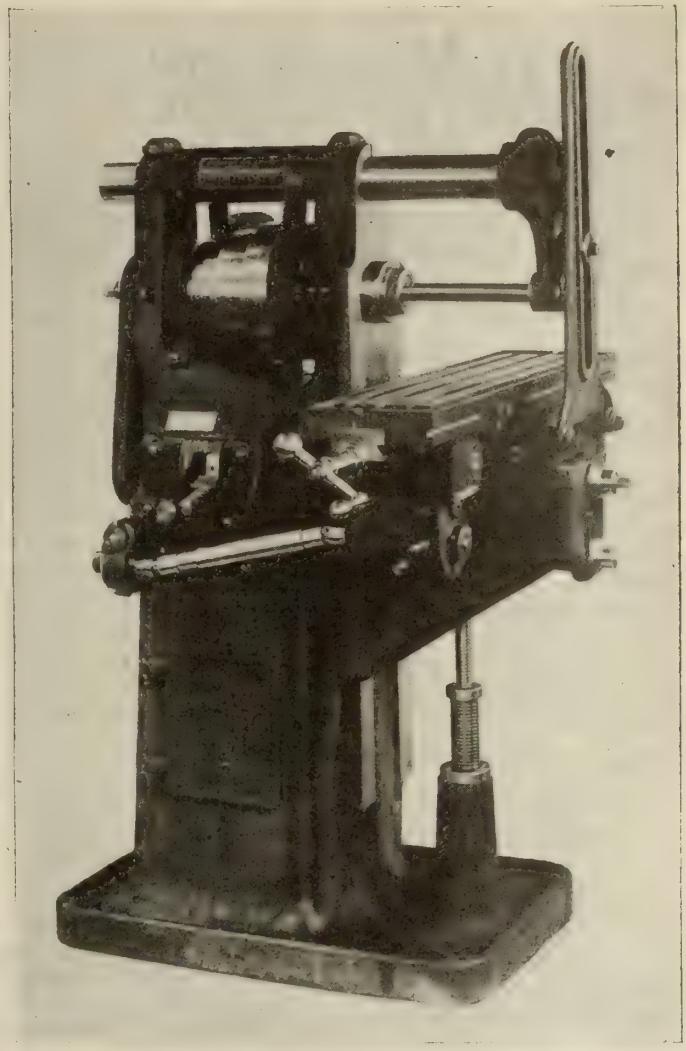
Table bearings are extra wide and the top is provided with three ⅝ in. slots.

The spindle is made of forged crucible steel and runs in phosphor bronze bearings, easily adjusted to wear without removing the spindle. The front journal is 2½ inches in diameter and 4¾ inches long. The nose of the spindle is 2¼ inches in diameter, threaded 10 threads per inch, R.H. The hole through the spindle is 11/16 inches in diameter and the front end is bored to receive a No. 10 B. and S. taper socket. Spindle thrust collars are hardened and ground, and ample lubrication is assured through large oil reservoirs located in the housings.

A three-step driving cone is used, with diameters of 7.73, 8.86 and 10 inches, adapted for 2¼ in double belt. The ratio of the back gears is 4.57 to 1. Twelve spindle speeds are provided, in geometrical progression: 20, 27, 35, 45, 59, 77, 95, 123, 160, 204, 270, and 350 revolutions per minute. Change gears are self contained and located in the bed of the machine. Twelve feed speeds are provided, ranging from .004 to .047 inch per revolution of the spindle. All feed gears are made of a special alloy steel, the drive from the spindle being obtained by means of a roller chain. All feed changes are obtained through three levers, while the reverse is made by a push rod located on the feed box. All working parts of the machine are oiled from the one main reservoir in the column. The feed tripping mechanism is of the plunger type.

The overhanging arm is made of special steel, and is 3¼ inches in diameter, its under side being 6⅜ inches from the centre of the machine spindle. The arbor is made from .70 carbon, chrome nickel steel, heat treated, and having a diameter of 1 inch, and a length of 10 inches between the shoulder and the nut. The outer end is supported in special design ball bearings. Dials on the feed screws are all adjustable, and graduated to register movements of the slides in thousandths of an inch.

The countershaft is adapted for two speeds, 123 and 270 rev. per min. Clutch pulleys are self-oiling, 10 inches diameter and 3½ inch face. Shaft is 1 9-16 inches in diameter and runs in self-oiling bearings. Vice, end braces and other accessories are also furnished. The extreme floor space occupied is about 48x74 inches, and the net weight about 1,900 lbs.



DAVENPORT PLAIN MILLING MACHINE.

RE NEW EQUIPMENT

It is our intention to make this section more interesting than ever before, and we would ask the various firms throughout the country to co-operate with us in this regard.

Immediately you have a new line or new addition to your line, send us photographs, or better still, electros or half-tones of the new departure, together with descriptive matter, after which we will do the rest.

In this way our section will prove of more value both to the reader and the manufacturer, for we will then be able to publish promptly these new lines as they come on the market.

When we receive electros or half-tones we can, of course, publish the matter more promptly than if we have to make our own cuts.

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Something Better Than a Strike

THE sympathetic strike in Winnipeg has been called off. This should not be regarded in the light of either victory or defeat for capital or labor.

It must be taken as nothing short of a challenge to both parties to set to work to build up conditions from the Winnipeg mess that will make such an event out of the question again in this country.

The manufacturer, or the employer of labor in any capacity, might as well face the conditions. These new conditions are here, and they show no signs of picking up and moving out.

The personal element—the human side of the shop business—is coming to the front. The wise employer is going out and meet that new element half way. The fool hirer of men may slam the door in its face. By so doing he is going to nurse trouble and fall into the rear end of the industrial procession.

The manufacturers in many places are catching the vision. In some cases the light is taking a fairly long time to break through.

That big wall that has been built up between the shop and the office, between the firm and the employees, has got to be battered down. Not all at once. Such an attempt would spell failure at the outset. But little by little, pulling down a brick here and a tier there—gradually putting that bogey barrier out of existence. It is a big job and a hard one, but the very fact that it is hard and big make it attractive to men who like to tackle worth-while propositions.

CANADIAN MACHINERY has discussed this matter with men who have much to do with the framing of conditions under which thousands of men work. There is a new feeling in the work. It may be a result of the war—it may be a desire to give a square deal to men who risked everything at the front—it may be on account of pressure from industrial unrest—take what reason you wish, but the bare fact remains that there is a greater realization than ever before that the man in the shop must come more than ever to the front. He must not only have his labor power for sale, but the management is coming into the market now to get the good-will of the man as well as his ability and his muscle. The firm that gets its men—their ability, strength, enthusiasm and good-will—gets the real thing in industry.

There is no reason for the men to regard this new movement with disfavor. There is nothing in it that fights their views on unionism, or interferes with their affiliation with any legitimate trades or labor organization. The men should meet it with an open mind. Don't take the prejudiced view that the company is trying "to put one over."

There has been too much bitterness during the past few months. It is not going to get the employers or employees anywhere, except in a heap of trouble. Every question has two sides, and on neither of these sides can all the right and virtue be corralled. If these two parties are not prepared at this or any other time to sit down together and talk calmly, honestly and candidly about THEIR business affairs, then the future for both is poor and black.

This is not a time to harp or gloat over the success or failure of the Winnipeg general strike. It was a nightmare and a mistake. The big thing now is not to glory in post-mortems over that event. The great task is to set determinedly to bring about conditions in this great country that will draw a straight and clean-cut line between the legitimate complaint of a worker and the machinations of the agitator who makes more money on strike than at work.

CANADIAN MACHINERY believes that RIGHT NOW is the time for these things to take root and grow. Employers who look ahead can see the new era in industry coming. The old period of master and servant, of lord and hireling has gone. Don't struggle to make yourself believe that it will return. It will not and you would not bring it back if you could.

The new industrial era is here. The wise man is going out gladly to meet it and take it into his organization.

Amateurs and Experts

THE editor of the Toronto *Telegram* was called to Ottawa a few days ago to appear before the Commission that is now investigating the high cost of living, or simply the cost of living, because it would be poor business for anyone connected with a Government to say living was too high.

The Toronto editor and the committee had a real session. It was no parlor meeting, accompanied by the tinkling of tea cups or the trickling and dripping of soup.

They all went out into the backyard, left their smocks, caps and trinkets on the steps, and set to.

Many things were said. Even the sergeant-at-arms, who is supposed to play the part that an Indian plays for a cigar store, was wheeled out to look through the knot-hole while the game was on.

When it was all over the yard was badly mussed up and the committee and the editor were all ready for a spell with the clay dab in the shade of the wood-pile.

The cost of living hadn't been brought down—not a dent made in it, but there had been one single, lonesome truth that stuck up like a sore thumb.

It was tossed in by J. R. Robinson, editor of the *Telegram*, when he said:—

> "I stated an obvious truth that a committee of amateurs cannot examine an expert."

There have been more committees at Ottawa at times than they have had rooms to put them in. When they got tired calling them committees they changed the shingle to read "commissions."

And these committees or commissions have proceeded to spade up the garden lot for facts that should be gone after with a derrick and a stump puller.

In fact, it might not be a bad idea for some of the handy men they have choring around the Ottawa House to carve a bit of a sign and nail it on the door of the investigation chamber:—

"A committee of amateurs cannot examine an expert."

The Investment Buyer

THE markets are waiting for the coming of the investment buyer. He has been out for some time, and any sign of his return would be welcome news.

The investment buyer is a fairly long way removed from the hand-to-mouth purchaser. The former sits down and figures that he can find a market for something. That something may be goods for export, may be office space or hotel accommodation. His buying represents an investment, a tieing up of money against which he will have to work for some years to come. The hand-to-mouth buyer is a different proposition. He gets in a job and he buys the material necessary to see it through. What he puts into the work can hardly be called an investment. He simply puts his money in and collects it all in a short time from the buyer of his work. The market cannot run on this man's business alone. It does not give the necessary stability. It does not produce the large orders needed to get capacity output at the mills, without which production costs cannot be brought down.

The investment buyer hesitates to come into the market. He has had a list of reasons for not doing so that are a yard long. After war conditions, price-fixing and one thing after another have been grabbed up and gazed upon as bogey men to keep him from the market.

The signing of peace has been the last big consideration. For months it has been bolstered up as the last defence behind which the should-be buyer has squatted.

Now this may be taken away from him by the few strokes of a pen.

The market needs the investment buyer. He has been out of commission for a long time, although he has been making all sorts of motions that he is about to return.

Let him come. The hand-to-mouth chap has been doing fairly well, but he has his limits. Lead in the investment buyer.

Not All Profiteers

THE investigations that have gone on at various times in Canada into the charges of profiteering have brought two parties to the front, namely, the investigator and the party investigated.

A third party should be taking a hand in the interests of the great body of Canadian manufacturers.

The word profiteer is being hitched to-day by inference and association where it does not properly belong.

There are firms that made money out of war contracts. If they made too much it is up to the Government to get it away from them.

There are other firms that would have been better off by thousands of dollars had they never seen a munitions contract.

There are concerns that made money during the war years. The Government got a goodly share of it. At the close of the war they were left with thousands of dollars' worth of stock that had nothing but scrap value the day fighting ceased. There was no come-back for them. This year they are going to have a financial funeral.

Canadian manufacturers, in their own best interests, should see to it that no commission gets a chance to tag them as a body of "profiteers."

Don't be a Tinker

DON'T be a tinker. If you are going to do anything in life, do it well.

Do one thing better than any person else can do it.

Ever see a handy-man? You know the kind. He's not particularly skilled at anything particular, but he can catch on quickly. He makes a great stop-gap in the shop—and he generally sticks right there.

Ever meet the chap who can play a few chords on the piano, and who can sing a couple of old songs to his own playing? He gets through all he knows in a few minutes, and if he has to do anything more, he's up against it. As a matter of fact, he's only a tinker. He can neither play nor sing, and yet he imagines he can do both.

You have seen the average clerk in operation in a store. No matter whether it's groceries, dry goods, boots and shoes. In a general way he can get you what you want if you have a pretty fair idea of what you want before you go in. But he will never sell you anything else. He will never size you up as you enter the store, or as he talks to you as a prospective customer for some new lines of goods that the store carries or is going to carry. He is just an average, garden variety. In fact, he's a tinker in his line of business.

You know a machinist who can draw a little. He can make a rough sketch. He cannot make an intelligent drawing that would serve for a blue print. He's just a tinker, and as far as getting himself any place, he might just as well hold up his fist and own up to the fact that he can't draw at all.

Don't be a tinker. Do something, well—much better than any person else. Then there will be a demand for your services that will shove you head and shoulders past the tinker class.

The Stopping of a Car

IN what distance can you stop your car? Perhaps you have never figured it out, but others have. Providing the brake mechanism is in good condition and the road conditions are average, or in such condition that the tires can grip, the following table is given:—

At ten miles an hour you should stop in 9.2 feet.
At 15 miles, in 20.8 feet.
At 20 miles, in 37 feet.
At 25 miles, in 58 feet.
At 30 miles, in 83.3 feet.
At 35 miles, in 104 feet.
At 40 miles, in 148 feet.
At 50 miles, in 231 feet.

TORONTO has had a street car strike for over a week. Of course, there have been some cases of inconvenience. The remarkable thing is how well people have got along without the cars. The automobile age has provided a tremendous amount of transportation. Each year now will make it increasingly hard for a street car strike in any large city to inflict the inconvenience of ten years ago on the general public.

* * *

IT COSTS more now to get your picture painted than formerly. Still that is one form of dissipation that we can side-step and still have a fairly good time.

* * *

TO HEAR some Western grain growers talk on tariffs and Eastern profits at times, one might think the Westerners were right down to a shoe-string and nose-bag of wild oats. At the Ottawa inquiry it comes out that the Grain Growers earned 23 per cent. on a large capital, paid handsome salaries and bonuses and piled up a big reserve.

* * *

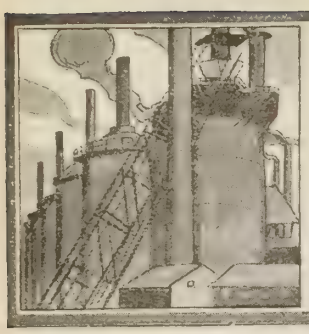
OCCASIONALLY one sees a stork in the Zoo, but there must be a stack of these things some place in the woods, for there were 1,352,792 births in United States last year.

* * *

A PENNSYLVANIA man named Hart got a quantity of maple syrup poured into his car instead of oil. And now we presume the neighbors will say, "There goes 'sweethart' for a drive!"

* * *

A CALIFORNIA man left $19,000 to his son. The only string is that the son has to earn $30,000 clear before he can get the $19,000. Chances are that by the time he piles up that sum he'll have cut enough wisdom teeth to know how to handle the smaller amount. It looks as though that fond parent knew a thing or two that the average chap never thinks about.



MARKET DEVELOPMENTS

Prices Stay Firm in Spite of Circumstances

Machine Tools Reports Say, Are Going to Move Higher in the Fall—Strike Is Giving Some of the Manufacturers a Big Problem —Greater Strength Shown in Scrap Market.

THE one surprising thing is the manner in which prices have been sustained during the months since the beginning of the year. In some ways it would seem that there has been nothing but monkey wrenches thrown into the industrial wheel, but the fundamental conditions remain firm.

Advices from the big machine tool centres hinted some weeks ago at a lessening of prices and greater discounts, but this is not borne out by reports that are coming through now, as indications are for higher prices for the better machines. Deliveries are only fair, indicating that in a good many cases the demand for machines keeps well ahead of the ability of the shous to turn them out.

The same can be said of the price of steel. Rumors were plentiful that the withdrawal of the fixed price would see the price crack. It did not happen then, and it has not happened since although the price control and support has been withdrawn for some time.

As mentioned before in this report, the end of the strike in this district is much desired just now. There are serious problems facing some of the manufacturers. It may be that shops will close down for the rest of the year, if not for the winter as well, as the season has in some cases almost closed when the product could be sold to advantage. Large investments, running into hundreds of thousands, are tied up all the way from the molding shop to the shipping department.

Buying is not in large quantities in the warehouse trade, although some of the dealers are quite certain in their statements that they have no complaints about the amount of business moving. They look forward to better days, reckoning that in many instances these must come irrespective of circumstances. They know there are large buildings that must be gone on with, and the time when these orders will be ripe for conversion is drawing close.

Machine tools still come into competition with the large amount of war-ship equipment remaining in this country. The bargain hunter is present in the machine shop business just as truly as elsewhere, and the "price" has a lot to do with the placing of business.

THE STEEL MARKET WAITS FOR THE RETURN OF THE INVESTMENT BUYER

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., July 3.—The signing of the peace treaty is expected to bring out a great deal of additional demand for steel. It is pointed out that a great many construction projects, involving the consumption of steel, have undoubtedly been held back, as a matter of general policy, to await the actual signing of peace. It was the common appraisal of the future of business, before the armistice was signed, that business of all descriptions would be stifled to a greater or less extent during the interim period between the cessation of hostilities and agreement upon peace terms.

The demand for steel in the past few months, when analyzed in detail, has shown clearly the distinction between two classes of orders, those that involved ordinary everyday consumption of steel and those that involved investments, such as can be made or postponed according to the judgment or whim of the investor. For example, there has been an excellent demand upon the pipe mills for "oil country goods" because oil is high priced and there is a continuous demand for it, but there have been practically no projects involving the laying of long oil lines, such as are regarded as of an investment character. Again, there has been an excellent demand for nails, which are used in common everyday life, while there has been little demand for structural shapes, which are used for building factories, skyscrapers, and bridges. A comparison like this might be carried to great length. The investment buyer of steel is expected now to be a much greater factor in the market than in the past few months.

Some Demand Increased

A further improvement is reported in the demand for sheets. Having operated at about 60 per cent. of capacity in May, the sheet mills operated last week at fully 75 per cent. This week there is some idleness on account of the holidays, the time being propitious for making repairs. One plant, the Deforest, at Niles, recently acquired by the Republic Iron & Steel Company, is down for the month, installing an electric drive. The steam plant is abandoned and current will be purchased from a public service corporation, although eventually the company may carry current from its main plant in Youngstown to the newly acquired plant.

There has been improvement in demand for butt weld pipe, which is now running at a rate of about 75 per cent. of capacity, while lap weld departments of the pipe mills, chiefly by reason of the heavy demand for oil country goods, are not only operating at capacity, but are filled quite solidly with orders for a couple of months to come.

In merchant bars there is improved demand, though the total is still far below mill capacity. Plates continue to present an extremely sluggish appearance, although perhaps the appearance would not be so bad if there had not been such a large increase in productive capacity in the past two years.

In addition to the 200,000 tons of rails recently purchased, the Railroad Administration will probably buy 300,000 tons, which will round out its requirements for the year.

Prices Firmer

Price cutting has not disappeared from the finished steel market, but there is less of it, apparently, than 30 days ago. The important feature, however, is that there has been price cutting for so long a time without its pulling down the general market level. The market has displayed an inherent strength that was hardly expected of it. Earlier in the year the philosophy of the mills was, in substance: "Let us hang together, so that we do not hang separately." Price cutting, it was then thought, would cause the bottom to drop out of the market. Accordingly, it was very unpopular to cut prices, but of late there have been several lines of finished steel product in which a mill could have felt free to cut prices, if it desired, because it had so many examples to follow. In sheets, for instance, while the leading interest has adhered strictly to regular prices at all times, there was a time when probably 25 per cent. of the tonnage booked by independents was at cut prices. The proportion is now less. The Inland Steel Company, for instance, has withdrawn from the market entirely, being comfortably filled with orders. In pipe the irregularities recently far from uncommon have practically disappeared.

Pig Iron Steadier

Pickands, Mather & Company and M. A. Hanna & Company are each reported to have sold fully 100,000 tons of pig iron, chiefly foundry grades, in a period of 30 days. Other producers have also done well, and the merchant furnaces now operating, with perhaps an occasional exception, are now comfortably filled with business for the third quarter, with some tonnage booked for fourth quarter. As a result there is little disposition to shade regular prices, which are those of March 21, except where it has been necessary for individual districts to develop different levels in order to place their markets in normal trade relation with prices in other districts.

While the market has thus improved materially, furnacemen hardly expect any advance in prices to occur in the near future. They recognize that with so many furnaces out of blast the market would experience difficulty in advancing. The furnaces that went out of blast did so not because they wanted to be out of blast, of course, but because they wanted the situation to be liquidated. They did not want to take chances in trying to stay in blast by cutting prices, as there was no telling where prices would go in such case. Now, however, they are eager to get in blast again, and many of them would probably decide to blow in if they saw an opportunity to build up some backlog business for the start, even perhaps at the expense of cutting existing prices slightly. Thus while few are disposed to predict positively that pig iron will advance this year, there are many who express conviction that next year it will be above present levels.

Mill Operations

Steel mill operations may be estimated at a rate of 65 per cent. of capacity, representing a rate of ingot production of about 32,000,000 gross tons a year, capacity being about 49,000,000 tons. This compares with an average rate of 54 per cent. during May, while about the middle of that month the rate had probably dropped to about 50 per cent. Thus there has been a very substantial recovery. The present rate is approximately equal to the average rate in April.

Wage Scale Settlements

After making extremely strong demands in connection with the sheet and tin plate wage scales for the twelve-month beginning July 1, the Amalgamated Association has accepted some slight advances for some members of the crews, whereby the total of sheet mill wages is advanced 3.6 per cent. and the total of tin mill wages about 2.6 per cent. The settlement refers only to the labor at the hot mills. Less than half the mills are organized, but the non-union mills, with few exceptions, pay at least union rates, and some make a practice of paying just a shade more.

POINTS IN WEEK'S MARKETING NOTES

Scrap metal markets are much stronger this week. Large dealers report that Canadian foundries and steel mills are buying, which is the first time this has been reported for some weeks. Although prices have not been marked up in several cases the values are better than the price list indicates in Toronto. Montreal has advanced prices quite materially.

—

Cancellation privileges that went with some good sized orders for tubes were not taken advantage of, and the shipments were taken on. This may mean some news in regard to the settlement of the metal trades strike.

—

Machine-tool dealers report that they still come into conflict with the war shop machinery, of which there is considerable in the country yet. However, they are willing to admit that this is not nearly so serious as appeared likely at the close of the war.

—

New York reports indicate that prices on machine tools may be even higher by the fall.

—

Pittsburgh despatches state that the improvement in the production of the steel at the mills there is being sustained.

—

Strikes in the West have made matters pretty much tangled with the firms that have their head offices in the East. There had been no communication for some days and no express. Many of the managers and staff were away from business entirely, acting under instructions from the Committee of One Thousand.

—

Metals are stronger, copper being marked up again, with indications that third and fourth quarter deliveries may reach still better figures.

STRIKE PUTS END TO SALES THIS YEAR

One Firm Has Quite a Proposition as to Whether to Close for the Season

TORONTO.—The holiday coming in the middle of the week has a tendency to make it a short one for dealers, as many of their prospects take the week-end and the section of the week lasting over the holiday as well. Small sales are the order of the day. Not much business is coming out of the Toronto field at present, the strike, which has now lasted going on two months, being responsible for much of this. Those who were figuring on equipment are not going ahead until things become settled, and those who purchased equipment are rather tied up for want of production from it.

Big Decision to Make

One of the firms now affected by the strike is seriously considering what to do for the future. They make a line of goods that has a ready sale during the summer and fall months in the rural communities. When the war ended, they put over $200,000 in new equipment, and got in shape for going ahead, expecting to get production at the latest by the middle of June. The strike has tied them up, their orders have largely been allowed to slide, or they have farmed them out elsewhere, and their sales staff has been left with much less to do, adding to the overhead of the firm. For almost two months now over $200,000 worth of equipment has been tied up there all the way from the molding shop to the shipping room. The firm has not decided whether to shut down entirely for the season, as production later on now in the fall will be of no use to them for this year's selling.

Meet Competition Here

Some of the dealers claim that they are still running into the old war shop material when trying to dispose of new equipment. While this may be so, it has not proven to be the menace to the trade that was feared some time ago. The railroad shops, for instance, were

out with a big list some weeks ago, a large amount of which went direct to Bertram's at Dundas and the C.M.C. at Galt. The list was then sent to the old Ross Rifle plant at Quebec, which the Government owns, to see what material would be available there. Dealers had been figuring on getting a nice slice of that business, but they are not complaining, and are ready to admit that it is good policy for the Government to go ahead and use the material they have on hand.

The strike in the West has had quite a marked effect on some businesses here with branches there. In one case the manager of a big machine-tool house was out for weeks in charge of one of the fire stations, while the assistant manager was in the barracks training as a soldier under the Committee of One Thousand. No mail or express go through, and it will be some time before the affairs of that branch can be straightened out.

But no one comes along to say that business is poor. Willing to admit that it might be better, dealers are also unwilling to state that they have a serious kick to make. In fact the manager of one of the houses in Toronto stated to CANADIAN MACHINERY this week that their business was keeping up remarkably well month after month, and there had been nothing so far that looked like a slump.

One Cheerful Chap

CANADIAN MACHINERY ran into one chap who was all optimistic this week. He is in the scrap metal business in a big way. He was not at the point where his optimism led him to mark up prices, but he was quite willing to admit that it would come very soon, in fact values are a little better right now than the price list indicates, but it is not good to shove up the list for a few days and then lower again.

The scrap yards are selling a fair amount of material right in Canada now to the foundries and mills. This is the first week that any movement of this sort has developed to any extent. There is a better feeling in the market, and that hesitation that was so manifest for some time is largely passing away. There is a certain amount of shipping directed to United States points. More material is being offered for sale than for some weeks past. Dealers are willing to part more freely with some of their material, and transportation and other companies are sending fair offerings to the market. It all points to better days for the scrap market. They are well nigh due, as the second hand metal market has been a poor one nearly all the way through since the signing of the armistice.

Buying in Small Lots

Prices remain firm in all lines of steel. This is the general statement that is given out, but the fact remains that the firmness of the prices might not be quite so pronounced were a nice, good-sized block of business to show up on the horizon. There has not been enough big buying for some time to really tempt the market figures down, and there is a general feeling that if much buying starts now the price tendency would be in the other direction.

The railroads are still buying a lot of material, and some of the shipyards are coming into the market, too. These firms generally buy pretty well in advance, so it seems likely that it is for business just booked that the inquiries are now coming in. There are some orders in Toronto shops that were on the anxious seat for some days recently. There was a cancellation clause attached —tubes in one item referred to—and it did look as though it would be asked for. However, the firm has taken the goods all in and is in the market for more. It may mean that they intend to operate again shortly. Whether any solution of the strike is in sight that we have not heard about, is not known, but the fact that they are in the market in a fairly large way is a bright spot not to be overlooked.

Metals Are in Demand

There is good demand for metals this week. Some of the largest dealers claim that although there has been some loss of trade due to strike conditions, business is a long way from being seriously affected. Buying is very general in many lines and firms that have much call for copper later on in the year are buying quite freely now in view of prices that seem to point upward for the third and fourth quarter. There is no doubt, either, that the recent tariff is having some change in the price of copper.

Spelter is also stronger, and a little of its new strength may also be traced to tariff conditions and changes. It is selling now at $8.50 per pound.

"PEACE TIME" TRADE IN MONTREAL SHOULD MEAN BETTER BUSINESS NOW

Special to CANADIAN MACHINERY.

MONTREAL, July 3.—The signing of peace marks the close of an epoch of the world's history that many of us are glad to see come to an end. The future may not be all roses, but predictions are that a period of industrial activity will follow the depression that has been evident during the first six months of this year. It is generally conceded that the delay in the concluding of peace has been instrumental in the reluctant attitude of many manufacturers in starting on a campaign of reconstruction activity. This condition may now be replaced by keener interest on the part of business men and the way opened for establishing a reliable basis for future enterprise. This step may be aided considerably by the better tone in the strike situation, a factor that will, no doubt, assist materially in quickly adjusting the business and working relations between labor and capital. Steel is devoid of active interest and dealers here report a very quiet in fair volume, but general steel commodities are quiet.

"The high cost of living," stated one dealer, "is felt in more directions than those directly connected with home surroundings. This condition is naturally reflected in industry and conservative methods are the rule where enterprise is contemplated. Many circumstances are combined to restrict the reconstruction activity and time alone is the one factor that will solve the final adjustment of present unrest and unsettlement." Local strikes have been felt slightly, but have had little effect on current demand.

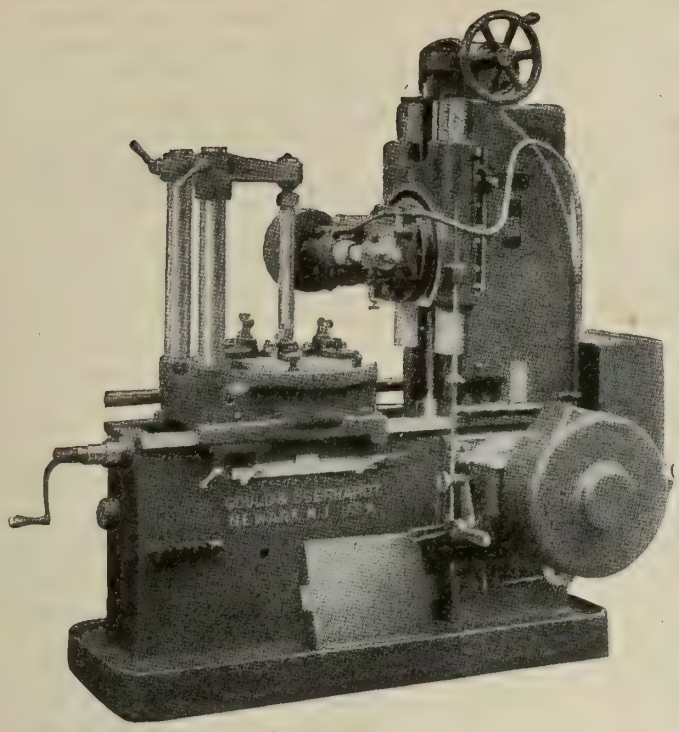
The belief still hovers about that peace settlement will act as a turning point, and that from now on business will show a steady return to normal. Price quotations in all lines are quite firm, and even with a strong undertone.

Steady Strength in Metals

Whether the signing of peace is responsible for the better tone of the metal market, or that the time is opportune for a better buying movement is a question of the hour, but the fact remains that dealers are disposing of more metal now than they have done for some time past. This is particularly noted in coppers and spelter, the sales of these metals having registered material increases. Copper is now quoted at 22 cents for lake and 21 cents for electro and castings. The tin situation is gradually adjusting itself, as the market is now virtually free from Government restrictions, as far as Canada is concerned. The supplies of tin are more plentiful and present requirements are normal, assuring ample metal for all possible early demand. Dealers here are quoting 55 cents for tin, a decline of one cent on the week. The stronger spelter market is responsible for an advance of ¾ cent in the quotation, this week's price being 9¼ cents per lb. Lead is also stronger on steady demand, the price quoted being 7¼ cents per lb. Antimony is firm on light demand. Aluminum is weaker with fewer sales; the local quotation is 36 cents per lb., a drop of 2 cents on the week.

Scrap Retaining Its Strength

Although the demand has shown no marked increase over the past few weeks, the strength of the old metal situation is well maintained and quotations are of a very firm character. The foundries are not buying as heavily as usual and only for immediate needs. The feeling, however, still exists that better times are in prospect before the summer is over. This is the impression of quite a number, and the reports from different quarters seem to verify this belief. The general movement of scrap is comparatively light, but what little enquiry is reported would imply a better buying of scrap might develop in a few weeks. Firmness is a feature as to prices and



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what few changes are effective show a slight advance. Machine composition is quoted ¼ cent higher at 12¾ cents per lb. Medium brass is quoted at 7 cents, an advance of one cent over last week. Scrap zinc is selling better and the price asked is 5½ cents, ½ cent higher than a week ago.

NEW YORK MARKET PREDICTING HIGHER PRICES FOR MACHINE TOOLS

Special to CANADIAN MACHINERY.

NEW YORK, July 3.—Some manufacturers of machine tools predict that selling prices during the latter half of the year will be higher than those which now prevail. Labor costs show a tendency to advance rather than decline. Quite a few machine-tool builders have already received notice from foundries of higher prices for castings due to the demands of iron molders for higher wages and a shorter working day. Among machine-shop workers also there is an agitation for a 44-hour week without a reduction in pay, and if this becomes generally operative, higher labor costs will naturally follow. All indications at all events point to the probability that prices will not go lower, this year at least. Many users of machine tools who feel that they cannot afford to pay the high prices demanded for new tools are looking very carefully into the second-hand machinery market. A fair proportion of the tools from war plants are in pretty good condition, and the prices on this equipment are considerably lower than on corresponding new tools. The competition of second-hand tools is becoming a more and more serious factor from the standpoint of the machine-tool builder.

Conditions in the New York market continue only fair. There is no improvement in business, a fair amount of small orders coming in, but there are no large inquiries. While there is some disappointment that the readjustment from a war to a peace basis has been proceeding so slowly, the first half of the year has produced for many machine-tool builders a very satisfactory amount of business.

The John Wood Mfg. Co., Conshohocken, Pa., manufacturer of tanks and boilers, has acquired a manufacturing plant in Toronto and will purchase equipment there and in Philadelphia for the Canadian branch. Among the company's requirements are plate-working and pipe machines.

BUYING BETTER AND PRICES ARE SHOWING A TENDENCY UPWARD

SMALL advances in price are pretty general in the scrap market. These are not all based on actual trading, but in some cases reflect the feeling of optimism among the dealers. Following are the reports from U. S. points:

Chicago.—Feeling that there will be a buying movement by mills and foundries in the near future, dealers are bidding up prices on Government scrap offering. Advances have amounted to as much as $2 per ton. The Government has sold 17,000 gross tons of ingots at an average price of $19.

Philadelphia.—Dealers are showing no anxiety to sell heavy melting steel at present prices. They prefer to pile it in their yards in anticipation of an advance. Small sales of car wheels, low phosphorus and turnings have been made at prices a little higher than those on previous sales.

Birmingham.—Cast scrap is being sold freely, but heavy melting steel is being held by dealers for a better market. The tone is generally good. Steel rails are quoted from $12 to $14; cast iron borings from $6.50 to $7.50; steel axles from $18 to $20.

Buffalo.—A fair amount of business is being done and a large number of enquiries are out. Dealers' demands are, however, more than the consumers are willing to pay in many instances, especially in heavy melting steel. Dealers are holding for $16.50 to $17, and expect a $20 price before long.

New York.—Contrary to prevailing conditions in other countries, the most activity here is in heavy melting steel, borings and turnings and iron pipe. Prices have advanced on an average 75 cents during the past week. Chinese interests recently purchased 3,000 tons of steel scrap.

St. Louis.—Although various railroads offered last week an aggregate of 7,000 tons, the market continues to hold its strength. This is chiefly due to trading among the dealers themselves, which continues, though little business is being done between consumers and dealers. Prices are therefore nominal.

Cincinnati.—The feeling of the dealers is reflected in prices, which have been advanced on several grades. Rerolling steel rails have shown the greatest strength in this direction, being quoted $17 to $18 per gross ton dealers' yard. Other grades have gone up 50 cents to $1.50 per ton.

Cleveland.—Although dealers have large stocks, they are disposed to hold them for better prices. Heavy melting steel has sold as high as $18.50, one consumer taking 1,500 tons at that price. There has been a general advance in all other grades, No. 1 cast being quoted $23 to $24.

BUYING BETTER

Reports Indicate That Business is Now On a Much Better Footing

CONTINUED activity in the centres where the buying movement originated, and an improving interest in some of the quieter spots, are the market features this week. Following are reports from various centres:

Chicago.—Genuine enquiries, followed by prompt buying of round tonnages, describe the conditions here. Quantities closed run from 500 to 4,000 tons. Good enquiries for malleable are on the market. Stocks held on furnace banks are fast disappearing, and talk of blowing in idle stacks is heard.

Philadelphia.—Sales of foundry iron have been good during the week. Prices firm, though showing weakness in spots. While nothing that could be construed as a general buying movement has developed, a satisfactory increase has been shown in sales.

Birmingham.—The last two or three weeks have been responsible for business reaching nearly 150,000 tons. Yard stocks are showing signs of depletion, and the total holdings in this line are much below 100,000 tons. Export business is expected to improve with the easing off of freight rates.

Buffalo.—While the total quantity of iron sold does not equal that of the preceding week, a good business has been done. Most of it has been in foundry and malleable grades. One sale of 7,000 tons malleable is reported, the price being $27.75.

St. Louis.—Purchases are confined to small lots from carload to 200 tons, for immediate requirements. Furnace men are not pushing sales at the present prices, and consumers are not showing much anxiety to buy. The largest enquiry is for 2,000 tons from a stove concern.

New York.—Trading has not been so active during the past week, the aggregate of foundry iron having reached about 35,000 tons. While freight rates are declining, exporters are finding it difficult to get replies to their cables. Furnaces are not making any concessions for last half business.

Cincinnati.—Sales have not reached the standard of the past few weeks, though enquiry for last half foundry is good. Four thousand tons for August-September delivery are being sought by the Standard Sanitary Manufacturing Co. Schedule price is being maintained on high silicon grades, which are in good demand.

Cleveland.—Numerous sales of round tonnages, mostly for last half, have featured an active week's trading. Sales of 130,000 in the first two weeks of June are reported by two sellers. Some sales have been made for first quarter 1920. Steel-making grades are quiet.

45,000 SHOWERS

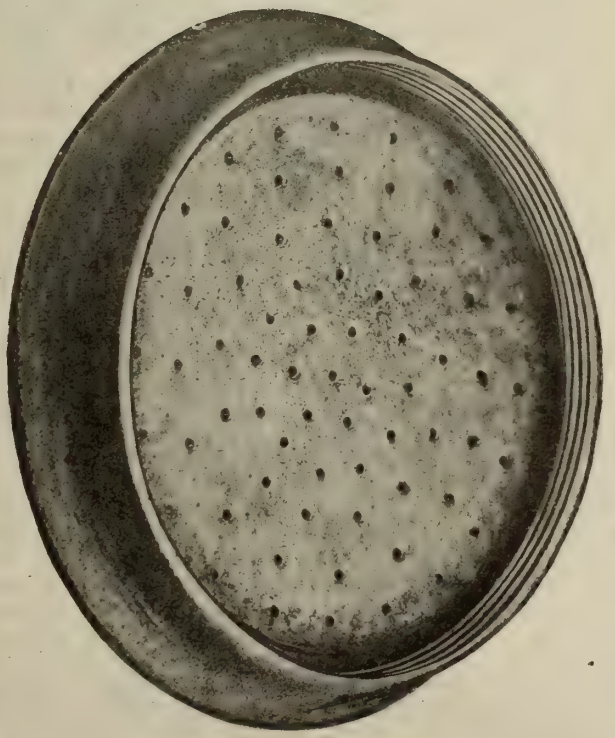
A Manufacturer Gives the Details of Filling a U. S. Government Order for 45,000 Shower Heads, Using Geometric Die Head and Collapsing Taps.

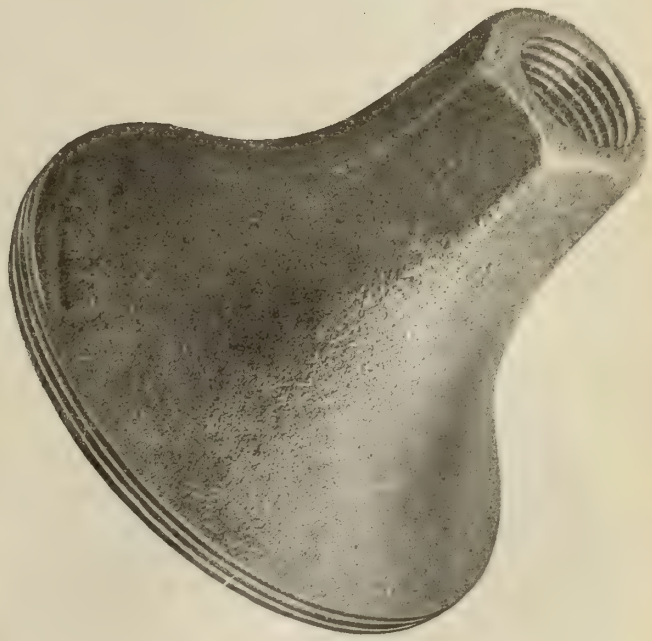
"On the main thread of the shank 3⅜"-16, we average 230 per hour, with a surface speed of about 400 feet per minute. On the pig iron end we averaged 220 per hour, with a surface speed of about 200 feet per minute. This speed may seem a little low, but we cut this down in order to get a quicker handling of the work. We handled these in air chuck, and in releasing air chuck the work automatically dropped to a box below.

"On the face, tapped 3⅜"-16, we averaged 210 per hour, with a surface speed of about 400 feet per minute.

"We were very much pleased with the Geometric tools on this work, especially with the chasers, as we completed 30,000 showers, male thread, with one set of these chasers."

Try a Geometric Thread-Cutting Die Head or Collapsing Tap on your work, and be equally pleased.





The Geometric Tool Company

New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

C.A.S.E. GATHERING AT BRANTFORD WAS A MOST SUCCESSFUL EVENT

THE busy manufacturing city of Brantford was the place chosen for the 30th annual convention of the Canadian Association of Stationary Engineers, which was held on the 24th, 25th, 26th June.

The local lodge, Brantford No. 4, which had the arrangements in hand, rose to the occasion, overcoming quite a number of severe handicaps in ensuring a successful meeting. Not the least of these obstacles was the influenza epidemic, which laid the members of the lodge by the heels one after the other. Just to show that they were superior even to influenza, the local committee commandeered the Emergency Hospital building to hold the convention and power exhibition in. Needless to say, the last remaining germ was driven forth before the convention assembled, and the building made a very suitable place for gathering the various mechanical exhibits.

The Exhibits

The number of firms exhibiting power plant accessories and appliances were as numerous as in former years, and the quality of the exhibits compared favorably with any previous exhibition. The opportunity for getting acquainted with the latest aids to economical power production was appreciated by some of the delegates, but on the whole the attention given was not all that might be desired.

The business of the C.A.S.E. delegates to the Grand Lodge was carried on in private sessions during the three days, the election of officers taking place on the morning of the last day. The place of meeting for the convention of 1920 was chosen at Woodstock, Ont.

The executive officers of the Grand Lodge, C.A.S.E., were elected as follows:

Past president—W. Cook, Belleville.
President—Geo. E. Moll, London.
1st vice-pres.—I. J. Tait, Montreal.
2nd vice-pres.—D. L. Webster, Brantford.
3rd vice-pres.—Fred Harper, Kingston.
Sec.-treasurer—John Hale, Hamilton.
Conductor—Ross C. Leach, Toronto.
Doorkeeper—Geo. Lee, Ottawa.

Mr. W. Cook was chosen as a delegate to the National Association of Stationary Engineers, with Mr. Balmfirth, Toronto, as alternative delegate.

The Exhibitors' Association also elected their officers for the coming year, the results being as follows:

President—Jas. Mock, Montreal.
1st vice-president—J. E. Fitzgerald, Montreal.
2nd vice-president—Grant Cole, Toronto.
Treasurer—L. L. Archibald, Toronto.
Secretary—Gordon C. Keith, Toronto.
Asst. Secretary—Geo. M. Wilkinson, Toronto.

Chairman Exhibits—A. Betton, Toronto.

Committee Exhibits—E. Hanson, Toronto; H. Fletcher, Toronto.

Entertainment Com.—Chairman, Bertram Curzon, Montreal; H. Burbridge, Montreal; H. W. Cockfield, Toronto.

Reception Com.—Chairman, R. Sexton, Toronto; J. Thompson, Earl Gordon, Hamilton.

The Entertainment Committee of the Exhibitors' Association provided a varied programme of amusements during the convention. The final event, under the auspices of the Brantford Lodge, was the annual ball. This was held in the Masonic Hall, and was very well attended, forming a fitting wind up to a successful and pleasant convention.

CANADIAN ELECTRICAL ASSOCIATION DISCUSSED WIDE VARIETY OF MATTERS

The annual convention of the Canadian Electrical Association was held on June 27 and 28 at Alexandria Bay, Thousand Islands, this location providing a delightful outing for the members in combination with the necessary business meetings. The programme consisted largely in the presentation of reports from committees much as former years. These reports were submitted from the committees on accident prevention, prime movers, electrical apparatus, meters, rate research and light and power sales.

Progress has been made in the field of prime movers during the last year. Larger turbo-generators have been installed, and while this has been the case, operating troubles have been experienced. These troubles have in some measure been caused by the necessity for employing inexperienced help owing to war conditions. More rigid inspection is being carried out. Higher steam pressures are much in evidence and the development of still higher pressures seems to be a matter of boiler design.

The water turbine has seen little development in the last year, but the use of high specific speed vertical single-stage runners is rapidly becoming standard for all low-head installations.

A very important feature, and one around which much discussion arose, had to do with the newly-appointed engineering standards committee at Ottawa. The electrical industry could be materially benefited by co-operation with this committee and by the adoption of standards tending towards elimination of useless features of design.

Power sales of various large companies are practically as good to-day as when the armistice was signed. The signing of the armistice rendered a decrease in power sold inevitable for a short time, but this was almost wholly regained before the close of 1918.

Industrial lighting has received a considerable impetus, and well-designed lighting installations have been a material factor in the production of munitions. Greater attention will necessarily have to be devoted to this subject by the industry in the future if production is to be maintained.

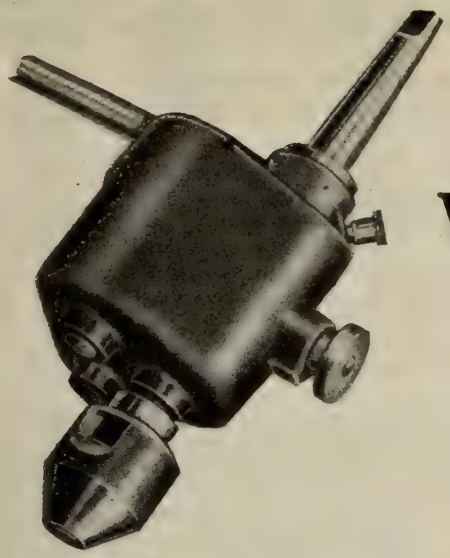
One of the most interesting features of the convention was the paper delivered by E. P. Fredericks on "Service at Cost Plan as Applied to Public Utilities." This plan in brief guarantees the return of a fair amount on capital to the investor, insures an economically-managed plant and protects the public from extortion. While new in some parts of the country, the scheme has been well tried in a dozen or more cities and has been found to be the only solution of the urban transit problem. Various methods have been adopted to ensure satisfactory operation but in practically all of them street railway fares fluctuate at six month or longer intervals, according to the state of a reserve fund.

CONTROLLING CANADIAN SHIPPING NOT TO INTERFERE WITH BUILDING

MR. BALLANTYNE has introduced an amendment to the Canada Shipping Act providing that a shipowner wishing transfer of registry or of mortgage, must apply to the Minister of Marine to get it. In doing this Canada is following the precedent of Great Britain, the action being taken in order that there may be assurance none of our shipping will get into foreign hands. Under the provisions of the bill a foreign company applying for the registry or transfer of a ship must come to Ottawa and apply to the Minister, so that the bona-fides of the applicant and all particulars may be investigated. The bill is to remain in force for three years after the signing of peace.

Objection to the bill was made by Mr. Duff, of Lunenburg, an old opponent of the Minister's, who conducted a spirited attack on the Naval Department this session. He claimed that it would put many wooden shipyards out of business. Most of the wooden ships built in Canada are for sale, and not intended for the Canadian trade. He said it would work a hardship on shipowners. A ship might be in Brazil or France and a sale made by telegraph through the captain, which would require immediate acceptance. Application to Ottawa as required by this bill would, in Mr. Duff's opinion, create such delay as to make sale impossible or difficult.

Continued on page 80



Aikenhead's

Wahlstrom Attachment

Reduces Tap Breakage
Increases Tapping Speed

Taps holes as squarely as they can be drilled and ten times faster than is possible by hand. Its action closely imitates hand tapping, because of the mechanically obtained **oscillating movement** and it minimizes tap breakage.

The quality of material and construction assures a long lasting trouble-free service.
Takes taps of all sizes up to 1½ inch.

Send for Bulletin.

Order One On Trial
Your Money Promptly Refunded if Unsatisfactory

AIKENHEAD HARDWARE, LIMITED
17 Temperance Street, Toronto

Aikenhead's

Van Dorn Portable Electric Drills

Works 50% faster than the best pneumatic drills, known amongst actual USERS as thoroughly reliable, fool-proof and trouble-proof.

You cannot go wrong with a Van Dorn Electric Drill.

Catalogue sent upon request.

Aikenhead Hardware Limited
17 Temperance Street TORONTO

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

Pittsburgh to Following Points	Per 100 lbs. C.L.	L.C.L.
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

Lake copper	$22 00	$21 00
Electro copper	21 00	20 75
Castings, copper	21 00	18 00
Tin	55 00	55 00
Spelter	9 25	8 50
Lead	7 25	6 50
Antimony	9 50	9 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit
Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
tandard couplings, 4" and under 40%.
4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$12 50	$12 00
Copper, crucible	16 50	15 00
Copper, heavy	16 00	15 00
Copper wire	16 00	14 50
No. 1 machine composition	12 75	14 00
New brass cuttings	9 25	9 00
Red brass turnings	10 00	9 00
Yellow brass turnings	7 25	6 50
Light brass	6 00	5 00
Medium brass	7 00	6 00
Scrap zinc	5 50	5 00
Heavy lead	4 50	4 00
Tea lead	3 50	3 00
Aluminum	15 00	12 00
	Per Ton	
Heavy melting steel	10 75	9 00
Shell turnings	6 00	6 00
Boiler plate	10 00	8 00
Axles (wrought iron)	17 00	15 00
Rails	12 00	11 00
Malleable scrap	12 00	12 00
No. 1 machine cast iron	18 00	15 00
Pipe wrought	8 00	5 00
Car wheels	20 00	18 00
Steel axles	20 00	20 00
Mach. shop turnings	5 50	5 00
Stove plate	14 00	10 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd hd., brass	net
Machine screws, o. and fil hd brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per Ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

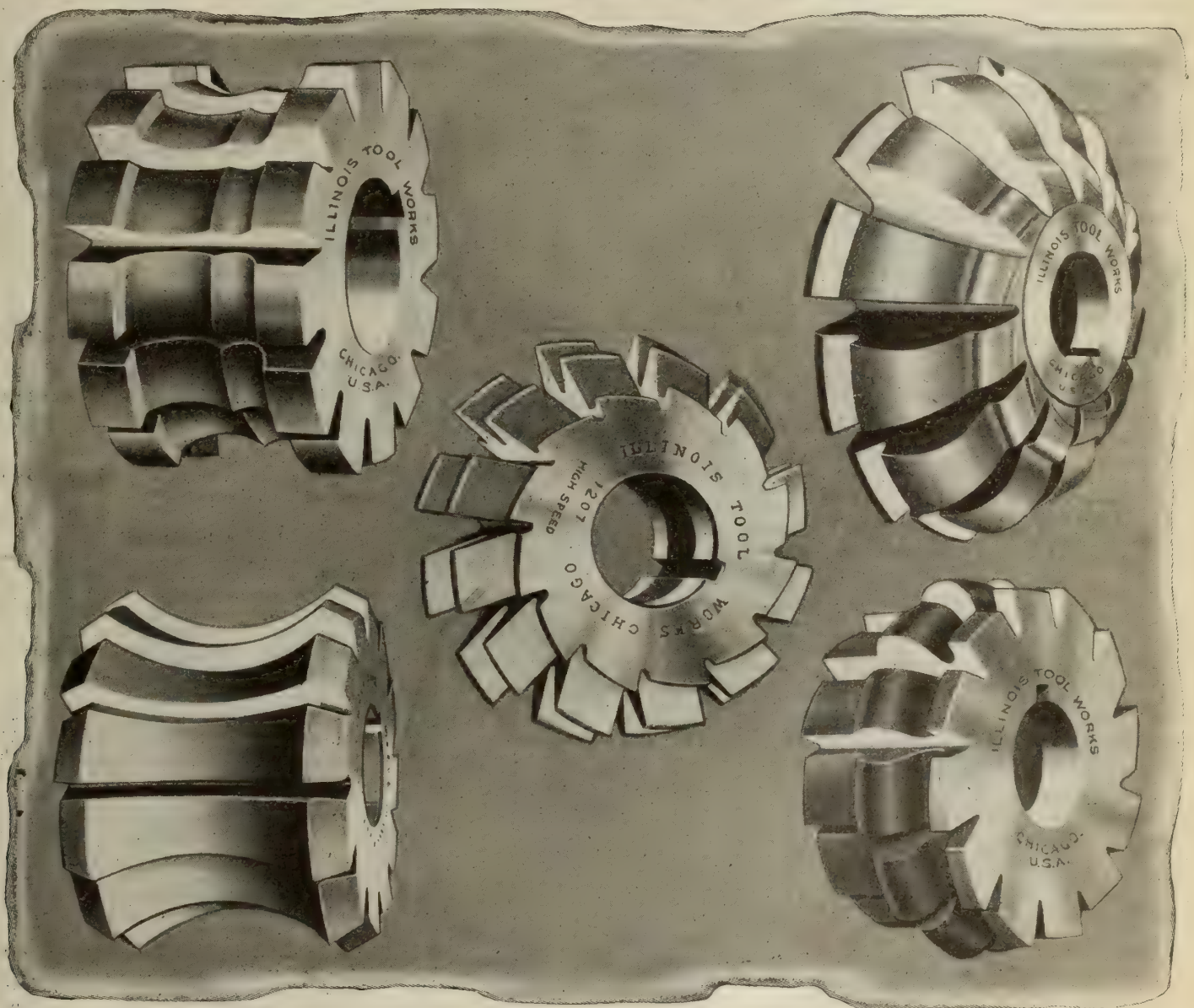
ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

ILLINOIS
TOOLS



"ILLINOIS" Formed Cutters are noted for their accuracy, dependability and durability. Our engineer-experts insure those qualities, from the selection of the high speed steel to the final testing of the finished tool, no matter how unusual the requirements or design. That's why "Illinois" stands for infallibility in tools.

ILLINOIS TOOL WORKS
CHICAGO, U. S. A.

Detroit
Woodward and Warren Aves.

A. C. Towne, Inc.
17 W. Swan St. Buffalo.

S. J. Pfaff
Pioneer Bldg., St. Paul.

Rose Tool and Supply Co.
111 Market St., Pittsburgh

Louis G. Henes
75 Fremont St. San Francisco.

Title Insurance Building,
Los Angeles

Indianapolis Office
616 Fletcher Sav. & Trust Bldg.

New York Office
141-145 West 36th St.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sies up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, al sizes	40 plus 10
3-fluted drills, plus	10
Jobbers' and letter sizes	40 plus 10
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 50
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	8 00
Can. plates, all bright	8 50	9 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head, 28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S.	.....	7 95
Premier, 10¾ oz.	.....	8 25
Zinc sheets	20 00	20 00

PROOF COIL CHAIN B

¼ in., $14.35; 5-16 in., $13.85; ⅜ in., $13.50; 7-16 in., $12.90; ½ in., $13.20; $13.00; ⅞ in., $12.90; 1 inch, $12.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS

Brass rods, base ½ in. to 1 in. rod	0 30
Brass sheets, 24 gauge and heavier, base	$0 38

WASTE

Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

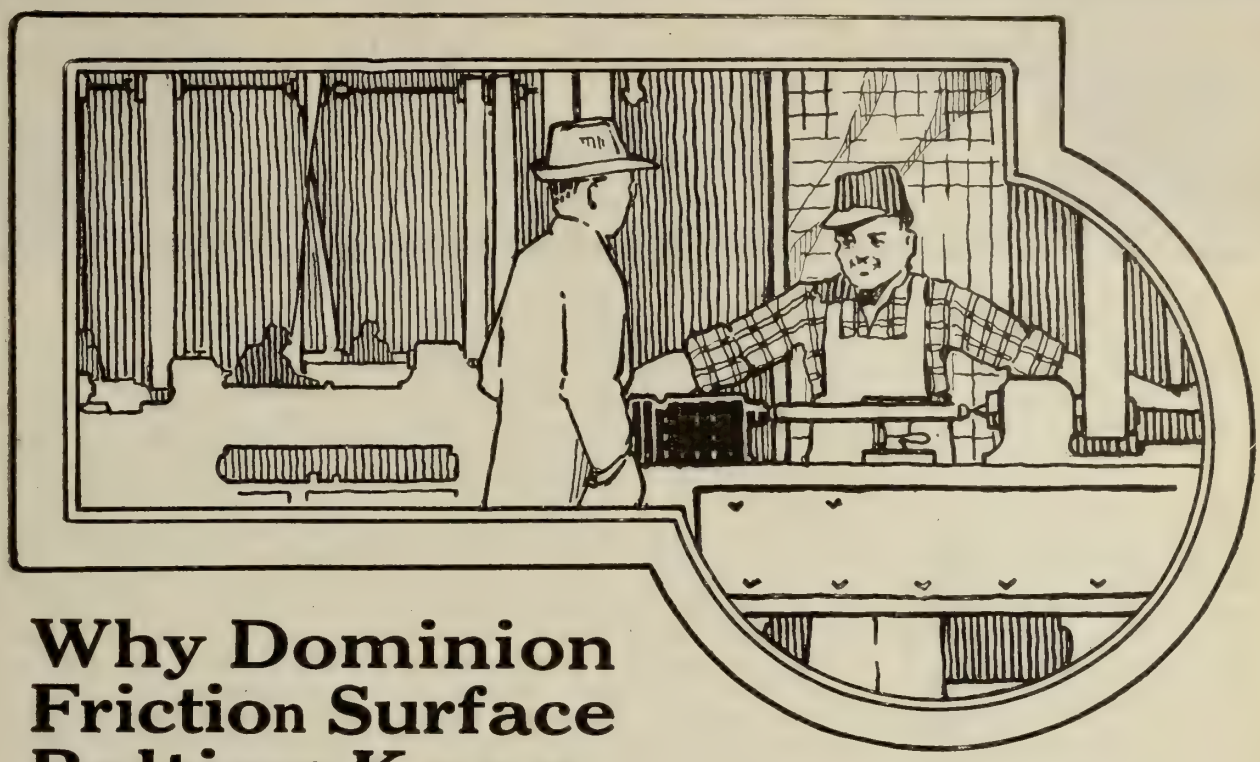
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	.
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated.



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There are few manufacturers who haven't discovered that satisfied employees are an absolute necessity to low cost of production.

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Dominion Friction Surface Belting, in eliminating these conditions, does much to keep employees satisfied, for it enables operators to turn out maximum production at low cost — does away with most transmission troubles and saves power by taking a grip on pulleys that practically prevents all slipping.

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Montreal,	Kitchener,	Regina,	Vancouver,
Ottawa,	North Bay	Saskatoon,	Victoria

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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

New Pulp Mill.—Five million dollars are to be spent by the Spruce Rock Falls Pulp and Paper Company, who will start on July 15th on the erection of a large mill and townsite, near Kingston, Ont.

C.P.R. Buys Land.—An additional eighteen acres has been acquired by the Canadian Pacific Railway at Swift Current, Sask. The property is located south of their tracks and west of the North and South highway. What use is to be made of it is not divulged.

Dominion Foundry to Close.—The Dominion Foundry plant at Hamilton will be closed down for two weeks in July while electric ovens are installed. Not many men will be affected, as the plant has been running light for some months. It is reported that the company intends to operate rolling mills in the course of a couple of months.

New Flour Mill.—Mr. R. M. Pincombe of Strathroy has purchased the property belonging to the estate of the late John Mills, adjoining the G.T.R., and will erect a flour mill having a capacity of 250 barrels per day. The mill will be operated by hydro power, and be thoroughly up-to-date in its equipment. The grain elevator will be moved from its present position to a site adjoining the new mill.

New Brunswick Telephone Construction.—An expenditure of between $150,000 and $200,000 will be made this year by the New Brunswick Telephone Company, according to officials who are on a tour through the St. John Valley. New copper circuits from Bathurst to Dalhousie and St. John to Moncton are included in the estimates, which will improve the service and allow for extensions to existing lines.

Bertram's Annual Pic-nic.—The annual pic-nic of the employees of the Bertram and Pratt and Whitney's, one hundred and fifty strong, motored out from Hamilton to Grimsby, where a programme of sports and races was gone through. A baseball match between representatives of the two firms was won by the P. & W. team, who received a beautiful silver cup as the result of their endeavors. Refreshments were served, and the day was voted a great success.

C.N.R. Construction.—The only thing delaying construction on the Kamloops-Kelowna branch of the C.N. Railway is the unsettled state of the labor market. Contractors and sub-contractors are now in their appointed localities, and will start work just as soon as they can secure the necessary help. Major Swan, the divisional engineer, states that every effort will be made to complete the whole section by the fall of 1920, but in any case the Lumbly spur will be made available for marketing fruit this fall.

Who is the Owner?—The New Glasgow "Chronicle" wants to know who is the real owner of the cars now being built by the Eastern Car Co. for the Canadian Government and labelled Canadian National. It points out that on a recent shipment of cars the legend "Canadian Northern Railway" appears. On the flat cars now being built is the name of "General Trust Co., Trustee, Owner and Lessor, Philadelphia, Penn." On the gondola cars still another title appears, "Property of Canadian Northern Rolling Stock Co., Ltd."

Erect Fuel Factory.—The Anthracite Briquette Company will start building immediately on the new industrial site of the Toronto Harbor Commission a factory for the making of compressed anthracite briquettes. Large supplies of waste anthracite have been secured, and the plant will have at first a capacity of ten tons per hour. The rights of a patented binder have been secured from the United States. The use of these briquettes will, it is claimed, make a big saving in the cost of fuel. Some of the best brains of the chemical staff of the Toronto University have been connected with the process, and it is understood to be a first rate commercial proposition. The capital is all privately subscribed.

Ontario's Production.—In the annual report to the British Parliament, F. W. Field, the British Trade Commissioner, gives some interesting figures. Ontario gives 46 per cent. of the mineral production of Canada, and 30 per cent. of the wool clip. One-half of the manufactured goods are made in Ontario, and one-third of the agricultural product is grown here. Ontario yards received 30 per cent. of the shipbuilding orders.

To Build New Hospital.—Toronto intends to build a new reception hospital, and Controller Cameron presented a motion that the city architect be instructed to prepare the necessary plans and estimates. An extension to the Civic Abattoir is also contemplated, at an estimated cost of $50,000.

May Arbitrate Now.—Mr. F. G. Wallace, president of the Canadian Locomotive Company, Kingston, has replied to the letter sent him by the committee appointed by the City Council to endeavor to bring about a settlement between the company and its striking employees. Mr. Wallace, in thanking the committee for its kind offer, says that the time is not opportune for outside intervention, and continues as follows: "Had we refused to meet our employees, your committee might have been of great assistance, but our men fully understand that they can arrange a meeting with us at any time they so desire. Under these circumstances you will readily see that it is impossible for us to avail ourselves of your kind offer." The Strikers' Committee has written the Council's Committee that it is ready to negotiate its differences.

MUNICIPAL

Pembroke is going to have a new lighting system.

A memorial club house, costing $35,000, will be built at Brampton.

Work is being commenced at once on extensions to the rail mill at the Algoma Steel Corporation.

Sarnia is going to vote on July 4 on by-law for new collegiate and technical school to cost $350,000.

The Township of York call for tenders for the construction of a number of cast iron water mains. Frank Barber, 40 Jarvis St., Toronto, is the engineer.

Niagara Falls, Ont., contemplate making improvements to the electric light plant and system. Debentures for some $18,000 will be issued to provide for the work.

The Town of Aurora, through James, Loudon & Hertzberg, 36 Toronto St., Toronto, are in the market at once for a centrifugal pump of 750 gallons per minute capacity, to be driven by a gasoline engine.

PERSONALS

Alex. Lentz, for the past five years secretary and manager of sales of Brown's Copper and Brass Rolling Mills, Limited, Toronto, has resigned that position, effective July 1st, and will be associated with the Kent, Ockley, Limited, Toronto, as vice-president secretary and treasurer.

MARINE

Collingwood.—The Collingwood Shipbuilding Company launched the "Canadian Signaller" from their Collingwood yard, making the fourth ocean-going steamer to leave their ways this year.

Detroit.—The steamer J. T. Hutchinson loaded with ore has gone ashore on Trout Island shoal, and is leaking badly. A wrecking steamer from Sault Ste. Marie has gone to her assistance. The steamer Major is also reported to be off the port of Lexington, and a steamer from Port Huron has gone down to help her off. She went ashore in a thick fog.

Victoria. — The Foundation Company had a successful launching of their eighth ship recently when the Ottawa was put in the water. This is the eighth ship out of the twenty building for the French Government. The launch was in charge of the assistant Northwest manager of the Foundation Company, Mr. Edward E. Jenkins. The sponsor was Mrs. W. J. Stephens.

Washington.—The American Bureau of Shipping, which has been formed in the U. S. on somewhat similar lines to those of Lloyd's Register in Great Britain, is expected to do great things for American shipping. Commodore E. P. Beethold, commandant of the Coast Guard, will take charge of the Bureau, and is retiring from his present position on June 30th for this purpose.

Victoria.—The first of the twenty ships building by the Foundation Company for the French Government made her steam trials recently. The course used by the Imperial Munitions Board was the one chosen. The vessel on trial was Hull 207. Hull 216 will be ready to take her trials early in July, and there are several other hulls waiting their turn at the fitting-out shed.

Victoria.—The Canadian Merchant Service Guild has been incorporated at Victoria, and will be incorporated with the other branches of the guild, making it one big organization. The headquarters of the Western body will be at Victoria, the Middle East at Collingwood, and the Eastern at Halifax. There are already 500 members in the Western body, which embraces the entire coast and lakes of British Columbia.

Victoria.—An unusual scene was witnessed recently when the Prince Rupert was being loaded for her trip to the North. The officials of the Grand Trunk Railway, from C. E. Jenney, the general agent of the company at Vancouver, turned to and assisted in getting the freight and baggage aboard the vessel. The vessel was bound for Vancouver and Prince Rupert, and carried a large number of passengers, as well as supplies for the Northern ports.

London, Eng.—In reply to a question in the House of Commons, Mr. Bridgeman, Parliamentary Secretary to the Board of Trade, said that the resolution of the Imperial Conference with reference to steamship lines did not aim at creating either lines or subsidies. It simply urged that the best mail service possible should be given, between Canada, Newfoundland, and Australia. An Imperial Investigation Board was being created, which would deal with these questions.

Ottawa.—Although the war is over, the amount of shipping passing through Canadian ports under the control of the Canadian Director-General of the British Ministry of Shipping is larger for the first five months of 1919 than it was in the demobilization period of 1918. The total tonnage for the five months is 1,804,995 tons, nearly as much as the total tonnage for the year of 1916. The total amount of material and supplies, exclusive of horses and mules, cleared from Canadian ports since August, 1914, to May, 1919, is 14,044,758 tons.

Montreal warehouses are filled to capacity with freight waiting for shipment. This is due to the shortness of tonnage, and there is no prospect of immediate relief. The British Ministry of Shipping still controls 70 per cent. of the available cargo space, and it is a strenuous job for the steamship companies to divide out the remaining 30 per cent. without hurting the feelings of at least some of their clients. Col. W. I. Gear, of the Robert Reford Co., states that the Cunard line has chartered and purchased every available ship, while the Donaldson and Cairn lines each expect a new ship about August.

Vancouver.—Addressing the retail bureau of the Board of Trade at a luncheon, Commissioner McClay stated that the construction of harbor facilities would be started as soon as the Government allocated the $5,000,000 appropriation to the work. These facilities consisted of a terminal railway, four new deep sea berths with fire-proof sheds, a lumber assemblage wharf for export lumber, a large central booming ground for saw logs, oil storage tanks for non-inflammable oils, and the purchase of a suitable fire and tug boat combined. The speaker in calling attention to the importance of shipping to the port, mentioned that a ship of the Robert Dollar Line spent as much as $40,000 in the port each trip.

TENDERS

Board of Trustees, Pathfinder School District No. 3690, Manville, will receive tenders up to July 12th for the erection of a frame school building. Plans and specifications from the office of the Secretary-treasurer, Manville.

The town clerk of Oakville will receive tenders up till July 7th for the supply of material and construction of tarvia or asphalt macadam pavement on six streets. Plans and specifications at office of town clerk, Oakville, or Jas. A. Bell and Son, St. Thomas, Ont.

The City of Toronto require tenders, by registered post only, up to July 8th,

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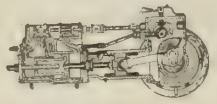
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Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

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Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

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The Department of Railways and Canals ask for "Tender for Tugs," tenders to be in by July 7th for two tugs from 250 to 400 h.p. each. Not less than 75 feet or more than 100 feet in length, 18 to 22 feet beam, and nine to 10½ feet draught. To have compound or triple expansion condensing engines, and to carry not less than 125 lbs. steam pressure. Accepted cheque for $1,000 to accompany each tender. Complete specifications, boiler inspection report, and place where tug can be inspected to accompany tender.

CATALOGUES

The Bastian-Blessing Company, Chicago, have issued a pamphlet entitled A New Principle in Welding and Cutting Apparatus. This publication takes up the principles on which their torches operate and also gives the advantages resulting from this apparatus.

The Foster Instrument Co., Letchworth, Herts, England, have issued a very practical chart on the care and use of pyrometers. This chart, suitable for hanging up in the works, contains hints on the use of pyrometers of various types, such as radiation thermo-couple and electric resistance, and also has a useful Fahrenheit-Centigrade conversion chart ranging from 50° to 3550° Fah.

CONTROLLING CANADIAN SHIPPING

Continued from page 72

The Minister allayed his fears somewhat by saying that there would be no delay. The incident opened up a very interesting discussion on shipping, in the course of which some very interesting information was elicited. Mr. Duff said that there was a lot of American money which might be put in Canadian shipping if encouraged. He himself knew of one Boston man willing to invest fifty thousand dollars in Nova Scotia ships.

Mr. Ballantyne assured Mr. Duff and other critics that there would be no interference or delay, as it was the policy of the Government to increase all Canadian shipbuilding. But a certain amount of caution had been shown to be necessary. One of the neutral countries had applied to Canada for registry for a ship which it was found was to engage in enemy trade. The principal object of the bill was to see that none of our ships get into the hands of enemies, and to conserve Canadian tonnage for Canada as much as possible.

Michael Clark objected to the principle that we should try and prevent the enemy countries getting shipping facilities; without them they could never export the goods to pay the indemnities, but the Minister insisted that if he received an application from Germany or

Austria, he would refuse it. During the course of his speech he remarked that a large number of wooden ships had recently been transferred from Canadian to Newfoundland registry, which involved a stay of the man concerned only three hours in Ottawa. He assured Mr. Duff that there would be no trouble in any case.

During the debate on the budget the member for South Cape Breton, where the coal and steel works are located, brought up the matter of Canadian shipping commandeered by the British Government during the war, and not yet returned, though badly needed. The Nova Scotia and Dominion companies have lost control of the St. Lawrence coal trade, which has passed to American interests, through lack of shipping. The ships taken were under long contract. The matter has since been brought up in the House and the Premier made a statement, in which he left the impression that the Government was doing everything possible to get the ships out of the hands of Great Britain, but it was hanging on to them like grim death. Mr. Ballantyne and others stated pretty frankly their opinion of the spirit which insisted on retaining the ships to the profit of those who have them, but to the loss of Canada.—T.M.F.

GREAT LAKES TRANSPORTATION COMPANY

Mr. John Bell, who is in charge of this firm's business at Fort William, seems to have been causing a great deal of activity around the river since he took over the ice-breaking contract last fall. We understand he will have three tugs in commission during the summer months and a very fine steel tug is being built in Midland specially designed to keep the harbors at Fort William or Port Arthur open as late, or early, as may be found necessary.

Mr. Bell is getting together a very fine salvage outfit, and while not employed in that special work it will be kept busy towing sand and gravel from the North Shore of Lake Superior.

CONCRETE CHIMNEYS AND LIGHTNING

A concrete chimney, 6 ft. by 120 ft., was struck by lightning recently, and though without lightning rods it was not injured in the least. The chimney stands in the midst of greenhouses, and if it had been brick, there would undoubtedly have been some lost glass.

Commissioner Chisholm's Remedy.—Riverdale and other parts of Toronto have been suffering considerably from the effects of the soot deposited by the smoke from the many locomotives working in the vicinity. A test case is being brought against the C.P.R., to see if the city by-law cannot be enforced against the company for operating locomotives that give forth more smoke than the law allows. Commissioner Chisholm suggests the electrification of all railroads coming into the city as the only remedy.

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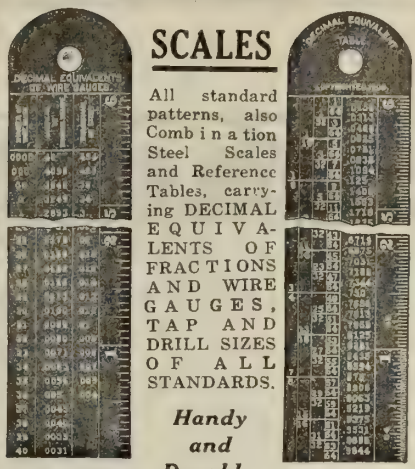

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (cfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

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A CANADIAN MANUFACTURER OF MACHinery for the use of Contractors, Miners, etc., is open to undertake the manufacture of any other machinery or device for the use of either contractors or miners, and invites correspondence with holders of Canadian patents, or with U. S. concerns desiring a Canadian manufacturing agency. Liberal inducements also offered for successful suggestions regarding machinery or other articles that can be manufactured and sold in connection with the above-mentioned lines. Address Box 610, Canadian Machinery. (c2m)

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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1 Matheson Feed Water Heater, 3 ft. x 18 in.

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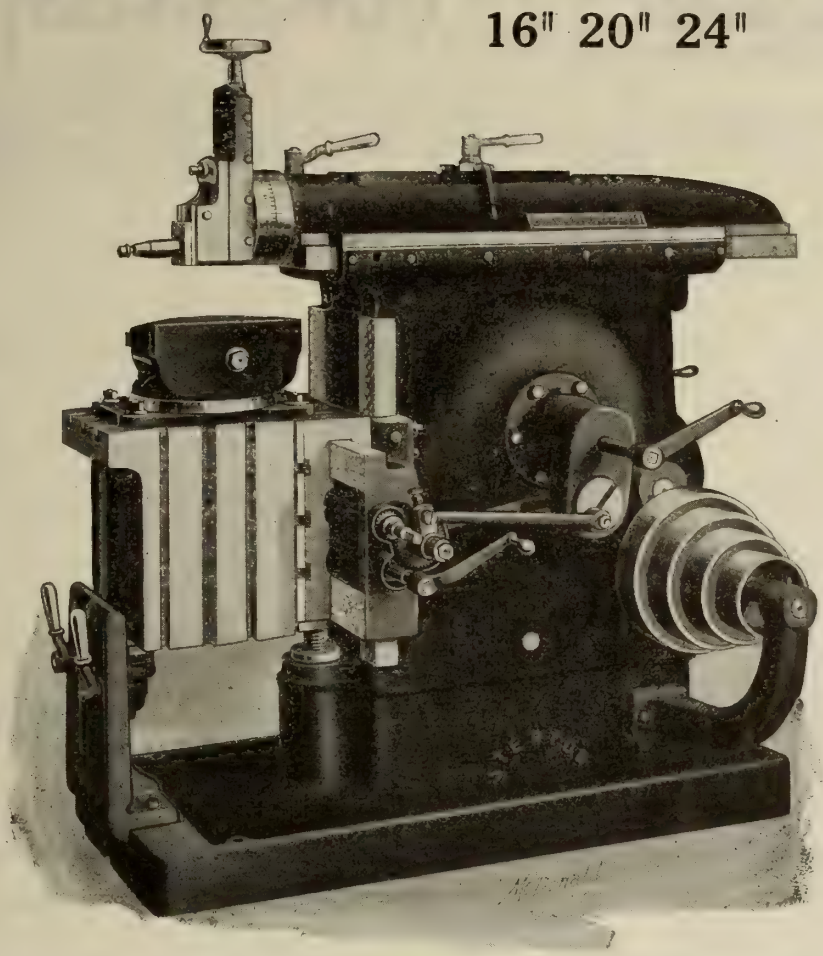

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Give full details in first letter.

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2 and 3 Phase—25 Cycles.

Generator. K.W.	Volts.	R.P.M.	Engine. Cylinder Dimensions.
250	220	214	15 x 22 x 17″
260	220	214	15 x 17″
450	550	125	17 x 34 x 30″
1000	240	107	24 x 48 x 42″

2 and 3 Phase—60 Cycles.

Generator. K.W.	Volts.	R.P.M.	Engine. Cylinder Dimensions.
25	440	1200	8 x 8″
50	2200	300	11 x 19 x 11″
50	2300	300	11 x 12″
100½	240	277	14 x 14″
125	220	225	14½ x 18″
125	240	200	12 x 21″
150	220	225	10 x 20 x 18″
150	2300	225	14 x 22 x 16″
200	2300	200	
300	480	150	14 x 28 x 30″
300	2300	150	18 x 30 x 22″
325	2300	120	24 x 36″
325	2300	150	18 x 36 x 24″
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450	550		24 x 36 x 36″
500	480	120	20 x 40 x 36″
600	2300	150	20 x 38 x 24″

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Partial Selection from our Big Stock:

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1—Used FERRACUTE D-151 Vertical Double-geared Straight-sided Single-action Redrawing Press, exerting 150 tons pressure. Length of stroke, 13". Width between columns, 32".

6—Used FERRACUTE DGG-56 Vertical Double-Geared Straight-sided Single-action Redrawing Presses; 5 of these presses have 18" length of stroke and 1 has 20" length of stroke. Distance between uprights, 30".

7—Used FERRACUTE DGG-56 Vertical Double-Geared Straight-sided Single-action Redrawing Presses, exerting 100 tons pressure; 6 of these presses have 15" length of stroke and 1 has 12" length of stroke. Distance between housing, 30".

6—Used FERRACUTE DGG-55 Vertical Double-geared Straight-sided Single-action Redrawing Presses, exerting 75 tons pressure. Three of these presses have 15" length of stroke and three have 18" length of stroke. Distance between housing, 26".

1—Used FERRACUTE C-5 Open-back Inclinable Cutting Press, Direct Belt Drive., that is, not geared, having capacity for exerting about 50 tons pressure. Length of stroke 2". Distance from centre of ram back to frame, 12". Width of opening through back, 18½". Height of opening through back 7½".

3—Used FERRACUTE PAG-4 Geared Adjustable Bed Punching Presses, having capacity for exerting 50 tons pressure. Length of stroke, 2". Distance from centre of ram back to frame, 8½".

3—Used FERRACUTE PA-3 Adjustable-bed Punch Presses, not geared, having capacity for exerting about 35 tons pressure. Length of stroke, 2". Distance from centre of ram back to frame, 7".

1—Used BROWN-BOGGS No. 215 Inclinable Power Press. This is a geared press. Arranged with 24" x 6" pulley. Distance back from centre of slide, 9½". Distance from bed to slide, when up, 13¾". Width between gibs, 11⅞". Length of stroke, 4".

7—Used FERRACUTE D-45 Horizontal Double-end-Screw Press designed for deepening or redrawing sheet metal tubes and shells about 3" diameter and 18" deep. Capacity for exerting 100 tons pressure. Three of these presses have length of stroke of 36" and 4 have length of stroke of 40". Diameter of ram screw, 6½". Diameter of side rods, 5".

2—Used E. W. BLISS No. 60½ Vertical Geared Rack-driven Presses. Length of stroke, 36".

3—Used FERRACUTE E-57 Vertical Geared Toggle Coining Presses. Length of stroke, 3".

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4—Used No. 666 Vertical Geared Toggle Presses, manufactured by the TOLEDO MACHINE & TOOL COMPANY. Having 2¼" length of stroke and capacity for exerting 1,000 tons pressure on ram.

NOTE:—The above presses were all operating on manufacture of Cartridge Cases when work stopped about nine months ago. They were purchased new from manufacturers from February, 1915, to September, 1915, and have had about two years' service. They were not used continually since being purchased. Some have been repaired and all have been kept in good running order—Examination can be made in Montreal.

TERMS:—25% with order balance against Bill of Lading.

NOTE:—If these presses were to be shipped back to the United States there would be no duty to be paid—You would only require to add freight from Montreal to destination (except Brown-Boggs Press).

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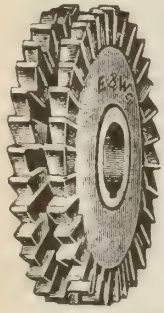

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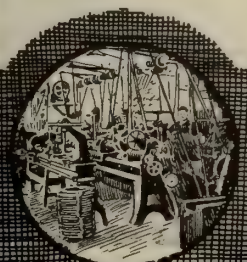

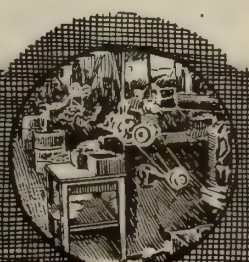

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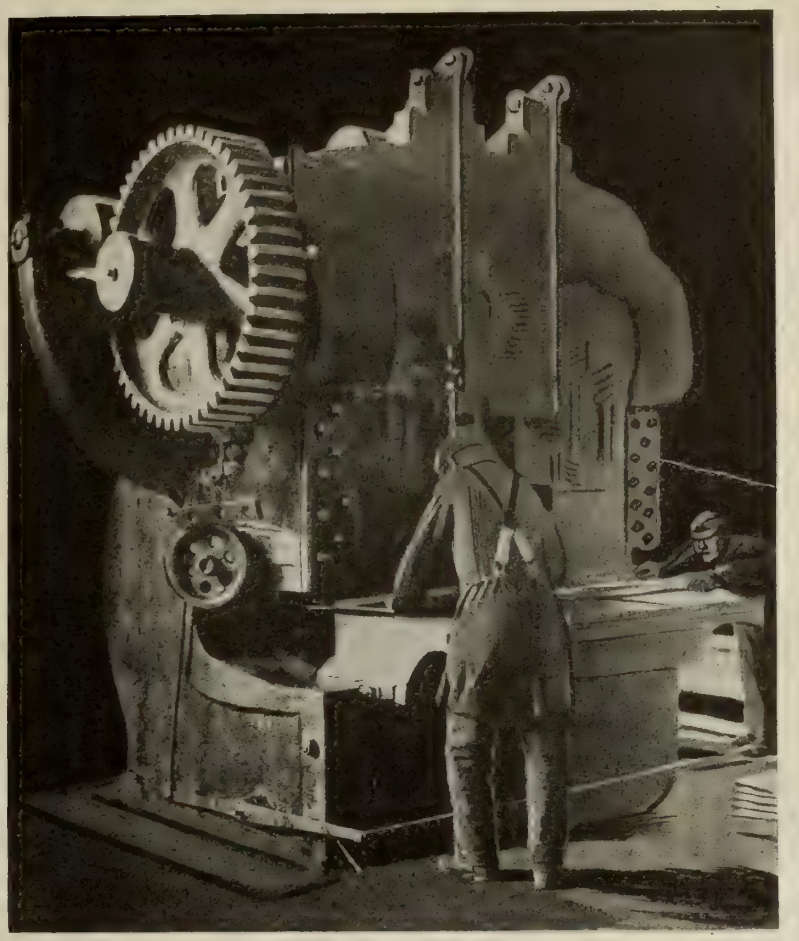

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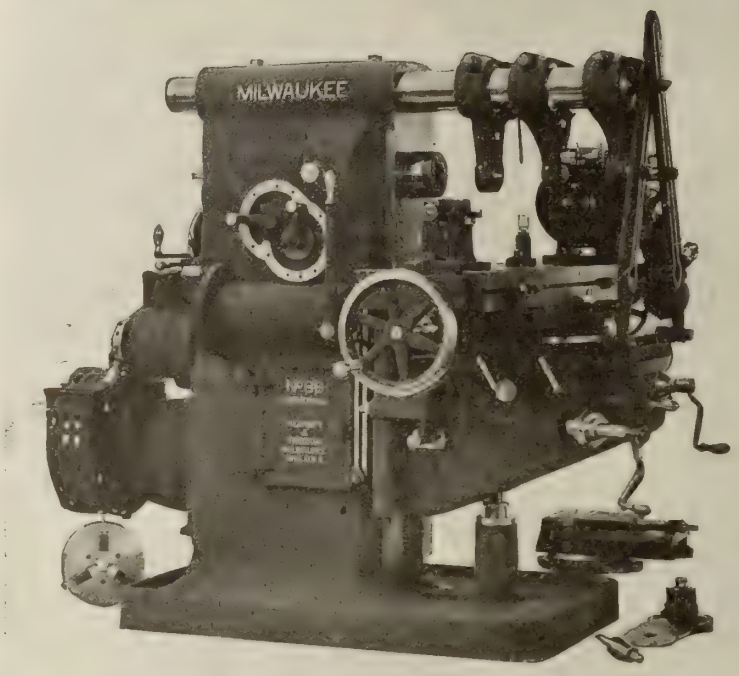

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The Column is a one-piece box section casting with few and small openings. The base is made pan shape to catch splashing oil and chips. The dovetail of the knee slide is extended upward to the overarm for the effective affixing of attachments.

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Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

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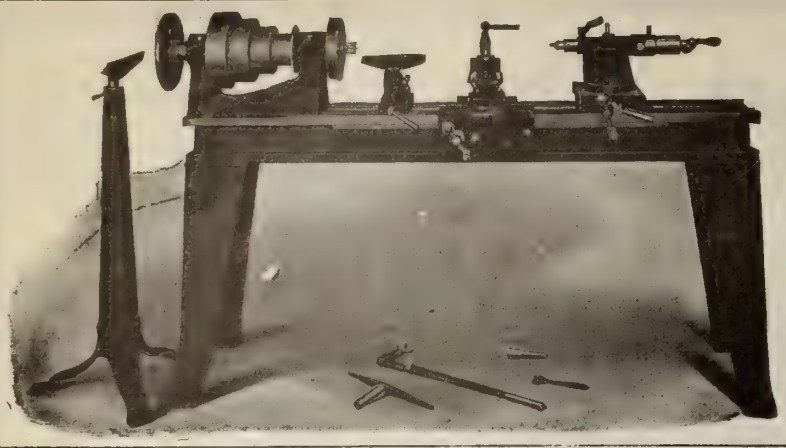

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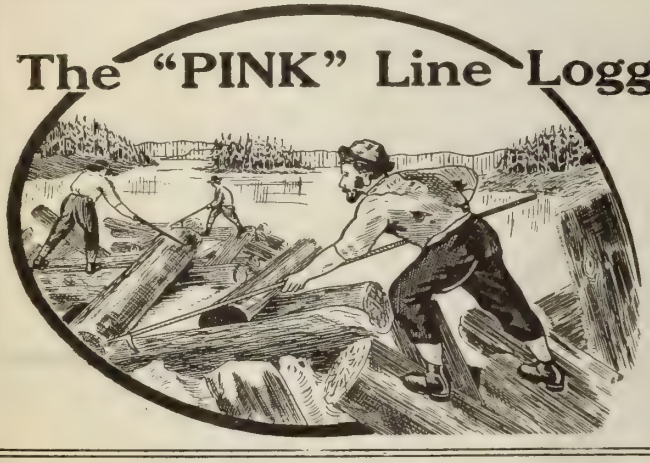

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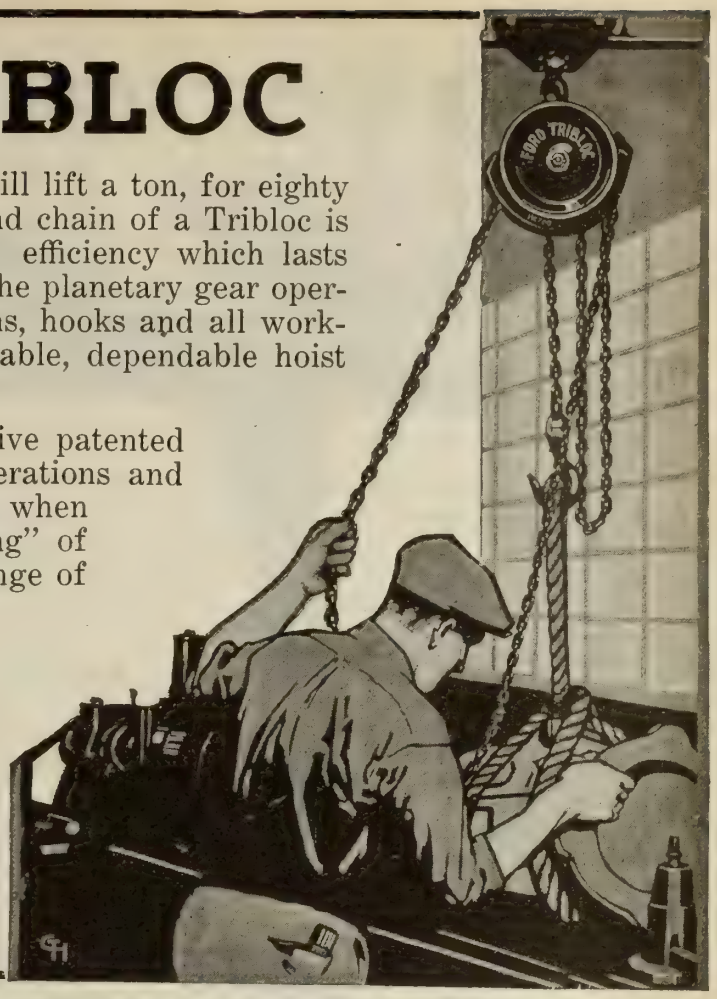
There's a 5-year guarantee with every Tribloc—in capacities of ½ to 40 tons.



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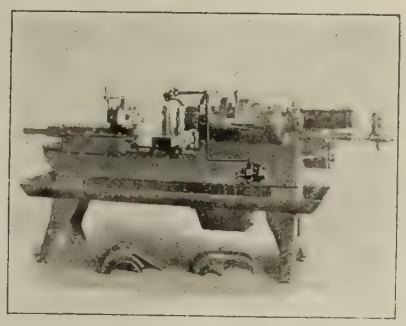
2155 D

TRAHERN LUBRICATING PUMPS



Screw Machine
W. K. Millholland Machine Co.

It does not take much reasoning to reach the conclusion that W. K. Millholland Machine Company would be very careful when selecting a pump to install on their product before its sale.

They would choose a pump which they had tried and knew to be dependable.

They would select the best type from the dozens which are being manufactured to-day.

They chose a TRAHERN, for they knew it would increase the efficiency of their machines.

A trial is all that is necessary to convince you that they are THE logical installation.

We'll stand by you--Try One

TRAHERN PUMP COMPANY

ROCKFORD, ILLINOIS

Canadian Agents:

A. R. Williams Machinery Co., Toronto, Ont., Can.

DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

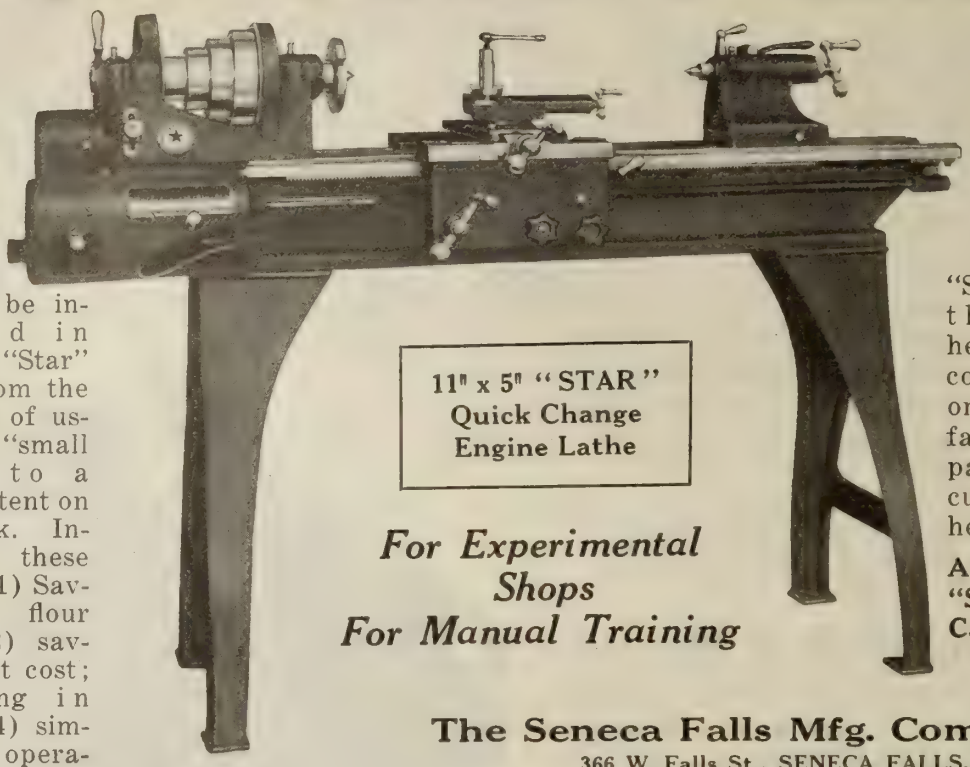
Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.

BRISTOL, CONN

For Light, Accurate, Commercial Work



11" x 5" "STAR" Quick Change Engine Lathe

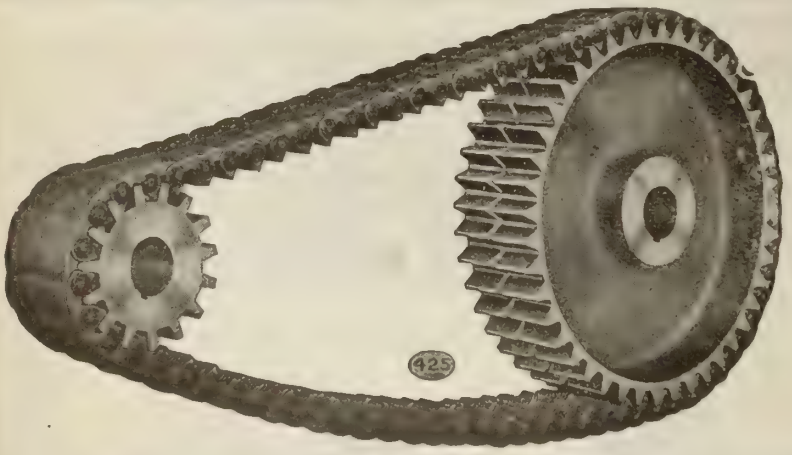
For Experimental Shops For Manual Training

You will be interested in studying "Star" Lathes from the viewpoint of using the "small lathe" to a greater extent on your work. Investigate these factors: (1) Saving in flour space; (2) saving in first cost; (3) saving in power; (4) simplicity of operation.

"Star" Lathes do the work of heavier, more costly equipment on light manufacturing and repair work. Accuracy is an inherent quality.

Ask for the "Star" Lathe Catalogue.

The Seneca Falls Mfg. Company, Inc.
366 W. Falls St., SENECA FALLS, N.Y.



Jones & Glassco (Reg'd)

ENGINEERS
MONTREAL AND TORONTO
Specialists in
POWER TRANSMISSION CHAINS
CANADIAN AGENTS FOR
"RENOLD"
Patent Silent and Bush Roller Chains
"MORSE"
Rocker Joint Silent Chains
Chain Drives from ¼ H.P. to 5000 H.P. in successful operation
Write for particulars to

Head Office: St. Nicholas Building MONTREAL
Branch Office: 1204 Traders Bank Building TORONTO

MAKE NAILS! NOT NOISE!

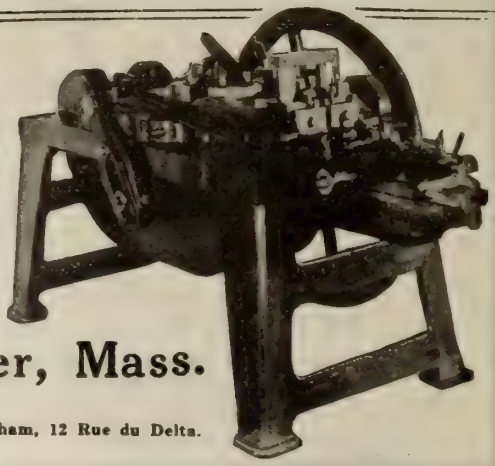
We offer the trade new types of

WIRE NAIL MACHINES

QUIET IN OPERATION; WITH VERY HIGH OUTPUT; ALL PARTS ACCESSIBLE; DECREASED MAINTENANCE COSTS; GREAT CAPACITY; OCCUPYING SMALL FLOOR SPACE.

Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.

PRACTICALLY NOISELESS IN OPERATION



Sleeper & Hartley, Inc., Worcester, Mass.

CANADIAN BRANCH, COATICOOK, P.Q.

London, England, F. A. Perry, 63 Queen Victoria Street, E.C. 4. Paris, France, Edgar Bloxham, 12 Rue du Delta.
Australia: Edwin Wood Pty. Ltd., Melbourne.

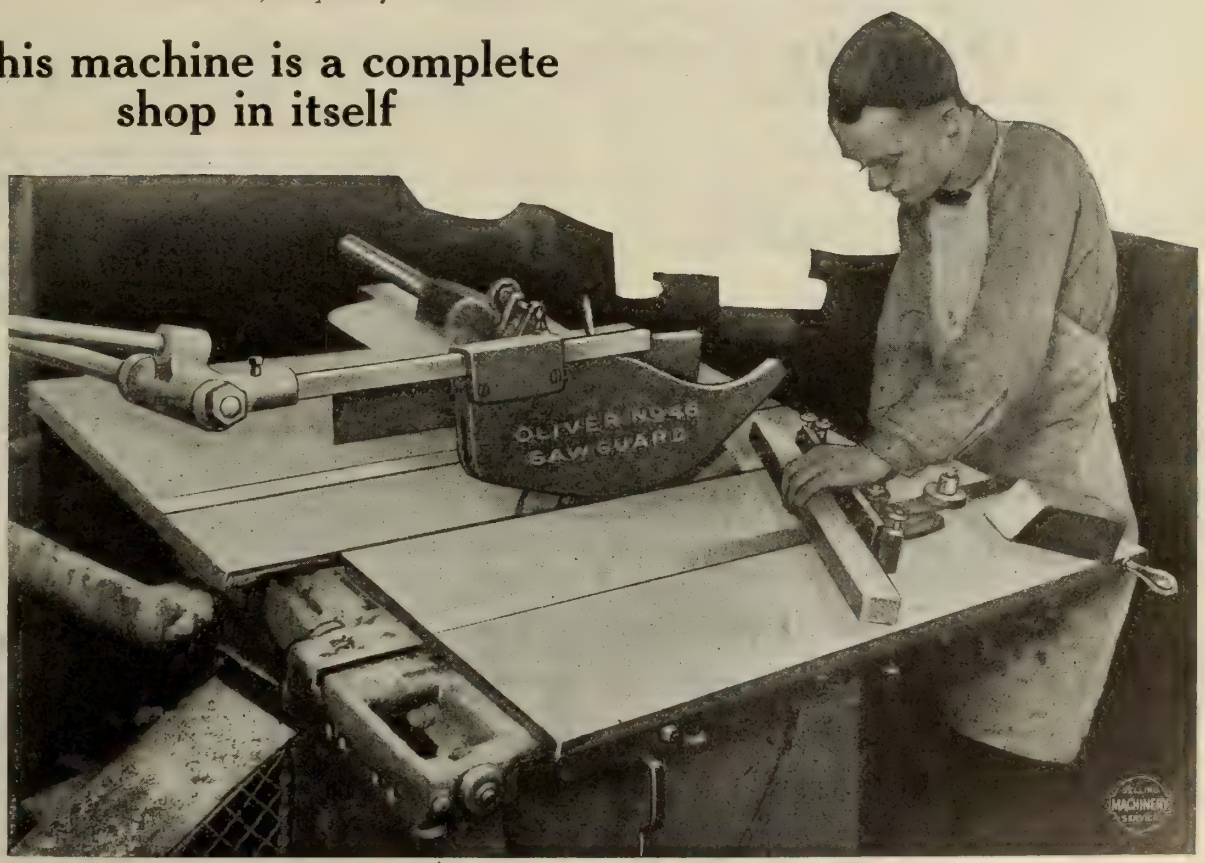
"OLIVER" Universal Saw Bench

A Pattern Shop Machine that you can keep busy all the time

Are you considering the Oliver Universal Saw Bench in connection with your "reconstruction" plans, or are you planning to buy *several* machines, each built for *one* purpose and used for only part of the time?

Reporting on this particular Oliver Universal Saw Bench our representative says: "A veritable procession of men used it all the time. One man had a cross-sawing job; a few turns of the handwheel displaced the rip-saw, which had just been used, and he was all fixed. Operations calling, in turn, for rip-sawing, cross-sawing, joint-cutting at various angles; or the use of the angular-attachment and tilted table in combination, rapidly followed."

This machine is a complete shop in itself



Foreign Offices: Manchester, Eng. Paris, France. Rotterdam, Holland. Tokyo, Japan

OLIVER MACHINERY CO.
GRAND RAPIDS, MICH.

Have The Maritimes Had Fair Play?

THE Maritime Provinces did not enter Confederation very willingly and it may surprise people in other parts of the Dominion to learn that at the present time the people of New Brunswick and Nova Scotia are not altogether pleased with the results of the bargain. There is a distinct feeling among them that the advantages of Confederation have gone to the other Provinces. In the course of an article in the July issue of MACLEAN'S MAGAZINE, Thomas M. Fraser explains why this feeling has grown and the basis for it.

This article was written for the purpose of letting the other provinces know that the feeling exists but it will be of intense interest to people in the Maritimes. Be sure to read it—"The Spirit of the Maritimes."

"The Land of National Leaders"

An article on the political aspect of the Eastern Provinces and the achievements of their leading statesmen.

"Guarding Our Coast Line"

An extremely interesting description of the measures that were taken to patrol and guard the Atlantic seaboard during the war.

Bonar Law, the man from the Maritimes, who has been the able lieutenant of Lloyd George at all crises in Great Britain, appears on the cover in a handsome three-color reproduction.

Other Big Features of the Number

"With the Snowball Brigade"

By Captain Louis Keene

Just back from Siberia—Captain Keene tells some sensational and intensely gripping things about conditions in that country which the Canadian forces are helping to stabilize. It is a record of international complications, strange atrocities and almost unbelievable living conditions.

"The Three Tommies"

By Robert W. Service

A war poem of unusual strength.

"Solving the Problem of the Arctic"

By Vilhjalmur Stefansson

The fourth instalment of his remarkable story of the five years he spent in the north for the Canadian Government, appearing exclusively in MACLEAN'S.

Three Magnificent Stories

The best fiction obtainable is found in this issue: "Owners Up," a race horse story by W. A. Fraser; "His Majesty's Well Beloved," by Baroness Orczy; "Bunkered," by Allen C. Shore.

The Review of Reviews

Here are a few of the articles in this splendid department chosen as the best published during the past month in all magazines:

Finding Husbands For Three Million Women.
Will England Become an Agricultural Country?
Germany Can be Prosperous Under the Peace Terms.
The Woman Who Wrecked the World.
The Great Lama Rides in Motor Car.
Strange Personalities at Paris.
Making All Men Equal.
Winning the Secrets of the Desert.

Over 70,000 Canadian Families Buy

MACLEAN'S

"CANADA'S NATIONAL MAGAZINE"

JULY ISSUE *Now On Sale At All News Dealers* ***20c.***

If there are no newsdealers in your town, or if your newsdealers cannot supply you, send 20 cents for a sample copy or $2.00 for a whole year's subscription to MACLEAN'S MAGAZINE, 143-153 University Avenue, Toronto, Canada.

Personal Satisfaction

means much to the skilled artisan.

The pleasure he gets out of working with a sharp file increases his efficiency.

That is why it pays to have him turn in dull files as soon as they reach their "inefficient point."

"Famous Five" Files stay hard and sharp because they are made of good steel, accurately cut and properly hardened. Specify them when ordering.

They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

Dominion Foundries and Steel, Limited

Hamilton Ontario

Steel Products

Open Hearth, Basic and Acid, Electric and Alloy Steels

Castings

For Ships, Railways, Rolling Mills, Gears, Machinery and Ingots to 35 tons

Railway Specialties

Penn Couplers, Bolsters, Truck Side Frames, Draft Gears

Forgings and Billets

Heavy Ship Forgings,
Locomotive and Car Axles
Miscellaneous Forgings

Plates

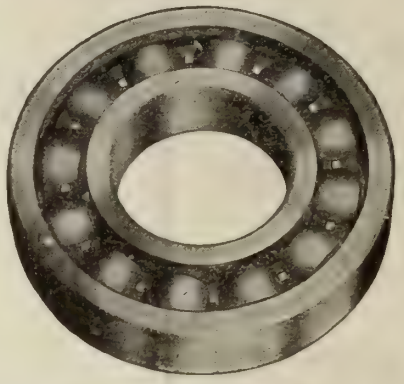
Plates and Heavy Sheets to 30 inches wide, Soft and High Carbon
Automobile Plates and Sheets

Agricultural Steel

Soft Center and Solid Plow Steel, Harrow Discs, Shovel Steel, Cultivator Blades

BALL BEARINGS
and AUTOMOBILE PARTS

All standard sizes, annular and thrust bearings. Shipped from stock. Quotations on special bearings given promptly.



Automobile parts, heavy and difficult steel stampings—also heat treatment and grinding of steel a specialty.

All Sizes of Steel Balls Shipped From Stock

The Gray Ball Bearing Company, Limited

686-692 St. Clarens Avenue TORONTO, Canada

H. COLLIER SMITH

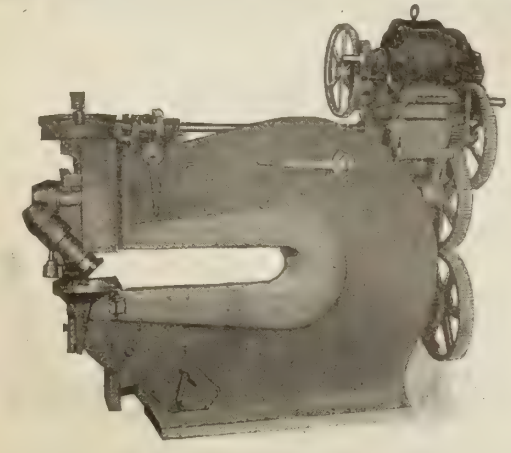
"QUICKWORK"

Registered U.S. Patent Office

ROTARY SHEARS

Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVES 50% TO 90%

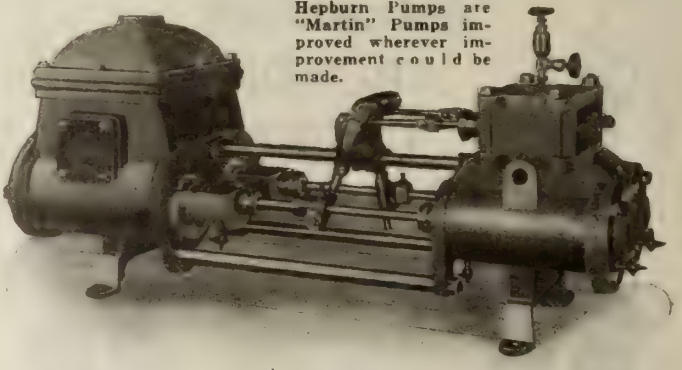
Eliminates Oxyacetylene Cutting and Plate Planing

Write for Catalogue

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street Toronto, Ontario

OXY-ACETYLENE

Thermit and Electric Welding

BY

THE CARTER WELDING CO.

OF TORONTO, LIMITED

Oldest, Best Equipped, and Most Experienced Welding Company in Canada

WRITE US ABOUT YOUR OXYGEN SUPPLY

TELEPHONES:
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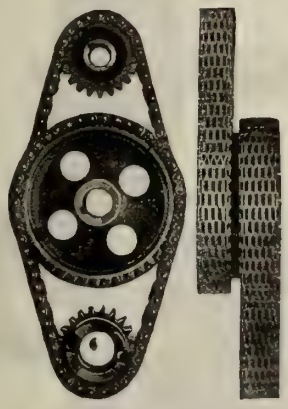
9-11 SHEPPARD STREET
TORONTO, ONT.



War Record Not Made Public

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-17 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
Hartford, Connecticut

The Largest Selling Quality Pencil in the World

VENUS PENCILS

IN the office, for jotting down your brain picture of a new machine—and in the drafting room, for carrying out its details with undeviating accuracy, you will find the superb VENUS Pencils dependable, **perfect** tools.

17 black degrees and 3 copying

For bold heavy lines
6B-5B-4B-3-B

For general writing and sketching
2B-B-HB-F-B

For clean fine lines
2H-3H-4H-5H-6H

For delicate thin lines, maps
7H-8H-9H

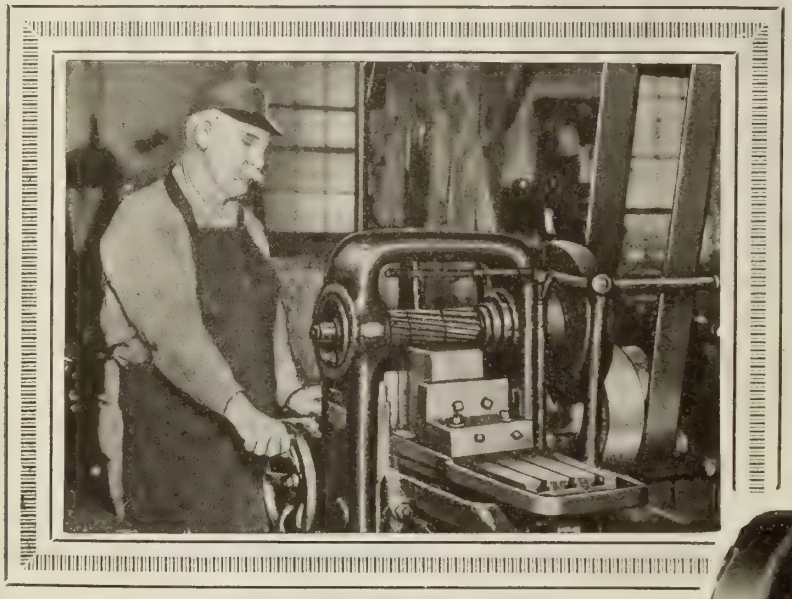
SPECIAL 14c OFFER

Send 14 cents for 3 trial samples, mentioning degrees. After you find how perfect VENUS Pencils are buy them at any dealer.

American Lead Pencil Co.
238 Fifth Avenue, New York
and Clapton, London, Eng.

BRIGGS MILLER

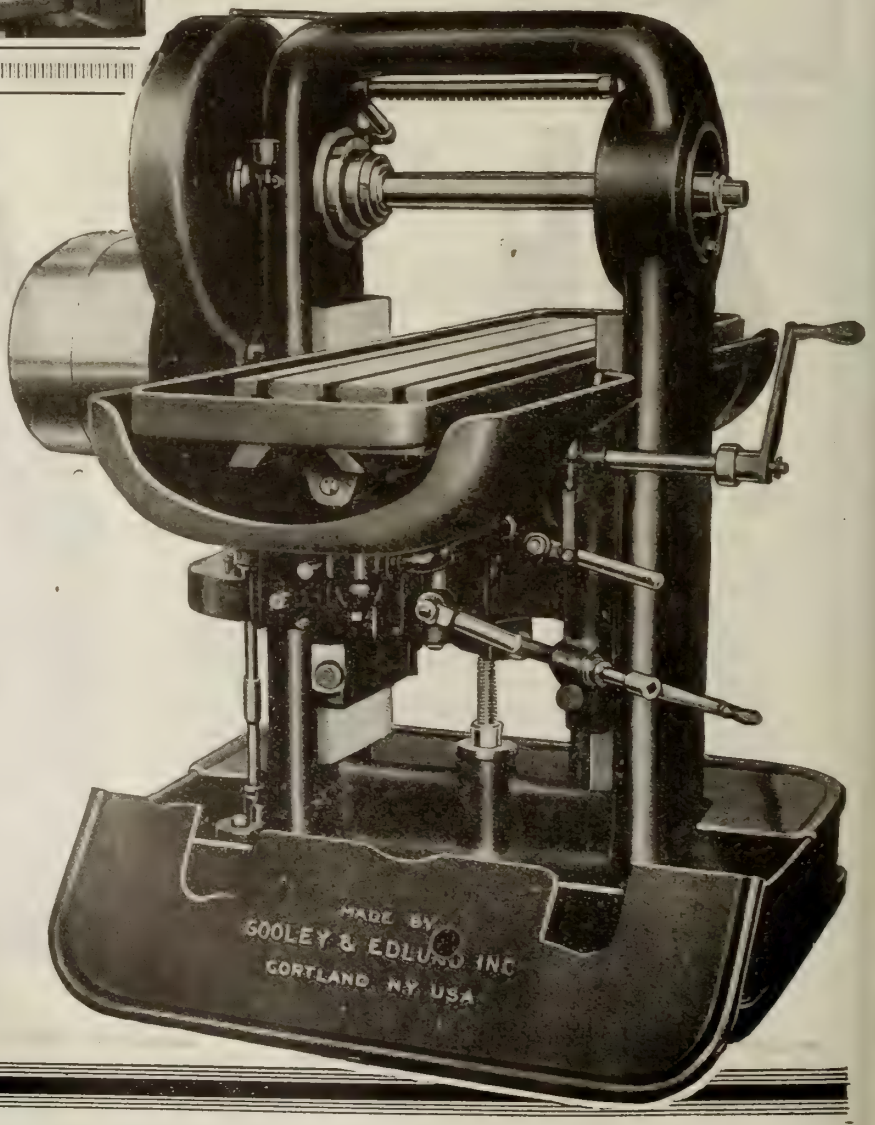
Keeps Five Die Sinkers Going



HERE you see the Briggs Miller Squaring Die Blocks, and it is working so fast it keeps five die sinkers going.

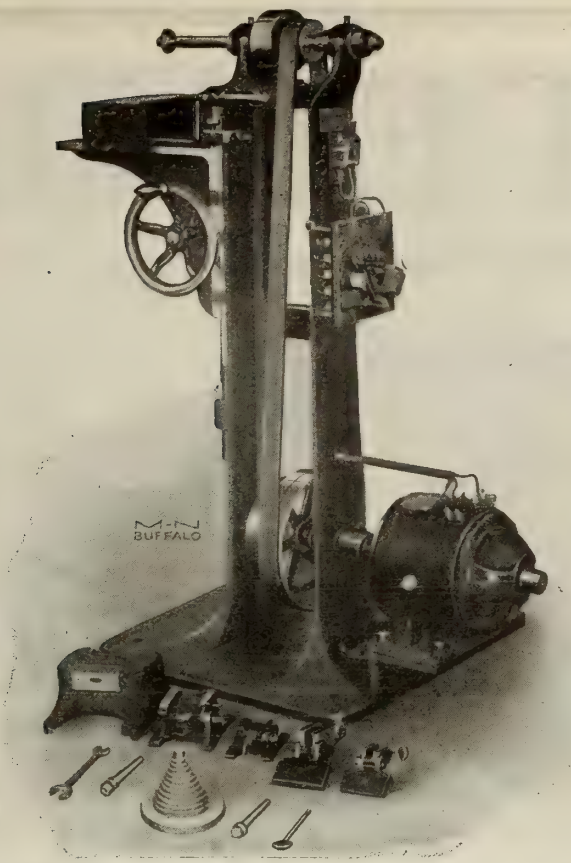
Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work. Unusual rigidity accounts for Briggs' higher efficiency.

Don't you think you could use this tool to advantage in your shop? Write for the details.



Gooley & Edlund, Inc.
Cortland, N.Y., U.S.A.

Garlock Walker Machinery Co., Ltd.
Toronto, Ont.
Williams & Wilson, Ltd., Montreal



The "MODERN" Die Chaser Grinder

Let Your Die Troubles End Right Here

Why let Die Trouble stand between you and maximum production?
In the

Modern Die Chaser Grinder

you will have a machine that does away with die trouble—because its output is **marvellously eccentric.**

Made for belt drive or a complete motor-driven unit. Special attachments for grinding Spring Dies, Pipe Dies, Reamers, Taps, Hobs, Spiral and End Mills, Milling Cutters, etc.; can be furnished with the regular equipment.

For Fast Accurate Work

Bulletin C. G. will give you full details. We would also be pleased to send you full particulars re **"Modern" Self-Contained Grinding Machines.** Tools splendidly adapted to meet the present demand for large production.

Modern Tool Company

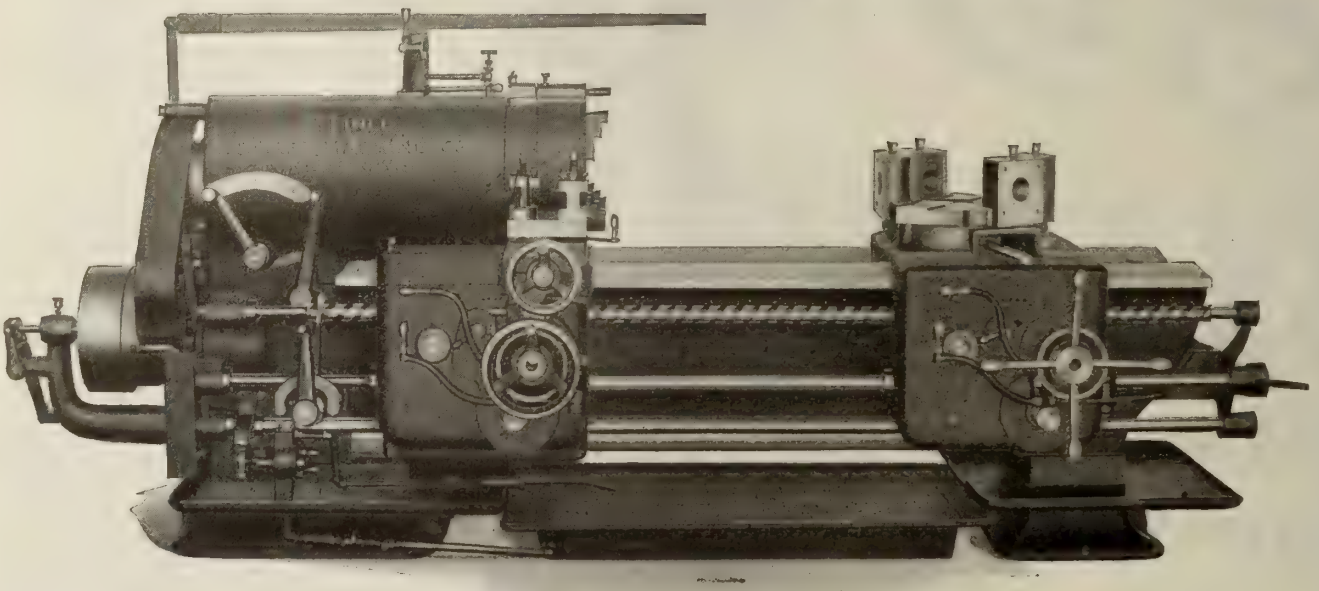
Main Office and Works: State and Peach Streets, Erie, Pa., U.S.A

Canadian Agents: Rudel Machinery Co., Toronto and Montreal

New York Office: - 50 Church Street
Chicago Office: - 32 N. Clinton Street

F. Wesley Parker, Resident Engineer and Export Agent, 2 Rector Street

STEINLE



Another reason why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

The Massive High Powered
Quick Change Speed Headstock

The headstock housing is cast integral with the bed, this design insuring rigidity and permanence of alignment. This headstock is of box section entirely closed on front, top and bottom and also on the back with the exception of an opening left for assembling purposes and for which a suitable cover is provided. This design and the distribution of metal are arranged with a view of securing rigidity and also with the idea of absorbing all vibration due to heavy wide faced cuts and shock or jar incidental to intermittent or uneven cuts, all of which it successfully accomplishes. The thirty spindle speeds are substantially divided into three groups as follows:

First train of gearing: 10 spindle speeds corresponding to open belt speeds.

Second train of gearing: 10 spindle speeds corresponding to back gear speeds.

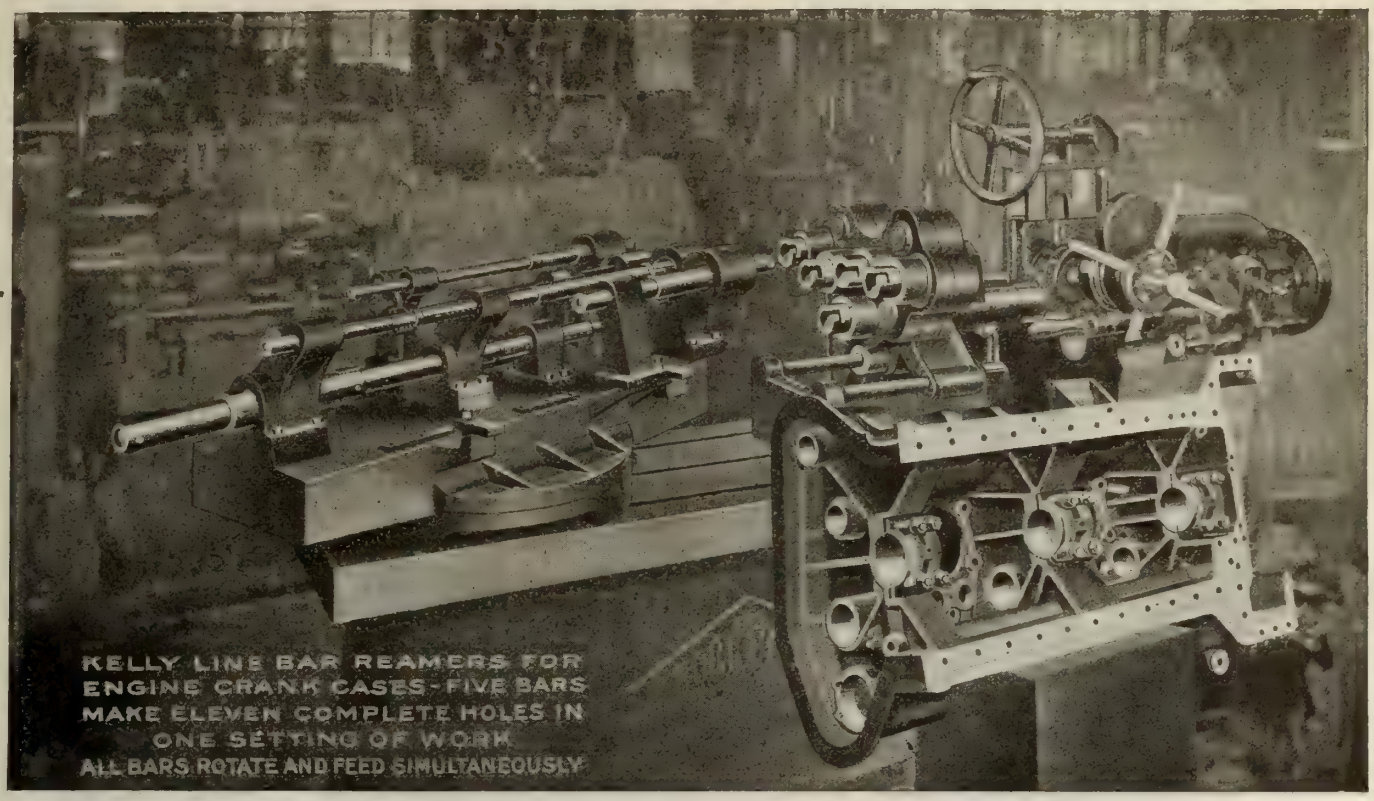
Third train of gearing: 10 spindle speeds corresponding to face gear or triple gear ratio. In reality the first train is back geared; the second double back geared; and the third quadruple geared. All of these gear ratios are high, resulting in great leverage in the application of power to the spindle. The utmost of power consumed in transmission is small, almost negligible in fact, with the result that the machine can be operated at very low power cost, the same amount of power being delivered to the spindle at all speeds but varying in the amount of torque according to the different gear ratios, the amount of torque increasing with the corresponding decrease in spindle speed.

All gear ratios and speed changes are controlled by conveniently located levers.

There are more good reasons why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work. We will give these reasons in future advertisements in this journal. Watch for them. They will be interesting to you.

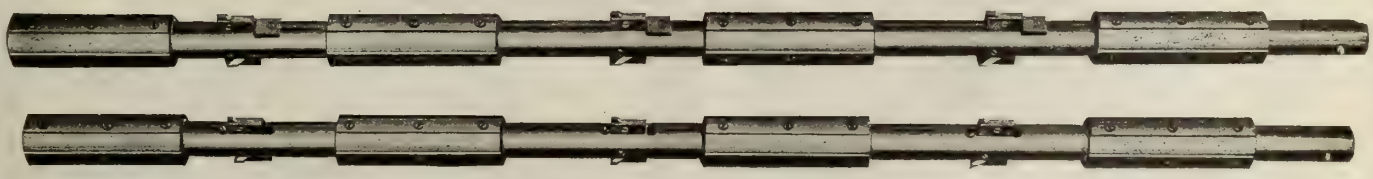
STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.



KELLY PRODUCTION TOOLS

LINE BORING AND REAMING BARS



INTERCHANGEABLE REAMERS ADJUSTABLE-REPLACEABLE BLADES

KELLY SERVICE

all combine to make KELLY tools the RIGHT tools for your work.

Deliveries 1 to 10 days. *Send for our Catalog J-4*

THE KELLY REAMER COMPANY

Cleveland, Ohio, U.S.A.

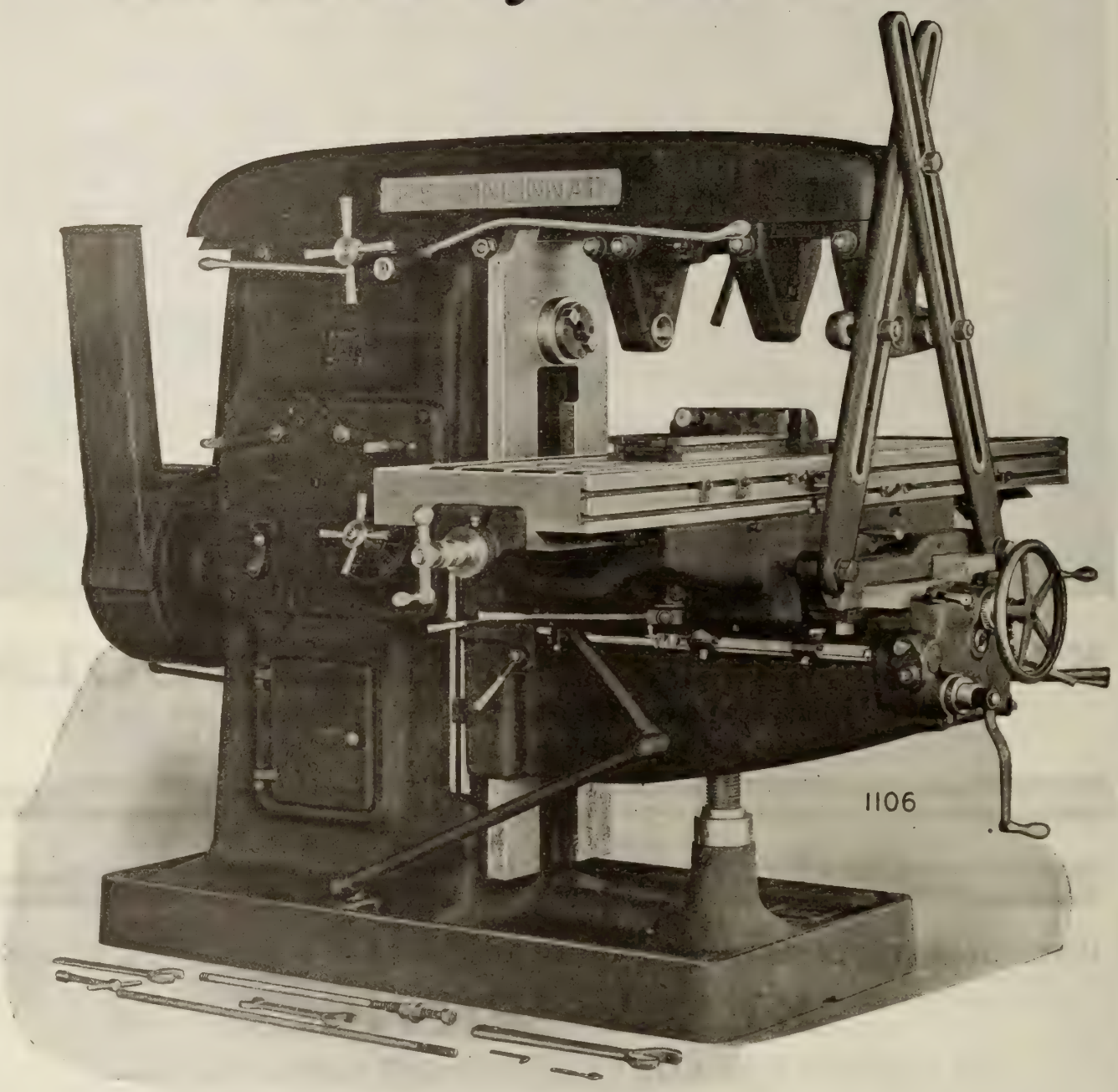
AGENTS

Forty Domestic Agents

WINNIPEG: **Canadian Fairbanks-Morse Co.**

London: Burton, Griffiths & Co., Ltd. Paris: Burton Fils. Stockholm: G. A. Galco, Ltd.
Latin America: Fox Bros. & Co., New York City

An Entirely New Miller



"The Cincinnati No 5."

Sixteen Big Productive Features

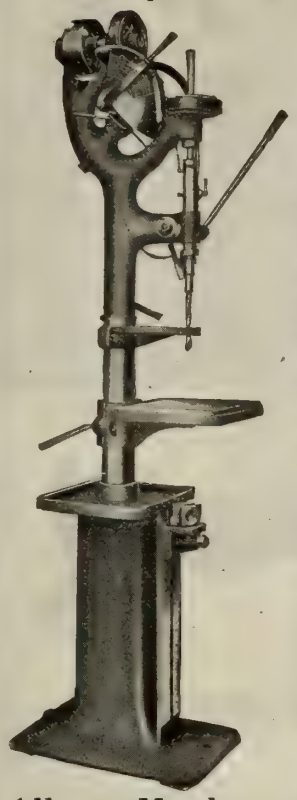
Intermittent Feed with Power Quick Traverse, Rectangular Overarm, Square Gibbed Narrow Guides, Feed Changes made in Front of Machine, Individual Feed Control Levers at Front of Machine, Individual Feed Control Levers at Side of Machine for Control from behind the Table. Automatic Lubrication for Mechanism in Column, Centralized Oiling for other Mechanism, six Stations, Stream Lubrication for Cutters and Work, Sliding Gears for Speed and Feed Changes, Safety Couplings for both Feed and Quick Traverse, Main Starting Lever, Controlled from Front or Rear, Automatic Brake for Spindle Stop, Cincinnati Flanged Spindle End, No. 14 Taper Hole in Spindle for large Arbors, Spindle Reverse in Machine.

The Cincinnati Milling Machine Company
CINCINNATI, OHIO

Canadian Agents:

H. W. Petrie, Ltd. - - - Toronto, Ont.
Taylor Engineering Co., Ltd. - Vancouver, B.C.
H. W. Petrie, of Montreal, Ltd., Montreal, Que.
General Supply Co., of Canada - Winnipeg, Man.

Albany 12" Tool Room Drill



A real time saver in drilling holes up to ½ inch, because—

Patented friction drive furnishes 10 spindle speeds, from 268 to 2140 r.p.m., which are instantly available.

The operator can drill at full speed to the finish, saving time on every hole. Micrometer gauge shows exact depth of drill at all times, and the spindle may be stopped — or started—almost instantly.

The average operator can use this drill with the facility and accuracy of an expert.

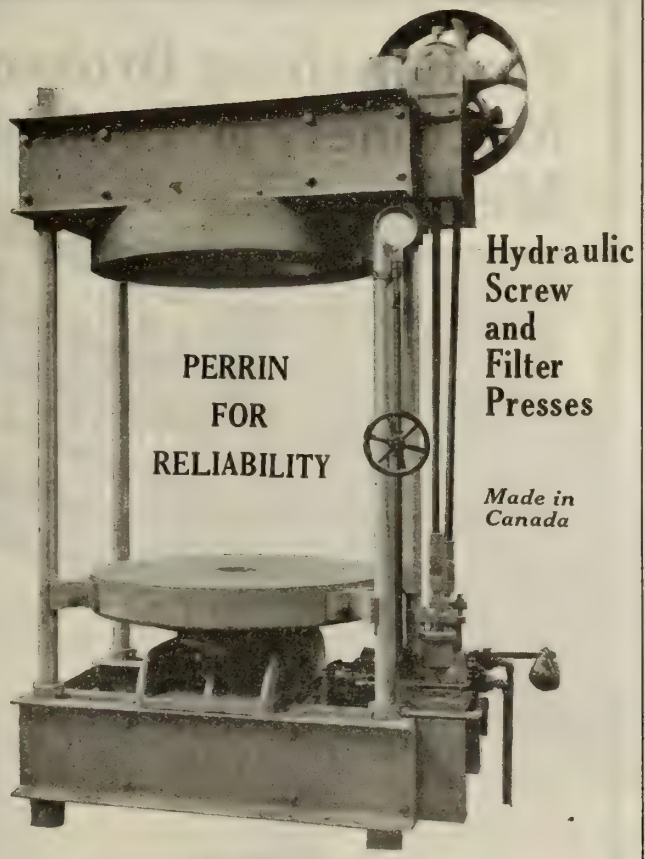
Splendidly built; has special ball bearing transmission; chucks and drills quickly changed.

Details in Circular.

FOREIGN AGENTS: F. W. Horne & Co., Tokyo, Japan, China, Korea. R. L. Scrutton Co., Ltd., Sydney, Australia and New Zealand. Litton's Machine Tool Co., London, England. A. Berthoin, Grenoble, France. V. Lowner, Copenhagen, Denmark. Aktiebolaget, Rylander, Asplund, Stockholm, Sweden. Gillespie Bros. & Co., South Africa (New York City). Monti & Oscuro, Milan, Italy.

Want description of this ideal tool room drill

Albany Hardware Specialty Mfg. Co.
ALBANY, WISCONSIN



PERRIN FOR RELIABILITY

Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED
TORONTO

Your Money's Worth

Never again will the Canadian Nation and People be the same careless improvident spenders of "ante bellum" days. "EFFICIENCY" and "GET YOUR MONEY'S WORTH" will be the popular motto and the successful machine shop manager must be able to see the advantage of making one pound of High Speed Tool Steel do the same work as ten pounds in forged tools; in other words he must and will

USE ARMSTRONG TOOL HOLDERS

No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men—a good thing to consider from a production standpoint.

Our Catalogue is of handy pocket size and will be mailed to you upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.

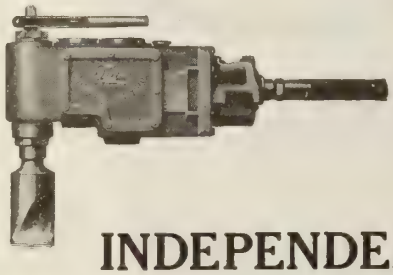
Thor

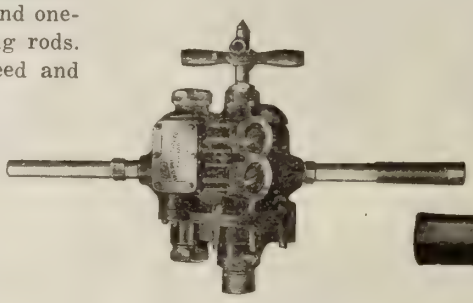
Pneumatic DRILLS and Hammers

There is a Thor Tool made especially for your work. Try it—and watch it save you time and labor and increase your production.

No. 32-L Reversible Compound Piston Air Drill driving ⅜-inch studs in Motor Crank cases.

Thor are the only air drills made in America having Corliss valves, roller bearings, and one-piece pressed Vanadium steel connecting rods. Also equipped with telescopic screw-feed and removable crank chamber plate.





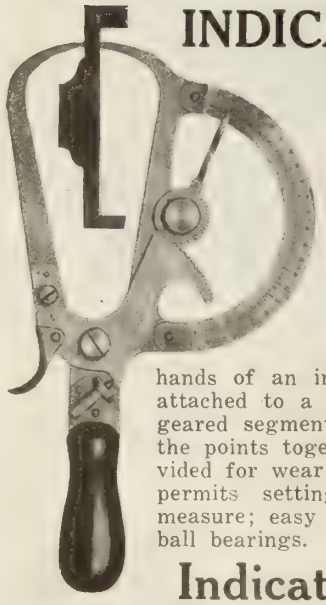
For full particulars write—

Twenty years of knowing how built into each Thor Tool you buy.

INDEPENDENT PNEUMATIC TOOL COMPANY

334 St. James St., Montreal, Que.

Toronto: 32 Front St. W. **Winnipeg: 123 Bannatyne Ave. E.** **Vancouver: 1142 Homer St.**



INDICATING CALIPERS

This finely made tool, of the simplest construction, incorporating features of outside calipers, rule, magnifier, and indicator, is accurate, easily read and manipulated with one hand. Great saving of time is effected in the hands of an interested user. A hand attached to a pinion is actuated by a geared segment; a coiled spring draws the points together; adjustment is provided for wear of parts; locking device permits setting of tool to required measure; easy movement is effected by ball bearings.

Indicating Calipers

are used by

MACHINISTS, PATTERN, TOOL and MODEL MAKERS.

$8.75 **3"** Graduated in 64th inches, Scale enlarges two times. **2"** Graduated in 100ths inches. Scale enlarges three times.

Write for folder or make inquiries thru local dealer.

MADE EXCLUSIVELY BY THE

INDICATING CALIPERS CO.

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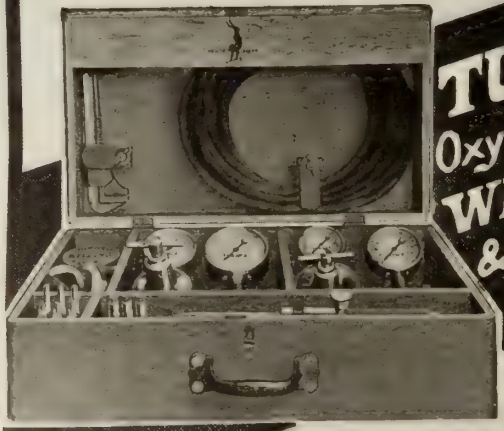
Stocked by Exclusive Canadian Agents:
Williams & Wilson Limited, 84 Inspector Street, Montreal, Que.

For Repairing Broken Machinery or Tools of Medium Size

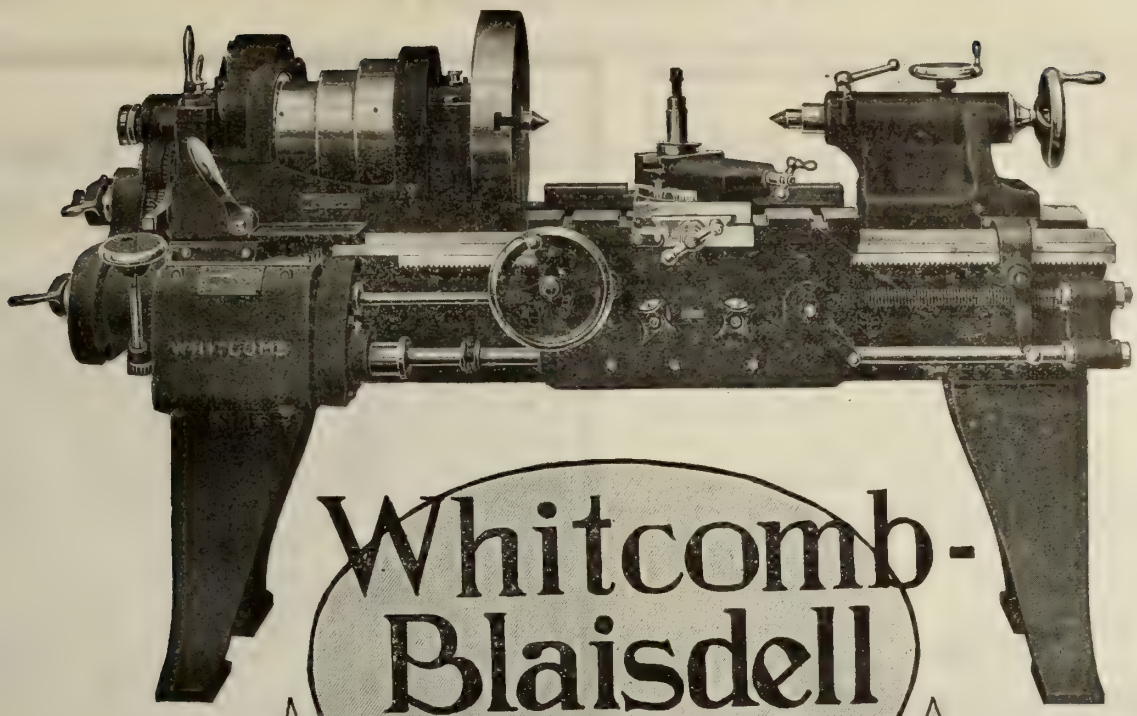


These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

The Turner Brass Works

SYCAMORE, ILLINOIS, U.S.A.



Whitcomb-Blaisdell Lathes

POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product.

Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes.

Lathes

WHITCOMB-BLAISDELL MACHINE TOOL CO.

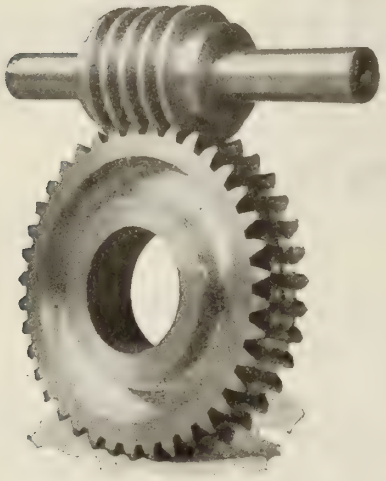
WORCESTER, MASS.

Planers

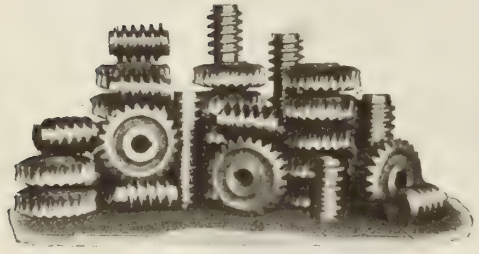
CUT GEARS

Worms and Worm Gears

Large Sizes or Small



WORM GEARS



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by Experts

Get Our Quotations

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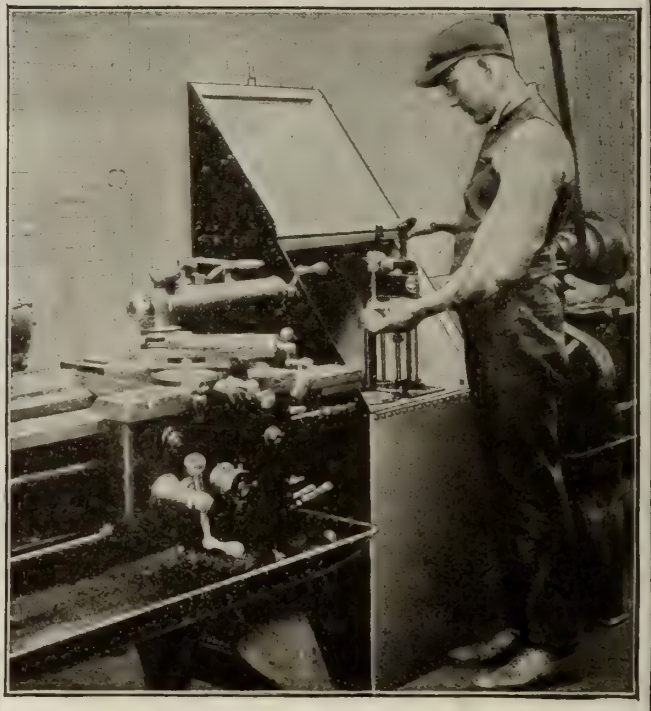
Van Horne Street TORONTO

Prevent Idle Time
of Men and Machines



By placing Bowser Lubricating Oil Cabinets in departments where oil is used.

There is no going back and forth to the oil room, no spilling, no wasted oil, no fire risk from the oil storage.

Save the Oil

The oil supply can be stored and handled as systematically as raw materials or finished parts—income checked, distribution measured, charged and recorded.

Write for literature, explaining why and how Bowser Systems pay for themselves, many times over in saving of oils and labor.

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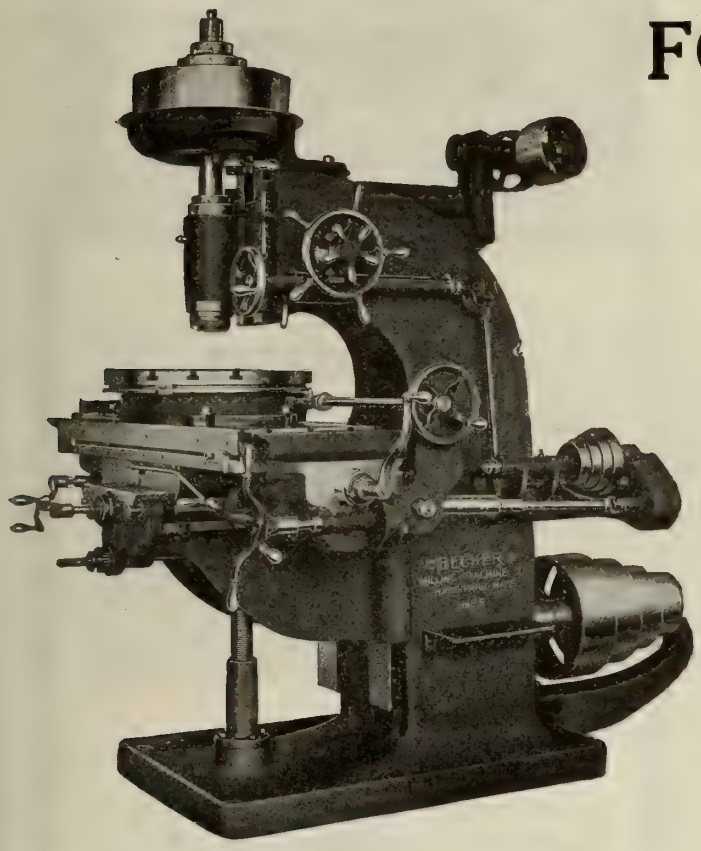
BECKER Belt Driven MILLERS

FOR PRODUCTION



"THE MACHINE
THAT GIVES THE
SMOOTH FINISH"

MODEL 6

BECAUSE:

The table is rigidly supported throughout its entire working length, keeping the work permanently aligned with the spindle.

The Becker Internal Belt Drive displaces the transmission gears with their attendant, destructive vibrations and by forming an elastic drive to the spindle, prolongs the life of the cutter through elimination of chatter. This gives the smooth finish for which the Becker is famous.

The stringent code of tests, through which every Becker machine must pass, insures perfection through perfectly made parts accurately assembled.

For accuracy, economy and productive ability, specify Becker Belt Driven Millers.

BECKER MILLING MACHINE CO.

DETROIT HYDE PARK, BOSTON, MASS. INDIANAPOLIS

Canadian Agents:

A. R. Williams Machinery Company, Limited - 64 Front Street West, Toronto
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Oxy-Acetylene Welding and Cutting

Strength and Neatness in Manufacturing and Repairing

This illustration shows a Prest-O-Lite operator welding parts in the factory of the Packard Motor Car Co., where neatness and strength are essential.

The Prest-O-Lite Process of Oxy-Acetylene welding has been adopted as standard practice in thousands of factories, mines, machine shops and shipbuilding plants, both in Canada and the States. In the production end, this process results in increased strength with reduced weight in vital parts, while effecting substantial savings in cost.

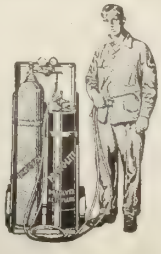
Prest-O-Lite PROCESS

is not limited to production work. Its value in repairing is universally acknowledged. Worn and broken metal parts are quickly reclaimed and put back into useful service, avoiding costly tie-ups and delays. The actual saving on one Prest-O-Lite repair often more than pays for the entire welding outfit.

The Prest-O-Lite Process employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready to use) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Manufacturers, mining and production engineers will find our welding literature full of valuable data and helpful suggestions. It may help *you* to reduce your costs and improve your methods. Write for it *to-day*.

Address Dept. C-106



Prest-O-Lite Company of Canada, Limited

PREST-O-LITE BUILDING
Corner Elm Street and Centre Avenue
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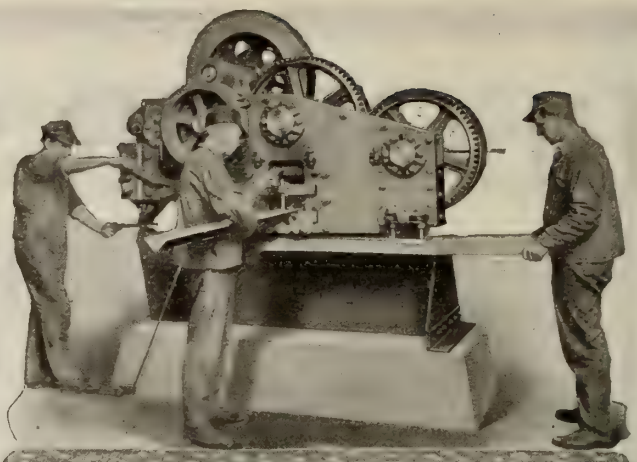
Plants: Toronto, Ont., Merritton, Ont. St.Boniface, Man., Shawinigan Falls, P.Q.

World's Largest Makers of Dissolved Acetylene



Canadian "Universals"

CANADIAN Universal Slitting Shears, Punches and Bar-Cutters are seven and one-half times as strong as cast iron and only one-third as heavy, for the same capacity.

That's why Uncle Sam used these machines so extensively during the war—that's why they should prove equally popular as a Peace Time manufacturing investment.

They will perform three separate operations at one time—slit plates, punch and cut angles, flats, squares or rounds.

Write for Catalog 325-16.

Canadian Blower & Forge Company, Ltd.

KITCHENER, :: ONT.

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"Canadian"

Manufacturing Opportunities

A large plant idle since shell making stopped, for sale at a very low price. Can be utilized for many lines of manufacture. : : :

TOTAL FLOOR SPACE 109,500 SQ. FT.

TOTAL AREA OF PROPERTY NINE ACRES

This large plant, consisting of three separate buildings, approximately 1,000 ft. long, with a width of from 50 to 140 ft., has a floor space of about 109,500 sq. ft., and with an area of nine acres gives ample room for storage or expansion. Railway running across the property. Building in foreground of above cut built in 1918—frame construction—contains 85,000 sq. ft.; building in centre, built in 1909—brick construction—built for a stove foundry—has a cupola—contains 18,380 sq. ft.; building in background built in 1916—frame construction—contains 5,520 sq. ft. These three buildings can be used separately, each for a different line of manufacture. Price for entire property, $50,000.00.

The Town of Pembroke is situated at the junction of the Ottawa and Muskrat Rivers, and is favorably located between the East and the West, being on the main line of three transcontinental railways; has good water supply, good homes, good schools.

Unlimited Hydro-Electric power obtainable at very low rates. There is a plenitude of labor available, both male and female. An unrivalled opportunity for an industry to start up with a small outlay.

For further particulars and plan of buildings, apply to

Pembroke Iron Works, Limited - Pembroke, Ont.

Cuts Costs ---*it is a Rockford Machine*

Increases Production

This powerful machine is made to drive high-speed drills up to 3″ diameter, for drilling and boring tools up to 8″ in diameter, for boring out cored holes in cast iron.

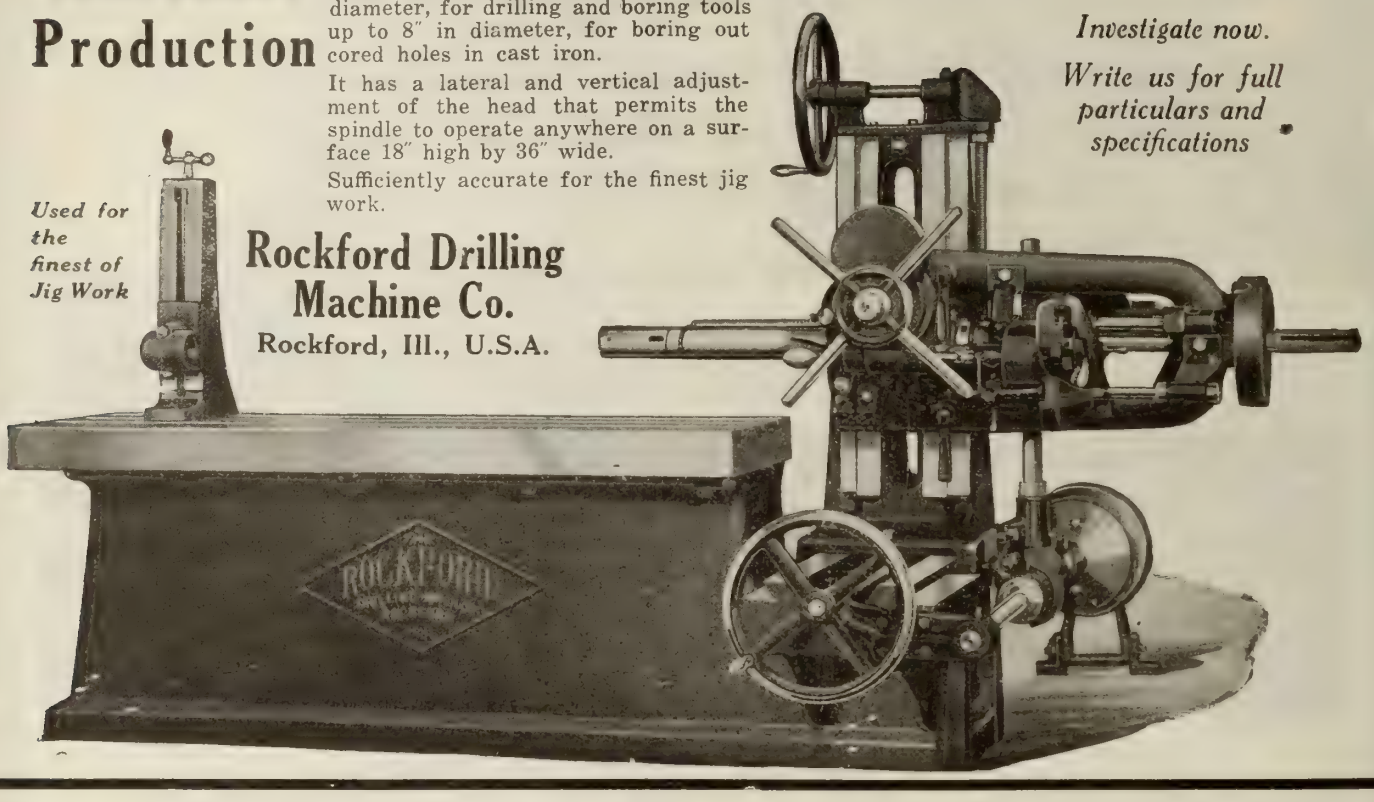
It has a lateral and vertical adjustment of the head that permits the spindle to operate anywhere on a surface 18″ high by 36″ wide.

Sufficiently accurate for the finest jig work.

Used for the finest of Jig Work

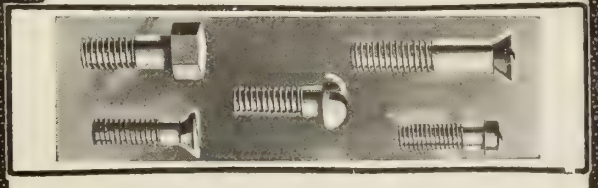
Rockford Drilling Machine Co.
Rockford, Ill., U.S.A.

Investigate now.
Write us for full particulars and specifications



Wood Screw Making Machinery

SEND FOR CATALOGUE
Series B6



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

Write or Wire us.

Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
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Asa S. Cook Co.
Hartford, Conn.

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

The City of Welland

offers Every Advantage to Industry

ONE YEAR'S RECORD

The following are extracts from the Welland Industrial Commissioners' report for the year 1918:

Our manufactured product valued at $35,400,340, a substantial growth over the previous year.

Over a million and a half spent in factory buildings and equipment. Though Welland located three new industries last year, only one of these erected new buildings, yet in all $470,771 was spent in new factory buildings and $919,281 in new equipment.

Payrolls exceeded $6,000,000.
In the pay envelopes of Welland's industrial workers there was placed last year $6,466,221, about three times the amount of 1915.

The second year that the City of Welland has been a leader in population growth.
Welland had a gain in population last year of 10.6 per cent., a record that was approached by only one other Ontario city, and, with this one exception, over double the percentage gain of any other Ontario city.

Welland fifth city in Customs Returns. In every hundred dollars collected in customs duties in Canada last year, one dollar was taken in at the Port of Welland.

The Destiny of Welland.

The compilation of our industrial statistics lends a new weight each year to the common prophecy that the City of Welland is destined to be one of the first manufacturing centres of Ontario, and the zone of the Welland Ship Canal, the workshop of the Dominion. Be sure to write for complete details and investigate Welland thoroughly before deciding definitely on your new location.

For particulars, write—

LOUIS BLAKE DUFF

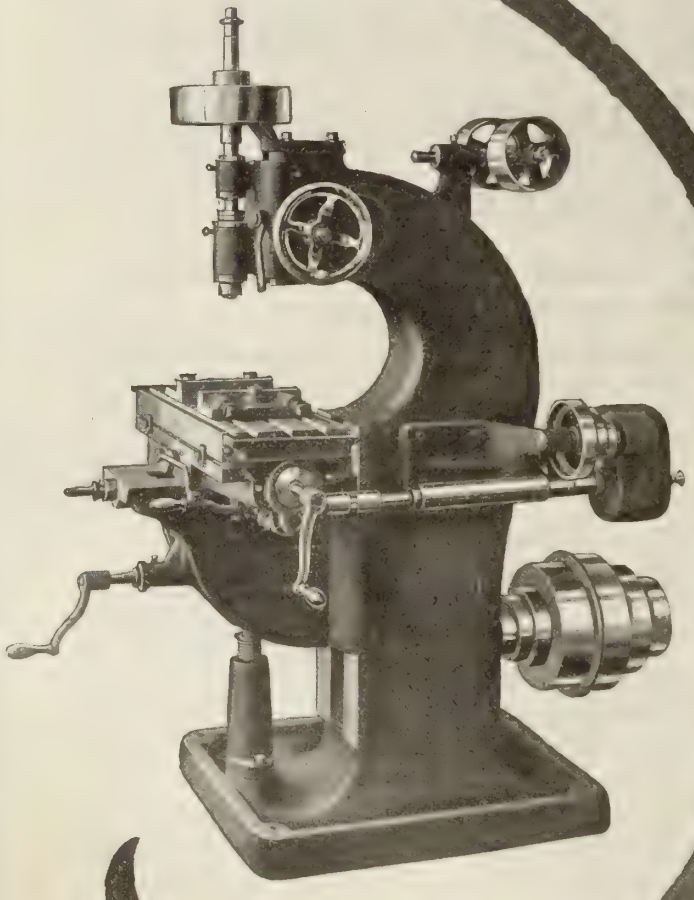
Industrial Commissioner

WELLAND CANADA

BRISTOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

The Greenfield Universal Grinder

For General Tool Room Work

This grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

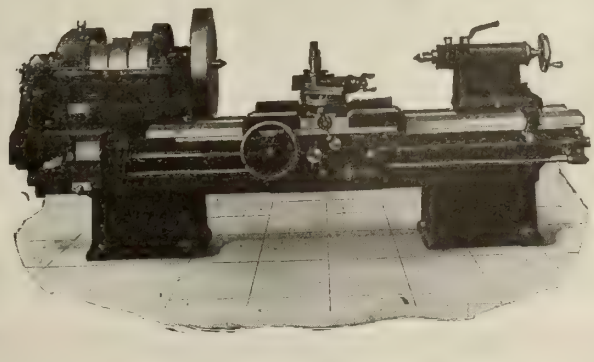
The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,
GREENFIELD, MASS., U.S.A.

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.

Clipper
Clipper Belt Lacer Co
REGISTERED TRADE-MARK

Industry and "Clipper" Belt Lacing

ONE hundred thousand Clipper Belt Lacers stand guard, ready for instant duty, in ninety thousand of the world's largest industrial plants. During strenuous years the Clipper kept the wheels of industry turning safely and economically—kept production at the maximum. Loss of time through breakage or adjustment of belts was reduced to the minimum.

There will be no lagging in this year's production—or in the years to come—where the Clipper stands guard to keep the belts of industry moving.

The Clipper Belt Lacer
Laces a Belt in Three Minutes

Before the adoption of the Clipper way of quick belt lacing it took from fifteen minutes to half an hour to make even an inferior joint. No wonder manufacturers hailed the efficient Clipper. No wonder it has been so universally adopted.

Not one but a number of Clipper lacing tools are used in many plants—distributed at convenient points for instant emergency use. No especial skill is required to lace a belt with the Clipper. Any workman can do it.

The Clipper makes a durable and perfect joint—one that pulls better and is safer—that is, flush with the belt on both sides and is as flexible as the belt itself.

The Clipper goes to manufacturers on free trial. It is backed by a perpetual guarantee.

The American Museum of Safety gave the Clipper the only gold medal ever awarded for metal lacing.

The Clipper will as effectively solve your belt lacing problems as it has done in so many other manufacturing plants.

Some mill supply dealer in every city sells the Clipper.

European trade supplied through London office, No. 10 Norfolk St.

Distributors in all parts of the World.

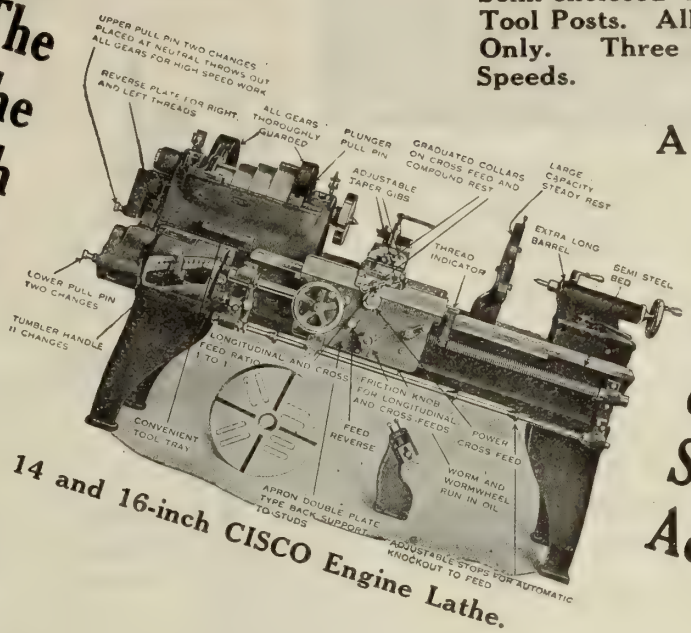
Clipper Belt Lacer Company
GRAND RAPIDS, MICHIGAN, U.S.A.

Every Canadian Shop Should Have One or More Ciscos

The Lathe With the Pull

Semi-enclosed Heads. Drop Forged Tool Posts. All Steel Gears in Apron Only. Three Levers for Feeds and Speeds.

A Cisco satisfies



14 and 16-inch CISCO Engine Lathe.

The Lathe of Simplified Accuracy

.0005 in 18″, or Better
Large Swing
Proportionately Heavy
Simply Operated

THE CISCO MACHINE TOOL COMPANY, CINCINNATI, U.S.A.

Builders of

14"-16"-18"-24" Engine and Tool Room Lathes, Cone or Motor Drive, Geared Head, Belt or Motor Drive.

Peerless HIGH SPEED

Has Proven Its Efficiency Where Others Have Failed

DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

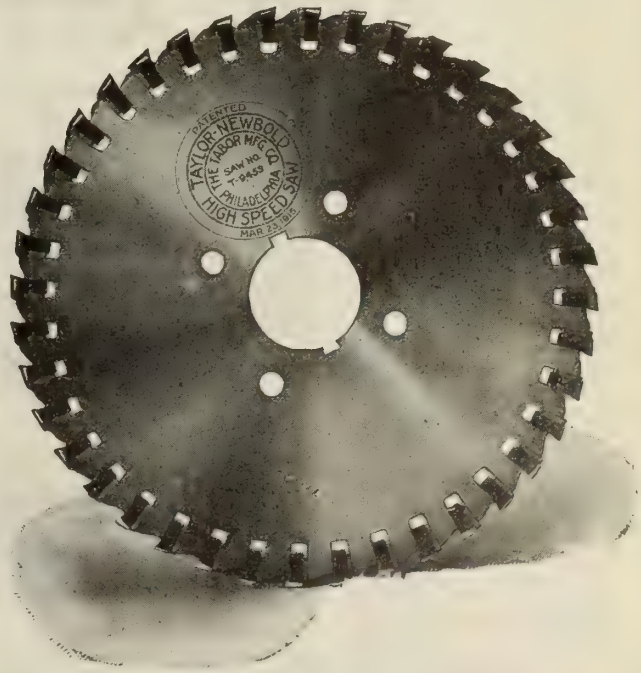
The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN

THE IMPROVED

TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

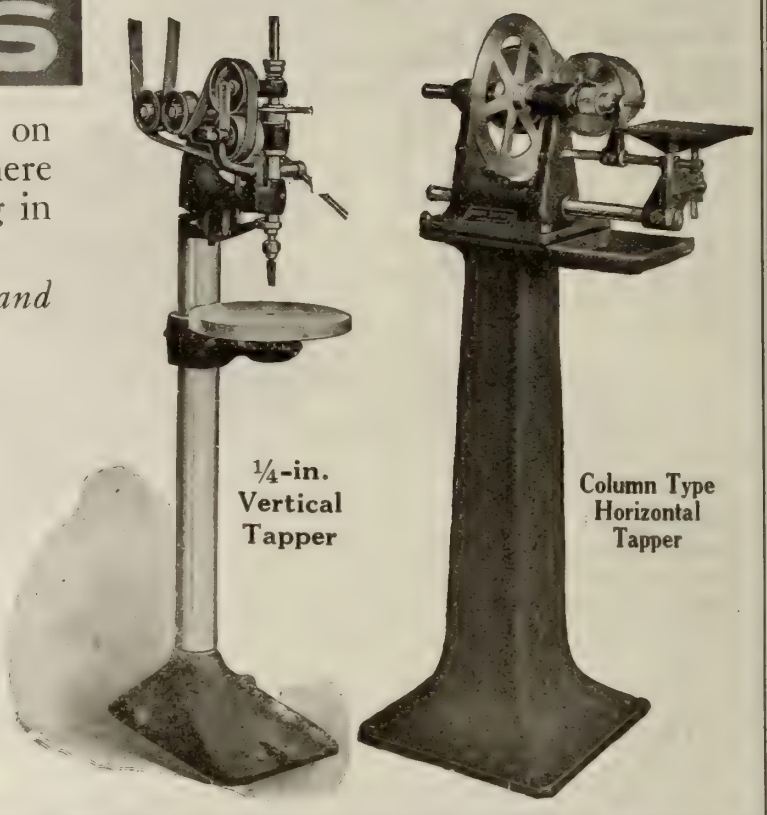
RICKERT-SHAFER TAPPERS

Save Tap Breakage

The *smooth drive* reduces the strain on the taps—they wear longer—and there are fewer delays from taps breaking in the work.

R-S Tappers ensure faster tapping and quicker assembling.

Friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on ⅝-in. work—50 per cent. faster than the usual tapping speed for that size. Uses but 1 h.p.



¼-in. Vertical Tapper

Column Type Horizontal Tapper

Write for specifications

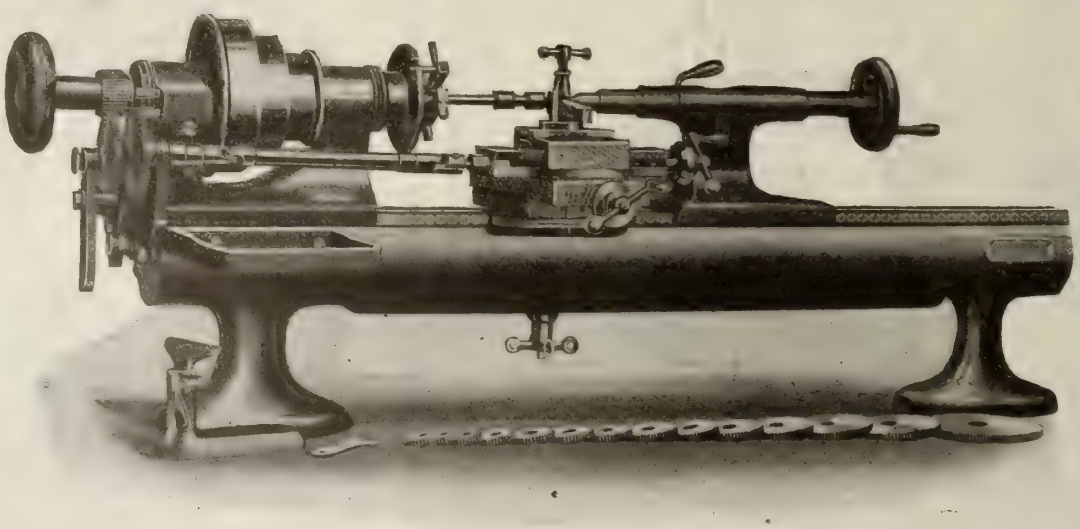
The Rickert-Shafer Co.

ERIE, PA., U.S.A.

FRED HERBERT, Foreign Agent, Coventry, England.

CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

Tycos

TEMPERATURE INSTRUMENTS

Indicating Recording Controlling

Its the instruments that perform the service—not the advertising

Perhaps you will feel it to your advantage to investigate *Tycos* Instruments, and ask us name of installations near you.

Tycos Type Angle and Straight Stem Thermometers
Tycos Recording and Indicating Thermometers
Automatic Temperature and Pressure Regulators
Mercury Vacuum and Absolute Pressure Gauges
Engraved Stem Thermometers
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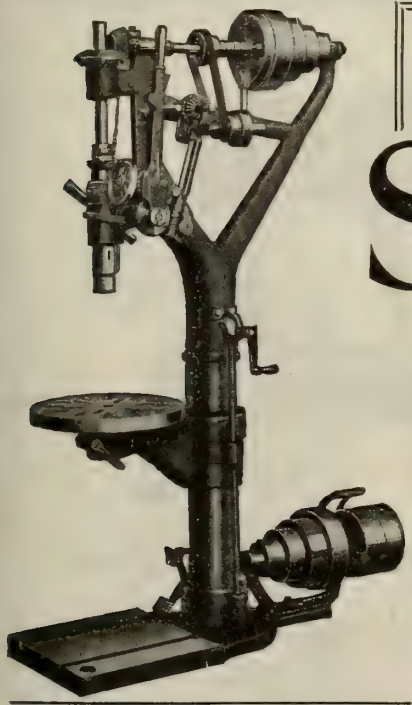
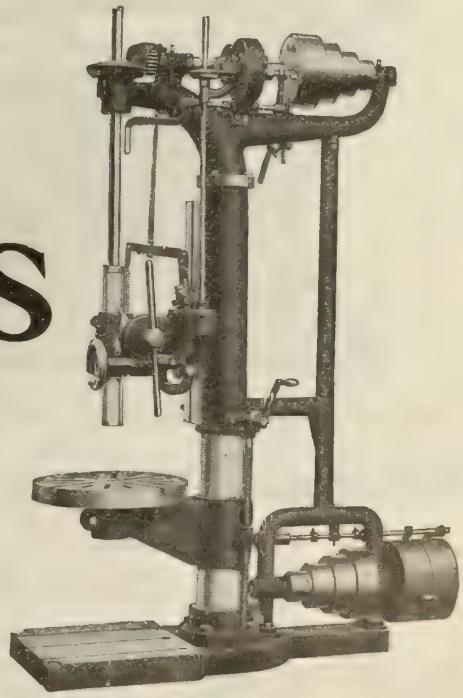
There's a Tycos or Taylor Thermometer for Every Purpose



Meet the keen competition of peace times by putting into your shop faster, stronger and more accurate upright drilling machines. Sixty-four years' drill building experience is back of these perfected

Silver Drills



The 25″ Silver Drill has eight spindle speeds and six positive geared feeds. The 20″ Silver Drill is built in four distinct styles with round or square base. Furnished singly or in gangs of 2, 3 or 4 spindles.

Write for further facts.

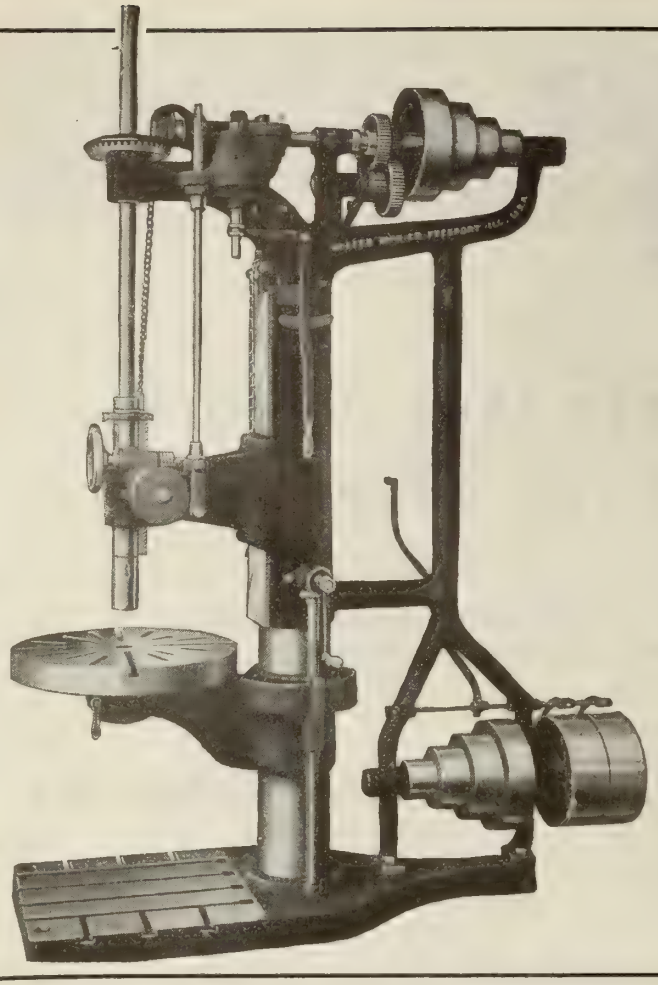
SILVER Salem, Ohio, U.S.A.

The Silver Mfg. Co.

290 Broadway

SALEM OHIO

Prompt Deliveries



The Know-How of Making A Drill

Twenty-five years of study and practice have given the Hoefer Manufacturing Company the knok-how of making a driller.

And know-how is a lot different from know-it-all. The Hoefer engineers are eternally plugging away to make a better driller.

This is the spirit you'll like in Hoefer service.

If you will set your drilling needs before us, we'll give you the benefit of twenty-five years' contact with some of the drilling problems of the biggest manufacturers in the country.

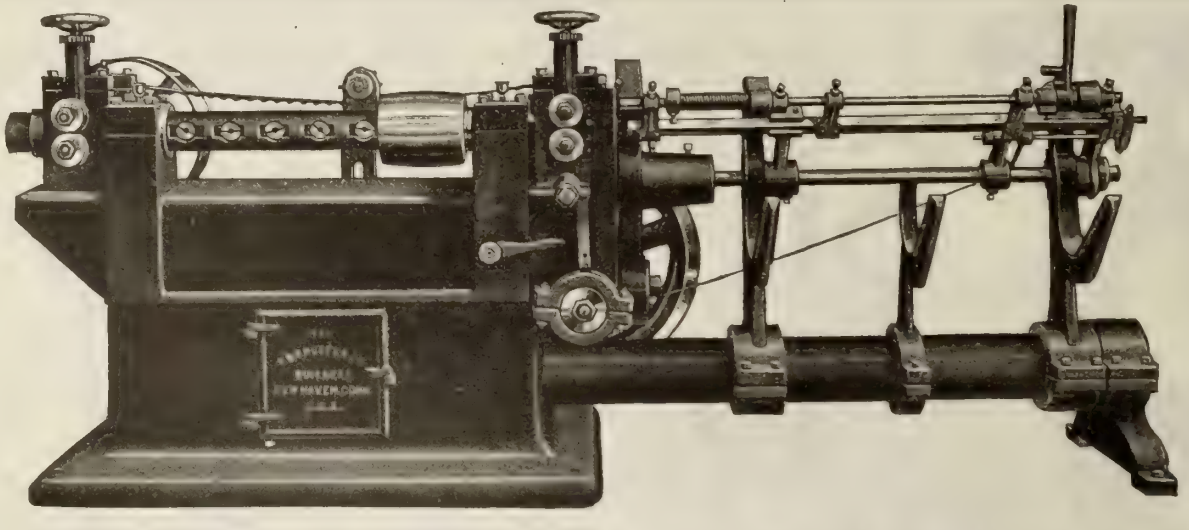
Our product, Hoefer Drillers, embodies the latest word in design, efficiency and accuracy.

Regardless of the size of the press, drilling is possible to a fine degree of precision, provided you use Hoefer Drillers, the recognized standard for a quarter of a century.

Catalog showing complete line on request.

HOEFER MFG. CO.

FREEPORT, ILL.



Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

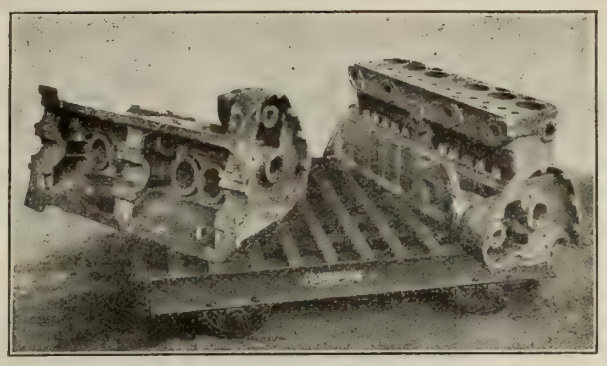
Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

How long would it take to clean this Cylinder by your present methods—and what would be the labor cost alone?



How long would it take to pay for a Sand-Blast installation from the saving in labor cost if you cleaned it in 3 minutes?

CLEANED IN THREE MINUTES BY

PANGBORN SAND-BLASTS

and whether your requirements are the cleaning of Castings, Forgings, Stampings, Sheet, Plate or Structural, or the removal of scale from Heat Treated Parts there's a Pangborn Unit or Combination for every need, large or small, that will make a saving for you—and a more attractive product.

PANGBORN
CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS
P. O. BOX 8503

"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

Photographic Copying
The PHOTOSTAT

(Trade Mark Registered)

"Orders are now delivered three or four days earlier to our customers by making photographic copies of sketches and drawings which are the same in every detail instead of having our draftsmen reproduce the original.

"Practically all orders were previously held up three or four days by our drafting department while copies of the intricate drawings of ordered tools were being made. Now with the Photostat, only 15 or 20 minutes are required to make the three copies, exact duplicates of the original, which the factory needs to turn out the order. By eliminating this needless delay we are able to provide better service for our customers, and attract new prospects because of prompt deliveries."

This cut shows a PHOTOSTAT on which a large drawing has just been copied in less than a minute.

Never Makes a Mistake

It is simple, practical, easy to handle. Requires no expert knowledge. The machine is loaded with a roll of sensitized paper especially manufactured for the purpose.

The original subject is photographed directly upon this paper producing a facsimile copy which is immediately cut off, developed and fixed right in the PHOTOSTAT itself.

The focusing, exposing and developing are all controlled by simple mechanical devices and no glass plate, film or other intermediate negative has to be made.

After fixing, the copy is removed to a tank of running water and rapidly washed free from chemicals. It is then dried and is ready for use. As many copies as desired may be run off in this manner.

By a simple adjustment of the mechanical focusing device the copy may be made at actual size, reduced, or enlarged, within the size limitations of the machine.

Error in copy is impossible because every copy is an absolute facsimile. The operations are all simple, such as a boy or girl can do.

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Pencil Drawings, Ink Drawings,
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Contracts, Ledger Pages,
Illustrations for Salesmen, Insurance Records,
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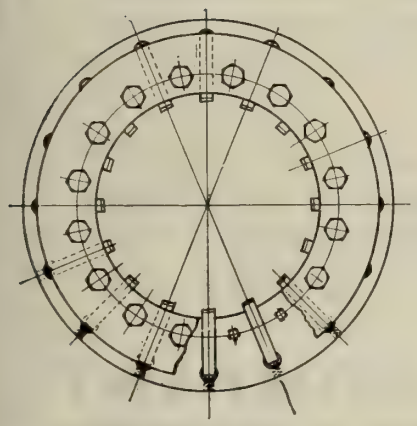
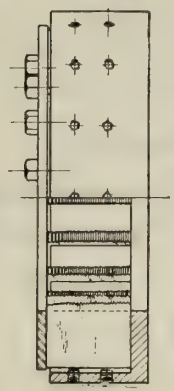
SMALLEY
GENERAL THREAD MILLER





Cuts Quality Milling Costs

Smalley-General Thread Miller reduces costs, increases output and improves the accuracy of the finished product. Accompanying blue-prints and time studies show results that should interest you.

MACHINE—Smalley General Thread Miller No. 1.
PIECE MILLED—Chasers for 8″ pipe die. Two sets milled at one time.
THREAD—Diameter, 8½″; length, 3⅝″; 8 pitch, Briggs, Ltd.
TIME STUDY—

	Min.	Sec.
Inserting jig in chuck		30
Champfering for leading threads	5	
Milling roughing cut	13	
Finishing cut	8	
Removing jig from chuck		30
TOTAL TIME	27 minutes	

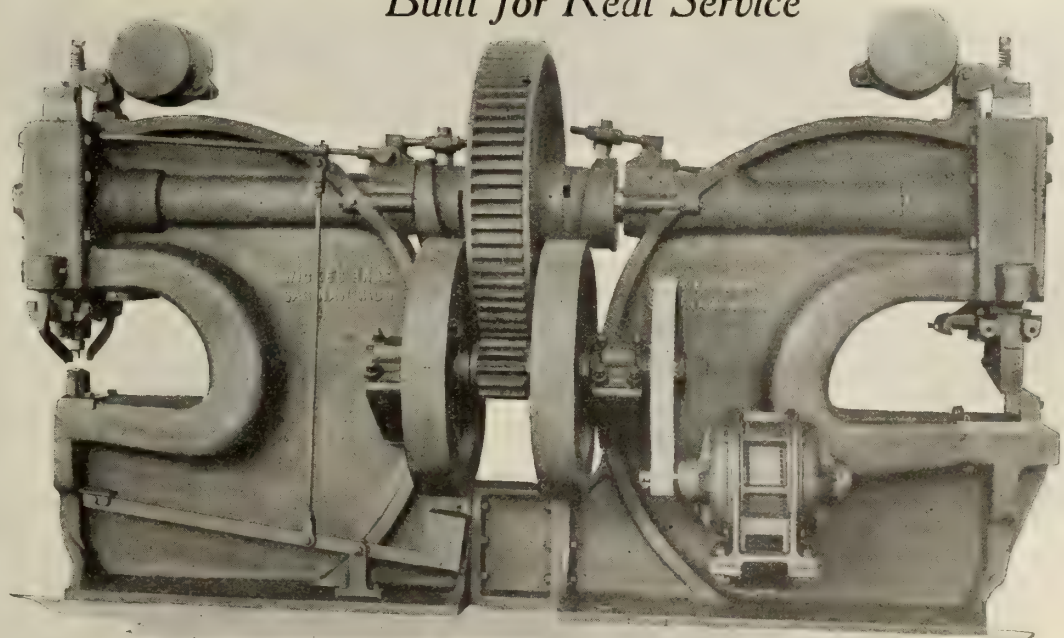
for two sets of chasers or 13½ minutes per set.
MILLING FEED—Roughing cut, 2″ per minute. Finishing cut, 3″ per minute.
MATERIAL—Rex A Tool Steel.
NOTE—Jig was arranged so as to hold two sets of chasers. Chuck was an air collet.

Consult us on every phase of thread milling. We will show you how to cut the costs.

Smalley General Company, Inc.
Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

WICKES' Heavy Duty Double Punch
Built for Real Service



We also manufacture High Grade Horizontal and Vertical Rolls, Angle Rolls, Single Punches, Shears, Spruce Cutters Radial Wall Drills or Counter-sinking Machines, Flanging Clamps and Heavy Duty Engine Lathes. *Ask for Catalogue.*

WICKES BROS., SAGINAW, MICH., U.S.A.

GARVIN

No. 12 Plain Milling Machine-Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments .....18 x 6 x 15 in.

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

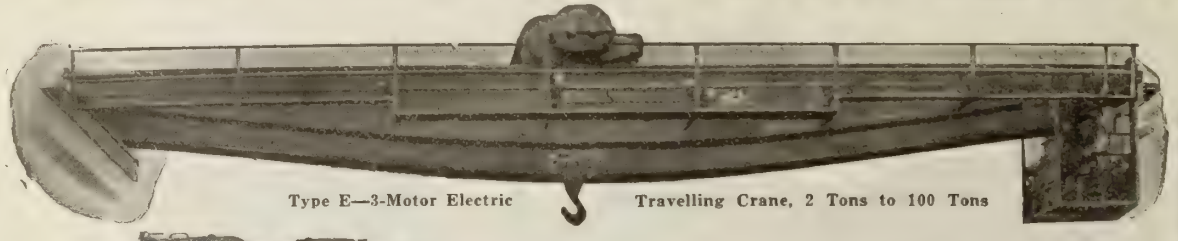
Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

CANADIAN MADE CANADIAN MADE

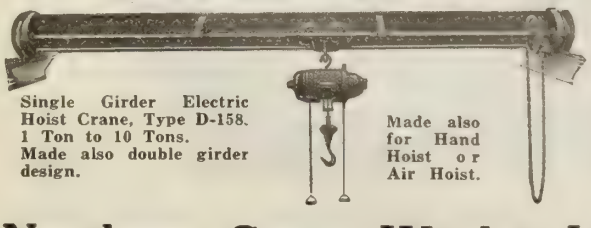
Electric and Hand Traveling Cranes



Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons

Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



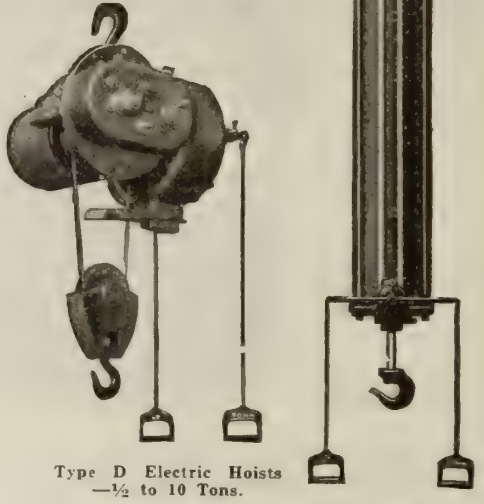
Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.



Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada

One Customer Says:

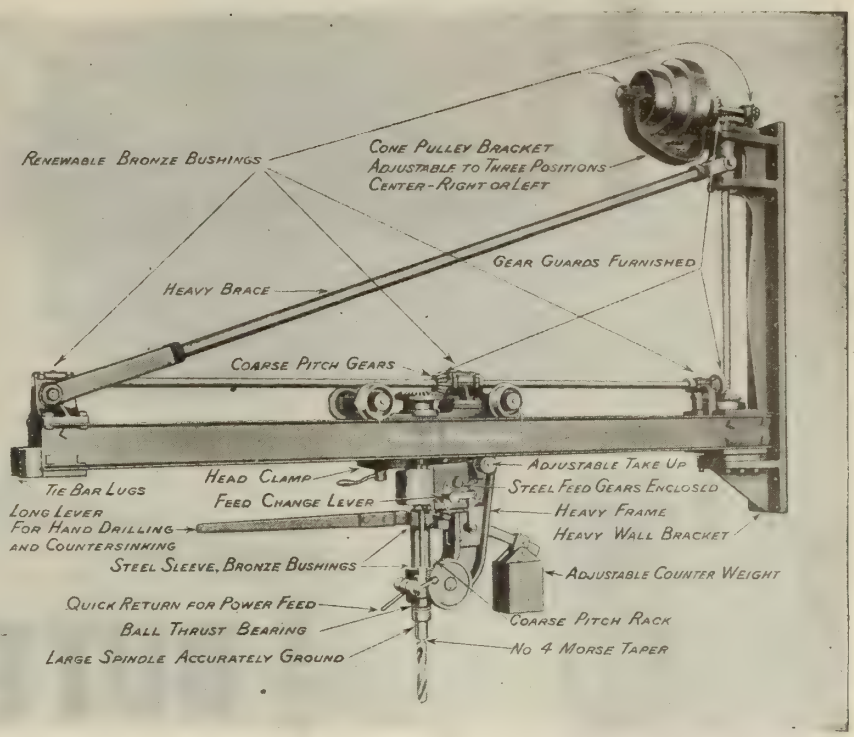
"These machines were put in operation immediately upon arrival, have been producing ten hours per day every day since, and we have never experienced a bit of trouble with same." We know you will appreciate what this means in any shop, and believe this is the sort of machine you are looking for. We consider the machine the finest in its line on the market to-day, and believe an installation would save money for you in the cost of your production.

Our illustrated bulletin will interest you, giving detailed information.

MADE IN FOUR STANDARD SIZES

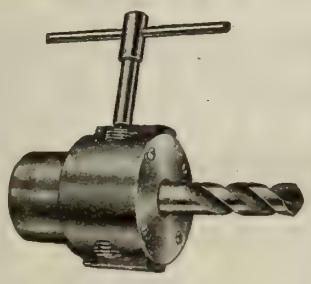
Rated size	Drills to center of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

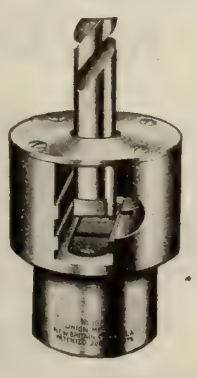
419-425 Atlantic Avenue **BOSTON, MASS.**



UNION

POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



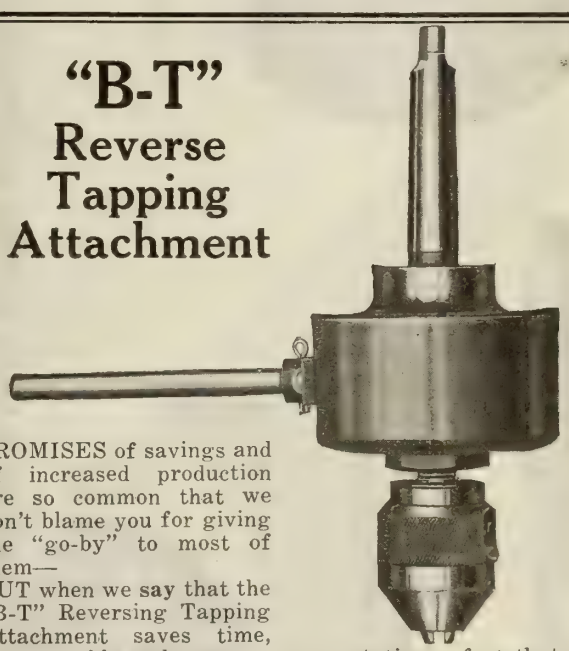
UNION Manufacturing Co.

New Britain, Conn.

New York Office **26 Cortland St.**

Makers of a complete line of chucks

"B-T" Reverse Tapping Attachment



PROMISES of savings and of increased production are so common that we don't blame you for giving the "go-by" to most of them—

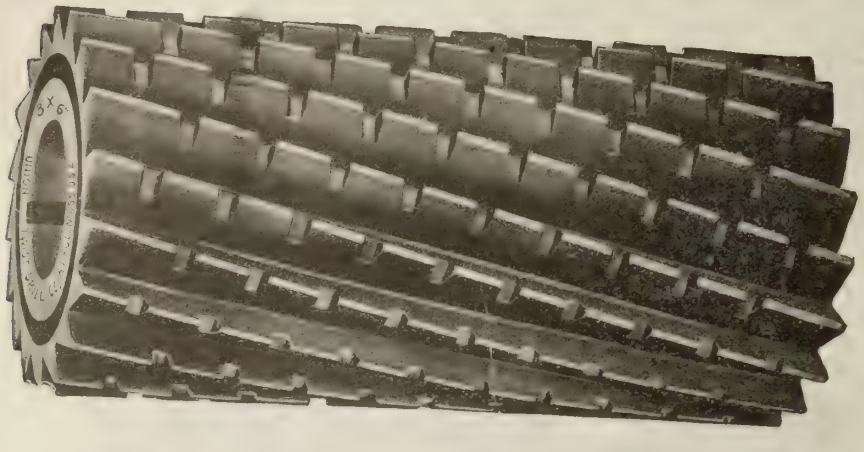
BUT when we say that the "B-T" Reversing Tapping Attachment saves time, taps, trouble and money, we are stating a fact that we are ready to prove to you—PERFORMANCE in your own shop will show the "B-T" advantages. Equipped with friction drive—automatically adjusts itself to pressure, eliminating reversing strains and preventing tap breakage due to binding or other breaking stresses. Made also with positive drive.

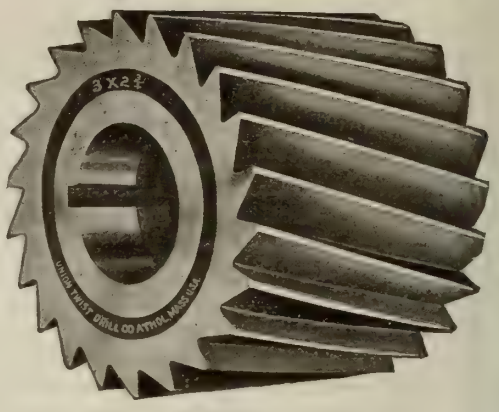
Trial will Prove. Write for our proposition.

Bicknell-Thomas Company

Greenfield, Mass., U.S.A.

Canadian Representative: The Jas. Buckley Co., St. Nicholas Bldg., Montreal, P.Q.





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TWIST DRILLS GEAR AND MILLING CUTTERS

(Carbon and High Speed Steel)

It will pay every manufacturer, who is not acquainted with Butterfield Tools, to measure their quality by the test of long, hard SERVICE.

You'll find the Butterfield durability the key to tool economy.

Drop us a line for catalogue.

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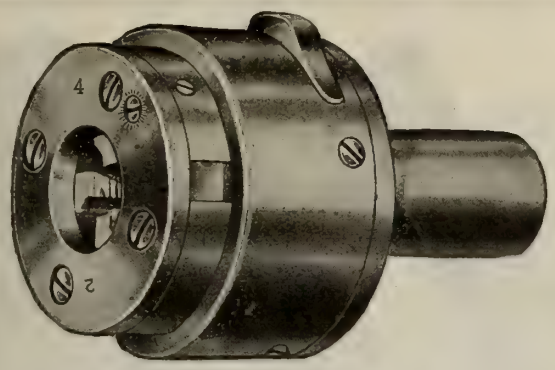
Rock Island, Quebec

Toronto Office:
220 King Street West



H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

CUSHMAN

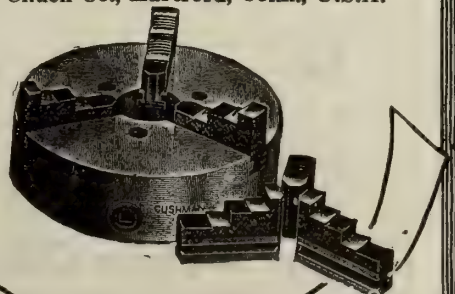
We've been Manufacturing

Nothing but Chucks and Their Accessories

FOR NEARLY 60 YEARS
AND OUR PRODUCTS SHOW IT

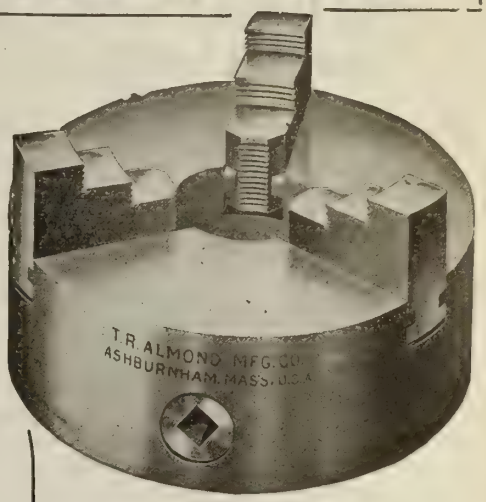
Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

Let us send you our catalogue.
Cushman Chuck Co., Hartford, Conn., U.S.A.

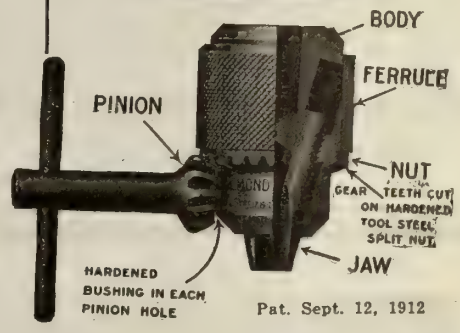


ALMOND CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5", 6", 7½", 9" and 12".



Geared Nut Drill Chucks, in various capacities, 0" to 1".



Micrometer Calipers—

English Readings, 1", 2" and 3".

Metric Readings, 25, 50 and 75 m/m.

Request our Catalog for your files.

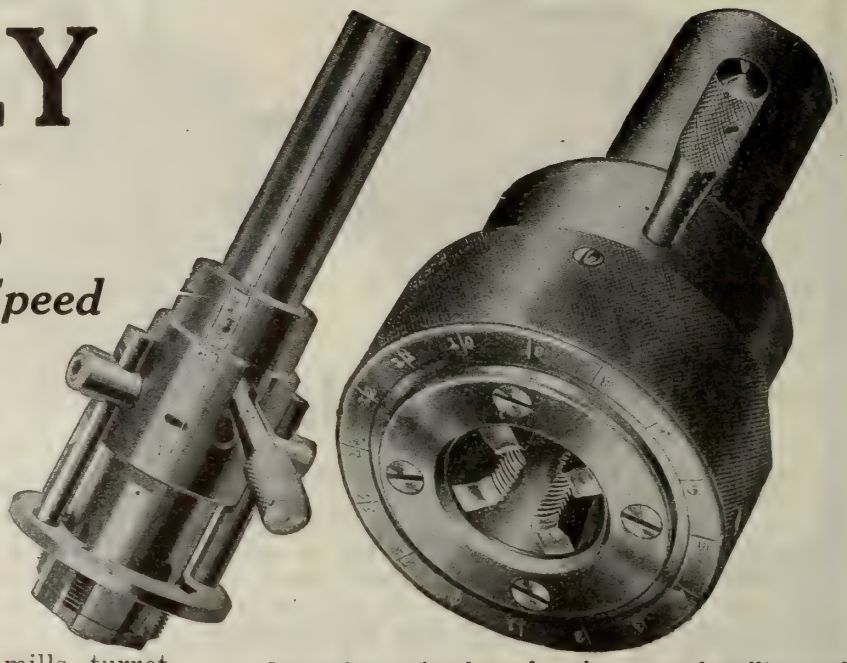
T. R. ALMOND MFG. CO.

6 Maple Avenue, Ashburnham, Mass.

MURCHEY

COLLAPSING TAPS and SELF-OPENING DIES

Promote Accuracy and Speed



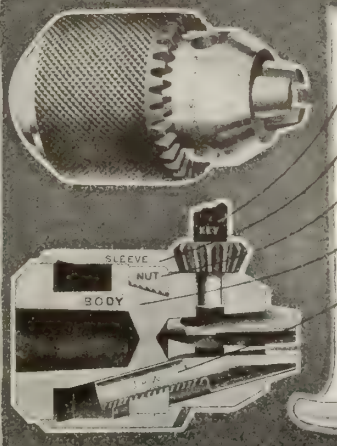
MURCHEY Collapsing Taps and Self-Opening Dies are cleared free from the thread instantly, preventing all danger of stripping, besides cutting time for production in half. **Thus you are sure of greater accuracy and greater production.** Murchey Tools are speeding production in all parts of the country on tapping machines, drill presses, monitor machines, boring mills, turret lathes, and all other machines to which taps or dies may be attached.

Let us know the class of work you are handling and we will show you how to increase your production 50 per cent. without running up the cost.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
FENWICK FRERES & CO., 15 Rue Fenelon, Paris, France.

JACOBS IMPROVED DRILL CHUCK



Gripping Features

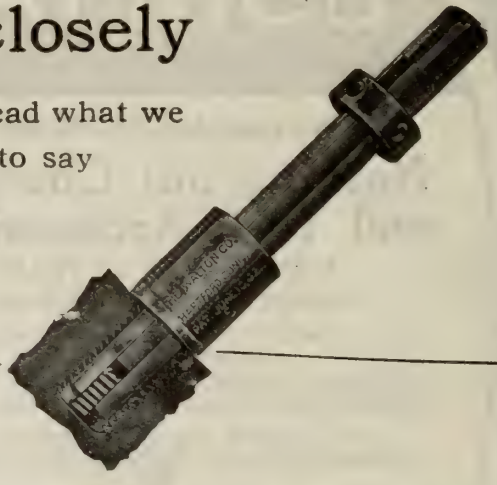
Key quickly and firmly tightens jaws.
Toothed sleeve superior to other chucks.
This nut insures accurate operation of the jaws.
Body — Durable — Sturdy — Compact.
The jaw always firmly clamps the tool accurately on center.

THE JACOBS MFG. CO.

HARTFORD, CONN. U.S.A.

Look at this again —closely

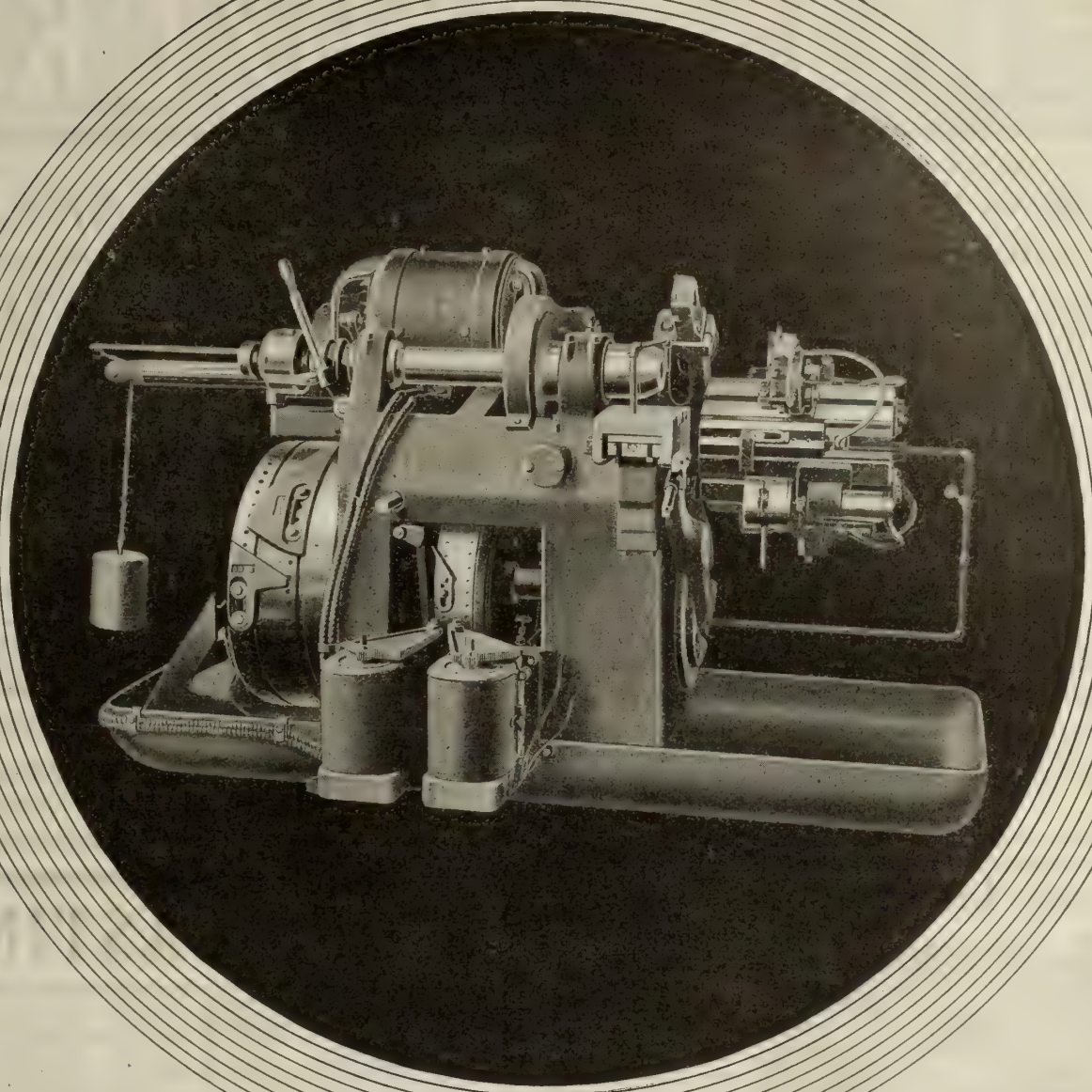
and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find this Walton **Tap Extractor will save a great deal** of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company

Hartford, Conn.



Let's be specific:

A comparison of two different Turret Lathe jobs for accuracy or for output, merely on heresay or opinion has often resulted in a new attitude when the real figures were known.

Gridley Automatic Turret Lathes stand or fall by their specific performance on *your* work in your shop. May we quote you *specifically?*

Capacities 2¼-5".

THE NATIONAL ACME COMPANY

AUTOMATIC SCREW MACHINERY AND ITS PRODUCT

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THE D. H. STOLL CO., INC.
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JAMES BALLANTYNE
HEATING and PLUMBING CONTRACTOR
ALSO
MACHINE SHOP and BLACKSMITH WORK
163 NAZARETH ST.
MONTREAL, P. Q.
Machine Work Wanted for Lathes, Shaper, Milling Machine and Planer, etc.
Quotations given on all classes of work. Wrought Iron Pipe Bends made to order, ¼ to 8". Pipe Cut and Threaded, ⅛ to 12".
Write for Prices.

TRADE MARK
BRISTOL'S
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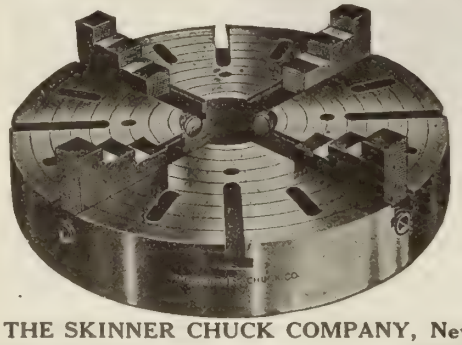
ELECTRIC PYROMETERS
FOR EVERY SERVICE

Bristol's Recording Pyrometer furnished with patented frictionless smoked chart recording system, especially valuable for processes requiring continuous heat treatment.
Simplicity of construction and ruggedness make them ideal shop pyrometers. The ONLY pyrometer equipped with Weston milli-voltmeter movement.
Write for Bulletin I-205.
THE BRISTOL CO.
WATERBURY, CONN., U.S.A

Skinner Independent Chucks

FOR HIGH SPEED WORK
IRON OR STEEL BODY
The last word in chuck construction.
Wide jaws; hardened steel thrust bearings; adjusting screws of large diameter, threaded full length; jaws ground after hardening, etc.
Write us to-day for prices.
THE SKINNER CHUCK COMPANY, New Britain, Conn.
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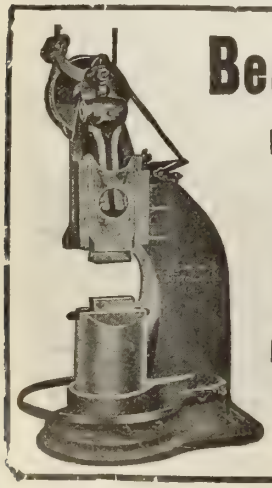
STEEL CASTINGS
ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.
PROMPT DELIVERY
Manitoba Steel Foundries, Ltd.
1204 McArthur Building
Winnipeg - - - Manitoba


Beaudry Hammers
FOR GENERAL FORGING
Save Fuel, Time and Labor. Cut Forging Costs in two.
BELT OR MOTOR DRIVEN
BEAUDRY & COMPANY, Inc.
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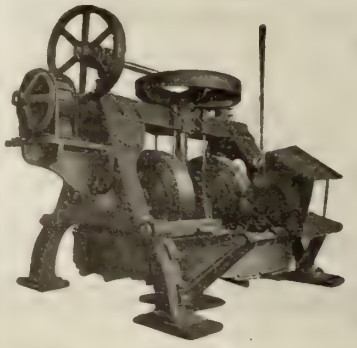
Alfred Herbert, Ltd., Coventry, England, London, Paris, Calcutta, Yokohama.

Canadian Steel Foundries Need Frost Improved Sand Mills

WINNING FEATURES
Heavy Mullers
Unloading Device
Motor or Belt Drive
The Frost Mfg. Co.
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WHEEL TRUEING TOOL CO.
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MANUFACTURERS OF

INDUSTRIAL DIAMONDS

DIAMOND POINTED TOOLS

Goods Submitted on Memorandum if Desired
JOHN W. GORDON, Manager
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All Mountings Fully Guaranteed
Office and Factory:
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Gas Engine Clutches. Jaw Clutches.
Write for interesting printed matter.
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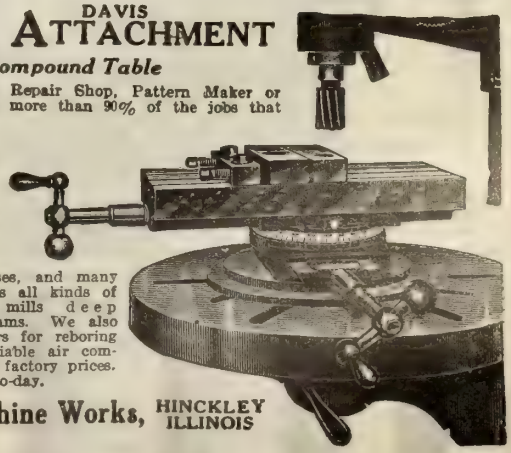

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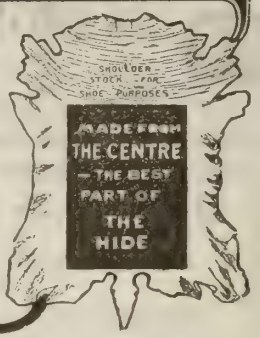

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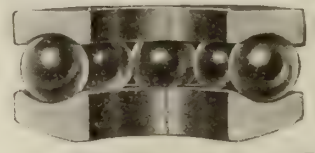

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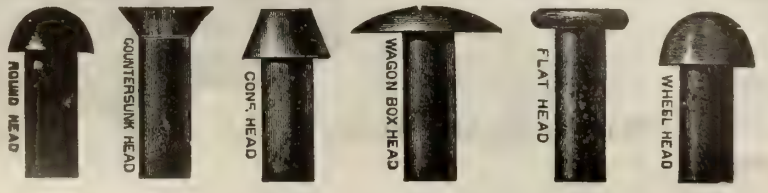

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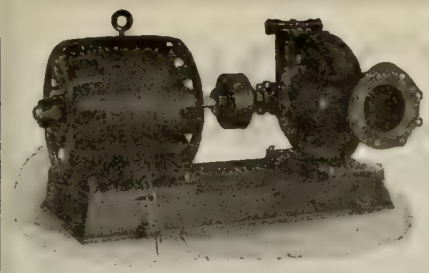

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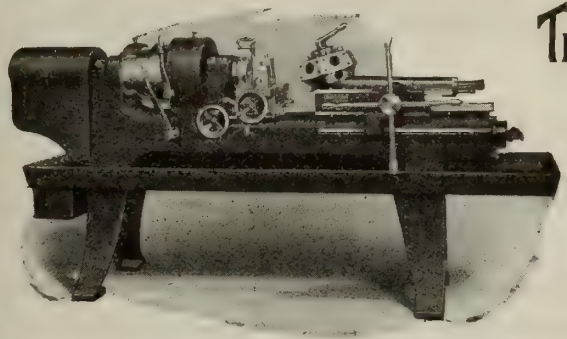

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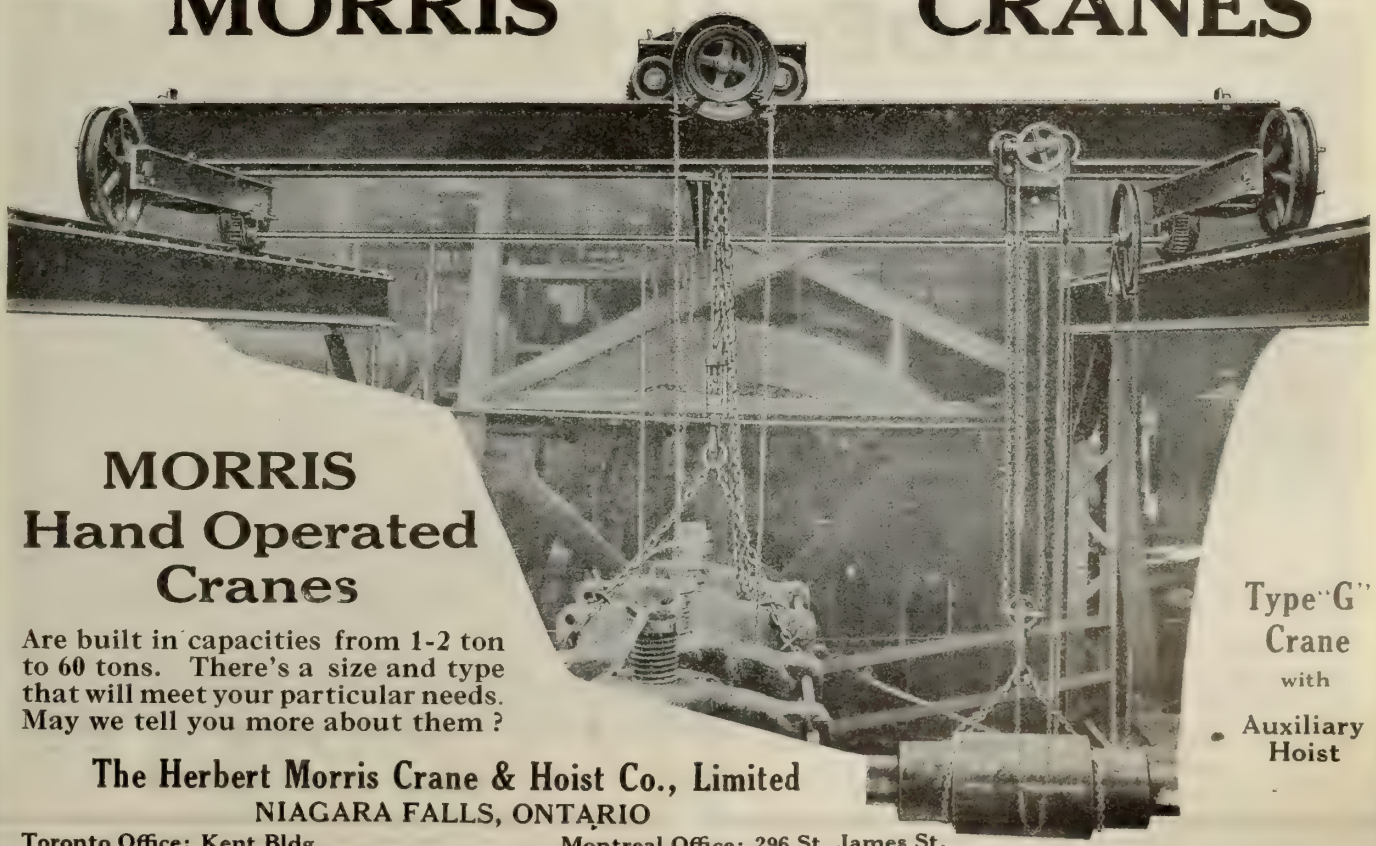

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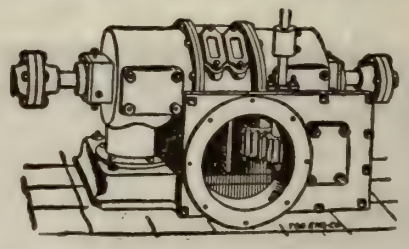

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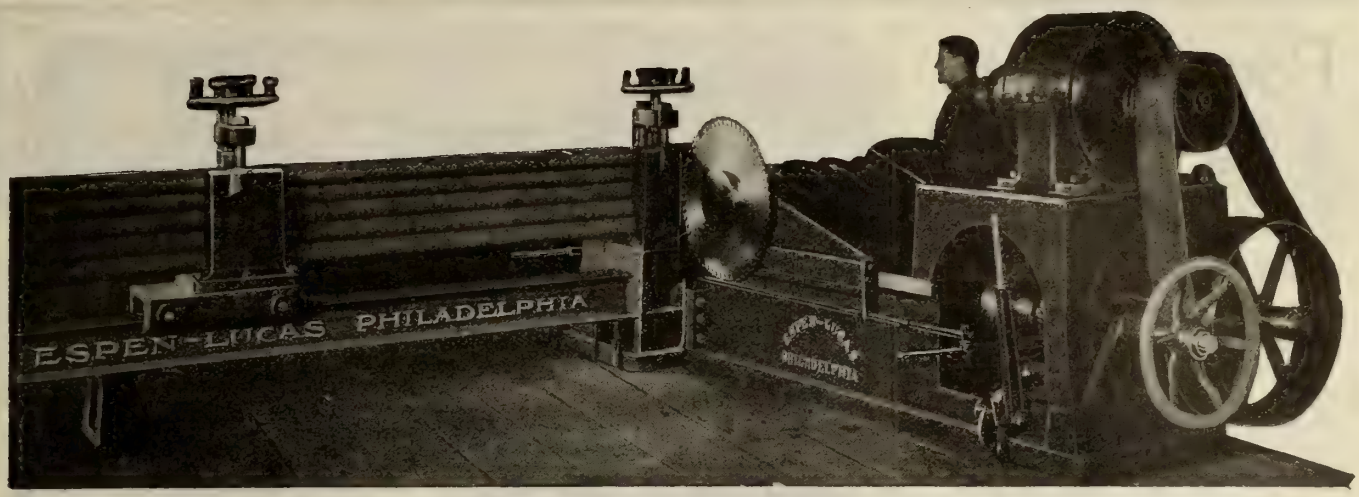

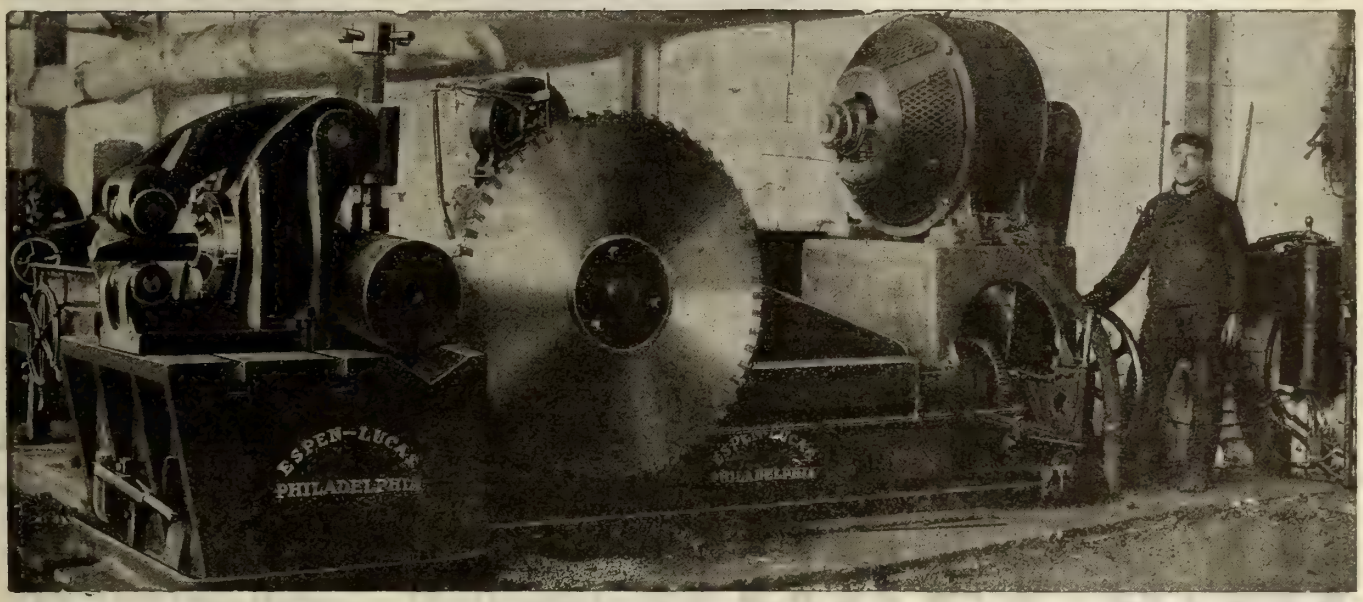

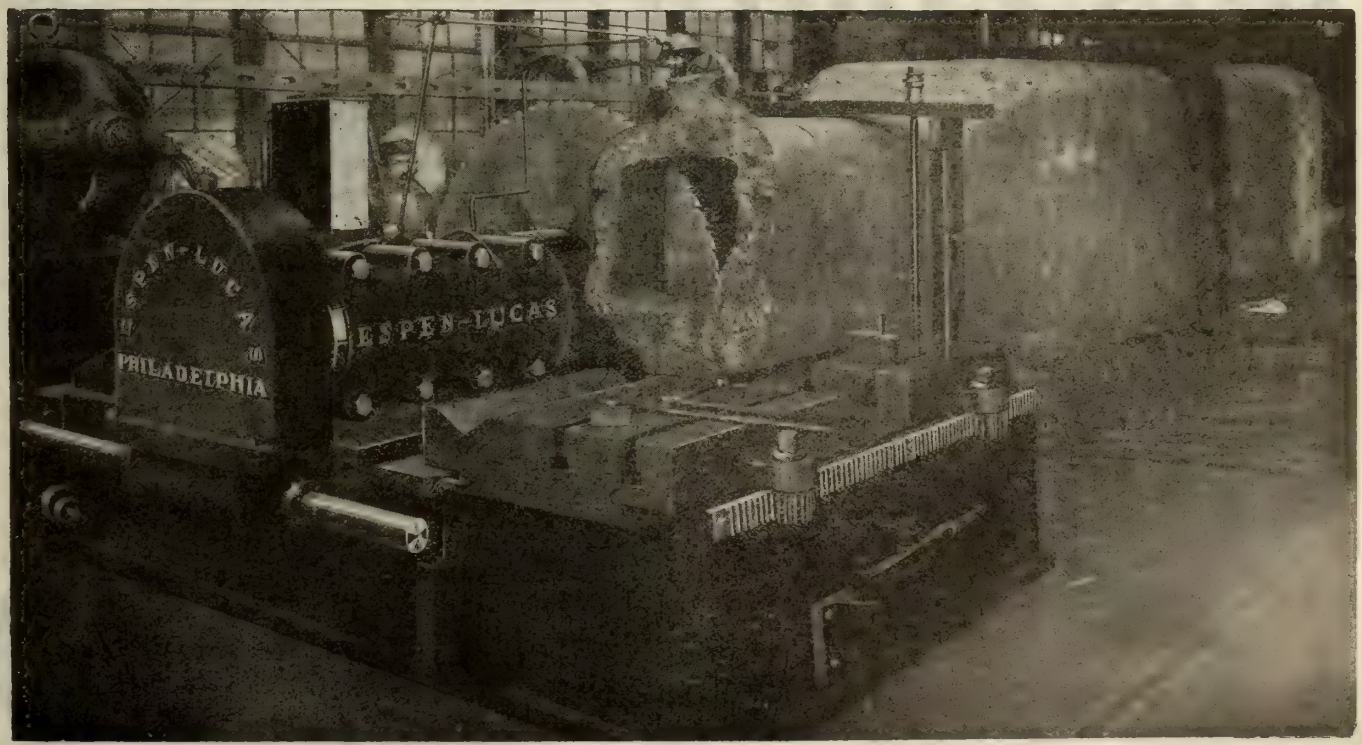

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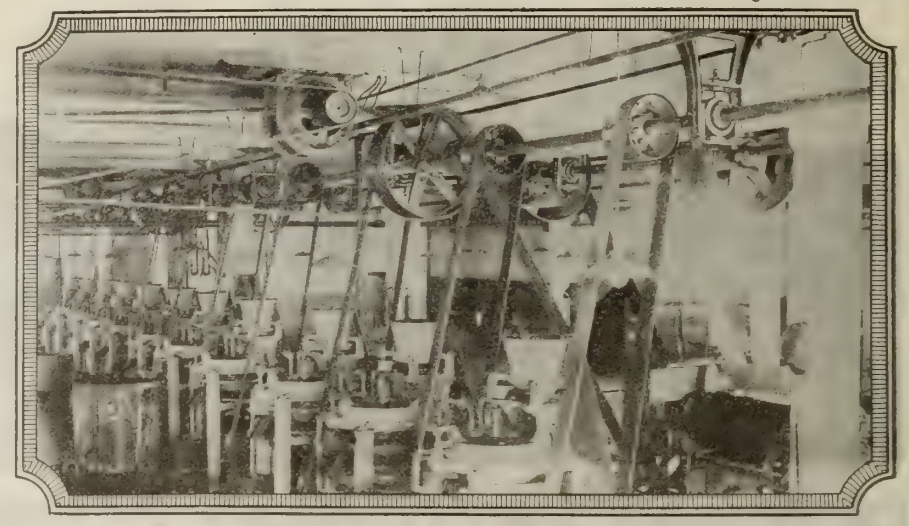

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Canadian Machinery Corp., Galt, Ont.
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Landis Machine Co., Waynesboro, Pa.
Rice, Lewis & Son, Toronto, Ont
Wells Brothers Co. of Canada, Galt, Ont.
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BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
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Williams & Wilson, Ltd., Montreal, Que.
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Garlock-Walker Machinery Co., Toronto, Ont.

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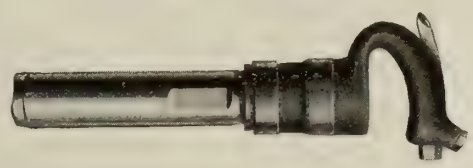

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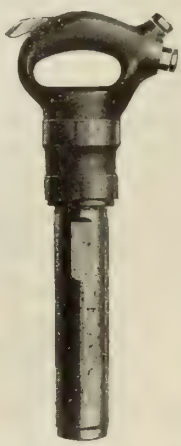

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Rice, Lewis & Son, Toronto Ont.
Tabor Mfg. Co. Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING-OFF MACHINES
Armstrong Bros. Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Canadian Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Machy. & Supply Co., The Geo. F., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy Co., South Sudbury, Mass
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Standard Machy & Supplies, Ltd., Montreal, Que
Tabor Mfg. Co. Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor, Ont.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich.

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co, Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DEEP DRAWING DIE STEEL
J. F. A. Comstedt, New York City, N.Y.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co. Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Anderson & Co. of Can., Geo., Montreal, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Windsor, Ont.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal, Que.

DIAMONDS, CARBON & BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pittsburgh Steel Stamp Co., Pittsburgh, Pa.

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Banfield, W. H., & Son, Toronto.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy & Supply Co., Montreal.
Gardner, Robt., & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Ltd., Montreal.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

DIES, THREADING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston, Mass.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES, BOLT, PIPE
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt, Ont.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
Wells Brothers Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

DIE BLOCKS, HEAVY FORGED
Hammond Steel Co., Inc., Syracuse, N.Y.

DIE FORGINGS
Hammond Steel Co., Inc., Syracuse, N.Y.

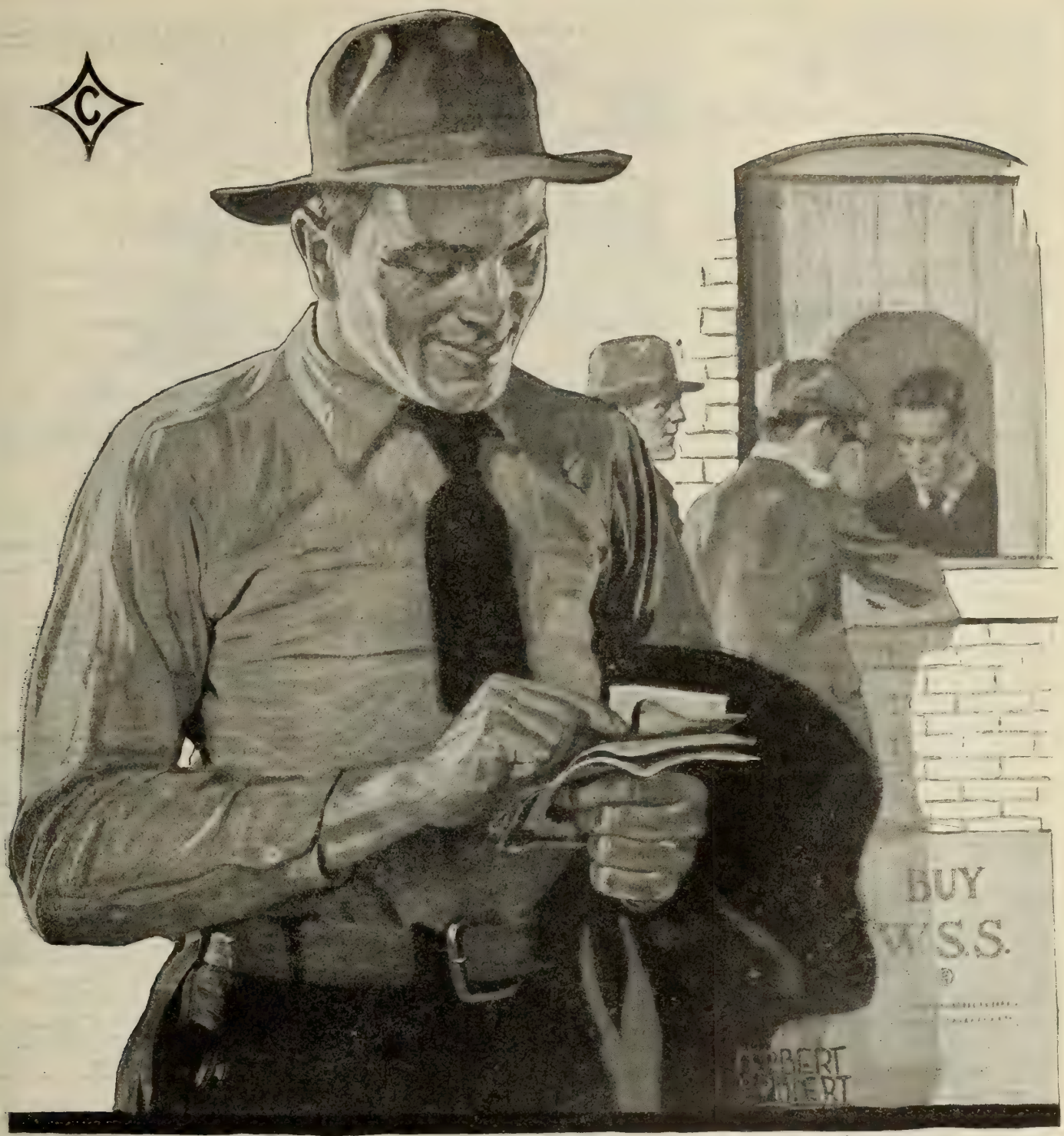
DIE FILING MACHINES
Oliver Machinery Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong, Whitworth of Canada, Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Wells Brothers Co. of Canada, Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Windsor Mach. & Tool Co., Windsor, Ont.
Worth Engineering Co., Toronto, Ont.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.



You Can Tell He Uses CLEVELAND

THE CLEVELAND TWIST DRILL CO., Cleveland, New York, Chicago

Agents for Europe, CLEVELAND TWIST DRILL CO. (GREAT BRITAIN), Ltd., 36-37 Upper Thames St., London E.C.4.

Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Brothers Co. of Canada, Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Ltd., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

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W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

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Henry Hope & Sons of Canada, Ltd., Peterboro.

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Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Desmond-Stephan Mfg. Co., Hamilton, Ont.
Ford-Smith Mach Co., Hamilton, Ont.
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal, Que.

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp, Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
United States Mach. Tool Co., Cincinnati, O.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn.
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Limited, Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.

DRILLING MACHINES RADIAL AND TURRETT
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Reed-Prentice Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
D. McKenzie Machinery Co., Guelph, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati, Ohio.
Williams & Wilson, Limited, Montreal, Que.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Machinery Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Fry's (London), Ltd., London, England.
Garlock-Walker Machinery Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
National Automatic Tool Co., Richmond, Indiana.
Reed-Prentice Co., Worcester, Mass.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach. Co., Rockford, Ill.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, VERTICAL
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros., Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto, Ont.
W. F. & John Barnes Co., Rockford, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fry's (London), Ltd., London, England.
Garlock-Walker Machinery Co., Toronto, Ont.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
United States Electrical Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Canada, Walkerville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

ELECTRIC FURNACES
Electric Steel & Metals, Ltd., Welland, Ont.
General Steel Co., Milwaukee, Wis.

ELEVATOR ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton, Ont.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Canada, Walkerville, Ont.

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll, Ont.

DRILLS, ELECTRIC AND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
United States Electrical Tool Co., Cincinnati.
A. R. Williams Machinery Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, EMERY
Garlock-Walker Machinery Co., Toronto, Ont.

DRILLS, HIGH SPEED TOOL ROOM
Albany Hardware Spec. Co., Albany, Wis.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong, Whitworth of Canada, Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal.
H. A. Drury Co., Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill.
Perfect Machine Co., Galt, Ont.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Taylor, J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., St. Catharines, Ont
Wilt Twist Drill Co of Canada, Walkerville, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Machinery Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Canada, Walkerville, Ont.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Cleveland Twist Drill Co., Cleveland.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Canada, Walkerville, Ont.
United Brass & Lead, Ltd., Toronto.

DRINKING FOUNTAINS, SANITARY
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co.
Jones & Glasco, Montreal.
Morse Chain Co., Ithaca, N.Y.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
Sheldons, Ltd., Galt, Ont.

DRUM CONTROLS
Electric Steel & Metals, Ltd., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
Pratt & Whitney Co., Dundas, Ont.
MacGovern & Co., Montreal, Que.
Standard Machy. & Supplies, Ltd., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Williams & Wilson, Limited, Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich.

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto
Ford-Smith Machine Co., Hamilton, Ont.

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Baxter & Co., Ltd., J. R., Montreal, Que.
Brantford Emery Wheel Co., Brantford, Canada
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Trueing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll, Ont.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ENGINE SHAFTS
Hammond Steel Co., Inc., Syracuse, N.Y.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal
Sheldons, Ltd., Galt, Ont.

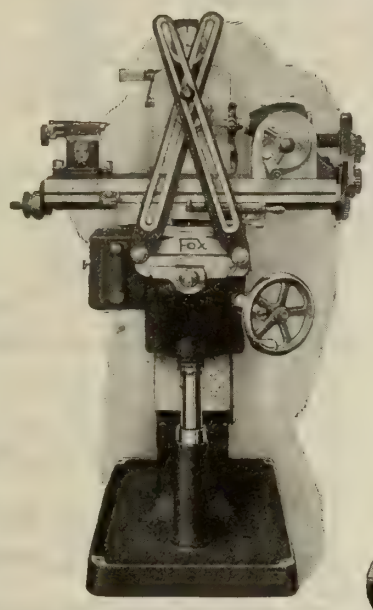
EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Sheldons, Ltd., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

TRADE FOX MARK
REGISTERED

MILLING MACHINES

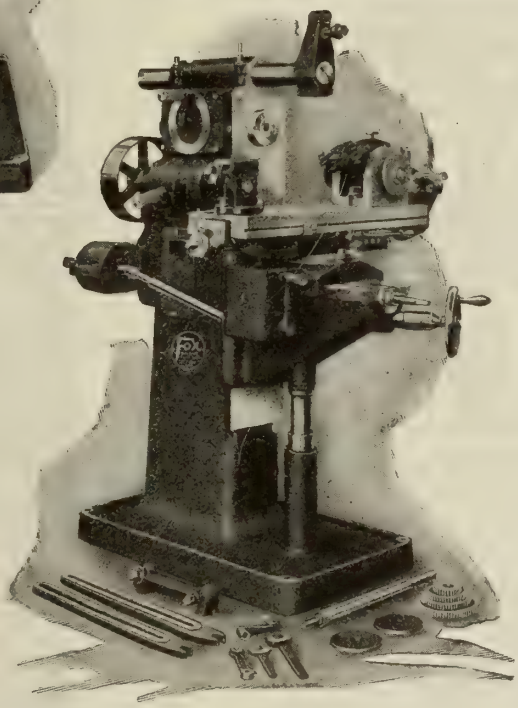
FOR

Rapid Production of Motor Parts



The **demand** for increased production **requires tools** of **great strength** and **durability**; the Fox 2-A Universal Milling Machine illustrated has met this demand, and is being used wherever extreme accuracy and quantity production are required.

The machine has a universal table, spiral cutting attachment, 10″ Dividing Head with 6″ Universal Chuck, making it a machine **especially adapted for Tool Room Work.**



The **United States Government** used this machine in its various **repair shops** for **Aeroplane Motors.**

You should be using this tool to help the production of parts necessary for reconstruction.

Specifications—No. 2-A Miller.

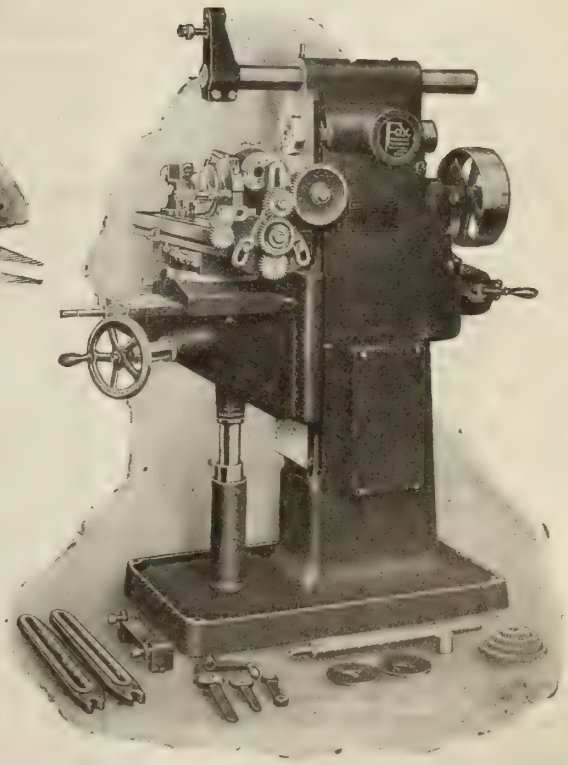
Spindle speeds 12
From 21 to 423 r.p.m.

Table feeds 6
From .317″ to 2.79″ per min.

Table .....8½ x 27″
Long. feed (power) 26″.
Vertical feed (hand) 13″.
Trans. feed (hand) 8½″.

Drive...Single pulley 10 x 3″ running 250 r.p.m.

Gears — Hardened steel.
Weight .....1,500 lbs.



We build this same machine with a plain table, omitting the spiral cutting attachment and Dividing Head.

Our No. 1 type machine has a four-step cone drive, and while being a lighter machine is a "bear" for work. This was proven by **the hundreds** of **them in the largest munitions plants.**

We also build the Fox Multiple Spindle Drilling Machines.

FOX MACHINE COMPANY

1047 W. Ganson St., Jackson, Michigan, U.S.A.

EXTRUSION DIE STEEL
J. F. A. Comstedt, New York City, N.Y.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EXTRA TOOL STEEL
J. F. A. Comstedt, New York City, N.Y.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.
United Brass & Lead, Ltd., Toronto.

EYE PROTECTORS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Limited, Montreal, Que.

FENCE, IRON AND FACTORY
Canada Wire & Iron Goods Co., Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa.

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.

FILES
Wm. Atkins & Co., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
Canada Wire & Iron Goods Co., Hamilton, Ont.

FIRST AID CABINETS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FIRE BRICKS
Harbison-Walker Refactories Co. of Canada, Montreal, Que.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, Ohio.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener, Ont.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Sheldons, Ltd., Galt, Ont.

FORGINGS, STEEL AND IRON
Can. Foundries & Forgings, Ltd., Welland, Ont.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE

FORGING AND WELDING
Victoria Foundry Co., Ottawa.
Can. Billings & Spencer, Ltd., Welland, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Limited, Montreal, Que.

FORGINGS, SPECIAL
Armstrong, Whitworth of Canada, Montreal, Que.
Canada Foundries & Forgings, Ltd., Welland, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
Henry Hope & Sons of Canada, Ltd., Peterboro.

FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FOUNTAINS, DRINKING
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Ltd., Montreal.

FUEL OIL SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.
Gilbert & Barker Mfg. Co., Springfield, Mass.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield, Mass.
Mechanical Engineering Co., Three Rivers, Que.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Limited, Montreal, Que.

FURNACES, BLAST
Belleview Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield, Mass.
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL, SHELL
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, LEAD AND SALT
Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, RIVETING
Standard Fuel Engineering Co., Detroit, Mich.

FUSE BOXES, STEEL
Dom. Forge & Stamping Co., Walkerville, Ont.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

GASOLINE TANKS
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

GASOLINE PUMPS, SELF-MEASURING
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

GAUGES
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGES, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, FUSE HOLE
Windsor Mach. & Tool Co., Windsor, Ont.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Toronto Tool Works, Toronto, Ont.
United Brass & Lead, Ltd., Toronto.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal, Que.
Dom. Foundries & Steel, Ltd., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Works, Rochester, N.Y.

GEAR BOXES, REDUCTION
Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN
Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Ltd., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Victoria Foundry Co., Ottawa.
Hull Iron & Steel Foundries, Ltd., Hull, Que.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia, Pa.
A. R. Williams Machy. Co., Toronto.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GENERATORS, ELECTRIC
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Toronto.

GENERATORS, MOTOR
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
MacGovern & Co., Montreal, Que.

GERMAN SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.
Strong, Kennard & Nutt Co., Cleveland, Ohio.

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich.

GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland, Ohio.
Willson & Co., Inc., T. A., Reading, Pa.

GOVERNOR, WATER WHEEL
Wilson & Co., J. C., Belleville, Ont.

GRAPHITE
Aikenhead Hardware, Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

GOGGLES
Consolidated Optical Co., Toronto, Ont.
Standard Optical Co., Geneva, N.Y.
Strong, Kenard & Nutt Co., Cleveland, Ohio.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal, Que.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (SEE LUBRICANTS)

GRINDERS, AUTOMATIC KNIFE
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co. Providence, R.I.
Cincinnati Milling Mach. Co., Cincinnati, Ohio.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mach. Tool Co., R. K., Cincinnati, O.
Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

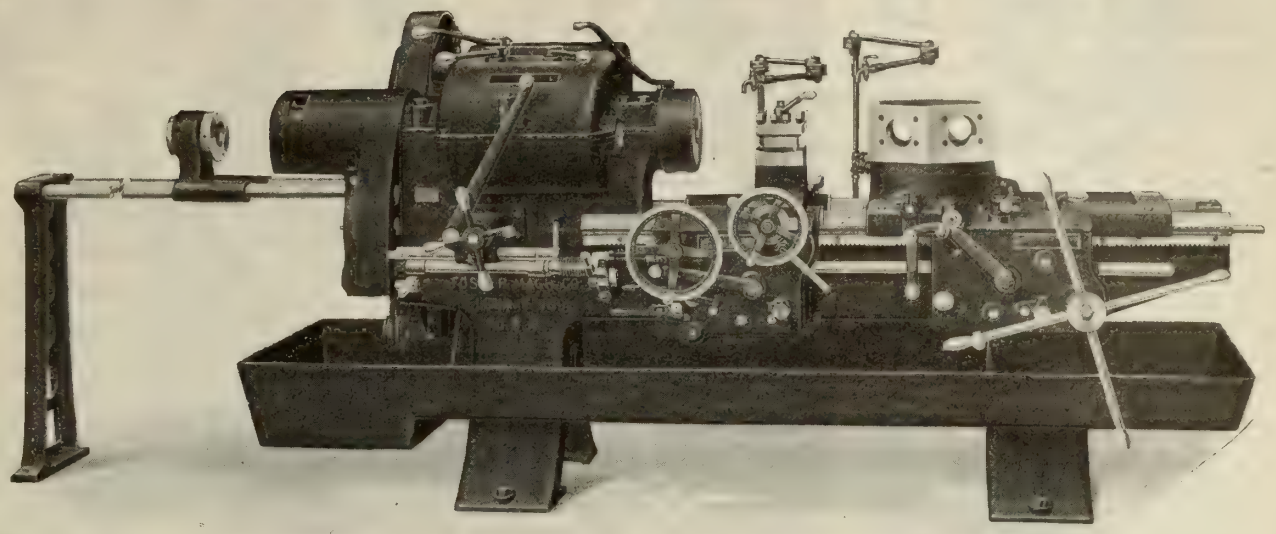
GRINDERS, DRILL
Aikenhead Hardware Co., Toronto, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
United States Electrical Tool Co., Cincinnati, O.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

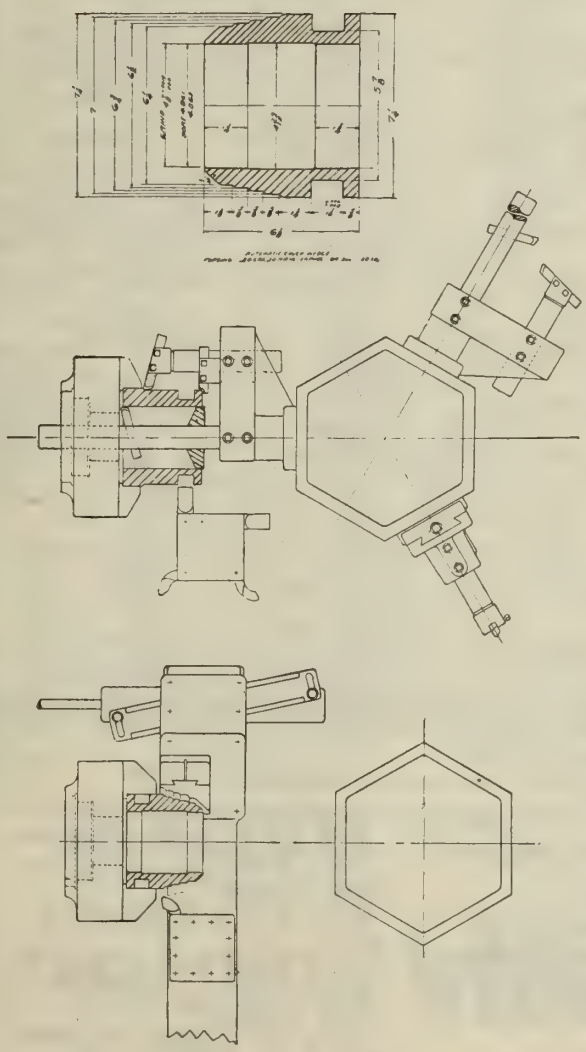
GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, PORTABLE, ELECTRIC, HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Wisconsin Electric Co., Inc., Racine, Wis.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
United States Electrical Tool Co., Cincinnati, O.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
MacGovern & Co., Montreal, Que.

THE FOSTER METHOD





Machining an Automatic Chuck Wedge on the Foster 2-B Universal Turret Lathe

The line drawing shows the Foster method of machining a large automatic chuck wedge.

The material used is a hollow forging. This is gripped in a three-jaw scroll chuck. Two cutters carried by a Multiple Turning Head on the hexagon turret, bores and rough turns the piece while a cutter in the square turret on the cross-slide roughs the face.

Next, cutters carried by a second Multiple Turning Head finishes the bore and outside and rounds the corner and a square turret tool finishes the face. A centre on the Multiple Turning Head supports the work, while square turret tools rough and finish the slot. The recess is bored by a cutter in the slide tool on the hexagon turret.

For the second operation the work is gripped by soft jaws in the scroll chuck; a cutter in the square turret in conjunction with the taper attachment removes rapidly all the excess stock. The stepped portion of the wedge is then finished by a forming tool rigidly carried by a holder mounted on the rear end of the cross slide and the automatic wedge is finished.

Trace these operations through again and see how the multiple tooling idea, as applied to this piece of work, saves time—and money.

How about your own work? There are a lot of parts in your factory where multiple tooling can save you time and increase production. Send us your blue prints. Let us study it over and show you how.

THE FOSTER LINE

No. 1-B UNIVERSAL TURRET LATHE
Bar Cap. 2" — Swing over Carriage, 14" over Cross Slide, 8"

No. 2-B UNIVERSAL TURRET LATHE
Bar Cap. 3¼" — Swing over Carriage, 20" over Cross Slide, 13½"

No. 3-B UNIVERSAL TURRET LATHE
Bar Cap. 4½" — Swing over Carriage, 26" over Cross Slide, 18¾"

No. 0 PLAIN HEAD SCREW MACHINE
Bar Cap. ⅞" — 10" Swing

No. 1 PLAIN HEAD SCREW MACHINE
Bar Cap. 1⅛" — 11" Swing

No. 2 PLAIN AND FRICTION HEAD SCREW MACHINES
Bar Cap. 1⅜" — 13" Swing

No. 3 PLAIN, FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1⅝" — 14½" Swing

No. 4 FRICTION HEAD SCREW MACHINE
Bar Cap. 1⅞" — 17¼" Swing

No. 5 FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1⅞" — 17¼" Swing
Nos. 6, 7, 8, 9, 10 FRICTION HEAD SCREW MACHINES
Bar Cap. 2⅛"; 2⅛"; 2⅜"; 2⅝"; 3⅛" resp. — 20" Swing

No. 2 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1⅜" — 14" Swing

No. 2 FRICTION SET-OVER TURRET LATHE
Bar Cap. 1⅜" — 14" Swing

No. 3 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1⅝" — 16" Swing

No. 3 FRICTION HEAD SET-OVER TURRET LATHE
Bar Cap. 1⅝" — 16" Swing

THREAD MILLERS
Manufactured under the Holden & Morgan Patents

Foster Machine Co., Elkhart, Ind., U. S. A.

GRINDERS, ROTARY SURFACE
Bristol Machine Tool Co., Bristol, Conn.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Ford-Smith Machine Co., Hamilton, Ont.
Grand Rapids Grinding Mach. Co., Grand Rapids, Mich.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Wing & Son, J. E., Hamilton, Ont.

GRINDERS, UNIVERSAL, PLAIN
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, VERTICAL SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Reed-Prentice Co., Worcester, Mass.
Gisholt Machine Co., Madison, Wis.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Limited, Montreal, Que.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford.
LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York, N.Y.
Norton Grinding Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wis.
Williams & Wilson, Limited, Montreal, Que.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT
Norton Grinding Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Brantford Emery Wheel Co., Brantford, Canada
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Norton Co., Worcester, Mass.

GRIT, ANGULAR
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ontario.
New Britain Mach. Co., New Britain, Conn.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland, Ohio.

GUN AND AMMUNITION SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

GUN TAPS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baxter & Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Fry's (London), Ltd., London, England.
Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que
Victor Saw Works, Ltd., Hamilton, Canada.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo, N.Y.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Ford-Smith Machine Co., Hamilton, Ont.
McKenzie Machy. Co., D., Guelph, Ont.
Peerless Machine Co., Racine, Wis.
Perfect Machine Co., Galt, Ont.
Racine Tool & Mach. Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Williams & Wilson, Limited, Montreal, Que.

HAMMERS (DROP), MOTOR AND BELT DRIVEN
Beaudry & Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Limited, Montreal, Que.

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited Montreal, Que.

HAMMERS, CHIPPING, CAULKING, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

HAMMERS, MARKING
Matthews, Jas. H. & Co., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE
Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston Mass.

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAMMERS, SHELL NOSING
Beaudry & Company, Inc., Boston, Mass.

HAND PLANERS
Oliver Machinery Co., Grand Rapids, Mich.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie, Ont.
The Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner, Robt., & Son, Montreal.
Jones & Glassco, Montreal.
Standard Pressed Steel Co., Philadelphia, Pa.
Williams & Wilson, Limited, Montreal, Que.

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., New York.

HEAD, AUXILIARY
Hoefer Mfg. Co., Freeport, Ill.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.

HEATING AND PLUMBING CONTRACTS
James Ballantyne, Montreal.

HEAT TREATMENT OF STEE L
The Gray Ball Bearing Co., Ltd., Toronto.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland, Ohio.

HIGH SPEED STEEL
J. F. A. Comstedt, New York City, N.Y.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

HIGH SPEED TOOL ROOM DRILLS
Albany Hardware Spec. Co., Albany, Wis.

HIGH SPEED TOOL METAL
Deloro Smelting & Refining Co., Toronto, Ont.
J. F. A. Comstedt, New York City, N.Y.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.
Illinois Tool Works, Chicago, Ill.

HINGES
London Bolt & Hinge Works, London, Ont.

HOBS
Greenfield Tap & Die Corp., Greenfield, Mass.
Illinois Tool Works, Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Wells Bros. of Can., Galt, Ont.

HOISTS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTING AND CONVEYING MACHINERY AND ENGINES
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Quebec.
Jones & Glassco, Montreal.
MacGovern & Co., Montreal, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal, Que.

HOISTS, CHAIN AND PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto, Ont.
Ford Chain Block & Mfg., Philadelphia, Pa.
Independent Pneumatic Tool Co., Chicago, Ill.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal, Que.

HOISTS, ELECTRIC
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
Electric Steels & Metals, Ltd., Welland, Ont.
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal, Que.

HOLDERS, STEEL DIE FOR MARKING
Matthews, Jas. H., & Co., Pittsburgh, Pa.

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland, Ont.

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids, Mich.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke, Que.
Dominion Bridge Co., Montreal, Quebec.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, PNEUMATIC
Baxter & Co., Ltd., J. R., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

HYDRAULIC MACHINERY
Garlock-Walker Machinery Co., Toronto, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
William R. Perrin, Ltd., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.
Williams & Wilson, Limited, Montreal, Que.

HYDROMETERS
Taylor Instrument Co., Rochester, N.Y.

HYGROMETERS
Taylor Instrument Co., Rochester, N.Y.

HYGRODEIKS
Taylor Instrument Co., Rochester, N.Y.

INDICATORS, SPEED
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R. I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal, Que.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

INGOT METAL
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
United Brass & Lead Ltd., Toronto.

INGOTS, STEEL
Nova Scotia Steel & Coal Co., New Glasgow, N.S

INGOTS, FORGING AND ROLLING
Electric Steel & Metals Co., Welland, Ont.

INSTRUMENTS, ENGINEERING
Consolidated Optical Co., Toronto, Ont.

IRON GREY
Brockville Foundry Co., Brockville, nt.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

IRON SAND
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

IRON, WROUGHT, ROLLED AND PIG
Swedish Steel & Importing Co., Ltd., Montreal.

IRREGULAR CUTTING SHEARS
Quickwork Co., St. Marys, Ohio.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

JACKS, PNEUMATIC
Northern Crane Works, Walkerville.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

JOINTERS
The Gray Ball Bearing Co., Ltd., Toronto.

JIGS, TOOLS, ETC.
Brown Engineering Corp., Toronto, Ont.
Elliott & Whitehall Mach. & Tool Co., Galt
Gisholt Machine Co., Madison, Wis.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Ltd., Welland, Ont.

KEY SEATERS
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.

KNIFE GRINDERS
The Gray Ball Bearing Co., Ltd., Toronto.

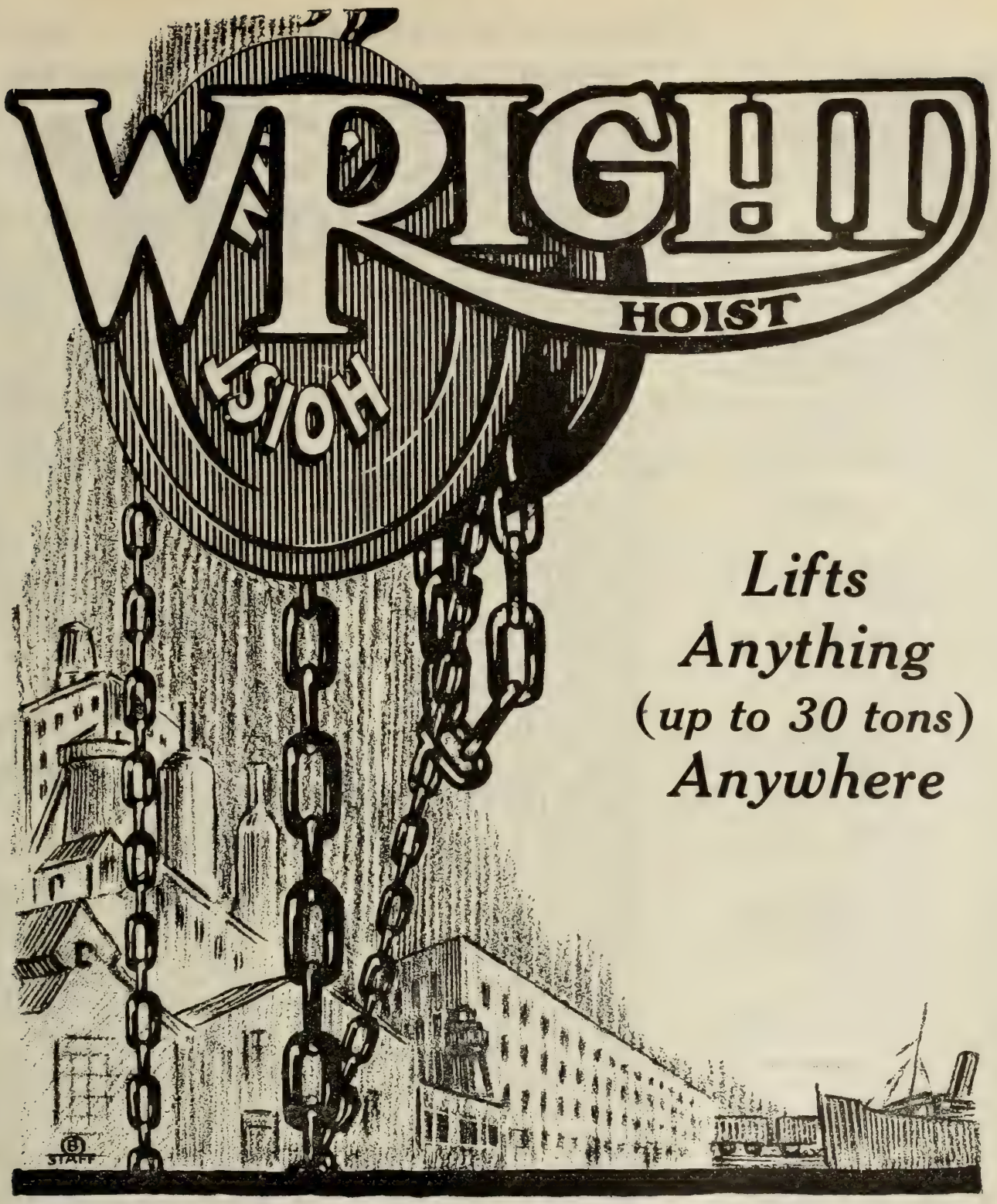
LABELS AND TAGS
Matthews, Jas. H. & Co., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (SEE CHEMISTS)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, Mich.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.



Lifts Anything (up to 30 tons) Anywhere

Wherever there is anything heavier than 50 lbs. and lighter than 30 tons, to be lifted or lowered, whether on land or sea, or in the bowels of the earth, one of three types Wright Hoists will do the work, quicker, better and at less cost.

Wright Hoists are made better; that's why they serve better.

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Wood Turret Machine Co., Brazil, Ind.

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LATHES, BORING
Bridgeford Mach. Tool Wks., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.

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Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Williams & Wilson, Limited, Montreal, Que.

LATHES, BAND TURNING
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LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Inc., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited. Montreal, Que.

LATHES, ENGINE
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John Bertram & Sons Co., Dundas.
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Canada Machinery Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, Ohio.
Wickes Bros., Saginaw, Mich.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Kennedy & Sons, Wm., Owen Sound, Ont.
R. McDougall Co., Galt.
Miles-Bement-Pond Co., New York.
Reed-Prentice Co., Worcester, Mass.
Smalley-General Co., Inc., Bay City, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
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Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blasdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited. Montreal, Que.

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LATHES, HORIZONTAL
Wood Turret Machine Co., Brazil, Ind.

LATHES, METAL TURNING
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Wood Turret Machine Co., Brazil, Ind.
Geo. F. Foss Mchy. & Supply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Williams & Wilson, Limited, Montreal, Que.

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Baxter & Co., Ltd., J. R., Montreal, Que.
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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Hepburn, John T., Ltd., Toronto.
Roelofson Mach. & Tool Co., Toronto, Can.
W. T. Whitehead, Son & Co., Montreal, Que.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, Ohio.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Wickes Bros., Saginaw, Mich.
Hepburn, John T., Ltd., Toronto.
Niles-Bement-Pond Co., New York.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal, Que.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
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Williams & Wilson, Limited, Montreal, Que.

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Williams & Wilson, Limited, Montreal, Que.

LATHES, TURRET, HAND, HORIZONTAL
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Bertram, John, & Sons Co. Dundas Ont.
Blount, J. G., & Co., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
H. C. Dodge, Inc., Boston, Mass.
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Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co. Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn, John T., Ltd., Toronto.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio
Mullmer-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Wood Turret Mach. Co., Brazil, Ind., U.S.A.
Williams & Wilson, Limited, Montreal, Que.

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St. Lawrence Welding Co., Montreal, Que.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
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Standard Optical Co., Geneva, N.Y.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LIFTS, PNEUMATIC
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glasseo, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Limited. Montreal, Que.

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Bertrams, Ltd., Edinburgh, Scotland.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Archibald & Co., Chas. P., Montreal, Que.
Baxter & Co., Ltd., J. R., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
The Geo. N. Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY, HAMMER AND NAIL
Garlock-Walker Machinery Co., Toronto, Ont.

MACHINERY GUARDS (SEE GUARDS)

MACHINERY REPAIRS
Marten Mach. Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY, MULTI-DRILLING
National Automatic Tool Co., Richmond, Ind.

MACHINERY, TRANSMISSION (POWER)
Morse Chain Co., Ithaca, New York.

MACHINES, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids, Mich.

MACHINES, ROLLING AND BENDING
Stoll Co., Inc., The D. H., Buffalo, N.Y.

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Norton Grinding Co., Worcester, Mass.

MACHINES, MULTI-BORING
National Automatic Tool Co., Richmond, Ind.

MACHINE SHOP WORK
James Ballantyne, Montreal.

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Can. Fairbanks-Morse Co., Montreal.
Marten Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
MacGovern & Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
J. H. Williams & Co., Brooklyn, N.Y.
Williams & Wilson, Limited. Montreal, Que.

MACHINE TOOLS
Williams & Wilson, Limited, Montreal, Que.

MACHINE & REPETITION WORK
Katie Foundry, Ltd., Galt, Ont.

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Can. Fairbanks-Morse Co., Montreal.
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A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Matthews, Jas. H., & Co., Pittsburgh, Pa.

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Perrin, Wm. R., Toronto.
Williams & Wilson, Limited, Montreal, Que.

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Strong, Kennard & Nutt Co., Cleveland, Ohio.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

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Bowser & Co., S. F., Inc., Fort Wayne, Ind.

MEASURING TAPES AND RULES
James Chesterman & Co., Ltd., Sheffield, Eng.

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METAL SAWS
Simonds Mfg. Co., Fitchburg, Mass.
Hoefer Mfg. Co., Freeport, Ill.

METAL SAWS, POWER
Hoefer Mfg. Co., Freeport, Ill.

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Canada Metal Co., Toronto, Ont.
Dom. Iron & Wrecking Co., Ltd., Montreal, Que.
Enushevsky & Son, B., Toronto, Ont.
International Metal & Trading Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
United Brass & Lead Ltd., Toronto.

METAL STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS
Can. Cartridge Co., Hamilton, Ont.

METERS, WATER
Can. Cartridge Co., Hamilton, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser & Co., Inc., S. F., Toronto, Ont.

MICROMETERS
Almond Mfg. Co., T. R., Ashburnham, Mass.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
Bertram, John, & Sons Co., Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Limited, Montreal, Que.

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Bilton Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal, Que.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Cleveland Milling Machine Co., Cleveland, O.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
The Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram, John, & Sons Co., Dundas Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
The Geo. F. Foss Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati, Ohio.
Whitney Mfg. Co., Hartford, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited, Montreal, Que.

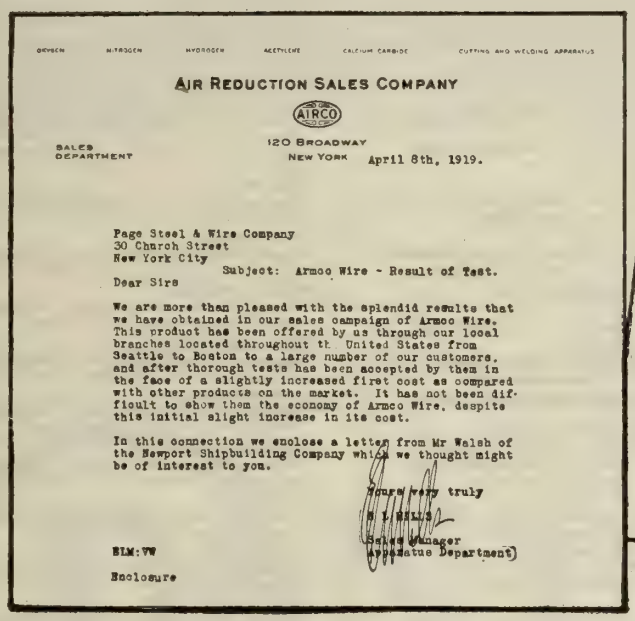
ARMCO IRON WELDING RODS

AMERICAN ARMCO INGOT IRON

The trade mark ARMCO carries the assurance that iron bearing that mark is manufactured by the American Rolling Mill Company with the skill, intelligence and fidelity associated with its products, and hence can be depended upon to possess in the highest degree the merit claimed for it.

cost somewhat more than ordinary filling material, but, compared with the total cost of the weld, the difference is insignificant. The difference in strength and safety of the weld, on the other hand, is of vital importance.

"It has not been difficult to show them the economy of Armco Iron Wire—"



OXYGEN NITROGEN HYDROGEN ACETYLENE CALCIUM CARBIDE CUTTING AND WELDING APPARATUS

AIR REDUCTION SALES COMPANY

AIRCO

SALES DEPARTMENT 120 BROADWAY NEW YORK April 8th, 1919.

Page Steel & Wire Company
30 Church Street
New York City

Subject: Armco Wire - Result of Test.

Dear Sirs

We are more than pleased with the splendid results that we have obtained in our sales campaign of Armco Wire. This product has been offered by us through our local branches located throughout th United States from Seattle to Boston to a large number of our customers, and after thorough tests has been accepted by them in the face of a slightly increased first cost as compared with other products on the market. It has not been difficult to show them the economy of Armco Wire, despite this initial slight increase in its cost.

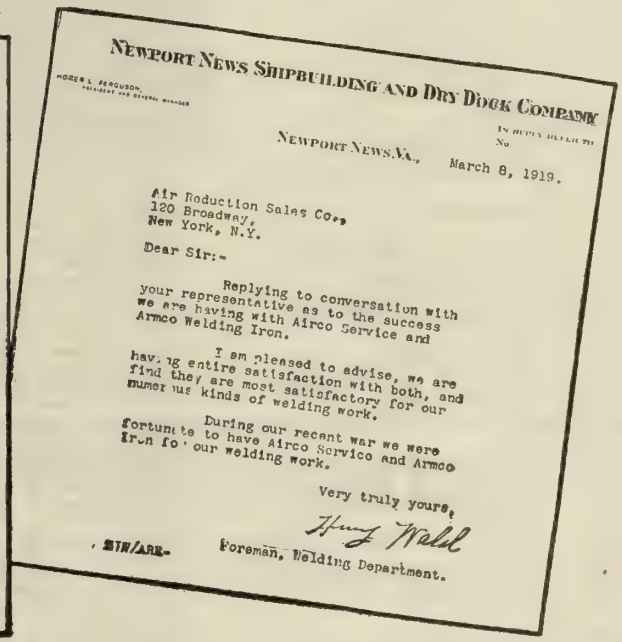
In this connection we enclose a letter from Mr Walsh of the Newport Shipbuilding Company which we thought might be of interest to you.

Yours very truly

H. L. Sills
Sales Manager
(Apparatus Department)

HLS:VW

Enclosure



NEWPORT NEWS SHIPBUILDING AND DRY DOCK COMPANY

HOZIER L. FERGUSON, PRESIDENT AND GENERAL MANAGER

NEWPORT NEWS, VA., March 8, 1919.

Air Reduction Sales Co.,
120 Broadway,
New York, N.Y.

Dear Sir:-

Replying to conversation with your representative as to the success we are having with Airco Service and Armco Welding Iron.

I am pleased to advise, we are having entire satisfaction with both, and find they are most satisfactory for our numerous kinds of welding work.

During our recent war we were fortunate to have Airco Service and Armco Iron for our welding work.

Very truly yours,

HWW/ARE- Foreman, Welding Department.

The above typical letter to one of our distributors shows that the superiority and real economy of ARMCO welding material are readily appreciated. Welders who use ARMCO IRON exclusively have a big advantage over competitors who buy inferior filler and their customers soon learn the difference.

Another ARMCO advantage from the welder's standpoint is the fact that two kinds of rods of guaranteed ARMCO analysis, one specially treated for electric and the other for oxy-acetylene welding, do all the work (with better results) that heretofore has required a choice of one from many compositions. This means that with a much smaller investment for stock of filling material a shop is fully prepared to handle the usual run of steel and iron welding work.

Because of their exceptional purity and even density Armco Iron Welding Rods flow freely, weld evenly, and give a joint that lends itself perfectly to hammering, forging, and, where necessary, to annealing and quenching.

Our booklet on "Armco Iron Rods and Wire" is full of interesting and useful welding data. Send for it.

PAGE STEEL & WIRE CO.

Established 1883 as Page Woven Wire Fence Co.

STEEL AND WIRE PAGE QUALITY PRODUCTS

Makers of "Copperweld" Copper Clad Steel Wire; ARMCO Iron Welding Rods and Electrical Wire; Wire Mill Products, Plain and Galvanized; Wire of Special Analysis; Wire Fencing for all Purposes; Factory Gates; Ornamental Iron Fence; Machine Guards; Tool and Stockroom Partitions; Architectural Iron.

Plants: Monessen, Pa., and Adrian, Mich.

Sales Offices: 30 Church Street, New York

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Canadian Distributors: Taylor & Arnold, Ltd., Montreal and Winnipeg.

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41

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Becker Milling Machine Co, Boston, Mass.
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Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss, The Geo. F., Mchy. & Supply Co., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
R. K. LeBlond Mach. Tool Co., Cincinnati, Ohio.
Niles-Bement-Pond Co, New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss, The Geo. F., Mchy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal, Que.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Limited, Montreal, Que.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
The Gray Ball Bearing Co., Ltd., Toronto.

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Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Lancashire Lynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.

MOULDS, RUBBER
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MULTI-DRILLING MACHINERY, VERTICAL AND HORIZONTAL
The National Automatic Tool Co., Richmond, Ind.

MULTI-BORING MACHINES
The National Automatic Tool Co., Richmond, Ind.

MULTI-TAPPING MACHINERY, VERTICAL AND HORIZONTAL
The National Automatic Tool Co., Richmond, Ind.

MUNTZ METAL
Brown Copper & Brass Roller Mills, New Toronto, Ont.

NAILS
Graham Nail Works (operated by Canada Metal Co., Ltd.), Toronto.
Page Steel & Wire Co., Adrian, Mich.

NAIL SETS
Morrow Screw & Nut Co., John, Ingersoll, Ont.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews, Jas. H., & Co., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

NICKEL
Boker & Co., Inc., H., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
J. F. A Comstedt, New York City, N.Y.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
John H. Hall & Sons, Ltd., Brantford, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Morrow Screw & Nut Co., Ltd., John, Ingersoll.
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
United Brass & Lead Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

NUT BURRING MACHINES
National Machy. Co., Tiffin, Ohio.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal, Que.

NUT TAPPERS
Bertram, John, & Sons Co., Dundas Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hall, J. H., & Son, Brantford, Ont.
A. B. Jardine & Co., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Limited, Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse, Co., Montreal.
Sheldon's, Ltd., Galt, Ont.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machinery Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OPENING DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Can., Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford, Ont.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND UNDER TRUCKS

OXYGEN, ELECTROLYTIC CELLS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford, Ont.

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Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.

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Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.
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Graton & Knight Mfg. Co., Worcester, Mass.
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Frost Mfg. Co., Chicago, Ill.

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Bertrams, Ltd., Edinburgh, Scotland.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
Page Steel & Wire Co., Adrian, Mich.

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto, Ont.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

PATTERN MARKERS' LATHES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN MAWERS' VISES
Oliver Machinery Co., Grand Rapids, Mich.

PATTERN SHOP SUPPLIES
Oliver Machinery Co., Grand Rapids, Mich.

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Dominion Pattern Works, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Greenleafs Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

PEDESTALS WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

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Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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John Morrow Screw & Nut Co., Ingersoll, Ont.

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids, Mich.

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International Malleable Iron Co., Guelph, Ont.

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Curtis & Curtis Co., Bridgeport, Conn.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Limited, Montreal, Que.

PHOTOSTATS
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Toronto Iron Works, Ltd., Toronto.

PIERCING
Oliver Machinery Co., Grand Rapids, Mich.

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Greenfield Tap & Die Corp., Greenfield, Mass.
John H. Hall & Sons, Ltd., Brantford, Ont.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE DIES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE CUTTERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE REAMERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE STOCKS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE THREADERS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE TAPS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE VISES
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield, Mass.
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General Steel Co., Milwaukee, Wis.

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Oliver Machinery Co., Grand Rapids, Mich.
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Gardner, Robt., & Son, Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
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Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
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Garlock-Walker Machinery Co., Toronto, Ont.
Garvin Machine Co., New York.
Hamilton Machine Tool Co., Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
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A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
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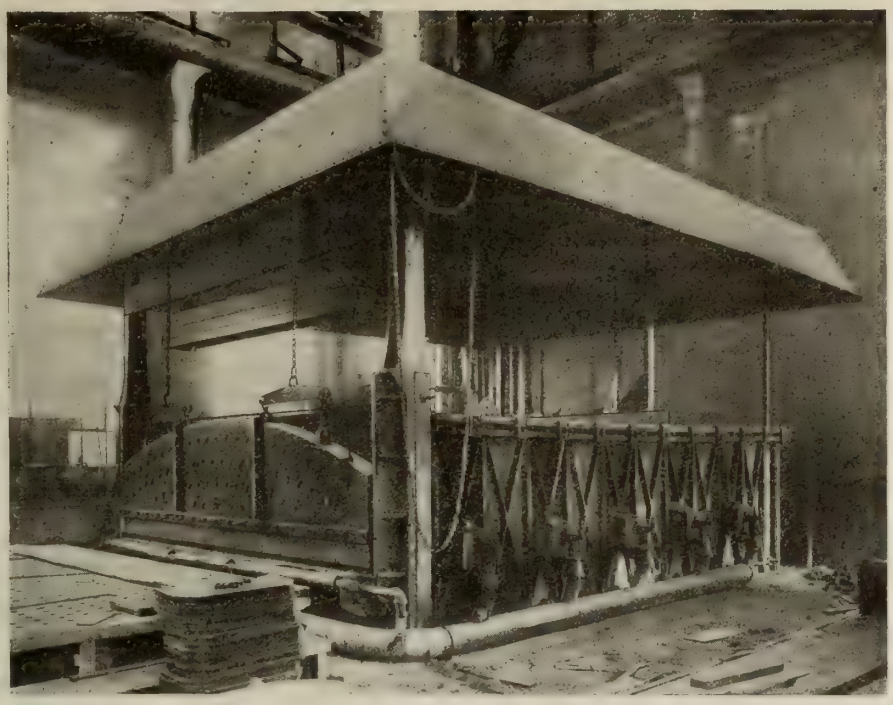

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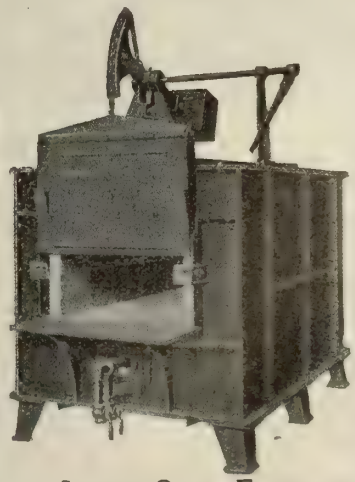

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Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto, Ont.
William R. Perrin, Ltd., Toronto.
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Consolidated Press Co., Hastings, Mich.
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Canada Machinery Corp., Galt, Ont.
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Bernard Industrial Co., Fortierville, Que.
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Ford-Smith Machine Co., Hamilton, Ont.
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Williams & Wilson, Ltd., Montreal, Que.

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Bernard Industrial Co., A., Fortierville, Que.
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Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Works, Ltd., Toronto
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Johnson, Carlyle, Mach. Co., Manchester, Conn
Williams & Wilson, Limited, Montreal, Que.

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MacKinnon Steel Co., Sherbrooke, Que.

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Wickes & Co., Saginaw, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
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Niles-Bement-Pond Co., New York.
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Shore Instrument & Mfg. Co., New York City.
Taylor Instrument Co., Rochester, N.Y.

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Niles-Bement-Pond Co., New York.

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Niles-Bement-Pond Co., New York.

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Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal, Que.

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Marshall, Son & Bunney, Toronto.

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Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilt Twist Drill Co., Walkerville, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Kelly Reamer Co., Cleveland, O.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Baxter & Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
The McCrosky Reamer Co., Meadville, Pa.
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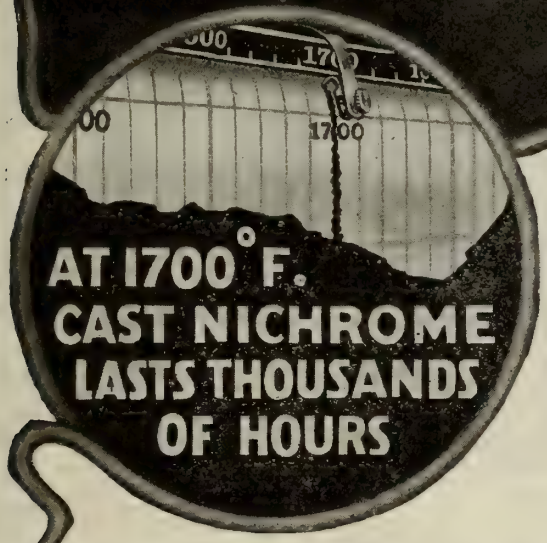

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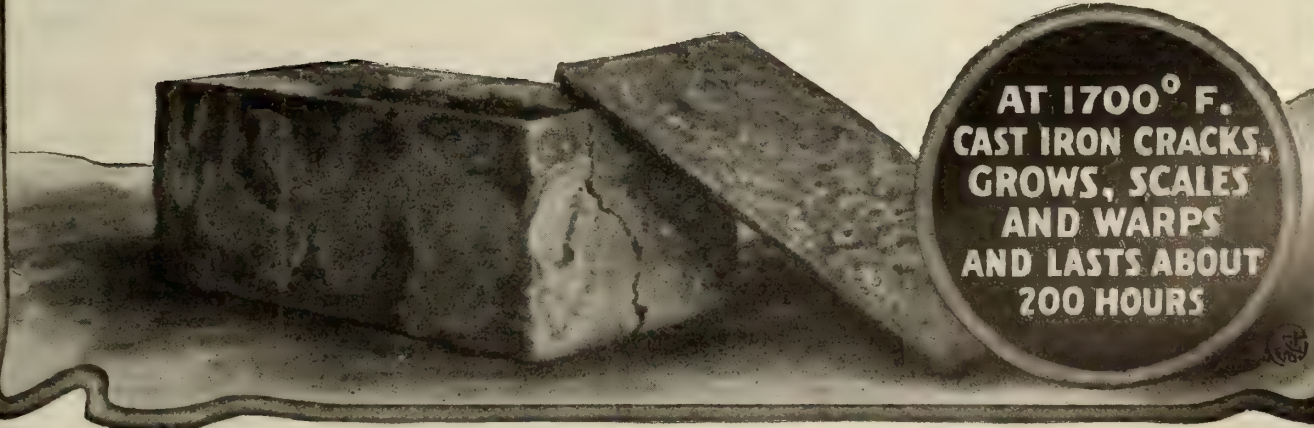

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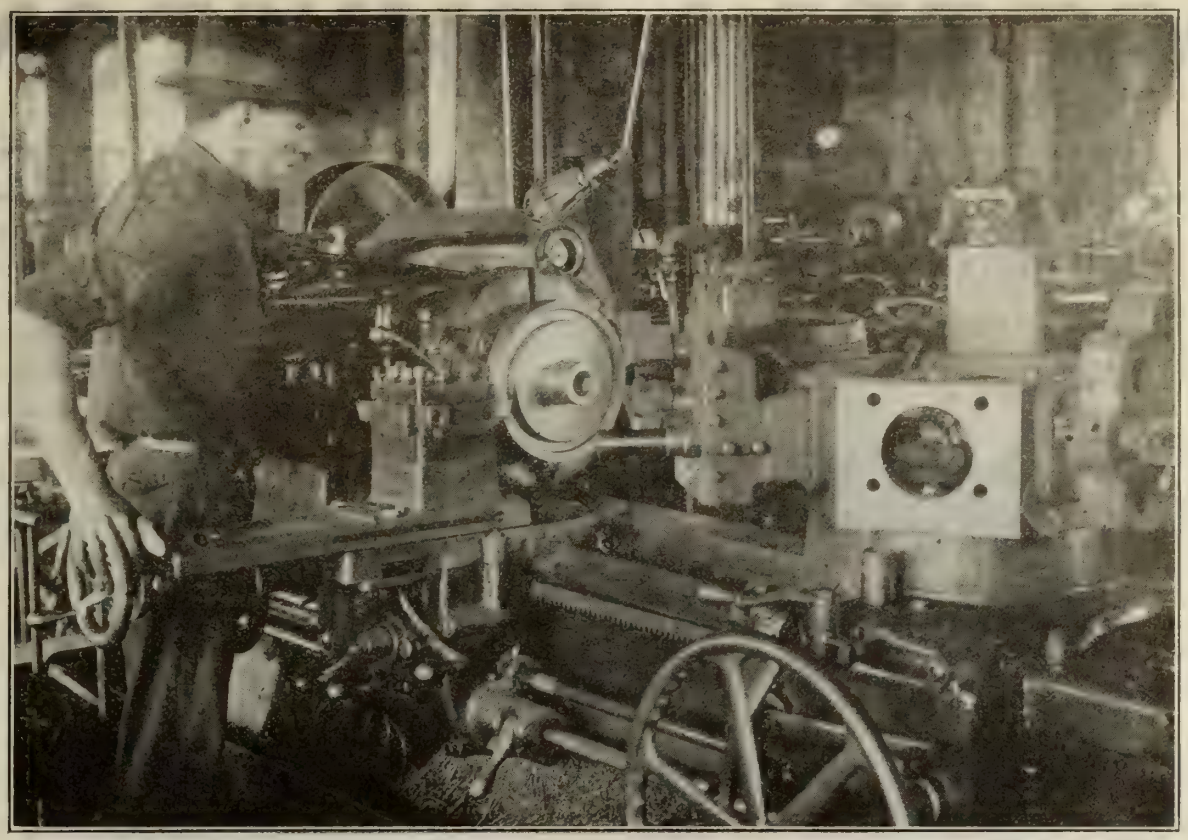

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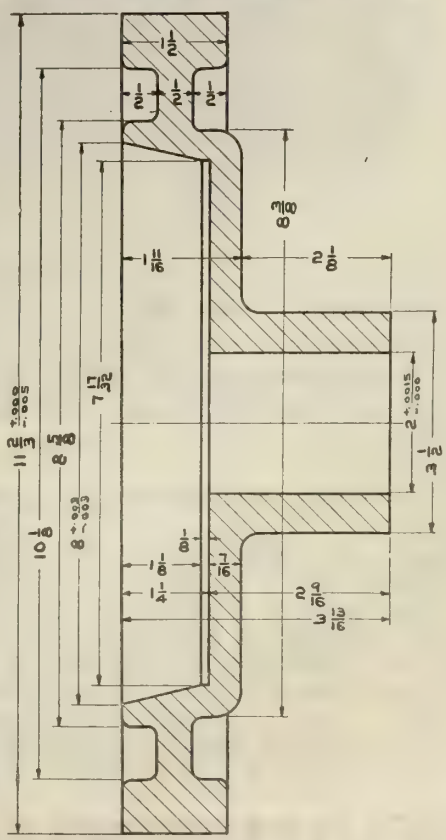

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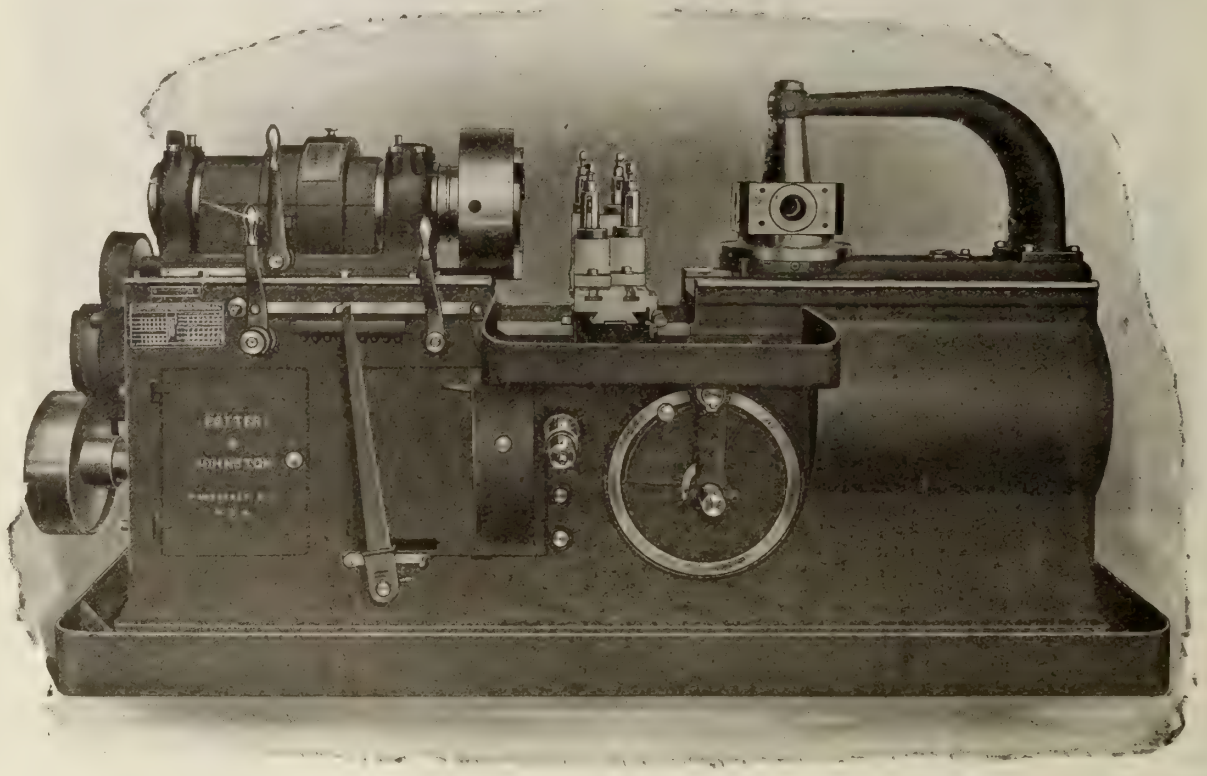

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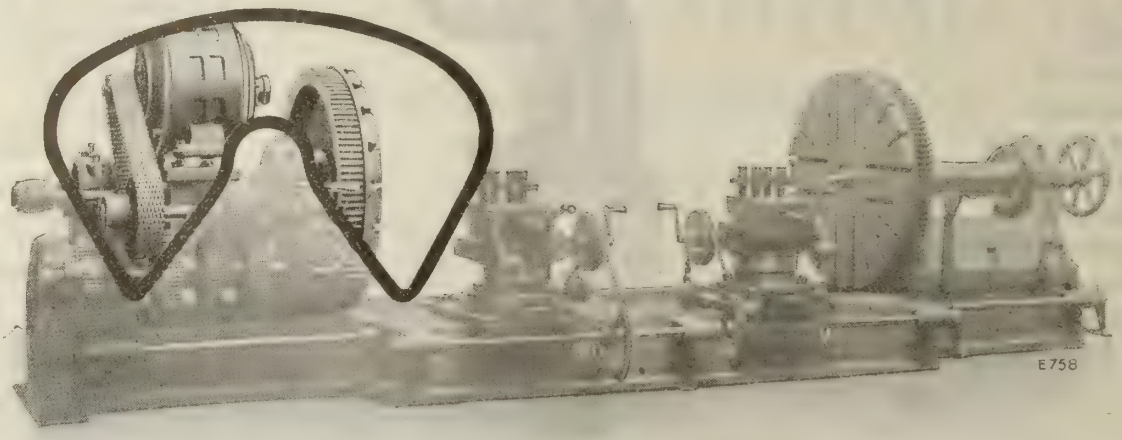

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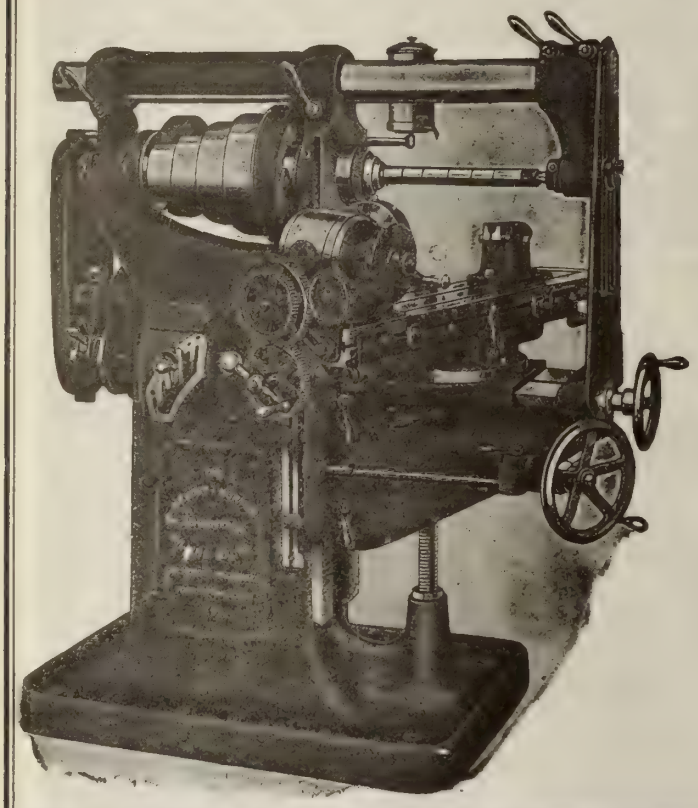

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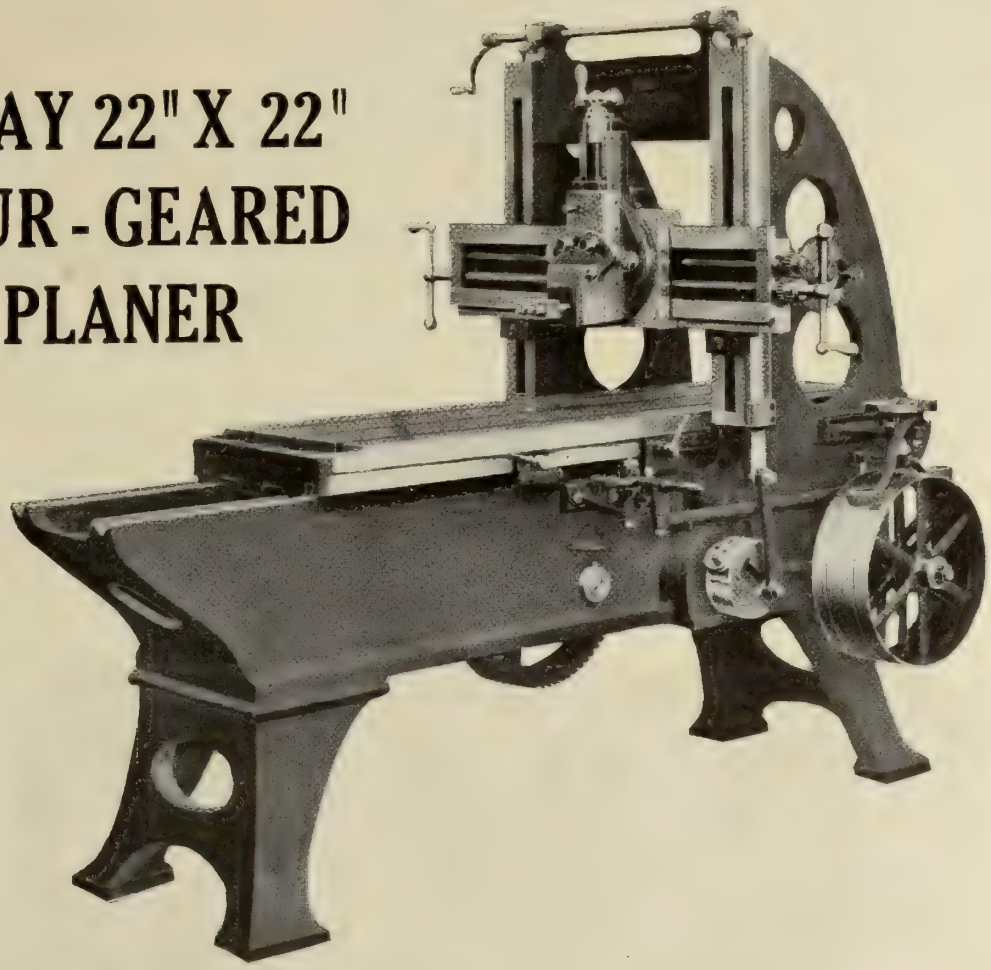

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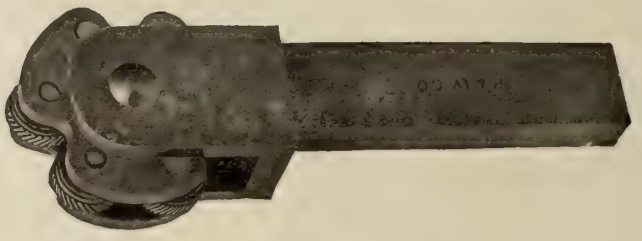

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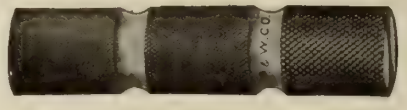
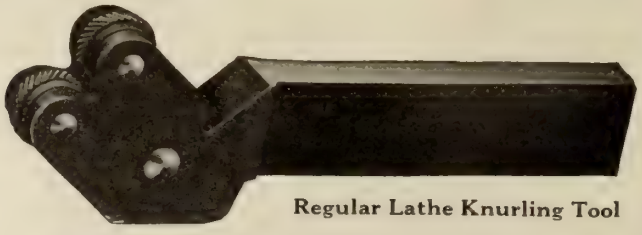
You will save time by using this three-in-one Lathe Knurling Tool.

It carries three pitches of knurls fine, medium and coarse, as shown in sample. This does away with necessity of having three holders or of changing knurls where but one holder is available. Same knurls can be used in this holder as are used in our regular Lathe Knurling Tool.



FINE MEDIUM COARSE



Regular Lathe Knurling Tool

PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your order there to-day.

Precision Machine Tools---Standards & Gauges

PRATT & WHITNEY CO.

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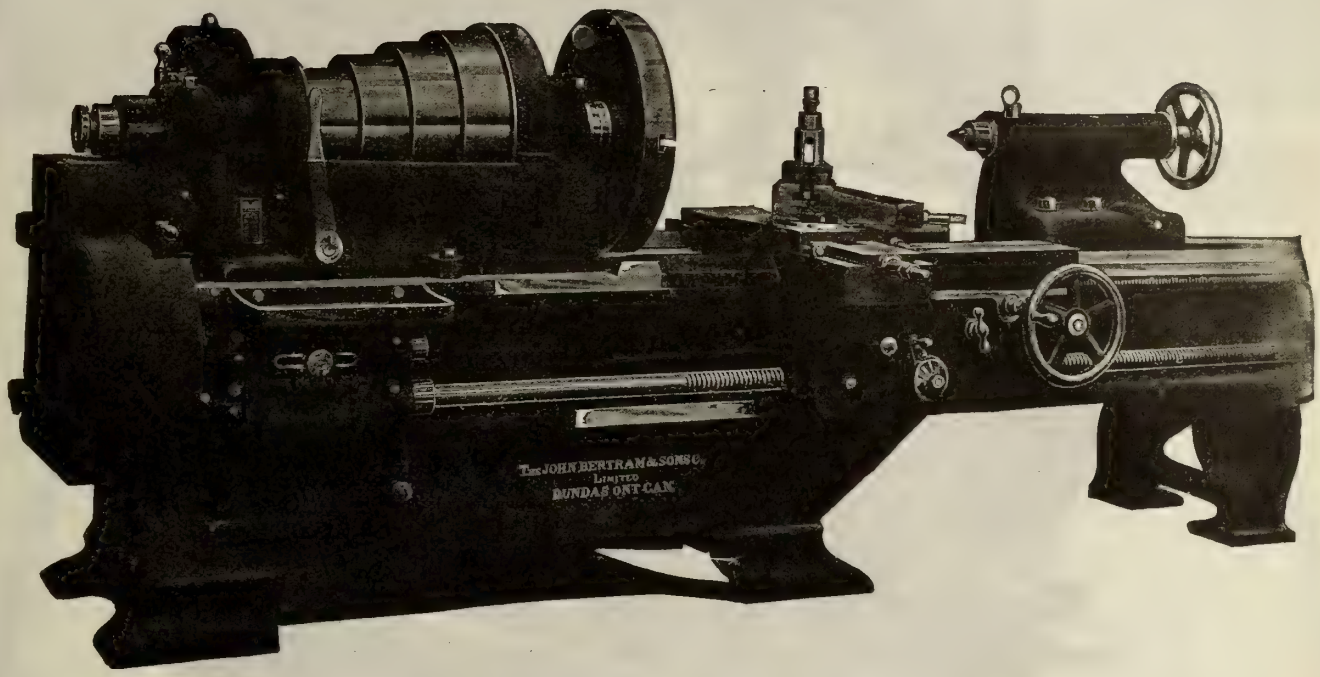
BERTRAM
MACHINE TOOLS



Double Back Geared Gap Lathe

26-inch x 42-inch Swing

Bertram Machine Tools are built for safety and service, and are backed by a concern with sixty years' experience and the largest of its kind in Canada.

The John Bertram & Sons Co., Limited

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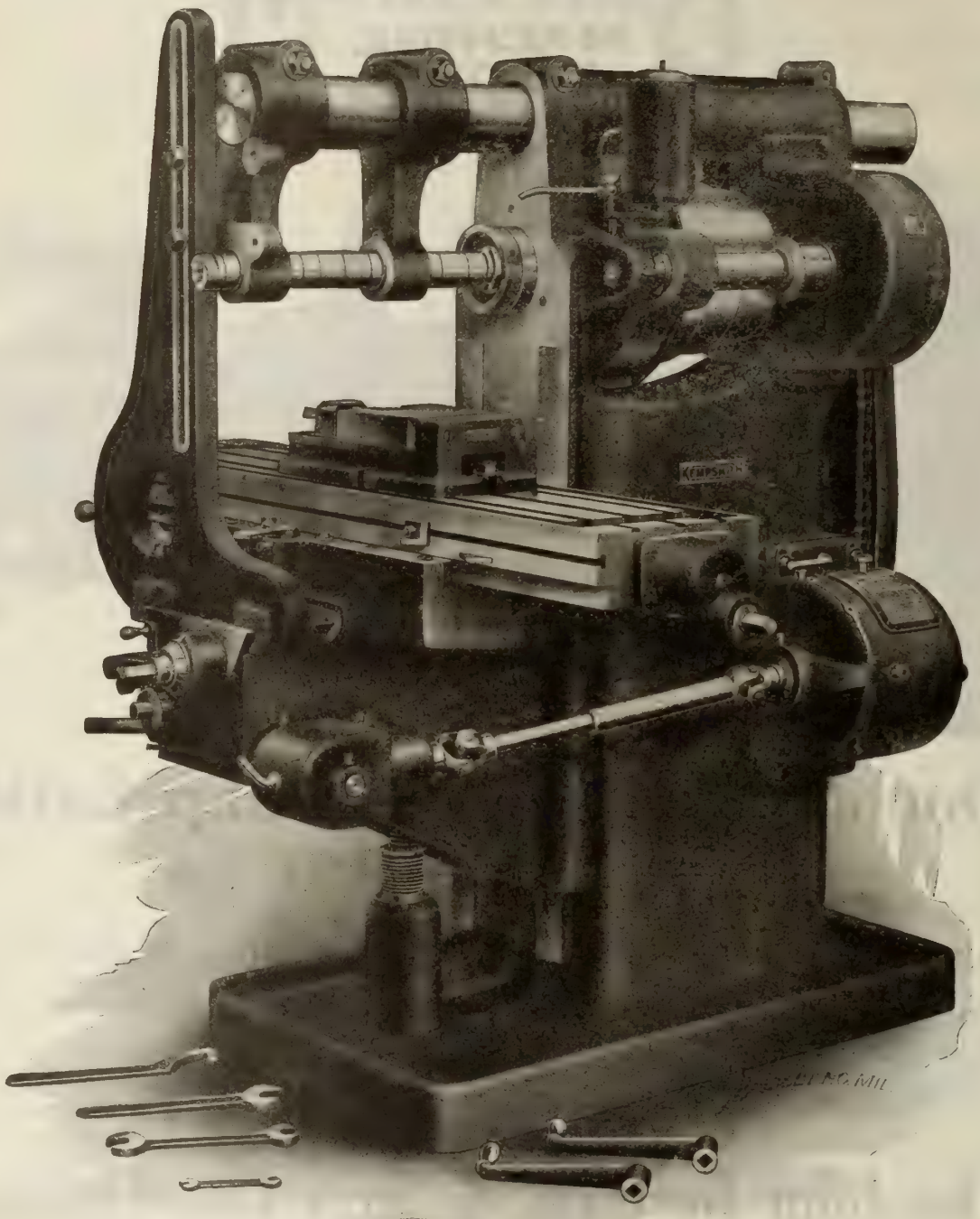
Canadian Machinery and Manufacturing News, July 10th, 1919. Vol. 22, No. 2. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3.00; United States, $3.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as Second-Class Matter July 1, 1912, at the Post Office at Buffalo, under the Act of March 3rd, 1879.

KEMPSMITH



KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared.

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Milled. Write for a copy to-day.

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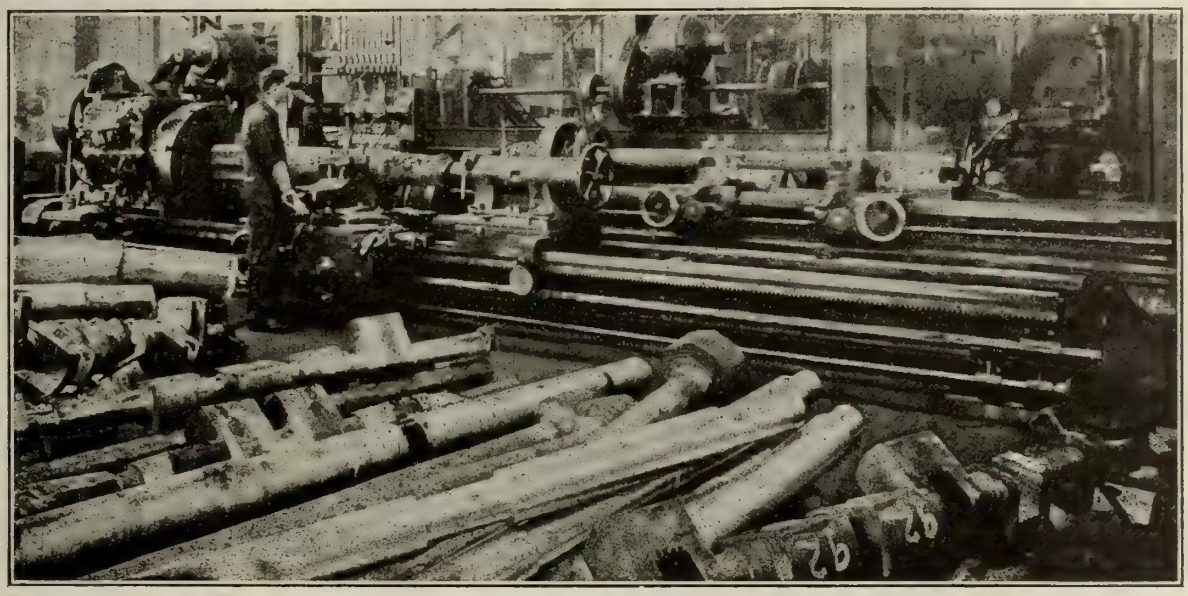
GENERAL VIEW OF THE PLANT OF THE ALGOMA STEEL CORPORATION FROM THE WATERFRONT

BRIDGEFORD

Heavy Duty Lathes



The above photograph shows a Bridgeford 27″ Manufacturing Lathe finish boring a cast-iron transmission housing for the new Fordson Tractor.

The diameter of housing is 19⅛″ and the limits of accuracy are .002″.

Maximum production is a requirement in the Ford plant and that is why a Bridgeford was selected to do the work. The Bridgeford turns out 80 pieces per day of 8 hours, which is excellent production.

There's a Bridgeford for every heavy duty lathe requirement. Bridgefords are in operation in all parts of the world on all kinds of duty. The line includes Heavy Geared Head Engine Lathes from 24″ to 72″ swing, Cone Driven Engine Lathes, Axle and Journal Truing Lathes and Manufacturing Lathes of 27″ and 30″ Swing.

Send for interesting data on Bridgeford Lathes.
We are in a position to make prompt deliveries.

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Manufacturers of Heavy Duty Lathes for more than 20 years.

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Less Overhead Expense

Whenever a strong, dependable hoist is needed, the "Imperial" air motor hoist fills the bill.

Few Parts Mean Less Trouble
The "Imperial" has few parts

The motor is completely balanced; the sensitive control allows the load to be raised or lowered a fraction of an inch at a time. Ball and roller bearings and thorough lubrication insure long wear.

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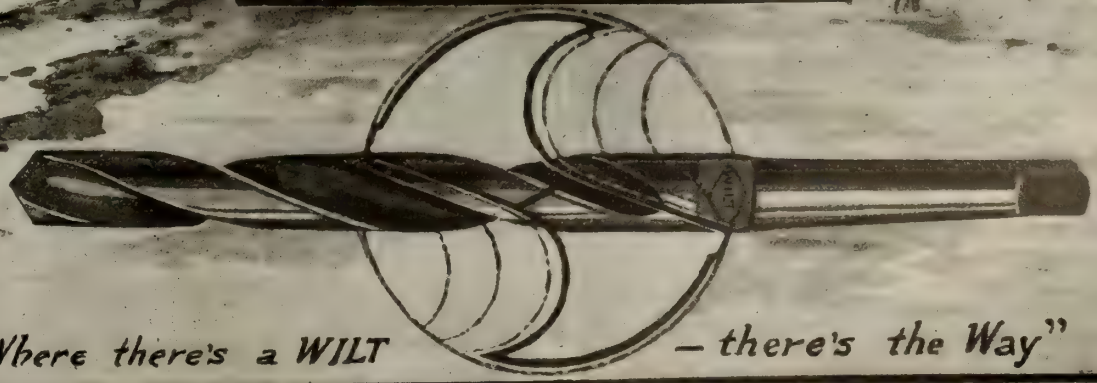
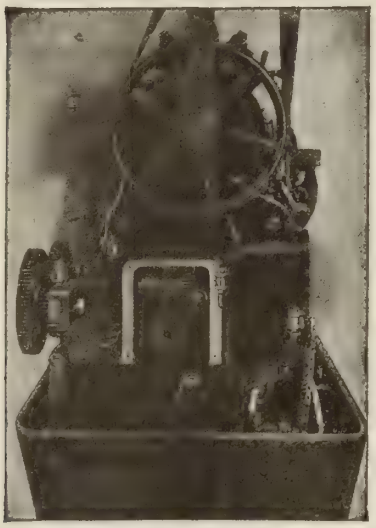


"Where there's a WILT — there's the Way"

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



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YOUR MACHINE

should be equipped with clutches that will give just such satisfaction.

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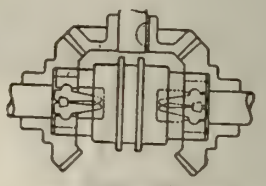

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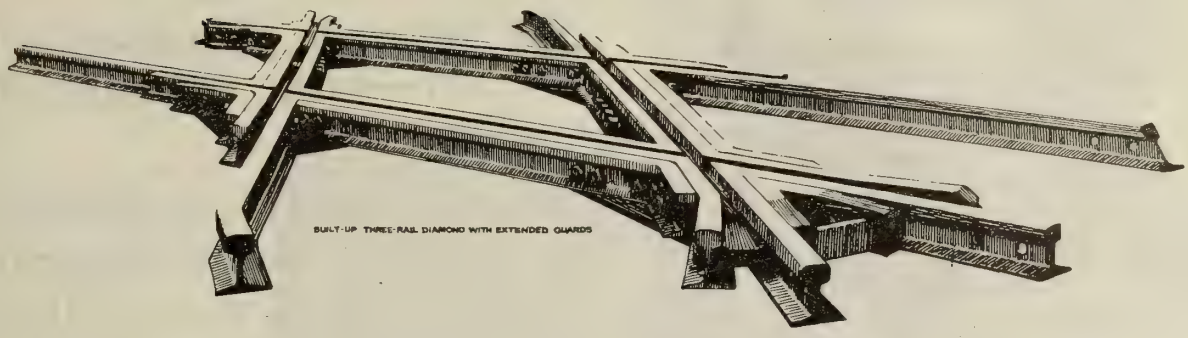

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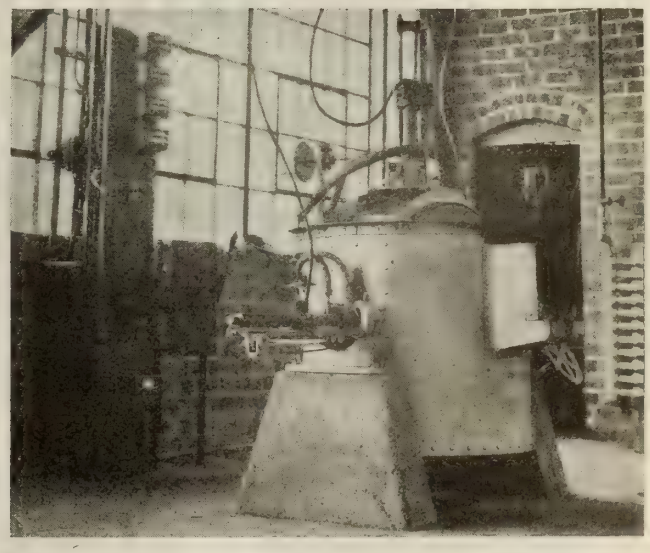

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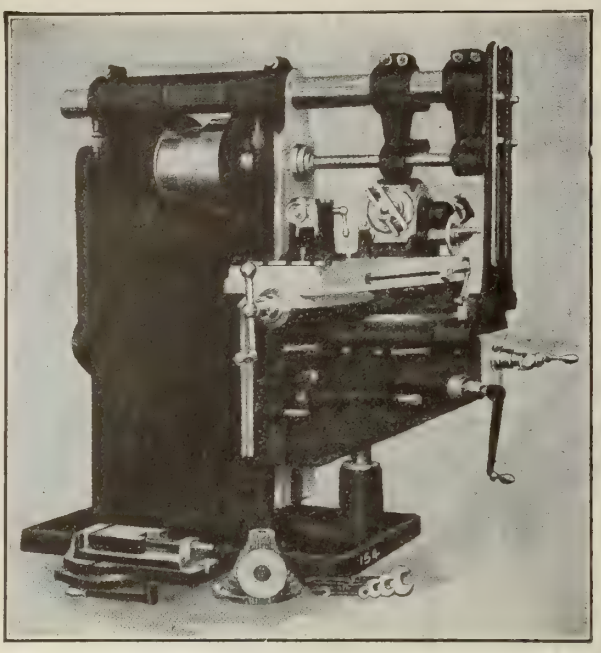

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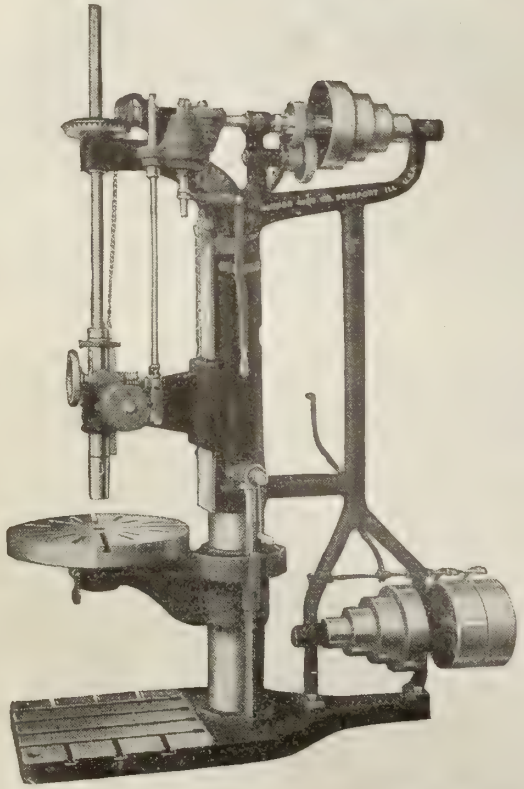

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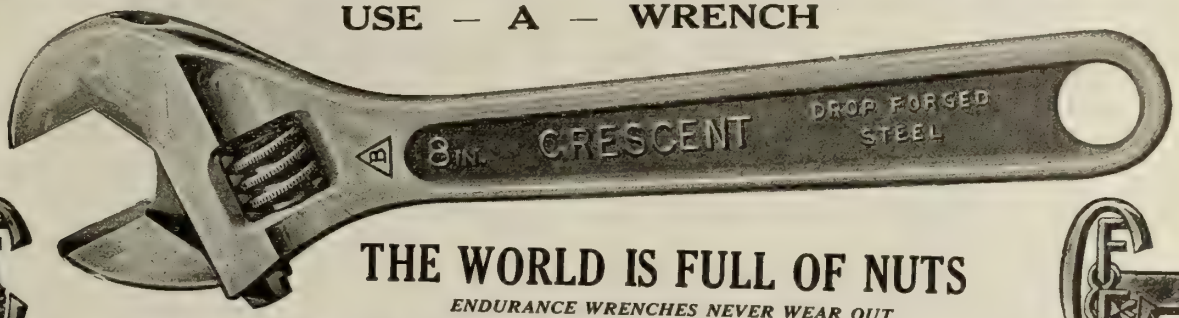

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ENDURANCE WRENCHES NEVER WEAR OUT
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Crucible
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"ARGO" BRAND *HIGH-SPEED* STEEL

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RALPH B. NORTON, AGENT
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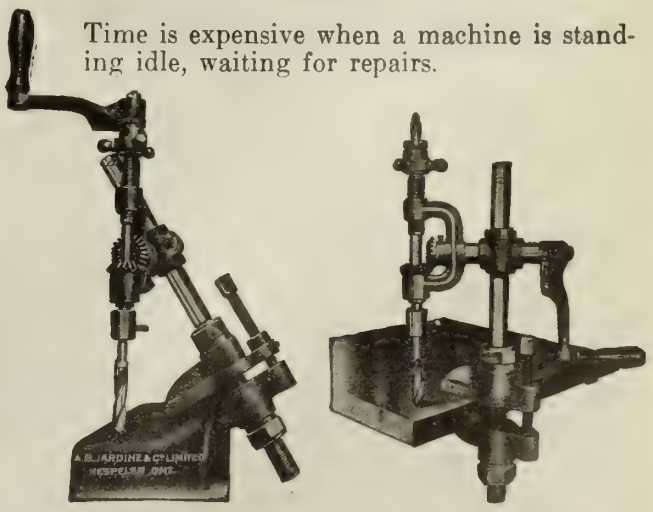
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.
Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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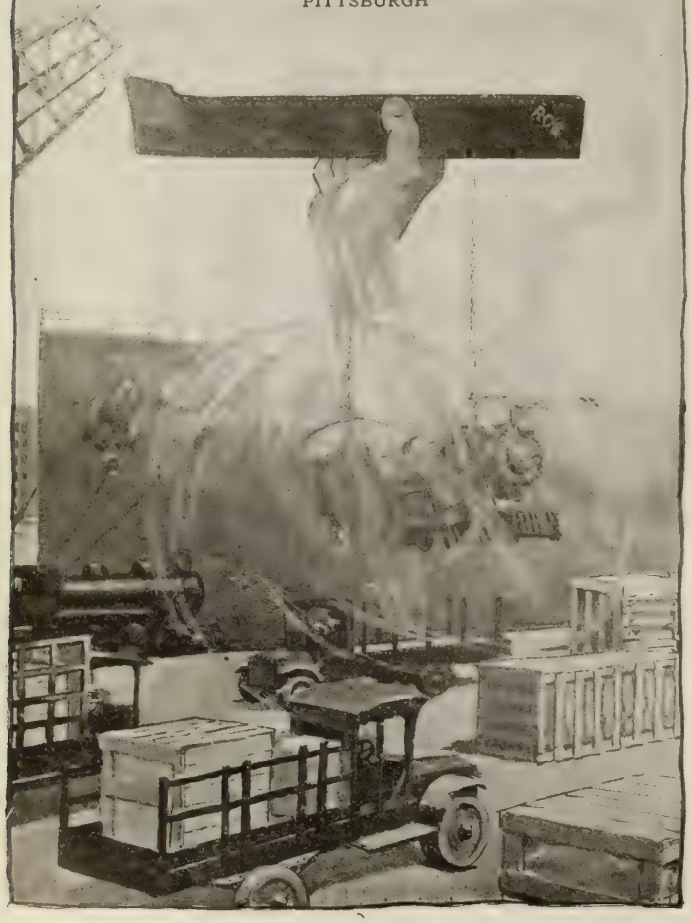

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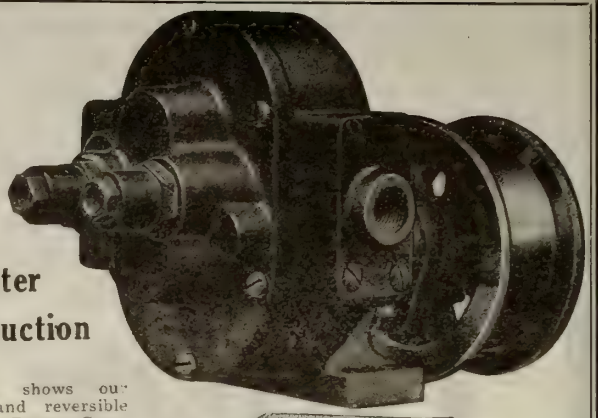

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The Trahern

There's little or no wear to a pump operated at slow speed. A Trahern Pump operated at slow speed will flood your cutting tools with coulant. With Trahern Positive Drive all the lubricant needed is discharged with sufficient force to reach the cutting point of the deepest buried tool. Advantages peculiar to Trahern Rotary Geared Pumps!

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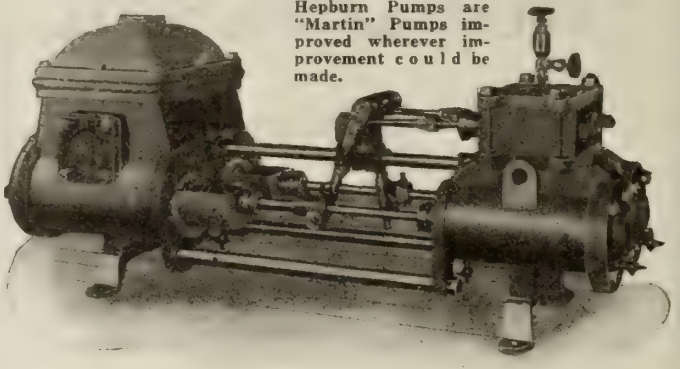
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.



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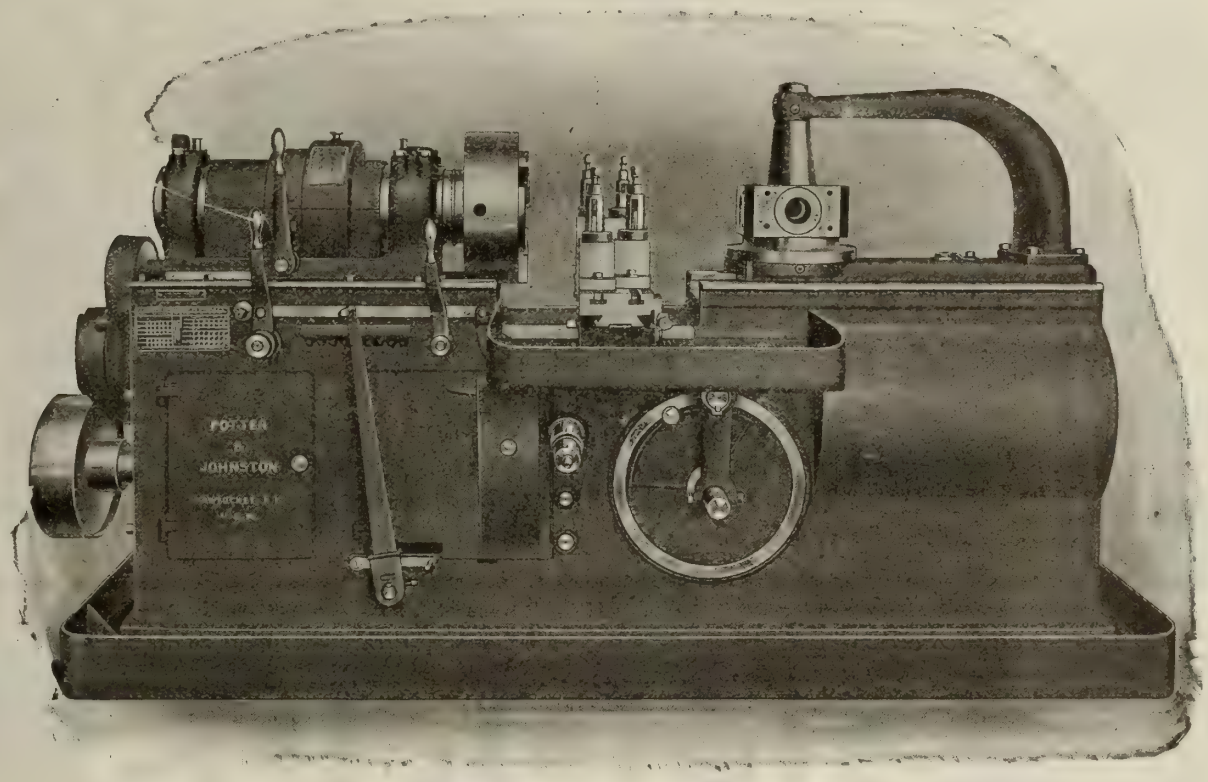

6-A Potter & Johnston Automatic Chucking and Turning Machine

6-A Potter & Johnston Automatic Chucking and Turning Machine

Geared head, having three automatic changes of spindle speeds.
Geared feed.
Auxiliary reaming and threading feed.
Cross slide.
Automatic back facer bar through spindle.
16-inch convertible two and three-jaw scroll chuck.
Spindle 5¾ inches diameter, hole 3½ inches diameter.

DO IT AUTOMATICALLY

All operations are entirely automatic. One attendant can readily run a battery of two to six machines.

In addition to automatically machining all varieties of castings from iron, bronze or steel, also forgings, the machines are also recommended and are widely used for finishing pieces from bar starch which have previously been cut off to length. This is a highly economical method of producing gear blanks, bushings, studs, etc.

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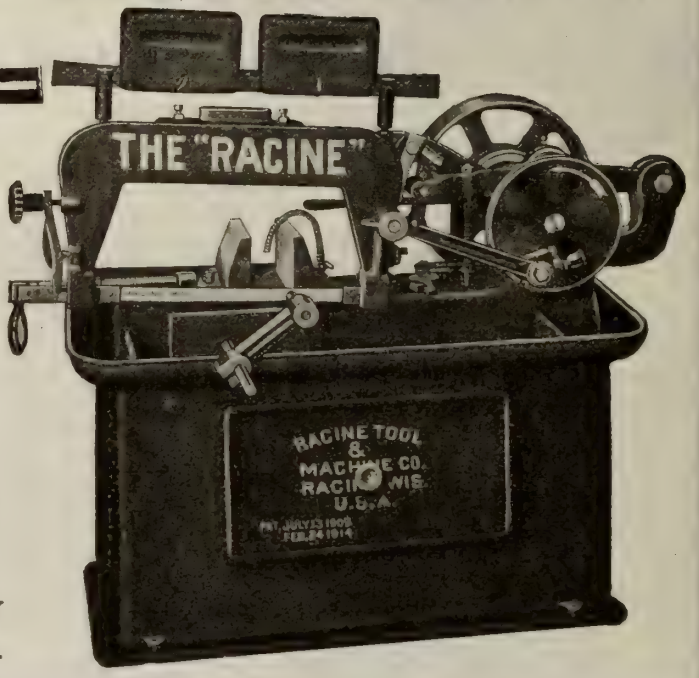
This is the only machine in the World that has an ABSOLUTELY POSITIVE AUTOMATIC LIFTING DEVICE, a feature secured by patents. Another feature is the rigid saw frame guide. These two assets combine to give long life to the cutting blades and save a lot of money.



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Use "RACINE" H.S. Tungsten-Power Blades.

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UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited

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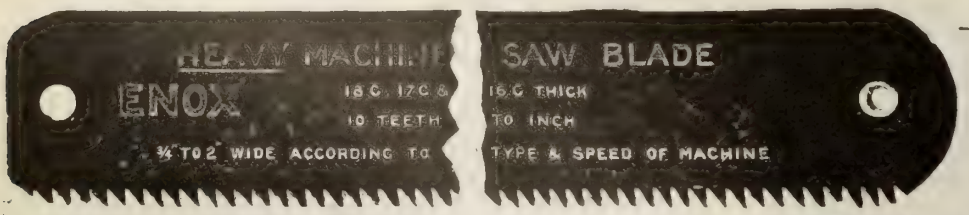
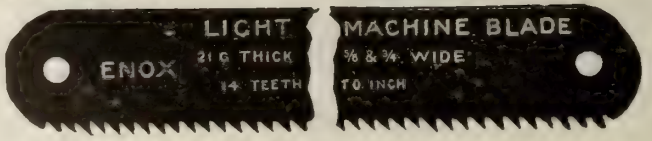


ENOX

Hacksaw Blades

ARE THE BEST



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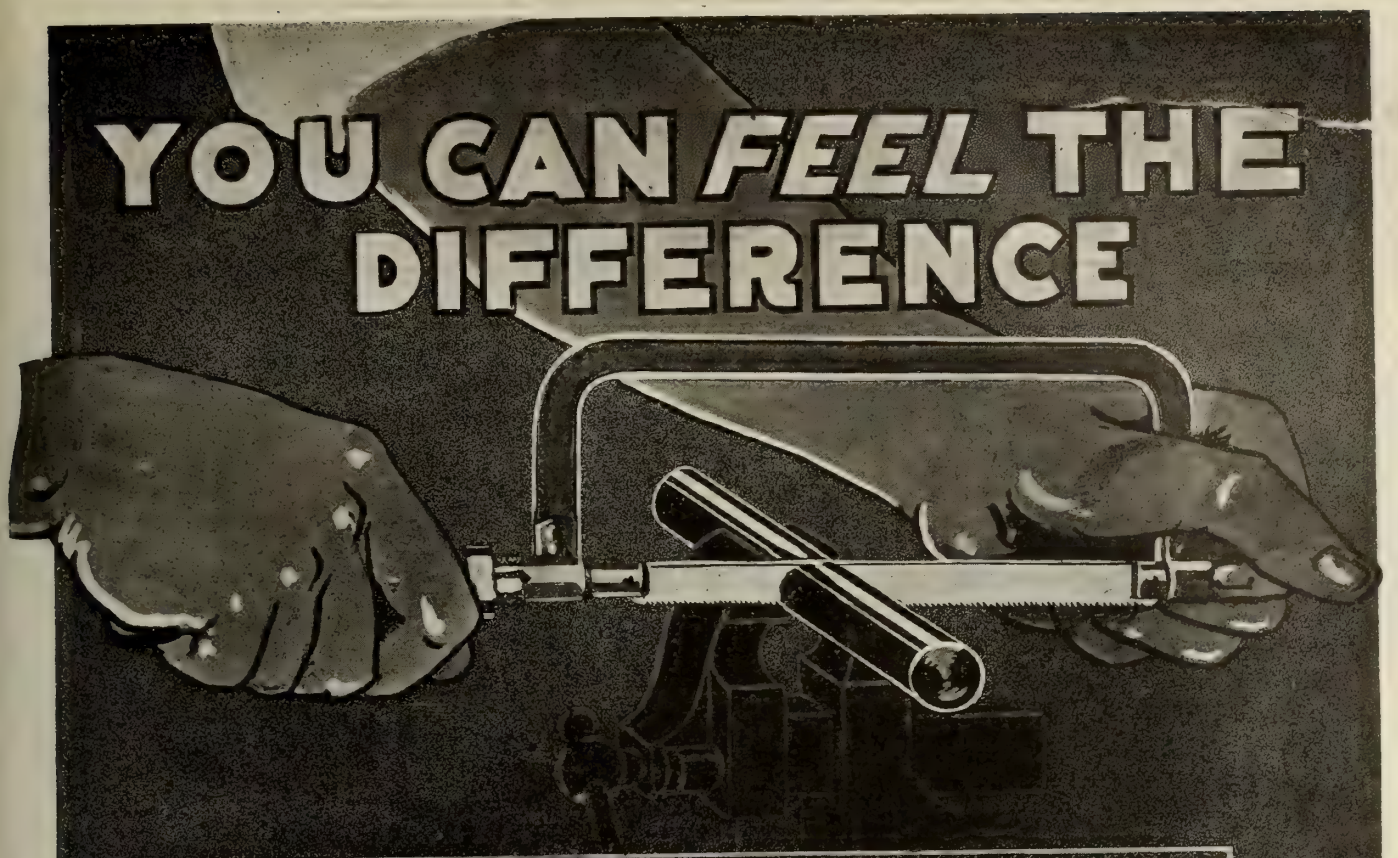

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Cut with less effort. That's the point that appeals to the machinist. In hand-sawing he feels the difference in his arm. On a power saw the economy of the Starrett blades shows in the increased number of cuts per hour and cents per blade.

The combination of the Starrett Hack Saw Chart MA and Starrett Hack Saw Blades will reduce the cutting costs in any shop.

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"WACO"

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"Double Waco" Quality—for Quick Production Work.

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"BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

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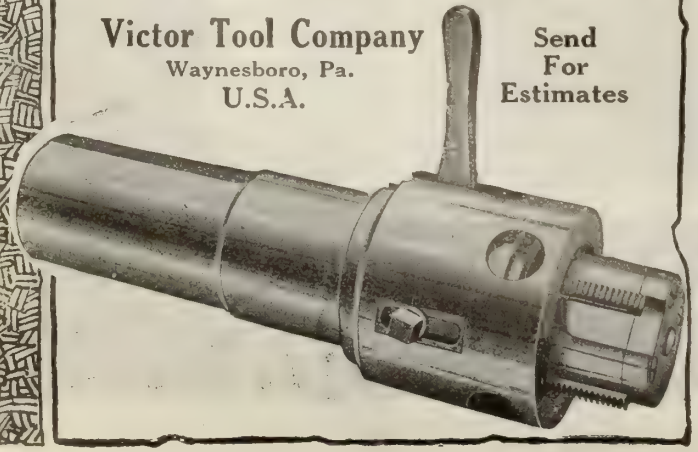

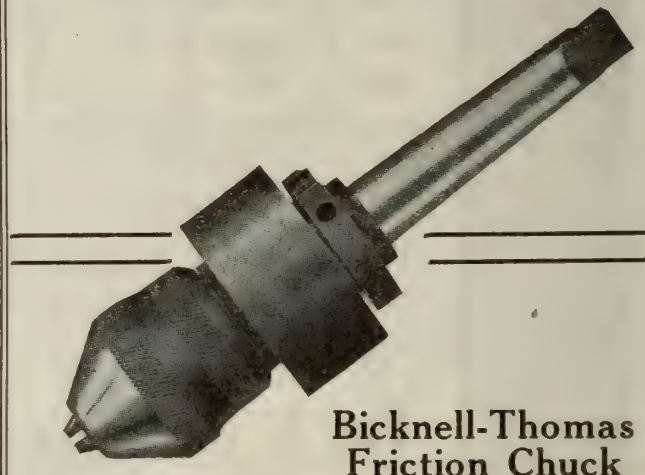

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not only prevents tap breakage but saves loss due to damaged parts and removing taps. It is the simplest Tapping Chuck made; it is the most efficient and fits any kind of machine. It can be used on multiple spindle drills or tapping machines, even when they are close together.

Try one out on us. Write to-day for illustrated Circular, describing same fully.

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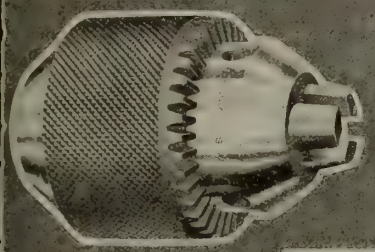

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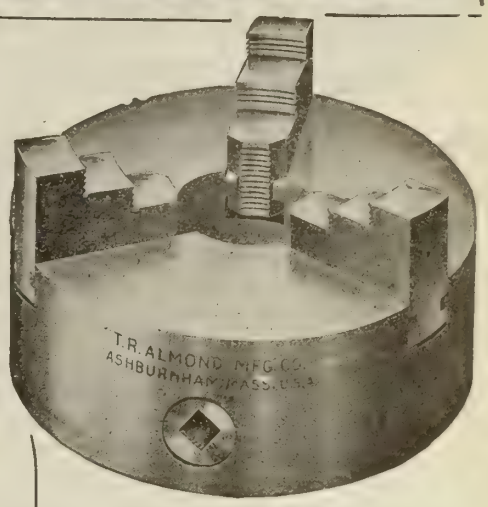
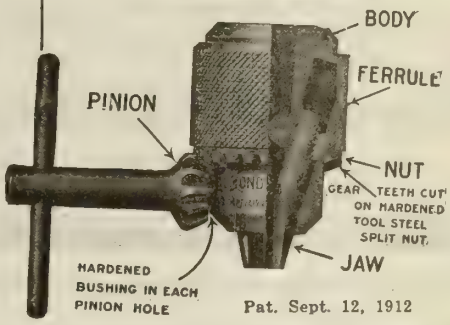
Give them a try out. Universal Geared Scroll Chuck—Sizes 5″, 6″, 7½″, 9″ and 12″.



Geared Nut Drill Chucks, in various capacities, 0″ to 1″.



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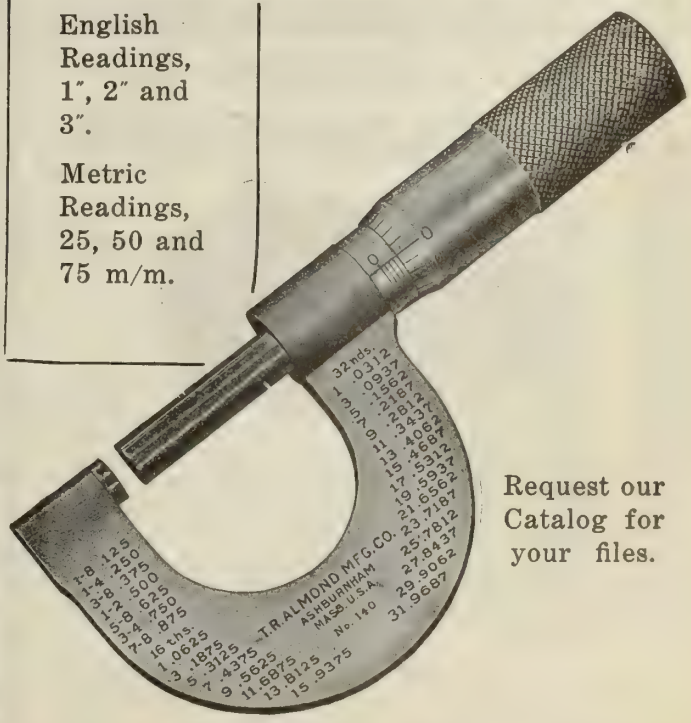

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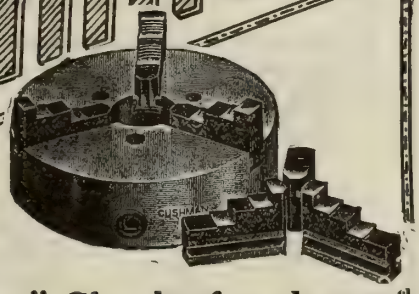

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The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

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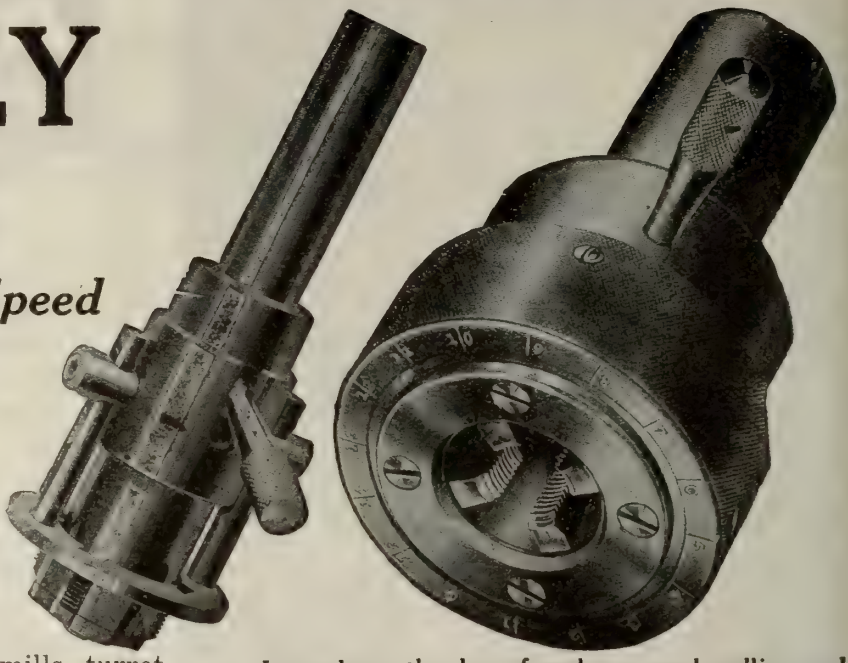
MURCHEY

COLLAPSING TAPS and SELF-OPENING DIES

Promote Accuracy and Speed



MURCHEY Collapsing Taps and Self-Opening Dies are cleared free from the thread instantly, preventing all danger of stripping, besides cutting time for production in half. **Thus you are sure of greater accuracy and greater production.** Murchey Tools are speeding production in all parts of the country on tapping machines, drill presses, monitor machines, boring mills, turret lathes, and all other machines to which taps or dies may be attached.

Let us know the class of work you are handling and we will show you how to increase your production 50 per cent. without running up the cost.

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THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
FENWICK FRERES & CO., 15 Rue Fenelon, Paris, France.

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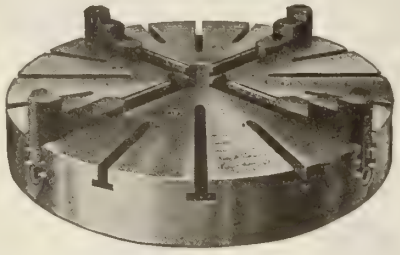
Show preference for the
UNION INDEPENDENT CHUCK



It has an iron body, and is made heavy and strong. The double bearing ribs for the jaws make a stiffer chuck for heavy work than the ordinary single rib type.

The screws are also of the "socket" type and operate in hardened steel thrusts, which also add to the strength and stiffness of a chuck that is designed for **heavy duty.**

The jaws are wide and the screws are correspondingly large.

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Makers of a Complete Line of Chucks

H & G

Die Head Cuts
Perfect Threads

The H. & G. Die Head illustrated is only 3⅝" outside diameter, yet it will cut from the smallest up to 1" standard thread and up to 1⅛" fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or aeroplane plant for certainty.

Made in 9/16", 1", 1½" and 2" sizes.

No stronger, more durable, more accurate Die Head was ever made.

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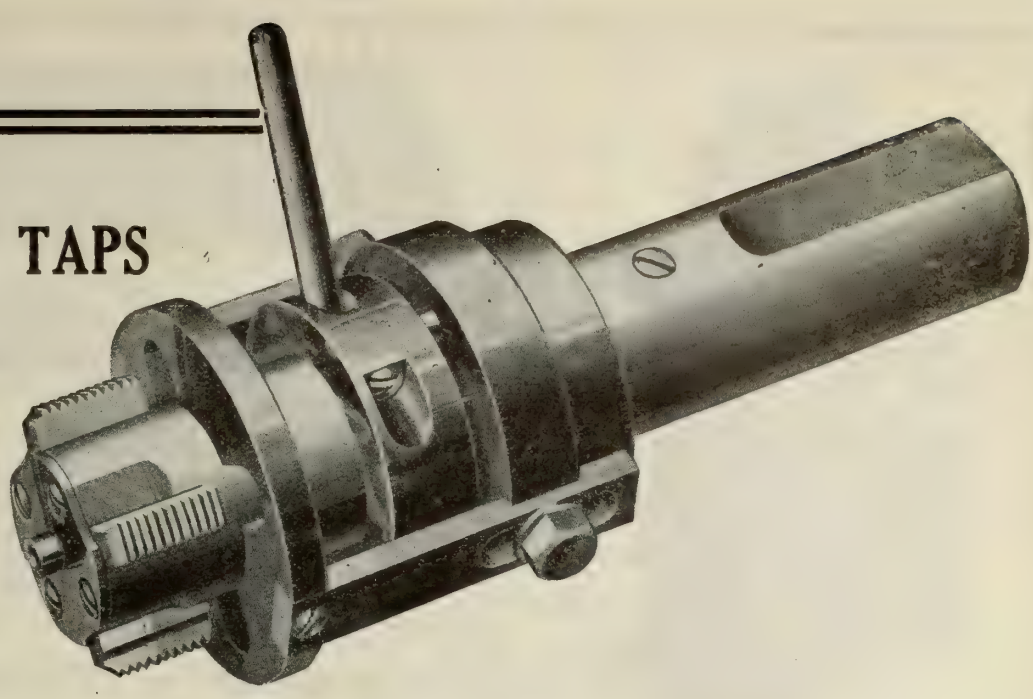
NAMCO COLLAPSING TAPS

AUTOMATIC

The simplicity of action and positive releasing of chasers from the finished threads are only part of the reasons for the continued successful use of NAMCO TAPS.

May we show you how they can meet **your** requirements?



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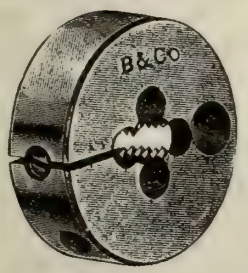

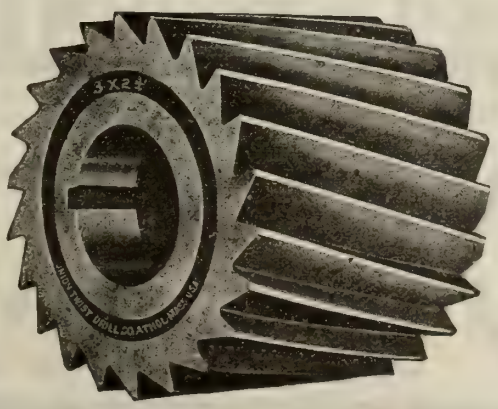

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Butterfield quality gives the Maximum returns on your investment.

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It ensures **clean and accurate cuts** and will duplicate the work over a long period of use.

Butterfield Quality is the result of 35 years' continuous effort to keep our product distinctly in the lead from the standpoint of efficiency and economy.

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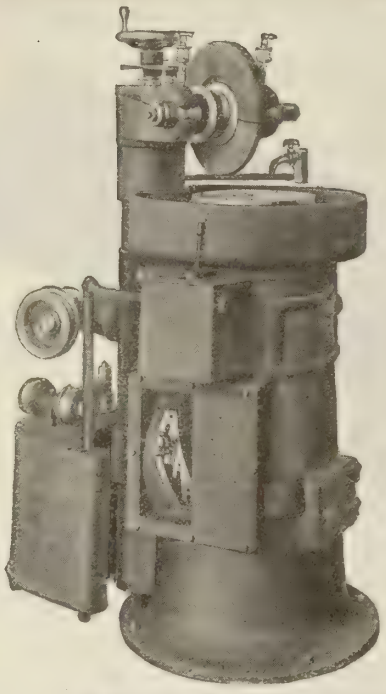

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Bristol 12-inch Rotary Precision Surface Grinder

Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

Bristol Rotary Surface Grinders are made in several types and sizes and are regularly equipped with 8-in., 12-in., and 16-in. magnetic chucks, either belt or motor driven and for dry or wet grinding.

Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

Grinds within .0004 in. of absolute Accuracy

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SUCCESSORS TO G. G. GARRIGUS MACH. CO.
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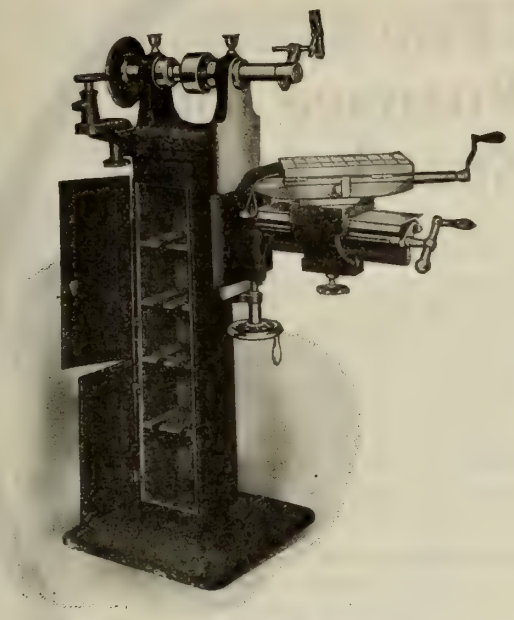

GARVIN No. 3, Universal Cutter and Surface Grinder
Use Code—Banish

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL
CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14″ x 6″; SURFACES, 9½″ x 6″

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Our illustrated bulletin will interest you, giving detailed information.

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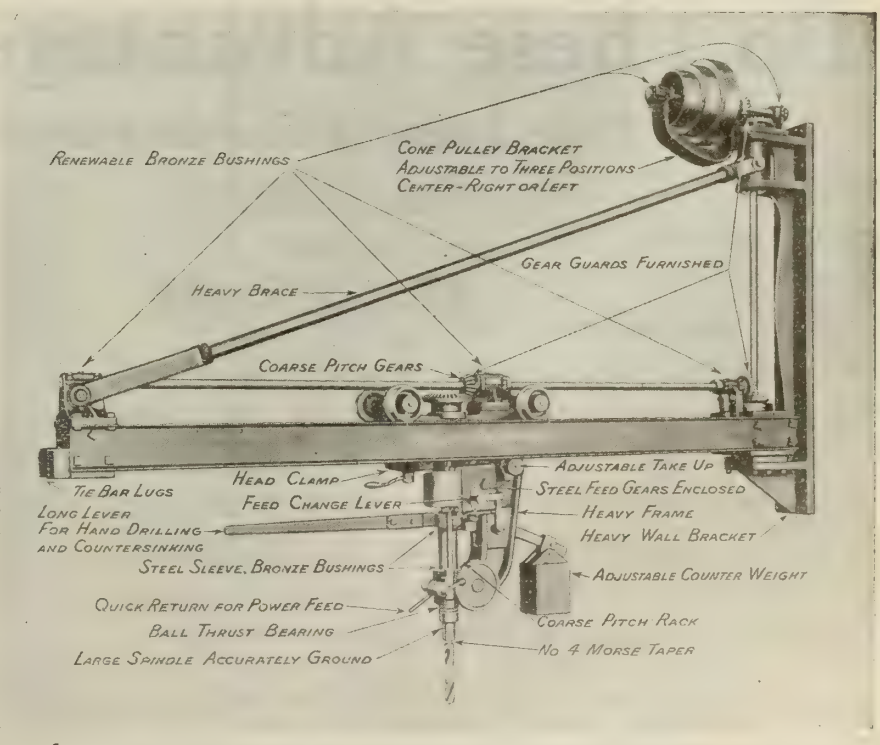
Rated size	Drills to center of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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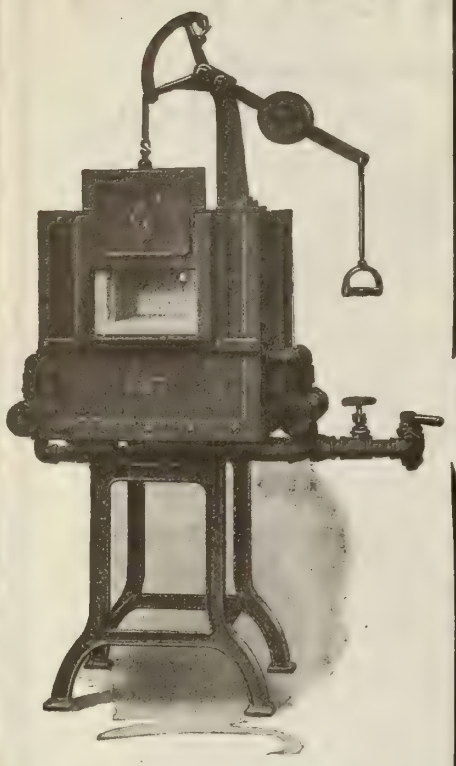

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The Right Furnace for High Speed Steel

Too much—too little or an uneven heat treatment of High Speed Steel renders it practically worthless for the purpose intended.

This Gilbert & Barker furnace has been designed especially for the correct heat treatment of High Speed Steel. A temperature of 2400°F. is quickly obtained and **easily maintained.** The heat is uniform on all sides of the work and loss by radiation is reduced to the minimum by special insulation.

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PROMPT DELIVERY ON G. & B. FURNACES

Recent additions to our plant, already one of the largest in this field, makes it possible to offer immediate shipment of your order.

Tell us your problem and we will tell you the type of furnace you require, but first send for Bulletin 24. To-day is a better day than to-morrow--write.

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It's economy — requires one-half the space; costs less than half; no chimneys or flues required; instantaneous and perfect control of temperature; higher temperature obtained; no coal ash handlers required; no coal or ash piles; less waste of fuel, because it is shut off instantly; requires much less time to get the required heat. *Can you afford to lose the Advantages of this oil Furnace?*

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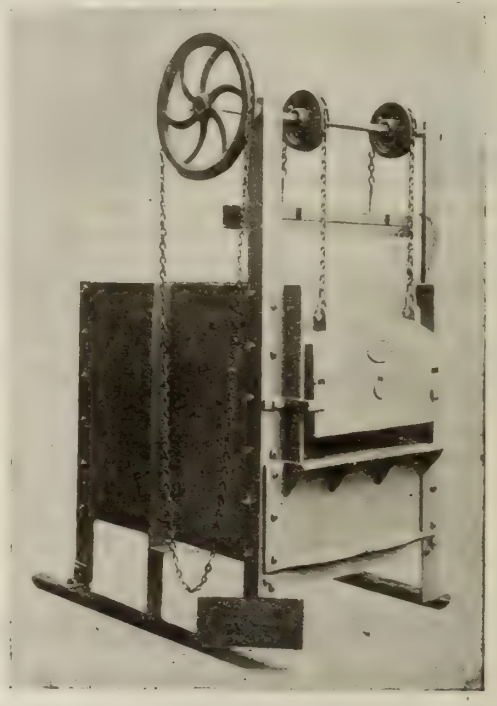

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It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into forge shop.

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Introducing

Williams' "Agrippa" Turning-Tool Holders Set Screw Pattern

To provide increased and abundant variety of selection in Williams' "Agrippa" line of Tool Holders, we offer this Set Screw pattern of Turning-tools primarily for those who use Cutters made of steel which has been hammered or rolled with a greater variation in size than is common to usual mill practice. But for the majority of users who purchase Cutters of accurate size, we recommend the original "Agrippa" Turning-tool of Cam Pattern as being stronger, more reliable and more generally satisfactory than any other method of Cutter-fastening. Both patterns are illustrated above.

The Screws, made of a fine grade of Alloy Steel, are accurately machined and carefully heat-treated and hardened. They are unusually tough and strong and give the maximum efficiency obtainable from this type of Cutter-fastening.

Right and Left Hand Offset and Straight Shanks in stock at same prices as Cam Pattern of corresponding size.

May we send you a copy of our Machinists' Tools Booklet.

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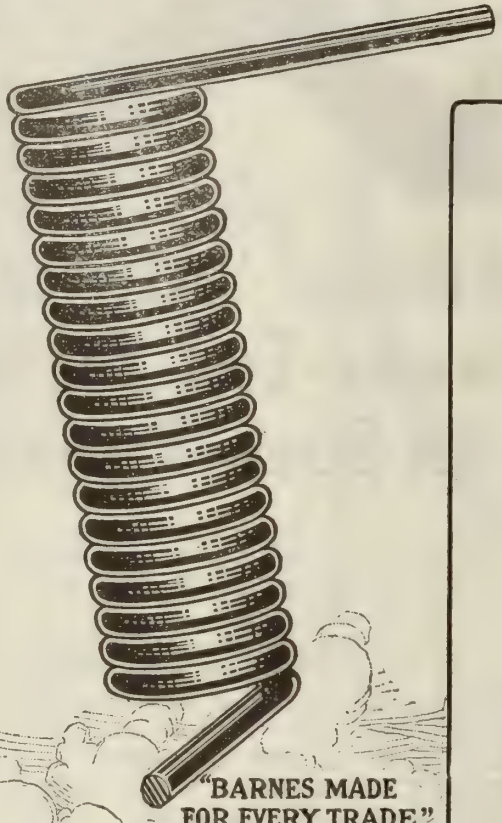
Agents for Manitoba, Alberta, British Columbia and Saskatchewan

The Wallace Barnes Company



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The "Gun" Tap maintains its size and lead in any material.

The Acorn Die

The Acorn Die is capable of a minute adjustment, holds its lead with accuracy, is absolutely rigid while cutting and will outwear a number of ordinary dies.

Nicely illustrated booklets describing the "Gun" Tap and the Acorn Die will be sent on request. Also new No. 40 Small Tools Catalog.

Wells Brothers Company of Canada Limited
GALT, CANADA
Canadian factory of the
Greenfield Tap and Die Corporation

98

Notes On Grinding
NORTON COMPANY, WORCESTER, MASS.

No. 60A

Cam Grinding

What causes Cams to show softness after grinding

A frequent difficulty met with in cam grinding is a sequel to the effect produced in the use of too hard a wheel, which causes the face of the cam to crack or check. The difficulty is known to the operator as the softening of the cam and is usually charged by him to some defect or error in the machine attachment or method, whereas as a matter of fact in almost every case it is due to carelessness in regulating the work speeds, the depth of cut or the grade of the wheel used.

By the best known methods of testing hardness, either by the Brinell meter or the scleroscope, when the proper speeds and grades of wheels have been used there is no effect of softening that can be detected by such tests. This matter comes back to the same old difficulties in cam grinding, namely, that it is usually the common practice in finishing cams to use too hard a wheel, which in order to act properly causes the operator to take too deep a cut, which generates so much heat that the compound does not dissipate it fast enough and the temper in the cam is drawn slightly, or in the other case when the other defect is noticed the cheeks of the cams are checked or cracked. But when light cuts are taken and soft wheels used these errors are entirely removed.

There is a knack in grinding cams which requires greater skill on the part of the operator than in most grinding operations. It is largely due to the fact that the cam is of an irregular shape and the action of the wheel at different points on the periphery of the cam varies, so that the operator has to use a great deal of care in adjusting other conditions, such as the speed of work, depth of cut, and flow of water to bring about the desired results.

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B. Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

ELECTRIC FURNACE PLANTS
NIAGARA FALLS, N. Y. CHIPPAWA, ONT.

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FOR TRUEING GRINDING WHEELS
QUALITY SERVICE SATISFACTION
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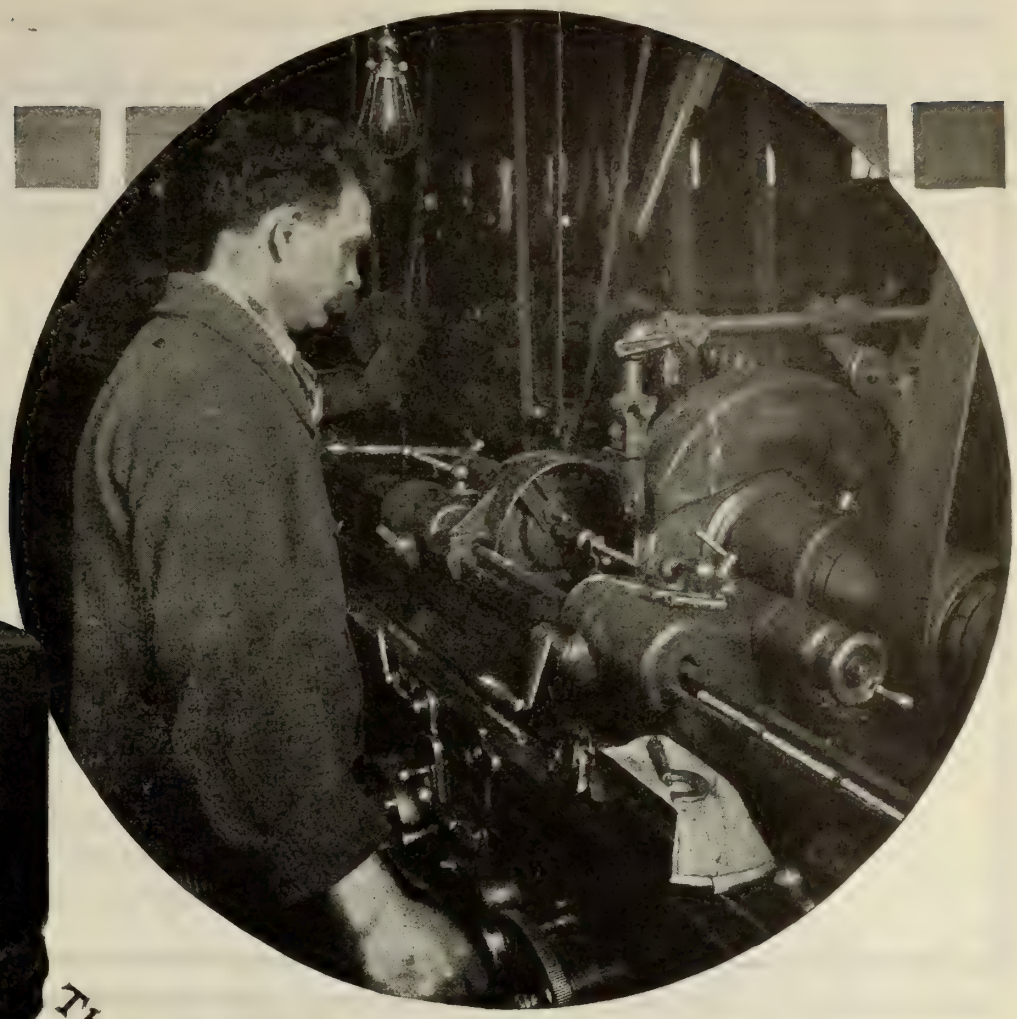

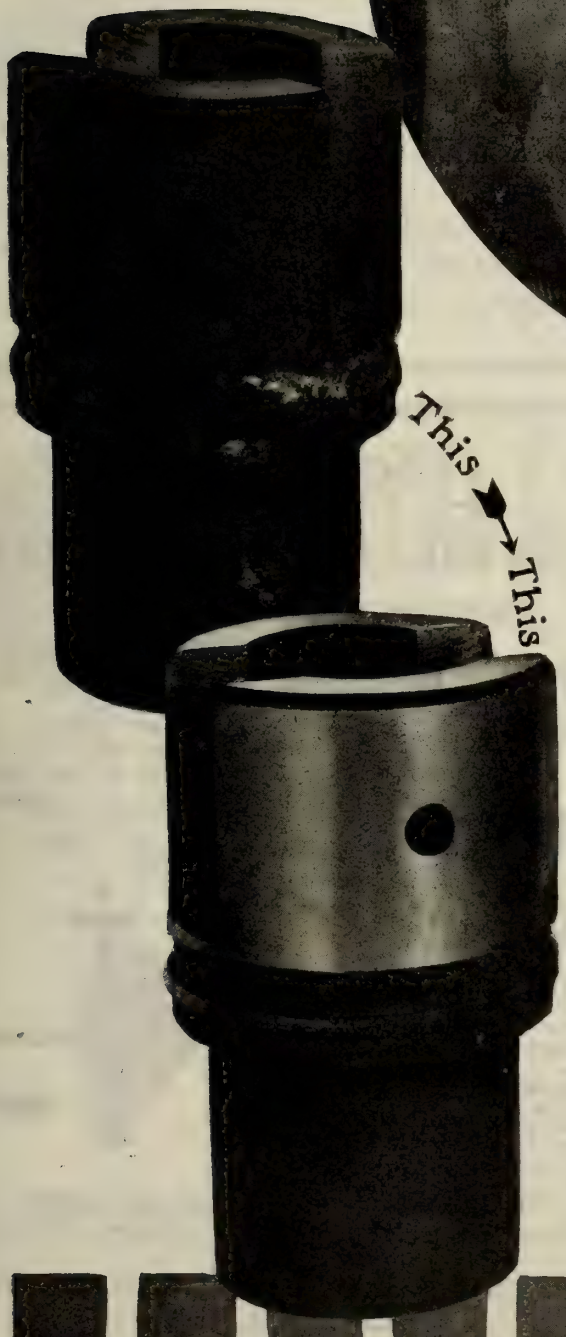

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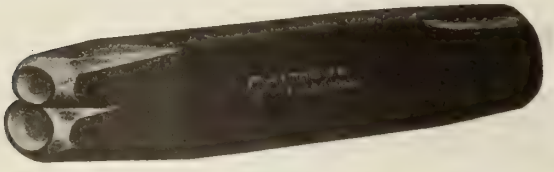

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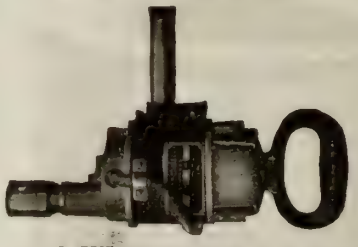

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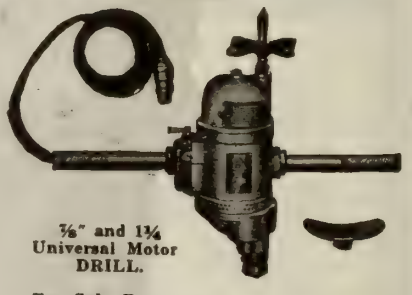

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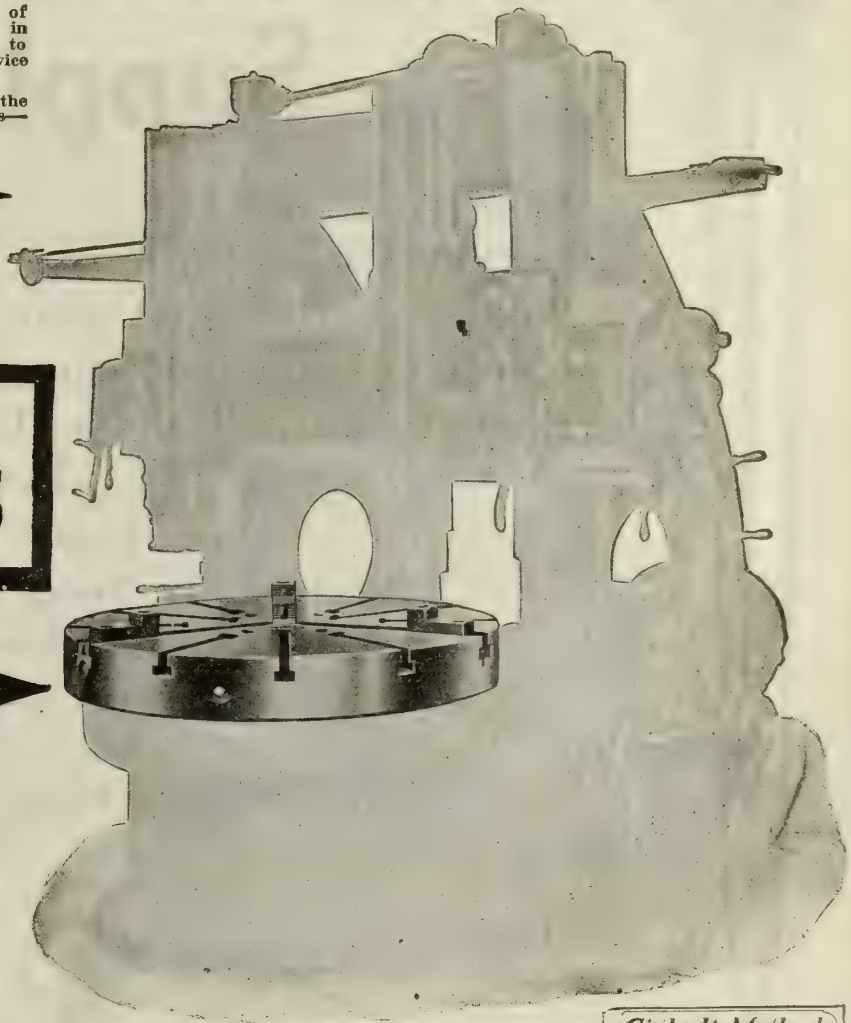

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MANUFACTURING NEWS

Volume XXII. No. 2. Toronto, July 10, 1919

Pneumatic Scraper for Fine Machine Work

No More Tedious Hand Scraping if We Use Such a Scheme as the One Spoken of in This Article—We Hear the Man in the Shop Exclaim, "It's Too Good to Be True."

By J. H. MOORE

IT is a well-known fact that one of the most responsible and delicate operations of the machinist, requiring both skill and perseverance, is that of scraping metal surfaces, usually cast iron, where minute accuracy is required. Under this head naturally we think of valves, valve seats, slides of lathes, planers, etc.

Such operations are usually entrusted to only the best of workmen, and at present in the majority of shops, this is considered a hand operation.

What may tend to change this style of scraping is an air-driven tool which the Anderson Brothers Manufacturing Co., Rockford, Ill., are now building, and which is illustrated by various photos throughout this article.

Such a fixture or tool should prove a valuable acquisition to any machine shop equipment.

The scraping tool in actual use is first shown at Fig. 1. This is carried at the end of a long arm, and the air cylinder and operating parts are located at the opposite end of this arm. To facilitate the manipulation of the tool, this air cylinder and its auxiliary mechanism are carried by a trolley which may easily be run back and forth on the supporting rail in order to enable the scraping tool to reach exactly the desired position on large pieces of work. The operator holds the scraping tool firmly down on to the work with the left hand, and the right hand is used to manipulate a knurled sleeve which actuates a valve in the air cylinder. When this knurled sleeve is pushed forward it allows the air to enter the cylinder and forces the scraping tool forward.

FIG. 1—THE SCRAPING TOOL IN ACTUAL USE.

FIG. 3—VIEW SHOWING TURNTABLE.

As the only effort required of the operator is to hold the tool down to the work, he is relieved of the additional effort of pushing the tool forward, and as a consequence is not so tired at the close of the day as he otherwise would be were the job a hand process.

Fig. 2 illustrates two types of stands, first the stationary type of base, and secondly the portable base, which of course is more often used where one scraping tool is used at various parts of the plant. Fig. 4 later on in the article shows this portable stand in use.

Fig. 3 illustrates a turntable, on which the work can be placed, and by pressing on treadle you can turn the work to whatever position you desire.

We see the actual work being performed at Fig. 4, and the convenience

FIG. 2—THE TWO TYPE OF BASES.

of the apparatus is self-apparent. No doubt before long we will see all up-to-the-minute machine shops do their scraping by some method such as described.

A LARGE HACKSAW

By L. P.

Sixty years ago, and even later, the hack-saw was the most ill-used tool in a workshop. It was soft enough to be sharpened with a saw file, and was very soon blunt. No one would sharpen it after use, so filing it up was preliminary to using it. The teeth had no clearance beyond the rough side produced by the file, and so a deep cut was a laborious business that no one liked. The modern hacksaw is a very different tool and has effected extraordinary economies in the workshop. It is made of a very high quality of steel, having great durability, and, when handled with reasonable care, will do an enormous amount of work before being worn out. Fitted in a sawing machine in which the speed movement and pressure are carefully regulated, it will cut up round and square bars to finished lengths that require no further treatment. In course of time the size of the work it would undertake grew beyond anything at first contemplated, and to-day there is in use at the Royal naval gun factories in England a set of five motor-driven hack-saws that will deal with all hardened bars of gun steel 15 inches in diameter. They are looked after by one unskilled man and a woman. A larger machine has recently been added to the outfit of the same works. It weighs 3½ tons and will cut through a 26 in. square billet of steel with one blade that still remains serviceable. A 3 h.p. motor drives it. The cost of sawing is only one-sixth of the cost of the method previously employed. At the present time there is much competition in hack-saw blades as in files, so that their price remains so moderate that no well-appointed workshop can afford to be without them. It must, however, be noted that the modern hack-saw is not fool-proof; it can be spoiled in less than a minute by any stupid workman who, using it like a file, may rub the teeth off in a few strokes. The user should begin with a slow and steady stroke at a very moderate pressure, using the whole length of the saw until it is properly entered into the metal. The pressure may then be increased to a moderate degree, but it should never be excessive as the saw consists of a row of very small cutting points that are highly tempered and not meant for rough work. Rightly used, the hack-saw will save a great amount of filing and chipping, representing time that is convertible into money.

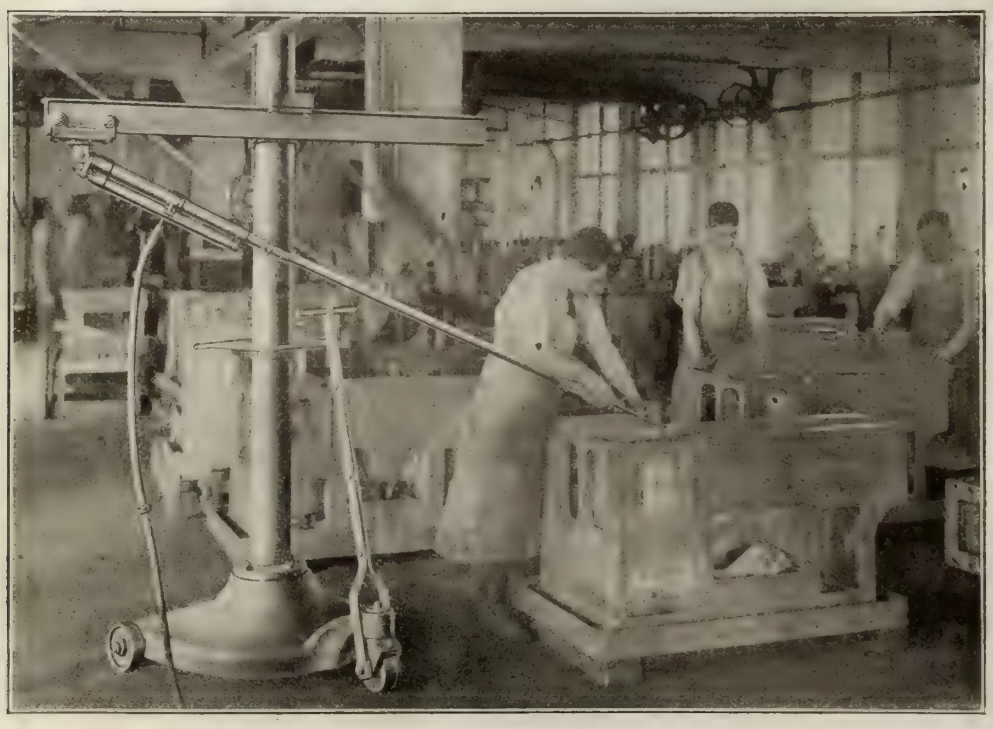

FIG. 4—THE ACTUAL WORK BEING PERFORMED.

HOW TO BLACKEN BOLT HEADS

By John H. Bedell

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Specially prepared lacquers can be obtained from supply houses for giving metal work for electrical switchboards a dull black finish. If such preparations are not available, dull black paints, which will serve in emergencies, can be obtained in ten cent or larger cans at most hardware stores or paint shops.

The following process has been used successfully for giving bright-finish steel cap bolt heads a dull black finish: First, heat the bolt to a dull red in a blow-torch flame, then dip it in asphaltum paint. Now burn the paint off with a blow-torch and rub it with a cloth while it is still warm. If the bolt is permitted to cool before it is rubbed with a cloth, the resulting finish will be glossy instead of dull.

Improved Process of Case Hardening

AS the result of an investigation into the prevention of flaking and chipping of certain case-hardened articles, such as nickel steel gear wheels used on motor car and aero engines, and straight carbon steel camshafts. Mr. D. Hanson and Mr. J. E. Hurst have devised certain modifications in the case-hardening process, which they described before the Iron and Steel Institute.

After a discussion of the theory of case hardening, the authors said that among the articles in which cracks developed during grinding were various forms of gear wheels made from steel containing about 2.3 of nickel. These had carburized in a mixture of charred leather with 10 per cent. of barium carbonate for 10 hours at a temperature of 900 degrees C., after which the box was withdrawn and cooled in air. For refining and rehardening a subsequent reheating to 800 degrees, followed by oil quenching, was adopted, and after this treatment the mechanical properties of the core and the hardness of the case were perfectly satisfactory. The gears were sent to another firm for grinding, and many of them failed during this operation, through the formation of fine cracks running from the surface into the metal. On cutting sections through the teeth of a number of wheels, and examining them under a microscope, in almost all cases a certain amount of free cementite, arranged in cellular form, was detected at the edges of the teeth. It was not invariably found, but in some cases might have been removed during the grinding process.

Slow Cooling

Experiments were made to elucidate this condition and to determine whether by submitting the steel to a slowly falling temperature during the later stages of the carburization a case would be obtained in which the harmful cementite network was not found. Pieces of the 2½ per cent. nickel steel were heated in contact with the carburizing material for 6½ hours at 900 degrees, at the end of which time there was a high concentration of carbide in the outer portions of the case. The temperature was then gradually reduced to 800 degrees, the refining temperature of the core, which temperature was reached in 4½ hours, and was maintained for a further four hours, the total length of the whole operation being 15 hours. It was found that by this treatment a depth of case was obtained equal to that formerly obtained by 10 hours heating at 900 degrees. These times were arrived at after a few preliminary experiments. The specimen was then cooled in the box, which was removed from the furnace.

Microscopic examination showed that this treatment had been very successful. The outer portions of the case contained in no part more than a slight cementite network, and on quenching the steel from 800 degrees it was found that no cementite was left undissolved, and the structure consisted mainly of a uniformly fine martensite.

In other cases the lowering of the temperature from 90 degrees was slower; in many operations on a works scale the whole period of 8½ hours was taken for this lowering, when the box was withdrawn without further treatment, with results that were quite satisfactory. Annealing for one or two hours at the lower temperature, however, appears to give a case slightly lower in carbon than a treatment in which the box is removed immediately 800 degrees is reached, but in all the cases examined no free cementite was found after the articles had been hardened.

Lower Final Temperature

More recently the authors have carried the reduction of temperature somewhat further. In the above cases the final temperature has been that of the refining operation. In their later experiments, and in routine operations on a large scale, this final temperature has been reduced to a point between the refining temperature of the core and the hardening temperature of the case. In articles made from a 3½ per cent. nickel steel the fallen temperature treatment has been carried out from 900 degrees to 740 degrees in the same time of 8½ hours, and the results have been entirely satisfactory. A case in 3½ per cent. nickel steel obtained by carburizing at 900 degrees for 6½ hours, and from 900 degrees to 740 degrees in 8½ hours, followed by cooling in the box, contained in the outer layers mere traces of a cementite network, and a layer of steel of practically eutectoid composition extended from the surface for a distance of .5 in. into the steel. Further, the transition from case to core was very gradual, and took place over a distance of .03 in. There was no sign of "liquation" at any point, and indeed the authors have failed to detect any signs of this phenomenon in any of the steels which they have examined after submitting them to this treatment.

Practical Results

This modification of the case hardening process has been adopted for some months past in the works of Messrs. D. Napier and Sons (Limited) in all operations on straight carbon and nickel steel parts (except 5 per cent. nickel steel) and has given highly successful results. Many thousands of articles have been treated, and the amount of scrap material has been reduced from at least 25 per cent. to practically nothing. For example, by the old methods of carburizing the scrap in the manufacture of air screw shaft gears from a 2½ per cent nickel steel amounted to 25 per cent. On adopting the 900-800 deg. falling temperature treatment this was reduced to 2½ per cent. On changing to the 900-740 deg. treatment (the steel at the same time being altered to 3½ per cent. nickel), up to the time of writing, out of 75 completed gears, none has been found defective. Experience with other forms of gears has been equally satisfactory. In the manufacture of valve end-pieces from 3½ per cent. nickel steel, out of the first 500 manufactured by the old method of carburizing at 900 deg. at least 25 per cent. were defective. By adopting the 900-740 deg. falling temperature treatment the trouble has disappeared.

With straight carbon steels equally satisfactory results have been obtained. In the manufacture of cam shafts, for example, the only failures which have been experienced since the modifications were introduced are very small in number, and can, in each case, be traced to excessive non-metallic enclosure in the steel. In every case in which grinding cracks have developed a sulphur content of over 0.1 per cent. has been found, and microscopic examination has revealed large quantities of sulphide.

It may be safely said that since the introduction of the modifications of the case-hardening process which have been described troubles from flaking and cracking during and after grinding have become practically unknown, and the very few cases which have occurred can all be connected with material which is otherwise defective.

Carburizing 5 Per Cent. Nickel Steel

With articles made from 5 per cent. nickel steel, trouble from flaking has never been experienced, in spite of the fact that the usual practice has been to carburize at 950 deg., a temperature considerably higher than that used for any of the other steels mentioned in this paper, and at least 150 deg. above its upper critical point. The authors suggest that the explanation is probably to be found in the fact that this steel, when carburized, is air-hardening, and normal slow cooling in the box is sufficient to suppress the carbide separation, or, at any rate, to prevent its separation in a harmful form. They have not, however, investigated this steel.

Description of a New Automatic Threading Tool

In This Article is Described a Very Interesting Tool Fixture Recently Placed on the Market by a Well-Known English Firm—Its Description Is Well Worth the Reading.*

It is often necessary, and still more often desirable, to cut screw threads on a number of pieces of work in the lathe; whether on centers or in chucks. It takes a great deal of time to make the successive cuts and get the exact size. Much of this is non-cutting time; in the reverse travel, advancing the tool, changing to finishing tool or comb, etc. When the screw has to end against a shoulder the trouble is doubled. There has not, hitherto, been a practical fixture or attachment for the lathe to deal with this class of work with any reasonable approach to self-acting efficiency.

A new tool fixture recently placed on the market by Alfred Herbert, Limited, Coventry, has been designed specially for this work, in cast iron, bronze, brass and other soft metals. It is not recommended for steel.

Before describing it we may as well summarize its advantages as compared with the usual method of screw cutting in the lathe.

1. It will cut a complete form thread in one travel of the saddle.

2. The thread is cut by six separate tools, which take the various cuts from roughing to finishing.

3. It will cut to a fixed point or up to a shoulder and finish the last thread.

4. Each tool automatically springs clear of the workpiece at a set point, which may be as close to a shoulder as in the ordinary process.

5. Once set it will automatically repeat the same size of thread on any number of similar pieces until the cutting tools require sharpening. It is not necessary to measure each piece, further than to check occasionally, as in screwing with dies.

These five advantages may be condensed into one statement—that the tool will cut a completely formed thread to required size in a fraction more time than is now taken for one cut; or, allowing for reversing, measuring, etc., it will cut the thread in less than one-tenth of the time.

This, of course, refers to a thread turned in the lathe true with the other turned parts of the workpiece; or with the workpiece as chucked or centered if the other parts are not turned.

The construction will be fairly clear from the illustrations, which show different views of the tool fixtures. In its assembled state it is in two parts: a tool box and an abutment, or stop piece.

The abutment, shown in Fig. 1, fits the Alfred Herbert No. 4 capstan lathe. It could be adapted to most lathes or a special stop made. It must, of course, be firm, clear of the moving parts of the lathe, and be adjustable to a fine degree; but the making presents no special difficulty.

The tool box is fixed on the cross slide of the lathe, and once the correct diameter of screw is attained the slide may be firmly clamped so that no small movement or shake may occur. The usual change wheel setting and lead screw are used to travel the saddle in the usual way, except that a complete thread is formed in one travel.

The chasers. The six tools are varied on their cutting edges so that the first starts cutting on the full round surface and the last chases and finishes the thread. The tools are in correct continuous pitch with each other, so that each precisely takes up the work left by the one in front of it. The tools or chasers are of usual form, but accurately ground on the shanks to slide in their places and with a cross slot near the back end, as shown in Fig. 5.

The recoil. Above each chaser is a bar with a projecting piece, the detent bar, to engage the slot in the chaser and suitably formed to be influenced by springs. A stepped former bar, shown in plain view in Fig. 4, with the box cover and detent bars removed, holds the chasers in cutting position until the set point for the recoil is reached. As shown in Fig. 4, the stepped bar has been pushed along to allow three chasers to recoil and still holds three in cutting position—the first of the second three being near the point of recoil. It will be clear that the stepped bar is stopped by the abutment, while the saddle and tool box move along the cut under the action of the lead screw. Therefore the

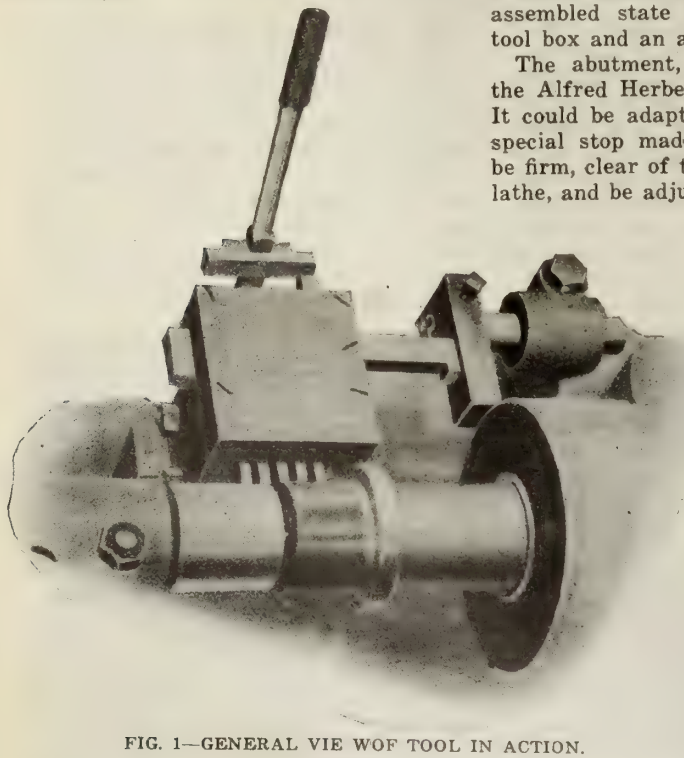


FIG. 1—GENERAL VIE WOF TOOL IN ACTION.

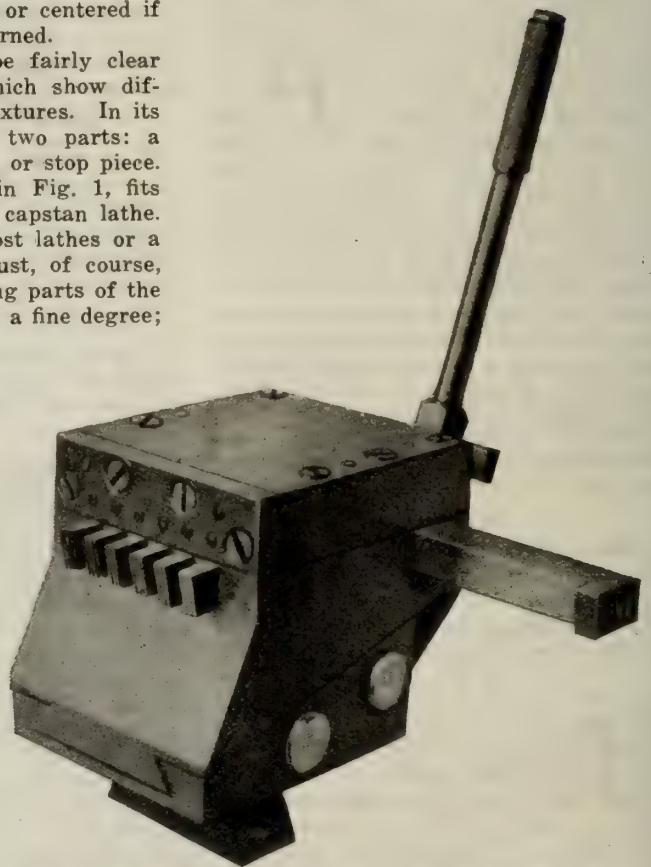


FIG. 2—VIEW OF CUTTING TOOLS AND STEPPED BAR.

*From "Machine Tool Review."

chasers will successively and automatically recoil at the same point.

Re-setting. When a thread is finished the saddle is released from the lead screw and travelled back in the usual way. The chasers are all pushed back simultaneously by the handle and plate bearing on the rear ends of the detent bars, and thereupon the stepped bar springs back to the full extent, as shown in Fig. 2. Another workpiece is then inserted in the lathe and the half-nut put into action as usual.

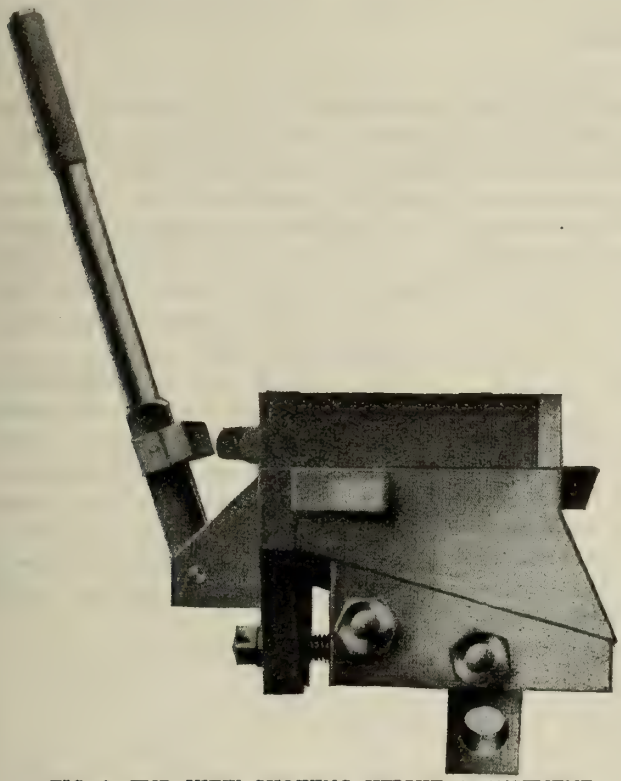


FIG. 3—END VIEW SHOWING HEIGHT ADJUSTMENT.

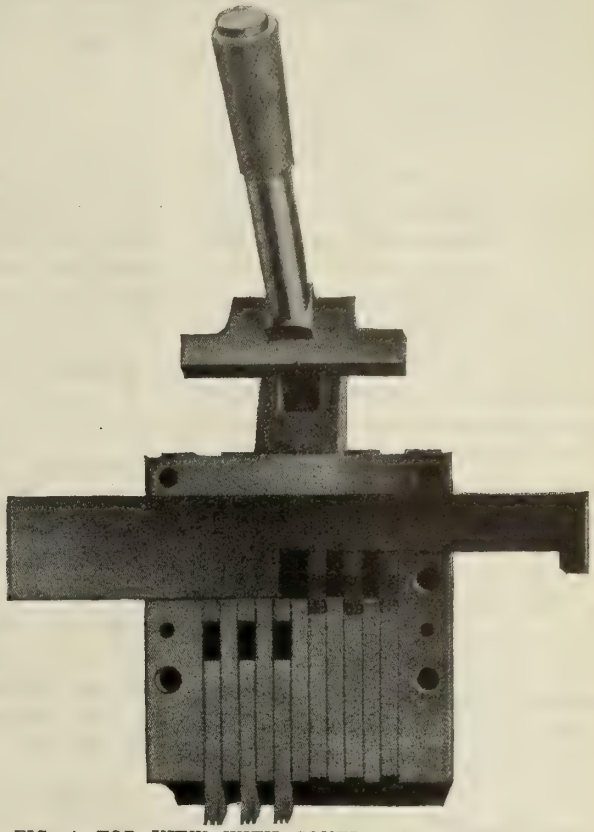


FIG. 4—TOP VIEW WITH COVER AND DETENT BARS REMOVED, SHOWING ACTION OF STEPPED BAR.

Sharpening the tools. The chasers must be ground on a machine, surface grinder or cutter grinder, as the grinding must be equal and accurate. Two methods are available: (1) To take out the chasers and clamp the set accurately together and grind all at once; or (2) to transfer the tool box with the chasers to the grinding machine table and grind all together in position. The chasers are ground flat on the top.

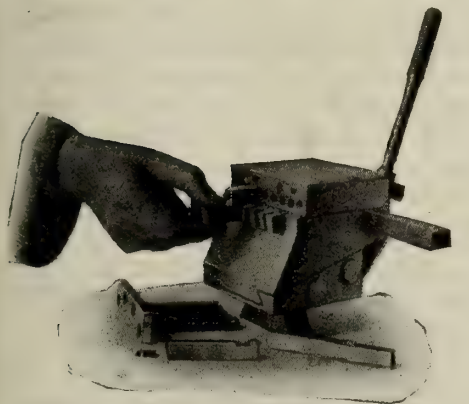


FIG. 5—METHOD OF REMOVING TOOLS.

Setting up. The setting up is reduced to a simple matter. First, fix the tool box and stop to allow the necessary clearances. Then adjust the height of the cutting edges to the diameter and material to be cut. Fig. 3 shows a square head screw for adjusting the height to a nicety and the nuts of the two clamping screws which hold the tool box firmly when adjusted. Figs. 6 and 7 show the main measurements, etc.

Cutting position. The tools being flat on the top, how is the cutting rake obtained, and how varied? Reference to Fig. 6 will make this clear, with a little explanation. The workpiece is shown as a circle, the center of which is below the level of the tool edge. A line drawn from the tool edge to the center of the workpiece would show the top rake as an angle, and this angle can be varied by adjusting the height of the tool edge in relation to the center of the workpiece. A table in the catalogue shows the height of tool edge above the workpiece center equivalent to rakes of 8, 10, 12, 14 and 16 degrees, and shows them for various diameters. For example, a rake of 12 to 14 degrees is suitable for cutting cast iron, and the table shows that a height, as defined, of 7-32 in. to ¼ in. will equal these rake angles for a 2-in. diameter. Similar figures for other diameters and rakes are given; 8 to 10 degree rake is suitable for cutting brass or gun metal, etc. The clearance below the cutting edge is sufficient for the necessary rakes.

The fixture is very compactly made, and sets of tools are stocked to cut Whitworth standard threads from 10 per inch to the finest pitches. The fixture is protected by patent, and is called "The Coventry Automatic Threading Tool." We understand that a small number of the fixtures are ready for delivery and more are in hand.

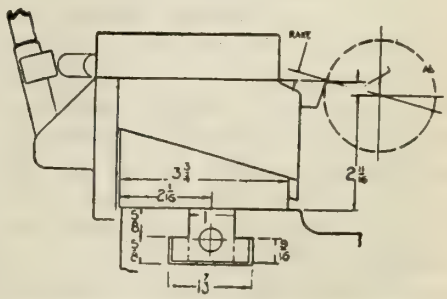


FIG. 7 —FRONT VIEW OF FIG. 6.

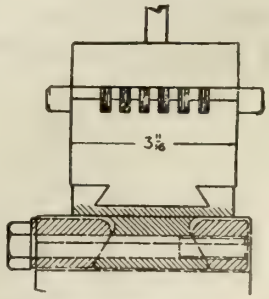


FIG. 6—MEASUREMENT AND METHOD OF ADJUSTING TOP RAKE OF TOOLS.

Leather Prices Still High.—With advances in the different grades of from 1c to 17c, the tendency is for still higher prices. The overseas demand has cleaned out the stocks of leather merchants and tanners, and the price of both shoe and harness leather is affected.

Shop Arithmetic, Mensuration of Solids

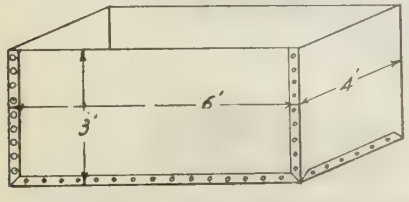
Eighth of a Series in Practical Mathematics for the Mechanic and Those Learning the Machinist Trade—The Present Article Takes Up the Subject Mentioned in the Title

By J. H. RODGERS

IN calculating the area of plain figures, length and breadth are the only two dimensions required, apart from such constants as are universally recognized for the solution of problems of this character. For the measurement of solids (figures that occupy space) three dimensions are necessary, and with these any constants that have been derived for easy solution. The surface of the solid enclosing the space is found by adding together the areas of the several sides. The surface of a cube would be equal to six times the area of one of the sides. The volume would be the area of one of the sides multiplied by the thickness.

The unit of measurement is the cubic inch, the cubic foot, or the cubic yard, the latter being used chiefly by civil engineers in excavation calculations. Some of the more common solids are shown in the chart herewith together with the formulae required for finding the value of the different elements.

To illustrate the practical application of the measurement of solids, we will give a few concrete examples. Suppose it is required to construct a tank that will contain 540 gallons of oil, and the floor space allowable is 6 by 4 feet, what will be the height of the tank? The volume of the U. S. gallon is equal to 231 cubic inches, and the first detail required is to find the cubic contents equal to 540 gallons. This is found by multiplying the volume of one gallon by the number of gallons; thus:

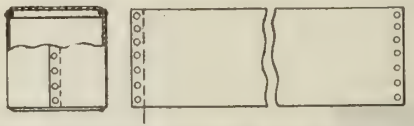


231 x 540 = 124740 cu. in. or
124740 ÷ 1728 = 72.18 cu. ft.

As the area of the base is 6 x 4 feet, or 24 sq. ft., the height would be:

72.18 ÷ 24 = 3.008 ft. or 3 ft. .11 in.

Suppose we have a cylindrical tank to make that will contain 1,000 gallons, and we are restricted to a height of 6 feet, what will be the diameter, and also the dimensions of the flat sheet required to form the cylindrical portion, allowing for a lap seam of 2 inches? The volume corresponding to 1,000 gallons would be:



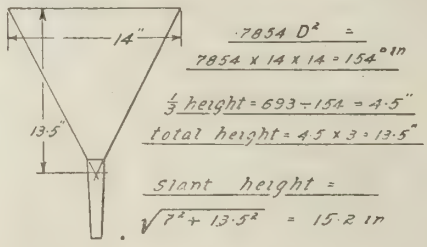
231 x 1000 = 231000 cu in or
231000 ÷ 1728 = 133.68 cu ft.

As the height is to be 6 feet (no allowance being made for the thickness of metal) the cross sectional area will be: 133.68 ÷ 6 = 22.28 sq. ft. The diameter can then be found by dividing this value by .7854, and extracting the sq. root of the quotient.

$$\sqrt{\frac{22.28}{.7854}} = \sqrt{28.342} = 5.32 \text{ ft}$$

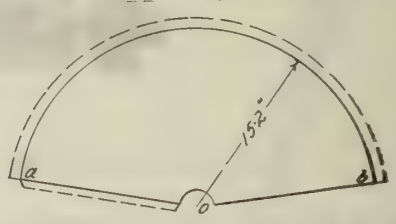
The length of plate would equal the circumference of the tank, plus the width of the lap seam, or—(64 x 3.1416) + 2 equals 202 inches.

A cone-shaped funnel is required, its maximum capacity to be 3 gallons, and the large diameter to be 14 inches; what will be the central height of the cone, neglecting the diameter of the small end? The volume of three gallons would be 231 x 3 equals 693 cu. in. The volume of a cone equals the area of the base times one-third the altitude, or axial height. Therefore, one-third the height will equal the volume divided by the area of the base. In this case the area of the base would be:



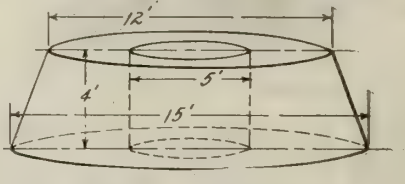
These dimensions, however, are of little value unless we know how to lay out, on a flat surface, a shape that, when formed up, will give us the cone desired. First, find the slant height by the principle of the solution of right angles. The slant height is equal to the hypotenuse of a right triangle with sides of 7 and 13½ inches respectively, these dimensions representing the radius of the base and the perpendicular height. The slant height will then equal the sq. root of the sum of the squares of these two lengths.

Now, with a pair of compasses or trammels, describe a portion of a circle having a radius of 15.2 inches. Then from the point A lay off a distance A-B, equal to the circumference of a 14 inch circle. Connect B with O and the enclosed space will represent the shape of the piece required. In addition to this



it will be necessary to add sufficient to one edge to make the seam, and also on the outer circumference for wiring or stiffening purposes. A small portion at the apex will require to be cut away to provide for the lower opening. These modifications are shown in dotted lines.

A concrete foundation, in the form of a frustum of a cone, and with a hole in the centre 5 feet in diameter, is required for a machine support. The lower diameter is 15 feet, and the top diameter is 12 feet, with a height of 4 feet; what would be the number of cubic yards of material in the foundation? The volume of a frustum of a cone is found by adding the area of the upper and lower bases and the square root of the product of the two areas, and multiplying the sum by one-third the altitude. The area of the bases would be:



15² x .7854 = 176.7 Sq. ft.
12² x .7854 = 113.1 Sq. ft.

Placing the above rule in the form of a formula, and representing the base areas by A and a, and the altitude by H, we have:

$\frac{1}{3}H\left(A+a+\sqrt{A\times a}\right) = \frac{1}{3}H\left(176.7+113.1+141.36\right)$

$\frac{1}{3}\times 4\times 431.16 = 574.88$ cu. in.

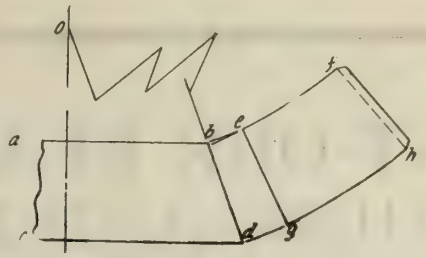
From this we deduct the volume of the centre hole, which would be:

$5^2\times .7854\times 4 = 78.54$ cu. ft.

& $574.88 - 78.54 = 496.34$ cu. ft.

If a sheet steel protecting casing was placed on the outer convex surface, what would be the shape of each portion if the frustum was composed of 8 pieces, with 2 inch laps?

The method of developing the flat sheet is shown in the above sketch, where the foundation of casing is shown



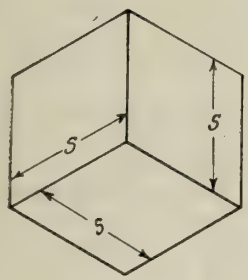
in elevation, with the axial line and the slant surface, produced to meet at the point O. With O as a centre and O-B and O-D as radii, describe the areas B-F and D-H. On the outer arc lay off a distance equal to ⅛ the circumference of the lower base circle, and from the ends draw the radii G-E-O and H-F-O. The portion E-F-G-H will be the shape required. Add the required lap for the seam.

Suppose we wish to make a sphere of cast iron that will weigh 80 lbs., what must be the diameter? Cast iron weighing .26 lbs. per cu. in. The cubic inches in the ball would be the total weight divided by the unit weight, or 80 ÷ .26 equals 307.7 cu. in. The volume of the sphere equals the cube of the diameter multiplied by .5236. Therefore the diameter will equal the cube root of the quotient of the volume divided by the constant .5236, or

$\sqrt[3]{\frac{V}{.5236}} = \sqrt[3]{\frac{307.7}{.5236}} = \sqrt[3]{587.66} = 8.37''$ (11)

The convex surface of a sphere equals 3.1416 D^2. The convex area of the above ball would be 3.1416 D^2 equals 3.1416 x 8.37^2 equals 220.1 sq. in.

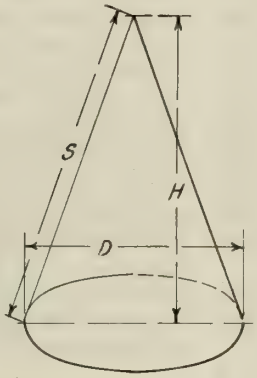
Data for Chart



CUBE

The exposed surface of a cube equals six times the area of one of the sides, or S x S x 6.

The volume equals the area of one of the sides multiplied by the thickness, or S x S x S.



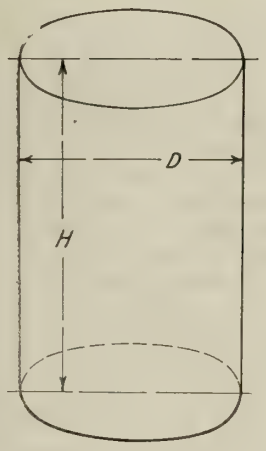
CONE

The convex area of a cone equals the circumference of the base multiplied by one-half the slant height, or A equals 3.1416 D x .5 S.

The volume equals the area of the base multiplied by one-third the altitude, or V = A x 1/3 H.

The slant height equals the square root of the sum of the squares of the base radius and the altitude, or

$S = \sqrt{\left(\frac{D}{2}\right)^2 + H^2}$.



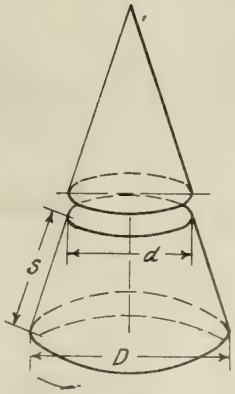
CYLINDER

The convex surface area equals the circumference multiplied by the height, or 3.1416 D H.

Area of one side equals .7854 D^2.

Volume equals .7854 D^2 H.

Contents in U. S. gallons equals the volume in cubic inches divided by the constant 231.



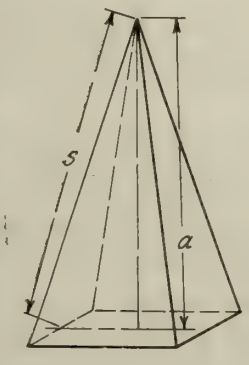
CONE FRUSTUM

The convex surface of the frustum of a cone equals the product of the slant height and one-half the sum of the perimeters of the two bases, or A equals S x .5 (3.1416 D 3.1416 d).

The volume equals the sum of the areas of the upper and lower bases and the square root of the product of the two base areas, multiplied by one-third the altitude, or

$V = \frac{3.1416}{4}(D^2 + D\,d + d^2) \times \frac{1}{3h}$

The slant height equals the square root of the sum of the squares of the altitude and the difference between the radii of the bases, or S equals $\sqrt{H^2 + (R-r)^2}$.



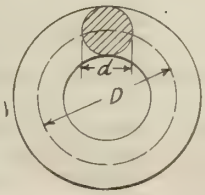
PYRAMID

The convex area of a right pyramid equals the perimeter of the base multiplied by one-half the slant height, or A equals perimeter x S.

The volume of a right pyramid equals the area of the base multiplied by one-third the altitude, or V equals A x 1/3a.

SPHERE

Convex surface equals 3.1416 D^2. Volume equals .5236 D^3.



CIRCULAR RING

Convex area equals the circumference of the cross section multiplied by the length of the central line of the ring, or A equals 3.1416 d x 3.1416 D.

The volume equals the area of the cross section multiplied by the length of the central line of the ring, or V. equals .7854 d^2 x 3.1416 D.

WHAT OUR READERS THINK AND DO

Centering Chuck Work Discussion Re-opened

Readers of Our Magazine Are All Het Up Apparently Over the Subject of the Art of Proper Centering. Here Are Three More Suggestions, With Which We Will Close This Discussion

Compiled by J. H. MOORE

ANYBODY who remarks that CANADIAN MACHINERY is not well read may take a back seat at once, for we have proof positive every day as to the wide field which it covers. The interest taken in the article by J. J. McIntyre in our May 8th issue, regarding his method of centering, started another proof ball rolling, for since his article appeared all sorts of schemes, replies, and criticisms have rolled in from various readers.

In our May 29th issue we reviewed the article and published two other suggestions. But still the ideas roll in.

To close this discussion, which, of course, must close some time, we publish three more schemes and call it quits. Be it understood that we have played a strictly neutral role in this matter and continue to do so. These three articles are published to illustrate the variance of opinions on the subject.

We will first see what a Brantford reader has to say:

MY IDEA OF QUICK CENTERING

By S. G. MACKLIN

Referring to page 554, your May 29th issue of CANADIAN MACHINERY, I would like to know why these gentlemen go to this trouble to centre work? Or what are the particular circumstances that make it necessary in this line of work?

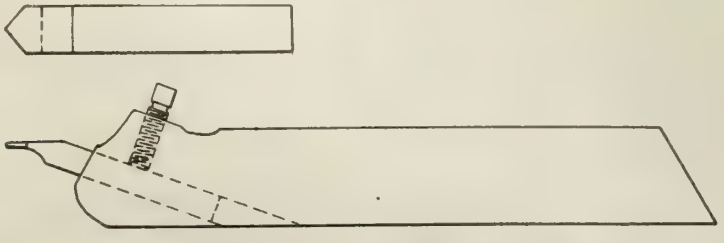


FIG. 1—S. G. MACKLIN'S SUGGESTION.

In our line the only circumstance that would justify this method of centering work would be when one diameter is the diameter of the stock,, in which case we would proceed as follows:

We would chuck the work, and face the end, using an Armstrong tool holder, then without changing the tool holder, but removing the tool bit, we would insert a tool bit ground as a centering tool, as shown at Fig. 1.

The face, A, is ground parallel with the holder, as shown and ground like a flat drill 118 degrees included angle. The advantages of the incline of the tool holder is self apparent for it supplies a ready means of quickly bringing the tool to the centre.

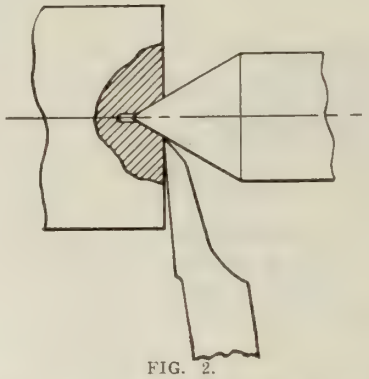


FIG. 2.

Having now a centre in the work, we take the drill chuck with its No. 3 Morse taper unglorified, and using the tail centre in the chuck's centre, make the required centre in the work without giving the matter any thought at all (being one of the things in a day's work). It is taken for granted (just as the blacksmith puts his tongs on a piece of work and places it in the fire without any thought that the fire will make it hot) so to continue.

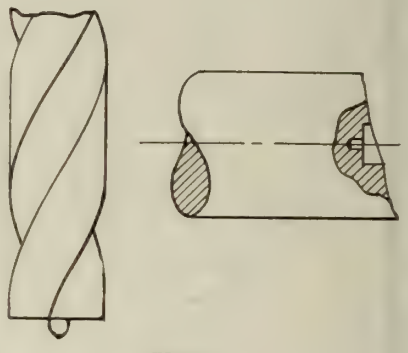


FIG. 3.

Now let the writer issue a little tip for the man that always leaves a tit on his faced ends. Is he not aware that by letting the centre back a little the tool can be made to pull the work over and cut from the edge of the centre, and tightening up as soon as the tool is past the centre, being careful to note that the tool is reasonably near the shape required for such an operation, similar to shown at Fig. 2?

Another scheme is as follows: Make two stabs at the work by grinding a twist drill, with a little pilot on it and square faces, at Fig. 3, before putting the 60 degree centre in the end of the work, face down, as far as it may be necessary to straighten the end of the piece.

To refer once more to where we started we admit that in cases of necessity this method of centering work is advisable, but for a general practice, making special tools to centre work looks like a long way round for a short way home.

Now that Mr. Macklin has had his views aired, let us hear from another reader from Amherst, Nova Scotia:

REGARDING CHUCK DISCUSSION

By T. WILLIAMS

Regarding quick method of centering chuck work. CANADIAN MACHINERY is read by quite a large number of tool makers, machinists and apprentices that they may become more efficient; as well as executives, who want to keep abreast of the times.

It is a good idea to be able to exchange views and know how things are done in other shops as new ideas spring up from time to time. It is also instructive reading, how some difficult repair has been accomplished in a thorough and workmanlike manner. With your assistance, Mr. Editor, I would like to see CANADIAN MACHINERY maintain this standard.

I know you are not responsible for other people's views.

In CANADIAN MACHINERY of May 29th, page 554, referring to Fig. 1, I fail to see how Mr. S. Simpson can claim an improvement on Mr. J. J. McIntyre's "Chuck Under Discussion," illustrated on the same page.

Everyone who uses combination drill and countersinks know, and sometimes to their sorrow, how easily they are broken.

Referring to Fig. 1 to use it, it is first necessary to spot drill the piece of work or locate the centre; otherwise reverse the tool-holder or replace with a suitable piece of stock in the tool post. Place the drill chuck complete, as shown in Fig. 1. in position for drilling, and bring up the back centre; now the tail of the lathe dog most likely will bear on the compound rest to prevent turning; if the piece of work to be centered has not already been spot drilled, the piece of stock in the tool post, as before mentioned, must be brought against the drill to bring it in the centre. With the drill chuck placed in position the drill has a greater strain on it by virtue of the extra weight than it would have by using Mr. J. J. MacIntyre's "Chuck Under Discussion" idea, which is self-centering, and holding the same by the fingers, as shown in the photograph.

And the fact of it being self centering it is unnecessary to use a piece of stock in the tool post to force the drill in the centre.

He goes on to say such a scheme has its disadvantages, for, first, it is difficult to tighten the chuck with the hands. etc. It should be unnecessary to call Mr. S. Simpson's attention to the fact that those chucks as illustrated are supplied with a pinion wrench to be used for tightening, and by so doing it is not necessary to use the vice under ordinary circumstances.

Last, but not least, we come to the views of a Halifax reader.

CHUCK DISCUSSION

By G. R. FOWLER

I noticed the articles in CANADIAN MACHINERY in connection with centering chuck, and I think I can offer a better suggestion than any I have read so far. Make a collet, as shown at Fig. 4, to fit the tapered portion of tail stock of lathe, and place a ¼ in. pin in the same, which in turn will fit into slot across the end of tail stock barrel, preventing the same from revolving while the strain of drill is on.

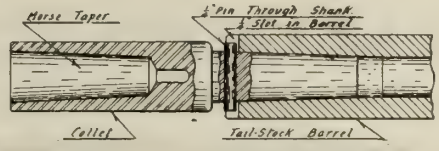


FIG. 4—G. R. FOWLERS' IDEA.

The end of collet is tapered to fit chuck or drill, and made with the usual slot going through in order to receive key for removing chuck or drill.

By adopting this method everything is central, and by using combination drill and countersink, it will not be necessary to spot work with the tool at all.

I made one of these collets to fit all of our lathes, and find them very handy and quick, not only for centering, but for drilling. By slotting end of bush in headstock to receive pins through male part of collet it can also be used for drilling cast iron pipe flanges, etc., which may be too long to go under the drill press.

By using tailstock as a means to feed the work up to drill, and placing drill chuck in collet, when the live centre has been found very useful for turning small ——— which would be found difficult to hold in a large chuck.

There are several other advantages that a practical man will readily see, so hope you see fit to print this in regards to the discussion.

Here endeth the discussion so far as we are concerned. Our space in this section is limited, so we must get into other fields. Is there not some jig or fixture of any kind that has proved a real saving proposition? If there is we want to have the privilege of looking your sketch and article over to see if we can use the same in our columns. We pay for such articles, so get moving and make some easy money on the side. Did you note that Brantford, Amherst, Nova Scotia; and Halifax, were the parts where these letters came; and our distribution centre is Toronto? Think it over.

Tunnel for Windsor.—There is a good deal of talk going on here on the subject of a tunnel between Windsor and Detroit under the Detroit River. The idea originated with Mayor Winter, and a Detroit contractor has already called on the Mayor and made tentative proposals for the construction. Estimates of the work are that it could be done for $6,000,000, exclusive of approaches. The plan would be for each city to build the approach to the tunnel on its own side, and the cost of the tunnel itself to be borne by a stock company. A toll sufficient to pay a reasonable return on the investment could be charged and arrangements made for the two cities to take the subway over after a reasonable time.

REGARDING STAMP CLEANER ARTICLE

WE have had brought to our attention a matter of a rather serious nature regarding an article we published recently in our columns.

This article was entitled: "Cleaning Off the Title Stamps." In the same was mentioned that the contents of a fire extinguisher made an ideal stamp cleaner.

On the surface, this seems like a good joke on the extinguisher, but listen to what one of our readers has to say.

"Referring to a recent article in your paper, with reference to extracting carbon tetra chloride from fire extinguishers. It is admitted that carbon tetra chloride is a well-known, but somewhat expensive cleaning agent or solvent and is largely used in the arts for this purpose.

"In view of the strong efforts now being made by various parties, including some of the Canadian trade and technical papers, in order to endeavor to prevent some of the terrific waste that is now taking place from fires, it is felt that this article is a little out of place.

"One of the difficulties met with around factories, stores, etc., in connection with the maintenance of chemical extinguishers is to prevent tampering. Tampering being a great difficulty, especially with extinguishers of the one quart carbon-tetra chloride type, of which the "Pyrene" is a sample.

"These extinguishers, when new, or issued from the makers, are sealed with a fine wire, and several firms make it a practice to periodically send a man around to reseal these extinguisher handles from time to time.

"You will appreciate that if the extinguishing agent is removed from an extinguisher by all or sundry who require the fluid for cleansing purposes that when the emergency arises the apparatus will fail.

"I would suggest that a good way of endeavoring to remove the harm done would be for you to insert an article somewhat as follows:

"It must be distinctly understood that to tamper with fire extinguishers under any conditions is absolutely prohibited, the reason being obvious.

"I trust you will excuse my calling your attention to this apparently trivial matter, which, however, is of quite a serious nature."

We thank our correspondent for this reminder, and heartily endorse his statements, that, much as we wish an ideal cleaner, we do not wish to perhaps endanger life as a result of thoughtlessness.

Construction Men for France. — The Canadian Des Moines Co., of Chatham, are asking for sixty steel erectors and riveters to proceed to France for nine months' work. The place mentioned is Bordeaux, and the work consists of erecting observation towers. Board and transportation will be paid each way and pay commence at the start of the trip. Wages offered are 70c per hour and a 50-hour week.

DEVELOPMENTS IN SHOP EQUIPMENT

BEAMEN & SMITH CONTINUOUS MILLING MACHINE

THIS is a heavy, rigid manufacturing machine, designed for the rapid and economic handling of milling work.

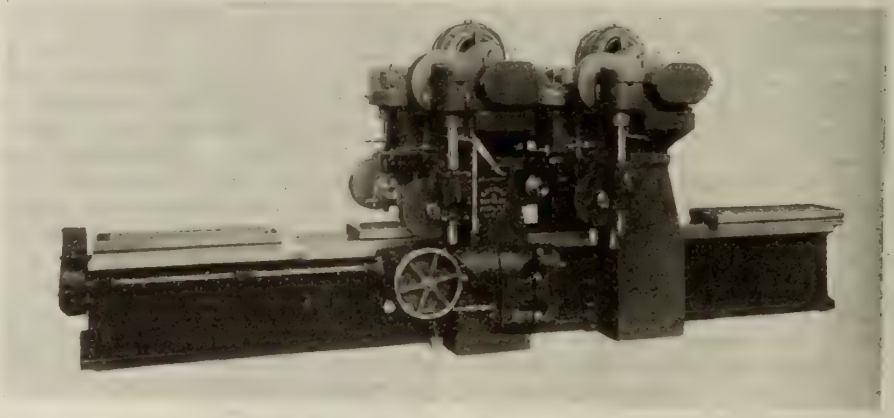
It consists of a substantial bed to which uprights are attached. A pair of these uprights supports the horizontal spindle heads and the cross rail which carries the vertical spindle heads. Each pair of uprights with its bank of spindles is one milling unit. As many spindles may be mounted on this unit as necessary, and as many units may be attached to the bed as required to do the work. Usually two are sufficient. The feed driving mechanism is carried on one unit only.

Removable tables, carrying the work, feed continuously along the bed, (taking a fast motion when the cutters are idle and a slow motion when the cutters are working.) These tables, after having passed all the cutters, are lifted from the bed and the finished work removed. Another table with the work already attached is placed on the front end of the machine and the process repeated. As many tables are furnished as are necessary, usually four, to maintain continuous milling. Such machines will handle, on one trip of each table by the cutters, any milling required on two sides and the top of any piece, within its capacity. By loading the tables to capacity a large amount of work can be handled in a very short time.

A single glance at the cut shows a sturdy machine with two units and three removable tables. A closer inspection shows the wide variety of work which can be handled and the high production rate which can be maintained. The machine, once started, need not be stopped until it is desired to change the cutters or to accommodate new work.

The bed ways on which the tables travel are flat, with slight tapers on the inside edges to accommodate corresponding tapers on the bottom of the tables.

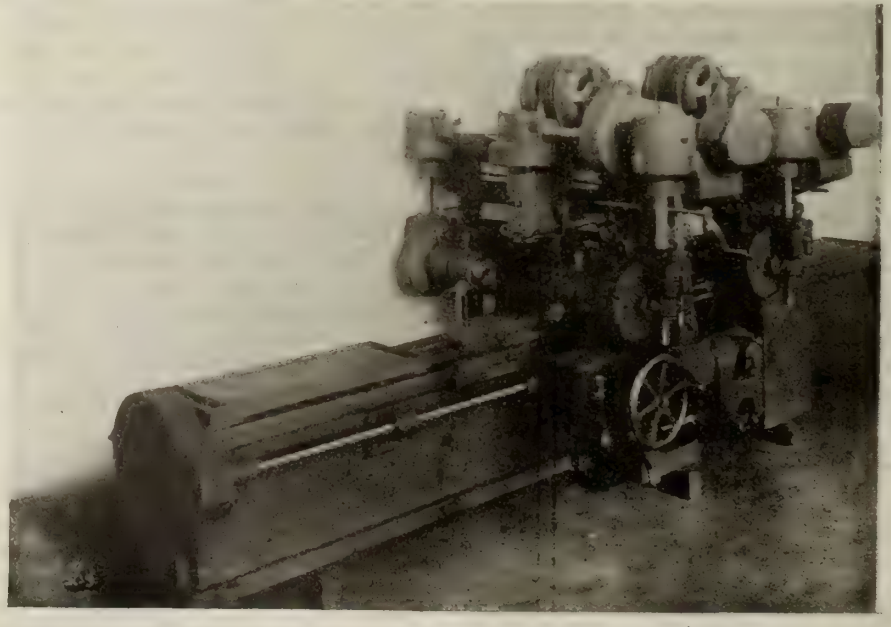
These centre the tables without wedging them, and allow them to be put on and taken off rapidly. The tables hold themselves in position by gravity while travelling, except when passing by the cutters. Here they pass under gibs, fastened to the bed, which hold them against all vertical movement while the cuts are being taken. A feature of the table design is the narrow guide which is tapered as above mentioned. This makes for the maintenance of a greater degree of accuracy through a longer period than the common wide guide. There is a taper gib to take up wear.



GENERAL VIEW OF THE MACHINE.

A feed shaft, which runs the entire length of the bed and is driven on the front end, carries a series of worms spaced at such intervals that the travelling tables are picked up by one worm before they have completely left the other. These worms engage in a rack on the bottoms of the tables. The spacing of the worms makes it impossible to set a table in the wrong position on the bed, and no matter where set it will pick up and travel instantly. The tables have feed in one direction, and fast motion controlled by hand, forward and reverse.

There are four changes of feed through gearing, providing a variation of from approximately 3 in. to 8 in. a minute, with a fast motion of about 12 ft. a minute when the cutters are idle. Two changes of feed are possible through change gears at the end of the gear box and two more are possible through a feed gear shifting lever. The feed and fast motion are controlled by one lever which makes it impossible to get



CLOSE UP VIEW OF THE MACHINE.

both at the same time. The object of the feed gear shifting level is to slow down the feed as occasion may require. The feed mechanism is driven by means of a vertical shaft connected through bevel and reducing gears to the main drive shaft.

Each unit is motor driven. The motor and driving mechanism is carried on the cross rail which is supported by the uprights.

The drive shaft is geared direct to the motor and, through reducing gears, drives the vertical and horizontal spindles. Through change gears which are easily accessible the spindles can be given various speeds.

The heads are of rigid construction, cast in one piece and are adjustable along the ways by means of hand operated screws. Wear is taken up by taper gibs. All have the feature of narrow guide for maintaining accuracy of alignment. When a cutter is located the head is clamped firmly in position.

Spindles are furnished in three standard sizes, the largest diameter in the front bearings being 3⅝ in., 4⅝ in. and 5⅝ in. All sizes can be incorporated on one machine and in heads located as occasion requires. They have hand adjustment in and out of the heads by pinion and rack. The pinion is held in the head and the rack is on the spindle quill. The quill is held in final position by being clamped.

Careful attention is paid to the oiling of all running parts.

The machine is controlled at the unit which carries the feed gears.

Quality of finished work, great rapidity of production and ease of operation are the characteristics of this type of machine.

The machines are patented at home and abroad.

Big Factory for Quebec.—It is understood that the Marceau Oil Cloth Company will shortly erect a factory in the city of Quebec. The buildings are estimated to cost half a million.

WHAT IS KINITE?

ONE of the recent developments in steels for cutting tools is a patented alloy known as "Kinite," which is especially adapted for making cutters, dies, taps and other tools with multiple cutting edges. It is said that the many kinds of tools required hardening after finishing and which must retain their original shape and dimensions after hardening can be made to last longer and take less labor in finishing when made of "Kinite." Tools of this class are:—blanking, stamping, forming, perforating, drawing and threading dies, and plug surface and snap gauges.

"Kinite" is cast in specially prepared moulds and has the appearance of a good smooth forging. A peculiar property is that it does not elongate under tensile strain or decrease in cross-sectional area. It retains the shape and size that is desired until the breaking point is reached. Castings made from it are free from the defects and blow-holes usually found in a casting. Unlike all other high-speed steels, it contains no tungsten. It will harden better than many forged products, and when hard is very uniform and close-grained, being one of the densest products of the steel family. "Kinite" hardens in oil or air, at a comparatively low temperature, and anneals at about the same temperature. It is high in heat-resisting qualities and does not scale in the fire, which makes it an ideal material for making cutting tools that have comparatively thin cutting edges. It is also valuable for making machine parts that must resist heat and wear, and which are subject to great abrasive action while in service.

"Kinite" castings do not change their form during the hardening process, hence it is possible to make the casting so near the desired shape and size of the finished tool or die that very little machining or labor is necessary to complete it. This fact also makes it possible to produce large dies in one single piece instead of many small pieces where ordinary die steels are used. In the latter case the pieces must be lapped or ground together after they have been hardened to allow for the shrinkage and change in form when hardening.

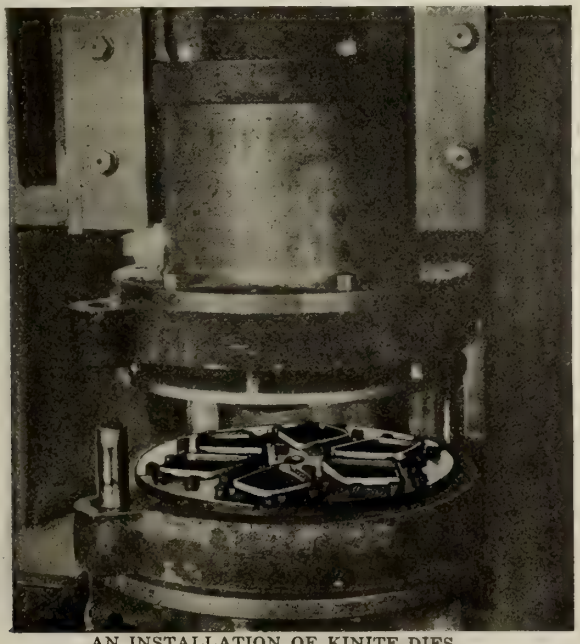
"Kinite," on the other hand, has the unusual characteristic of not changing shape or size during hardening, which saves from 20 to 40 per cent. of the labor necessary to finish dies after they are cast. Further, the purchaser saves considerable metal as no more is used than is actually required for the die (regardless of the shape) plus the small amount to be taken from the cutting edges when finishing. The die being cast to practically the finished size a large amount of stock is saved which ordinarily would be wasted. This saving alone in intricate dies, is no mean percentage of the cost of the die.

Another saving is effected in the labor of finishing such types because all the machining can be done while the metal is soft or in its annealed state. Practically no allowances are necessary for changes in hardening.

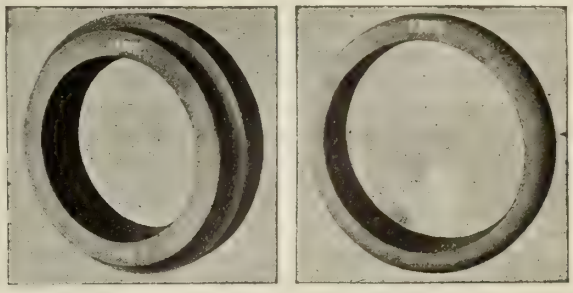
A certain stove company in Cleveland, Ohio, is using a "Kinite" punch and die to blank out stove legs from 3-16 in. black unannealed steel. They have averaged over 200,000 pieces per grind, and the die appears to be good for at least another season.

Some idea of the kind of dies that are

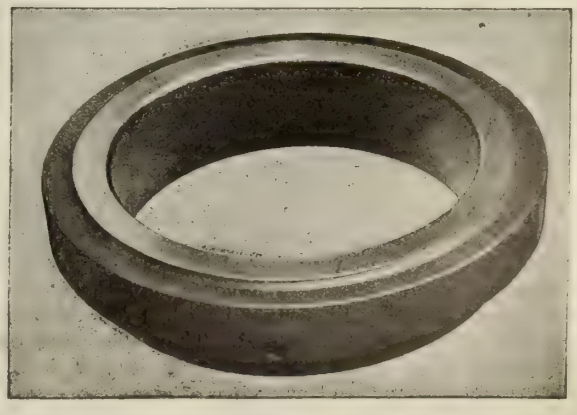
(Continued on page 42)



AN INSTALLATION OF KINITE DIES.



VIEW OF KINITE DIES.



ANOTHER KINITE DIE.

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The Craze For Factories

THERE are municipalities in Canada that are willing to give the shirt off their back in order to secure industries.

This is not a new disease, but it seems to be like the measles in that there is no telling when it is going to break out in a fresh place.

For a number of years the cry of the municipalities has been, "We must have industries." They have in many cases lost sight entirely of the fact that industries go where conditions are favorable for their development. They fail to recognize the history that has been written all over this country of the fool industry seeker.

There are taxpayers in scores of Canadian villages, towns and cities who are even yet putting up their good money for some idiotic scheme that was foisted on the place years ago, and the only memory they have now is the taxes they pay for their foolishness. It is not correct in many cases to say that these concerns were "hoisted" on the municipality. Too often the municipality was out looking for the proposition. It was a happy time for the promoter who had a real lemon in his pocket. It was not hard for him to find places that would listen to him. He would give employment to one hundred people, he would do this, that and the other thing. Well, if he failed? Municipality had the building or the plant, if there happened to be a plant. They might have an asset and they might not. They certainly had a liability in the money or loan they had made.

But this thing still lives. Only a few days ago a Canadian city had a letter from an American concern. This firm happens to be all right. It has been planning to come to Canada for a branch business to handle export trade. It is coming no matter if the municipalities make concessions or not. If they have to pay their own way they will do it. That firm right now has four wonderfully favorable propositions before it. They are being offered for nothing what they were prepared to pay for.

Here is another and perhaps a more concrete case, because we are able to publish some of the correspondence. In this instance a Canadian city, quite an industrial place, wrote to an American plant, intimating that they had heard they were going to open a business in Canada, and on the strength of that taking the opportunity of pointing out the advantages of this particular Canadian centre.

It was only a few days after that the city received the following letter from the U.S. firm:

"Replying to your letter of the 14th ult., will say, that we now have before us a Canadian proposition, in which this particular city has offered us ten acres of land on a railroad siding and have agreed to build on this land a one-story fireproof factory to contain 30,000 square feet, and turn same over to us, free of charge, and give us water and taxes free for ten years. The Hydraulic Power Co. have agreed to give us electric power at ½c per K.W. hour. In return we are to start operations with at least 100 men and to agree, in case we discontinue during the first ten years, to return the property to the city.

"If you have any better proposition to offer, we would be pleased to receive it, and give it due consideration."

Now there may be some few details that were lacking in the offer that was made to the company. They might have been offered free hay and oats for the first six months, free street car rides for the employees and a twenty per cent. discount on their grocery bill at the corner store.

But after looking over what that Ontario town is prepared to do, one might well be prepared to lean back and say, "If you know of a better 'ole, go to it."

Must Get Started Now

THE more deeply one goes into conditions that have to do with the business of this country, the more apparent it is that fundamentally things are sound.

We are emerging from a period that has been enough to put all kinds of business in the hands of the bailiff. It would seem that every influence in the land has set its hand to creating trouble of one sort and another. There has been an absence of influences and conditions that would usually be looked for when trade was booming.

It is necessary that we should not experiment too long along these lines. It may be the height of folly to try and see how long we can do a fairly good business when conditions are not favorable.

This country has got to get to work. There has been a tremendous amount of labor and engineering power gone to waste in strikes and in fighting them.

These conditions are not the ones that keep business sound. Business probably has kept sound in spite of them rather than with their assistance.

Get to work before there is a crack and a sag. Don't let this period of tinkering be too long drawn out or we may find it hard to stop the thing and put the peg in just at the right place.

THE wisdom of bringing the ex-Kaiser to trial in London is open to question. The war is over, conditions have been dictated by the Allies and Germany has signed. Anything done now would be in the nature of a post-climax. It would give the Kaiser a chance to pose as a martyr, a thing that should be studiously avoided.

* * *

THERE is greater ingot capacity in United States than there is capacity to turn out the finished product. During the war the call was for ingots for forging into shell steel. It is hardly likely that it would be practicable or possible to secure full capacity for the furnaces under these conditions.

* * *

SOME wise men have it all figured out that people should produce more and save more. With the first suggestion no person is going to find fault, but with the latter there is good reason to start an argument. Will some of the wiseacres please go into detail and show how anything can be saved while everything necessary to existence camps on a peak-load basis?

We're All Friends---and We All Profit

By W. H. KELLER

President, Keller Pneumatic Tool Company

TOM CHAPLEY was stumped by a piece of work on the heavy milling machine that he runs. The foreman was busy with some other rush work, so Tom appealed to me to help him adjust his machine. While we worked it out together my shirt lost its dignity.

Meanwhile a business acquaintance dropped in. Someone told him to go right out into the shop. He appeared, greatly surprised; I was oily and disheveled.

"How do you manage to preserve any working discipline when you are so free-and-easy?" my friend inquired. "If I helped out one of my men, he would lose no time in passing the word that it was time to 'jump the old man' for more money."

My friend was right. His men would "jump" him. The difference, as I happen to know, is that my friend commands, while I guide. His office is his office; my office is everyone's office.

We made some big changes when we moved our plant to Grand Haven, Michigan, in September, 1915. Many of the "old timers" came along with us; but we enlarged and eventually took on so many new people that it amounted to a brand-new outfit. We have no moth-eaten traditions to observe; no false ideas of the employer's dignity. We got off on the right foot—on a really friendly basis. There we have stayed ever since.

"Here's how I reasoned out my plan for working with others. I set down the three main points for my attention:

1. The right personal contact.
2. An effective general organization policy.
3. Welfare work that counted for, not against, the company.

The right personal contact between workers and employer is mighty difficult to get. The mere physical task of getting out among the men is easy. But that may be far from real "personal contact."

It depends largely on how much real sympathy the employer has with his workers. Some employers—thrice blessed—are apparently born with this fellow sympathy. Most employers have it to acquire. The employer who cannot acquire it must usually hire some man with understanding and sympathy to represent him to his workers. Workers instinctively recognize real friendship, and as instinctively reject sham. Sham friendship leaves the worker cold; it helps instead of hindering professional labor agitators.

The incident I have related shows my attitude toward the shop boys. It's the same in the office. For example, our business keeps everyone in the drafting room pushing; there is no apparent end to the number of plans and designs we have to turn out, usually in a hurry. It is not uncommon for one or another of the draftsmen to come in and ask me about some point in the work, just as the machine operator asked me about the adjustment.

I have never gained the impression that the boys in either shop or office think it strange that I am around them so much. They don't pay any special attention to me; and they never put on the false hustle you see in some plants when the boss happens to make an inspection.

Personal contact with our workers doesn't end when the closing whistle blows. I don't want it to.

We have athletics, encouraged by the company. I play basketball and indoor baseball two or three nights a week in winter, or bowl. Incidentally, the exercise helps keep me in the best kind of physical trim.

We have a considerable number of women workers in our plant. They play basketball, too. I go to just about all the dances in town, and usually dance at least once with each of our girls there. We often have home parties, and I attend when I am invited—which is most of the time.

My personal friendship with the workers is something I would not give up. Never have I been imposed upon; and the familiarity which has been built up has never—as far as I know—held the slightest tinge of contempt on either side.

The general organization of the work—the second point of the three I mentioned—is important. When I say "organization" I cover it by the entire daily conduct and routine of the plant and personnel.

Never, if there is another way out, do I give orders merely as orders. One of our executives remarked the other day that, to hear me outlining the work, he might almost suppose the other fellow was doing the ordering. Perhaps he is right—but the method gets results. Sometimes, even, I can handle it so that the other fellow believes the suggestion is his own. If it happens this way, so much the better.

I want to make one other point about organization, in connection with building pride in the company. I find that one of the best ways to do this is through our advertising. During the past few years we had so many orders ahead that advertising merely to get more was unnecessary. So I directed the appeal in our copy to the men. Many of these advertisements I had framed and hung up around the plant. They had a big effect on general morale; the workers displayed a lot of interest, and commented on them frequently.

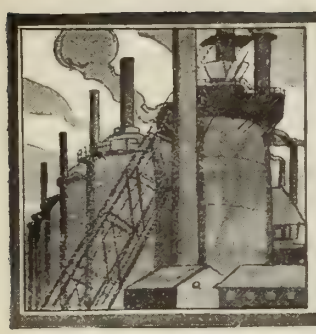
I favor practical welfare work as opposed to the sort which spends a lot of money and gets nowhere. For example, last winter I was told that some local grocers were profiteering. At once we prepared to sell groceries to our people, at cost. The grocers came into line quickly. That's an example of practical welfare work, as I see it.

The first year we came here our gross business was $60,000; last year—our third—it was about $2,000,000. We realized from the start that the best and easiest way to get the friendship of our workers was through friendly co-operation. And the growth of our business has been possible only because the men and women who work in our shops and offices, the men who have invested in this business, and the men who manage it, are real friends.—From *System*.

IF THE best we can do for the foreigner who is regarded as undesirable is to deport him, it is a small tribute to our boasted civilization. Of course, there are cases where no other course is advisable, but have we ever made an honest effort to show the foreigner that we have something better here than he was accustomed to in the land he left?

PORTLAND, ORE., it is reported, will build 5,000 houses to absorb surplus labor. How long will enlightened communities tinker away and simply bridge over conditions that will spring up again when the supposed cure is removed?

IN A Chicago hotel fire 1,700 men escaped in their night attire. In such a case the pyjama habit is much more becoming than the old Mother Hubbard style of nightdress to which some of the sterner sex still adhere.



MARKET DEVELOPMENTS

Old Country Lines Too High to Get Business

They Also Refuse to Put in Tenders as They Are Asked For—Increase in Production of Steel is Well Maintained in Pittsburgh District

IF buying in general were as large as it is with some of the firms in Ontario just now there would be a large volume of business in the iron and steel trade. The firms buying now have Government contracts of one kind and another, and the placing of more ship contracts is going to mean busy days ahead of several of the yards along the Great Lakes and the St. Lawrence.

It is worth noting that British chains and anchors are having trouble in getting into the Canadian market. They were put to the test just this week in a contract, but the business went to a U. S. firm. The price of the Old Country material was about ten per cent. too high, but there is another reason that was against them. There were so many provisions as to price being altered if there were a change of hours, etc., that the figure could not be counted as final. Also the British firms persist in naming a flat price per pound for anchor and chains, combined, while the customer particularly specified that the price on chain and anchor was to be separate. The Old Country firm in question refused to tender in this way and as a result the tender was hardly considered as it could not be compared with other figures that put a price as asked for.

While not looking for higher prices for such lines as sheets, etc., it is worth noting that mills have withdrawn all concessions that have been offered for some time past, and several large sheet mills have withdrawn from the market, booked up for the time at least. One large manufacturer stated this week, "The buyer that puts off too long is going to get left."

Prices on machine tools show no inclination to come down to anything approaching the pre-war state. It seems much easier and more comfortable to stay up than make the effort of a come-down. In fact, predictions of higher prices are freely made.

MONTREAL SCRAP DEALERS AGAIN MARK UP THEIR BUYING SCALE

Special to CANADIAN MACHINERY.

MONTREAL, Que., July 10.—What effect the signing of peace will have upon Canadian business and industry generally, is more or less problematical, as there has been little indication, so far, that the event has been anything more than one of many factors making up the conditions under which we are all working, but it is safe to say that the world at large is more satisfied now that the treaty awaits the ratification of the respective Governments, and when this stage is finally reached, we may look forward to more reasonable consideration of the world's industrial problems. A local steel dealer, recently returned from England, states that conditions there are in a chaotic state and that Canada is fortunate in maintaining the fair state of stability that has been shown since the termination of hostilities. Strike conditions here are still affecting industry, and adjustments are being made in many instances; Canadian Vickers men are still out, but settlement is looked for shortly. Steel requirements are light and dealers, while still optimistic, do not anticipate any marked improvement until the fall. Some little structural material is going, but the demand shows no great expansion in the building lines. As one dealer said: "Manufacturers are only buying to cover their immediate needs. Few are willing to embark on heavy expansion or construction, under existing high costs, with the prospect that building and equipment would deteriorate greatly in value in a few years."

Metal Strength Continues

"Business cannot be said to have shown any marked improvement as a result of peace being signed, but it is undoubtedly true that activity in some lines is of an encouraging character. The movement of metals, while not showing any material increase, is nevertheless of a steady nature and inquiry would imply that the present good demand would continue." This statement, made by a dealer here, seems to characterize the present metal situation. The consumer, it would appear, is still influenced by circumstances and purchases are being made on the basis of existing requirements, little business being placed for future needs. In some respects this might be considered as a good sign, as it would indicate that consumers are not carrying large supplies in face of possible developments. There is, however, little to show that an easier market will arise in the near future; with world business assuming normal conditions, demand for all materials should gradually increase and present high costs of production will virtually prohibit any marked decline in any of the metals with the probable exception of tin, which may develop an easier tone in the coming weeks. Europe's need of copper is well known and a return to normal trading conditions will naturally result in the absorption of large supplies, particularly copper. Montreal dealers are quoting 23 cents for lake copper, and 22 cents for electric and castings, a one cent advance on the week. Tin is firm at 55 cents, with plenty of metal available; trade restrictions are virtually all removed and shipments are quite regular. Spelter and lead are both down ¼ cent, the quotations being 9 and 7 cents respectively. Aluminum demand is steady on a decline of one cent, the price quoted being 35 cents per lb.

Quiet Week in Machine Tools

While business cannot be said to be dull, reports appear to indicate that the past week has been exceptionally quiet, the holiday and the middle summer season being partly responsible for the quiet market, a factor of disinterest seemingly pervading all trade circles. What few sales have been recorded are almost confined to one or two in a lot, and the greater proportion for used equipment. As one dealer put it: "There is generally sufficient to demand our presence at the office, but sales are of a quiet character. While we anticipate better times ahead, these may not materialize for some little time yet."

Steady Demand Maintains Strength

Despite the fact that steel business in this district is below normal, the activity in old material is of a steady character. Local consumption is only fair, but considerable material is going to the States as a result of the better demand from the American mills, many of which are evidently increasing their output. Foundries continue to absorb cast iron scrap, but the volume going in this direction is light in comparison to that of a year ago. Present buying would apparently indicate that little thought is given to future requirements, as the movement of scrap is confined almost exclusively to immediate needs. A factor that assists in maintaining the market at a high level is the fact that much of the material that is brought into the yards is brought in by the small peddlers that go from place to place, gathering up the remnants of the war period. These men insist on high prices for their "product." Dealers take the stuff, knowing that existing conditions point to a period of continued strength, and one that will be further emphasized when developments take a turn for steady and regular expansion. Coppers are quoted up from 1 to 1½ cents, the range being from 13½ cents for light to 17½ cents for crucible. With the exception of zinc, all the scrap metals have been advanced. The same tendency is shown in iron and steel, and advances, while not general throughout the list, are reported on the different lines, principally on boiler plate, malleable and cast iron scrap, the advance being $2, $3 and $2 respectively. Other lines to advance and the current quotations are, heavy melting steel, $12; shell turnings, $7; wrought iron pipe, $9; and stove plate, $15.

POINTS IN WEEK'S MARKETING NOTES

Pittsburgh reports this week state that the production at the steel mills is sustained and real. Buying is becoming larger and more general.

—

Warehouse interests in Canada are buying quite heavily now, on much the same plan as they did before the war. They are placing their needs for three months or so, which goes to make up the sort of tonnage the mills like to get.

—

Montreal scrap metal dealers marked prices up this week. This was not done in Toronto, although dealers in the latter place are ready to admit the strength of the market.

—

Sheets may not go to a higher figure for some weeks, but it is worth noticing that the concessions which many mills have been in the habit of making are being withdrawn, while a couple of mills have gone off the market for the time, booked up.

—

The Canadian National Railways are in the market for machine tools for the Western Canadian shops, and for taps, reamers, etc., for the St. Malo shops, equipment for which was placed some weeks ago.

—

There is a good amount of business in sight in Ontario for the machine tool trade. Of course the used war machinery is still a factor to be reckoned with, but dealers admit readily that it is not bothering them as much as anticipated at the beginning of the armistice.

—

There are several large firms of boiler and engine builders in Ontario that are placing very large orders for steel this week. A large tonnage is involved.

SOME FIRMS TAKE IN LARGE AMOUNTS

But the Business in Several Lines is Largely Local Rather Than General

TORONTO.—If buying in general were as good as it is in some local instances there would be a very large amount of business moving in the Dominion just now. As it is buying is very heavy in some lines, and practically at zero in others.

There are several large propositions under way, and announcement of these will no doubt be forthcoming in a few days or weeks now. There is still the same feeling of uncertainty regarding the outcome of the strike in this district. It is poor business that it is not settled, and the continuance of the strike is doing harm to both sides that it will take some time to overcome.

More Railroad Equipment

The western divisions of the National Railways are coming in for their share of attention just now, and big lists have been out for some days, asking for tenders on a list that has some 60 machine tools of all kinds in it. Many of the dealers have sent in their bids for this equipment, and the award should mean good business.

The same buyers are now in the market for the small tools such as drills, taps, reamers, etc., for the St. Malo shops. The lists for the machine tools for this was out some time ago, and the work was pretty well secured between the Canadian makers and the equipment which the Government had on hand in the gun shop at Quebec.

The chances are that there will be some fairly keen bidding for the last list that is out, viz., the drills, taps, reamers and other similar lines. Some of the agents have been waiting for this business to show up for some weeks, and are well prepared to go and make concessions to land it.

There is a fair amount of buying going on now, and some of the machine tool men are well pleased with the amount of business they are securing. There are several good-sized developments under way, and they are going to count largely in the volume of business that is booked. Buildings are being put up to house good-sized plants. As noticed in previous reports there is no material change the strike situation in this district. It is making the going poor in more ways than one, and business continues to drift into new and strange channels because the people who want work done cannot receive any promises of delivery from the shops. There are rumors, some of them apparently well founded, that say that a settlement is near. Others again say that many of the strikers have left the district to secure work elsewhere.

Concessions are Withdrawn

Prices are firm in the steel market. A. T. Enlow, president of the Sheet Metal Corporation, Hamilton, stated to MACHINERY this week that there was a firmer tone to the market for sheets and kindred lines. "I would not state that we could look for higher prices right away, or even soon," he remarked, "but it is a fact that in nearly all the mills the concessions that have been common for some time have been almost entirely removed, and some of the mills, you will notice, have retired from the market for the time, being well filled with business."

The trouble just now is that buying is too local. Were it as big all over as in some points it would be great. Plates are being asked for in two Ontario shops in very large quantities. In one order there were two items worthy of notice. One was for nine plates with a total weight of 31,000 pounds, another for eight plates that weighed 30,000 pounds. There was enough material to make five cars or so, and the business went through a Toronto warehouse early this week.

Buying In Old Way

"We are buying now as we did before the war," stated on of the warehousemen to MACHINERY this week. "For a long time past nearly all our business has been of the hand-to-mouth sort. We have simply taken the business that came and passed it on to the mills. Now we are buying in quantities that should put our stock in good shape for a quart-

er. Deliveries are spread over this time and will be more or less protected against any increase in price. We do not look for a decline at the present time. In fact prices are firmer, and the man who is putting off his buying is going to be left."

The Old Country Trade

One contract that came up a few weeks ago, and tenders for which are placed this week, called for chains and anchors. Bids were asked from Old Country firms by their Toronto agents, but there is very little chance of them securing the business. In the first place they are high in price, and in the second place they will not place their tenders as they are asked, in order that comparisons may be made with bids from the States. "There were too many qualifying clauses in the English tender," stated the Canadian firm handling this line. They had provisions that meant that their price was off if changes were made in hours of work or half a dozen other things. In fact their bid was not definite enough to put in. Then again the English concerns insist on putting in their bids their own way. They lump the chains and anchor, and put in a price to cover the whole equipment, whereas the firms buying in this country ask for and insist upon a price per pound on chains and a price per pound for anchor. The Old Country houses will simply let us go by the board rather than make the concession."

It is understood that the British firms are still quoting about ten per cent. too high, and, in consequence, the business, or all of it that does not specify Old Country lines, is going to U.S. points.

The Scrap Metal Markets

There is a movement on the part of some of the dealers to let go of a considerable part of their holdings. They figure out that prices are not going to jump very much higher, especially in coppers. In fact it may be that they are now near the level that will make about as good selling as can be expected for some weeks.

Fairly large shipments of iron and steel are being made to the U.S. market. Canadian mills and foundries are not taking up very much material.

STEEL MILL OPERATIONS ARE NOW GETTING CLOSE TO CAPACITY AGAIN

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., July 10.—Pig iron production in June was at the rate of about 26,100,000 tons a year, the rate showing an increase of an even million tons over the rate in May. This is the first increase in pig iron production since before the war ended. Last September the record rate was attained, 41,900,000 tons, and month by month thereafter there were successive decreases. The turn has now been rounded. It is possible, however, that July will show little if any increase over June, because midsummer brings such high humidity, cutting down individual blast furnace outputs. There is, at any rate, a greater furnace capacity in blast than the average of June.

A curious feature of the showing for June is that the increase in output over May was almost entirely on the part of the merchant furnaces. There was no material increase in the number of merchant furnaces in blast, and the conclusion is that in May some of the merchant furnaces in blast did not produce their full outputs, being gated down, something that is quite feasible with a well built and managed stack. The merchant furnaces have been quite opposed to piling iron. Many merchant furnaces are idle and they will hardly get into blast until they are certain of being able to dispose of their output substantially as fast as made. At the moment there is no such prospect, since the recent buying movement has played out, and, while the furnaces in blast are comfortably filled with orders through the third quarter of the year, and into the fourth quarter, the consumers are no doubt covered in a corresponding way for their requirements. An increased demand for their products is requisite for the development of another buying movement in the near future.

Mill Operations Increase

Steel mill operations on July 1 were running at the rate of fully 65 per cent. of capacity, and there has been a slight further increase since then. A 70 per cent. rate may be attained within two or three weeks as there is a continued tendency to put more capacity in operation since the orders received have been consistently running ahead of the shipments made. The low point in operation was about 50 per cent., at the middle of May, the month as a whole showing an operation of 54 per cent., against 65 per cent. for April, and an estimated 60 per cent. rate in June, the official figures for June not being available as yet.

Now that steel mill operations are increasing, and so sharply, the fact should be pointed out that a 100 per cent. operation, on the basis of the monthly reports used for computing these percentages, is in all probability not necessary to bring about full operation of the steel industry as a whole. The only production reports made are of steel ingot production, but steel ingots are not an ordinary commercial proposition. The demand is for finished steel products, in the various forms of bars, shapes, plates, sheets, wire, etc., produced from ingots through the various finishing processes. It is practically certain that the capacity for producing steel ingots is in excess of the absorbing power of the various finishing departments, this arising from the fact that during the war many additional open hearth furnaces had to be built to produce ingots, on account of the heavy demand for shell steel, which was not rolled through any of the regular finishing channels. The result is an unbalanced industry. In ordinary times the total of finishing capacity has exceeded the ability of the steel departments to produce the raw steel, an excess being necessary because in one year the demand might run more heavily to certain products, and in another year it might run more heavily to others. Steel ingot capacity increased from 35,000,000 tons a year in 1914 to 49,000,000 tons at the present time, or 40 per cent., whereas outside the building of many plate mills there was but little increase in steel finishing capacity. While it is very difficult to estimate, it is probable that the various finishing departments, excepting the rail and plate mills, would probably be filled up solidly before the requirements in ingots ran beyond 85 or 90 per cent. of the capacity. If so, one does not need to look for steel mill operations to attain one hundred per cent. before there is full activity. Taking it that ingot production was 50 per cent. of capacity at the middle of May, and 65 per cent. on July 1, the increase in that short space of a month and a half represented between one-third and one-half the total progress necessary to bring virtually full operation to the steel industry as a whole.

Little Effect from Midsummer

Almost invariably the steel market slows down for July and August, the midsummer months. This year no such seasonal influence has been felt, thus far at least. This is regarded as indicating that business is so ready and anxious to go ahead that it cannot take a vacation, but even if there were some slight relaxation at this time it would be only temporary.

Furthermore a few branches of the finished steel trade are now so well filled with business that they can take no more for early delivery. The butt weld departments of the pipe mills are sold up solidly for several weeks, and the wire mills are practically sold up, particularly on nails. In sheets there is a very fair volume of business on books and delivery promises have lengthened. But before the end of June sheet mills began advising their customers to place specifications for August rollings if they wanted to insure against disappointment.

Labor Supplies

For two or three months past there have been predictions that eventually a labor shortage would develop as manufacturing and building operations should expand, but there was an indisposition to set a definite time for the shortage to develop. Now it is the common observation that the shortage has very nearly put in an appearance already.

There is very little unemployment, yet there are orders on the books of mills and factories and contracts for construction jobs let that will involve the employment of more and more labor week

by week. In addition to increasing employment there is more and more emigration, and some mills have found by making actual canvass among their employees that very considerable percentages of the foreign born intend to go to the lands of their birth as soon as circumstances permit. All talk of prospective wage reductions has, of course, disappeared, and here and there wage advances are occurring.

THE TURN UPWARD HAS AGAIN BEEN MADE IN PIG IRON MARKET

AFTER a steady decline in the output of pig iron since September last, when it reached its highest peak, the turn has again been made upward. The output for June was the highest for any month since that date. Following are reports from various U. S. points:

Pittsburgh.—A slackening off in the market for foundry iron has been noted this week, the reason being that most makers have covered their requirements for the last half. There is no demand so far for Bessemer or basic grades. Prices are keeping firm, with basic at $25.75.

Chicago.—After a heavy rush of business during June, the market is going through a period of rest. It is held that many makers were conservative in their buying for last half, and will have to come into the market again. Enquiries for small lots up to 1,000 tons are still coming in for foundry grades.

Philadelphia.—There is a disposition on the part of some furnace interests to blow in idle stacks as soon as business offers, and this will tend to keep prices from going up. There is one sale of basic reported between 6,000 and 7,000 tons at $26 furnace. Enquiry is weak for foundry grades.

Buffalo.—After the first three weeks heavy buying the last week of June showed a falling off, and the past week's sales have fallen off still further. Third and fourth quarter requirements are responsible for a fair enquiry for foundry grades. The March 21st schedule is being maintained, and the outlook is held to be good.

Cincinnati.—Quite a few sales of small lots, averaging about 500 tons, were made for last half shipment, mostly to Ohio smelters. Sales generally were considered good, but the enquiry is not very brisk. Another furnace will be blown in shortly.

Birmingham.—The demand in this district is keeping steady, and the Republic is reported to be about to blow in another stack. A good volume of sales has been made for fourth quarter, and a large interest is said to be fully stocked up for the last half of the year. The output of iron castings is increasing.

St. Louis.—There have been no changes in price though the market still continues dull. Neither sellers or smelters are willing to engage themselves very far ahead, and it will take an active general movement to make any change.

New York.—A period of quietness has apparently set in in this district. For No. 2x $27 Buffalo is quoted, and the same grade of $28 eastern Pennsylvania. Till ocean freight rates are better export business is stagnant. One sale of 250 tons for Dutch East Indies is reported.

Cleveland.—There has been an easing up after the brisk market movement of the past few weeks, but a fair volume of business was done during the week. Foundries seem to keeping pretty busy, which is keeping up the demand for pig iron. Steel making grades are not in demand.

SCRAP MARKET NOT DOING SO WELL AS IT WAS A WEEK OR SO AGO

The market for foundry scrap is dull, trading being confined mostly to dealers. However, there is a pretty widespread demand for the steel making grades. Following are reports from United States points:

Pittsburgh.—A strong demand for steel making scrap and a short supply are the market features in this district. Heavy steel, borings and turnings are all eagerly sought. The foundry grade is not asked for. Heavy melting steel has sold at $19 per gross ton delivered.

Chicago.—Dealers are buying up Government and railroad scrap as it is offerred at prices which are steadily advancing. Dealers are holding on to their stock in expectation of further advances, but the opinion of the consumers is that prices are too high. This keeps trading within very confined limits.

Philadelphia.—Considerably over 5,000 tons of heavy melting steel has been sold at a price of $18 to $18.75 delivered. Low phosphorus melting scrap is quoted at $23 to $24 delivered, if guaranteed .04 or under in phosphorus. Steel rails for rerolling are quoted at $18.50 to $19.50 delivered.

Buffalo.—With no demand from consumers in the district to or from outside points dealers are doing all the buying in sight. They seem to have no doubt about being able to dispose of their stocks at an advance. Heavy melting steel is quoted $16.50 to $17 f.o.b. Buffalo.

Cincinnati.—With a good demand and improving business nearly all grades of scrap advanced in price last week. Steel rerolling rails are in good demand as is also No. 1 railroad scrap. Heavy melting steel is quoted f.o.b. dealers' yard $14.50 to $15.

New York.—An increase in all grades, but chiefly in heavy melting steel, is noted here. The latter has jumped around $1 per ton in the last week. A 2,000 ton lot of mixed scrap, including about 60 tons copper wire, brought a bid of $20.36, f.o.b. Morgan, N.J.

Cleveland.—A dealers' market in heavy melting steel borings and turnings obtains in this section. Dealers are paying $19 per ton for heavy melting steel, but mills will not offer more than $18.50 for the same grade. Prices are holding firm. $21 is reported to have been paid for low phosphorus melting scrap.

Birmingham.—With consumers pretty well stocked up, the market is dull, and no immediate betterment is looked for. Steel rails are quoted at $12 to $14 per gross ton, and cast iron borings at $6.50 to $7.50.

St. Louis.—From this centre comes the report that the only market is a dealers' market. Scrap offerings have been light at the latter end of the month, but lists put out earlier brought good prices.

BIG FRENCH CONTRACT

Rebuilding of Nancy to be Undertaken —Price is About $250,000,000

A contract for the reconstruction of buildings, bridges and other structures in the district of Nancy, France, has been entered into between the Vulcan Steel Products Company of New York and a committee representing the French Government. McArthur Brothers, one of the largest railroad contracting firms in this country, have received subcontracts covering the excavation and masonry involved, while the McClinton-Marshall Construction Company will supply the bridge and structural steel work. The minimum amount named is $250,000,000, but it is understood that this only a tentative figure and that the final sum involved will probably be considerably more.

Negotiations had been entered into between the committee of Nancy and Rodney D. Chip, general manager of the Vulcan Company, and the contract was signed about a month ago. On account of the size of the project it is not believed that operations will begin before next spring.

At present exchange with this country is heavily against France and with the hope of bolstering the rates, which have declined during the last three months to a point not reached during the war, the French Government has been loath to allow any dealings which would involve further payments to this country. Imports are being strictly controlled and for this reason the announcement of the signing of such a contract was received with some surprise by the financial community.

It is understood, however, that all obstacles have been overcome. The in-

Continued on page 42

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

Lake copper	$23 00	$21 00
Electro copper	22 00	20 75
Castings, copper	22 00	18 00
Tin	55 00	55 00
Spelter	9 00	8 50
Lead	7 00	6 50
Antimony	9 50	9 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$13 50	$12 00
Copper, crucible	17 25	15.00
Copper, heavy	17 50	15 00
Copper wire	17 50	14 50
No. 1 machine composition	13 50	14 00
New brass cuttings	10 00	9 00
Red brass cuttings	11 75	9 00
Yellow brass turnings	8 50	6 50
Light brass	7 00	5 00
Medium brass	8 00	6 00
Scrap zinc	5 50	5 00
Heavy lead	5 00	4 00
Tea lead	4 00	3 00
Aluminum	16 00	12 00
	Per Ton	
Heavy melting steel	12 00	9 00
Shell turnings	7 00	6 00
Boiler plate	12 00	8 00
Axles (wrought iron)	17 00	15 00
Rails	12 00	11 00
Malleable scrap	15 00	12 00
No. 1 machine cast iron	20 00	15 00
Pipe wrought	9 00	5 00
Car wheels	20 00	18 00
Steel axles	20 00	20 00
Mach. shop turnings	5 50	5 00
Stove plate	15 00	10 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅝" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅝ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sies up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, al sizes	40 plus 10
3-fluted drills, plus	10
Jobbers' and letter sizes	40 plus 10
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 50
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings. 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head.28 B.W.G.	.....	.....
Fleur-de-Lis. 28 B.W.G.	.....	.....
Gorbal's Best. No. 28	.....	.....
Colborne Crown. No. 28	.....	.....
Premier. No. 28 U.S.	.....	7 50
Premier, 10¾ oz.	.....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

B

¼ in., $14.35; 5-16 in., $13.85; ⅜ in., $13.50; 7-16 in., $12.90; ½ in., $13.20; $13.00; ⅞ in., $12.90; 1 inch, $12.65; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $13.00; 3-16 in., $12.50; ¼ in., $11.75; 5-16 in., $11.40; ⅜ in., $11.00; 7-16 in., $10.60; ½ in., $10.40; ⅝ in., $10.00; ¾ in., $9.90.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10%		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated.

demnity due from Germany under the peace treaty is understood to be the source of the funds which will be used in making payment for the work and it is believed that the Government of France will issue some form of security in anticipation of the indemnity payments. The du Pont interests are arranging the transaction's financial details.

The city of Nancy, just behind the battle line, sustained considerable damage from air raids, though the Germans never turned their artillery upon it, probably because they counted upon possessing the city after the war and did not wish to damage it. The neighboring district, however, sustained great damage.

SHIP CONTRACTS TO BE GIVEN OUT

Statement From Ottawa About Building To Be Carried on This Season

According to information received from the representative of CANADIAN MACHINERY at Ottawa, the Government will shortly give some more contracts for ships to the Collingwood Shipbuilding Company, and the Dominion Shipbuilding Company. They will also give some to another of the St. Lawrence yards.

SERIOUS EFFORT NEEDED ON PART OF CANADIANS TO GET CHINESE TRADE

IT is quite evident that Mr. Ross, Canadian trade commissioner for China, is not greatly impressed with the seriousness of the efforts that Canadians have made in the past to go into the great Chinese market and sell goods to the millions of purchasers there.

This fact and others came out in an interview which CANADIAN MACHINERY had with Mr. Ross during a short stay in Toronto a few days ago. "There is too much pressure on the land in China," remarked Mr. Ross, "as fully 80 per cent. of the four hundred million people live off the land. They have not developed their natural resources to any extent. There is going to be a development in China. I am not disclosing any secrets when I say that certain powers are going to take China in hand," continued Mr. Ross, "and there will be loans made for development purposes."

"What about the machinery situation?" inquired the reporter.

"There will be a market there—in fact it is there now," he replied, "for mining machinery, cotton and flour mills. There are large engineering firms at Shanghai and Hong Kong. There is no reason why our engineering firms should not go into that field and get a fair share of the business that is offering. There will be bridge building to be done on a good scale and other works of a similar nature. Canadians going into that field will understand, of course, that they will have to compete with the world. In such a field they could ask no favors, and they would not be under any particular handicaps. It is as easy to send material to China from Canada as from England. The Chinese market requires steel bars for reinforcing, corrugated sheets, tin plates, wire, nails."

Mr. Ross made it plain that in many lines the goods sent to China would have to be made down to a price. This did not hold good in reference to machinery, and he advised that no Canadian dealer or maker should risk his reputation by putting a machine in that country that would not stand up and do the work. Japan had ruined her chances by this very thing, trying to put inferior material off on the Chinese trade

"Above all else," concluded Mr. Ross, "the Canadian trade has got to make up its mind to get closer to the people of China if they are going to sell to them. It is no use standing ten thousand miles off and dangling the goods in the air. There has never been a serious, concerted effort to capture the trade of that great nation. The Canadian manufacturers have never yet got down to hard pan in this matter. In less than a quarter of a century China will be one of the greatest customers in the world. The English language is all that is necessary to do business with. The opportunity is there, but it is up to the Canadians to get together and seriously enter the Chinese market." Mr. Ross intimated that he was only too pleased at all times to help the Canadian trade, and answer all inquiries about the Chinese field. He can be located by addressing the Department of Trade and Commerce, Ottawa.

PRICES WILL NOT BE LOW

"I am rather a firm believer in the natural economic laws, and I do not find myself in accord with the impression that many people seem to have that the level of prices is not likely to be radically changed over the decade," said John D. Ryan of the Anaconda Copper Co. "I believe that prices must be made that will equalize consumption and production.

"We have seen some sharp adjustments already from war prices, and in every product in which the companies with which I am connected are interested prices have gone back to pre-war averages, and in some cases lower. These products are copper, zinc, lead and manganese.

"I do not believe that the level of prices will fall permanently as low as before the war, but I am convinced that we can now look for gradual adjustments in most staple products. I think prices will have to be put where building and development of all kinds must be encouraged before we will see consumption approach production of the staples.

"I think in the adjustments which are necessary labor will have to contribute its share or unemployment on a very serious scale is bound to result. I hope, however, that the intelligence and foresight of those who have to settle these questions will be such that every consideration of the needs of those who work for wages and salaries will be considered before profits, and that reductions in wages will take place only where it is imperative."

WHAT IS "KINITE"?

Continued from page 33

readily made of "Kinite" can be gained from the accompanying illustrations, which show the rough castings for a large circular die for drawing milk cans. The finished die, shown in the larger illustration, weighs 141 pounds, is 13 in. inside diameter and 4⅞ in. deep. The mean out-of-round, after hardening, was .003, a change so slight that no grinding was required, and as the surface was smooth, showed absolutely no scale, and was so near the required size that it was used just as it came from the fire without any additional work.

A superintendent of a large metal stamping company has been using "Kinite" dies for several years. On a job requiring three "Kinite" dies two of them were in perfect condition after drawing 116,627 pieces, while the third broke off at the point on the 94,227th piece. With regular carbon steel he averaged only 22,000 pieces on the third operation, when it was necessary to rework.

Another "Kinite" die, which he uses for forming a handle from 16-gauge sheet iron, has run 75,000 pieces thus far and shows no wear at all. With regular carbon steel reworking is necessary after 25,000 pieces.

The Kinite Company, of Milwaukee, who handle this product, state that further information will be gladly forwarded to those interested.

Help for Farmers.—The present situation with regard to farm help shortage in Brant County is so acute that the Brantford Chamber of Commerce has appealed to the manufacturers of Brantford to draw this matter to the attention of their men during stocktaking, or when men are let out for any other reason. It is emphasized that wages being paid in the country at the present time are equal to city wages.

INCORPORATIONS

The Alberta Pioneer Canning Co., Ltd., has been incorporatde with a capital stock of $40,000 in 800 shares of $50 each. The company will carry on the business of fruit packers, etc., and the head office of the company will be in Edson, Alta.

The firm of Doheny, Quinlan & Robertson has been incorporated with a capital stock of $2,000,000 in 20,000 shares of $100 each, the head office to be in Montreal. The firm will carry on the business of general contractors and engineers.

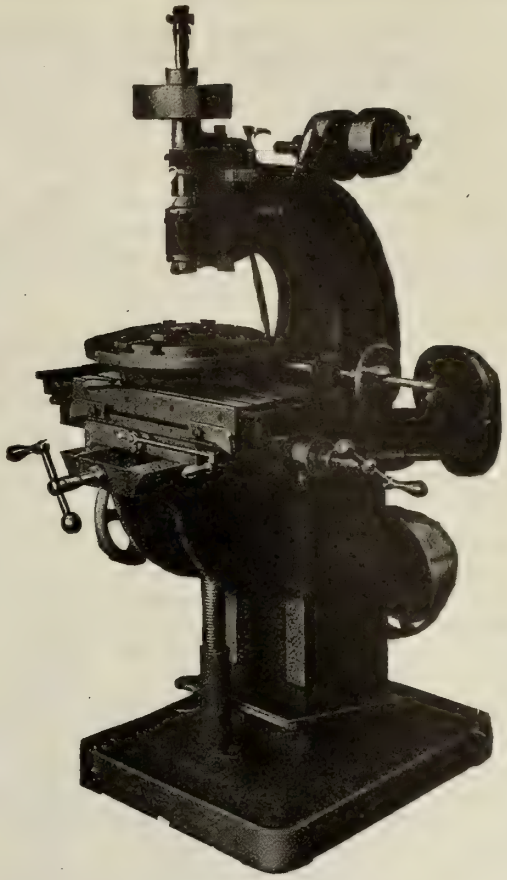
BECKER

Belt Driven Millers

The Machine that Gives the Smooth Finish

Stringent shortage of labor during the war put a premium on machinery of superior productive ability. Never was the capacity and value of Becker Millers better emphasized than during that period. And Becker Millers will always continue to demonstrate their ability to return maximum production for minimum expenditure of manual effort.

Send us blue prints of your work and other data and we will submit estimates on Becker production. Adopt this "safety-first" course; it may mean added profits to you.



The A. R. Williams Machinery Co.
LIMITED, TORONTO

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited
Steel Foundry Division, Lachine Canal
Head Office: 187 Delisle St. MONTREAL
Phone Victoria 1492

MORROW SCREWS MORROW

MORROW
INGERSOLL

In assembly you should use only the best "Morrow's."

Best Jobbers carry "Morrow's."

Set Screws, Cap Screws—"It's the finishing die that does it."

Nuts (every variety of finish).

Twist Drills, "will do more drilling with less regrinding."

Order Ingersoll Files from us, "they cut faster and wear longer."

John Morrow Screw & Nut Co.
LIMITED
INGERSOLL - CANADA

Always, everywhere, use "Morrow" products. Made just a little better than seems necessary.

DRILLS FILES MORROW MORROW NUTS MORROW

WELDER IN R. R. SHOP AT NEVERS, FRANCE, RECEIVES D.S.M.

When America put her strong hand to the task of war, nowhere did her effort tell with greater effect than in the great car shops where the men who had linked two oceans and laced a continent with steel, pulled denims over their O. D.'s for the fight behind the lines.

One of these men, Buck Private Matousek, now master engineer, wears the Distinguished Service Medal, and wears it with the satisfaction of knowing that the work he did amid the roaring machines of the great shop at Nevers was worth as much to his country as many a deed of glory at the front itself. Matousek was the man who, upon his own personal initiative, and thanks to his peculiar skill as a welder, saved many thousands of dollars and many thousands of still more precious moments by healing wounded locomotives and putting them back to active service.

The war couldn't have been won without locomotives, and without men expert in the operation and repair of locomotives. What American railroaders and machinists accomplished in France astounded the French railroaders and mechanical experts. It was one thing to bring to France an enormous number of locomotives and cars, together with ample equipment. It was another thing to keep not only these locomotives and cars but many of those of the Allies in order.

One powerful locomotive could haul dozens of cars of munitions to the front. For every locomotive that was put out of the running and stayed out of it, dozens of cars of food, equipment and shells, needed at the front, had to stand still on a side track.

Under the terrific strain of war work the blown-out cylinder was a frequent occurrence. To wait for new parts meant interminable delay. And here Matousek stepped in and, despite the doubt and skepticism of some of his superiors, undertook to repair the breaks himself. He succeeded, and with such results that his work soon took on an importance that it resulted in the award of the D.S.M.

Instead of lying idle for weeks, locomotives that needed new cylinders were ready for action in four hours. Kneeling on the concrete floor, directing the white flame of his oxy-acetylene welding torch with the artistry of an expert, Matousek kept the wheels moving that carried the munitions and the supplies to the men in the forward lines.

Here at the great A. E. F. railroad shops of Nevers, America's effort is still visible. The buildings were made the repair headquarters of locomotives in 1918 and were turned over to the Americans for equipment. This they did with the finest equipment from the shops of the country that lead the world in railroading.

And now, with the war work over, American ingenuity is utilizing the plants as a school of instruction.

From all parts of the A. E. F. hundreds of students have come to Nevers. These men are receiving instruction from such experts as Matousek. The work of the shops goes on, and, right with it, the school work. The students act as apprentices and helpers. They are taking courses in welding, machine shop practice, tool making, heavy railroad blacksmithing and forging, foundry work, railroad electrical work, and other lines. And instead of delaying production, they are actually increasing it.—"Stars and Stripes."

BOOK REVIEW

The Construction of Graphical Charts, by John P. Peddle. The McGraw Hill Book Co. Price $2.

Much of the work of calculation done by the engineer and designer is in the repeated calculation of a limited number of formulae to a variety of different conditions, which involves merely the substitution of different variables in identical equations. Any mechanical means for performing this operation expeditiously will not only lead to a saving of time and mental wear and tear but will also minimize the chances for error. Such a device is the chart or nomogram, and the present work enters into its construction in a very clear and practical manner. Believing that the subject should be particularly useful to the practicing engineer who is often a trifle rusty in some parts of his mathematics, an effort is made to simplify the mathematical treatment. A series of illustrative problems has also been worked out in detail as it was thought by the author that these would afford a clear insight into the methods and a better understanding of the difficulties likely to be encountered than would be possible from a purely theoretical analysis. In the second edition of the work now presented a chapter on the use of determinants, in the plotting of graphical charts, has been added.

Contents

Charts plotted on rectangular coordinates; the alignment chart; the hexagonal index chart; proportional charts; empirical equations; stereographic charts and solid models; the use of determinants.

—From the "Passing Show" (London).

PLAYING POSSUM.

Germany's Statement to Her Creditors.

INCORPORATIONS

The Andian National Corporation, Ltd., has been incorporated with a capital stock of $1,000,000 in 10,000 shares of $100 each. The object of the company will be to search for minerals, oil, gas, etc. The head office of the company will be in Ottawa.

The United States Rubber Co., of Canada, Ltd., has been incorporated with a capital stock of $20,000,000, divided into 200,000 shares of $100 each, the head office to be in Montreal. The company will manufacture and deal in all kinds of rubber goods. The principals are Alexander Chase Casgrain, Errol Malcolm McDougall, Leslie Gordon Bell, Sadie Conrad Demers, and Edward James Waterson.

William Simon Morlock, Sydney Ellis Wedd, Roy Beverly Whitehead and Bruce Victor McCrimmon, solicitors, and Samuel Davidson Fowler, solicitors' clerk, all of Toronto, have been incorporated under the name of the Allied Packers of Canada, Ltd., with a capital stock of $10,000,000 in 100,000 shares of $100 each to deal in hogs, cattle, etc., and make food products of various kinds. The head office of the company will be in Toronto.

PHILADELPHIA FOUNDRYMEN'S ASSOCIATION

The above association held its 228th meeting at the manufacturers' Club, on Wednesday evening, June 4, 1919, at 8 o'clock, this being the last meeting until September.

The program for the evening was as follows:

H. A. DeFries, chief engineer of Hamilton & Hansell, Inc., Park Row building, New York, showed slides and gave a talk covering the Rennerfelt electric arc and melting furnace for melting steel, brass, copper, nickel, ferro-manganese, etc.

He based his explanations chiefly on the points of applying the proper way of electric heating at the proper moment. These points were not included in their last address.

Don't forget the A.F.A. and foundry exhibit beginning the week of September 29, at the Commercial Museum, 34th and Spruce Streets, West Philadelphia.

It will be the greatest event of the foundry world, as England, France and Italy will be there to show America what they learned in foundry practice during the world war.

The members of this association will give the delegates and their women folks a most cordial welcome.

The above is respectfully submitted.

THOS. DEVLIN, President. HOWARD EVANS, Secretary.

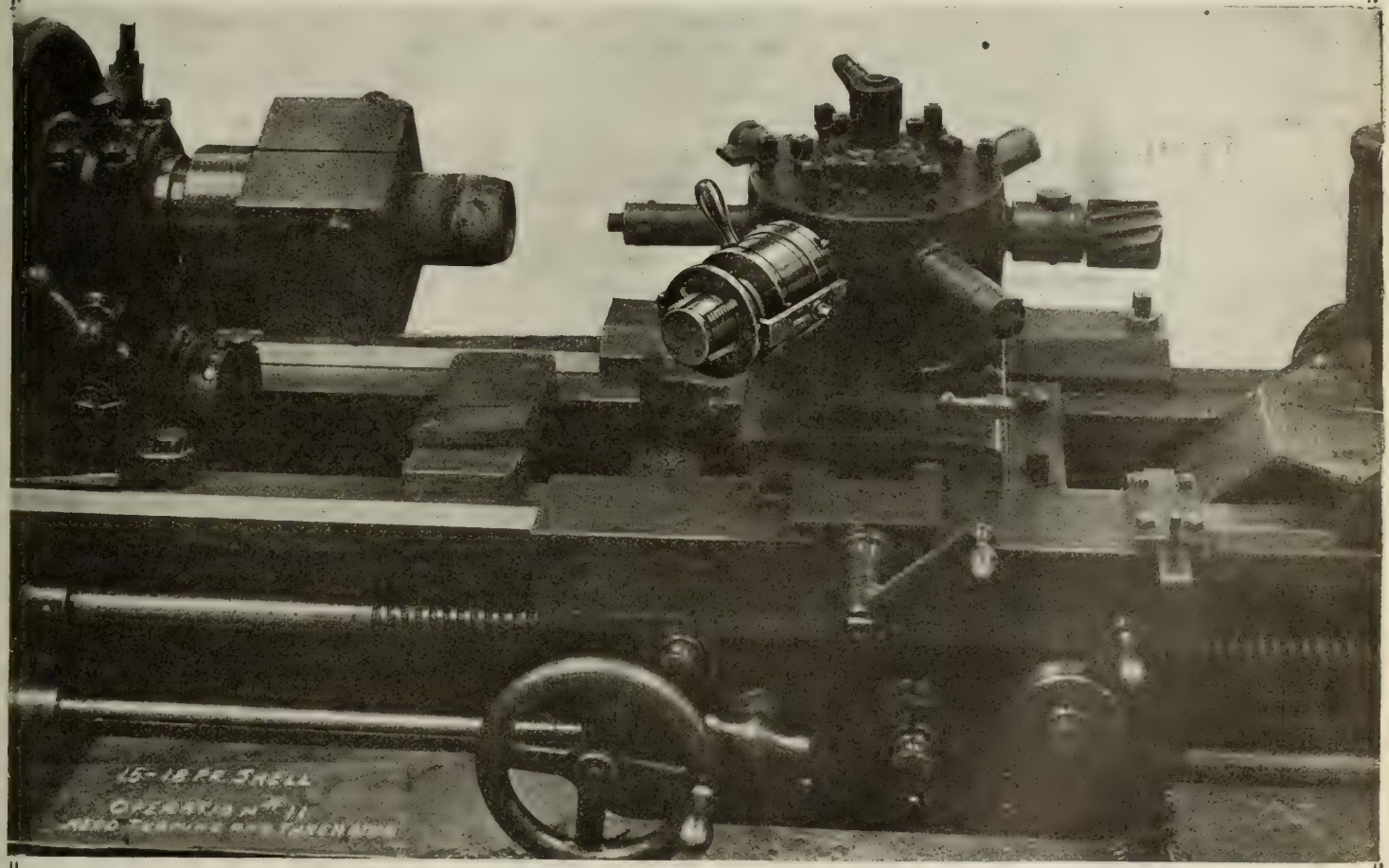
ANOTHER GEOMETRIC FEAT

DESCRIBED IN A LETTER FROM CANADA

Messrs. Geometric Tool Company,
New Haven, Conn., U.S.A.

Gentlemen:—

"The engine lathe shown in the photograph which we are sending you commenced work on shells within four months of the start of the war, when methods were in course of development, and special machines were unknown. Material and labor were both frequently unsatisfactory. Rejections due to poor threads were



frequent troubles with shell makers. Despite many adverse conditions the contract was successfully completed, and the Geometric Tap used on this lathe (fitted to cross-slide on carriage) was an important contributing factor in the good work done in the early strenuous times."

Very truly yours,

Whether yours is a tapping or threading job, or both, you would be satisfied with the Geometric way of doing it.

The Geometric Tool Company, New Haven, Conn., U.S.A.

CANADIAN AGENTS:
Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

MUNICIPAL

Ottawa.—The proposed new Cummings bridge will cost about $200,000.

Simcoe.—The public utilities commission is going to buy a centrifugal pump for sewage disposal work.

Chatham.—An engineer is to be engaged to go over the situation here and report on the best plan for a waterworks system.

Elora.—Tenders are being received for a steel bridge 75 feet long over the Grand River. S. Aitcheson, reeve of Pilkington, is the party to address.

TENDERS

The Ministry of Lands and Forests will receive tenders up till the 16th July, for the right to cut timber on Groves and St Louis Townships, in the District of Sudbury. All particulars can be obtained from the Minister or from Mr. Charles Henderson, Crown Timber Agent, Sudbury.

The Manitoba Department of Public Works will receive tenders up till July 10th for materials in connection with construction of a transmission line between Winnipeg and Portage La Prairie. All information can be secured from J. M. Leamy, Engineer of Mechanical Services, New Parliament Buildings, Winnipeg.

The Galt Housing Commission are asking for sealed tenders for all trades required in the erection of fifty houses, half to be of four rooms and half to be of six rooms. Alternative tenders for one hundred houses, half to be four and half to be of six rooms, are also asked. Plans and specifications can be obtained from Messrs. Evans & Hall, 30 Water Street, Galt, Ont.

Tenders will be received, by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Monday, July 21st, 1919, for the construction and delivery of 16-inch lapwelded steel pipe. Specifications and tender forms for the foregoing may be obtained upon application at the office of the Water Main Extension Section, Department of Works, Room 320, City Hall, Toronto.

TRADE GOSSIP

New Pulp Mill.—Advices from Bear River, N.S., state that work has started on the new mill for Clarke Bros. The buildings will consist of a pulp mill, saw mill, boiler room and machine shop.

London's Motor Industry.—The Republic Motor Truck Co. of Alma, Mich., are planning the erection of a factory in London, Ont It is understood that the buildings will cost in the neighborhood of $500,000.

Factory Extensions.—Two Arnprior firms are making plans for extensions and additions to their factories. The Arnprior Cabinet Co., Ltd., are about to make two additions to their present plant, and F. C. Hyck & Sons are making extensive alterations to their premises.

New Firm Incorporated.—The New Brunswick Typewriter & Specialty Co., Ltd., with a capital stock of $24,900, and headquarters at St. John, N.B., has been incorporated. The principals are H. C. Parker and C. F. Wetmore, both of St. Johns, and Pearl Soulis, of Halifax.

The Bastian-Blessing Company, Chicago, have issued a booklet on the Rego welding and cutting apparatus, which goes into the details of this equipment in a very thorough manner, and lists, together with the prices, the various types of complete welding sets and torches made.

Lumber Prices Increase.—An increase of $2 per 1,000 feet in all grades of lumber is in effect This is due, it is alleged, to the appearance of American buyers in the British Columbia market, who are competing with Canadian dealers, thereby enhancing the market value of the lumber.

Going Ahead.—The R. McDougall Co., Ltd., Galt, were not seriously inconvenienced by the fire which took place in their plant recently. The machine shop and foundry were uninjured, and the patterns that were burned or injured have been largely replaced. Their deliveries on their usual lines have not been interfered with.

Praise for Board.—The British Minister of Munitions has sent a cable to the Imperial Munitions Board congratulating them on the report of their war expenditures. The British comptroller and auditor general report that the accounts of the I.M.B. are highly satisfactory, and the manufacturing establishments controlled by the Board very successful, the accounting arrangements having reached a high standard.

Protest Against Demurrage.—The proposal of the railways to charge $2 per day on all cars at the seaport not unloaded after twenty days will be protested by the Guelph Chamber of Commerce. The matter will come before the Railway Board at an early date. The ground taken by the Chamber of Commerce is that any delay which may occur after the goods are shipped is due to the railway company and not to the shippers.

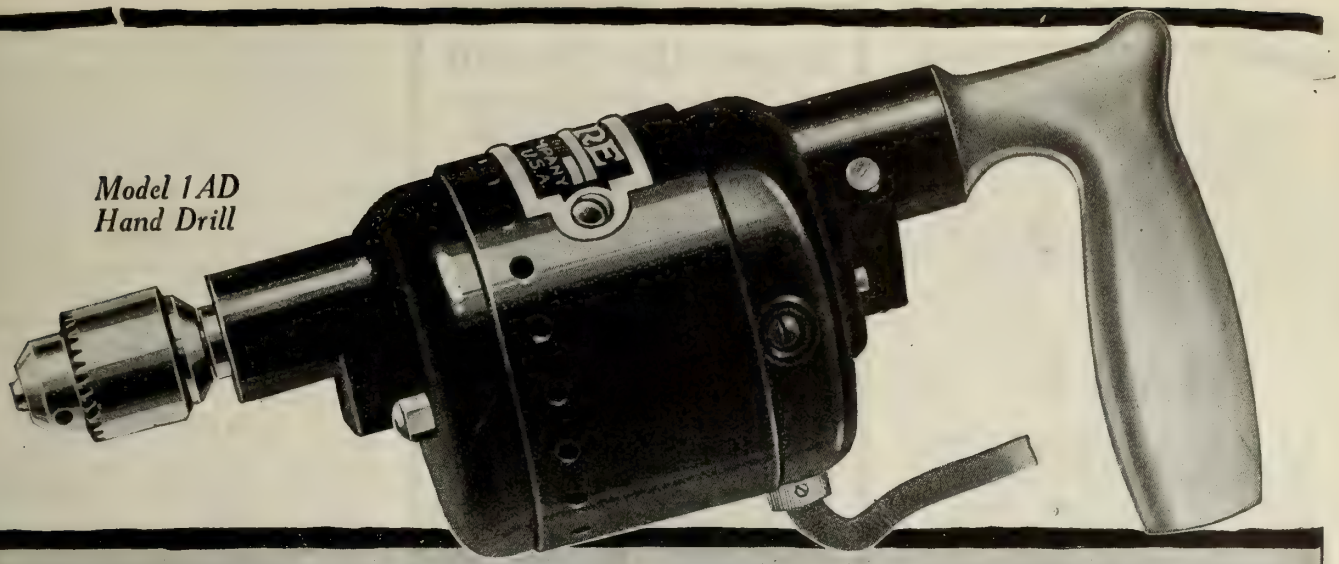
New Pumps for Guelph.—The Fire, Light and Water Committee have recommended the acceptance of the tenders of the Goldie McCullough Co. for the installation of a 750 gallon pump with a 75 h.p. Crocker Wheeler motor, at $2,904, also a 1,250 gallon pump with 125 h.p. Crocker Wheeler motor for $3,640. The Bawden Pump Co. secured the order for a 2,100 gallon booster pump with 100 h.p. Crocker Wheeler motor for $2,621.

Get Big Contract.—The Vulcan Steel Products Co., of New York, has secured a contract for rebuilding the war swept district of Nancy, at a figure estimated at $250,000,000. It is understood that this figure may be increased to $500,000,000 before the task is finished. Two of the largest contracting firms in the United States are associated with the Vulcan Co. in the contract, the McClintock Marshall Co. and the McArthurs Bros. Co.

New Industry for Collingwood.—The firm of Edwards & Co., industrial brokers of Toronto, have given the Chamber of Commerce a written statement that if they succeed in financing the proposed industry for the manufacture of hard rubber goods, the industry will be located in Collingwood Mr. Duff, of Edwards & Co., is selling stock in the proposed industry in Collingwood and the district.

Trade Commissioner's Visit. — The British Trade Commissioner, Mr. Field, is visiting Sarnia with the object of promoting British overseas trade with local concerns. Samples of German and Austrian goods used in the district before the war will be obtained, and an effort made to get these lines manufactured by British firms will be made. Invitations have been extended to Mr. Field by several of the local manufacturers to visit their plants, and he will be enabled to get in touch with the manufacturing and labor conditions in the district.

Skilled Mechanics Leave. — It is stated by Mr. G. F. Doolan, one of the delegates who interviewed Sir Robert Borden on behalf of the metal trades, that many of the skilled mechanics who are members of the Amalgamated Society of Engineers are booking or have booked their passage to the Old Country. The reason he gives is that the industrial situation in Canada is such as to make it absolutely unattractive, and they have more confidence in the British Government's efforts to ad-



Model 1AD Hand Drill

MODEL 1AD Hand Drill

Length—10 inches.

Weight—4¾ pounds.

Capacity—Steel, brass, aluminum and alloys, 0 to $\frac{3}{16}$ inches.

Motor—Universal, operates on either direct or alternating current. Diameter of motor 3⅜ inches.

Spindle—Offset from center $\frac{25}{32}$ inches.

Drive—Helical gears.

Handle—Aluminum. Complete with 10 foot cord, plug, switch and chuck. Jacobs chucks used as regular equipment.

MODEL 2AD Sensitive Drill

Height—18 ins. **Weight** 18 lbs.

Stroke—3¼ ins. **Feed**—Rack and pinion. Helical gear drive.

Capacity—Steel, brass aluminum and alloys, 0 to $\frac{3}{16}$ inch. Drills to center of 7½ inch piece.

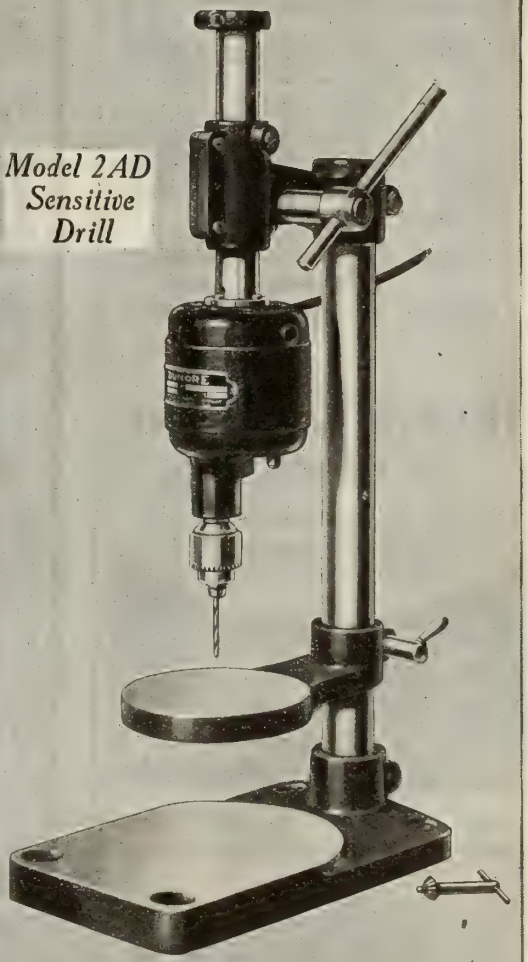
Motor—Universal, operates on either direct or alternating current. **Diameter**—3⅜ inches.

Spindle—Offset from center $\frac{25}{32}$ inches.

Thrust—Ball bearing.

Table—Adjustable, may be raised, lowered or swung entirely out of the way. Complete with 10 foot cord, plug, switch and chuck. Jacobs chucks used as regular equipment.

Wisconsin Electric Company
2913 Street Racine, Wisconsin



Model 2AD Sensitive Drill

DUMORE GEARED ELECTRIC DRILLS

TRADE MARK
"HAWK" BRAND STEEL

REGISTERED U.S. PAT. OFFICE NOS. 50932-61349
CANADIAN PAT. OFFICE NO. 54

"HAWK VANADIUM"
TOOL STEEL

Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

Order "Hawk Vanadium" for your End Mills and cutters. Once known—always used.

Large Stock. Prompt Shipment.

Write for full particulars to

Hawkridge Brothers Company

Main Office and Warehouse:
303 Congress Street, Boston, Mass
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STEEL
OF EVERY DESCRIPTION
SEND US YOUR ENQUIRIES

Machine Tools
FOR SHIPBUILDERS ETC. ETC

BERTRAMS LIMITED
SCIENNES EDINBURGH

BLACK DIAMOND OVENS

OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Kernchen Siphonage Ventilators, Bakers Ovens, trucks, casters, etc.
Write for Booklet.
Brantford Oven & Rack Co., Ltd.
Brantford, Canada.

BLACK DIAMOND OVENS

Upon the Health
of your employees
depends your profit
and production

Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

Canadian Agents
McKENZIE BROS.
18 St. Alexis St., Montreal, P. Q.

CASTINGS
Medium Weight Grey Iron, Brass, Etc.
JOBBING
GREENLEAFS, LIMITED
Belleville, Ontario

MORTON MANUFACTURING CO.
PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE AND WORKS, MUSKEGON HEIGHTS U.S.A.

just the industrial situation than those of the authorities at Ottawa.

A Disappointment.—Such little relief as Canadian shippers may have looked for in August by the release of vessels now used as transports for Canadian troops seems likely to be offset. The British Ministry of Shipping is understood to have decided to take 70 per cent. of all cargo space next month leaving only 30 per cent. for commercial purposes. This is an unpleasant surprise for the Canadian exporters, as this month only 50 per cent. of space had been commandeered for Government purposes and it was hoped this would be lowered to 40 per cent. in another thirty days. This new move will make the Canadian shipping problem, already rather hopeless, almost insoluble if no change is made.

PERSONALS

Corporal William A. Nugent, who served during the war in Company I, 21st Engineers, has returned from France and resumed his duties with the Independent Pneumatic Tool Co. as traveling representative. He has been assigned to his old territory in Indiana.

MARINE

Cleveland.—Artificial fog in the way of smoke from the burning Ontario forests held up the fleet on the lakes from midnight till daylight at the Soo. Even for some time after the coming of dawn movement was difficult in the hazy atmosphere.

St. Thomas.—The long search for the missing car ferry, "Bessemer," is at last to be abandoned. Capt. Clarke, of Toronto, has supervised the dragging of Lake Erie from end to end, without succeeding in getting any trace of the vessel, although the operations were continued all last year, and up to the present time.

Halifax. — A tern schooner was launched recently from McKean's Shipyard, Tuft's Cove, after being under construction since August last. The hull is constructed of hard pine and Douglas fir. Dimensions are 155 feet overall by 33 feet 2 inches beam by 12 feet depth. She will be rigged as a three-masted fore and aft schooner.

St. John, N.B.—The number of American vessels loading lumber in the port of St. John makes many of the old timers sigh for the good old days of the wooden sailing vessels. These fine ships, owned in Nova Scotia and New Brunswick, carried lumber from St. John and Halifax and other Maritime ports to the United Kingdom, loading thence for the East, and coming home with tea from China or wool from Australia, to reload lumber and repeat the voyage.

Esquimalt. — The Canadian patrol boats, "Armentieres," "Givenchy," and "Thiepval," arrived at Esquimalt recently after a voyage from Halifax, N.S., by way of the West Indies and Panama Canal. The "Stadacona," their flagship, was damaged in a gale off the

coast of Oregon and had to be towed into San Francisco. She sustained the loss of her rudder, and after being repaired will proceed to Esquimalt to rejoin her squadron.

Ottawa.—The present position of the Canadian Government steamers is as follows: The "Canadian Ranger" is at Liverpool. "Canadian Warrior," bound from Cuba to Canada. "Canadian Recruit," bound from Canada to West India and Cuban ports. 'Canadian Voyageur," loading for same ports. "Canadian Volunteer," loading at Victoria, B.C. Two vessels are receiving their finishing touches at Vickers, and three more are expected from Great Lakes yards in the near future.

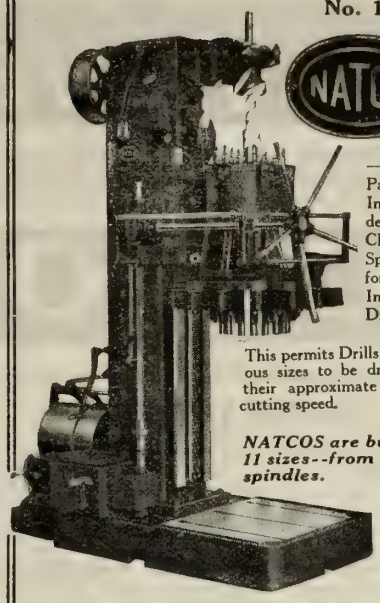
Gore Bay.—Capt. Alexander Cunning, wrecking master of Great Lakes Towing Co., has been successful in his suit against the Erie & Western Railway. This was in connection with the salvage of the steamer "Wissahickon" in 1910, when the vessel was in the hands of the wrecking company. She was looted of property worth $45,000, and Capt. Cunning was accused of complicity in allowing his crew to do the robbing. He was arrested and subsequently released on bond. and in turn brought suit against the E. & W. R. for $50,000. The Chicago court has awarded the Captain $10,000, and completely vindicated him of the charge of complicity.

Vancouver.—The harbor commissioners who were appointed in May, 1913, under the act passed in that year. have been asked by the Minister of Marine to hand in their resignations. A clause in the appointment reads, "During the Minister's pleasure." The reason given for the request for resignation is that the Minister wishes to have a free hand in the expenditure of the $5,000,000 recently voted for harbor improvements. The Board will probably be reconstituted with the same personnel as at present with the inclusion of at least one returned soldier. The present Board consists of F. C. Carter Cotton, chairman; J. A. Fullerton and S. McLay, Board members, and W D. Harvie, secretary.

Montreal.—The Canadian Government Merchant Marine. Ltd., is getting rounded into a fully equipped organization rapidly. A manager for the company has been secured in the person of Mr. R. B. Teakle, with headquarters at the C.N.R. offices on St. James street. Mr. Teakle, who is a Canadian, was associated for a number of years with the Allan Line, and later with the France-Canada S. S. Co. Other members of the staff are Mr. H. Milbourne, marine superintendent, formerly of the Royal Line; Capt. H. E. Webb, traveling marine superintendent; Mr. W. A. Cunningham is export and import freight agent. Another former Allan Line man is Mr. Thos. M. Todd, auditor of the company.

The Hayes Wheel Co. have been granted letters patent to increase their capital stock from $200,000 to $1,000,000, the increase to consist of 8,000 shares of $100 each.

No. 14



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This permits Drills of various sizes to be driven at their approximate correct cutting speed.

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We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

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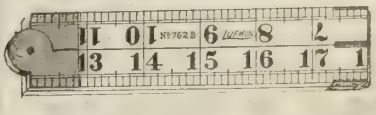

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WANTED—BY A CRUCIBLE STEEL MANUfacturer in the United States a representative in Canada who is thoroughly familiar with the business in Carbon Tool Steels and principally High Speed Steel. State age, previous experience and salary wanted. Box 577, Canadian Machinery (c1m)

Mining Machinery for Sale

Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.
Ingersoll-Rand 800 ft. Air Compressor.
1 Tube Mill Fraser & Chalmers 5 x 22
1 Power & Mining 5 x 22.
Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

Zenith Coal & Steel Products
Limited
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FOR SALE

Used locomotive crane.
Engine—Double-cylinder, 9″ x 12″ stroke.
Boiler—Vertical, new tubes, hood and smoke-stack, good for 100 lbs. working pressure.
Bucket—¾-yard, boom 58 ft. 6 in. long, wheel base 14 ft., gauge 14 ft.; hoisting and slewing gears in good condition.
All motions operated from one platform.
Further particulars on application to:
CANADIAN ALOXITE CO., LTD., P.O. Box 536, Niagara Falls, N.Y. (c25m)

LOCOMOTIVE

For sale, one 35-ton shunting locomotive, complete with trailer, tender, air pump, etc.

In good operating condition, can be seen and all particulars obtained at the plant of

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WANTED — TOOL ROOM FOREMAN ON automobile drop forge dies and general machine work; must be skilled in close work; state age, salary expected, where last employed and in what capacity. Box 611, Canadian Machinery.

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (cfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

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A CANADIAN MANUFACTURER OF MACHinery for the use of Contractors, Miners, etc., is open to undertake the manufacture of any other machinery or device for the use of either contractors or miners, and invites correspondence with holders of Canadian patents, or with U. S. concerns desiring a Canadian manufacturing agency. Liberal inducements also offered for successful suggestions regarding machinery or other articles that can be manufactured and sold in connection with the above-mentioned lines. Address Box 610, Canadian Machinery. (c2m)

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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FOR SALE—One used lighting unit, consisting of one 25 K.W., 125 volt, 200 ampere direct current generator to operate at speed of 320 to 350 r.p.m. Generator made by Westinghouse Company. This machine is directly connected with a Goldie & McCulloch 9x10 Ideal engine. This machine can be examined and all particulars obtained at the plant of

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WANTED—ONE ONLY 200 H.P. WHEELOCK Steam Engine, second-hand. Must be in good condition. State price, and where it can be inspected. Apply Box 613, Canadian Machinery. (c3m)

WANTED TO BUY—SECOND-HAND BULLdozer. Must be in good condition. State particulars as to weight, stroke, price, etc. Box 614 Canadian Machinery. (c4m)

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Two Canadian Patented Steam Specialties for sale; one Steam Trap, Patent Number 187215, and one Steam Separator, Patent Number 183340.

Allentown Experimental Works
Allentown, Pa., U.S.A.

Mill and Mining Machinery

1 Babcock & Wilcox Water Tube Boiler, 100 h. p., 36 in. x 20 ft. 0 in., 4 in. Tubes with complete fittings. Working pressure 150 lbs.

1 Blaisdale Air Compressor, 14 x 14 and 22 x 16. 150 r. p. m. Duplex Steam, Compound Air. Steam and air pressure 100 lbs. Displacement 1126 cu. ft. per minute.

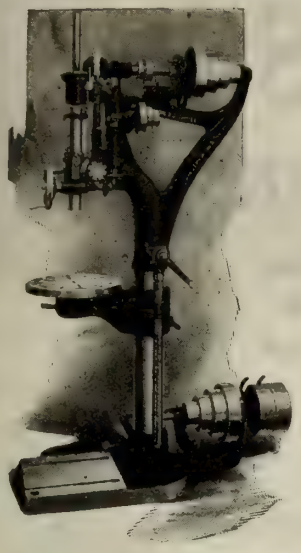
1 C. C. Canadian Rand Compressor, 9 x 12. 14 x 12.

1 Matheson Feed Water Heater, 3 ft. x 18 in.

1 Stack, 60 ft. x 30 in. x 3-16 in. Steel.

1 Lidgerwood Single Drum Friction Hoist, 10 x 12.-54 in. and extra piston. Corrugated Drums built to carry 1100 ft. 1 in. rope. Load 4,500 lbs. Maximum speed 800 ft. per minute at 100 lbs. pressure. Including Dial Indicator.

NEW GLASGOW MACHINE CO.
NEW GLASGOW, NOVA SCOTIA



A light type drill, having hand wheel, hand lever and automatic feed.

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Machine Tools

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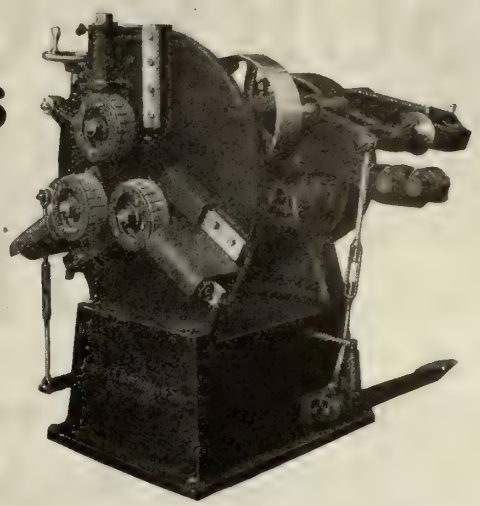
Complete equipment for Boiler Shops, Structural Steel Works, Railroad Spring Shops, Flue Shops, or Machinery for any other purpose, or Woodworking Machinery of any kind



A Universal Machine for cutting and cleaning from 1½" to 6½" flues.

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New and Slightly Used Machinery and Tools

1", 1½", 1⅝", 1¾", Turret Screw Machines.
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Floor and Bench Drill—Presses.
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Burke Millers.
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1—"Used" Plate Punch and Shear 36" gap, capacity ⅞" hole in ⅞" plate
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Both machines must be modern in design and in good operating condition. Offers with full details, price and shipping point, will be considered.

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Entire Plants or Separate Tools

What have you to offer?

State condition, make and price. We pay cash for any type of machines, motors or belting.

Give full details in first letter.

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Heavy Bliss and Toledo Toggle, Crank and Rack and Pinion Presses

Send for Detailed List and Prices.

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PARTIAL LIST OF TOOLS

2—60″ Bullard Vertical Boring Mills
1—60″ Niles Vertical Boring Mill
No. 4—B. & S. Plain Miller
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No. 3—Cincinnati Universal Miller
5—No. 0 Steptoe Hand Millers
13″ x 5′ 6″ New Carroll-Jamieson Quick-Change Lathe
14″ x 6′ New Carroll-Jamieson Quick-Change Lathe
15″ x 6′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
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17″ x 8′ New National Quick-Change Lathe
3—17″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
17″ x 10′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
18″ x 24″ New Rahn Larmon Lathe, D.B.G. Quick-Change
19″ x 10′ New Sidney D.B.G. Quick-Change Lathe, swing 21″
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33″ x 14′ Putnam, arranged for Motor Drive
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100-lb. New Little Giant Hammer
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30-ton Watson & Stillman Hydraulic Press

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2—Allis-Chalmers Turbine Pumps, 2,000 gals. cap.
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4—	200	H.P.,	440	Volt,	3 Phase,	25 Cycle.
4—	150	"	440	"	3 "	25 "
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6—	60	"	440	"	3 "	25 "
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Also a large number of smaller Motors 25 and 60 Cycle, 220, 440, 550 and 2,200 Volts.

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A large number of Transformers, 6,600 to 550 Volts and 6,600 to 440 Volts.

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2—5-ton Storage Battery Locomotives, 36″ Gauge, 40 Cells, M.V., 13 iron-clad Oxide Storage Battery, capacity 189 amps. per hr.

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A large number of Valves, all sizes, good condition.

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All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.

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With trained and skilled mechanics always available for immediate dispatch in case of Breakdown in your Plant. We're always ready.

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Special Machinery

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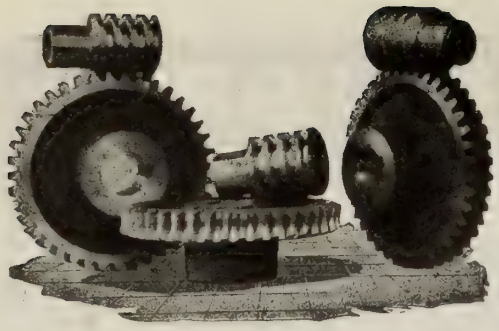

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An exceptional garment at a reasonable price.

Suits, leggings, gloves, mittens that actually reduce accident hazards. Booklet D-2 shows the complete line of Protexal Clothing manufactured in our own plant.

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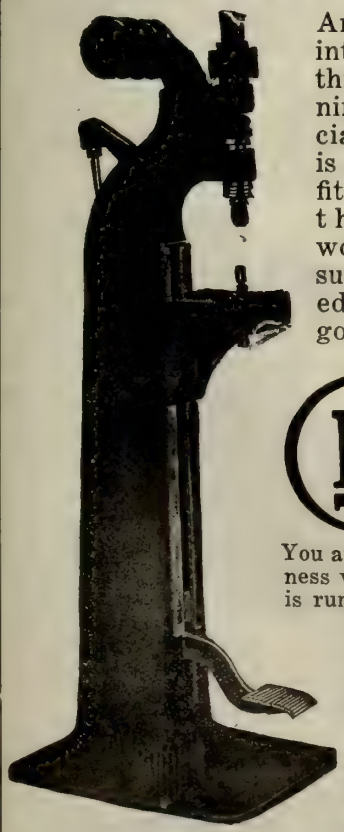
No Skill Required



Anybody with ordinary intelligence can operate this Rotary Rivet Spinning Machine. No special skill is required. It is a tool that perfectly fits labor conditions as they exist to-day. A woman can operate as successfully as the skilled mechanic who has gone to the front.

The GRANT is noiseless

You are assured of perfect quietness wherever the **Grant Rotary** is running. And it spins a perfect polished rivet head every second without breaking or marring the casting. Rivets tight or loose. Write for details.

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We take contract work—and turn it out quickly and accurately. We have facilities for:

Drawing
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All the energy of America's most modern machine shop and foundry is concentrated upon one product.

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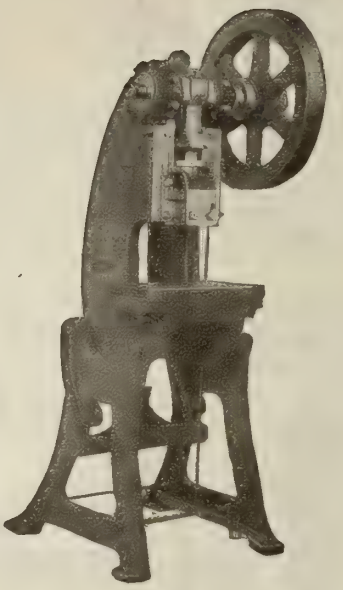

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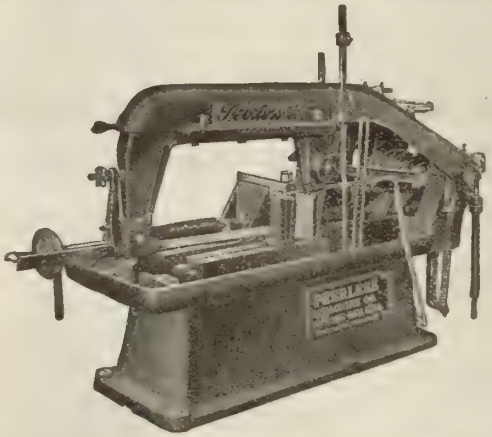
For trimming, stamping forging, punching, embossing.

Special presses are designed where the customer's requirements are unusual.

CONSOLIDATED POWER PRESSES

Peerless HIGH SPEED

Has Proven Its Efficiency Where Others Have Failed



DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE CO.
1607 RACINE STREET RACINE, WISCONSIN

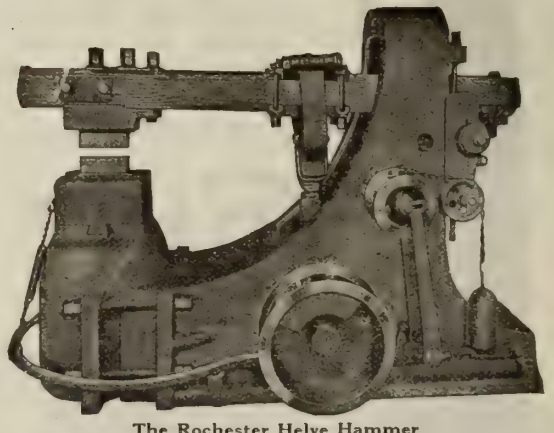
When You're in a Hurry

TO DO THE BEST WORK IN YOUR SHOP IN THE LEAST POSSIBLE TIME

THAT'S INSPIRATION!

WHEN YOU INSTAL A ROCHESTER HELVE HAMMER

THAT'S ACTION!



The Rochester Helve Hammer

It is a well-built, substantial tool for welding and general forging. MADE IN SIX SIZES, 25-lb to 100-lb. Heads and two styles of frame.

Send for our HELVE HAMMER BOOKLET, and give us information regarding character of your work.

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THE WEST TIRE SETTER CO.
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Steel, Chrome, Manganese and Nickel Steel Castings

ANNEALED AND UNANNEALED

Cement Mill and Mining Machinery Castings, Stamp Mills, Crushing Plants, Excavating Outfits, Steel Car Wheels, Locomotive Driving Wheels and Frames, etc.

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Any Size Up to Eighteen Feet Without Patterns

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SMALLEY

GENERAL THREAD MILLER

Reduces Cost of Production

To the manufacturer who cuts threads in quantities the Smalley-General Thread Miller is urgently recommended. It turns out a larger volume of work in less time than any ordinary machine. Let us prove it! Send us a blue print of what you consider the most difficult thread milling operation in your plant. Or better still, send us samples of the work at our expense for actual test. Our engineering department will give you a time-study and a detailed report of the operation. The test will be fair, practical and convincing. It will prove the ability of the "Smalley" machine on your particular work.

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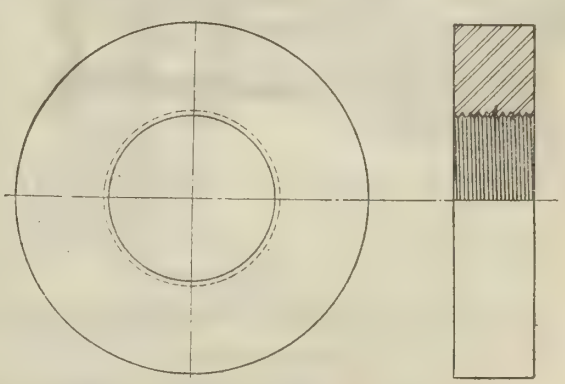

The Proof in Detail

We herewith give a practical demonstration of the Smalley-General Thread Miller's work:
MACHINE—Smalley-General Thread Miller No. 2. Air collet chuck.
PIECE MILLED—Threaded collar.
THREAD—Diameter 2¾", length 1¼", 8 pitch thread U.S. standard.
LIMITS—.001.
MILLING FEED—25" per minute. Not limit of machine but of hob. Job also faced at same chucking.
MATERIAL—Machinery steel.

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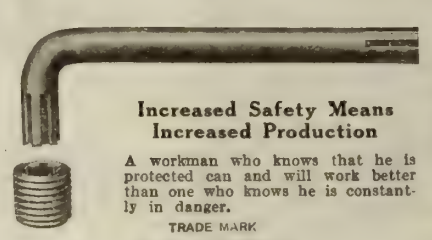

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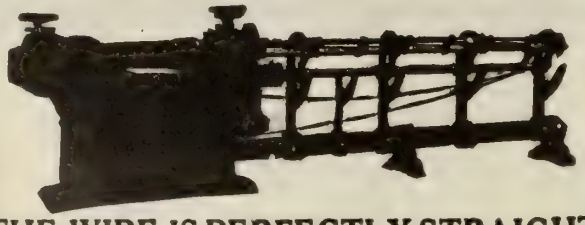

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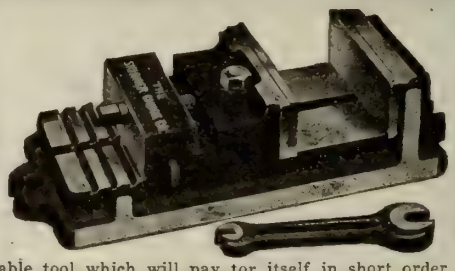

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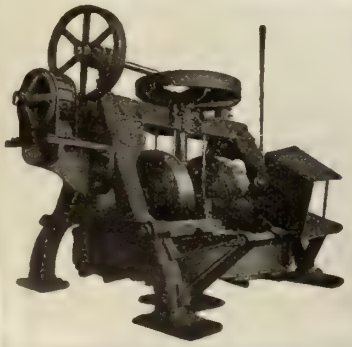

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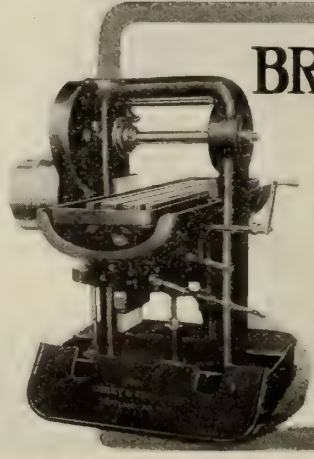

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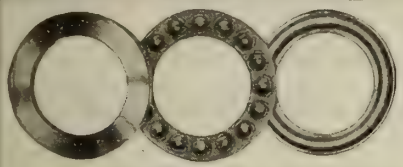

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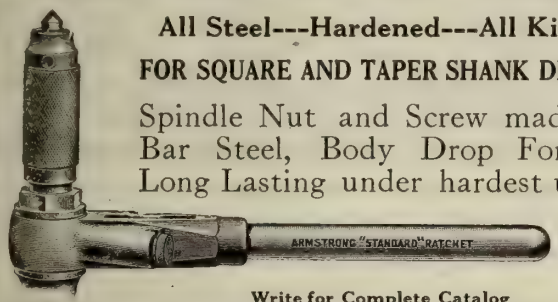

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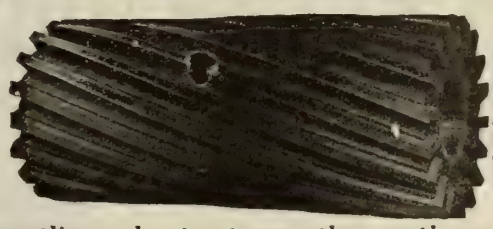

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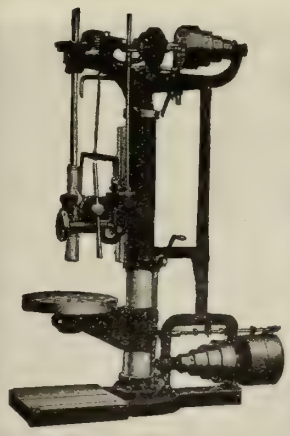

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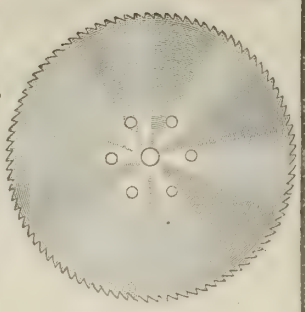

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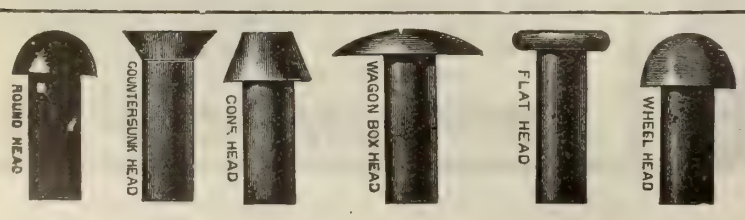

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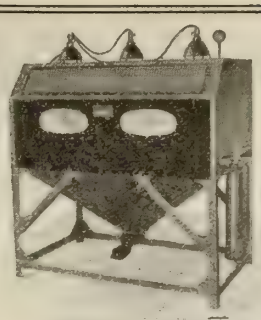

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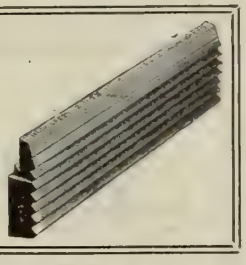

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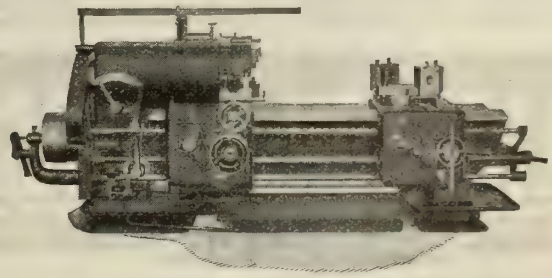

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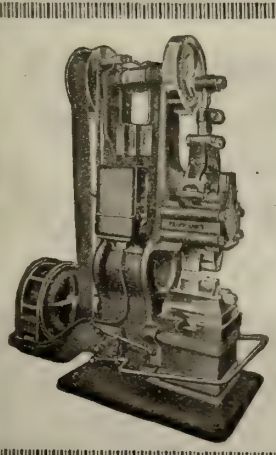

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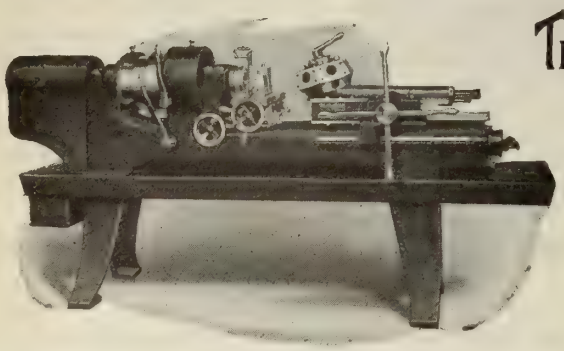

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Boker & Co., Inc., Montreal, Que.
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The Gray Ball Bearing Co., Ltd., Toronto.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

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Pangborn Corporation, Hagerstown, Md.

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Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

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Northern Crane Works, Walkerville, Ont.
Wilson & Co., J. C., Belleville, Ont.
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Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
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BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie, Ont.

BEADING MACHINES
Quickwork Co., St. Marys, Ohio.

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Williams & Wilson, Limited, Montreal, Que.

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BELT LACERS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
Foss Mchy & Supply Co., The Geo. F., Montreal
Graton & Knight Mfg. Co., Worcester, Mass.
Rice, Lewis & Son, Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids, Mich.

BELTING, BALATA
Baxter & Co., Ltd., J. R., Montreal, Que.
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co., Ltd., Montreal.

BELTING, CHAIN
Canadian Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
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Federal Engineering Co., Ltd., Toronto, Ont.
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Jones & Glassco, Montreal, Que.
McLaren, J. C., Belting Co., Montreal, Que.
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Plewes, Ltd., Winnipeg, Man.
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BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.

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Baxter & Co., Ltd., J. R., Montreal, Que.
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Garlock-Walker Machinery Co., Toronto, Ont.
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Norton, Ralph B., Agent, Montreal.

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Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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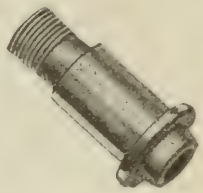

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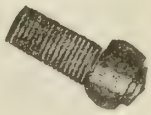

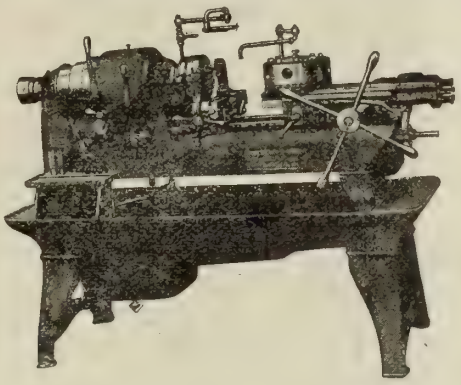

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Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Welland Motor & Machine Co., Welland, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

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Volta Mfg. Co., Welland, Ont.

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CONTROLLING INSTRUMENTS
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MacGovern & Co., Montreal, Que.

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Jones & Glassco, Montreal.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COOLERS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener, Ont.

COPPER, BUS BAR, SHEET, PLATES, RODS
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Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice, Lewis & Son, Toronto, Ont.

COUNTERSHAFTS
Almond Mfg. Co., T. R., Ashburnham, Mass.
The Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Limited, Montreal, Que.

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Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal, Que.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
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Gardner, Robt., & Son, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Wilson & Co., J. C., Belleville, Ont.

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Northern Crane Works, Walkerville.

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CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Quebec.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Anderson & Co. of Canada, Geo., Montreal, Que.
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Quebec.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Williams & Co., J. H., Brooklyn, N.Y.

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Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice, Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Graton & Knight Mfg. Co., Worcester, Mass.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

CHROME VANADIUM STEEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

CRUSHED STEEL
Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Northern Crane Works, Walkerville.
Sheldons, Ltd., Galt, Ont.

CUPOLA BLAST GAUGES AND BLOWERS
Sheldons, Ltd., Galt, Ont.

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Bowser & Co., S. F., Inc., Fort Wayne, Ind.

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Williams & Wilson, Limited, Montreal, Que.

CUTTERS, BOLT
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

CUTTERS, FLUE
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CUTTER HEADS
Oliver Machinery Co., Grand Rapids, Mich.

CUTTERS, PIPE (SEE PIPE CUTTERS)

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Williams & Wilson, Limited, Montreal, Que.

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Wheel Trueing Tool Co., Windsor, Ont.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal, Que.

DIAMONDS, CARBON & BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
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General Steel Co., Milwaukee, Wis.

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Wells Bros. of Can., Galt, Ont.
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Canadian Fairbanks-Morse Co., Montreal.
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Rickert-Shafer Co., Erie, Pa.
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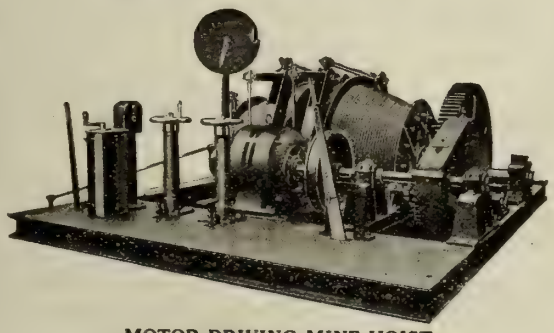

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Cleveland Twist Drill Co., Cleveland.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Canada, Walkerville, Ont

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A. R. Williams Machy. Co., Toronto.

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Can. Driver-Harris Co., Ltd., Walkerville, Ont.

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Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis, Mo.
Williams & Wilson, Limited, Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
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Can. Matthews Gravity Carrier Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich.

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Ford-Smith Machine Co., Hamilton, Ont.

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Brantford Emery Wheel Co., Brantford, Canada.
Foss Mchy. & Supply Co., The Geo. F., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Trueing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll, Ont.

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Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

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Sheldons, Ltd., Galt, Ont.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINE LATHES
Oliver Machinery Co., Grand Rapids, Mich.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

ENGINE SHAFTS
Hammond Steel Co., Inc., Syracuse, N.Y.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch Co., Gananoque, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal
Sheldons, Ltd., Galt, Ont.

EXHAUSTERS
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Pangborn Corporation, Hagerstown, Md.
Sheldons, Ltd., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

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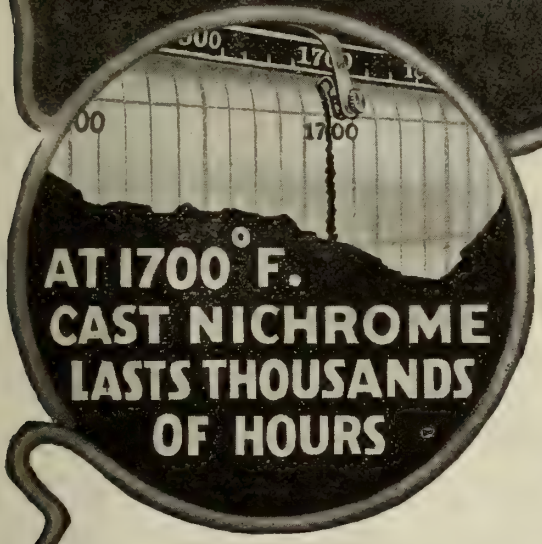
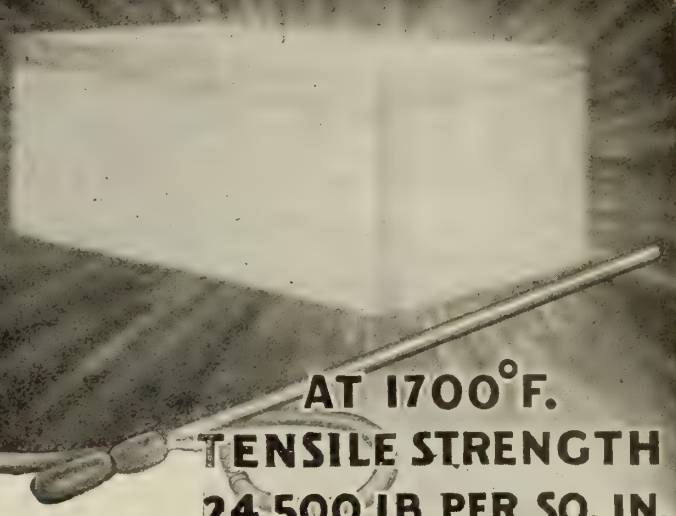
the Casting Durable





Nichrome Castings at High Temperatures

At a red or white heat, cast Nichrome will bend rather than break. A 20 lb. sledge, repeatedly striking the unsupported centre of a plate of cast Nichrome, ¾ in. thick and heated white hot, will merely cause a gradual bending.

The tensile strength of cast Nichrome is 30% greater at 1500° F. than that ot cast iron at 70° F.

Being exceptionally strong, cast Nichrome heat treating containers can be made light, afford great conductivity of heat, and requires less time for the completion of the heat treating process.

Nichrome castings are made to endure at high temperatures.

Nichrome castings are extensively used for annealing boxes, carburizing boxes, pots and tubes, and heating retorts.

Write for further particulars. Manufactured under Henderson Patents.

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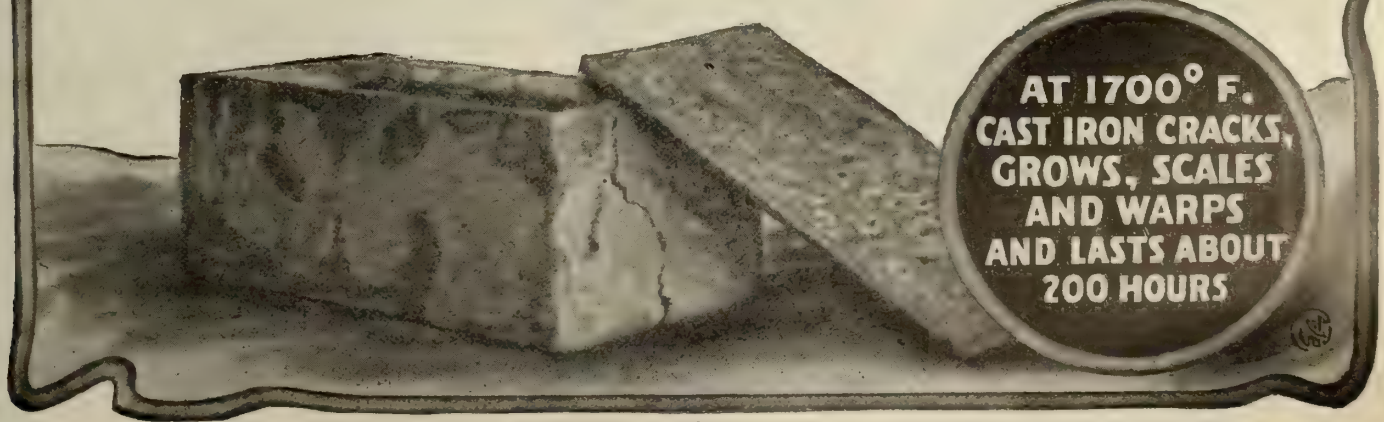

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EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EXTRA TOOL STEEL
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Vanadium-Alloys Steel Co., Pittsburgh, Pa.

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Nicholson File Co., Port Hope, Ont.
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Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

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FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

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Rice Lewis & Son, Toronto, Ont.
Sheldons, Ltd., Galt, Ont.

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Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Steel Co. of Canada, Ltd., Hamilton, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Limited, Montreal, Que.

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Armstrong, Whitworth of Canada, Montreal, Que.
Canada Foundries & Forgings, Ltd., Welland, Ont.
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FRICTION SURFACE BELTING
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Williams & Wilson, Limited, Montreal, Que.

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Standard Fuel Engineering Co., Detroit, Mich.

FURNACES, LEAD AND SALT
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FURNACES, RIVETING
Standard Fuel Engineering Co., Detroit, Mich.

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Bowser & Co., S. F., Inc., Fort Wayne, Ind.

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Taylor Instrument Co., Rochester, N.Y.

GAUGES, FUSE HOLE
Windsor Mach. & Tool Co., Windsor, Ont.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, STANDARD
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Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
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Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.
Toronto Tool Works, Toronto, Ont.
United Brass & Lead, Ltd., Toronto.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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Dom. Foundries & Steel, Ltd., Hamilton, Ont.
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Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
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Rice Lewis & Son, Toronto, Ont.

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Standard Optical Co., Geneva, N.Y.
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Blake & Johnson Co., Waterbury, Conn.
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Ford-Smith Mach. Co., Hamilton, Ont.
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Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
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Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Limited, Montreal, Que.

GRINDERS, DIE AND CHASER
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Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

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Armstrong Bros. Tool Co., Chicago, Ill.
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Ford-Smith Mach. Co., Hamilton, Ont.
Wisconsin Electric Co., Inc., Racine, Wis.
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Grant Mfg. & Machine Co., Bridgeport, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago, Ill.
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A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Wilkinson & Kompass, Hamilton, Ont.

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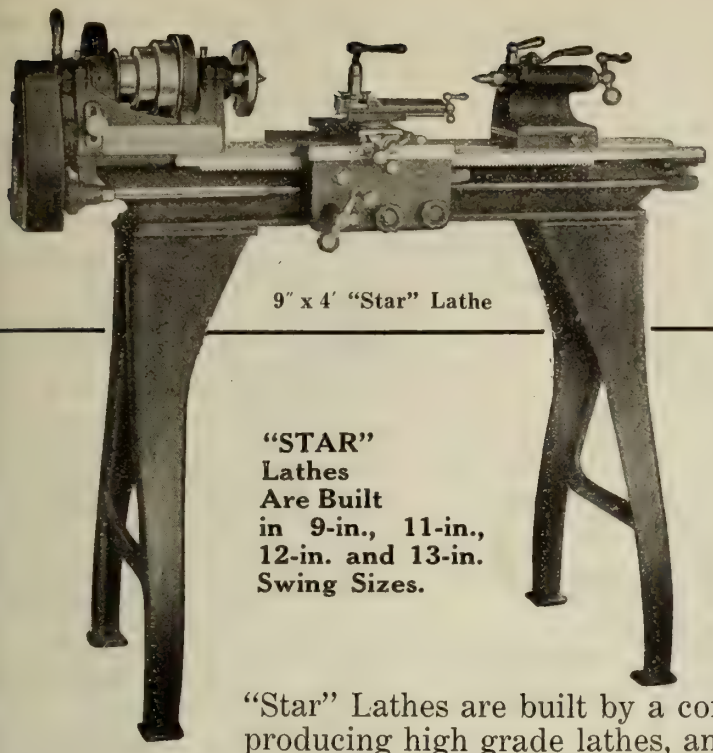
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.
MacGovern & Co., Montreal, Que.



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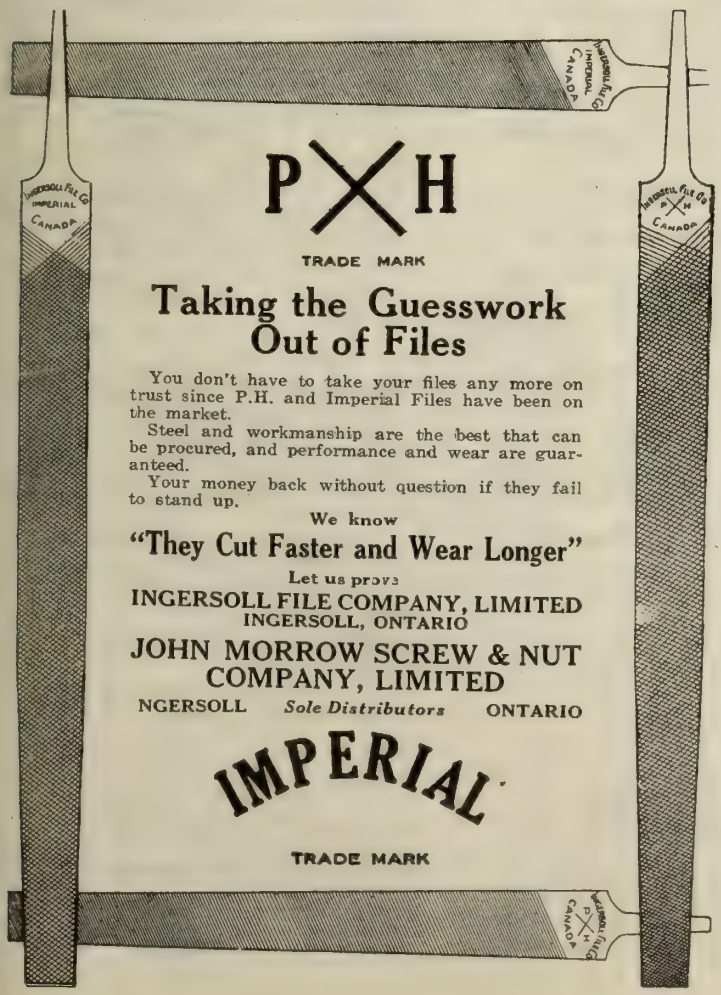

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National-Acme Co., Cleveland, Ohio.
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Garlock-Walker Machinery Co., Toronto, Ont.
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LeBlond Mach. Tool Co., R. K., Cincinnati.
Niles-Bement-Pond Co., New York, N.Y.
Norton Grinding Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wis.
Williams & Wilson, Limited, Montreal, Que.

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Norton Co., Worcester, Mass.

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New Britain Mach. Co., New Britain, Conn.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland, Ohio.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Boker & Co., Inc., H., Montreal, Que.
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Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
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Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Ltd., Montreal, Que
Victor Saw Works, Ltd., Hamilton, Canada.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal, Que.

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Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Works, Buffalo, N.Y.
The Geo. F. Foss Mchy. & Supply Co., Montreal
Ford-Smith Machine Co., Hamilton, Ont.
McKenzie Machy. Co., D., Guelph, Ont.
Peerless Machine Co., Racine, Wis.
Perfect Machine Co., Galt, Ont.
Racine Tool & Mach. Co., Racine, Wis.
L. S. Starrett Co., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto, Ont.
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Brown, Boggs Co., Ltd., Hamilton, Canada.
Canadian Billings & Spencer Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
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West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited Montreal, Que.

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Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

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HAMMERS, SHELL NOSING
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Standard Pressed Steel Co., Philadelphia, Pa.
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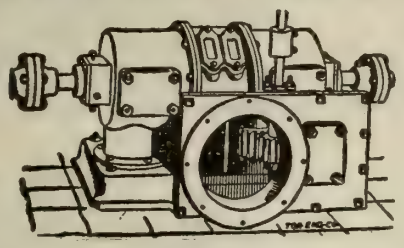

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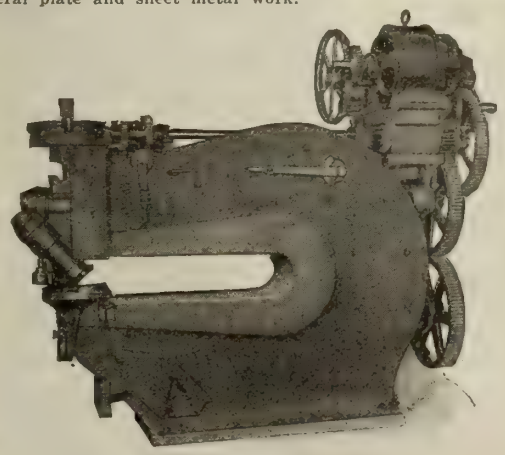

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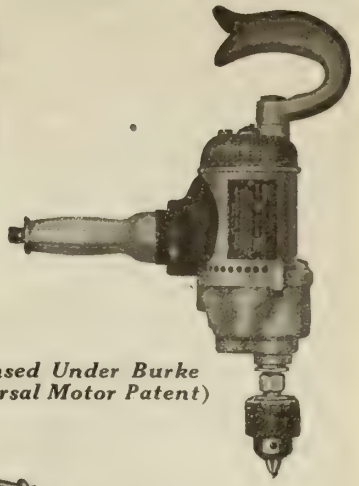

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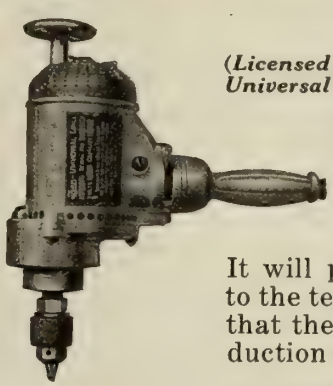

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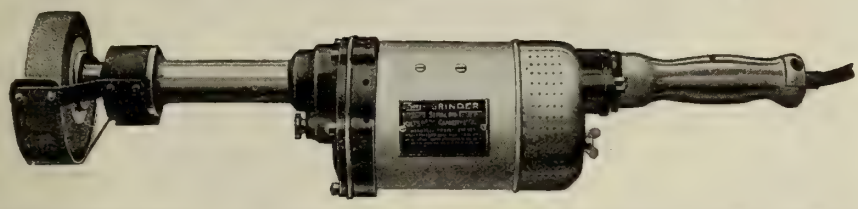

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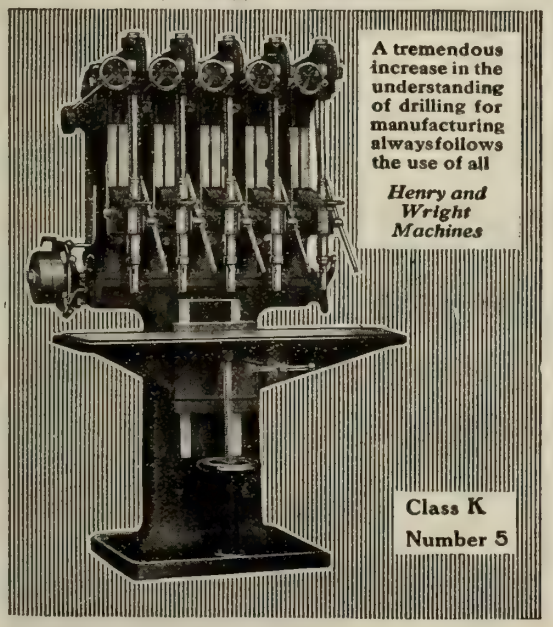

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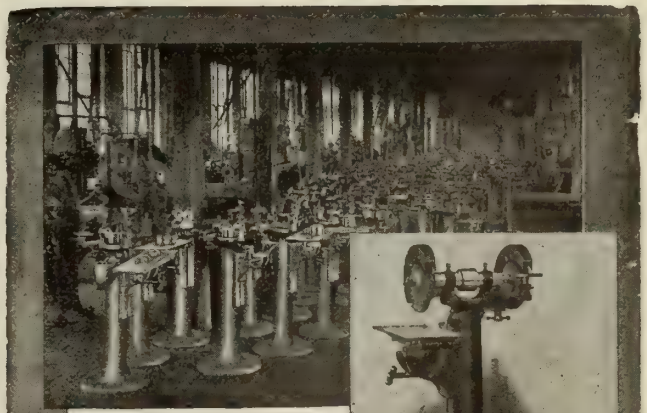

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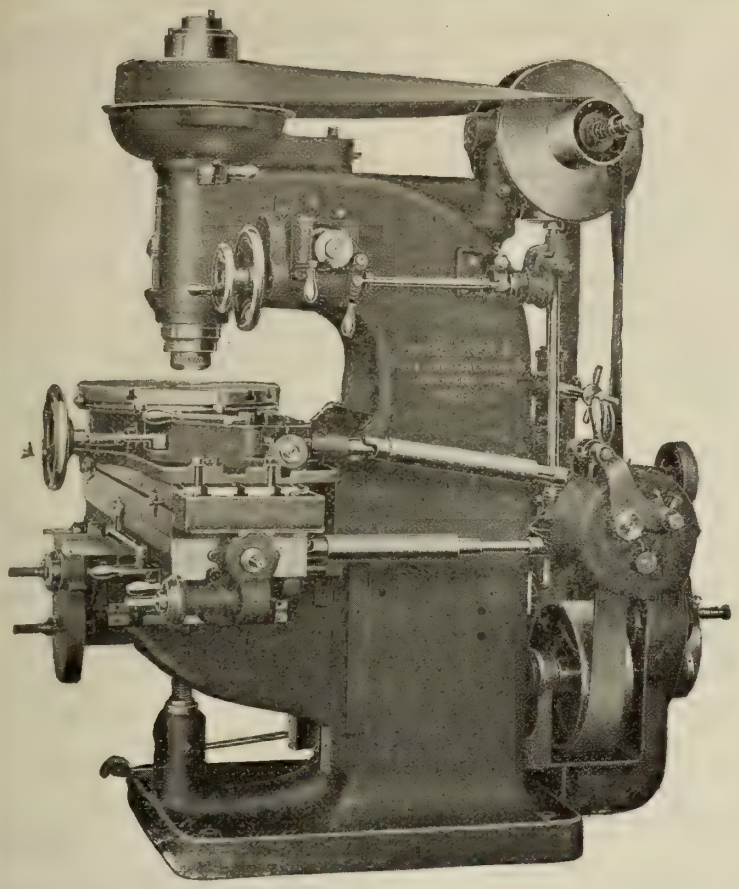

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Fry's (London), Ltd., London, England.
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MacGovern & Co., Montreal, Que.
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Baker & Co., Inc., H., Montreal, Que.
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Can Fairbanks-Morse Co., Montreal.
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Marten Machine Co., Hamilton, Ont.
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Pratt & Whitney Co., Dundas, Ont.
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Marshall, Son & Bunney, Toronto.
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Wells Bros. of Can., Galt, Ont.

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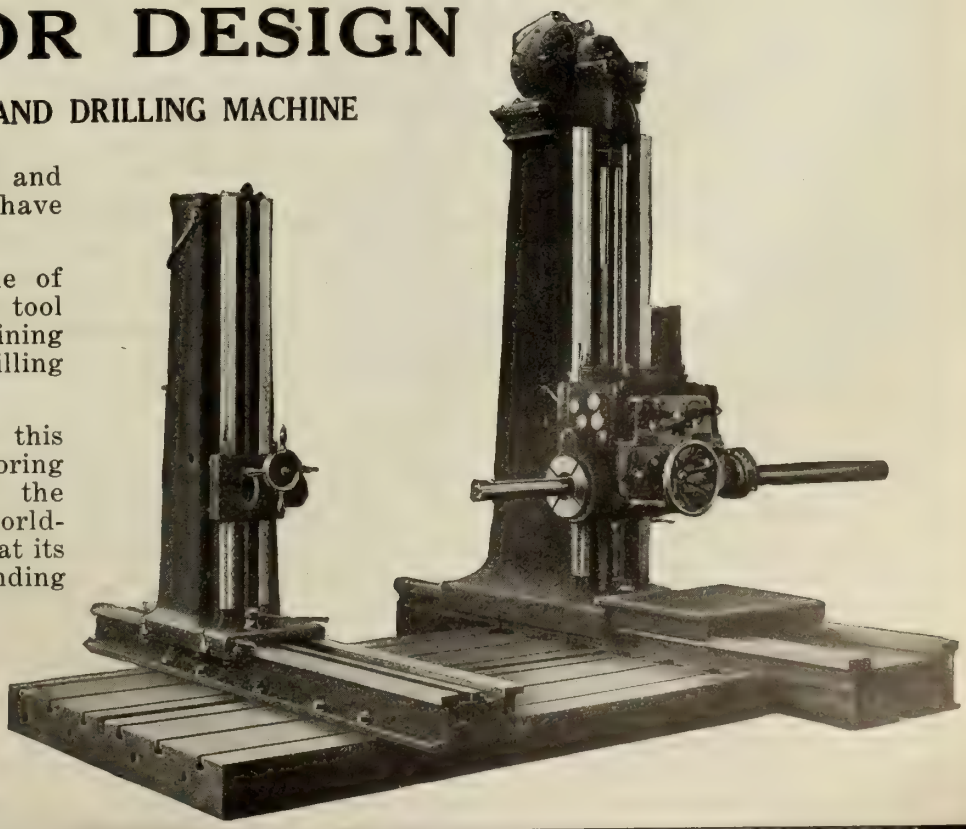

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Morrow Screw & Nut Co., John, Ingersoll, Ont.
National Acme Co., Montreal, Que.
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Steel Co. of Canada, Ltd., Hamilton, Ont.
United Brass & Lead Ltd., Toronto.
Wilkinson & Kompass, Hamilton, Ont.

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SCREW COLLARS
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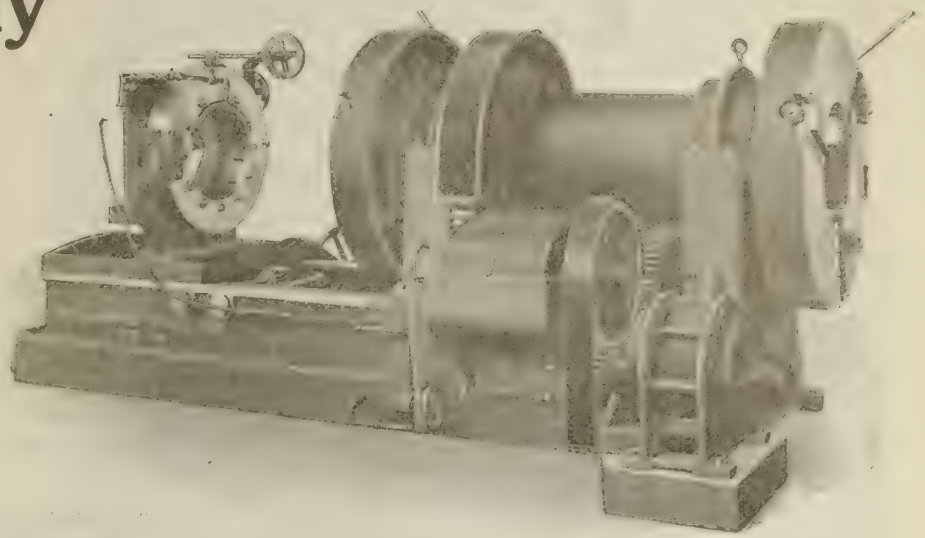

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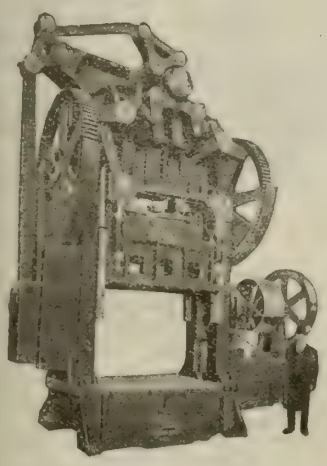

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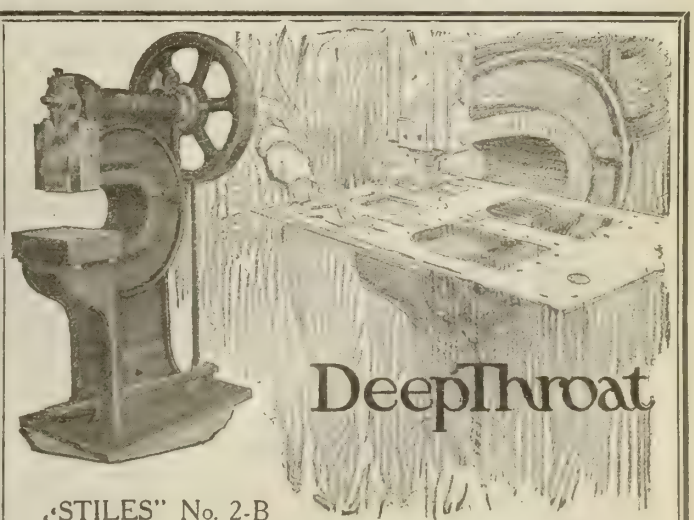

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Whitman & Barnes Mfg. Co., St. Catharines, Ont
Wilkinson & Kompass, Hamilton, Ont.

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Katie Foundry, Galt, Ont.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York
Rhodes Mfg. Co., Hartford, Conn.

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Morse Twist Drill & Mch. Co., New Bedford, Mass
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Brown, Boggs & Co., Hamilton, Canada
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
United Brass & Lead Ltd., Toronto

SOLDER
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Canada Metal Co., Ltd., Toronto, Ont.
Rice, Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead, Ltd., Toronto.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

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Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto, Ont.
Jas. Steele, Ltd., Guelph, Ont.

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Banfield W. H., & Sons, Toronto.
Beaver Engineering Co., Montreal, Que.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Brown Engineering Corp., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto, Ont.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont
Garvin Machine Co., New York.
Gooley & Eglund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Mulliner & Eglund Tool Co., Syracuse, N.Y.
Marten Machine Co., Hamilton, Ont.
Reed-Prentice Co. Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Welland Motor & Machine Co., Welland, Ont.
Wilson & Co., J. C., Belleville, Ont.
William R. Perrin, Ltd., Toronto.
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SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
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Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Wilson & Co., J. C., Belleville, Ont.

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Perrin, Wm. R., Toronto.
Wilson & Co., J. C., Belleville, Ont.

SPROCKET WHEELS, CHILLED THREAD
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SAW BENCHES
Oliver Machinery Co., Grand Rapids, Mich.

SAWS SWING
Oliver Machinery Co., Grand Rapids, Mich.

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Wells Bros. of Can., Galt, Ont.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

SANDERS
Oliver Machinery Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Machinery Co., Grand Rapids, Mich.

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Hope & Sons, Henry, of Canada, Peterboro, Ont.
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STAMPINGS, METAL AND STEEL
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Bliss Co., E. W., Brooklyn, N.Y.
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Matthews, Jas. H. & Co., Hartford, Conn.
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Oliver Machinery Co., Grand Rapids, Mich.

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Hammond Steel Co., Inc., Syracuse, N.Y.
Illingworth Steel Co., John, New York, N.Y.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

SURFACES
Oliver Machinery Co., Grand Rapids, Mich.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Kennedy & Sons, Wm., Owen Sound, Ont.
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Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
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Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Firth & Sons, Thos., Montreal, Que.
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Illingworth Steel Co., John, New York, N.Y.

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Pittsburgh Crushed Steel Co., Pittsburgh, Pa.

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Armstrong, Whitworth of Canada, Montreal, Que.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.
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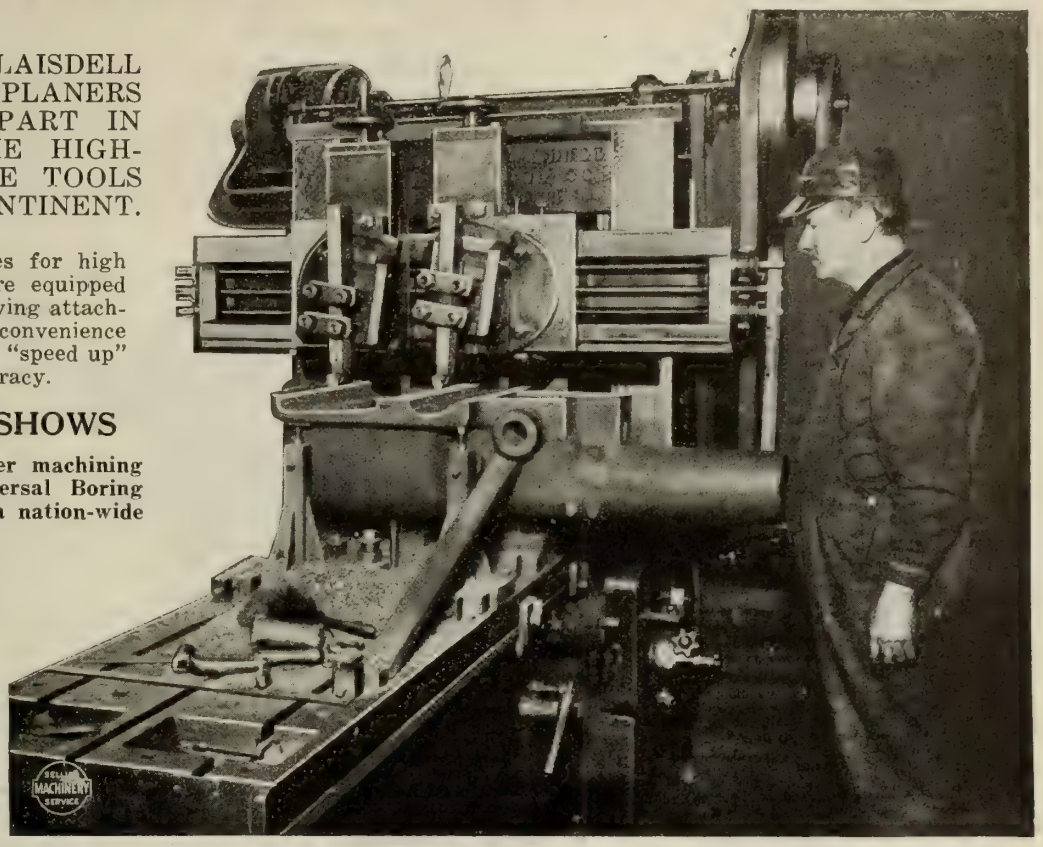

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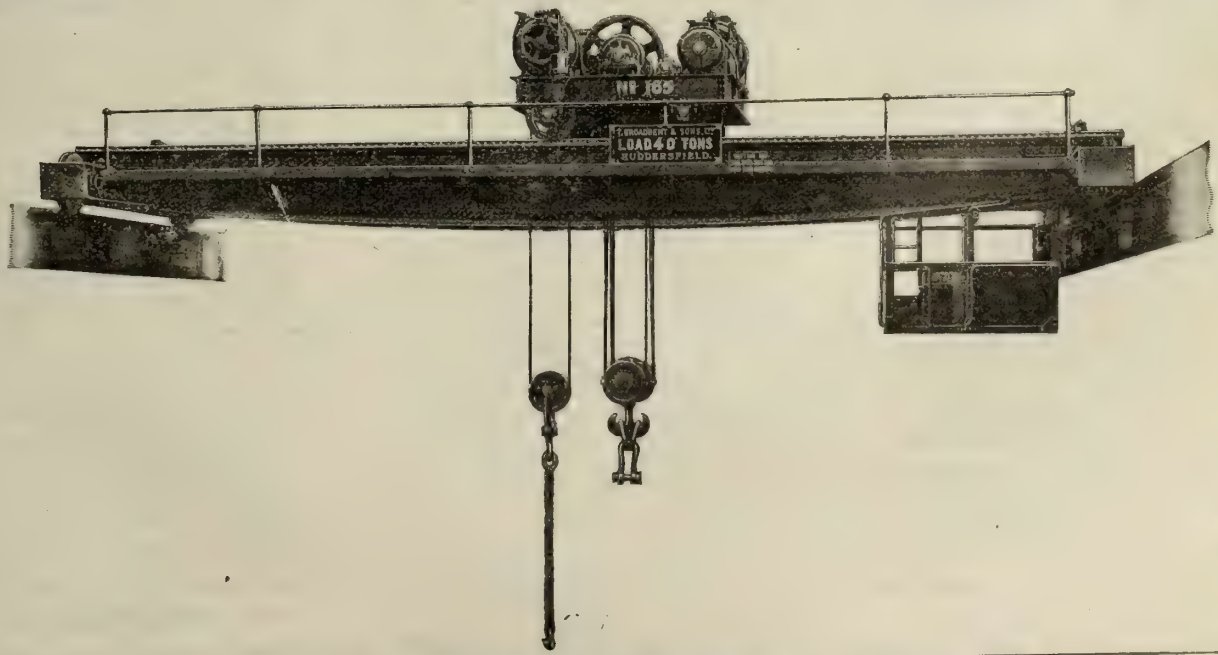

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Northern Crane Works, Walkerville
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Chapman Double Ball Bearing Co., Toronto
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Oliver Machinery Co., Grand Rapids, Mich.
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Rice, Lewis & Son, Toronto, Ont.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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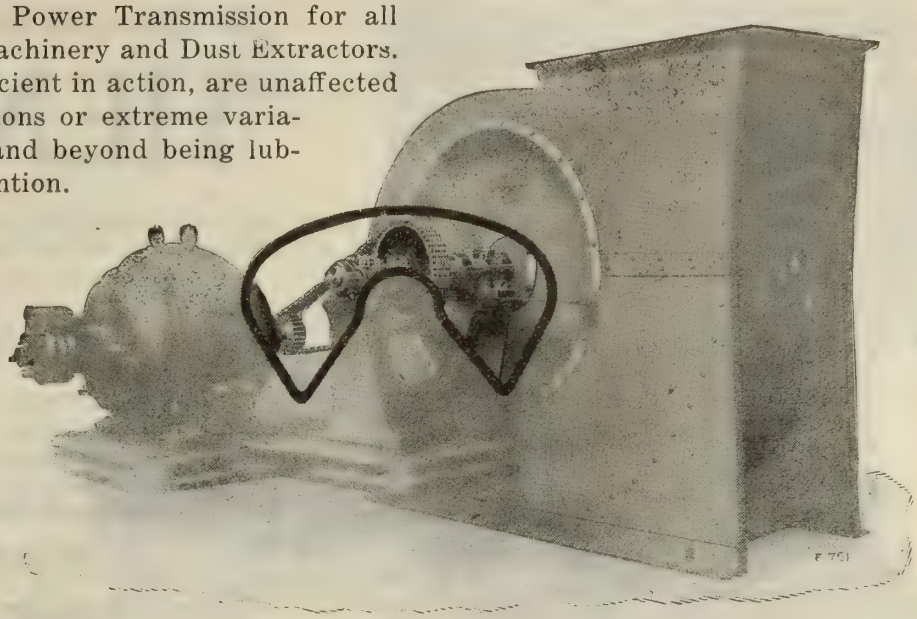

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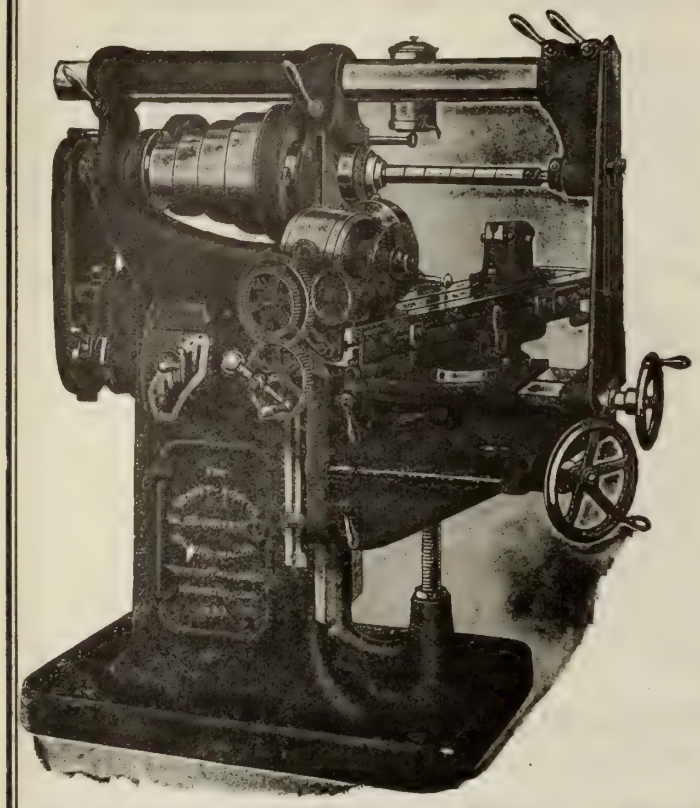

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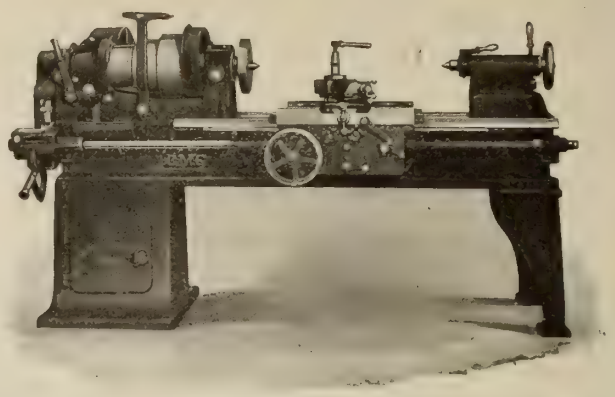

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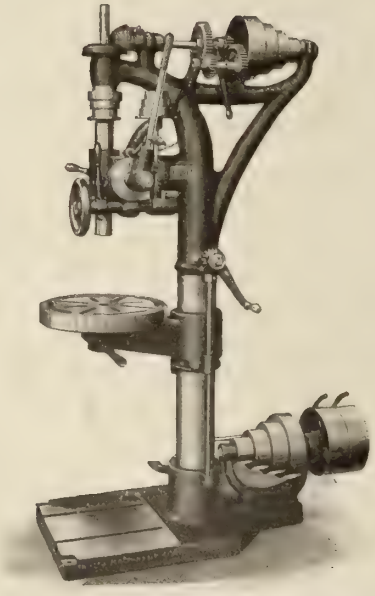

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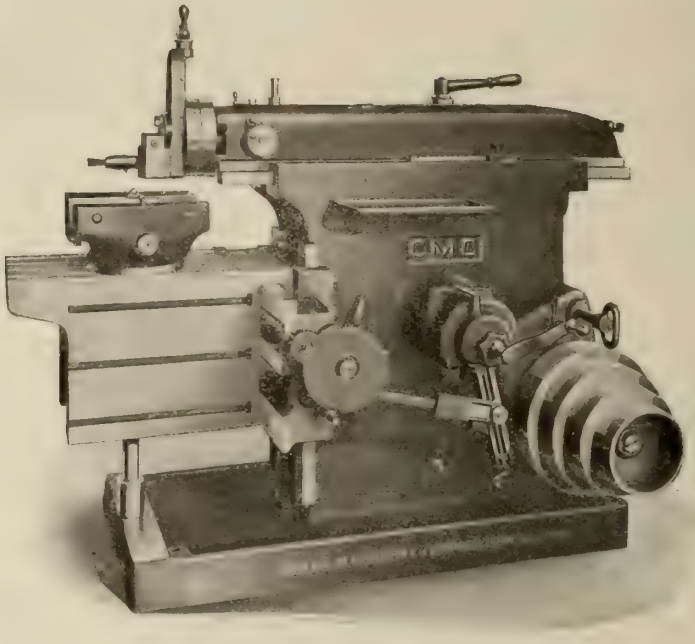

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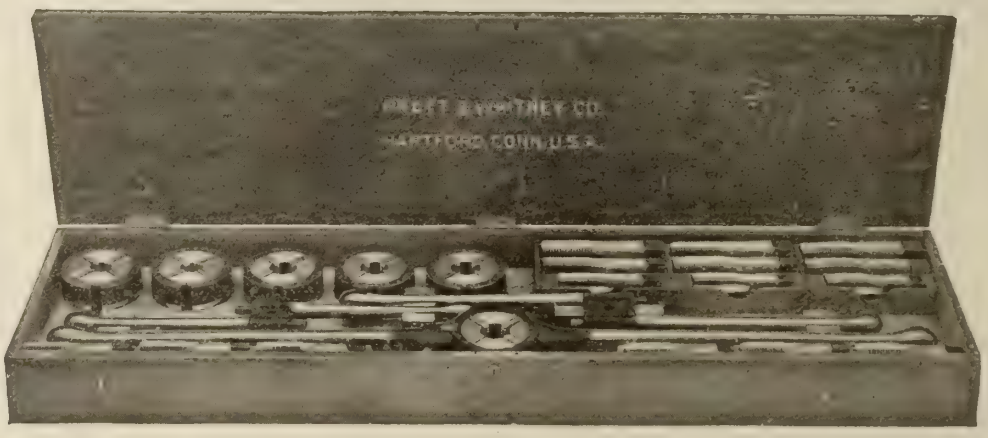

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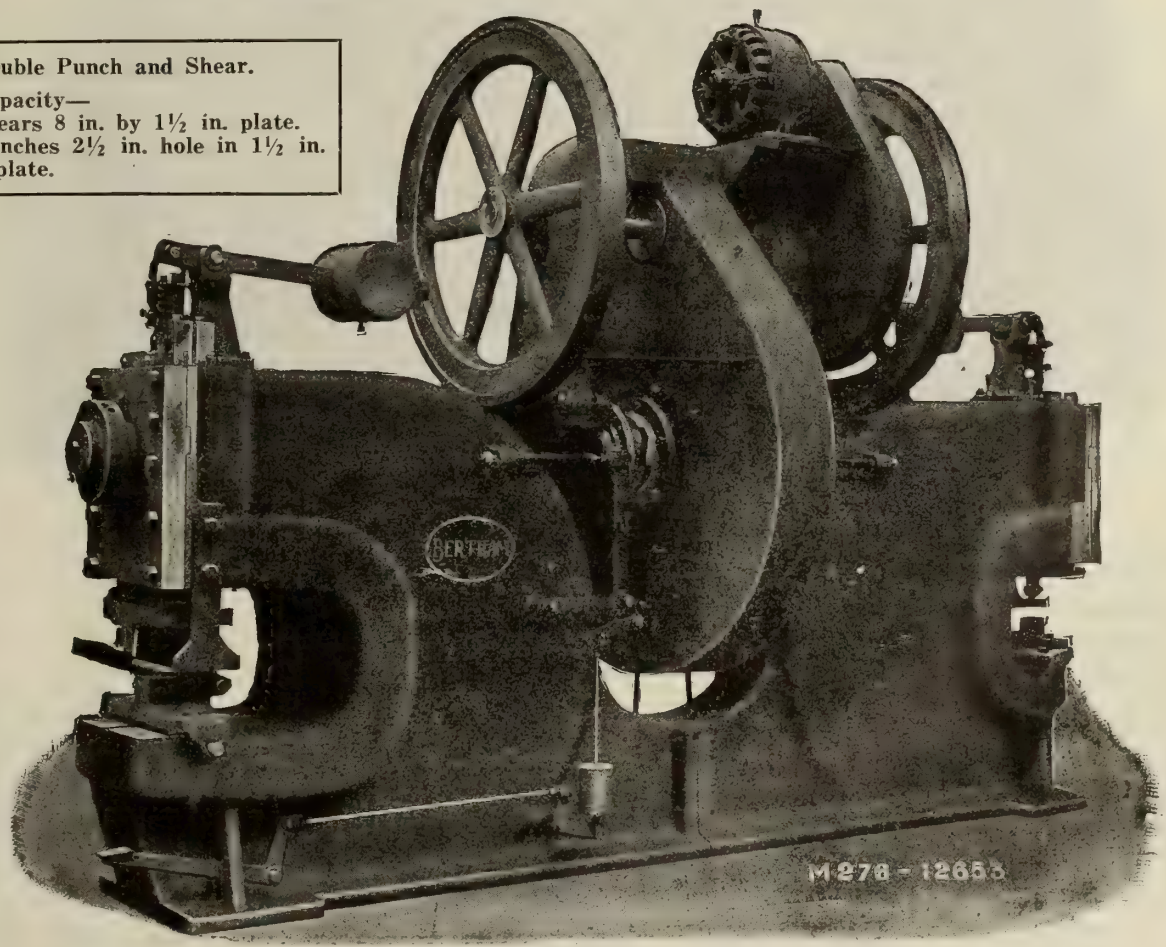

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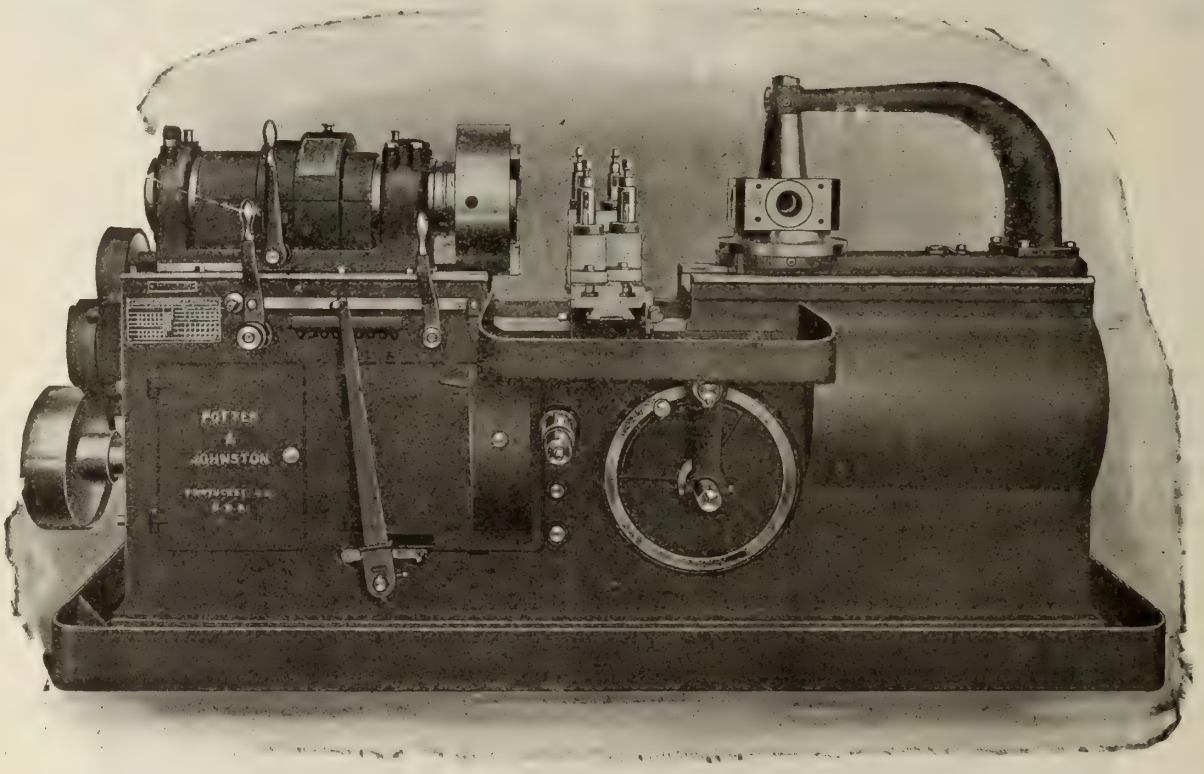

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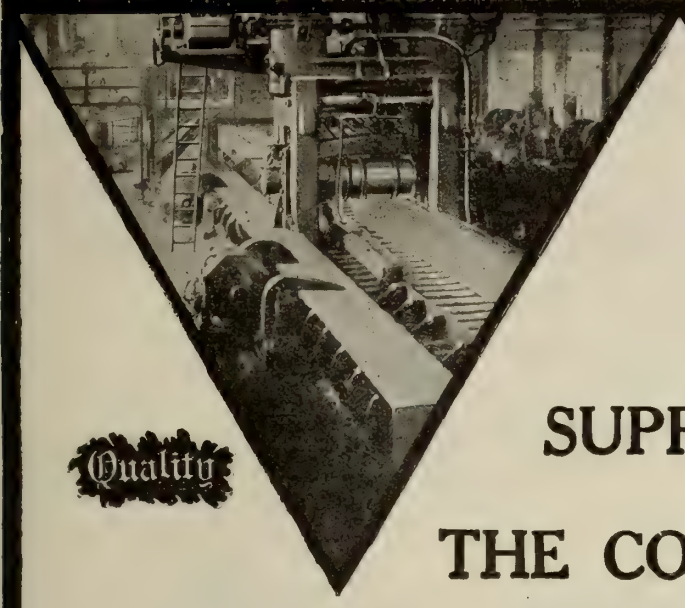

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(All Sections from 12 lbs to 100 lbs per yard)

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BASIC, FOUNDRY-
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Sulphuric Acid. Nitre Cake.

GENERAL VIEW OF THE PLANT OF THE ALGOMA STEEL CORPORATION FROM THE WATERFRONT.

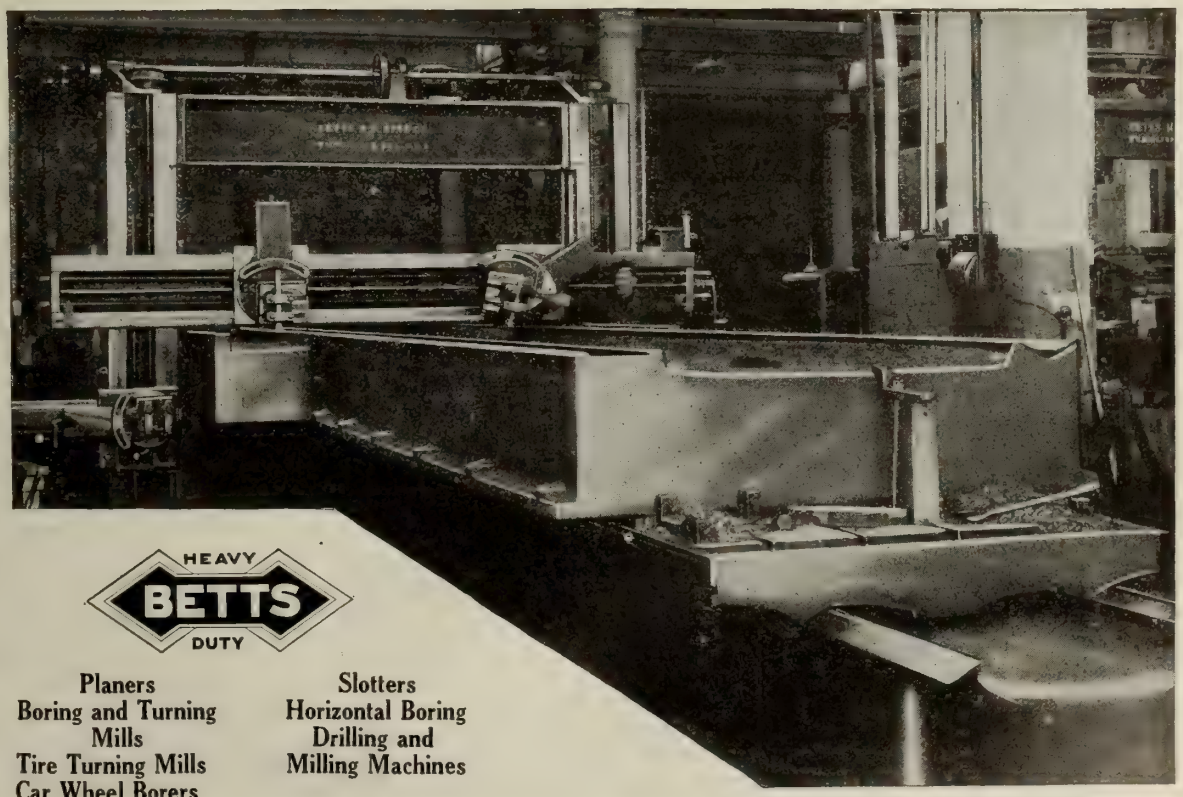
BETTS

16 Years of Faithful Service

The photograph below, taken in our own shops, shows a 22-ton cross planer bed casting being finish-planed on a Betts 120 x 72″ Planer. The depth of cut on roughing was ¾″ to 1½″, ⅛″ feed at a cutting speed of 28′ per minute.

This Betts Planer has been in active service 16 years, part of the time on 24-hour duty and continues to perform accurately and faithfully on a wide range of duties. Long life and faithful service are characteristic of all Betts tools because they are built to render service—not to sell at a price.

To avoid regrets—select a Betts. Send for detailed information concerning any or all Betts tools.



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The motor is completely balanced; the sensitive control allows the load to be raised or lowered a fraction of an inch at a time. Ball and roller bearings and thorough lubrication insure long wear.

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HIGH SPEED STEEL TRADE MARK

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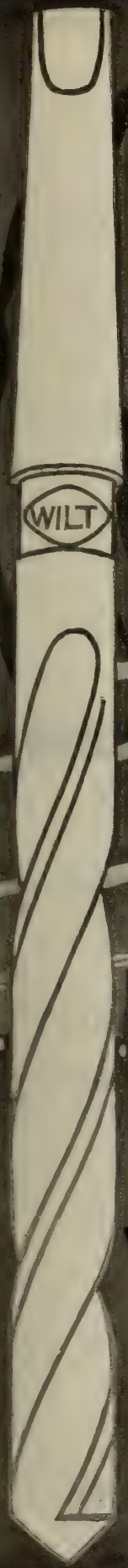
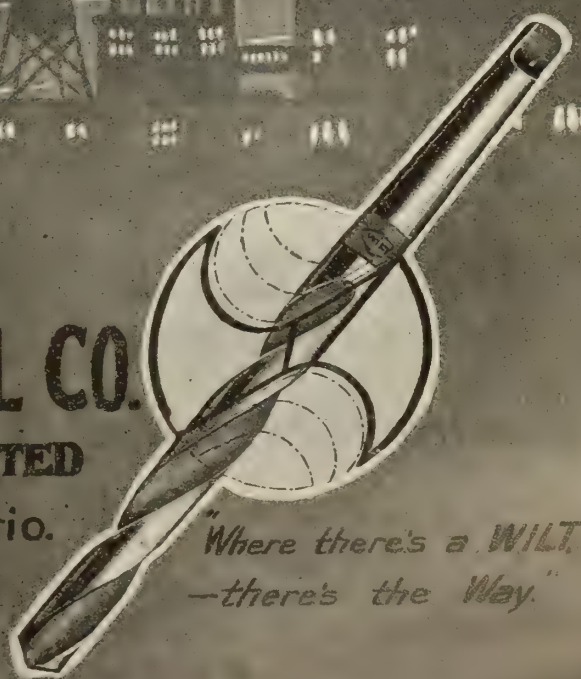
Machine shop foremen and superintendents who invariably specify **"WILT"** when requisitioning tools know **WILT Drills, Reamers and Milling Cutters** are superior—are absolutely guaranteed against defective material and workmanship—are rigidly inspected before being shipped. To produce more, use **WILT Tools.** To produce more economically, use **WILT Drills, Reamers and Milling Cutters.** Elimination of breakage alone will save you much.

HIGH SPEED AND CARBON TWIST DRILLS





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London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C.2, Eng.

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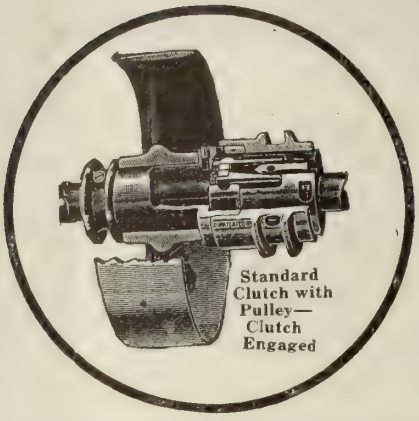
THE JOHNSON FRICTION CLUTCH

ON THE LEADING



Machine tools manufactured, is giving entire satisfaction. National Acme Co. say: "It will pull a heavy load. Very easy to shift. Fitted well into the plan of the machine."

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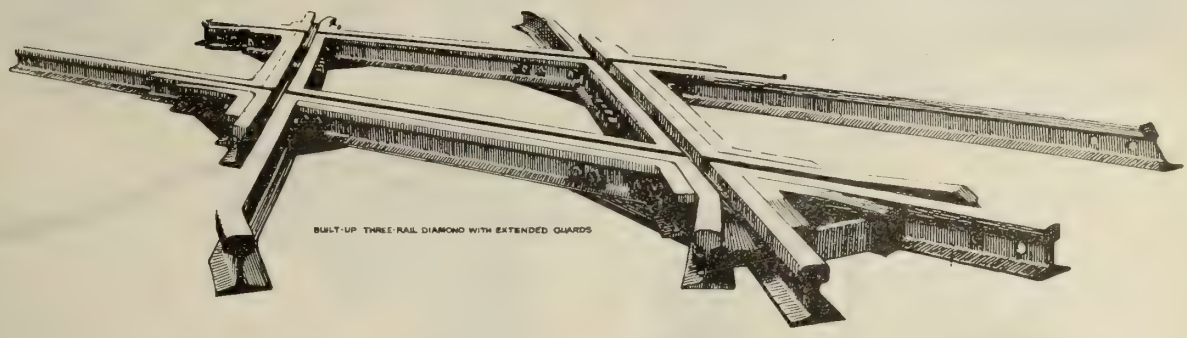

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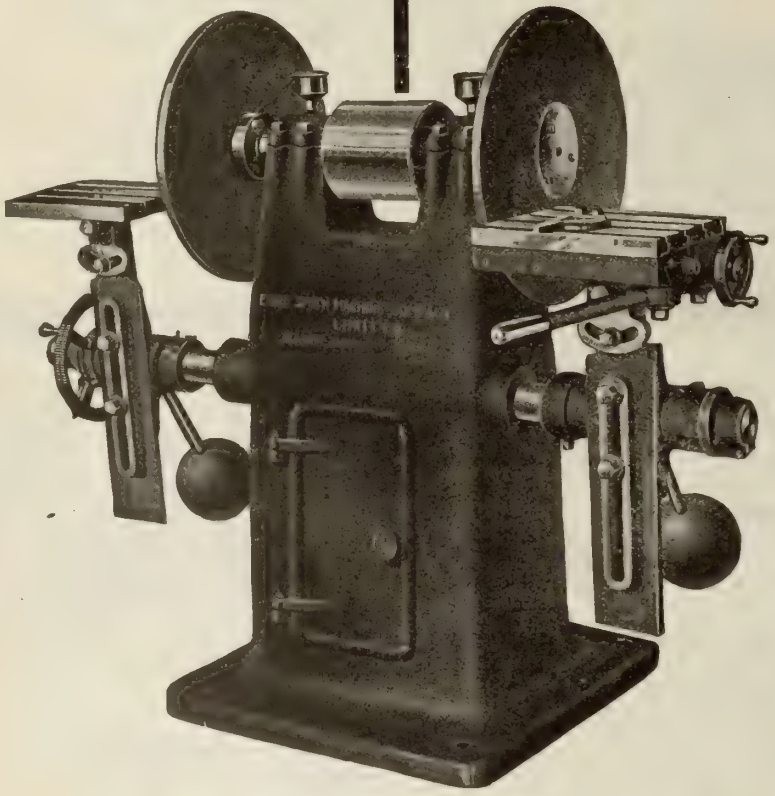

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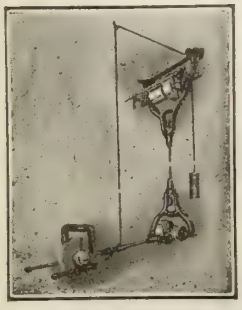
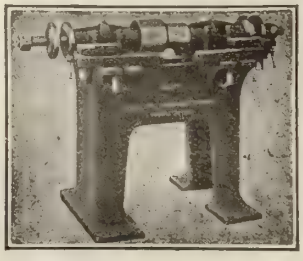
As a manufacturing proposition, the Disc Grinder (or Ring Wheel Grinder for rougher work) has nothing approaching it for production. The abrasive materials on the Disc Circle are to be considered as extra-high-speed cutting tools. This, backed by ample belt power, and a heavy rigid frame, is the secret of the success of this method of metal reduction. These improved Machines will not slow down, glaze, or get dull, when correctly set up, even when the work is forced strongly against them.



Swing Grinder



Heavy Type Floor Grinder

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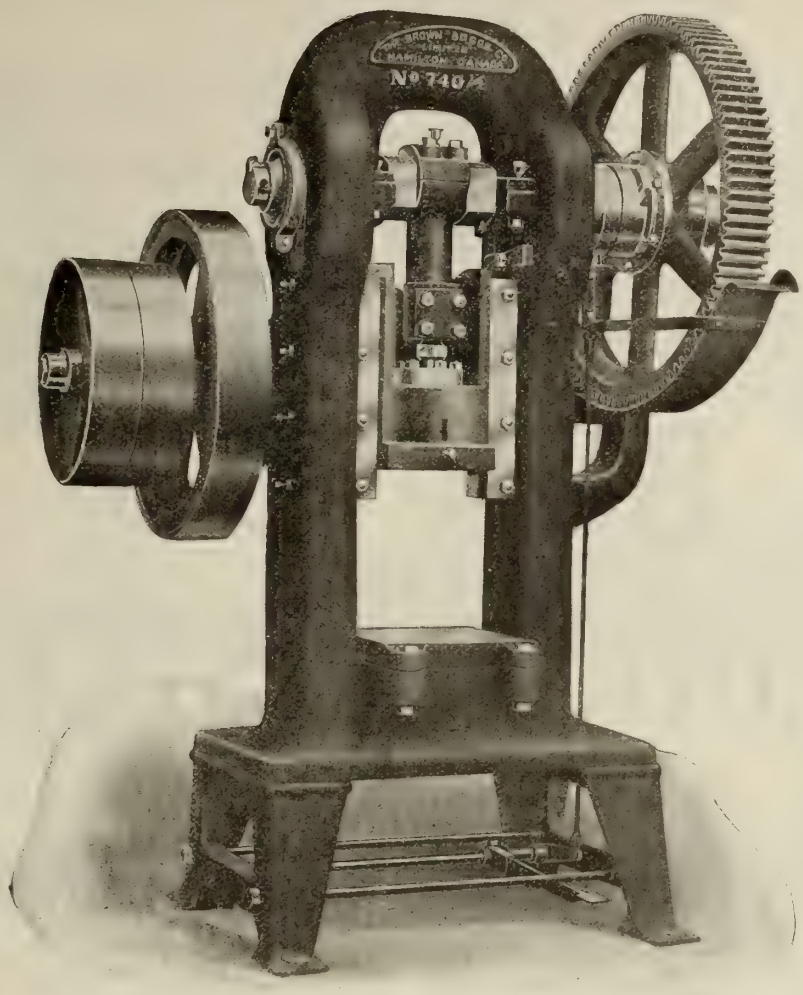

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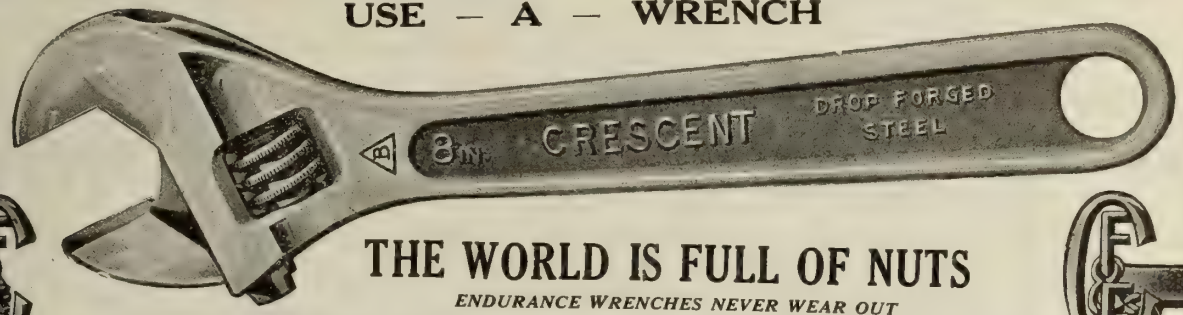

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25 Tons 1⅛″ Cruciform Section Solid Drill Steel.

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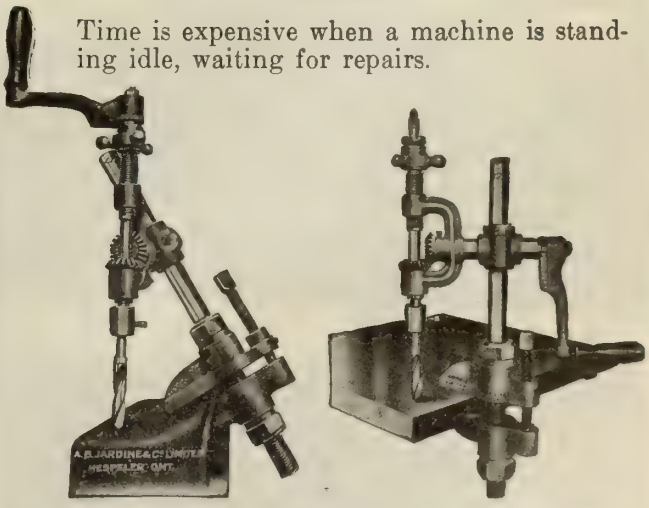
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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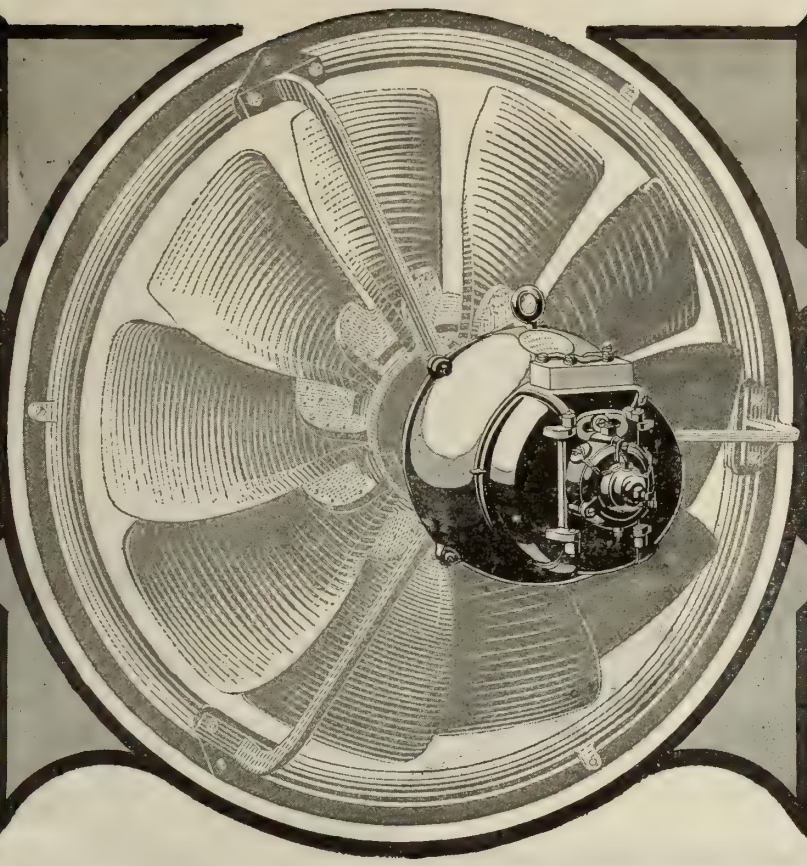

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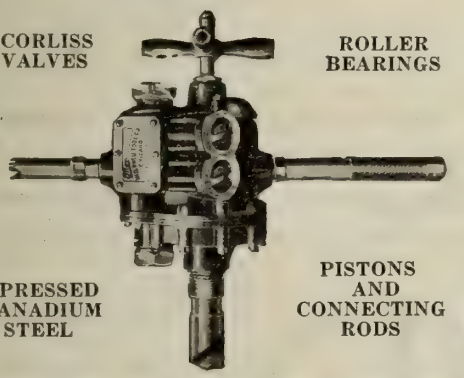

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All parts hardened and ground.

ELECTRIC DRILLS

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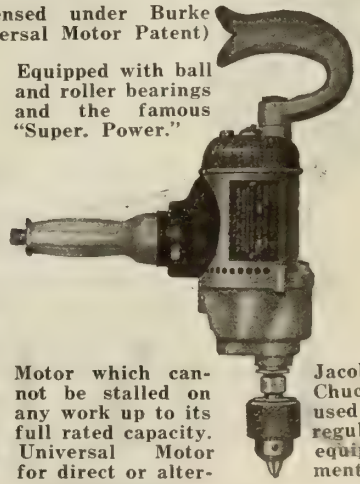

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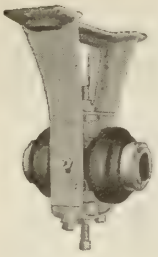

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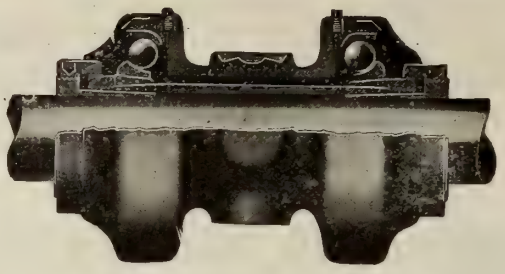

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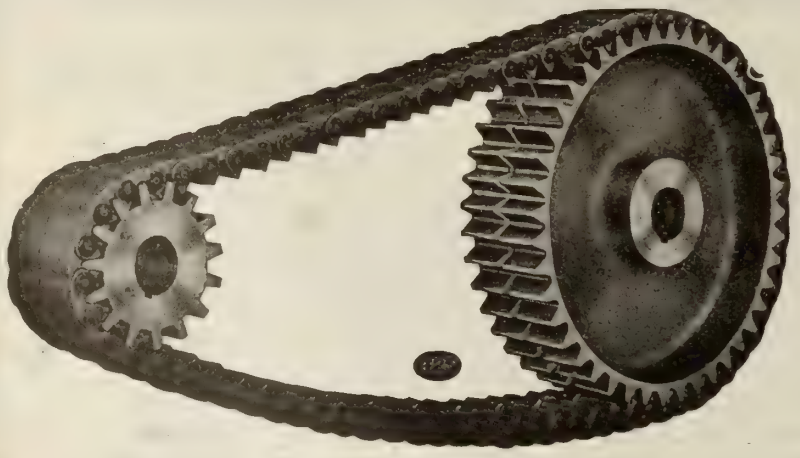

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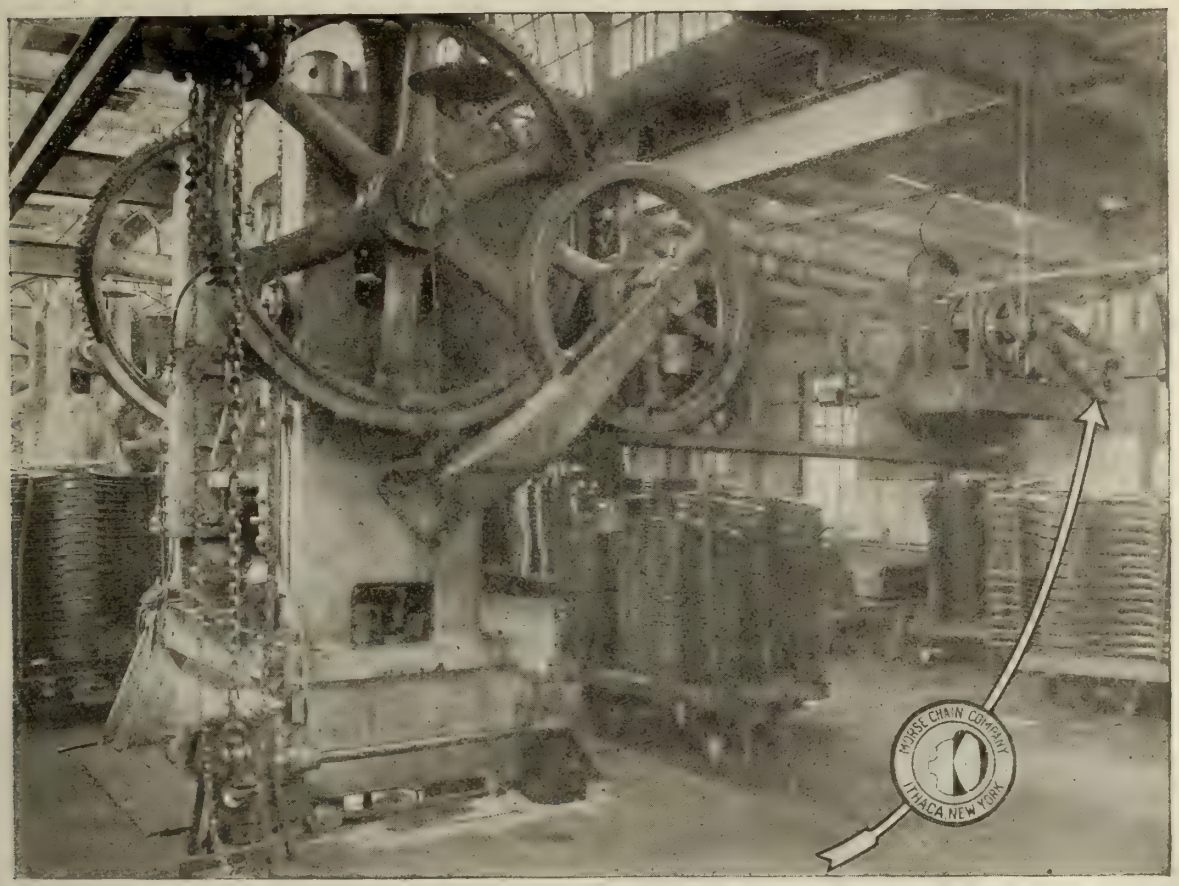

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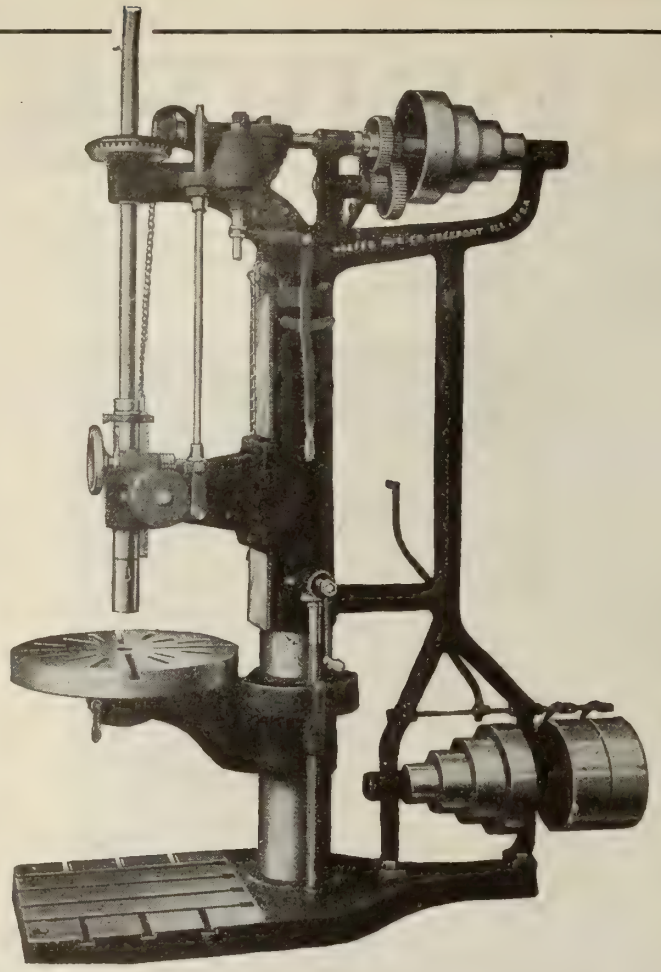

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Hoefer Drillers are looked upon as a recognized standard — the standard by which satisfactory service can be measured.

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UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER

HEAVY MACHINE SAW BLADE
ENOX 18 G. 17 G. & 16 TEETH 16 G THICK TO INCH
½ TO 2" WIDE ACCORDING TO TYPE & SPEED OF MACHINE

ENOX
Hacksaw Blades
ARE THE BEST

AGENTS IN CANADIAN TOWNS WANTED

Liberal Terms offered to firms willing to carry stocks and act as sole agents for the district.

Makers:

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AN ENTIRELY BRITISH COMPANY

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LIGHT MACHINE BLADE
ENOX 21 G THICK 14 TEETH ⅛ & ¾ WIDE TO INCH

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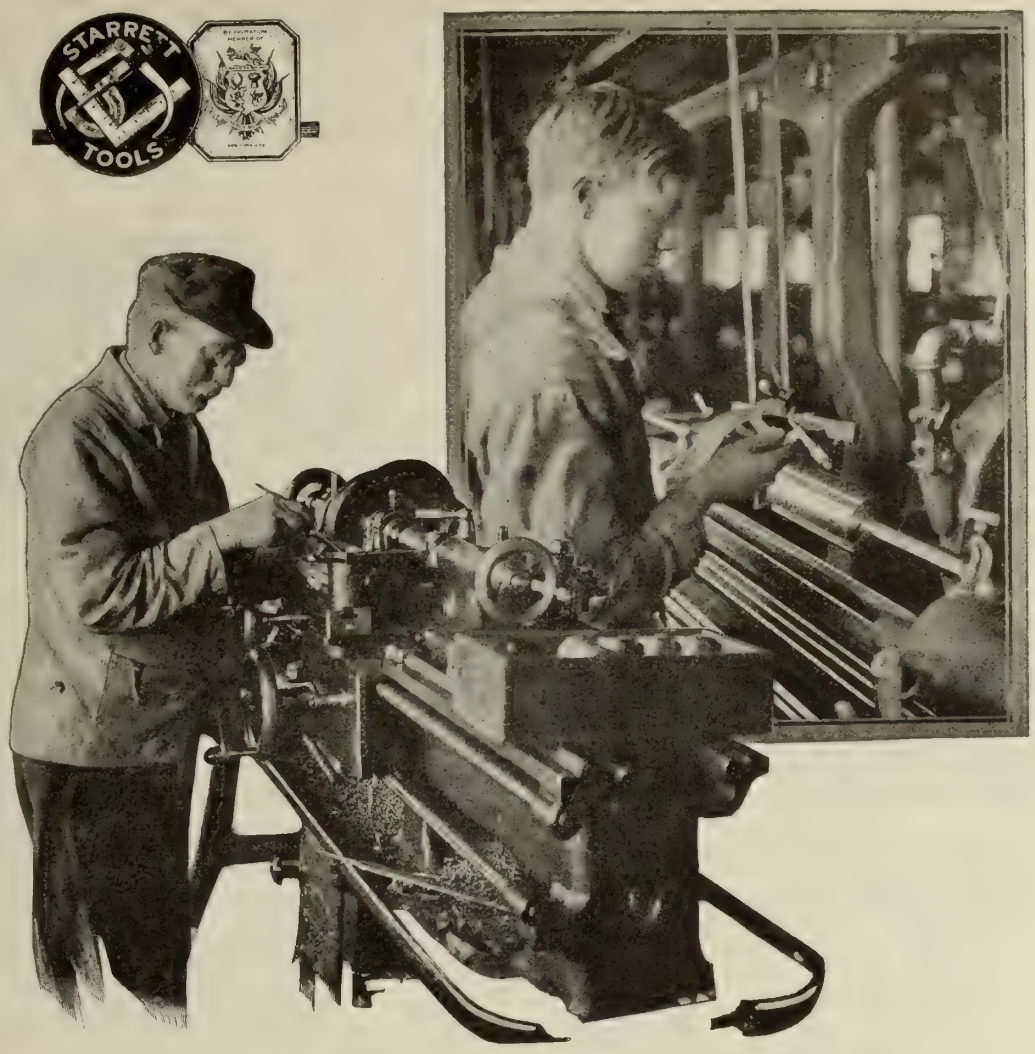
THE STANDARD MACHINERY & SUPPLIES, LIMITED, 261 Notre Dame St. West, MONTREAL, QUE.

Agents for British Columbia—The A. R. Williams Machinery Co., Lim ited, 495 Railway St., Vancouver, B.C.



FOR TWO GENERATIONS

Inspectors, Toolmakers, Machinists and Apprentices have pinned their faith to the accuracy of

Starrett Tools

In the lathe room, at the bench, throughout the shop, wherever metal work requires precision measurement, you'll find men using Starrett Tools from preference.

Catalog No. 213 sent free on request.

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The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

New York **London** **Chicago**

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THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

The Nationally Known—First Quality

HIGH SPEED STEEL

is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

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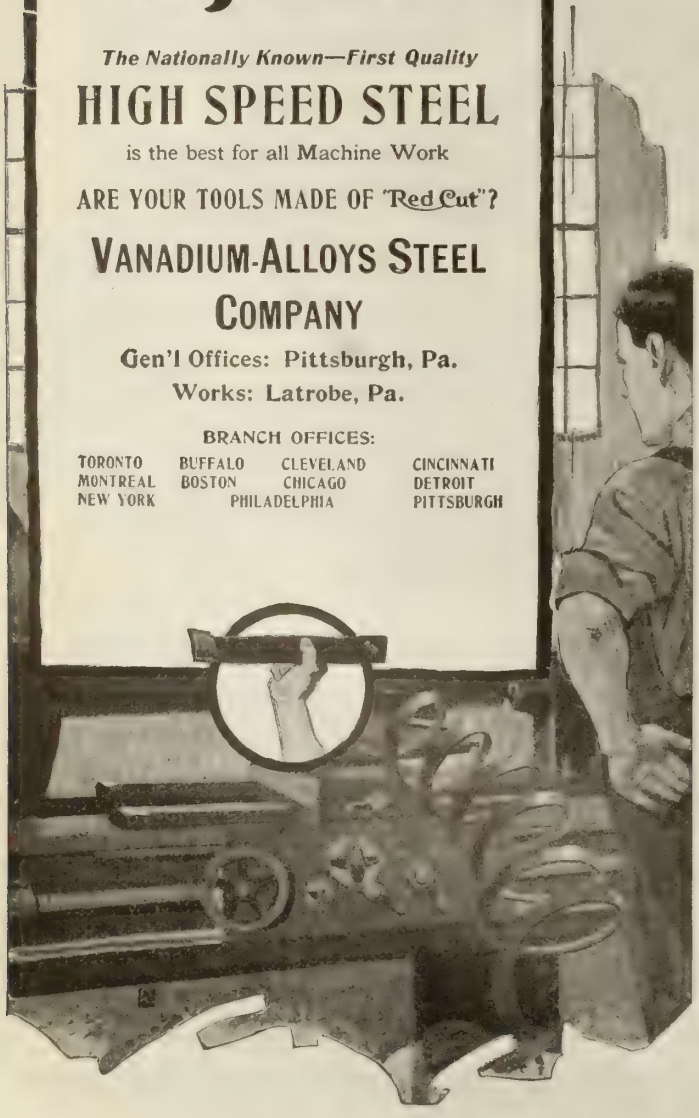

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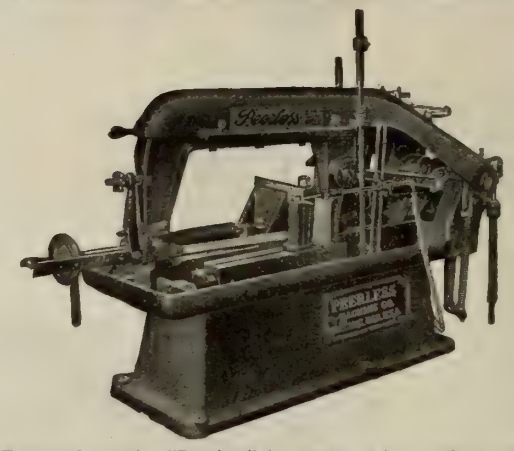
Has Proven Its Efficiency Where Others Have Failed



DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN

H. COLLIER SMITH

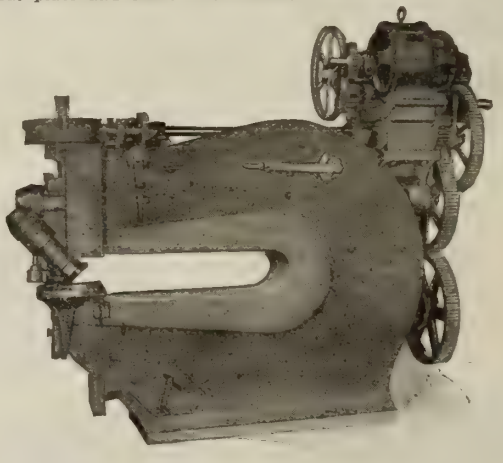
"QUICKWORK"

Registered U.S. Patent Office

ROTARY SHEARS

Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



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SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing

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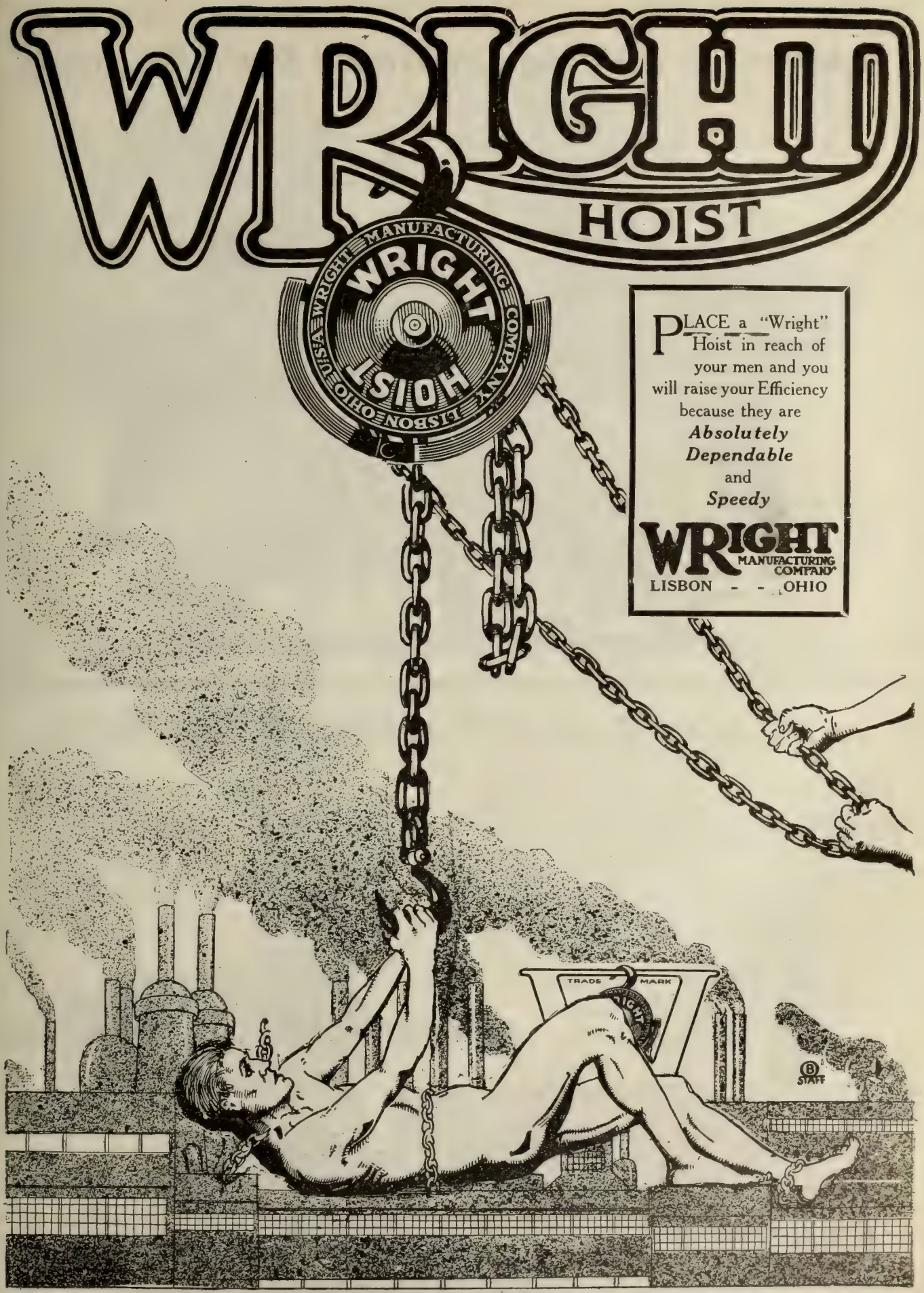

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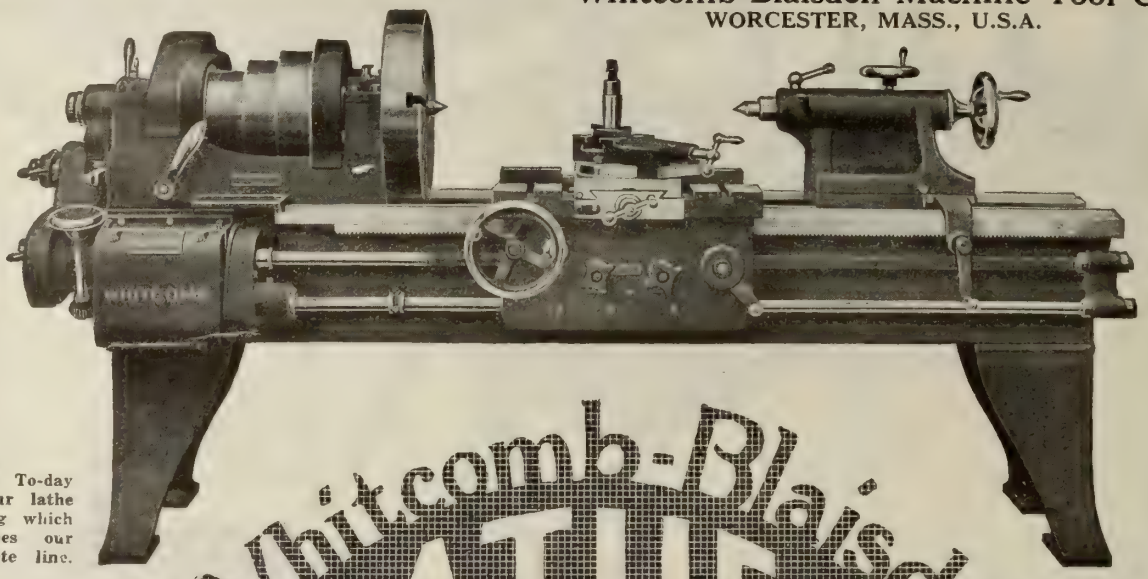
Williams & Wilson, Limited - - - - - - - - - - - 84 Inspector St., Montreal, Que.

Adapted to all kinds of Rapid Manufacturing

WHETHER your lathe requirements must suit the rapid manufacture of intricate parts or versatile demands of modern tool room practice, one of the Whitcomb-Blaisdell Line will fit exactly your individual needs.
When you buy a Whitcomb-Blaisdell Lathe you get a big measure of service in return for every dollar invested. The entire line of W-B Lathes is distinguished for superior design, workmanship and material.
Rigid inspection and thorough working tests in our shops are your assurance of accuracy and dependability.

Whitcomb-Blaisdell Machine Tool Co.
WORCESTER, MASS., U.S.A.



Write To-day for our lathe Catalog which describes our complete line.

Whitcomb-Blaisdell LATHES

Cuts Costs ---*it is a Rockford Machine*

Increases Production

This powerful machine is made to drive high-speed drills up to 3″ diameter, for drilling and boring tools up to 8″ in diameter, for boring out cored holes in cast iron.

It has a lateral and vertical adjustment of the head that permits the spindle to operate anywhere on a surface 18″ high by 36″ wide.

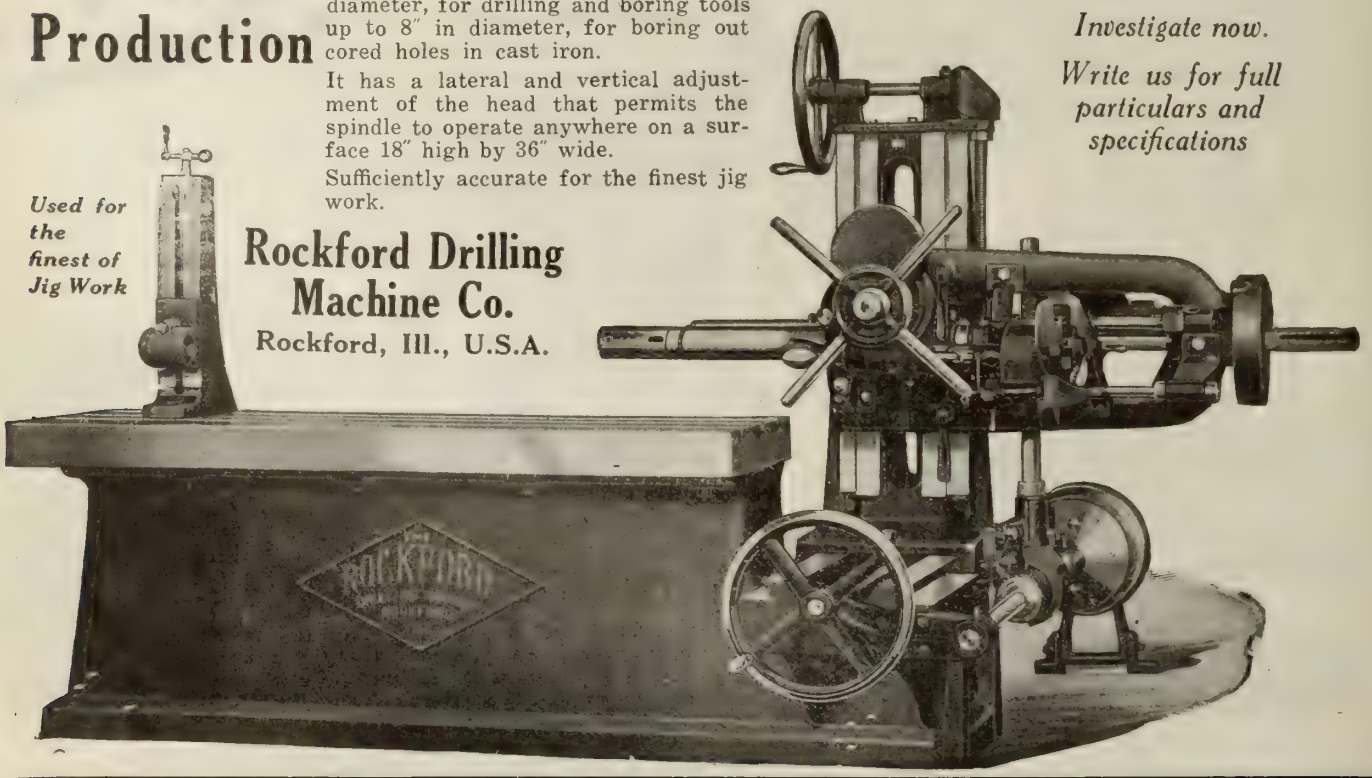
Sufficiently accurate for the finest jig work.

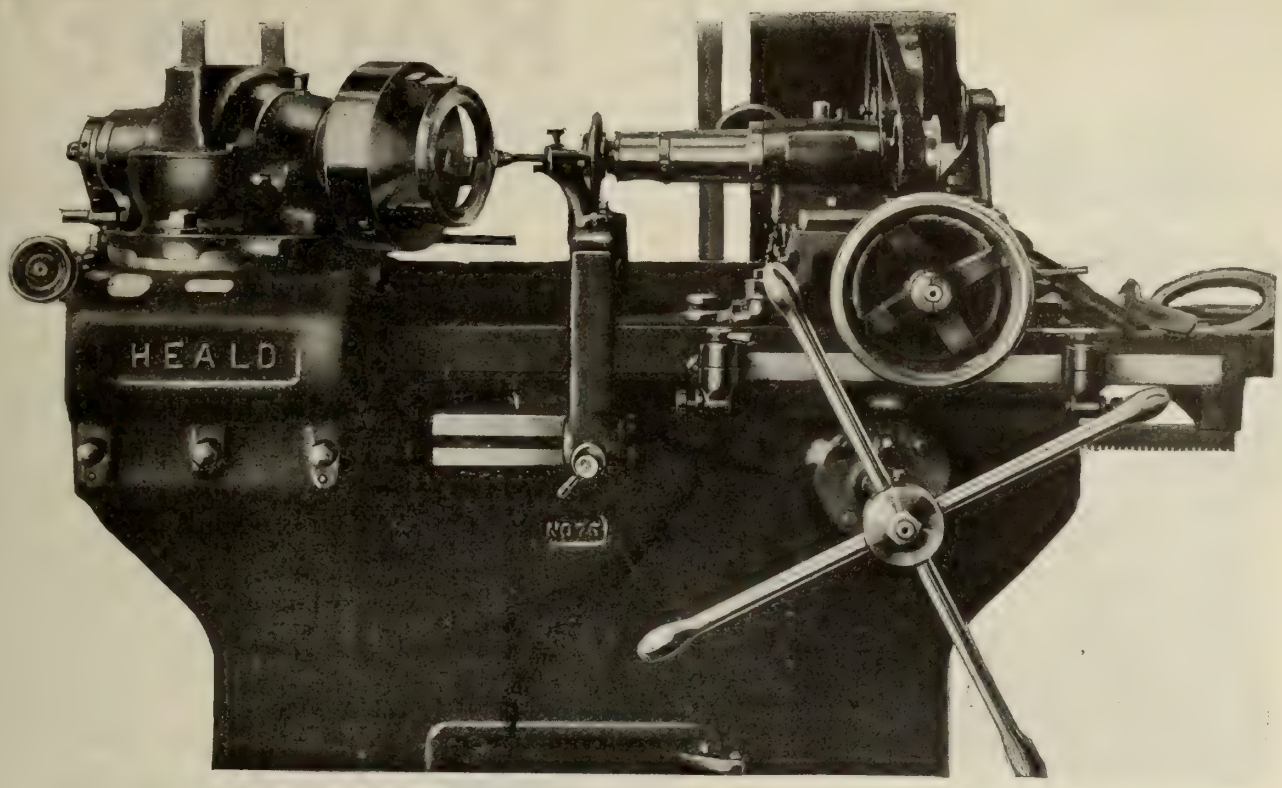
Used for the finest of Jig Work

Rockford Drilling Machine Co.
Rockford, Ill., U.S.A.

Investigate now.

Write us for full particulars and specifications





A Heald Job on a Heald Grinder

The above photo was taken at the Heald plant where a Heald No. 75 Internal Grinder is grinding a hardened steel ball race to be used in the construction of a ball thrust bearing for the 12″ Surface Grinder.

Notice the radius truing device adaptable to either the No. 70 or No. 75 Internal Grinders, and which it is possible to either concave or convex the wheel as desired. In this case the curvature was 11/32 radius and a mirror finish was produced.

The Heald Internal Grinders, both hand feed and automatic, are not only production machines but are ideal for tool rooms, doing straight and taper work, large or small. The various size wheel heads are units in themselves and easily interchangeable.

Branch Offices: New York, 839 Singer Bldg. Philadelphia 1308 Commonwealth Bldg. Chicago, 24 South Jefferson St. Detroit, 911 Majestic Bldg. Cincinnati 311 Provident Bank Bldg. Cleveland, 1102 Swetland Bldg. Western Agents Eccles & Smith Co., Los Angeles, San Francisco and Portland. Salt Lake Hardware Co., Utah and Idaho.

Foreign Agents: Alfred Herbert, Ltd., England Societe Anonyme, Alfred Herbert, France, Switzerland, Spain and Portugal. Societe, Anonima Italiana, Alfred Herbert, Italy. F. W. Horne Co., Japan. Wilh. Sonesson & Co., Sweden, Denmark and Norway.

THE HEALD MACHINE COMPANY

Worcester Massachusetts

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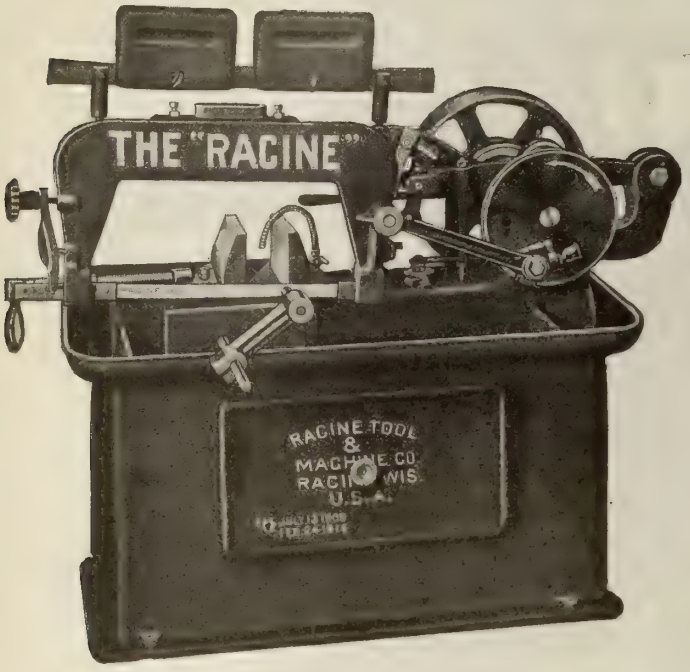
"How Heald Helped in Other Shops"

Standard the World Over

"THE RACINE"

HIGH SPEED METAL CUTTING MACHINE



Reduces Blade Expense

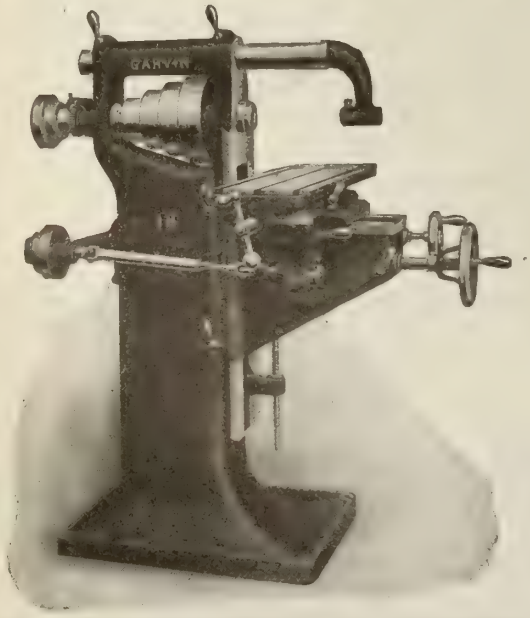
Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue - RACINE, WIS., U.S.A.

GARVIN



No. 12 Plain Milling Machine-Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments .....18 x 6 x 15 in.

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

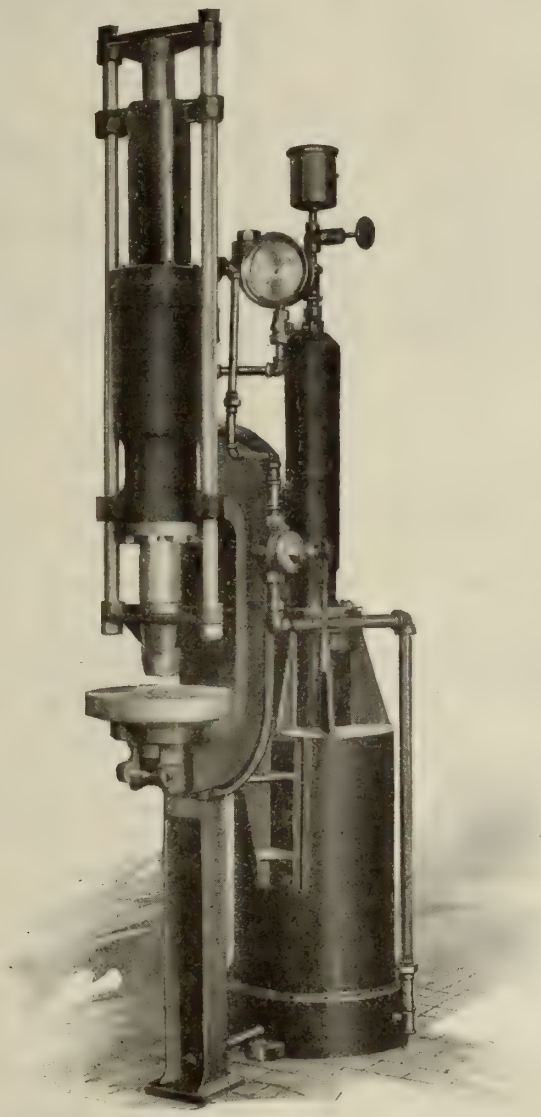
Spring and Varick Streets *(Visitors Welcome)* 50 Years New York City

ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

EXCLUSIVE SALES REPRESENTATIVES:

Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Pa.

Notes On Grinding

NORTON COMPANY WORCESTER, MASS.

No. 61A

From a Recent Discourse on Soft Wheels, by H. W. Dunbar

I have often had occasion in talking with some operator in a grinding department who felt that he was more or less in trouble because his wheel was wearing out rapidly or glazing and filling, and he could not produce the large number of pieces per day that he had hoped to, received in reply to my question, "Have you used a soft wheel?" the answer, "Oh, yes, this wheel is a K wheel." In his mind that wheel was soft because it occupied the position in the low scale of the grading list. He had given little thought to the fact that he was grinding work eight, ten or twelve inches in diameter. In each case the K wheel might have been quite a bit too hard for the operation, and again undoubtedly he had paid little attention to the fact that his speeds of work revolution could be of so great assistance to him in causing that wheel to act in a proper mannner.

When considering wheel grade to determine the correct one to use, the following points should be kept in mind.

1. That the grade letter has little meaning in so far as the wheel action is concerned, serving only as the means of identifying that particular wheel.
2. The diameter of the work will vary the cutting action of the wheel. The smaller the work the harder the wheel may be and the larger the work the softer it must be, of course, assuming that the diameter of the wheel is the same.
3. The larger the diameter of the wheel the harder the wheel will act. The smaller the diameter of the wheel, the softer it will act, the diameter of work remaining the same in both cases.
4. The wider the face of the wheel in contact with the work being ground, the softer the wheel must be to grind rapidly.
5. Work speeds are provided for the purpose of varying the cutting action of the wheel; in other words, so that the wheel may be made to act soft or hard.
6. The grain size affects the apparent grade of the wheel, finer grains appearing hard while coarse grains appear soft in their action, regardless of the bonding grade.

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B. Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

ELECTRIC FURNACE PLANTS
NIAGARA FALLS, N. Y. CHIPPAWA, ONT.

NEW YORK STORE 151 CHAMBERS ST. CHICAGO STORE 111 NO JEFFERSON ST.

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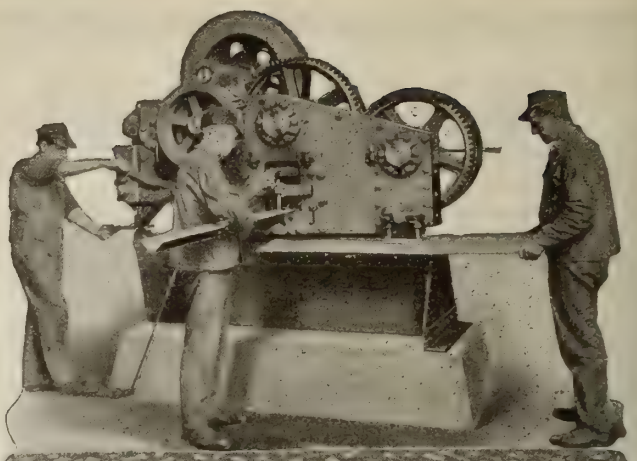

Canadian "Universals"

CANADIAN Universal Slitting Shears, Punches and Bar-Cutters are seven and one-half times as strong as cast iron and only one-third as heavy, for the same capacity.

That's why Uncle Sam used these machines so extensively during the war—that's why they should prove equally popular as a Peace Time manufacturing investment.

They will perform three separate operations at one time—slit plates, punch and cut angles, flats, squares or rounds.

Write for Catalog 325-16.

Canadian Blower & Forge Company, Ltd.

KITCHENER, :: ONT.

Toronto—220 King St. W.
Montreal—57 Canada Life Bldg.
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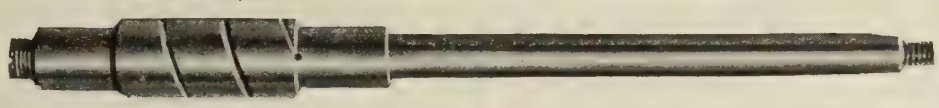
"Canadian"

Five Diameters Ranging From 9-16 to 1 ¼ in. on Each Shaft--

with a Norton Grinding Machine

He Completes 45 Shafts Every 9 Hours



Every machinist should know what an amazing variety of cylindrical work can be ground on Norton Grinding Machines at less cost per unit than by any other method.

Here is an example in one of the big Middle West factories of a variety of diameters at low production cost. This operator grinds cold rolled steel shafts for water pumps in automobile engines. In the rough these shafts are in five sizes, running from approximately 9-16 in. to 1¼ in. in diameter; he removes about 0.020 in. stock to secure his diameters and is allowed a tolerance of 0.0005 in. The finish is perfect, yet he finish grinds 45 of these shafts every nine hours. Is there any other process that can compare with this—to say nothing of the high quality of the work?

If your shop does any cylindrical work you should get in touch with us at once. Our Service Department will cheerfully furnish information concerning the advantages of cylindrical grinding.

Write us to-day.

Norton Grinding Company, Worcester, Mass.

Chicago Store: 11 North Jefferson Street

Vonnegut Machinery Company, Indianapolis, Ind. Robinson, Cary & Sands Company, St. Paul and Duluth, Minn. Manning, Maxwell & Moore, Inc., St. Louis, Mo. Henry Prentiss Co., New York, N.Y.; Boston, Mass.; Buffalo, N.Y.; Rochester, N.Y.; Syracuse, N.Y.; Scranton, Penn. The Motch & Merryweather Machinery Company, Cleveland, O.; Detroit, Mich.; Pittsburgh, Penn.; Cincinnati, O. Eccles & Smith Company, San Francisco, Calif.; Los Angeles, Calif.; Portland, Ore. The Canadian Fairbanks-Morse Company, Ltd., Montreal, Que.; Toronto, Ont.; Vancouver, B.C. C. T. Patterson Company, Ltd., New Orleans, La. Kemp Machinery Company, Baltimore, Md. W. E. Shipley Machinery Company, Philadelphia, Penn. English Tool & Supply Company, Kansas City, Mo. Alfred Herbert, Ltd., Coventry, Eng.; Paris, France; Milan, Italy. Post Van der Burg & Company, Rotterdam, Holland. The F. W. Horne Company, Tokio, Japan. Iznosskoff & Co., Petrograd, Moscow and Ekaterinburg.

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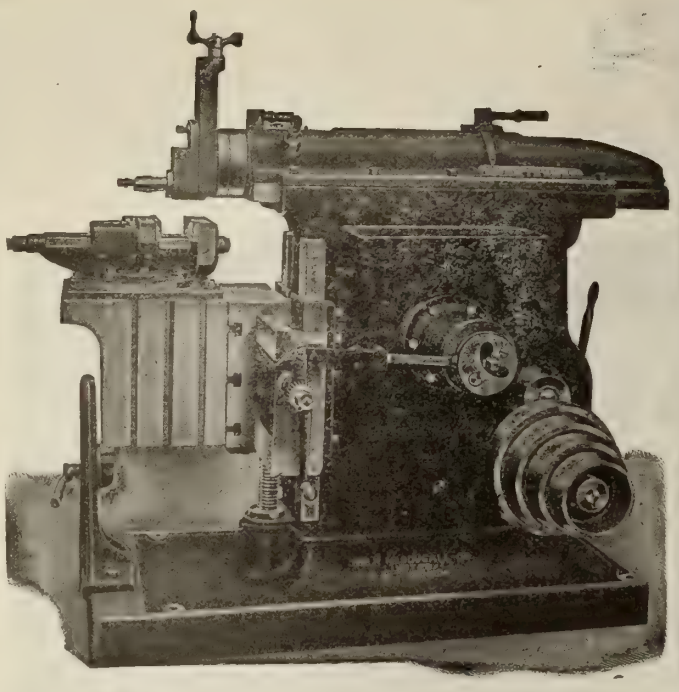

McDougall SHAPERS

Combine the best features of all machines which have hitherto been placed upon the market, and nothing has been included, except those points which experience has shown to be essential.

An examination of the construction will reveal features that make for increased production, ease of operation and accuracy.

Write for descriptive literature.

The R. McDougall Company Limited

Manufacturers

GALT, ONTARIO, CANADA

ARE-MAC-DEE IS A GUARANTEE

MARK YOUR PRODUCTS THE "MATTHEWS" WAY

"Matthews-made" steel stamps and lettering dies make easily read and durable marks on all classes of products. Matthews Champion Type Holders—for flat and convex surfaces—with interchangeable Steel Type, save time and lower marking costs. Matthews Inspection Hammers of best Pittsburgh Steel, are fashioned with the "know how" of over 50 years' experience.

Booklet "For Light and Heavy Marking" sent on request. Write for a copy of it.

Canadian Fairbanks-Morse Co., Limited

Montreal, Toronto, St. John, Quebec, Ottawa, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.

as. H. Matthews & Co. - Pittsburgh, Pa.

Steel Lettering Dies and Stamps

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company

HAMILTON, ONTARIO

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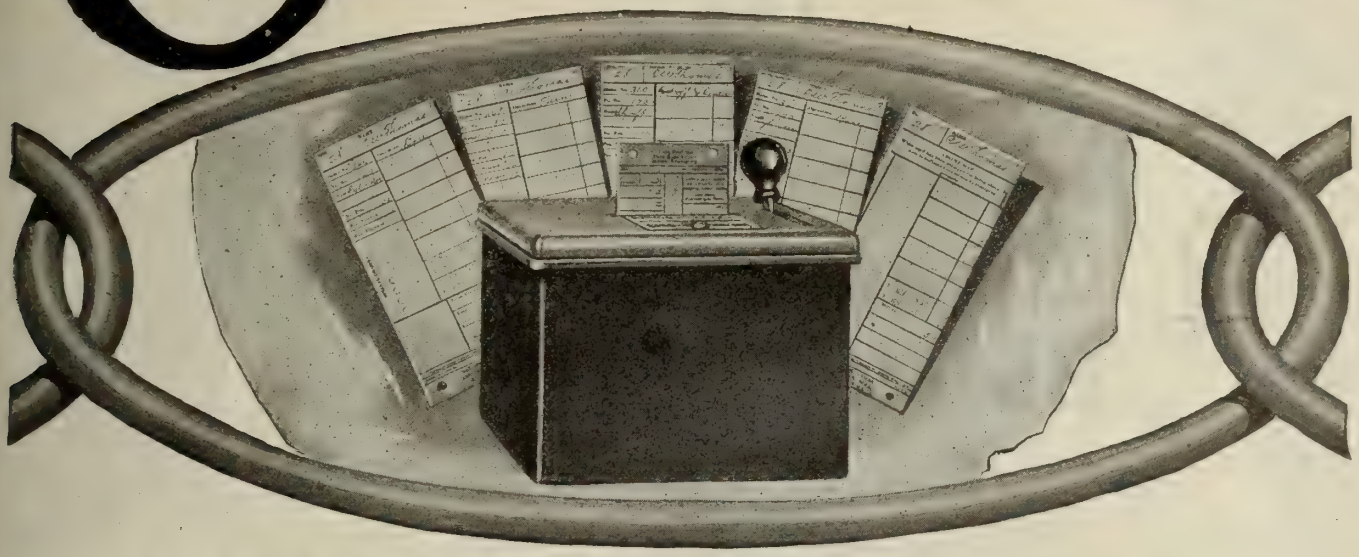
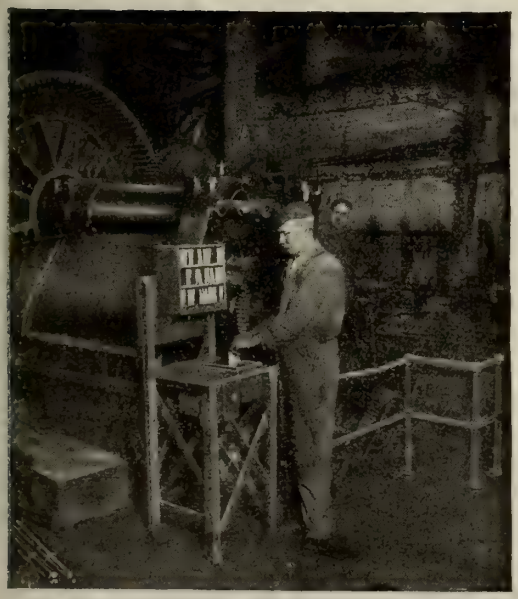
GISHOLT



A Vital Link in Securing Factory Control



The most important element of factory costs is labor. Record accurately every move of labor in your plant and you weld the master link.

Periodograph

gives you a true statement of what labor is doing. It produces business-like instead of haphazard records. It accounts for every fraction of working time, no matter how spent.

Look into the important part the Periodograph is ready to play in your factory in the matters of planning, producing and cost accounting.

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Builders of Standard and Automatic Turret Lathes, Vertical and Horizontal Boring Mills, Tool Grinders, Small Tools, Special Machinery, etc.

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Yale Chain Blocks

"from hook to hook a line of Steel"—provides the strongest, quickest and easiest means of hoisting, no matter what kind of plant you operate.

The parts are few and simple, they have the greatest overload capacity, the chain is tested to two and a half times its capacity, the gears centre around one main shaft.

In short, the Yale is the most practical of all hoists.

No matter what kind of loads you have to handle—no matter what difficulties there are to be overcome, the Yale meets the contingency. Before you equip your plant, or replace old equipment, investigate the Yale.

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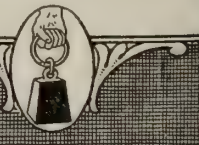

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"CANADA'S DEPARTMENTAL HOUSE OF MECHANICAL GOODS"

HALIFAX, St JOHN, QUEBEC, MONTREAL, OTTAWA TORONTO, HAMILTON
WINDSOR WINNIPEG SASKATOON, CALGARY VANCOUVER, VICTORIA

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII, No. 3. Toronto, July 17, 1919.

Making Steel in Canada

CONSIDERING operation, and some of the reactions that occur in the furnace, with various elements described. The third of a series of articles.

IN OUR last article we described the construction of a blast furnace and some of its accessories. Now let us briefly consider operation and some of the changes or reactions that occur in the furnace.

The first step toward operation upon the completion of the furnace is to thoroughly dry out the brickwork. As previously described, all the joints between the firebrick are made with the thinnest possible layer of fire-clay, but there still remains a large amount of moisture to be driven off before the brickwork can be subjected to high temperature without cracking.

This drying out process of the furnace is accomplished by building small furnaces opposite the cinder notches for either wood or coal fires. Products of combustion pass up the furnace stack and out through one of the bleeders, which is left slightly open. The process is a lengthy one, anything from two to six weeks being occupied in properly drying out the brickwork; the temperature being gradually raised and gradually dropped.

When the cost of the lining is considered and the importance of a thorough drying out realized, it will be seen that this is a very important operation.

The stoves are dried out by kindling a wood or coke fire in the bottom of the combustion chamber. The temperatures in the stoves are only about one-third as high as the temperatures in the furnace, the same amount of time and care is not given to drying out the stove brickwork.

Starting up the furnace is known as "blowing-in." In the olden days blowing-in a furnace was usually attended with some ceremony, especially if the furnace was new and had been named after the owner's daughter or some such important personage. In these more matter-of-fact days blowing-in is simply a commercial operation, and instead of a ceremony, dinners and wine, careful check of the cost is kept.

Over the bottom of the hearth is spread a layer of fine coke dust. This serves as a bed upon which the first iron melted can fall, and prevents chilling. Cord wood placed on end is then charged into the hearth, and about one-half way up the bosh, some of the intervening spaces being filled with small kindling. Coke is then charged to a point two or three feet above the mantle and a little limestone mixed with it. The regular charging of the furnace now begins.

A charge is known as a "round," and consists of so much coke, ore and limestone. The ratio between the ore and the fuel is known as the "burden" of the furnace. In beginning operations the amount of fuel used is very much increased over the usual run of operations.

When the furnace is charged up to the stock line, the wood in the hearth is lighted through the tuyeres, and all openings and gas pipes to boilers and stoves closed tightly off. One or two of the bleeders at the top of the furnace are opened and the blowing engine started to operate at a very low speed. Smoke soon begins to appears out of the bleeders, and when it becomes sufficiently gassy it is lighted and allowed to burn. As operations continue the various gas mains are opened up, but great care is exercised to make sure that the gas drives out all air, otherwise an explosive mixture would result, which might cause serious damage.

In some plants steam connections are made and the gas lines filled with steam to drive out the air. A few hours after the furnace is lighted a light slag falls away, and after about ten hours a little iron will have accumulated in the hearth. This first iron is, of course, very often of a low grade, but indicates that the furnace is getting into its stride. Charging operations become more regular, and

after about three days iron can be tapped at regular intervals of four hours, but it is usually a month before the furnace obtains its full capacity.

In starting up the stoves, it is usual at first to use some of the early gas to bring all four up to a temperature of four to five hundred degrees. Then one stove is put on a light blast and the other three on their regular gas schedule. As operations continue, stoves must be cleaned at regular intervals, especially when the furnace is working on soft ores, and a large amount of dust is carried in the gas.

There are many difficulties that occur in the operation of a furnace, such as scaffolding, sticking or adhering of the stock to the walls of the furnace just above the mantle. This obstruction causes the uprising gases to pass with greater velocity through any free area, and the scouring action of the gases cuts deep channels in the brickwork. Severe cases of this kind have to be treated by inserting an extra tuyere at the seat of the trouble to cause intense heat to bring away the obstruction, or at times a charge of dynamite is resorted to. At other times break-outs occur with serious results. Tuyeres and cooling plates may be melted, or due to an error in charging, the stock may become chilled. In fact, a blast furnace superintendent has ever to be on the watch for some outward and visible sign that indicates some inward trouble.

Now let us consider what happens inside a furnace. Four things go into the furnace: iron ore, coke, limestone and air, and four things come out: iron, slag, gas and a little steam. How do the changes take place?

Let us take all the various ingredients, pull them to pieces, and see what they are made of:

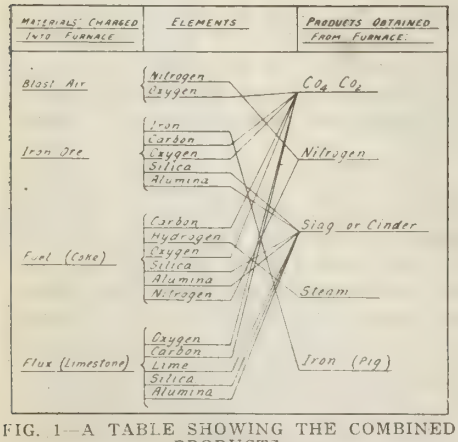


FIG. 1—A TABLE SHOWING THE COMBINED PRODUCTS.

Iron ore—iron, silica, carbon and oxygen.

Coke—Alumina, silica, carbon, nitrogen, hydrogen and oxygen.

Limestone.—Alumina, silica, lime, carbon and oxygen.

Air—Oxygen and nitrogen.

Iron—Iron, and many impurities in slight percentage.

Slag—Silica, alumina and lime.

Gas—Oxygen, carbon and nitrogen.

Steam—Oxygen and hydrogen.

Now look at Fig. 1 and see how they combine to form the products mentioned above.

Before going any further let us get acquainted with some of the gases mentioned.

First—Carbon Dioxide

When any substance rich in carbon burns in a plentiful supply of air, carbon dioxide is formed. The gas is colorless and has no smell; it is heavier than air, and is sometimes known as carbonic acid gas.

The chemical expression for this gas is $C + O_2 = CO_2$, or one part of carbon and two parts of oxygen. This gas will not burn and will not support combustion.

Second—Carbon Monoxide

The blue flame often observed burning on the surface of a coal fire is carbon monoxide gas. It is produced by carbon dioxide passing through the upper layers of heated coal, thus absorbing more carbon.

The chemical expression is CO, or one part of carbon and one part of oxygen. This gas is colorless, tasteless and odorless, is about the same weight as air, but if inhaled is an active poison.

The presence of this gas hanging around a furnace top is a source of great danger, and men are often overcome by the fumes.

Third—Hydrogen

This gas is lighter than air, burns with a pale blue flame, but will not support combustion. It is colorless and odorless, and when mixed with air it forms a highly explosive mixture.

The chemical expression is H.

Fourth—Oxygen

Oxygen has no taste, color, or smell, ordinary combustible substances burn more brightly in oxygen than air. This gas is indispensable to life, and is the part of the atmosphere which is used up in the process of combustion, decay and fermentation.

The chemical expression is O.

Oxygen combines with many things and forms oxides.

Fifth—Nitrogen

Roughly, the atmosphere contains eighty parts of nitrogen and twenty parts of oxygen. Nitrogen will not burn and does not support combustion, and, as may be expected from a gas forming so large a part of the atmosphere, it is without smell, taste, or color.

The chemical expression is N.

Now what happens in the furnace, hot air is blown in the tuyeres and meets hot coke; the oxygen in the air combines with the carbon in the coke and forms CO_2. This gas comes in contact with other portions of red hot coke and changes to $CO_2 + C = 2CO$, or carbon monoxide.

There is also some vapor in the air; the oxygen combines the carbon of the coke and leaves free hydrogen.

The nitrogen in the air blast remains to all intents and purposes unchanged.

This mass of gases rises upward with great pressure, and at a temperature varying from 2,200° Fahr. at the tuyeres to 400° Fahr. at the furnace top.

Starting at the top, let us see how the limestone and ore are influenced by these gases. At about twenty feet down from the top the limestone begins to crack and give off CO_2 gas; forty-five feet down it begins to soften and melt, uniting with the silica in the ore and the ash of the coke, the whole uniting to form a slag that floats on the iron, protecting it and forming a collecting blanket for impurities.

The iron ore begins to give up its oxygen at a lower temperature and increases in action as the temperature increases; deprived of the oxygen, the ore becomes a pasty mass, which melts upon reaching the bosh and drops in large drops into the hearth.

The above is a very simple expression of the changes that occur, stated without going into the necessary chemical expressions essential if a full explanation is desired.

The gases that are given off from the furnace top are roughly as follows:

Gas	By Weight	By Volume
Nitrogen (N)	52.59	54.51
Carbon monoxide (CO)	33.80	34.97
Carbon dioxide (CO_2) .	13.47	8.36
Hydrogen (H)	.14	2.16
	100	100

Part of the surplus or waste gases are used for heating the stoves as already mentioned. About 40 per cent. of the total gas generated is usually sufficient for this purpose, leaving 60 per cent. available for burning under boilers supplying steam for electric power and blowing engines.

Electric power, of course, is coming into greater use every day. Furnace bells that used to be raised either by steam, air, or hydraulic cylinders are now being electrically operated. Skip hoists that only a few years ago were always driven by steam engines are now being operated by electric motors.

Blowing engines are for the most part of the reciprocating vertical type, but already the turbo blower is entering the field, and on account of the vast saving in floor space, is fast superseding the more picturesque but less efficient vertical engine.

If the blast furnace is connected with the steel plant the product is usually conveyed in hot metal cars (see Fig. II) to the mixer in the open hearth department. If otherwise, the product is usually cast into pigs of a convenient size for handling. The casting of the pigs was at one time effected by making molds in the sand floor of the cast house. With the increased cost in labor, pig machines have come into use where the molds are attached to a moving chain. The chain passes underneath the pouring spout of a ladle, each mold is filled, passed down the chain into a tank of water, is cooled, comes out of the tank, and is discharged into a waiting car.

The disposal of the slag is quite a problem. When the plant is situated

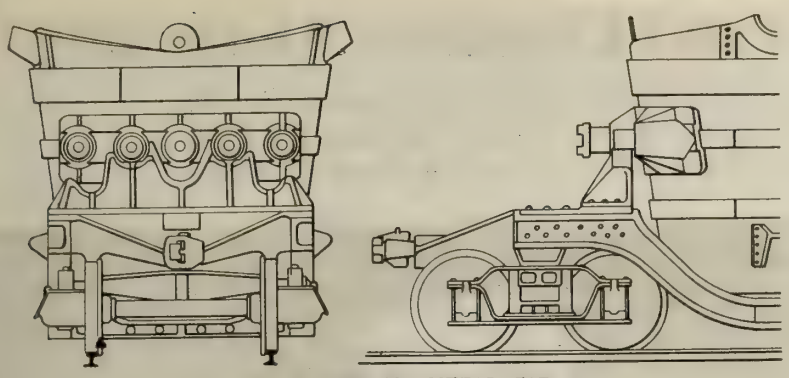


FIG. 2—THE HOT METAL CAR.

near a river or ocean shore the slag is poured into cars (see Fig. III) and dumped at the water's edge. If the plant is inland, great mountains are built up of the slag.

For a young country, Canada is fairly well supplied with blast furnace plants. The Dominion Iron and Steel Company, Limited, Sydney, N.S., have six furnaces, five having a capacity of 280 tons per day, and one having a capacity of 350 tons per day. The Nova Scotia Steel and Coal Company, Limited, Sydney, N.S., have two blast furnaces, one in operation and one under construction, each having a capacity of 250 tons per day. The Steel Company of Canada, Limited, Hamilton, Ontario, have two blast furnaces, one of 200 tons capacity per day and the other 300 tons per day. The Algoma Steel Company, Limited, Sault Ste. Marie, Ont., have three blast furnaces, two of 250 and one of 450 tons per day. Atikokan Iron Company, Limited, Port Arthur, Ont., have one blast furnace of 175 tons capacity per day. The Canadian Furnace Company, Port Colborne, Ont., have one furnace of 300 tons capacity per day. There are several other furnaces in the country, but mostly of small capacity or not in operation at the present time.

The product that we now have is iron, free from its earthly impurities, strong but brittle, possessing great compressive strength, but very little tensile strength.

We will next consider its cause of weakness and the way it is refined and the results of that refining.

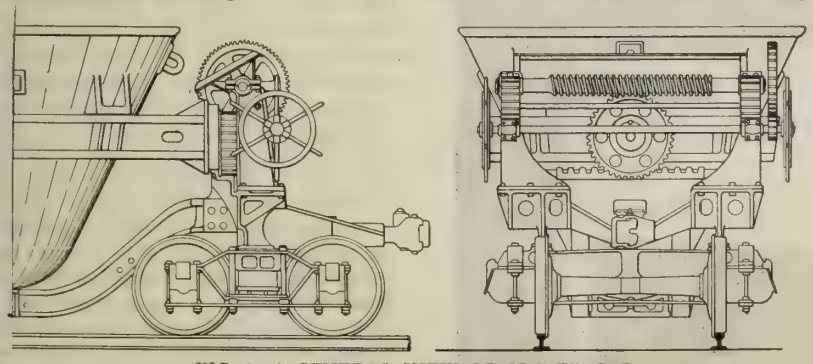


FIG. 3—A GENERAL VIEW OF CINDER CAR.

ACTIVITIES OF WELDING SOCIETY

One of the activities of the new American Welding Society is to be standardization. If any considerable progress is made in this one activity alone, the Society will have fulfilled a very high mission. While it is true that the underwriters' laboratories examination and registered label service has done much to keep up the general requirements on any acetylene consuming appliances, standardization on a scale possible and desirable in the acetylene industry would seem to be assured more readily by a bureau specializing in the one field in which we are most interested. Standardization in the automobile industry was laughed down 25 years ago, but no one factor has been more instrumental than standardization in the automobile industry's present state of development. If standardization was possible and successful in the automobile industry, it holds promise of equal benefits for the acetylene industry.

A NOVEL TACHOMETER

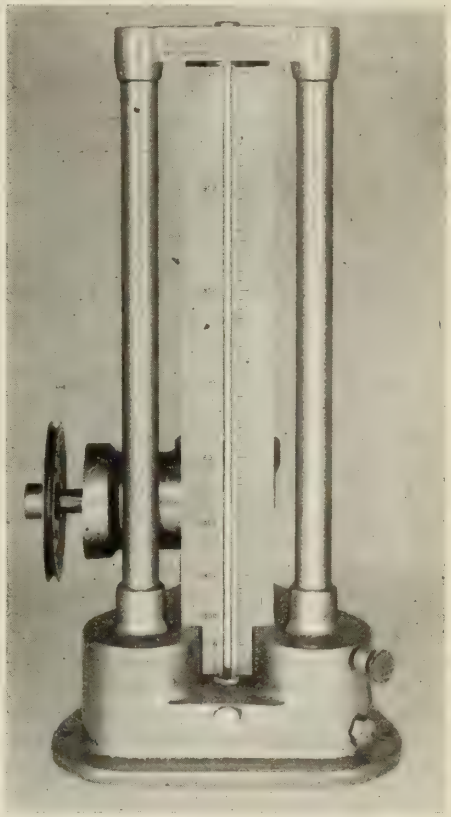
By FRANK C. PERKINS

THE accompanying illustration shows a unique speed indicator developed at Hartford, Conn. This tachometer is a permanently accurate instrument. It is a portable instrument for indicating revolutions per minute of dynamos, motors and shafting, and consists simply of a centrifugal pumps, a reservoir for liquid and an indicating tube. The only moving part is the paddle wheel in the centrifugal pump. This has radial blades and hence, indicates when run in either direction. When the paddle wheel is revolved, the liquid is forced out of pump and up the indicating tube by centrifugal force. The reservoir is connected by balanced openings to the centre of the pump and the liquid is discharged through balanced openings in its periphery.

It may be stated that the vertical height between the liquid in the reservoir and that in the indicating tube is approximately proportional to the square of the speed or revolution of the paddle. This makes the graduations open and easy to read at the upper part of the tube but too close for convenient reading at the bottom. Hence the scale is graduated only from the maximum down to about one-fifth the maximum. The graduations on the scale on front page represents variations of speed of one per cent. at top. A skilled observer can easily read the indications to within one-tenth of one per cent. at the top. Special scales with fine graduation can be furnished.

It will be seen that the reservoir is divided into 2 parts and the indicating tube is placed in the centre of gravity of the free surfaces of the liquid in the reservoir so that a slight inclination of the instrument does not appreciably vary its reading. The shaft of the paddle wheel is vertical so that no stuffing box is necessary and but a very slight amount of power is required to drive it. The paddle shaft is driven through a pair of bevel gears from a substantial horizontal shaft carried in ball bearings. The housing for this driving shaft can be rotated through more than 180° so that the instruments can be belted or geared from any direction. The vertical position of the paddle also serves to quickly eliminate any air bubbles which might be entrained in the liquid when the instrument is filled.

There is a displacement plunger provided for adjusting the level of the liquid to zero when it is at rest. There is a valve for throttling the passage from the pump to the indicating tube but this is used only when the speed varies suddenly. Kerosene colored with aniline dye is the liquid used.



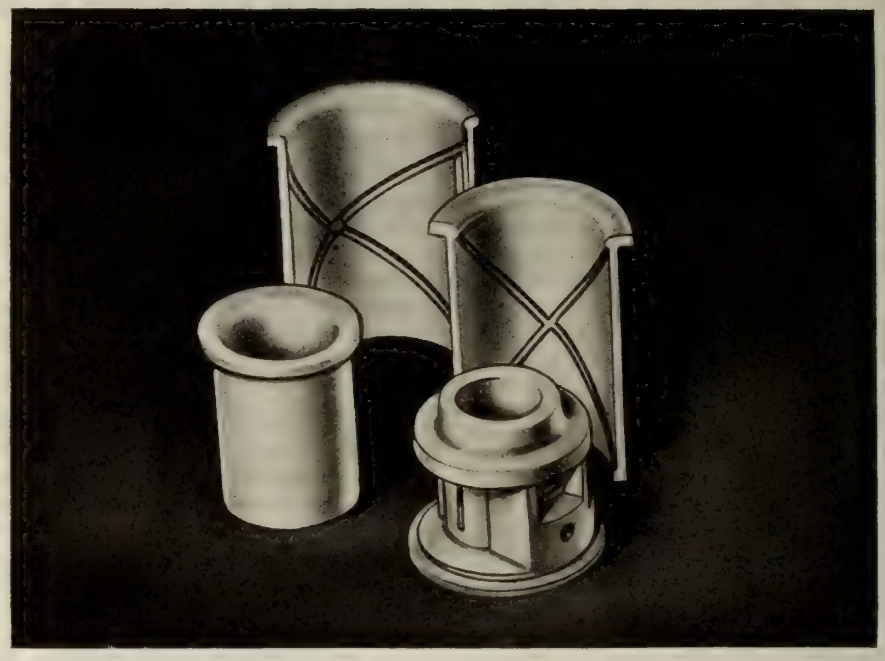
GENERAL APPEARANCE OF THE TACHOMETER

Use Die Castings and Eliminate Machining

Herein is Described From the Viewpoint of the Franklin Co., Why Die Castings Should be Used in the Design of Machinery to a Much Greater Extent Than They Are at the Present Time

THE manufacturing problems of Canada have changed greatly during the past few years. The need of rapid production in war materials has built up factories capable of large quantity production where before manufacturing was limited. Canada is today looking forward to a future that will mean still greater manufacturing achievement, and that will bring to the manufacturers of Canada a keener interest in everything which tends toward increased efficiency.

Among the many methods developed in the United States within the past 25 years, with a view toward improving large scale production, the process of "die-casting" has been widely accepted as a means of eliminating machining, and as such has gained steadily in favor. "Die-casting" is performed by forcing molten metal into steel molds under such pressure that after solidifying, its surfaces conform so minutely to the interior of the steel mould as to yield practically finished results. As a matter of fact there is usually less variation between two "die-castings" out of the same mould than between duplicate pieces machined by one and the same workman. Die-castings have long ago ceased to be of an unknown quantity. They have taken their recognized place with stampings, screw machine parts, forgings, etc., in the specifications for many well known products, among them automobiles and accessories, phonographs, electrical instruments, adding and billing machines, milking machines, cream separators, aeroplanes, motor boats and stationary engines. In fact, there are few lines of manufacture which have not found some use for die-castings.



AUTOMOBILE ENGINE BEARINGS DIE-CAST BY THE H. H. FRANKLIN MFG. CO.

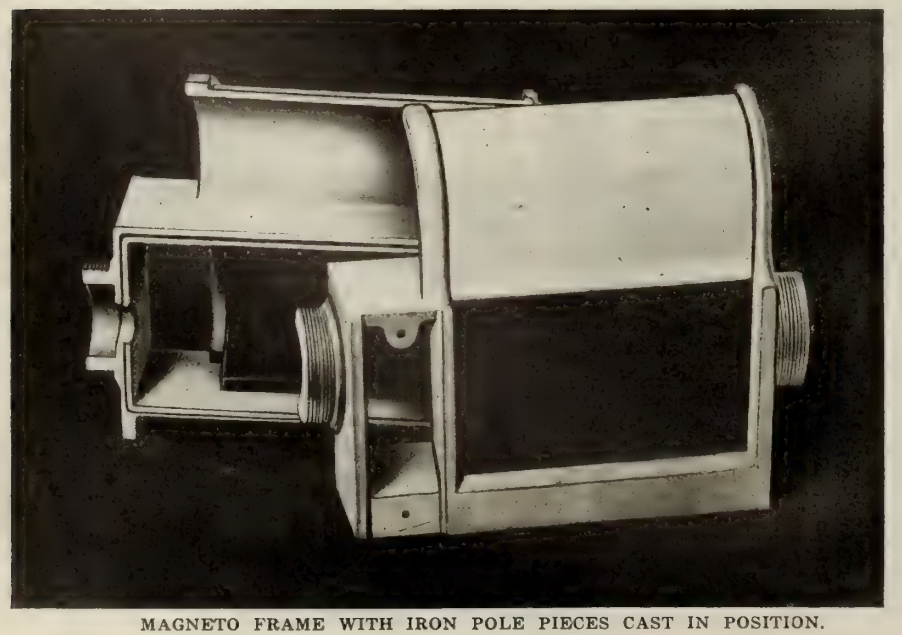
The H. H. Franklin Manufacturing Co. were the pioneers in the die-casting industry, Mr. Franklin having developed the process and having put it on a commercial basis as far back as 1892. In 1900 an exhibit of Franklin die-castings received recognition at the Paris Exposition, and by that time their advantages had been recognized by manufacturers of phonographs, telephones and other electrical instruments, cash registers and miscellaneous accounting devices. The castings were in those earlier days mostly small and made from low fusing alloys. But with the growth of the automobile industry came a marked advance in the production of die-castings. They were found of service not only for engine bearings but also in the framework for magnetos, lighting systems, oil, water and air pumps, engine governors and many other accessories.

The most recent recognition of die-castings has come through the world war, every die-casting firm being taxed to its utmost in the production of various parts carrying priority classification.

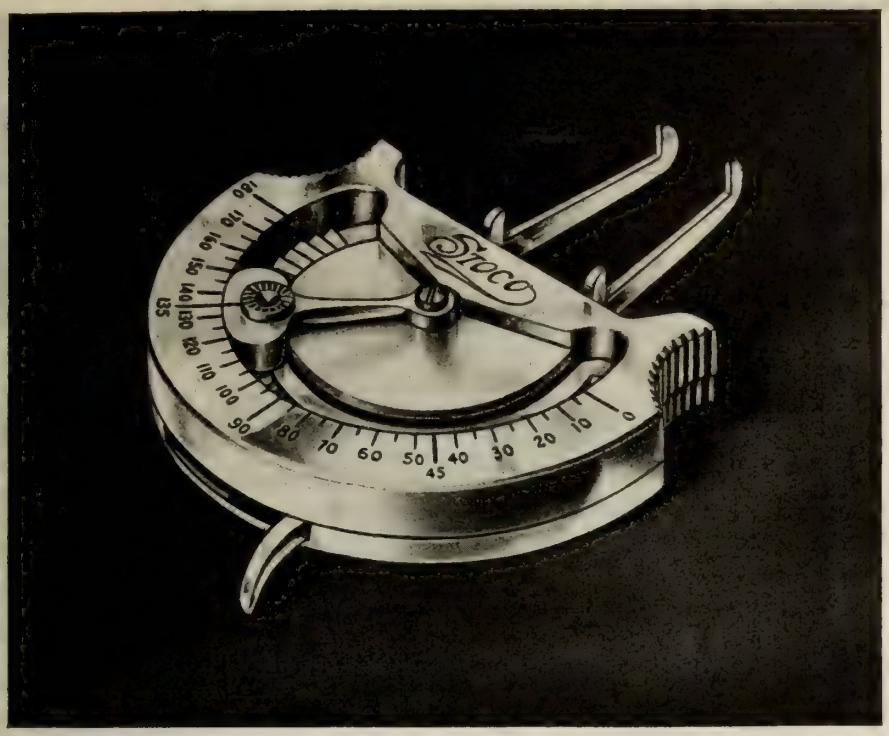
The addition of aluminum to the other alloys previously used made the die-casting process especially valuable in the production of small parts for aeroplanes, telescopes and binoculars, gas masks, bombs, machine guns, and numerous other devices where lightness was required. On the other hand, the standard die-casting alloys found ready use in the production of smoke bombs, hand grenades, shrapnel, truck governors, magnetos, lighting systems, and for the bearings in tractor and truck engines, and air compressors. Even drill stands, formerly considered as an advertising novelty, were recognized as important machine tools and given a high priority rating because of their wide use in shops doing Government work. The close of the war again releases to the general trade the various die-casting firms, all of them with organizations and methods more highly developed than ever before.

The metals most commonly used may be divided into the following groups:

(1) Aluminum alloys (usually the standard No. 12 aluminum, consisting of approximately 92 per cent. aluminum and 8 per cent. copper, and manufactured by the Aluminum Co. of America.)



MAGNETO FRAME WITH IRON POLE PIECES CAST IN POSITION.



OPTICAL INSTRUMENT MADE COMPLETE FROM FRANKLIN DIE-CASTINGS EXCEPT FOR SPRINGS AND SCREWS.

(2) The zinc base or white metal alloy sometimes incorrectly known as white brass. This is employed in the widest range of casting, the exact analysis varying with the requirements. As a general rule it compares most closely with cast iron as regards weight, strength and wearing qualities.

(3) Babbitts or tin base alloys. These are most commonly used in the production of high speed bearings or such parts as require great acid resisting qualities.

(4) Lead base metals chiefly employed in the production of slow speed bearings. During the war they were also commonly used in the production of shrapnel plugs and hand grenade parts.

The low fusing nature of most of the alloys as compared with brass or steel makes possible the introduction of pins, bushings or hardened blocks at points requiring special wearing qualities. This is of value, for example, in the manufacture of magneto frames where the iron pole pieces are accurately located in position when producing the die-cast frame.

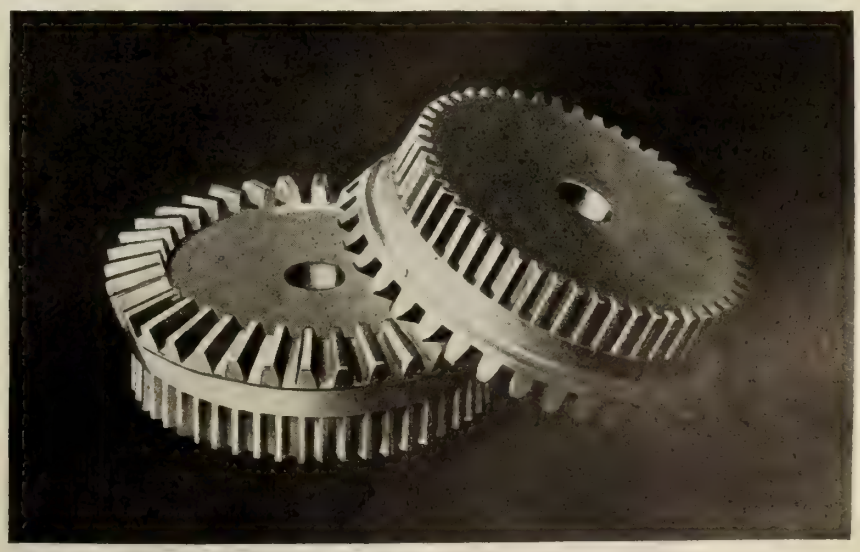
The dies used in the production of die-castings are of necessity expensive, and the process is not suited to small quantity production. This has somewhat restricted the use of the castings in Canada. But the change in manufacturing conditions due to increased quantity production is likely to revolutionize manufacturing methods during the next few years and result in an increased demand for these parts in Canada.

When planning to use die-cast parts there are certain general points, which, if borne in mind, will increase results in service obtained. (1) In dealing with steel cores, necessary in a process producing finished parts, undercuts or recesses in the interior wall of the casting should be avoided. In many cases it is, of course, possible to use collapsible or sand cores, but this increases the cost of both dies and castings. (2) A slight draft is in many parts desirable but not always necessary. (3) No allowance for shrinkage or machining need be made in making drawings except where excessive accuracy is required, or where a machining operation is required in order to true up an assembly. (4) It is cheaper to cast raised than depressed letters but both are practical. (5) Small filets added at sharp corners greatly strengthen the castings and increase the rate of production. (6) Where zinc or aluminum base alloys are used, the walls of the castings should be at least 1-16 to ⅛ of an inch thick, according to the size of the part, but when softer metals are used they can be still thinner. (7) Castings can be held to the accuracy of .001 in. to .003 in., according to the size and nature of the parts produced and the metal employed. (8) The best results are obtained in parts weighing under a pound in aluminum, and 2 or 3 pounds in the zinc base metal. Larger and heavier parts can often be produced satisfactorily. (9) Die-castings are not as a general rule made in competition with screw machine work, cheap stampings, or sand castings, which require little or no machine work.

THE STRENGTH OF FERRO-CONCRETE VESSELS

Owing to rumors of less satisfactory experiences with ferro-concrete vessels abroad, a Danish ferro-concrete shipbuilding company has asked the Director of the Norwegian Veritas for his opinion. It may be mentioned in this connection, that the Norwegian Veritas was the first institution of its kind to issue rules for the classification of sea-going ferro-concrete vessels and to classify such vessels. A fair number of ferro-concrete vessels and lighters have been built in Norway to Norwegian Veritas class, so that the institution has some experience with this method of construction. The director has now given expression to an opinion, which reads as follows: In the experience the Norwegian Veritas has had so far with regard to sea-going vessels of ferro-concrete, such vessels have proved themselves technically satisfactory, inasmuch as they have proved watertight and of sufficient strength. There have been no cracks which have caused leakage, and no trouble has been experienced in making the repairs necessary after collision or grounding.

Peterborough.—The contract for the Hunter Street high level bridge at Peterborough has again been awarded by the council to the Russell-Townsend Co., of Toronto. Of course, the by-law will be submitted to the council, and, as usual, might be revoked in the meantime. The Russell-Townsend's tender calls for $228,000, that is providing, of course, they do not build the steel arch.



COMPOUND SPUR AND BEVEL GEARS DIE-CAST BY H. H. FRANKLIN MFG. CO.

WELDING AND CUTTING

Various Jigs as Applied to the Welding Trade

Some Examples of Welding Jigs and Methods for Overcoming Distortion Are Taken Up by the Author, Who Presented This Paper Before the British Acetylene and Welding Association

By B. S. MILNE

(Continued from July 3rd issue.)

ANOTHER jig used for the manufacture of the same articles is shown in Fig. 16. In this case a boss "A" and stiffening cup "B" had to be welded to a hemisphere "C" at "B1" and "C1." Here again the hole in the boss had to be truly concentric with the axis of the sphere.

The hemisphere is supported on the casting "D," while the bottom edge is registered by ring "E." From the base of this casting spring two pillars "HH" supporting cross-bar "J," in which a hole is bored concentric with rings "D" and "E," through which passes pin "K" into the hole in boss "A," the pin being a nice sliding fit to the hole about two-thousandths less in diameter than the low limit of hole in boss. As the limit of the hole in "A" was only four-thousandths of an inch, the pin is always practically a fit to the hole in "A," and ensures that this must be concentric with the axis of the sphere. The pressure on pin "K," to hold the whole together during welding, is given by plate "L" and stud "M." This makes not only a very quick method of fixing and releasing, as about one turn of the nut will slacken plate "L," so that it can be turned out of the way while pin "K" is removed, but "L," being made of spring steel, while giving the required pressure, allows for expansion during welding.

This jig, like the last one described, is fixed on a pin at "O," at a convenient angle so as to turn easily during welding.

You will notice that the edge of the boss "A" is thinned to about the same thickness as cup "B," and the edge of cup "B" is thinned to about the thickness of the hemisphere, which greatly assists sound welding.

The hemispheres shown in the two preceding Figs. 14 and 15 had afterwards to be welded together and to be an exact overall length after welding.

As the welding already referred to caused slight shortenings and distortion, a cutting device was resorted to for cutting off the hemispheres to the correct length after the parts had been welded on. The hemispheres were left up to that time with rough edges as they came from the press. A diagram of this device or machine is shown in Fig. 17.

The cutting blowpipe is held in a swing arm "P" at an angle, so as to make a bevel cut which will give the necessary chamfer for welding. "Q" is a wheel which keeps the nozzle of the pipe always at the correct distance from the work. The work is attached to spindle "R." "S" is a fast and loose pulley,

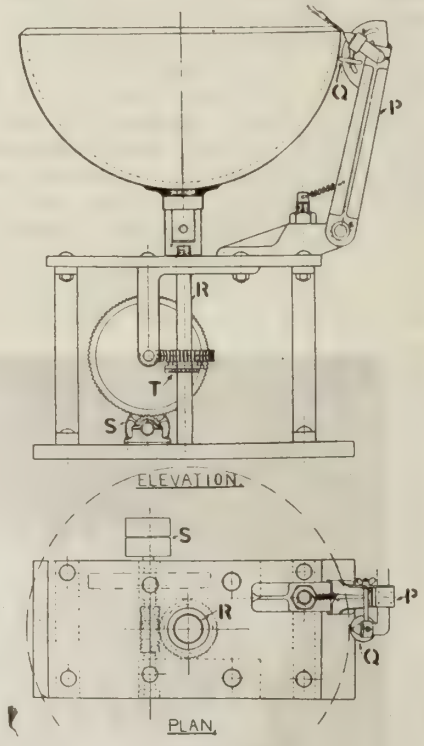


FIG. 17.

which is coupled to the line shaft in the shop with a belt. Spur and worm reduction gears bring the speed at which the work is revolved to the speed at which the blowpipe will do its work.

The blowpipe, which is an ordinary hand cutter, is lit and the work heated. As soon as the cutting jet of oxygen is opened, the belt is thrown over on to the fixed pulley, which starts the work revolving. The result is the well-known clean cut obtained with machine cutting devices.

In order to avoid the waste of time involved by slowly revolving the work a whole revolution, if a backfire occurred, or the cut failed at one part for any other reason, a ratchet device was fixed at "T" enabling the work to be quickly pulled round by hand.

Two further forms of joints in spherical work are shown in Figs. 18 and 21, both are for the same purpose, but the first gave rise to so many failures that the second was resorted to.

The test applied was 60 lbs. per sq. in. internal, and 200 lbs. external pressure. This puts a strain of 3 tons and 10 tons respectively on the weld, besides which the article, weighing some 7 cwt., was lifted by the cover on this flange. The snatch of a carelessly handled crane might put quite unknown stresses on it, but the design shown in Fig. 18 should stand this if properly welded.

Some causes of defects were:

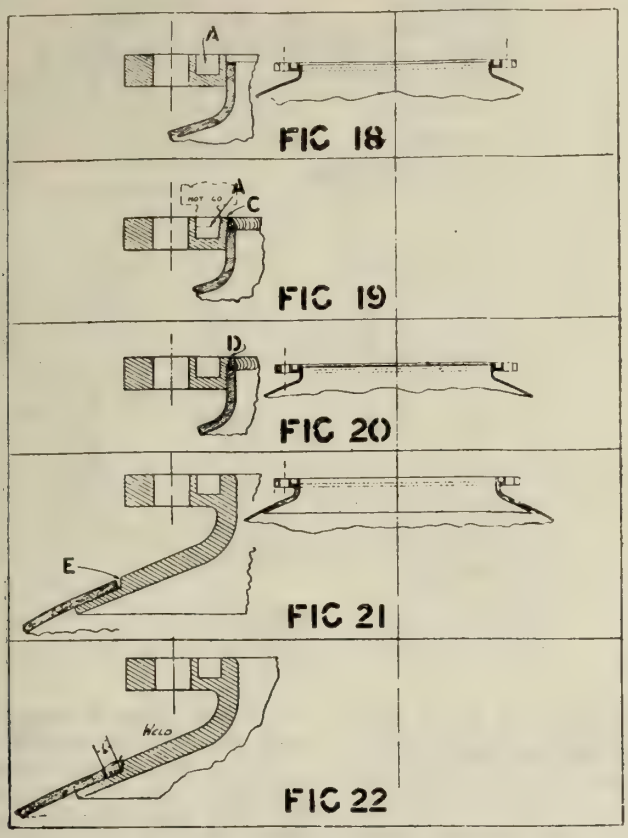
1. The groove A had to be correct to the hundredth part of an inch in width, depth and diameter, and the contraction, after welding, distorted the groove, as shown in Fig. 19, with the result that the Not Go gauge would enter and the fitter was obliged to hammer the inner edge back cold, putting severe strain on the weld.

2. The diameter frequently distorted oval, so that the diameter gauge would enter one way of the diameter and not on the other. This was corrected by cramping when cold and put a further strain on the weld.

3. Perhaps the greatest of all the causes of trouble was that one was supposed to keep ⅛ inch face at C, Fig. 19, consequently the welder, in fear of melting away the edge of the ring too much failed to make a weld at all.

Except where such fine limits are re-

quired in the groove, the design is, I think, fairly sound, and many of the failures were doubtless due to thoroughly defective welding. Anyhow, I was responsible for the welding of some 1,500



of these joints and had no complaint of defects after delivery, but I did slightly modify the design, as shown on Fig. 20.

By thickening the edge, as shown at D, Fig. 20, it can be freely melted without losing the face, and a better weld is made.

In the method of welding employed in Fig. 21, you will see that the hemisphere is shown lapped over the mouthpiece, which is a somewhat elaborate forging. The mouthpiece is machined at "E," to register into the hole in the hemisphere, with only 1-16 inch play. In a case of this kind, where one part is thick and one thin, this makes a very poor weld.

A concession was made allowing the hole in the hemisphere to be increased, and the joint was made as shown in Fig. 22, but this did not end the troubles. When the hemisphere was heated with the blowpipe, as might be expected, owing to its shape, it expanded outwards, and this not a matter of 1-32 inch or so, which would have been of no importance, but a matter of about ¼ inch. Even if clamped and tacked in six places, it lifted some 3-16 inch between tacks as welding proceeded.

Fig. 23 is a photograph of a section cut from one hemisphere which was clamped down in six places, by boiler screws, and shows the lift. On cooling, not only was the hemisphere distorted, but the bolt flange was buckled about ⅛ inch from the flat. A heavy cast iron ring was bolted on with six bolts, and a further attempt was made, but when the ring was removed the distortion, though reduced, was still about 1-16 inch.

Fig. 23a shows a photograph of two of the articles with the ring welded on after the difficulties had been overcome.

The jig shown in Fig. 24 shows how the difficulties were overcome. It consists of a base plate, A, on legs, with a spindle, B, at the centre, and three columns C, at the outside. The supporting ring, D, on legs, is merely used to hold up the mouthpiece until the heavy cast iron ring is bolted on to it. The heavy ring, E, drops on spindle, B, which holds it true with the base plate, A, and the correct height therefrom. The hemisphere is then dropped over and kept concentric with the mouth by four blocks, G, on the base plate. Over the columns, C, is dropped a ⅝ inch steel plate, H, with a chamfered hole at the centre, about ¾ inch larger in diameter than the hole in the hemisphere. This is tightly clamped down by the nuts on columns and prevents the hemisphere from rising off the mouthpiece.

The weld is completed while still clamped in the jig, when, by removing plate H and nut on spindle B, the hemisphere and mouthpiece can be removed with ring E still bolted on. The ring E is left on till cold. This almost entirely prevents distortion of the bolt flange of the mouthpieces from the flat. It was found that from nineteen to twenty-three thousandths of an inch shrinkage took place, in the diameter of the pitch circle of bolt holes and groove, and the diameter of the groove and holes had to be machined accordingly.

The plate H has the advantage of acting as a baffle plate, to keep the flame off any large surface of the hemisphere and also absorbs a large amount of heat from the hemisphere plate, thereby preventing the burning of the thin edge of the hemisphere, before the thicker mouthpiece is brought to welding temperature.

The execution of this weld had the effect of making the hemisphere shorten about 5-16 inch and distort slightly on the bottom edge. I had these machined at the bottom edge before putting on the mouthpiece, but, if I had to do this job again, I would resort to a cutting device like that already shown for a smaller hemisphere, as it is quicker and cheaper than machining and just as effective.

While I hold no brief for this design of joint, and do not consider it a good design, it certainly is an instance where suitable jigging made a most successful job of what at first appeared to be almost impossible. The reason being that, undoubtedly, the jig reduced the area of plate heated by the pipe, and, while using a certain amount of force to hold the work together, did not use it in such a way as to put great stress on the weld when the job was finished.

I have done nearly 1,000 of these hemispheres and hardly ever got even a pinhole, under test, and I have, on occasion, given the welds a severe hammering with a 7 lb. hammer before testing, without any ill effects.

Fig. 25 shows the jig in operation.

Fig. 26 shows a simple jig to overcome the ordinary welder's aversion to putting a thing on the right way round. This holds two lifting eyes in correct relation to each other.

One frequently meets with such work as that shown in the photograph, Fig. 27, namely light sheet metal covers, ⅛ inch thick, or less, welded to heavy flanges. This is always a difficult and somewhat unsatisfactory job to weld, but it is hard to see how to improve the design for welding without greatly increasing the cost of preparing the work. The difficulties are:

1. That the thin plate is overheated before the flange is brought to welding heat.

2. That welding along the inner edge causes shrinkage of this edge and consequent curvature of the flange.

A fairly satisfactory method of overcoming these difficulties is to heat along the outer edge of the flange with a larger blowpipe; this makes it possible to get a good weld without burning the thin plate, and to some extent counteracts the distortion, but even then some curvature takes place, and I have found it satisfactory to set straight flanges to a slight outward curve, before welding, and to make curved flanges of a somewhat larger radius. The amount of allowance to be made has to be found out by trial.

Everyone who has had to weld long longitudinal seams in sheet metal or plate, knows the difficulty of making the right allowance for the drawing together of the seam as welding proceeds, and also the difficulty of the edges of the

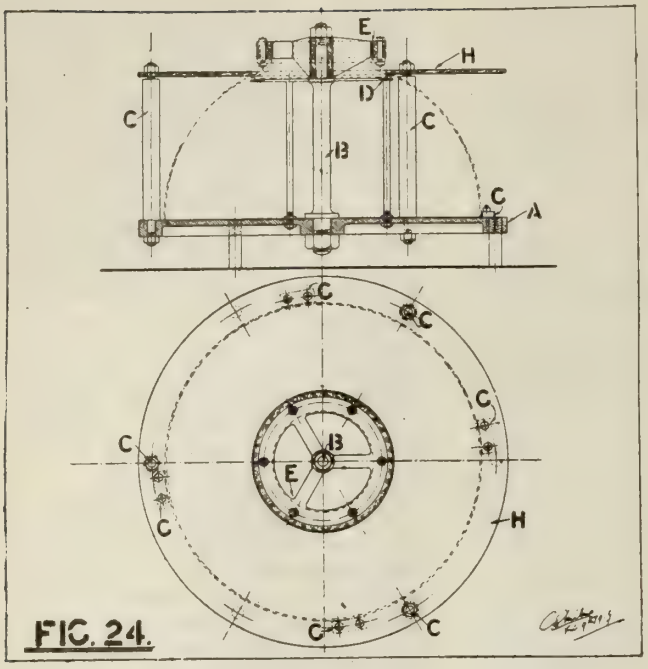


FIG. 24.

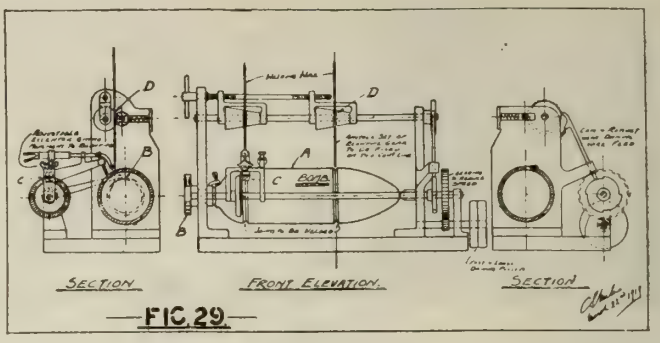


FIG. 29.

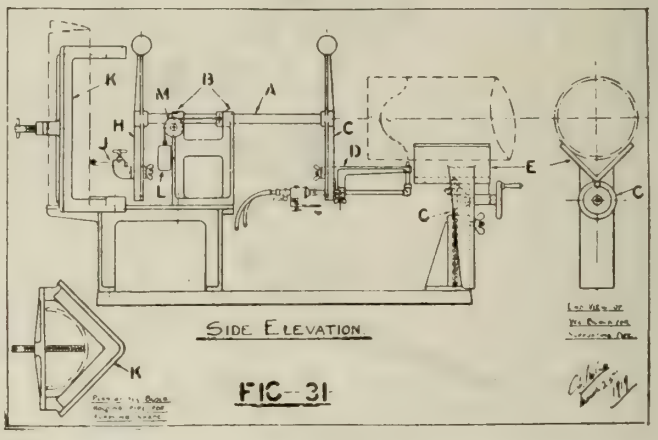


FIG. 31.

plate buckling, up or down, so that a perfect butt is not obtained.

Fig. 28 shows a very useful jig for overcoming this. It is a curved mandrel with a narrow hollow running down it. It is fitted with two clamps which can be swung aside to put the work in place, and afterwards tightened down by bolts at each end.

The joint comes over the hollow in the mandrel so that little heat is lost more quickly. When the clamps are sufficiently near the joint to keep it properly butted together.

The joint is left open the desired amount at the far end, and pulls together under the clamps. If it comes together too quickly the clamps can be tightened to restrain it, or, if the reverse, the clamps can be slightly loosened to allow the plate to come together more quickly. When the clamps are opened, as in the photograph, it makes a very useful mandrel for shaping up the work. I have these in various radii suitable for diameters from 5 inches up to 5 ft., and lengths up to 6 ft.

At one time during the war, the shortage of welders forced me to consider making an automatic welding machine, a matter which has been much neglected in this country. I was at the time considering the manufacture of 9½-inch trench mortar bombs, which were made of ⅜ inch plate. The bomb is shown at "A," Fig. 29. It struck me that the two circumferential seams might possibly be welded, both at the same time, by machine.

I made an experimental machine for the purpose, and several trial welds were made showing considerable promise, but, owing to the order for the bombs not maturing, it was never perfected. I am hoping shortly to continue my investigations.

A slight explanation of the lines on which I worked may, however, be of interest.

The machine was operated by a belt drive off the line shafting of the shop, and, through various gearing, turned the work, moved the blowpipe, and fed in the welding wire. The work was held in centres, and a ratchet "B" moved the work round, under the blowpipe, about 3-32 inch at regular intervals.

The blowpipe, through bevel gearing "C," was given a circular motion, making four revolutions to every forward movement of the work.

The wire was fed down into the weld by friction, between a V-shaped wheel "D" and cone-shaped roller, the object of the latter being to provide a variation of the rate of feed, by driving off the larger or smaller diameter on the cone. The cone was turned intermittently by a ratchet arrangement "E" which was adjustable.

The blowpipe was of the ordinary hand variety, but my experience led me to believe that a water cooled nozzle would be beneficial. The movement of the pipe was not altogether satisfactory, but with some modification I hope to be able to produce a serviceable machine.

Most of you are probably familiar with the type of cutting machine shown in Fig. 30, for cutting holes or circles in plates, and holes in tube, from 1½-inch diameter to 12-inch diameter. When cutting holes in a pipe, the blowpipe can be raised and lowered by means of the lever at the same time as it is turned. so that the nozzle can be kept at all times, the correct distance from the work.

I claim no novelty for this, but I do for that shown in Fig. 31. This is for cutting the ends of branch pipes to the correct form for fitting on to the main pipe.

It is a laborious business to set out on a drawing board the profile of branch pipes, and, when a template has been made and the line marked on the pipe, it is still difficult to cut accurately to the mark. This machine, however, does the work automatically for any size branch pipe, up to 12-inch diameter, to fit any size main pipe, up to 12-inch diameter.

The method of operating is as follows:

"A" is a shaft which can turn and slide in bearings "B." The slide "C," keyed to this shaft, has a carrier "D" for cutting blowpipe. This carrier can be set at any desired distance from the centre of shaft "A."

The Vee block "E" carries the pipe which is to be cut, and can be raised and lowered, by means of screw and gear "G," so that, whatever the size of the pipe to be cut, it can be set concentric with the shaft "A."

The other end of the shaft "A" has got keyed to it a slide "H," fitted with a carrier for a former wheel "J," which can also be set at any desired distance from the centre of shaft "A."

"K" is a Vee block in which a short length of pipe can be clamped vertically.

If, for example, a 6-inch branch pipe has to be fitted to a 9-inch main, a piece of 9-inch pipe must be clamped in Vee block "K," and a piece of 6-inch pipe put on Vee block 'E," which latter is then set concentric with shaft "A" and the cutting blowpipe set so that the nozzle is about ¼-inch from the outside of the pipe.

The former wheel "J" is set by the scale on slide "H" to 3-inch radius (i.e., half the diameter of the pipe to be cut).

Now as shaft "A" can slide, as well as turn, and as it is attached to weight "L," by a wire running over a pulley "M," the former wheel "J" will be kept on to the pipe in Vee block "K," so that

when the shaft is revolved the blowpipe takes not only the circumferential movement but also the longitudinal movement imparted by the wheel "J," running on the curve of the pipe.

According to the size of the pipe, and radius on which the wheel "J" runs, the shape of the cut made by the blowpipe will vary.

Fig. 32 shows a cutting blowpipe guide which is particularly useful for bevelling the edges of plates, to prepare them for welding. For this purpose one wheel is flanged to run over the edge of the plate. It is also useful for many other purposes.

Fig. 33 is practically a radial drilling machine with the cutting blowpipe as a drill. By the combination of the three cones belt drive, and the special drive in the head, infinite variety of speed,

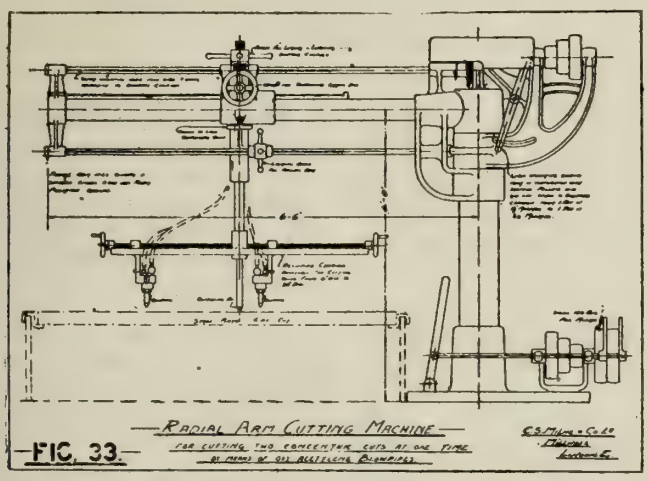


FIG. 33.—RADIAL ARM CUTTING MACHINE—FOR CUTTING TWO CONCENTRIC CUTS AT ONE TIME BY MEANS OF OXY-ACETYLENE BLOWPIPES.

between one revolution in 1½ minutes and one revolution in 24 minutes can be obtained, and the speed can be varied by means of the lever while the machine is running.

It was designed for cutting flanges from plate 2 inches thick and upwards. It is fitted with two cutting heads to cut the inside and outside of the flange at one time. Provided the difference in radii is not too great, the slight loss of oxygen, from one cut not being made at its greatest speed, is more than compensated for by the time saved.

To revert to the subject of welding for a few moments, I should like to show one or two pictures of repair work in the process of execution.

In the case of repair work, and particularly of cast iron repairs, I am a great believer in charcoal fires for heating in order to reduce cooling stresses.

My objections to the muffle furnace are:

1. That, unless one specializes in one particular class of work, the jobs vary so much in size that frequently one cannot get them into a muffle.
2. That frequently it is neither useful nor advisable to heat the whole casting.
3. To my mind the most serious objection is that, as the work has to be drawn out of the muffle to be welded, the body of the casting is cooling just at the moment when the part being welded is being made hotter.

Now with the charcoal fire the opposite takes place because the job can be welded while in the fire, and the draught set up by the blowpipe flame tends to fan the surrounding charcoal to a greater heat, thus evening up the heat on the surrounding casting.

If the casting is a large one, and only part of it wants to be heated (Fig. 34), the fire can be built round the part to be heated and, if desired, this fire can be moved with the casting, so that the work on all parts can be done in the most desirable position. Figs. 34, 35 and 36 show this.

The fracture being welded was the equivalent of a break, through "AA," in both sides of the frame, Fig. 34. It was lined up and clamped together and a sheet metal firebox was welded together round it. After the part which could be got at had been welded, it was turned on its side and the work continued as in Fig. 35, the box full of red hot charcoal going with it. It was then raised on its ends, as shown in Fig. 36, and completed.

In this way no chilling takes place during welding, and the weld can be done in the most favorable position. I personally have very little faith in vertical welding on cast iron, though in steel perfect work can be done, consequently I like to be able to turn the casting so as to work always on the flat.

Another example of partial heating is shown in Fig. 37. This wheel had to transmit 240 h.p. and, since the repair was made has been working for several years.

Possibly one or two lantern slides of other work may be of interest, if time permits, although this completes my "Examples of Jigs and Methods for Overcoming Distortion."

Company Gives Playground:—The Dominion Coal Company of Sydney, N.S., have donated a plot of ground to the city, which is to be used as a playground in summer, and an open-air rink in winter for the children of the district.

THE AUTOMOBILE TORPEDO

By M. E.

In 1868, the invention of the automobile torpedo by the English engineer, Whitehead, of Fiume, solved the problem of the submarine offensive in the most sudden and conclusive maner. Whitehead's success arose out of the failure of an enterprising Austrian officer, Captain Lupuis, who had been trying to steer a small fireship along the surface of the water by means of a rope from a fixed base either on shore or in a parent ship. The plan was a crude one, and was rejected by the Austrian naval authorities; it was then entrusted to Whitehead, who found it incapable of any practical realization. He was, however, impressed with Lupuis' beliefs in the value of a weapon which could be operated from a distance, and, though he failed in designing a controllable vessel, he conceived instead the idea of an automobile torpedo, and after two years' work, constructed it in a practical form. It has been spoken of as "the only invention that was perfect when devised," and it certainly came very near perfection at the first attempt; but it was erratic, and could not be made to keep its depth. In 1868, however, Whitehead invented the "balance chamber," which remedied these defects. The automobile torpedo was at first used only for the armament of ordinary warships; it was not until 1879 that an American engineer named Mortensen designed a submarine with a torpedo-tube in her bows. His example was followed by Berkeley and Hotchkiss in 1880, by Garret in his first Nordenfelt boat of 1881, and by Woodhouse and by Lagane in the same year. Even after this, Drzewiecke, Tuck and D'Allest designed their submarines without torpedo-tubes; but these were, in fact, indispensable, and the use of the Whitehead torpedo has been, for the last twenty years, assumed as the main function of all submarines designed for war.

HEAT TREATMENT OF STEEL

In a paper on the "Heat Treatment of Steel," read before the Society of Engineers, Mr. C. O. Bannister gives the following extracts from a book on trade secrets published in this country in 1583. "Take snayles and first drawn water of a red die, of which water, being taken in the first month of harvest when it raynes, boil it with the snayles, then heat your iron red-hot and quench it therein and it shall be as hard as steel. Ye may do the like with the blood of a man of XXX years of age and of a sanguine complexion, being of a merry nature and pleasant." Quenching mediums such as these were used for centuries, and in a book published as late as 1810 the worker was told to "take the roots of lilies, infuse it in wine and quench the steel in it, and the steel will be hard;" on the other hand, he was told that if he "takes the juice or water of common beans and quenches iron or steel in it, it will be as soft as lead."

WHAT OUR READERS THINK AND DO

We Start a Discussion on Another Subject

This Time It is a Reader Who Sends Us His Views on Parting Tools, Which We Believe Will Not Coincide With Those of All the readers of "Canadian Machinery"

DO you like a discussion? Following this introduction, so to speak, we are publishing a talk on parting tools, which we submit to readers for discussion. As to our attitude in the matter, we say absolutely nothing—for the present, but afford readers the first chance to comment on the authors' views. After everyone interested has had their fling, we shall perhaps speak on the subject, except in the meantime some other correspondent voices our sentiments. This article is published without a change to the author's manuscript.

Now since we have cleared up our reason for publishing this article, let us hear from the author himself.

A TALK ON PARTING TOOLS

By Wm. Ernest

Who has not at some time or other seen or experienced the provocations peculiar to parting tools? The most peculiar thing in connection with parting off stock, is that the poor old lathe nearly always gets blamed. If it isn't a loose spindle it's a rackety, old compound rest, or probably a loose gib in the cross slide that is considered to be the cause of poor results.

Well, to make the whole story plain, let us first consider the ordinary forged parting tool. In the opinion of most mechanics this is the best style of cutting off tool. However this may even become very troublesome if the proper clearances are not obtained. A good blacksmith will draw one out so that very little grinding is required, but often too much is taken for granted that because a tool looks right, it must work right.

Now if the clearances are just right, but the bottom of the tool is bevelled off to a slight degree, it will be seen that the screw in the tool post will draw it down to that level and consequently tilt over the under side of the tool, thus causing it to drag and chatter and dig in. Thus, it will readily be seen that the bottom must be horizontal, with the clearance equal each side: then if the cutting edge is wider than the back of the tool, and the front clearance not too much, even if the lathe spindle and other circumstances are rather unfavorable, once the tool is thrust into the work, and all slackness is taken up, the tool will peel cut nice shavings that make work pleasurable. To sum up briefly, "always see to it that the groove cut is lots wider than all except the extreme cutting edge."

The next tool to consider is the popular Armstrong parting tool holder with the blades held by a clamping screw. These tools have a bad habit of breaking, on account of not cutting their way clear. The makers claim that the good feature of this tool is that, when it breaks it is only the work of a minute to regrind and thus avoid delay. To my mind this is poor consolation, and to eliminate this tendency to break, I usually adopt the following method: First of all we know that the groove to be cut MUST be wider than the tool, therefore, an Armstrong parting tool must be widened slightly at the cutting point. It will be noticed that the blades are just soft enough to peen up if an ordinary hammer is used. I therefore tap the edge slightly and feel the increase in width between the thumb and finger. After this the edge must be touched up on an emery wheel and it is really surprising what a difference that few thousandths extra width makes.

In the operation of these tools; however, it will even be better to let the blacksmith upset the end slightly and then reharden. This extra trouble is well worth the while, for it will be found that a tool will work for a long time this way, and breakage is also reduced to practically nil. Finally, I would say that this is the only way that I would ever consider using the removable type of parting tool, and I would be very much interested to hear what luck others have with these tools.

What have you to say on this subject? Let us hear your views on the art of parting tools. All articles which we deem worthy of publication will be paid for at our regular rates, so get busy.

SPECIAL COMBINATION TOOL

Continued from July 3rd issue

By Robert Mawson

THE tool here described is used to overcome what was once a long and tedious machining operation, in fact a series of operations. This is the machining of a step for the spindle on a special machine. The manner in which this was formerly done was to first drill the hole to a predetermined depth, then turn the outside, afterwards face the end and machine a circular contour at the extreme outer end. It can readily be seen that when performing these operations singly there were many chances of error as each were independent of the other, not being controlled by any previously machined surface.

In the drawing is shown the casting and the special tool here described assembled. The work performed is drilling the hole A, facing the outside B and turning the concave surface C.

It will be noticed that two sizes of holes are to be drilled in the piece, which makes the operation more difficult. On the first tool made the drill was designed solid as shown by the detail D. It will be seen that this is made from a piece of high-speed steel with the end turned down to the correct length and diameter.

The trouble with this design is that there is no provision for either adjusting the position or length which is turned down after the end of the drill has been ground.

The new design E was therefore made to overcome these objections. This is made from two pieces of steel, one a stock drill .465 in diameter, which was slid into a reamed hole the same size in the body of the tool, which is .6875 in outside diameter. At the rear end of the drill is a tapped hole ¼ by 20 threads, and a headless set-screw is provided so that as the cutting edge of the drill is ground the inserted drill may be forced out by means of the screw to retain the .375 in. dimension. The tool was made with a concave groove on opposite

sides and a keyway machined at 45 deg. headless screw, one inch long, inserted in the shank.

The hollow mill used for the facing operation is shown at F. It will be seen that this element is made with three cutting teeth, and the back end counterbored and reamed to 1⅛ inch. Three holes are drilled and tapped at the counterbored end, one for a ¼ inch 20 thread screw, and two of ⅜ inch 16 thread screws. A detail of the extension sleeve is illustrated at G. The element is turned down at one end to 1⅛ inch for a distance of 63 sixty-fourths of an inch, and a hole drilled and reamed to eleven-sixteenths of an inch for a length of 3 and three-sixteenths of an inch. The rear end is drilled and tapped for ⅜ inch 16 threads set-screw.

By referring to the side view it will be noticed that a slot is machined on one side for a distance of 1½ inch. There is also a No. 11 hole drilled, and a tapped hole ¼ inch 20 threads, these last two holes being 13 thirty-seconds of an inch off centre. The tool for forming the concave surface is shown at H.

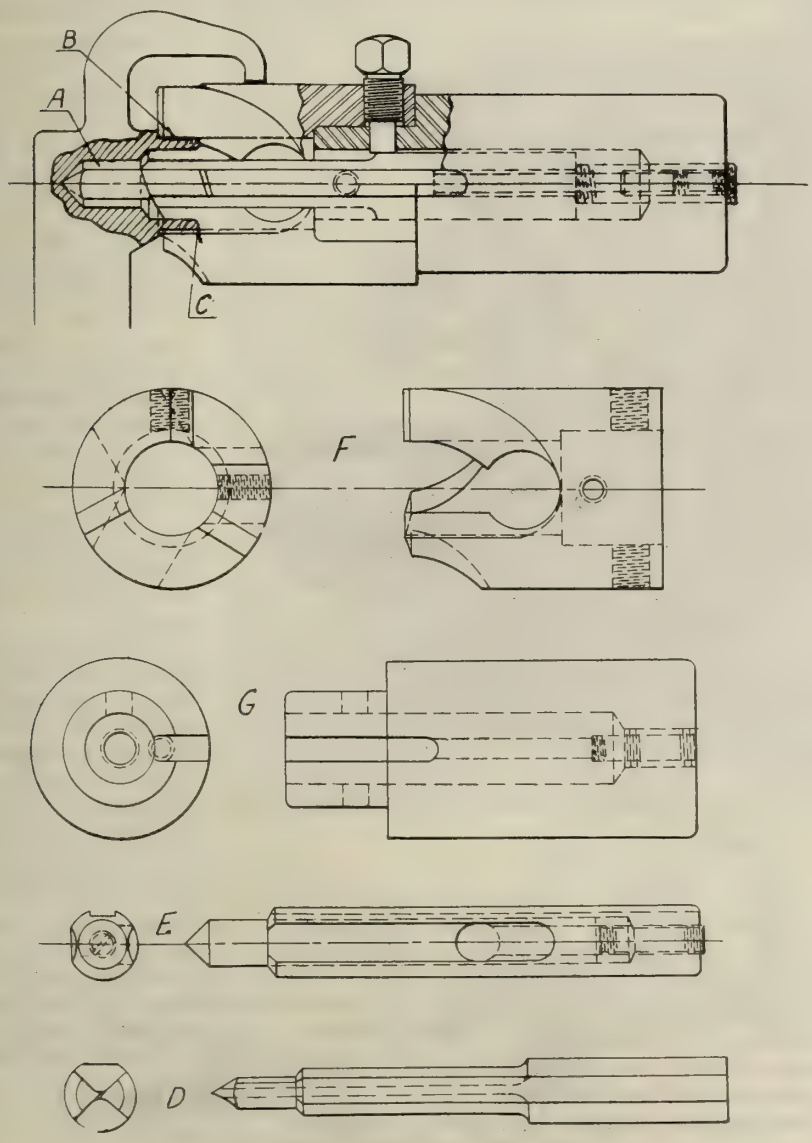
It will be noticed that this element is made of square high-speed steel, the cutting end being machined with the correct contour and clearance or rate ground on it.

When assembling the tool the drill E is placed in the extension G. The cutter H is then placed in the slot of the extension sleeve. The hollow mill F is afterwards placed over the extension sleeve.

The screw V is then screwed into the threaded hole of the hollow mill, the turned end fitting into one of the holes in the sleeve. An iron rod K, five-sixteenths of an inch diameter, and 2 and five-sixteenths inch long, is placed into the No. 11 drilled hole in the extension. A ¼ inch headless setscrew is placed at the rear of this rod and a ⅜ inch set-screw in the other tapped hole in the extension sleeve. A ¼ inch set-screw is also placed in the ¼ inch by 20 thread tapped hole in the hollow mill.

The tool is now ready for operation. The purpose of the two headless screws in the rear of the extension sleeve are for adjusting the drill and concave tools. The headless set-screw through the hollow mill is to hold securely the concave tool after it has been properly adjusted.

The ⅜ inch square-headed set-screw through the hollow mill and sleeve not only hold these parts together but it will be noticed that the turned end comes against the drill, thus holding that element in position after it has been adjusted for position with the headless set-screw at the rear end. The grooves on the drill are for chip clearance, allowing them to pass away from the casting being machined and enabling more rapid and better results to be obtained. Some of the principles shown in this tool may be no doubt used for other pieces as this combination tool has proved a great success in operation, the pieces being machined being not only interchangeable but produced at a much more rapid rate than was ever possible by single operations under the best conditions. A further advantage is that a cheaper class of workman can be employed to use the tool as measuring and checking for each separate operation is avoided.



VARIOUS DETAILS OF THE TOOL.

TO SHARPEN THE THREADS OF A SOLID DIE

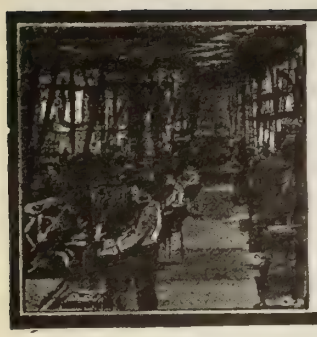
By H. J.

Solid dies are difficult to sharpen, because of the fact that the grinding wheel will not enter the cutting edges. If the dies are small they can be sharpened with a lap made of lead or wood, which is charged with emery. The lap can be revolved in the lathe, and the die worked back and forth on the lap. The proper angle will be ground, if the lap is a trifle smaller than the hole.

Selenium, an element analogous in some of its properties to sulphur which is obtained during the smelting and refining of copper, has had but little industrial application. Mr. H. A. Gardner, of the Paint Manufacturers' Association of the United States, has, however, prepared several pigments from it—the selenites of lead and borium, for instance—which are very white and of fine grain. Their exceptionally high refractive index gives them intense opacity. Other pigments of a closely related nature may be produced from beryllium. The oxide and similar products of zirconium have a very light degree of whiteness, opacity and permanence. From titanium many compounds have been produced, and it is probable that some day they may be used as pigments where great opacity and permanence are desired.

According to some investigations made in America on the best kinds of glasses for shielding the eyes of men working at furnaces, for protection from ultra-violet light, black, amber, green, greenish-yellow, and red glasses are efficient. Against the intra-red rays, deep black, yellowish-green, sage-green, bluish-green, and gold-plated glasses are best.

The Hudson Bay Railway.—At the recent session of parliament a sum of $300,000 was voted for the purposes of Hudson Bay railway construction. A further amount of $10,000,000 was passed for the government shipbuilding programme.



DEVELOPMENTS IN SHOP EQUIPMENT

HEALD ROTARY SURFACE GRINDING MACHINE

THE 8 in. or No. 20 and 12 in. or No. 22 Rotary Surface Grinding Machines have been designed for manufacturing purposes and at the same time will give an extremely fine finish. They have been built massive, yet simple, having all the necessary mechanical refinements required to readily get various speeds and adjustments.

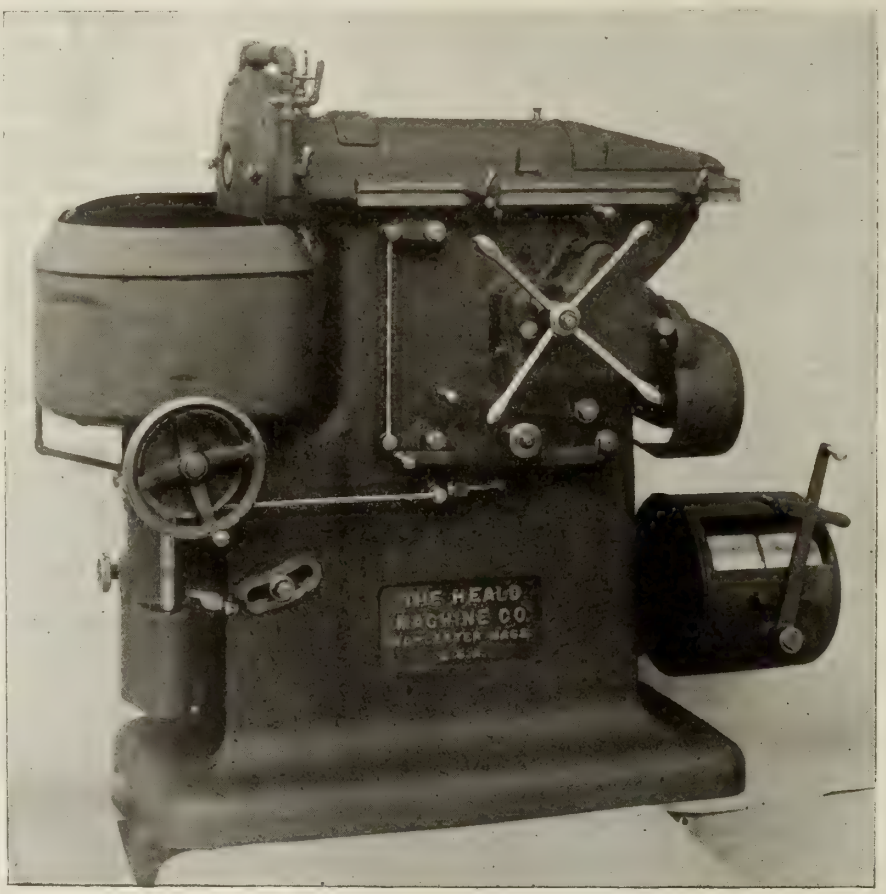
The wheel slide is a massive casting, having a flat and "V" way, which assures alignment at all times. The bearing surfaces are large and carefully protected from grit and dirt. Experience has proven that a downward pull of the spindle belt adds greatly to the rigidity and has been incorporated into the design of these machines.

The wheel guard is made separate from the wheel slide. It is not put on, however, in the usual manner, as it has the back face finished off to fit a finished surface on the wheel slide, making the two parts practically one. The advantage of this design is that if a customer should for any reason desire to use a larger wheel he will be able to do so.

The wheel spindle is large in diameter and made of chrome nickel steel. It is mounted in a straight plain adjustable bearing at the grinding wheel end. Adjustments for this bearing can be readily made through a hole in the top of the wheel slide provided for that purpose. This is the only adjustment required as the rear end of the spindle is mounted on ball bearings. A large sight feed oiler for the front bearing insures an ample supply of oil at all times.

The main drive bracket receives the power from the main line by tight and loose pulleys and transmits it directly by belt to the main speed box, wheel spindle, and pump. The guard for the tight and loose pulleys is adjustable, so that the openings can be lined up for the belt. The shifter lever is arranged with a spring plunger which locks it in place in the off or on position.

The main speed box, which is situated on the rear of the machine, furnishes power to the wheel slide by a three-step cone and three speeds to the chuck through a bank of gears. The speeds of wheel slide and chuck are independent of each other, allowing for a large latitude in regards speeds and feeds. The speeds to the chuck are controlled by a pull rod on the front of the machine.



GENERAL VIEW OF THE MACHINE.

All control levers and adjustments are within easy reach of the operator

The chuck spindle is driven by spiral gears, one of which is mounted directly on the spindle. This spindle is mounted in a sleeve, which has vertical adjustments. The upper portion of the spindle rests in a taper bearing, while the lower end is equipped with ball bearing. With this design adjustment is never necessary, as the wear is automatically taken up. The chuck bracket is adjustable to allow for grinding of concave and convex surfaces to angles up to 10 degrees.

The feed to chuck is made by a hand wheel and vertical screw through a nut on the spindle sleeve. The machines are also equipped with automatic vertical adjustment to the chuck, which will feed from .0005 to .003 at each end of the wheel traverse.

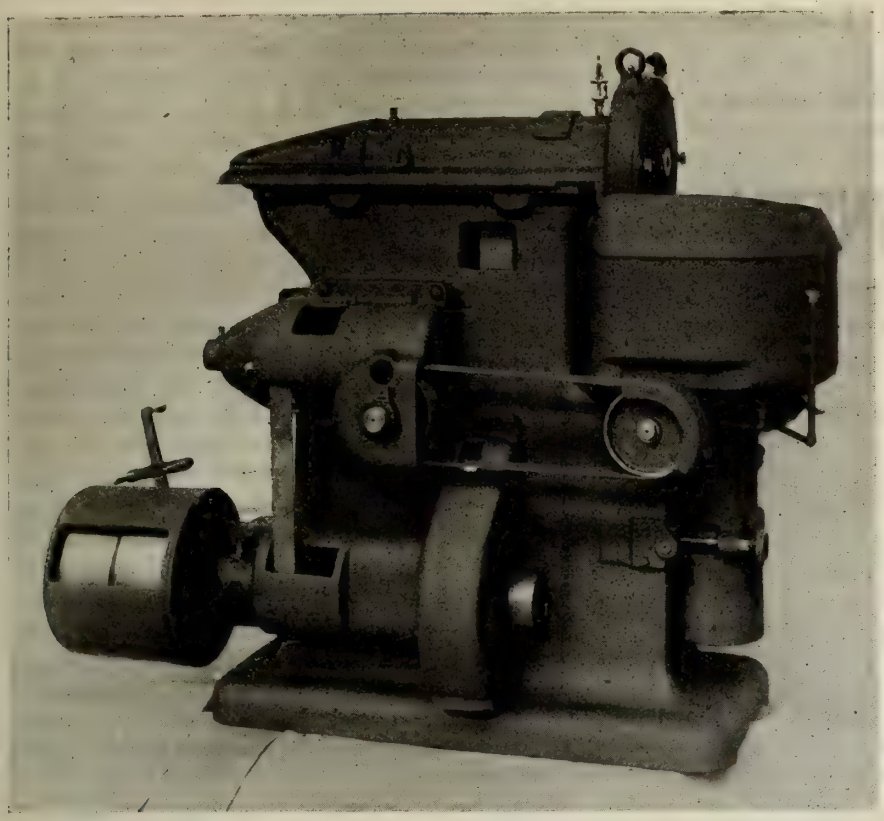
Water. The water equipment, including pump, tank, waterguard and connections, is regularly furnished with every machine. The tank is of unusual capacity, giving a most liberal volume of water, while a swivel joint in the distributing nozzle enables the operator to direct the flow at any desired point.

A Heald magnetic chuck, style 8 in. for No. 20, and style 12 in. for No. 22, are regular equipment. Three-jaw chucks or face plates with special fixtures may be substituted if desired or the work requires.

Motor driven machines can be furnished if necessary, the motor being placed where it is most convenient, on the floor, wall or ceiling, and belting directly to the main drive pulley. A few minor changes to the main speed bracket is all that is required when a machine is to be motor driven.

Specifications

12 inch.—



VIEW FROM OTHER SIDE OF MACHINE.

Diameter magnetic holding surface, standard chuck, 12 in. Face diameter, 13¾ in.

Size of grinding wheel, 12 in. diameter, 1¼ in. face, 5 in. hole.

Greatest distance, top of chuck to centre of wheel, 10 in.

Greatest distance between face of 12 in. diameter wheel and top of magnetic chuck, 4 in.

Smallest diameter grinding wheel, which may be used, 7½ inches.

Vertical adjustment of chuck, 5 in.

Largest swing inside of water pan, 16 in.

Floor space required, belt drive 48 in. x 70 in.

8 inch.—

Diameter magnetic holding surface, standard chuck, 8 in. Face diameter, 9¼ in

Size of grinding wheel, 10 in. diameter, 1 in. face, 3½ in. hole.

Greatest distance, top of chuck to centre of wheel, 8½ in.

Greatest distance between face of 10 in. diameter wheel and top of magnetic chuck, 3½ in.

Smallest diameter grinding wheel which may be used, 6½ in.

Vertical adjustment of chuck, 5 in.

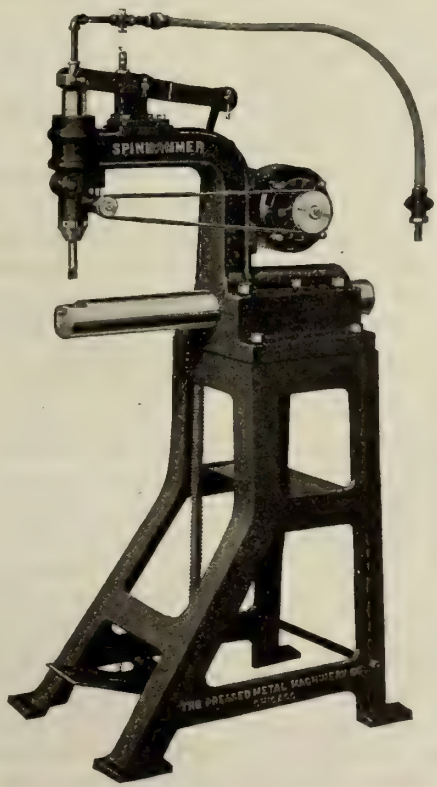
Largest swing inside of water pan, 13 in.

Floor space required, belt drive, 48 in. x 60 in.

SPINHAMMER FOR RIVETING

The accompanying illustration shows an improved type of riveting hammer developed by the Pressed Metal Machinery Co., 15 South Clinton Street, Chicago. This machine backs up the action of a regular rotary rivet upsetting machine, with the quick yet positive and powerful blows of an air hammer, which is built into the machine.

The rivet is set by the air hammer—not by the operator; the operator simply feeds rivets and work to the machine and upon his depressing the treadle, controlling the air valve, the hammer is thrown into action.



GENERAL VIEW OF HAMMER.

The rivet set or point is positively rotated by a self-contained ⅛ h.p. motor, transmitting its power through a rawhide belt and worm gearing. The chuck for the rivet set is integral with the worm itself.

The hammer head always stops at the top of its stroke or travel, thereby facilitating the insertion and removal of the work without any interference. The stroke of the hammer is adjustable from 2½ in. down to ½ in. to suit varying lengths of rivets or depths of work. This adjustment can be instantly made by merely turning up or down the thumb nut in the top of the operating valve.

The speed of the machine can be varied by increasing or decreasing the air pressure—the higher the pressure, the faster the speed, and the more quickly can rivets be set.

All parts are made to operate under and withstand a line pressure of from 60 to 200 lbs. per square inch.

Unlike the clanging noise of the ordinary air hammer, this machine merely issues a low humming sound and that only when actually upsetting work.

Interchangeable riveting and spoke-heading fixtures can be used, the frame being arranged and the machine is equally well adaptable for one as for the other type of fixture.

The spinhammer operates equally as efficiently on one style of head as another, the speed with which the work can be set depending entirely upon the shape of the head and the amount of metal making up the rivet head.

RAISING SUNKEN VESSELS

For attaching wire hawsers to the hulls of sunken vessels where a diver cannot pass them under a new method called the limpet system is described. The limpet is a soft iron body, carrying a number of drill taps driven by small motors, the current being supplied from the salvage vessel. The limpet is lowered until it comes in contact with the hull of the vessel when it is magnetized, causing it to cling to the plates. The drills are then started, and after running a predetermined length of time the current is switched off, the limpet is hauled to the surface and the drills are left tightly fastened in the ship's hull. The ends of these drills are formed into eyes, to which the hawsers can be attached.

The method employed by the R34 to determine her position is one that discounts atmospheric conditions, and does away with the need of a horizon, artificial or otherwise. A moving pointer attached to the wireless instrument points to the direction that the signals are coming from. If the signals are being received from three stations set at wide angles on the earth's surface, the navigator has only to perform a simple triangulation to determine his exact position.

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Concerning Insurance

HAVE you enough insurance on your plant? Now this paper is not selling insurance, but the question is one that is prompted by knowledge of certain cases where losses have been incurred recently by the small amount of protection carried.

You have a good plant, worth hundreds and thousands. You probably reckoned the replacement cost when you put on the insurance and acted accordingly. Have you ever stopped to think what your replacement costs would be now? The buying price of machinery has doubled. Has your insurance kept pace? You say you are willing to take a chance and be covered on your initial investment. Well, that is your own affair, but there is a real situation here that cannot be overlooked.

A plant that has been in five or six years, bought at the prices that prevailed at that time, could not be replaced now for less than very close to one hundred per cent. increase. Just figure out everything, including transportation and labor costs, and see how far this statement is out.

If a fire should wipe your plant out to-night would your insurance policies, if they were all cashed, look nearly as large as when you took them out? The increase in costs has in reality amounted to a very serious shrinkage in the aggregate for protection. It is a point that should not be overlooked.

Using Power of the Tides

THE feasibility of securing a supply of electrical energy from the tidal waters in the coastal rivers of Britain is again being made the subject of close study. For some time this question has been approached more as an academic perennial than as a practical accomplishment.

Judging from figures that are now out there has been a real move made. J. Smith & Co., engineers of Glasgow, have worked on the idea for years, and are well posted on all needful data. The river Severn at Pitshead, for instance, supplies (on paper as yet) 4,773,730 H.P. The Dee, in North Wales, at Point of Air, Manai Straits, and the river Mersey above Liverpool Docks—show a total of 5,651,984 H.P. It is claimed that by this scheme power could be generated and sold at a fraction of the present prices.

An explanatory guide to the tidal waters power scheme has been prepared by Mr. Smith, who points out that on all rising tides the head water runs through turbines into inside of weir; on all ebbing tides the water runs through turbines to outside of weir. All doors are closed at low water, keeping out the rising tide; also at high water, keeping in full tidal water. All rivers start turbines working at half tide rising or falling. This gives the half tide head for the working of the later half. There being about three hours between the time of high water at the weiring point in the Severn and the other rivers, this gives three hours' run for the Severn, starting at half rising tide—say, 17 ft. head—inside water being at low water and finishing at high water, 34 ft. minimum tide. The other rivers being now at half rising tide, they take over the working from the Severn until high water on their rivers.

The scheme has in view the furnishing not only of power, but of light to all the homes in Britain.

Perpetual Motion

EVERY so often someone who ought to know better, someone with engineering experience and training, brings forth some perpetual motion scheme, usually in its conception as old as the hills. Sometimes it is an electrically-heated boiler, steam engine and generator and sometimes a generator and motor, variations being rung in by juggling the speeds of the machines or having them different. Most of these false conceptions as to the availability of energy arise through its confusion with work.

Perpetual motion, as envisioned by its devotees, is distinct from the engineering principles often forming the basis of somewhat chimerical schemes for the utilization of the power inherent in wave motion or, as suggested by a correspondent writing to an American scientific paper, the utilization of the residual energy of tap water before it enters the sewer. Such things have as their basis some germ of engineering fact but fail through their application to things of little account.

Such is not the case with perpetual motion and anyone who has an idea, in its essence more foolish than the search for the philosopher's stone, transmitting base metals into gold, would be well advised to hie himself to a secluded corner and apply the principle of the conservation of energy to his own thoughts and to their misguided conceptions.

The nearest approach to a source of inexhaustible energy obtained without effort is found in the action of the radio-active elements, and in this case, enormous as is the store of in intra-atomic energy and lengthy as is its life, it is not everlasting but slowly diminishes and is created at the expense of the radio-active element itself, the final product being lead of a slightly varying atomic weight.

Disappearance of the Old-Time Shop Joker

By J. H. MOORE, Associate Editor Canadian Machinery

WHILE much has been said and written about humor in the shop, it seems as if all the articles stop there and do not touch on the actual danger of such humor.

Recently the writer read an article in a machine journal which took rather a rise out of up-to-date toolmakers in general. It was stated that the toolmakers of to-day were far below the standard of 10 or 15 years ago. The author of this article even went so far as to state that old timers take a kindly interest when they see the newcomer trying to adjust his lathe to turn a taper, by prying over the rear end with a crowbar. How often does such an occasion arise?

He goes on to state that the old-timers, notwithstanding their propensity for practical joking, were a kindly, good-natured bunch, ready and willing to impart information, or render assistance where it was honestly and properly desired.

There is no denying the fact that the aforementioned old-timers were a kindly inclined bunch, and willing to aid the apprentice—but regarding the practical joking—did they step over the boundary line, and often cease to be funny—and just plumb foolish?

For example, it is hardly a year ago since some old-timers put it into some boys' heads that compressed air was a dandy thing to play pranks with. To make a long story short, they placed the hose in one boy, turned on the pressure, and soon there was one boy less in the world. Readers might well say, the fools ought to have known better, but the fact remains that they didn't. This is one example of misplaced humor.

The writer personally played a rather good (?) prank, one first of April some years ago.

It was his habit to eat chocolates practically every day, which made it easier for him to carry out his intention. This morning in question, he was chewing candy as usual, and passed round the bag as per the regular custom. Each member of the staff thanked the writer and indulged. Some, on biting into their chocolate, received a surprise in the shape of a piece of Surprise soap, others got red pepper centres. The master mechanic received a candy with a marble centre, and almost choked himself. The writer came very close to getting fired, which would have served him right, for it was another case of misplaced humor. Work for that morning was, to say the least, disorganized in this particular department.

Then there is the boy who will persist in placing a pin or thumbtack on your chair in the drawing office. Usually you merely jump and roundly curse the lad, but one case which came to the writer's attention resulted in a rather serious illness later on, through this simple prank.

There is another form of humor, much to be regretted, namely, monkeying with electricity. Monkeying is the correct term, for monkeys, as a rule, are always up to some prank or other.

Here are two examples. "Go on down and get me a pint of amps," were the instructions issued by a workman to a new apprentice not so long ago. Off went the green hand complacently, and luckily went to the chief with his request. This chief had risen to position of chief through his ability to stick to business in business hours, so without delay he made all concerned understand that humor such as this was strictly prohibited.

Suppose some other irresponsible workman had received this apprentice's request, there is no telling what the result might have been.

The second illustration started so simply and ended with a totally unlooked-for finish.

Did you ever take a lamp and socket, and, holding the globe carefully, place the brass socket near to a wide, fast-running belt? The result, of course, is that you store in the socket an enormous amount of static electricity. You then hand the socket to some unsuspecting individual, with the result that he emits a shriek, and drops the socket as he would a red-hot coal. Sometimes the kick in the socket is something fierce.

In this case in point the chap who was handed the socket received such a shock that he fainted, fell up against a moving piece of machinery and was rather badly smashed. It was some six weeks before he was able for his work. Of course this incident sobered up all concerned, but still it was another example of misplaced humor.

It often happens that accidentally a good joke occurs. This is, in the writer's opinion, true humor and worthy of a laugh—that is after it is all over.

The incident in mind is one which occurred years ago when the writer was serving his time at the machinist trade. There was a rather quiet chap working alongside the writer on a lathe of similar make to his own. Suddenly one day when this fellow was leaning over his work he let out a yell, a horrible yell, in fact. It looked to the writer as if this chap was caught by the overalls, so he rushed and shut off the motor, but still the yells kept on. Suddenly like a flash the solution came to all the fellows now gathered around. One of them went and shut off the light switch which made everything O.K. once more, for this was the whole trouble. This chap's shoes were wet and he was standing on a steel plate, had his one hand on the lathe bed, the other on the wire lamp shield, which was not properly insulated. Of course the result was a severe shock. We all had a good laugh—but not until it was all over.

And now, as they say in the movies—comes the close-up. This same chap was working industriously away one day, when someone, trying to be funny, hit him behind the joints of the knee with a board. Of course he jumped, but in jumping got caught in the job which was being turned. It was his arm that caught, with the result that it was broken.

Which of the two cases is true humor?

Last but not least, another little tale which looked harmless, and was harmless in the shop, but very much otherwise outside the plant.

This fellow had just come over, as they say, about the newly-arrived from the Old Country. He dropped in this morning, asked for a job, admitted he was not a machinist, but knew what a drill press looked like. The foreman took him on as he needed a drill hand immediately.

The new hand started work, but his drill was none too good, and off he went to sharpen it. Here was our opportunity, so we crossed his belt on him before he returned.

In went the newly-sharpened drill, down went the hand feed lever, but horrible to state, the drill refused to drill. There was a sort of worried expression on the new hand's face, but he decided he could not have sharpened the drill correctly, so back he went. He returned but with the same result. To make a long story short, he did this about 4 times, without discovering the trouble. In the midst of his earnest search after the difficulty, the foreman dropped around to see how he was getting along. It didn't take very long for the foreman to size up the situation, with the result that the man put on his coat and hat.

Continued on page 56

Worth-While Information From Many Points

If equal parts of copper and antimony are melted together it forms an alloy of a beautiful violet color, which takes a nice polish, but, being too hard for many purposes, a substitute can be produced by taking an iron casting and copper plating it, after which immerse it for a moment in a solution containing antimony.

August 25th of this year is the centenary of the close of James Watt's life. At a meeting of the engineers of Birmingham (the city of his adoption) it has been decided to erect a James Watt Memorial Building to serve as a museum, and also to endow a professorship of engineering, to be known as the James Watt chair, at the University of Birmingham, for the promotion of research in the fundamental principles underlying the production of power and the study of the conservation of the natural sources of energy.

Where great power is applied slowly, particularly when space is at a premium, the worm-and-wheel drive is seen at its best. Another advantage of this type of drive is the ease with which it can be kept oiled. Perhaps greased would be a better term because the worm frequently works in grease. The whole drive is usually enclosed in a grease-tight box, though which passes the driving shaft.

Belts form a very important part of the equipment of factories—a part of equipment that is habitually used, however, in most inefficient and wasteful manner. There are exceptions, notably in connection with the more modern machinery. But many belts are running at an average speed of nearer 1,000 than 4,000 or 4,500 feet a minute. As a result six-inch belts are used where one-and-a-half or two-inch belts would be not only much cheaper in first cost but also much better. Bearing pressures are materially lessened, while friction and the accompanying wear and power consumption are reduced. This tends to conserve leather, fuel and oil, and lower repair expense.

In a certain plant the technical magazines which are received are first read by the engineers in the office. They are then placed in a box made especially for this purpose, at the employees' entrance. Any worker may take one at a time home, and after reading it, return it to the box so that other employees may read it. This scheme is worthy of more general application.

It is not generally known that sea lions played a most important part in sea warfare. The British Admiralty used these animals to hunt U boats. First the animal is trained to follow sounds from the water's depth. After graduation it is put overboard whenever U boats are believed to be in the vicinity of the ship. These animals proved a decided success and well worth the trouble spent in training.

Now comes the long-spouted oil can for lubricating revolving shafting, without going up to the danger zone. You merely stand on the floor, place this special oil can in position, press a button and out comes the oil. The inventor if this new can claims that dozens if not hundreds of lives will be saved with his device.

The annual output of thirteen billion gallons of petroleum in the United States consists of 1,800,000,000 gallons of kerosene and about twice as much gasoline, the remainder being gas oil, distillate and light and heavy residuals.

Salonika will become one of the most important ports of the near East if improvements started by the Greek Government are carried out. Expenditures of $100,000,000 are planned, and include a city water supply, drainage and sewer works, dock extensions, railway stations and underground railways, 100 miles of new streets with housing developments, theatres, etc.

It is anticipated that German railway systems will find great difficulty in rebuilding their lines to pre-war standards, and that cheaper construction will have to be used, both on account of scarcity of raw materials and also financial difficulties.

When a steel article with a metallic coating is scratched or abraded so that a small area of steel is exposed, the two metals will, in the presence of atmospheric moisture, form a galvanic couple or cells in which a current will be set up. The metal, which is electro-positive to the other, will be oxidized, while the electro-negative metal will remain uncorroded. When the coating is zinc, it is the zinc which will be oxidized. If, however, the coating be tin, which is electro-negative to iron, the steel will be attacked. Therefore tin as a protective coating is useful only so long as the coating remains everywhere continuous. Aluminum makes a good protective coating for steel. In the method called calorizing the metal object is placed in a mixture containing aluminum and heated up to 900 to 950 degs. C. By this means a coating of aluminum which penetrates into the iron is obtained.

In Canada the developed water power is estimated at 1,735,598 h.p., while the power available is placed at 18,803,000 h.p.

In the Great War some of the losses in killed were as follows: Russia, 1,700,000; France, 1,385,000; British Empire, 692,000; Germany, 1,611,104; Austro-Hungary, 800,000; Turkey, 300,000; Italy, 460,000; Serbia, 320,000; United States, 67,813.

The Dominion of Canada, since the beginning of the war, borrowed from the Canadian people no less than $1,436,000,000. This amounts to $192 per capita of population.

H. L. Van Keuren, chief of the gauge section, U.S. Bureau of Standards, says that any workman, with a glass true plane and light, can measure accurately to the millionth of an inch.

Figures have been given out showing the way in which costs of running the British railways have been mounting up. The present estimate of increased cost in working the railways during the financial year ending March 31, 1920, as compared with 1913, was from 104 to 109 millions, made up of war wages and other concessions, 57 millions; 8-hour day and new concessions recently gratified or still under discussion, 20 to 25 millions; and extra cost of materials and coal, 27 millions.

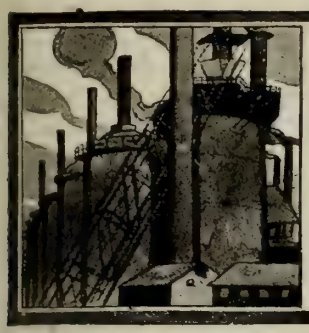
On one occasion last year the Westminster clock showed the wrong time to the extent of three seconds, but the error was less than a second on 151 days. The clock is checked but not corrected daily. The time ball at Devonport was correct to within a second throughout the year; that at Portsmouth was out of time to the extent of from one-half to one second on two occasions, and the Portland ball was incorrect to a similar extent on four occasions.

Corrugated iron huts, measuring 30 ft. by 15 ft., at £40 each, are one of the features in "Surplus," the second number of which has just been issued by the British War Office. The publication has been extended considerably, and many of the materials are now listed according to the county where they are situated. The Ministry announces that this paper, "Surplus," is issued to catalogue the left over and surplus war material.

The Nova Scotia Government is to create a hydro-electric commission similar to that in Ontario. Two bills, one to authorize the development of water power and the other to lay down regulations covering water and water courses, have been introduced in the Provincial Legislature.

The proposed extension of the water supplies to Moose Jaw, Sask., Con., will entail laying a pipe line about 70 miles long. The pipe will be of wood and 24 in. in diameter. The relative costs of wood, steel, and cast iron pipe for the work are in the proportion of 2.3, 5.7 and 10.5.

A. R. Roberts, formerly if Burns & Roberts, Ltd., Toronto, has discontinued his connection with the firm, and has opened an office at 201 Bank of Hamilton Building, Toronto. He will deal in new and used machinery, contractors railway and power plan equipment.



MARKET DEVELOPMENTS

Waiting for Period of Big Buying in Canada

Firms in This Country Still Buy Largely for Immediate Needs—Several Changes in Prices—Copper Stronger and Looks Like More Advance

THERE is a real and a noticeable improvement in the business going to the larger steel mills of U.S., and this is almost certain to be reflected at the Canadian mills and in business in general. The trade is discussing the new contract made between the Dominion Government and the Dominion Steel Corporation, and the opinion does not seem to be favored that steel at the price named, 3.65, can compete in this district. Taking Toronto as a given point, the Sydney plate would be 4.20 per pound, while Pittsburgh would lay it down here for 2.92½, plus exchange, leaving a margin too great to be discounted or ignored.

Speaking of plate, it is reported that a good tonnage was placed this week by the National Railways.

Buying is not improving as it had been hoped it would. Before the war there were plenty of concerns in Canada who made up an order covering many lines, such as plate, tubes, iron, bars, etc., that would be enough for an ordinary year's operations. Now most of these companies are buying for immediate wants only, and as a result business dribbles along and the mills do not get the much-wanted big tonnage orders.

Makers of some lines of machinery have served notices of advance. This is for material not much used in war work, and which has not risen far past pre-war prices. Against this, chain prices are eased off to the extent of $20 per ton. Chain did not come down immediately following the war, and the present reductions are practically delayed concessions.

The metal market is strong. Copper, it is anticipated, is in for a fairly well-continued session on high levels. Copper went very much to pieces directly after the war, but has been coming steadily back ever since. It is well above pre-war levels. Copper on the 31st of July, 1914, a day or so before the war, was quoted at 13, while the latest figure at New York names 23½c. The tendency is still up.

PITTSBURGH REPORTS THAT BUSINESS IS IMPROVING IN REAL EARNEST

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., July 17.—The report of steel ingot production in June makes an even more favorable showing than was expected. All observers recognize that there was much better mill operation in June than in May. With increasing operations during the month, even at the close of June few mills estimated their operations at over 70 per cent. of capacity, and as May had shown an average operation of 54 per cent., a fairer estimate for June appeared to be about 60 per cent. The official report since made, however, indicates an operation during June averaging 67 per cent. of capacity. The first four months of the year showed rates as follows: January, 87 per cent.; February, 85 per cent.; March, 77 per cent.; April, 65 per cent.

A little analysis of these figures will indicate how great an improvement there has been. It will be observed that the 54 per cent. average for May was far below the rates for April or June, and thus it is clear that at about the middle of May the rate must have been lower, probably not over 50 per cent. On the other hand, with production steadily increasing during June, and an average of 67 per cent. for the whole month, the rate at the close of the month must have been about 70 per cent. Accordingly there was a rate of about 50 per cent. at the middle of May and a rate of about 70 per cent. at the end of June, only a month and a half later, showing an increase in tonnage output of 40 per cent. in that short space of time.

The computation of percentages of operation are based on the monthly reports of the American Iron and Steel Institute, giving the output of 30 companies which in 1918 produced 84.03 per cent. of the total steel ingot output. The production of the 30 companies was 2,219,219 gross tons in June against 1,929,024 tons in May.

Production for the first six months of the year was at the average rate of 35,500,000 gross tons a year, for the whole industry, or at about 72.4 per cent. of capacity, which can be estimated at 49,000,000 tons a year.

Steel Corporation Business

The monthly report of unfilled obligations of the Steel Corporation shows that in June there was more contracting for forward deliveries of steel products than was reported at the time. It was well known that there was a continuous increase in the booking of actual shipping orders, comprising specifications against contracts together with new orders, specifications attached, but it was not supposed that there was much contracting for forward deliveries. For months there had been practically none at all, and some sales agents were remarking that they had forgotten how to fill out contracts, as the business received was all in the form of shipping orders.

The Steel Corporation report, however, showed 4,892,855 tons of unfilled obligations at the close of business, June 30, this including contract obligations as well as shipping orders. The increase during June was no less than 610,545 tons, whereas each of the preceding six months, beginning with December, had shown a large decrease, these decreases averaging 640,000 tons a month. These monthly reports are not a reflection of the rate of booking orders on which the mills actually operate. A month may begin with a certain volume of unfilled obligations and the mill may ship heavily, merely upon specifications against the contracts, whereby at the end of the month the unfilled obliga-

tions would be found to be decreased by the volume of the tonnage shipped. On the other hand a mill might book a large volume of contract business in a month but have very little tonnage of shipping orders on which to operate. Thus the main thing the Steel Corporation report shows is that contracting in steel products is now in vogue again.

Lake Ore Movement

Shipments of iron ore down the lakes in June amounted to 7,980,839 tons, against 9,921,860 tons in June a year ago. The season total to July 1 is 16,-008,419 tons against 18,949,730 tons for last year's season up to July 1. While there is a falling off of 2,940,000 tons the showing as to trade prospects is by no means unfavorable for the reason that there has been a large surplus of ore to liquidate. Last year's ore shipments were sufficient to carry the blast furnaces with full supplies up to about June 1 of this year, but as the war ended the production of pig iron declined very materially and not as much ore was used as had been provided. Indeed, the ore movement up to July 1 was almost wholly by the producer-consumer class, very little merchant ore being moved because the furnace interests that buy ore had not taken hold as to purchases for the season. Some had declared that they would not buy until about August 1, expecting the market to decline. Several weeks ago it became evident that ore prices would be held strictly and so there has been buying in a moderate way in the past two or three weeks, and the ore movement for the remainder of the season will probably show a picking up. The basis price for the season is $5.55, for Mesabi non-Bessemer ore at Lake Erie dock. An advance of 25c went into effect Oct. 21, 1918, under the auspices of the War Industries Board, making the price $5.75, but there is a 20c reduction for this year due to the lake carrying rate declining from $1 to 80 cents.

Railroad Buying

One of the chief things the steel industry now needs is a fair volume of railroad buying. Some departments of the finished steel trade that do not make materials used by the railroads are doing very well, while the branches that furnish railroad material are at the bottom of the list in point of activity. About three weeks ago it was reported in the inner circles that the Railroad Administration was about to place orders for 300,000 tons of rails, but nothing has come of this to date. It is surmised that possibly the Railroad Administration sees its way clear to returning almost complete control of the railroads to their owners at an earlier time than expected, though of course the earnings guarantee will run to the end of this year in any event. Thus it may be that the individual railroads will soon be in a position topla ce orders on their own initiative and responsibility. Another thing the steel industry needs is more construction work by way of large jobs, including bridges, large buildings, factories, etc. The erection of dwelling houses promises to be heavy the remainder of the year, judging by reports from various centres, and the fact that the nail departments of the wire mills are practically filled up for the next two or three months is concrete evidence of this activity, but that does not help the structural mills, which have a very light operation, in keeping with the rail and plate mills.

POINTS IN WEEK'S MARKETING NOTES

A Belgian concern has purchased practically all the machine tools that were left on the American market. The price was based on 1914 figures in many cases.

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There has been a very decided improvement in the purchasing of steel, according to reports from Pittsburgh.

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Prices on chain were marked down to-day 1c per pound or $20 per ton on electric and proof coil.

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Some machine-tool makers are announcing increased prices on lines that were not much inflated during the war.

—

Dealers state that plate made at Sydney at 3.65 cannot compete in the country for business. In Toronto, for instance, the price would be 4.20 against 2.92½ for U. S. plate.

—

Very little improvement is to be noted in the amount of buying going on. It is still on a small basis, purchases being confined to needs.

Pig Iron Moving

The pig iron buying movement is not altogether over, as it was thought at the end of June it might be. While there has not been much activity in the past week or two there has been some, and with the furnaces now in operation well filled for the third quarter, some of them practically through the year, the market is quite steady. Predictions of price advances in the near future do not seem to be well timed, however, as when idle furnaces see improving business ahead they generally hasten to get into blast and they are not very particular as to the prices obtained by the "back log" business they generally take before they blow in. Rarely does a furnace blow in to make up stock.

Mr. Robert K. Newton, formerly assistant manager of sales at Brown's Copper and Brass Rolling Mills, New Toronto, Ont., was appointed to the position of general sales manager on July 1.

Canadian Plate Will Be Too High

That is Opinion of Some of the Dealers —Market Doing a Fair Summer Trade

Toronto.—There is not a very large amount of business going this week, although some of the firms that have been in the market for equipment are still taking on material.

Inquiries are numerous, in fact there is a lot of business to be converted into cash, and it will surely be coming into the market in the not distant future.

Notice of Increases

Reference has been made in these columns several times to indications of higher prices for machine tools. Just how this will affect the sales is somewhat of a guess, and there seems to be a sharp difference on the advisability of such a move at the moment. Machinery is still on a high level, and any additions that are made will cause the purchaser to look rather hard at used equipment that may be on the market. Cochrane-Bly are out now with an announcement of a 20 per cent. increase on universal shapers, cold sawing equipment, etc., the raise running from 7½ to 20 per cent. It should be added that these machines did not increase much in price during the war, and even yet are much nearer old prices than many other lines that went up much and came down little.

The automobile business is the best anchor at present when it comes to real business. There has been a lot of buying done by the automobile interests, and there is going to be a lot more done. The making of differentials, with a heat treating plant, has been closed for the Willys-Overland people.

Dealers are inclined to be a little disappointed at the amount of business they are securing from the railroads. The National Railways have been out on several occasions with large lists, but they have not resulted in the placing of a very large amount of new business. For instance a Bullard boring mill is called for now, and the price will be around $8,500. Not so very long ago the purchase of one of these machines was urged at $6,500, it being in first-class shape, only running in a war shop for two months. The matter was delayed too long at the time, and the new machine will have to be bought now. Of course the machine tool salesman should not be particularly worried over the prospect of selling a brand new boring mill.

The railways are asking for bids on other lists just now too.

The Steel Trade

There are little pockets in the market that bring forth queer happenings. For instance a few days ago one dealer brought out a car lot of black sheets and offered them to warehouse interests for less than the Pittsburgh price to-day. He was rather out of that line now and anxious to unload. The same things hap-

pen at the mills now and then. Some interest comes to the top and takes a flyer into the market with the idea of hunting up a little added tonnage for immediate working. However, these things have always been in the market, and always will be, and they in no way touch the stable tone of the transactions.

The fact is, and it does not take much looking to discern it, that the market is even stronger than the prices indicate. Buying is not improving as it had been hoped for. There is still the policy of dribbling. Some years ago a firm would make up a list covering its requirements in plate, tubes, iron, bars, etc. The sales agent would have a trip and a good busy session. He would either get the year's business in a lump or he would lose it. Now these same places are nearly all buying in small lots.

There is a new price out on proof coil and electric weld chains which shows a reduction all round of one cent per lb. The reason is that chain did not come down along with other lines after the war. In fact it stood pat during the several reductions that were announced in steel.

The New Plate Mill

"Will there be any chance of the plate that is rolled at Sydney, under the new contract, coming into the market here as a competitor at a price?" asked MACHINERY of one of the big selling organizations this morning.

"Absolutely no," was the very emphatic reply. "The price is still away high. If they are going to pay 3.65 per pound for plate, they cannot compete for the business that is passing here. Plate from U. S. mills can be laid down in Toronto at 2.92½, while plate from Sydney at 3.65 would cost a good 4.20 when landed here. Of course Montreal would get a closer rate, but even that would not help matters."

The Scrap Market

A good amount of business is going through the scrap yards at present, and buying is fairly liberal, but prices are staying about where they have been for some weeks. There is more material coming on the market now than for some time past, and shipments out are correspondingly larger. Some misunderstanding is noticed in Montreal and Toronto quotations, owing to the higher figure for Montreal. Montreal is not only a consuming point, but its quotations are based on gross tons, against the net tons meant in the Toronto quotations.

Copper Market Strong

New strength is evident in the copper market, and prices are coming along showing decided evidence of increased strength. The copper prices have mounted well above pre-war figures. Electrolytic is quoted now at 23½, against 13 cents on July 31, 1914, a few days before the start of the war. Production costs are higher, of course, and there is going to be a tremendous demand for copper in many sections of the world.

MUCH BETTER FEELING NOTICED IN THE MONTREAL TRADE OF LATE

Special to CANADIAN MACHINERY.

MONTREAL, Que., July 17.—There is an undoubted improvement in the tone of the general situation, and while actual business has shown no marked increase, there is nevertheless a better feeling prevailing in trade circles. The announcement that the Government has renewed the contract with the Dominion Steel Corporation, at an adjusted figure, has had the effect of reassuring the steel interests of the continuance of shipbuilding and other activities for an extended period. The large plate mill at Sydney, the construction of which was suspended several months ago, will now be rushed to completion, and actual production of plates will be possible early next year. The strike situation is less pronounced and many settlements have been made or are pending. Shipworkers at Canadian Vickers will, probably, be all back to work this week. Business in and about the harbor is very active and every vessel leaving port goes out with a full cargo, the greater portion of which is food supplies and lumber. Steel merchants in this district report little change as a result of the signing of peace, but are hopeful of better business developing before the summer closes. The metal market is firm and the demand is slowly but steadily increasing. Business in machine tools is largely on used equipment. Old materials have been fairly active and firmness is maintained.

Metal Improvement Holds

The improvement that has been noted in the metal market during the past few weeks appears to be holding its own, and while the volume of sales may not denote a buying movement, there seems to be a more confident feeling expressed on the part of the consumer and sales are more regular. Small quantities are still the feature and trading does not show any great tendency on the part of the purchaser to carry supplies other than those required for immediate or early operations. It is believed that Germany will soon place large copper orders with the States, and this will be an influential factor in maintaining a strong market. It is reported that American supplies on hand are steadily decreasing, and as mining and refining are somewhat disorganized, as a result of shutdowns, some little difficulty may be experienced in securing labor for this industry. The movement here is not heavy, but it is of a steady character, and dealers are quite satisfied with the current volume of business. Coppers are again marked up one cent per lb., the quotations being 24 cents for lake and 23 cents per lb. for electro and castings. Spelter is in beter demand and prices have advanced to 9½ cents per lb., this quotation being one cent higher than last week. Other metals are nominally firm on light, but steady demand.

Machine Tools Still Quiet

One is at a loss these days to state, definitely, the actual condition in the machine tool industry. Some dealers report a fair volume of business, while others state that nothing is coming in. On the whole, it would appear that, apart from the sales on used equipment, the activity in machinery is confined to the requirements of a few new developments and for railroad purposes. The general demand is undoubtedly quiet. Inquiry is still of a character that might imply early buying, but apparently few of such inquiries have ripened to the point of purchase.

Scrap Remains Unchanged

While there appears to be a little hesitation about holding prices at their present level, the dealers here are reluctant at making reductions this week. Business has been fair during the past few days, and while some appear to incline to lower quotations, no definite action is yet noted. However, it would not be unexpected to see some changes next week. Coppers are quite firm, but other metals and steel scraps are developing an easier tendency.

Machinery Exhibition.—The Right Honorable Lord Weir of Eastwood, has promised to open the Shipping, Engineering and Machinery Exhibition at Olympia, England, on September 25th next. This exhibition, of which Sir Owen Phillips, G.C.M.G., M.P., is hon. president, Sir Archibald Denny, bart., chairman of the Committee of Experts, and Mr. F. W. Bridges, secretary and organizing manager, and which was to have been held in the autumn of 1914, but in common with other important events, had to be postponed on account of the war, will afford the general public an opportunity of becoming acquainted with the luxury, comfort and ease of present-day sea travel. The interval which has since elapsed has, moreover, afforded British engineers an opportunity of introducing vast improvements in connection with marine and general engineering, with the result that Olympia will be full to overflowing with machinery and appilances of intense interest to all concerned with the shipping, shipbuilding and engineering industry, and the exclusion of everything of enemy origin will enable the British public to see how absolutely independent we can be of anything produced in enemy countries, at any rate, as regards this particular industry. The exhibition is to remain open for three weeks.

BELGIAN CONCERN IS REPORTED TO HAVE BOUGHT UP U.S. WAR MACHINES

Special to CANADIAN MACHINERY.

New York, July 17.—Recent newspaper reports from Europe that the United States Army has sold all of its used machine tools abroad to La Construction de Metallique de Belgique, a Belgian manufacturing concern, is confirmed by Secretary of War Newton D. Baker. Machine tool builders who had been opposing the sale of Government tools abroad, maintaining that it was ruining the business of American builders, have withdrawn their objections. Secretary Baker says that the sale abroad was on the basis of August 1, 1914, prices, plus 55 per cent. c.i.f. Antwerp. He adds that the average price advance reported by 133 manufacturers in this line from 1914 to 1918 was approximately 93 per cent., and the average drop on new machinery since the signing of the armistice has been about 20 per cent.

Sales of used machinery by the War Department to date have totalled $3,200,411.10. This equipment cost the Government $3,898,833.85; therefore the Government has realized about 82 per cent. of the cost prices.

The first important inquiry from Europe for machine tools since the signing of the treaty of peace, has been issued by the Framerican Industrial Development Co., New York, representative here for the Creusot Works, France. About 30 large tools are required for a steam turbine plant, and immediate delivery is asked.

The Niles, Bement, Pond Co., New York, has received an order from the Navy Department for 42 large lathes for the naval ordnance plant at Washington, D.C., the cost being about $750,000.

Four ship repair plants are soon to be built on the Atlantic coast, under arrangement with the Emergency Fleet Corporation. The latter organization will build two 10,000 floating dry docks for each plant, and adequate shops for the repair of ships will be built and equipped. Contracts for this work are about to be signed. The four plants will be operated by the Norfolk and Hampton Roads Ship Repair and Dry Dock Corporation, Norfolk, Va.; the Perth Amboy Dock Co., Perth Amboy, N.J.; the Ramberg Iron Works, Brooklyn, N.Y., and Fraser, Brace & Co., New York City.

Machine tool business in the East continues in moderate volume. The Spicer Mfg. Corporation, Plainfield, N. J., bought about 15 or 20 tools last week, this being the most important buying by any manufacturer in the East in several weeks. Companies making candy machinery are very busy, and several of them are buying new equipment.

Prices are quite firm, and some advances have been made. The tendency toward making concessions is lessening. Machine tool builders are looking for a much better business during the latter half of the year. Many projects are pending which will doubtless come to fruition as soon as the business situation shows a further improvement.

PROVISION IS ALREADY BEING MADE FOR BUSINESS DURING NEXT YEAR

BUYING for next year's requirements of pig iron has started. Transactions of over 20,000 tons have been booked. Following are reports from United States centres:

PITTSBURGH.—The feature of the market has been the buying of large quantities of malleable for the end of this year and part of next. The feeling of consumers is evidently that prices are as likely to go up as down, and this is borne out by the fact that furnaces are not keen on booking business for 1920. There have been fair sales of foundry and bessemer.

BOSTON.—Business during the week preceding the holiday was confined to small lots, mostly of carload proportions. Some sales of 200 to 500 tons were made. Prices have remained firm, and furnaces are not keen on quoting for future business.

BUFFALO.—While the big rush is over a number of enquiries are coming in, and a fair amount of sales are being made. Furnaces are pretty well booked up and not much tonnage is available from stock. More stacks will be put in operation shortly.

NEW YORK.—Demand for pig iron has been very weak, both for domestic use and export. It is understood that the 20,000 tons enquired for from England has gone to a Luxembourg furnace, at $38.40 c.i.f. an English port, which is away below any American offer.

CLEVELAND.—Sales amounting to about 50,000 tons, mostly for outside points, have been closed during the week. Buying is quieter, as most of the furnaces are booked up for the rest of the year. Steel making grades are still inactive.

CINCINNATI. — Southern furnaces are fairly well stocked up with orders, and prices firmer in consequence. Furnaces are quoting the full schedule price of $28 for 2.25 to 2.75 silicon iron. No quotations are being made for 1920 iron.

ST. LOUIS.—While quietness is the leading note in the market this week, prospects are good for future good business. Automobile and truckmakers are working to capacity, and stove makers look forward to heavier business than at any time since before the war.

BIRMINGHAM.—Good enquiry for fourth quarter is forthcoming, and if the demand keeps up it is likely that more stacks will be blown in. Not much iron has been sold for last quarter delivery. Production for July is likely to be much higher than June.

PHILADELPHIA.—The market here is keeping fairly brisk, domestic foundry sales amounting to 20,000 tons being made. Some sales have been made to England at $39.60 c.i.f. Bristol Channel. There is business enough in sight for two or three months' activity of furnaces now working.

CHICAGO.—Buying of foundry and malleable is progressing normally, but there is no demand for steel making grades as yet. One Chicago interest sold 125,000 tons of pig iron last month, and now reports business picking up again.

STEEL MAKERS ARE IN THE MARKET NOW

Scrap is Being More Eagerly Sought; Some Districts, Though, Remain Dull

The scrap market, although showing dullness in some districts, is, on the whole, firm and on the upward grade. Following are the reports from various centres:

CHICAGO.—With the exception of rolling mill grades, all scrap is active and prices rising. $25 is predicted for heavy melting steel in the near future.

BOSTON.—There is considerable activity locally, with some price advances. Machine shop turnings are quoted from $8 to $8.50, while blast furnace turnings are from $7.50 to $8. Rerolling rails have been quoted up to $16.

NEW YORK.—Dullness due to the holidays in part, has resulted in prices remaining stationary, and, in some cases, dropping slightly. Heavy melting steel is a case in point, this grade dropping about 25c per ton.

PHILADELPHIA.—There is a good demand for all grades, and prices continue to advance. Heavy melting and No. 1 railroad wrought have sold up to $19 and $25 respectively. Heavy axle and forge turnings have been sold as high as $15.

PITTSBURGH. — The steel makers are coming into the market, and dealers are, in some cases, marking up their prices. $19 delivered for heavy melting steel has been paid, and the quotations are now up to $20. There is a good demand for rails.

BUFFALO.—There is a brisk market for all grades of scrap, and dealers' stocks are comparatively low. Dealers are predicting a shortage in the near future, especially as no country scrap is offering.

CLEVELAND.—Dealers are offering more for steel than consumers and yard interests are expecting much higher prices for the steel they have in stock. They say they would not consider $21 for it.

CINCINNATI. — Although little business was done, prices are nominally higher. Demand is better for No. 1 railroad wrought, cast scrap and rerolling rails. Steel turnings show weakening.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

Pittsburgh to Following Points	Per 100 lbs. C.L.	L.C.L.
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39.
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$24 00	$23 50
Electro copper	23 00	23 00
Castings, copper	23 00	22 50
Tin	55 00	55 00
Spelter	9 50	8 50
Lead	7 00	6 50
Antimony	9 50	9 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$13 50	$12 00
Copper, crucible	17 25	15.00
Copper, heavy	17 50	15 00
Copper wire	17 50	14 50
No. 1 machine composition	13 50	14 00
New brass cuttings	10 00	9 00
Red brass cuttings	11 75	9 00
Yellow brass turnings	8 50	6 50
Light brass	7 00	5 00
Medium brass	8 00	6 00
Scrap zinc	5 50	5 00
Heavy lead	5 00	4 00
Tea lead	4 00	3 00
Aluminum	16 00	12 00
	Per Ton.	Net.
Heavy melting steel	12 00	9 00
Shell turnings	7 00	6 00
Boiler plate	12 00	8 00
Axles (wrought iron)	17 00	15 00
Rails	12 00	11 00
Malleable scrap	15 00	12 00
No. 1 machine cast iron	20 00	15 00
Pipe wrought	9 00	5 00
Car wheels	20 00	18 00
Steel axles	20 00	20 00
Mach. shop turnings	5 50	5 00
Stove plate	15 00	10 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sies up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, al sizes	40 plus 10
3-fluted drills, plus	10
Jobbers' and letter sizes	40 plus 10
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 50
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head.28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S.	.....	7 50
Premier, 10¾ oz.	.....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	.....
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated

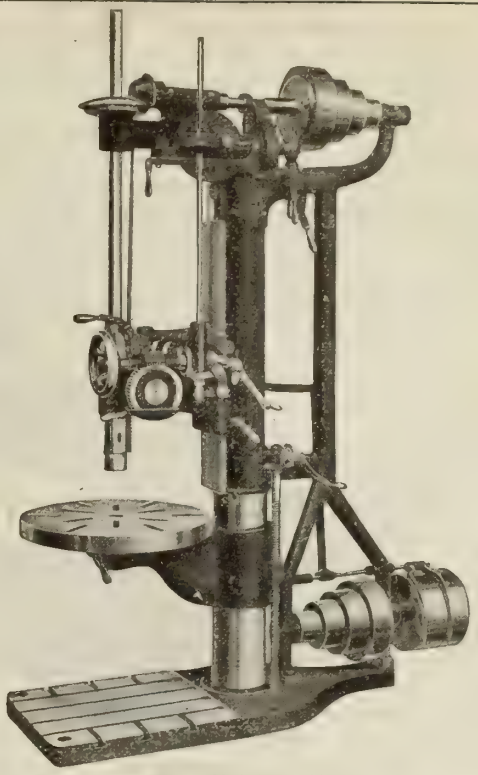
A Complete Line 8 in. to 50 in. Swing.
with or without tapping attachment.

BARNES

Upright Drills
Horizontal Drills
Gang Drills

Accuracy—Strength
Convenience of Operation

Carried in Stock by



26 in. Slid. Head Type

THE A.R. WILLIAMS MACHINERY CO., Ltd. 64 FRONT ST. WEST TORONTO

MONTREAL ST. JOHN, N.B. WINNIPEG VANCOUVER HALIFAX BUFFALO, N.Y.

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited
Steel Foundry Division, Lachine Canal
Head Office: 187 Delisle St. MONTREAL
Phone Victoria 1492

MORROW SCREWS MORROW
DRILLS FILES
MORROW NUTS MORROW

MORROW
INGERSOLL

Best jobbers carry "Morrow's."

"Morrow" Screws (it's the finishing die that does it).

"Morrow" Nuts.

"Morrow" Twist Drills "will do more drilling with less regrinding."

All of the highest possible quality made in Canada by contented, intelligent experts in the largest and best equipped plant of its kind in the Dominion.

John Morrow Screw & Nut Co.
LIMITED
INGERSOLL - CANADA

Always, everywhere, use "Morrow" products. Made just a little better than seems necessary.

DISAPPEARANCE OF THE OLD TIME SHOP JOKER

(Continued from page 57.)

And now comes the sequel. This chap had a wife and four children on the way over, and had tried very hard to secure some employment previous to coming to our firm, but without success.

He had landed this job at our plant, and if left alone, might have, in fact, no doubt, would have filled the bill, for the class of work he would have been given would have been fairly simple. However, our humor (?) changed all this, with the result that when his wife arrived they had some plugging before they could make ends meet. He could not secure a position and she was forced to work until later, when, on hearing the circumstances, we went to the foreman and requested he look over the matter and bring him back. The foreman was a good sort, saw our point of view and brought the fellow back. We had learned our lesson in the meantime with the result that later this chap spoken of developed into a first-class drill hand.

Of course we all remember the old trick of smearing the bottom of the file handle with red lead, of sending the greenhorn for the rubber wrench with glass jaws for polished work, and last but not least, the old, time-worn, hairy, and gory quest after the left-handed monkey wrench.

These are harmless, foolish jokes, but nevertheless interfere with efficiency in the shop. Compare the shop of 10 years ago with the plant of to-day and note the decided improvement over former conditions.

Operations, etc., are now systematized to such an extent that there is no time for such humor, for which we offer due thanks. Practical joking may be all right in its place, but its place is not in the shop, or office, especially in business hours.

THE PERFORMANCE OF THE MOTORS THAT CROSSED THE ATLANTIC FIRST

The crowning triumph for the Rolls-Royce aero engine is the first direct Atlantic flight, accomplished in 15 hours, 57 minutes, on a Vickers "Vimy" plane. Not the least remarkable part of the feat is the high average speed maintained, viz., 117½ miles an hour. Evidently the two Rolls-Royce engines fitted to the Vickers Vimy plane must have worked perfectly throughout the 1,880 miles flight.

It has been calculated that if the Atlantic crossing were completed in 20 hours by one Rolls-Royce engine running at an average of 1,800 revolutions per minute, its performance would be as follows (in a two-engined plane such as the Vickers Vimy the operations would naturally be doubled): Each engine will make 2,160,000 revolutions, and each piston will travel up and down the interior of its cylinder a total distance of 440 miles. As the Rolls-Royce engine has 12 pistons they will in all travel 5,280 miles. The valves will be operated some 25,-920,000 times in each engine, the magnetos and sparking plugs having to deliver the same number of sparks for the ignition of each engine.

The recent history of the Rolls-Royce aero engines discloses one or two very interesting facts.

On Nov. 11, 1918, when the armistice was declared, there were in possession of the R.A.F., Rolls-Royce aero engines of a total horse power of over 1,000,000, which far exceeded that of any other make of aero engine in use. Previous to armistice day, Nov. 11, 1918, there had been constructed 122 Handley-Page bombers of which no less than 113 were fitted with Rolls-Royce engines. Prior to the same date, 1,524 complete Bristol Fighters had been delivered, of which number 1,364 were also equipped with Rolls-Royce engines. Rolls-Royce engines were used exclusively in the planes of the London-Paris Government courier service for the conveyance of the ministers, officials and despatches to and from the Peace Conference, the speed record between London and Paris, viz., 75 minutes, standing to the credit of the Rolls-Royce aero engine. The only two aeroplanes which have flown from England to India were both fitted with Rolls-Royce engines.

MONTREAL NEWS

L. A. Desy, consulting engineer of Montreal, will shortly complete the construction of a large power plow, capable of plowing a strip of land 40 feet in width; the plow is of unique design and will be ready for a practical demonstration in the course of a few weeks.

Canadian Vickers employees return to work this week after a strike of six weeks' duration. Negotiations have been carried on constantly and no disturbances marked the progress of the strike.

In order to take care of the increased railway requirements on the harbor front, the Montreal Harbor Commissioners may take over the south side of Common and Commissioners streets—which is their property—and lay down railway tracks. In view of this the Harbor Commissioners have requested the city to transfer the tram tracks to the south side of the street.

Residents in the vicinity of the Montreal abattoirs are, at last, assured that their nasal organs will be relieved of the offensive odors arising from the production of animal food. Plans now in progress will, it is claimed, guarantee smell-proof rendering plants.

Roy M. Wolvin, vice-president and managing director of the Halifax Shipyards, has been elected a director of the Dominion Steel Corporation. Mr. Wolvin's knowledge of the transportation of ore and coal will prove of inestimable value to the steel corporation.

That inter-Empire trade opportunities await Canadian manufacturers is shown in the visit of G. E. Whitehouse, of London and Edinburgh, who is here on the invitation of the Canadian Government, to ascertain the commercial possibilities of this country. "You can produce more manufactured articles than you can consume, because your population is small," said Mr. Whitehouse, "and you may just as well sell those things to us and keep the business in the family, for the more business there is between two people the better they will understand one another. What I want to find out is the names of the firms who are actually ready and willing to ship their products to England."

The possibilities of export business is exemplified in the loading this week of twenty Canadian built locomotives, on the Elder Dempster freighter Kwarra, for the South African Government Railways. The same boat will carry a large number of Canadian-made automobiles.

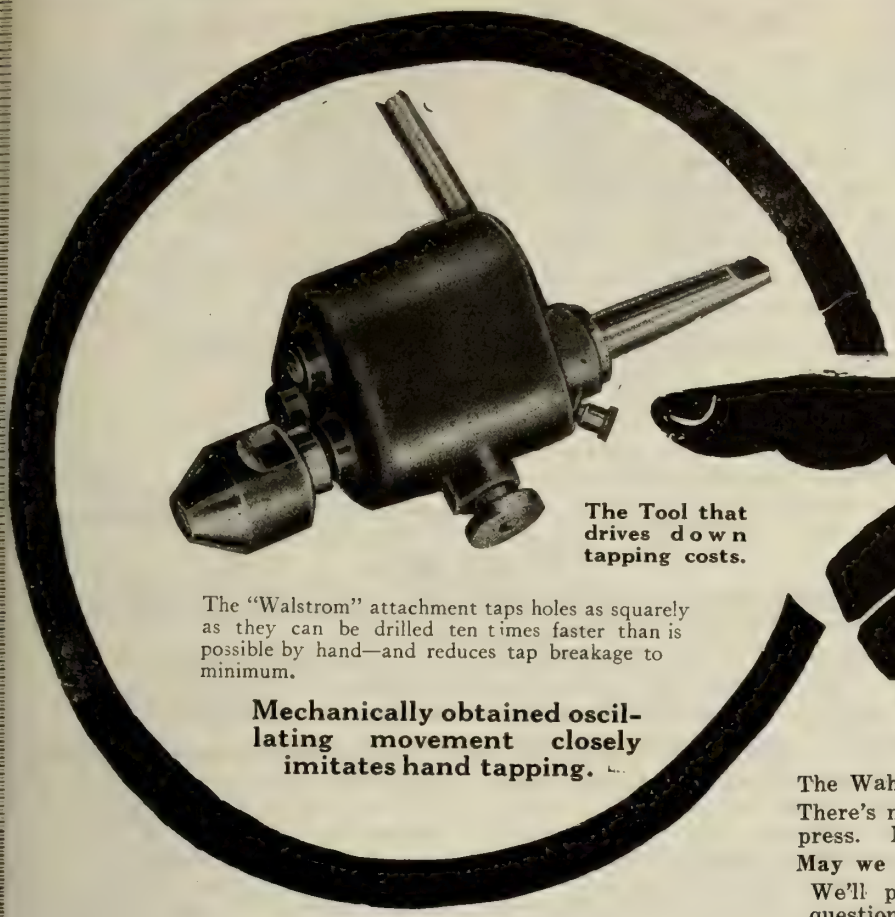
Numerous icebergs are reported along the coasts of Newfoundland and are proving a menace to Atlantic shipping. Last week the C.P.R. liner Grampian was seriously damaged, and several weeks in drydock will be required for repairs.

With the announcement that the steel plate mill at Sydney will be completed and the old contract fulfilled, we are almost assured of an extended period of shipbuilding activity. It would not be surprising to hear of additional ship contracts being let by the Government.

The Thos. Davidson Manufacturing Company of Montreal are building a large addition to their present plant on Delisle street, to take care of their rapidly increasing business. The grey iron foundry work has been discontinued at the main plant and a new modern foundry building, 100 x 74, is being constructed at Turcot, adjoining the steel plant of the company.

The Jas. Buckley Co. of Montreal have obtained the exclusive Canadian agency for the Mahrvel line of oil furnaces and blow torches, manufactured by the Mahr Manufacturing Company of Minneapolis, Minn.

The French gunboat La Somme, after some strenuous patrol duty off the banks of Newfoundland, is paying a visit to Montreal, and will participate in the celebration that is being held this week, to commemorate the fall of the Bastille. The vessel is one of 800 tons displacement, fitted with twin Parsons geared turbines and capable of 20 knots.

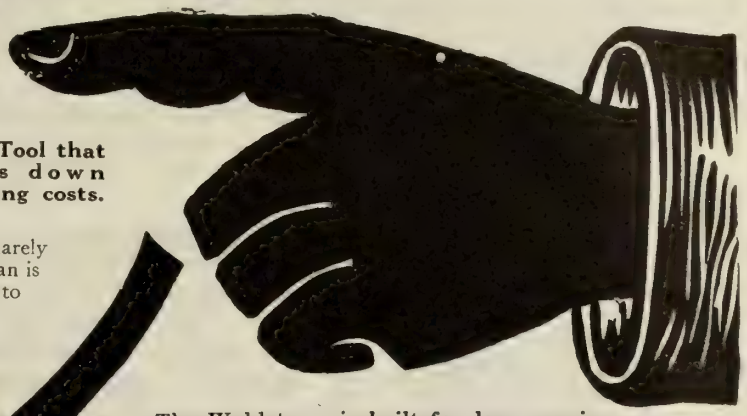


Aikenhead's Wahlstrom Attachment

The Tool that drives down tapping costs.

The "Walstrom" attachment taps holes as squarely as they can be drilled ten times faster than is possible by hand—and reduces tap breakage to minimum.

Mechanically obtained oscillating movement closely imitates hand tapping.



The Wahlstrom is **built for long service.** There's nothing to get out of order. Fits any drill press. Makes taps of all sizes up to ½-inch.

May we send one on trial?

We'll promptly refund your money without question, if you are not satisfied.

Aikenhead's Starrett Tools

The Best That Money Can Buy

A knurled licking nut contracting a split bushing around the spindle tightens and keeps the spindle central and true, or by a slight turn licks it firm, making a solid gauge when desired. Anvil and spindle are hardened, ground and lapped.

Send for bulletins.

Starrett Micrometer Calipers have a more exact and easier way of adjustment than by the old method of a movable anvil. Over the barrel is a thin, graduated sleeve, and on this sleeve is the zero line, instead of on the barrel itself. The thin sleeve keeps dirt from the screw and after years of use a turn of this sleeve brings the zero line correct to

Compensate for Wear

AIKENHEAD HARDWARE, LIMITED

17 Temperance St., Toronto

She was fully armed during the war, but is now reduced to one gun forward.

On and after July 1st, the firm that has been known as H. Boker and Co., Inc., Canada, will be conducted under the name of the Pilot Steel and Tool Company, Limited. The new company will be operated as a distinctly Canadian corporation but will continue to be affiliated with H. Boker Co., of New York, representing the latter in Canada. The Pilot Steel and Tool Co., as the Canadian representatives of the New York firm, will act as sole agents in Canada for the entire optput of Jonas and Colver, Ltd., of Sheffield, England, makers of Novo Superior high speed steel, Novo high speed steel, Intra steel, hot and cold rolled tool steel, circular saws, planer knives, files, etc. All the other lines formerly handled by the old company will continue to be stocked by the new company. The directorate of the new company will be practically identical with that of the old concern. F. E. Rejall who has been Canadian manager for a great number of years, will henceforth act as vice-president and director, and continue the management as heretofore.

As an instance of the ability of ships built on the Isherwood system to resist severe strains, the case of the oil tanker "San Zeferino," is typical. This vessel sunk after being holed in the engine room, which was right aft. Her stern sank in 90 feet of water, till her sternpost rested on the bottom, but the buoyancy of her oil cargo, kept the fore part up so that her fore foot was out of water. She remained in this position for a month before being floated, when a good portion of her oil cargo was salved in perfect condition, and the hull was in an absolutely unstrained condition.

An account of a dry dock for which patents are pending comes from the United States which reads like a fairy story. It is said to be the product of ten years' engineering study. The new dock will, it is said, have a speed of 42 knots per hour, and will be able to go to sea and relieve vessels in distress as well as perform the usual functions of a dry dock. It will be fitted with cranes and winches which will enable it to grapple with and raise any vessel existing. No details are given as yet, but they will be looked for eagerly.

Special Announcement

A FEW weeks ago we asked readers of CANADIAN MACHINERY, especially those engaged in the study of our Drafting Course, to state their views regarding the suspension of this course until Sept. 1.

So far the majority of letters suggested the plan of stopping work until this date, when the weather would be cooler. There are other students who unfortunately did not send in their views, so we must, for the present at least, follow the plan of closing the course until the fall.

Following are the winners for Plates Nos. 4 and 5. Later we will announce the winners for Plates 6 and 7. Should students desire a continuance of the course, without this vacation, so to speak, our only method of knowing their mind is by receiving letters, so be governed accordingly.

ANNOUNCING THE PRIZE WINNERS

PLATE No. 4

Hugh Scott, 27 Helena Ave., Toronto, Ont.
Wm. Williamson, 10 Crombie St., Galt, Ont.
Thos. Dunbar, 115 Proctor St., Sarnia, Ont.

NOTE.—Hugh Scott has now landed his second prize. Former winners, get busy after Sept. 1st, and land some more prizes.

PLATE No. 5

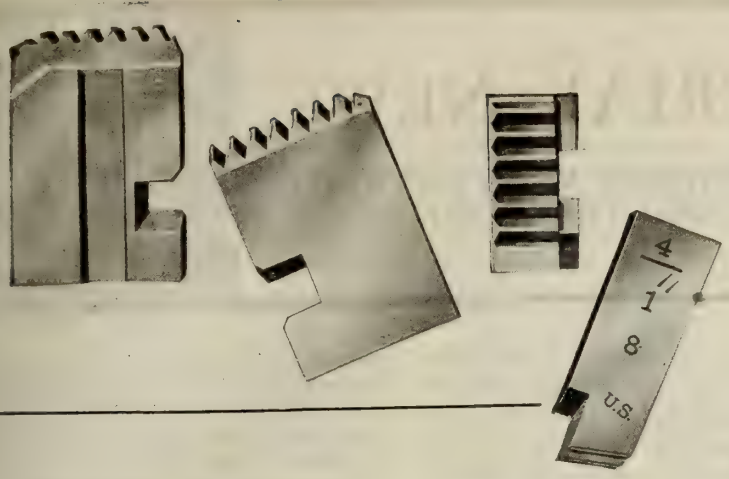
Leonard Snary, 170 E Superior St., Chicago, Ill., U.S.A.
David Winton, 95 Cedar St., Galt, Ont.
Joseph Wenzel, 438 Franklin Ave., Hartford, Conn., U.S.A.

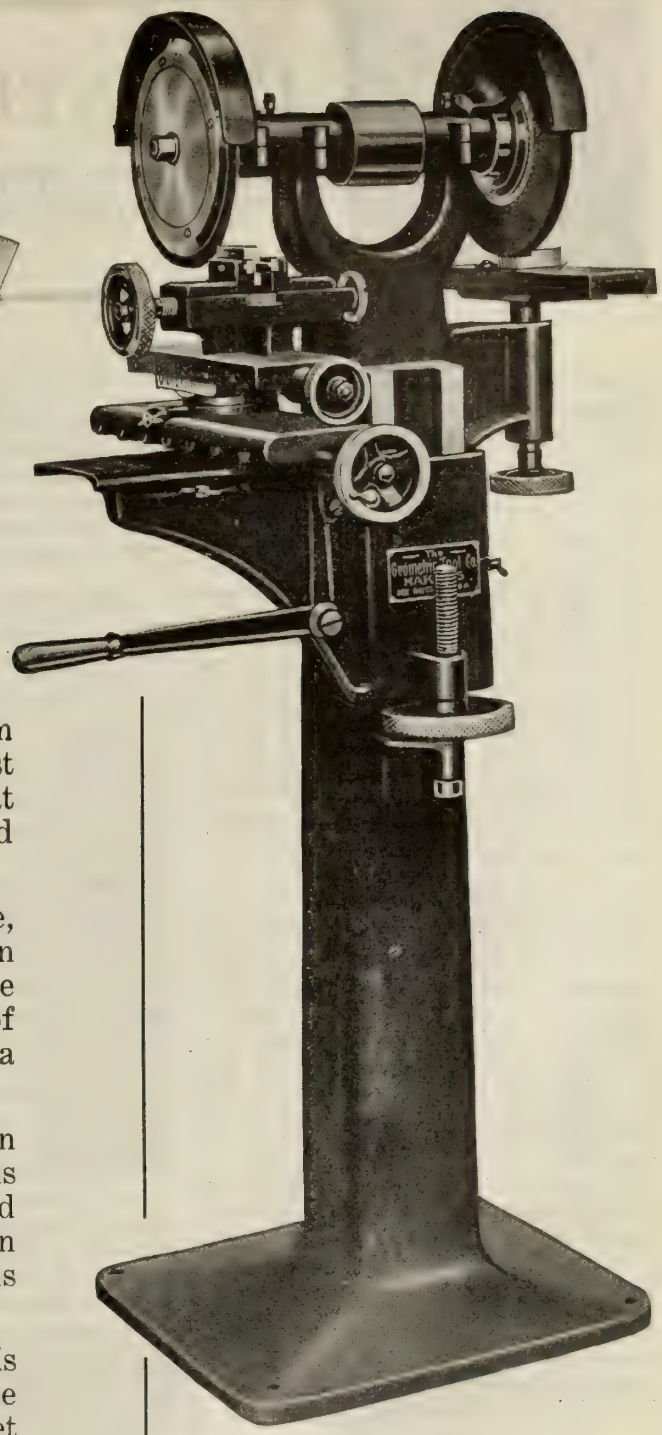
NOTE.—Two prize winners are from the land of Uncle Sam, showing that CANADIAN MACHINERY is well read, and distributed.

Current Events in Photograph

First Dirigible to Cross Atlantic

The photo gives a good idea of the great size of the R34. It was taken shortly after the explosion which tore the dirigible from her moorings. The explosion was caused by the gas in one of the front sections becoming heated by the sun. It tore a section of the outer skin thirty feet long from the forward lower surface of the gas bag. This accident has delayed the return trip of the huge aircraft. But it is now on its way, having left Wednesday at midnight.





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalog describing this machine is a mine of information on chaser grinding. Write for it.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN **CONNECTICUT**

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, Winnipeg, St. John, N. B.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

MUNICIPAL

The Kempsmith Manufacturing Co., Milwaukee, Wis., has issued a new general catalogue, descriptive of Kempsmith milling machines. This catalogue is composed of four-page circulars, each complete in itself.

Toronto.—The Dominion Shipbuilding Co. launched their seventh ship in the past nine months last week. This was the steamer "Hessa," a full sized freighter of 3,650 tons deadweight. Her dimensions are 261 feet by 43 feet 6 inches, by 24 feet 2 inches; her engines of the triple expansion vertical type, being designed to develop 1,200 h.p. She is fitted with two Scotch marine boilers, working at 180 lbs. per sq. in. steam pressure. The Dominion Shipbuilding Co. have orders for five more steamers to be delivered this Fall and next Spring.

St. Catharines.—The St. Catharines Journal says, in a recent issue: "When Mr. Gaby, chief engineer of the Hydro-Electric Commission,was before the City Council a week or so ago, he stated in reply to quotations furnished by Mayor Elson and Alderman Riffer, that the Commission could buy steel rails to-day at $40 to $45 per ton. The above two members of the council, who had prices on such materials, said their information was that rails cost from $55 to $65 today. A copy of the Daily Iron and Metal Trade newspaper, just to hand gives a report of the bid of an United States firm on a shipment of 5,000 tons No. 1 steel rails for Glasgow as $87 a ton. It adds that this was $8 per ton below the lowest British bid. In view of such prices prevailing in the United States the price quoted by the chief engineer of the Hydro is all the more mystifying."

TRADE GOSSIP

Major A. GG. Hutter has taken up the management of the Montreal office of the firm of Wonham Bates & Goode, Inc., New York and London, exporters and importers. Previous to going overseas Major Nutter was connected with Mussens, Ltd.

Plant Closes.—The plant of the Brunner Mond Company at Amherstburg has been closed down, to stay so until labor conditions become such that business can be carried on. The plant, which is a subsidiary of the Solvay Process Co. of Detroit and Syracuse, is the largest in this country. Several hundred men are affected by the unexpected development.

Ready for Operation.—Canadian Engines, Ltd., manufacturers of stationary and portable gas and gasoline engines, grain grinders and saw frames, who were practically closed down during the war, have resumed operations, and are taking on a full complement of men. They report an abundance of business in view and that the prospects are favorable for a busy time throughout the year.

Tanning Company Extends.—Advices from Kitchener, Ont., state that the Lang Tanning Company, one if the pioneer industries of the city, will make a considerable addition to its plant. This will consist of two buildings each 100 by 200 feet, four-storey brick construction. The present staff, which numbers about 200, will be increased to 300 and possibly more when the new buildings are ready.

Britain's Lumber Requirements.—The enormous quantities of timber required for the British Government's new housing program, is being mostly supplied from Baltic sources. The rates on Canadian lumber, always higher than those from Scandinavia, are now in the proportion of three to one. The whole question is one of shipping facilities, and if Canada could solve these difficulties, she would have a chance of competing with the Scandinavian countries.

New Power Plant.—A huge power plant is being constructed on the Winnipeg River at DuBonnet Falls, 75 miles north of Winnipeg. The Winnipeg River Power Company, backed by Mackenzie & Mann interests, are the owners. The ultimate capacity of the plant will be 168,000 horse-power, in six units of 28,000 each. The development will take three years, and will cost $700,000.

Ship Plate Agreement.—An important decision was made for the Dominion Steel Corporation when the Government decided to renew the plate contract at a reduced price. This is not only helpful to the company itself, but will naturally help the immediate district, and, indirectly, the whole country. The amount of money involved is in the neighborhood of $4,000,000. It may also mean the continued building of ocean-going ships in Canada, as the fact of being able to obtain plate in Canada should materially bring down the building cost.

Industrial Convention.—The forthcoming Industrial Convention in Alberta shows promise of being a great success. More than 150 American Chambers of Commerce have written signifying their intention of assisting in the good work, any many of them are sending delegates. The congress will be held in Alberta from Aug. 11 to 16, with special sessions in Calgary Aug. 13 and 14. Congress headquarters are at Pallisser Hotel, Calgary.

To Attend Athens Fair.—The fair at Athens, which commences on October 13th, will contain exhibits of Canadian manufactured goods. This is the result of Mr. Lloyd Harris's efforts to interest Canadian manufacturers in the possibilities of the Balkan markets. One of the methods of placing the goods before the visitors to the exhibition is by photo, and a large number of these have been sent. The invitation to attend came through the Federation of British Industries. The Canadian Manufacturers' Association has a representative who is interviewing all manufacturers whose goods might be suitable for the Balkan trade.

Trade Commissioner's Views.—The Canadian Trade Commissioner from Manchester, England, has been visiting Toronto, and has some interesting things to say anent the prospect of trade with Great Britain. He states there will be a good market for Canadian manufactured goods and raw materials in the Old Country for the next three or four years, and gave instances of orders recently placed by English firms in Canada. He mentioned a half million dollar order for confectionery placed by a Manchester firm in Canada, besides huge orders for rivets, wire nails and wire. There is a hosrtage of three-quarter million homes in Great Britain, and enormous quantities of windows and doors would be required.

New Steel Appointments.—Two important appointments are announced by the Dominion Steel Corporation. Mr. Roy M. Wolvin has been elected a director to fill the existing vacancy on the board, and his expert knowledge of shipping should make him a valuable adviser. Mr. Wolvin has been identified with lake shipping for a considerable period. He was president and general manager of the Montreal Transportation Co., and later vice-president of the Halifax Shipyards, Ltd. Mr. H. J. McCann has been appointed assistant to Mr. Mark Workman at the Montreal offices. Mr. McCann has advanced to his present position through various departments of the steel company, with which he has been identified for some years, entering its services as a telegraph operator.

Vancouver Terminals.—In connection with the construction of the new barbor terminal facilities at Vancouver, Mr. McClay, Harbor Commissioner, states that an effort will be made to have the terminals built entirely by veteran labor. He says that with returned soldiers the work can be done better, quicker and cheaper than by the employment of contract labor. In support of this contention he instanced the construction of Industrial Island under the Crafton Street Bridge, on which the Harbor Commissioners saved 10% of the cost. From the ranks of the Canadian Engineers, who had overcome such grave difficulties in France, Belgium and Palestine, men could be found to fill all the technical positions, as well as the rank and file.

Serious Coal Shortage.—A number of circumstances are combining to make the coal situation a serious one. Labor troubles and transportation difficulties aer the chief of these. The production of bituminous coal for the six months of this year was approximately 212,000 000 tons, which is 700,000,000 tons less than for the corresponding period last year. As the estimated requirements for the year are 560,000,000 tons, much greater production will be required for the ensuing six months to make up the average. This is unlikely to be achieved, as the labor force at the mines is about 10% below last year's. Add to this suspension of labor due to wage negotiations which are pending, and the prospects of a serious shortage cannot be denied.

Norton Changes—The business of the Norton Grinding Co. of Worcester, Mass., has been merged into that of the Northern Co. The name of the Grinding Co., associated with the Precision metal grinding machine, will disappear entirely. Besides the large foreign selling force, arrangements have been made to open branches in Norway and Sweden. A new store has also been established in Detroit. Officers of the new company are: George I. Alden, chairman of the board; Charles L. Allan, president and general manager; Aldnans C. Higgins, treasurer and general counsel; George N. Jeppson, secretary and works manager; W. LaCoste Neilson, vice-president and foreign manager; and Carl F. Dietz, vice-president and general sales manager. Formal announcement was made of the establishment of a factory in Japan and foreign sales agencies in several foreign countries which Mr. Neilson has frequently visited during the last few years and with whose conditions he is personally familiar.

MARINE

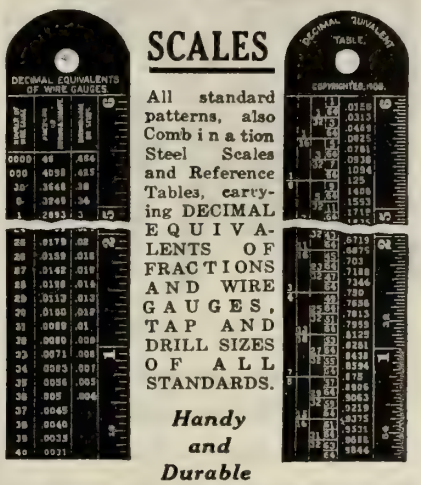
Ottawa.—Besides the six ships of the new Canadian Government marine already launched, it is expected that thirty more will be completed this year. The remaining vessels will be completed before the end of 1920.

London.—Sir Auckland Geddes, Minister of National Service and Reconstruction, in reply to a question in the House ofCommons, stated that the Government had made a profit of approximately £10,000,000 from premiums on shipping war risks insurance.

Port Arthur.—The contract for the new break-water to be built this year has been awarded to Chambers, McQuigge and McCaffrey Company of this city. Arrangements are being made to commence the work immediately. The Thunder Bay contracting company has secured the contract for the revetment wall at Fort William, and have already started operations.

Ottawa.—A start will be made this year on the construction of a new dry dock at Esquimalt, the total cost of which will be $400,000. The amount to be expended this year will be in the neighborhood of $500,000. Other harbor works for which money has been voted include Champlain Dry Dock, Quebec; River St.

LUFKIN



SCALES

All standard patterns, also Combination Steel Scales and Reference Tables, carrying DECIMAL EQUIVALENTS OF FRACTIONS AND WIRE GAUGES, TAP AND DRILL SIZES OF ALL STANDARDS.

Handy and Durable

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Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

Order "Hawk Vanadium" for your End Mills and cutters. Once known—always used.

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OF EVERY DESCRIPTION
SEND US YOUR ENQUIRIES.

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Machine Tools
FOR SHIPBUILDERS ETC. ETC

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SCIENNES EDINBURGH

Charles, Quebec; St John harbor improvements, Toronto harbor improvements, Vancouver harbor improvements, Victoria Harbor improvements, breakwater at Collingwood, and several smaller undertakings.

London.—Robert Houston, M.P. for Liverpool, and himself a large ship-owner, called attention in the House of Commons to the threatened competition of the U.S. in the shipping trade, and asked in view of the sacrifices made by British ship-owners during the war, whether the Government would make diplomatic representations to the U. S. with the object of preventing competition and friction between the two countries. Col. Wilson, the parliamentary secretary of the Ministry of Shipping, in reply, stated that all possible steps would be taken to protect British shipping, but could not assent that the question of American competion was one for Government representation to the Government of the United States.

Upon the Health of your employees depends your profit and production

Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills too. You can attach it in a few minutes. Tell us how many men, how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

Canadian Agents

McKENZIE BROS.

18 St. Alexis St., Montreal, P. Q.

MARINE

The City of Belleville requires tenders for the construction of Sanitary Sewers. Tenders to be delivered up to July 18th. Plans and specifications can be seen at the office of the City Engineer.

The Department of Public Works are offering for sale a 70-ton "Bucyrus" steaf shovel an ten dump cars, situated at Booth Street Yard, Ottawa. The material can be seen at this address between 7 a.m. and 5 p.m. on application to the Superintendent of Dominion Buildings, Ottawa. Tenders will be received up to July 21st.

Tenders addressed ti H. F. McNaughten, Secretary of Public Works, Ontario, will be received up to July 21st for an extension to Macdonald Hall and for a piggery, in connection with the Agricultural College, Guelph, Ont. Plans and specifications can be seen at the Bursar's office, Agricultural College, Guelph, and at the Department of Public Works, Toronto.

INCORPORATIONS

The Canadian Aero Co., Ltd., has been incorporated with head office at Brantford and a capital stock of $50,000, divided into 500 shares of $100 each, to establish a general aircraft service, carrying passengers, mail and freight.

A company has been incorporated with a capital stock of $24,000, divided into 240 shares of $100 each, and known as the Canadian Type Registering Scale Co., Ltd., with head offices at Hamilton, to manufacture scales and type registering devices.

The Premier Paper Products, Ltd., has been incorporated with head offices at Sarnia, Ont. The capital stock will be 650,000 in 500 shares of $100 each. The object of the company is to manufacture and deal in paper cardboard and other products of paper or pulp, and engage in a general lumber business.

The Canada Petroleum and Refining Co. has been incorporated with head offices in Toronto. The capital stock of the company is to be $2,500,000, divided into 2,500,000 shares of $1 each, and the object of the company is to carry on a general business in crude petroleum and its products.

PERSONAL

The Seneca Falls Manufacturing Co., Inc., Seneca Falls, N.Y., have issued a booklet on the quality and precision lathes manufactured by themselves. This publication lists the various sizes and kinds of "Star" and screw-cutting engine lathes.

Power Press Bargains

Partial Selection from our Big Stock:

3—Used FERRACUTE D-201 Vertical Double-geared Straight-sided Single-action Redrawing Presses, having capacity for exerting pressure of 200 tons. Length of stroke, 10″. Distance between columns, 32″.

1—Used FERRACUTE D-151 Vertical Double-geared Straight-sided Single-action Redrawing Press, exerting 150 tons pressure. Length of stroke, 13″. Width between columns, 32″.

6—Used FERRACUTE DGG-56 Vertical Double-Geared Straight-sided Single-action Redrawing Presses; 5 of these presses have 18″ length of stroke and 1 has 20″ length of stroke. Distance between uprights, 30″.

7—Used FERRACUTE DGG-56 Vertical Double-Geared Straight-sided Single-action Redrawing Presses, exerting 100 tons pressure; 6 of these presses have 15″ length of stroke and 1 has 12″ length of stroke. Distance between housing, 30″.

6—Used FERRACUTE DGG-55 Vertical Double-geared Straight-sided Single-action Redrawing Presses, exerting 75 tons pressure. Three of these presses have 15″ length of stroke and three have 18″ length of stroke. Distance between housing, 26″.

1—Used FERRACUTE C-5 Open-back Inclinable Cutting Press, Direct Belt Drive., that is, not geared, having capacity for exerting about 50 tons pressure. Length of stroke 2″. Distance from centre of ram back to frame, 12″. Width of opening through back, 18½″. Height of opening through back 7½″.

3—Used FERRACUTE PAG-4 Geared Adjustable Bed Punching Presses, having capacity for exerting 50 tons pressure. Length of stroke, 2″. Distance from centre of ram back to frame, 8½″.

3—Used FERRACUTE PA-3 Adjustable-bed Punch Presses, not geared, having capacity for exerting about 35 tons pressure. Length of stroke, 2″. Distance from centre of ram back to frame, 7″.

1—Used BROWN-BOGGS No. 215 Inclinable Power Press. This is a geared press. Arranged with 24″ x 6″ pulley. Distance back from centre of slide, 9½″. Distance from bed to slide, when up, 13¾″. Width between gibs, 11⅞″. Length of stroke, 4″.

7—Used FERRACUTE D-45 Horizontal Double-end-Screw Press designed for deepening or redrawing sheet metal tubes and shells about 3″ diameter and 18″ deep. Capacity for exerting 100 tons pressure. Three of these presses have length of stroke of 36″ and 4 have length of stroke of 40″. Diameter of ram screw, 6½″. Diameter of side rods, 5″.

2—Used E. W. BLISS No. 60½ Vertical Geared Rack-driven Presses. Length of stroke, 36″.

3—Used FERRACUTE E-57 Vertical Geared Toggle Coining Presses. Length of stroke, 3″.

5—FERRACUTE E-56, Vertical Geared Toggle Coining Presses. Two of these machines have 3″ length of stroke and 3 of them have 2″ length of stroke.

4—Used No. 666 Vertical Geared Toggle Presses, manufactured by the TOLEDO MACHINE & TOOL COMPANY. Having 2¼″ length of stroke and capacity for exerting 1,000 tons pressure on ram.

NOTE:—The above presses were all operating on manufacture of Cartridge Cases when work stopped about nine months ago. They were purchased new from manufacturers from February, 1915, to September, 1915, and have had about two years' service. They were not used continually since being purchased. Some have been repaired and all have been kept in good running order—Examination can be made in Montreal.

TERMS:—25% with order balance against Bill of Lading.

NOTE:—If these presses were to be shipped back to the United States there would be no duty to be paid—You would only require to add freight from Montreal to destination (except Brown-Boggs Press).

WILLIAMS & WILSON, LIMITED

Cable Address "Willwills" Montreal, P.Q. Established 1891

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ROLLING MILL OPERATOR WANTED — Experienced man on Ajax or similar hot reclaimed rolls. Apply Chief Mechanical Engineer, C.P.R., Montreal.

LAMINATEUR (ROLLING MILL) DEMANDE operator—Laminateur d'experience pour machine Ajax ou autres machines a laminage. Apply Chief Mechanical Engineer, C.P.R., Montreal. (c3m)

Mining Machinery for Sale

Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.
Ingersoll-Rand 800 ft. Air Compressor.
1 Tube Mill Fraser & Chalmers 5 x 22.
1 Power & Mining 5 x 22.
Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

Zenith Coal & Steel Products
Limited
402 McGill Building Montreal
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FOR SALE

Used locomotive crane.
Engine—Double-cylinder, 9" x 12" stroke.
Boiler—Vertical, new tubes, hood and smoke-stack, good for 100 lbs. working pressure.
Bucket—¾-yard, boom 58 ft. 6 in. long, wheel base 14 ft., gauge 14 ft.; hoisting and slewing gears in good condition.
All motions operated from one platform.
Further particulars on application to:
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LOCOMOTIVE

For sale, one 35-ton shunting locomotive, complete with trailer, tender, air pump, etc.

In good operating condition, can be seen and all particulars obtained at the plant of

THE G. W. McFARLANE ENGINEERING CO.
PARIS, ONT. C26M

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WANTED—ONE ONLY 200 H.P. WHEELOCK Steam Engine, second-hand. Must be in good condition. State price, and where it can be inspected. Apply Box 613, Canadian Machinery. (c3m)

WANTED TO BUY—SECOND-HAND BULLdozer. Must be in good condition. State particulars as to weight, stroke, price, etc. Box 614 Canadian Machinery. (c4m)

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. **Patterns in wood and metal for all kinds of machinery.** (cfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

PATENTS FOR SALE

Two Canadian Patented Steam Specialties for sale; one Steam Trap, Patent Number 187215, and one Steam Separator, Patent Number 183340.

Allentown Experimental Works
Allentown, Pa., U.S.A.

DRAIN TENDERS WANTED

Tenders will be received by the undersigned Commissioners up till 2 o'clock p.m. Saturday, the 26th day of July, 1919, for the repair to the 3-4 Sideroad and 8-9 Concession drain, in the Township of Brooke, County of Lambton. Estimate cost of excavation, $9,600. Contractors must furnish security for the completion of the work. Plans and specifications may be seen at the office of the Clerk, Lot 16, Con. 9, Brooke Township. Lowest or any tender not necessarily accepted.

L. LINDSAY, R.R. No. 2, Alvinston.
C. ATKIN, R.R. No. 1, Inwood.
Commissioners. (c4m)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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FOR SALE—One used lighting unit, consisting of one 25 K.W., 125 volt, 200 ampere direct current generator to operate at speed of 320 to 350 r.p.m. Generator made by Westinghouse Company. This machine is directly connected with a Goldie & McCulloch 9x10 Ideal engine. This machine can be examined and all particulars obtained at the plant of

G.W. McFarlane Engineering Co.
PARIS, ONT. c1m

MOTORS FOR SALE

1—30 H.P. Crocker Wheeler, 750 R.P.M., 25 cycle, 550 volt, 3 phase with slide base and starter, no pulley.
1—Canadian General Electric 25 H.P., 550 volt, 25 cycle, 3 phase, 750 R.P.M., Form K Induction Motor with slide base, 16" x 8" pulleys and starting compensator.
1—75 H.P. Fairbanks-Morse Induction Motor, 550 volt, 25 cycle, 3 phase, type B, Speed 750 R.P.M., complete with sliding base and starting compensator.
1—35 H.P. Crocker Wheeler, 550 volt, 25 cycle, E Phase, 750 R.P.M., with starter, base and pulley.
5—50 H.P. Westinghouse Type CCL, 550 volt, 25 cycle, 3 phase, 750 R.P.M. with base, pulley and starter.
1—50 H.P. Canadian Fairbanks-Morse Motor, 550 volt, 25 cycle, 3 phase, 750 R.P.M., complete with slide base, pulley and starting compensator.

H. Mueller Mfg. Co.
Limited
Sarnia, Ontario

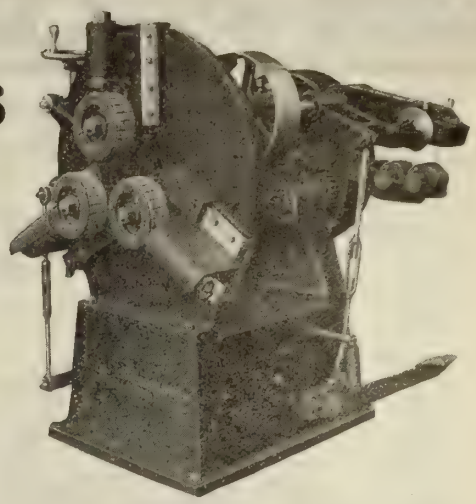
A light type drill, having hand wheel, hand lever and automatic feed.

If You Want

Machine Tools

New or Used

Complete equipment for Boiler Shops, Structural Steel Works, Railroad Spring Shops, Flue Shops, or Machinery for any other purpose, or Woodworking Machinery of any kind



A Universal Machine for cutting and cleaning from 1½" to 6½" flues.

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Mill and Mining Machinery

1 Babcock & Wilcox Water Tube Boiler, 100 h. p., 36 in. x 20 ft. 0 in., 4 in. Tubes with complete fittings. Working pressure 150 lbs.

1 Blaisdale Air Compressor, 14 x 14 and 22 x 16. 150 r. p. m. Duplex Steam, Compound Air. Steam and air pressure 100 lbs. Displacement 1126 cu. ft. per minute.

1 C. C. Canadian Rand Compressor, 9 x 12. 14 x 12.

1 Matheson Feed Water Heater, 3 ft. x 18 in.

1 Stack, 60 ft. x 30 in. x 3-16 in. Steel.

1 Lidgerwood Single Drum Friction Hoist, 10 x 12.-54 in. and extra piston. Corrugated Drums built to carry 1100 ft. 1 in. rope. Load 4,500 lbs. Maximum speed 800 ft. per minute at 100 lbs. pressure. Including Dial Indicator.

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NEW GLASGOW, NOVA SCOTIA

WANTED

Entire Plants or Separate Tools

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What have you to offer?

State condition, make and price. We pay cash for any type of machines, motors or belting.

Give full details in first letter.

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Hollander Machinery Co., Inc.
3 Howard Street N.Y. City

WANTED

1—"Used" Plate Punch and Shear 36" gap, capacity ⅞" hole in ⅞" plate

—also—

1—"Used" Air Compressor, steam actuated — compound steam—simple air —12" x 12" cylinder.

Both machines must be modern in design and in good operating condition. Offers with full details, price and shipping point, will be considered.

I. MATHESON & CO., LTD.
Builders of Machinery
New Glasgow, - Nova Scotia

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IN STOCK FOR IMMEDIATE SHIPMENT

ALTERNATING CURRENT UNITS

(ENGINE DRIVEN)

2 and 3 Phase—25 Cycles.

Generator. K.W.	Volts.	R.P.M.	Engine. Cylinder Dimensions.
250	220	214	15 x 22 x 17"
260	220	214	15 x 17"
450	550	125	17 x 34 x 30"
1000	240	107	24 x 48 x 42"

2 and 3 Phase—60 Cycles.

Generator. K.W.	Volts.	R.P.M.	Engine. Cylinder Dimensions.
25	440	1200	8 x 8"
50	2200	300	11 x 19 x 11"
50	2300	300	11 x 12"
100½	240	277	14 x 14"
125	220	225	14½ x 18"
125	240	200	12 x 21"
150	220	225	10 x 20 x 18"
150	2300	225	14 x 22 x 16"
200	2300	200	
300	480	150	14 x 28 x 30"
300	2300	150	18 x 30 x 22"
325	2300	120	24 x 36"
325	2300	150	18 x 36 x 24"
400	600	150	24"
450	2300	100	22 x 42 x 48"
450	550		24 x 36 x 36"
500	480	120	20 x 40 x 36"
600	2300	150	20 x 38 x 24"

MACGOVERN & COMPANY, INC.
285 BEAVER HALL HILL, MONTREAL
Offices: New York, Pittsburg, St. Louis
Plants: Brooklyn, N.Y., Lincoln, N.J., and Linden, N.J.
A Continent-Wide Service.

FOR SALE

PUMPS.

2—Allis-Chalmers Turbine Pumps, 2,000 gals. cap.
1—Allis-Chalmers Twin Pump, 1,200 gals. cap.
5—Triplex Deane Pumps, 7½" x 10".
5—Deane High Pressure Pumps, 4⅛" x 18", Water Pressure 1565 lbs., cap. 247 gals. per min.; 2 new, 3 used about 1 year.

MOTORS.

4—200 H.P., 440 Volt, 3 Phase, 25 Cycle.
4—150 " 440 " 3 " 25 "
2—100 " 440 " 3 " 25 "
6— 60 " 440 " 3 " 25 "
3—150 " 550 " 3 " 25 "

Also a large number of smaller Motors 25 and 60 Cycle, 220, 440, 550 and 2,200 Volts.

TRANSFORMERS.

A large number of Transformers, 6,600 to 550 Volts and 6,600 to 440 Volts.

LOCOMOTIVES (ELECTRIC)

2—5-ton Storage Battery Locomotives, 36" Gauge, 40 Cells, M.V., 13 iron-clad Oxide Storage Battery, capacity 189 amps. per hr.

VALVES.

A large number of Valves, all sizes, good condition.

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A number of 150, 125 and 100 H.P. Boilers, both H.R.T. and Locomotive.

C. P. Wilson Company
709 LUMSDEN BUILDING
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USED IN MUNITION WORKS

FOR SALE

Heavy Bliss and Toledo Toggle, Crank and Rack and Pinion Presses

Send for Detailed List and Prices.

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Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't been for that defective part, defective because it was improperly heat-treated.

It makes no difference whether you manufacture tractors or other machines or machine parts, unless you have the **right** heat-treating furnace the reputation of your product is in constant jeopardy.

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GILBERT & BARKER Heat-Treating Furnaces

insure uniform high quality of produce because they are designed right and built right. The combustion in a G. & B. Furnace is 100% efficient, temperature control is one of the big features, the heat is uniform **always**, the result is a finished product of maximum tensile strength which will stand up under the hardest usage.

The operating cost of G. & B. Furnaces is extremely low.

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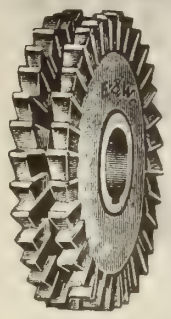
GALT, ONTARIO, CANADA
MILLING CUTTERS AND SMALL TOOLS



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All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.

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Electric, Thermit and Oxy-Acetylene
With trained and skilled mechanics always available for immediate dispatch in case of Breakdown in your Plant. We're always ready.
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Saves Oxygen Eliminates Flash-Back Better Welding
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1 to 5,000 pounds
Highest Quality
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Manufacturers of UNIVERSAL CYLINDER RE-BORING TOOLS.
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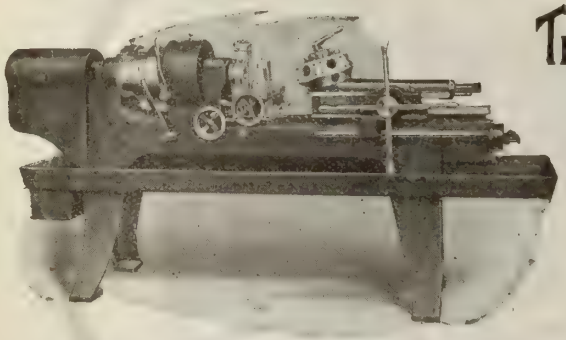
THE TILTED TURRET
A CLEAR TRACK FOR THE STOCK



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ARE ACCURATE AND PRODUCTIVE
Made In Twelve Different Sizes
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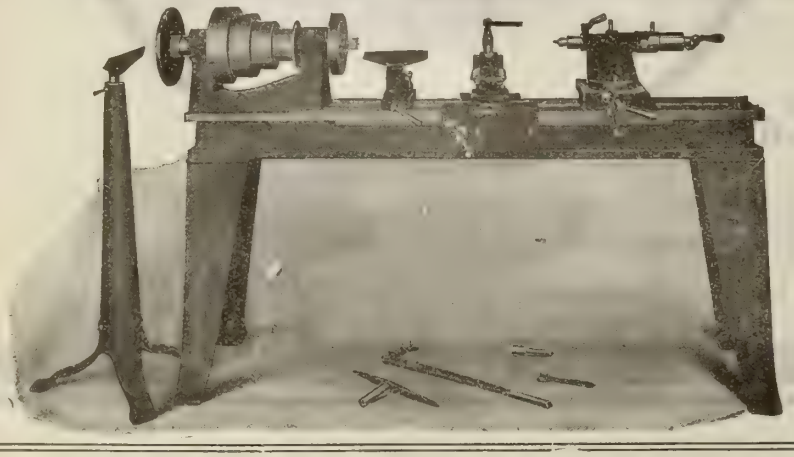

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FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.
Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.
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Plain Cylindrical Grinders

Built by

Fitchburg Grinding Machine Co.
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BATH Universal Manufacturing Grinders

built by

Universal Grinding Machine Company

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FOR TRUEING GRINDING WHEELS

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We take contract work—and turn it out quickly and accurately. We have facilities for:

Drawing
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in all kinds of sheet metal. If you have any work of this kind let us quote you prices.

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What Can You Save?

By Using Parts Made in the Punch Press

Look over your standard parts, Mr. Manufacturer, and see what parts can be made (or could be made by slight change in design) by this process.

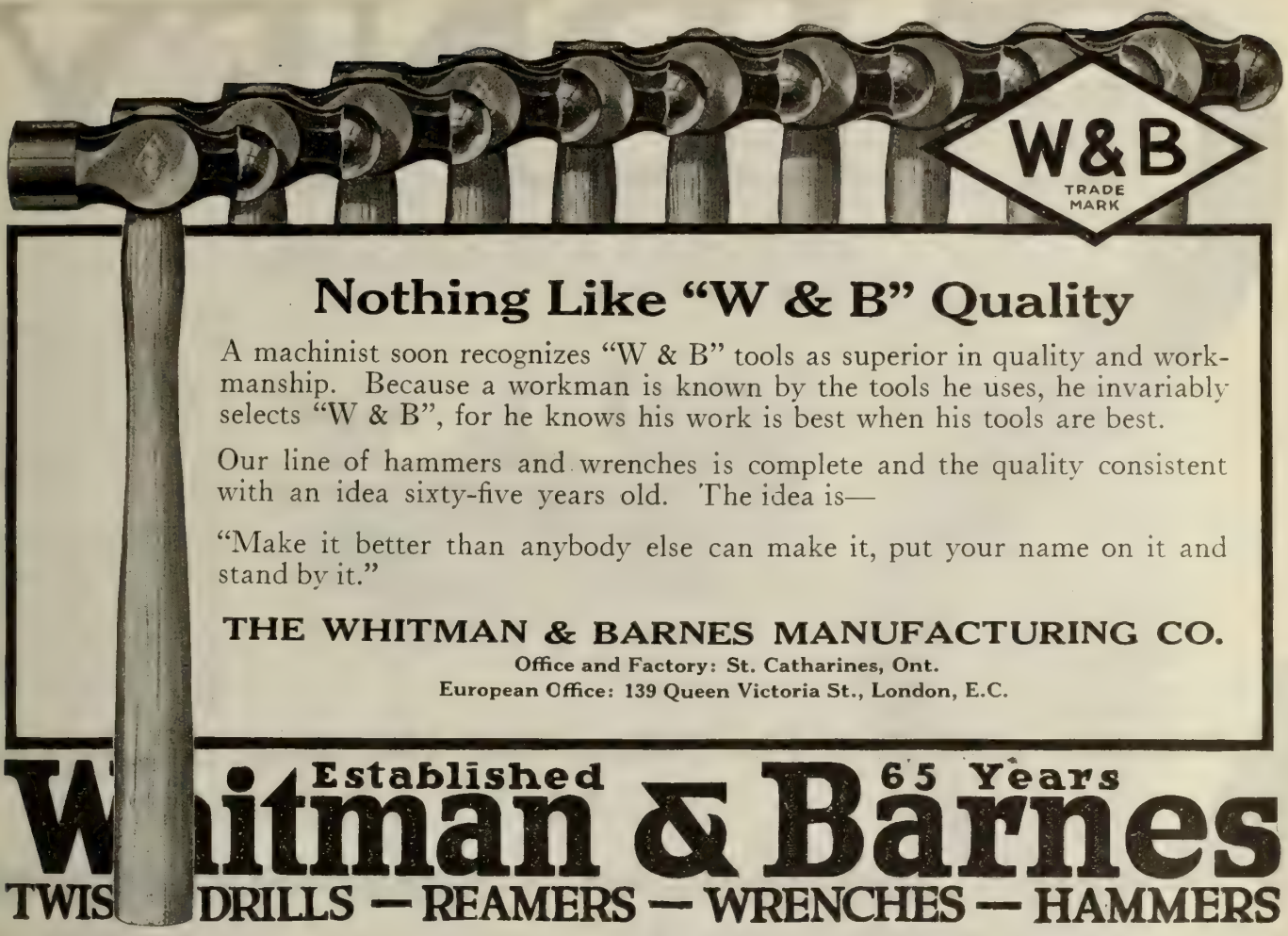
You will be surprised at the saving you can effect.

We make Blanking, Perforating, Drawing, Forming and all classes of dies and tools for plain or difficult stamping to suit the production required.

A Battery of presses is also available at our plant to manufacture parts for you with the understanding that you pay only for good parts made. Our facilities ensure prompt deliveries at right prices.

W. H. BANFIELD & SONS LTD.

370-386 PAPE AVE., TORONTO.



Nothing Like "W & B" Quality

A machinist soon recognizes "W & B" tools as superior in quality and workmanship. Because a workman is known by the tools he uses, he invariably selects "W & B", for he knows his work is best when his tools are best.

Our line of hammers and wrenches is complete and the quality consistent with an idea sixty-five years old. The idea is—

"Make it better than anybody else can make it, put your name on it and stand by it."

THE WHITMAN & BARNES MANUFACTURING CO.

Office and Factory: St. Catharines, Ont.
European Office: 139 Queen Victoria St., London, E.C.

Established 65 Years

Whitman & Barnes

TWIST DRILLS — REAMERS — WRENCHES — HAMMERS

"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

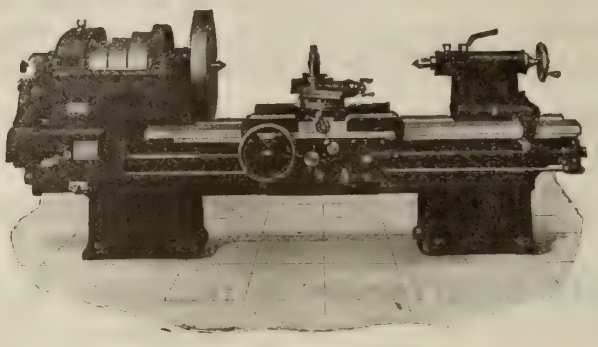
Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.

IMPERIAL CARBIDE

For Welding Cutting and Lighting

HIGHEST GAS YIELD
IMPERIAL CARBIDE
MADE IN CANADA

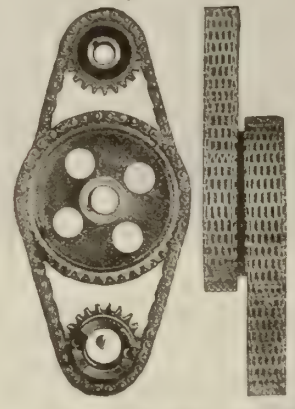
Manufactured by

Union Carbide Co. of Canada, Ltd.

Head Office: Dominion Bank Bldg. TORONTO, ONT.

Works: WELLAND ONT.

Large Stocks maintained at convenient distributing centres throughout Canada



War Record Not Made Pu lic

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-17 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
Hartford, Connecticut

(Photograph and data by courtesy of our customer)

Roasters 18 x 12 x 4½ deep from 24 gauge pickeled and annealed steel at 350 per hour.

Sold in 1898

A "Bliss" No. 14 Toggle Drawing Press. It is here being run at 7 strokes per minute, the operator catching 85 per cent. of the strokes.

The owners bought their first "Bliss" Press in 1871, and to-day our records show the purchase of 66 "Bliss" presses of various kinds. It is neither our longest nor greatest record for a single customer, but it has been maintained with characteristically mutual respect and satisfaction.

BLISS 1857

E. W. BLISS COMPANY

BLISS 1919

Main Office and Works: BROOKLYN, N.Y., U.S.A.

CHICAGO OFFICE
People's Gas Bldg.

DETROIT OFFICE
Dime Bank Bldg.

CLEVELAND OFFICE
Union Bank Bldg.

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E.

PARIS, FRANCE, 100 Boulevard Victor-Hugo St. Ouen

No. 54

NATCO

DRILLING 38 HOLES OF DIFFERENT DIAMETERS IN ONE OPERATION

The above cut visualizes the great economical possibilities of NATCO Multi-Drillers.

This driller is one of many NATCOS installed in the plant of the Hinkley Motors Corp. It is drilling 38 holes of different diameters in one operation in the bottom of aluminum crank cases.

A patented feature of the NATCO, Independent Change of Speed to each individual spindle, permits drills of various sizes to be driven at approximately their correct cutting speed.

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drillers.

LET US MAKE YOU PRODUCTION ESTIMATE ON YOUR WORK.

THE NATIONAL AUTOMATIC TOOL CO.

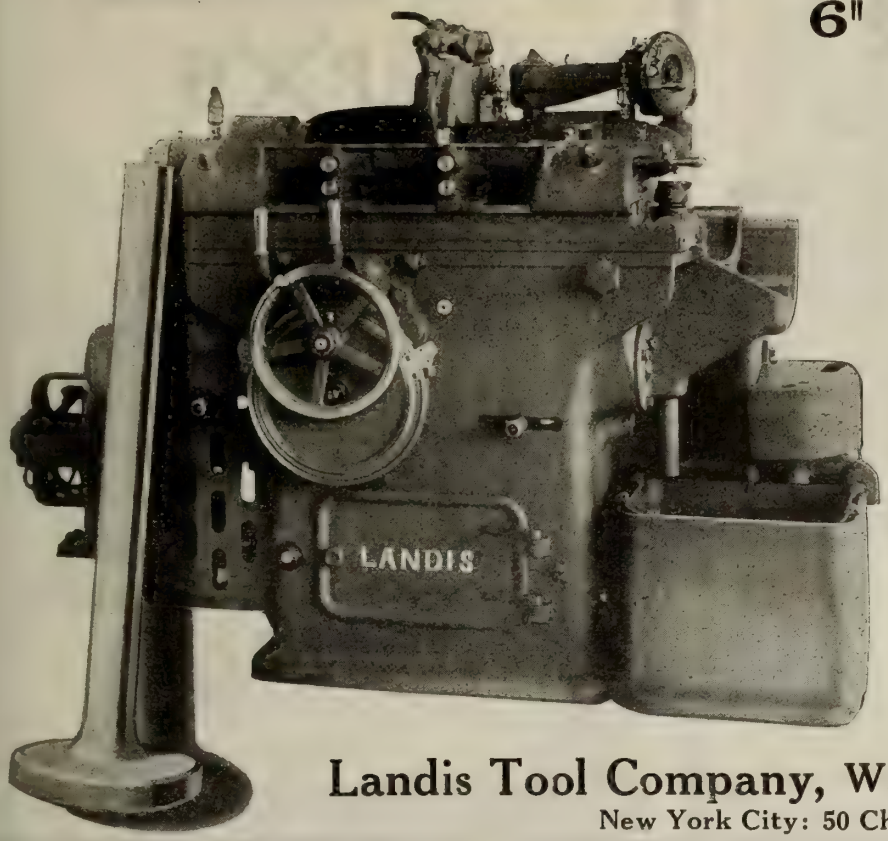
RICHMOND, INDIANA, U.S.A.

List of NATCO foreign agents:

Burton, Griffiths & Co., British Islcs.
E. Isbecque & Co., Belgium.
Aux Forges De Vulcain, France.

Allied Machinery Co. of America, Italy, Spain, Portugal and Switzerland.

140 Valve Stems per Hour on the "LANDIS" 6" x 18" Grinding Machine



ONE enthusiastic user calls this tool "the biggest little machine on the market." It is a great little producer, compact, sturdy and accurate.

The stems of these valves require finishing within .00025" limits. The Landis does this easily, using a 4-inch face wheel requiring a traverse of only 3/8" to cover the stem and at a speed of 140 valve stems per hour.

Landis Tool Company, Waynesboro, Pennsylvania

New York City: 50 Church Street

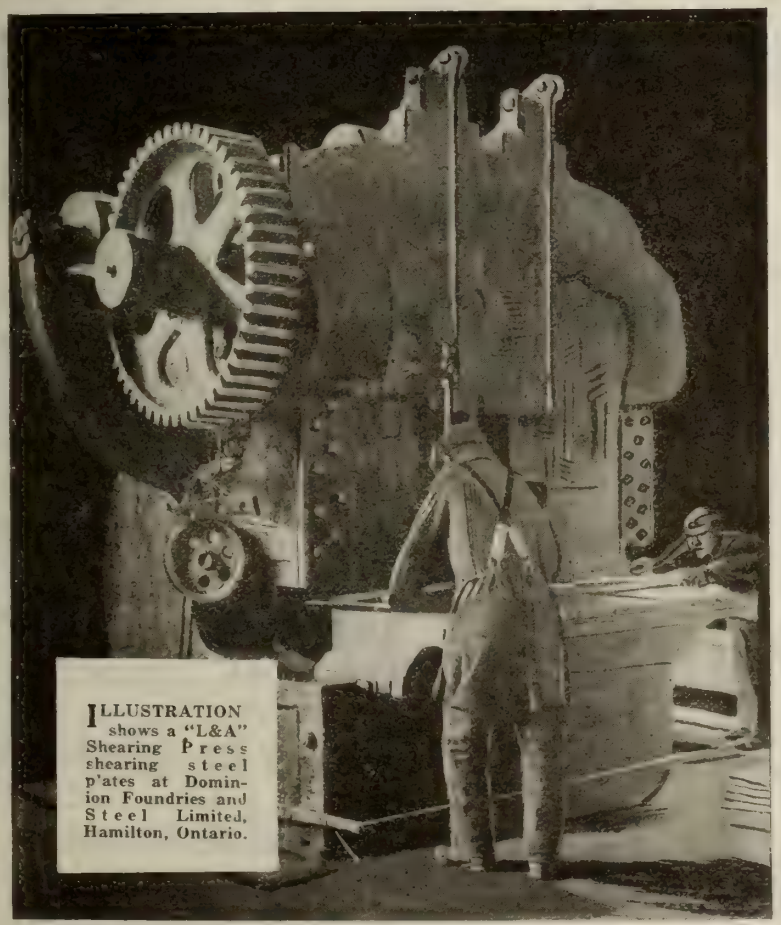


ILLUSTRATION shows a "L&A" Shearing Press shearing steel plates at Dominion Foundries and Steel Limited, Hamilton, Ontario.

"The Quality Line"

PUNCHING and SHEARING MACHINERY

We manufacture "The Quality Line" machinery equipment for Rolling Mills, Bridge and Structural Works, Steel Car Plants and Shipyards. All machines are built of the same high grade workmanship and material that have given the "L & A" product a recognized standard of quality of over 50 years.

Send for our big catalogue.

The Long & Allstatter Co.

American Punch & Shear Works

HAMILTON, OHIO, U.S.A.

Canadian Agents:
RUDEL-BELNAP MACHINERY CO., LIMITED,
Toronto, Montreal.

Oxy-Acetylene Welding and Cutting

Making Sheet Metal Chemical Tanks by Prest-O-Lite Process

"Rivetless" Metal Joining Makes Tanks Leak-Proof

HERE is shown how permanently leakproof sheet metal tanks are made by the Prest-O-Lite process. The metal sheets are first cut to shape with a Prest-O-Lite cutting blow-pipe. They are then set in position, and all joints are welded by the Prest-O-Lite process of oxy-acetylene welding. The joints are made stronger, neater, and at less cost than by riveting. All danger of leakage at joints is eliminated.

In repairing as well as in manufacturing the Prest-O-Lite process is literally "blazing the trail" to efficiency and economy. It saves hundreds of thousands of dollars annually in Canadian factories, mines, machine shops—wherever metal or machinery is used.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Aceytlene is backed by Prest-O-Lite service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow-pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow-pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

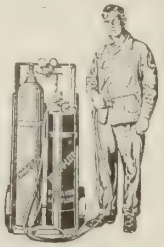
We will gladly send illustrated literature and interesting data showing actual instances of savings made by others It may suggest valuable ideas to you. Write for it.

Address Dept. C-107

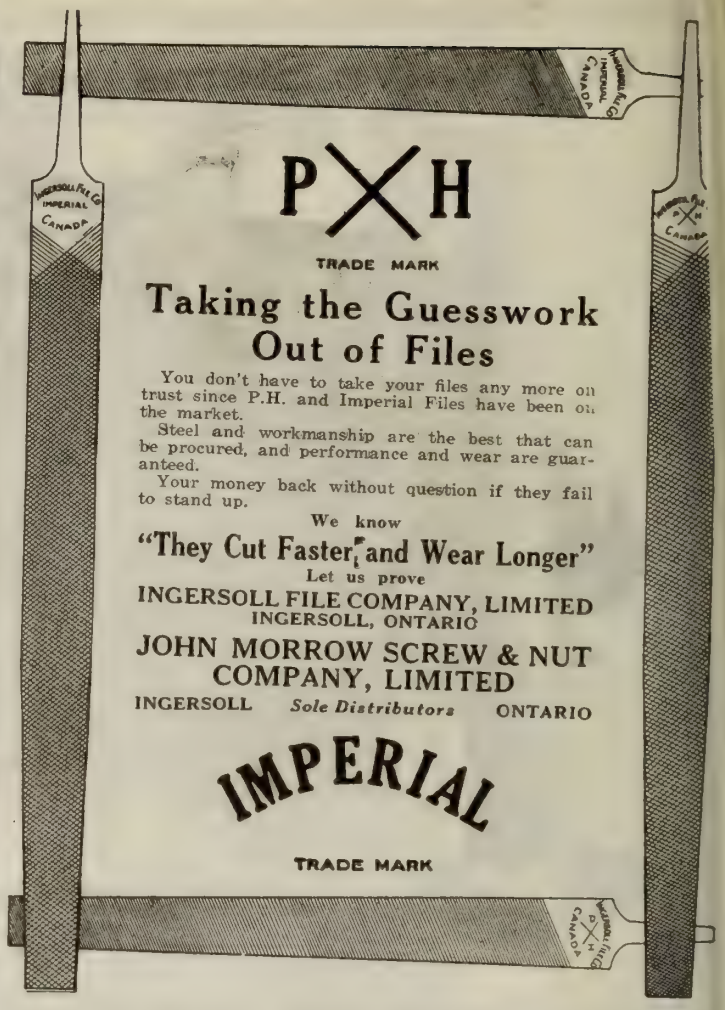
Prest-O-Lite Company of Canada, Limited

PREST-O-LITE BUILDING
Corner Elm Street and Centre Avenue
TORONTO

Plants: Toronto, Ont , Merritton, Ont.
St. Boniface, Man., Shawinigan Falls, P.Q.



World's Largest Makers of Dissolved Acetylene



MARTEN MACHINE COMPANY HAMILTON, ONT.

TOOLS

ACCURACY---RELIABILITY

OUR REGULAR PRODUCTS:
THREAD GAUGES
SNAP GAUGES
CYLINDRICAL GAUGES

WE ARE GENERAL AND SPECIAL TOOL MAKERS

Let us quote you on your requirements, and have your tools made as you want them made.

WOOD PATTERNS
METAL PATTERNS Hand and Machine

gaging

measuring

"Just Right —without looking"

That's the point exactly. With Johansson Limit Snap Gages, the operator does not *need* to look. He can feel when the job is between the high and low limits of the snap gage. The "Go" gaging plugs pass over the work, the "No Go" Plugs will not pass over. So, without "reading" anything, he knows the job is "good enough" and will pass the inspector's Johansson Snap as readily as it did his own.

This is the limit system in actual operation. Not a thought of what the work measures. It doesn't matter, so long as it comes somewhere—anywhere between the limits.

When an operator uses a Johansson Limit Gage he does not waste time trying to work to "absolute dimension." He simply *gages* his job, keeping in between "Go" and "No Go." And if the limits have been established in the gages correctly, the work is sure to assemble without further machining or fitting. When a part comes out of a machine, it is finished.

To operate the limits system, you need Johansson Adjustable Limit Gages. Twenty-one sizes give all dimensions up to 12 inches. If you are in doubt, let one of our gage experts call upon you and explain.

C. E. Johansson, Inc., 72 Queen St. West, Toronto.

New York address—245 West 55th St.

Johansson

Dominion Foundries and Steel, Limited

Hamilton Ontario

Steel Products

Open Hearth, Basic and Acid, Electric and Alloy Steels

Castings

For Ships, Railways, Rolling Mills, Gears, Machinery and Ingots to 35 tons

Railway Specialties

Penn Couplers, Bolsters, Truck Side Frames, Draft Gears

Forgings and Billets

Heavy Ship Forgings, Locomotive and Car Axles, Miscellaneous Forgings

Plates

Plates and Heavy Sheets to 30 inches wide, Soft and High Carbon
Automobile Plates and Sheets

Agricultural Steel

Soft Center and Solid Plow Steel, Harrow Discs, Shovel Steel, Cultivator Blades

Sharp Files Increase Men's Interest In Their Job

The man who uses a du file may work as har but he cannot work a well as the man with sharp file.

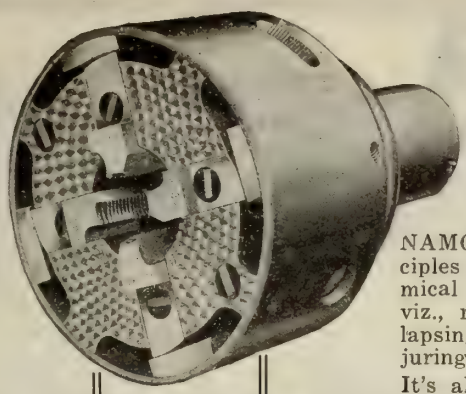
Tell your men to turn in dull file when they reach the "inefficier point."

"Famous Five" Files stay har and sharp because they are mad of good steel accurately cut an properly hardened.

Specify them when ordering.

They are:

DIES
SELF-OPENING



Simple
Few parts — easy adjustments — quick change of chasers — nothing complicated to get out of order.

Strong
Solid one-piece body.
Ample support of chasers.
Positive releasing and setting action.

Durable
All parts that are subject to wear are hardened and ground to a precise fit.

Made in Revolving and Non-Revolving types "for every threading requirement."

Quotations on request.

Send for a copy of the new NAMCO Tap and Die Book.

NAMCO

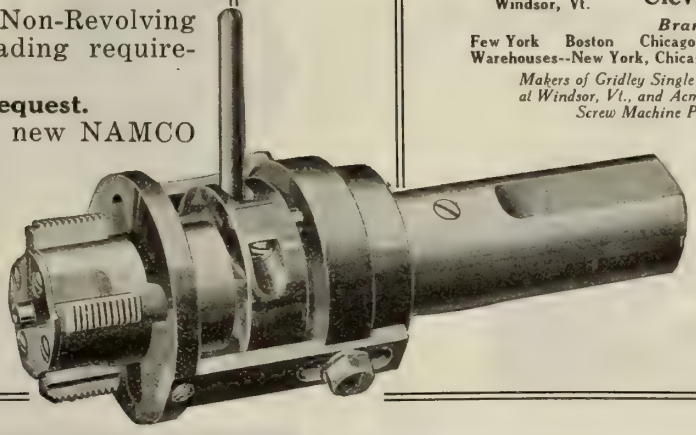
TAPS
COLLAPSING

NAMCO Taps embody all those principles essential to the rapid and economical production of clean-cut threads, viz., rigidly held chasers, positive collapsing, withdrawal of tap without injuring thread, and positive re-setting.

It's all in the construction.

Specific quotations on your work.

Capacities—⅞" to 5⅞".



The National Acme Co.

New England Plant Windsor, Vt. **Cleveland, O.** Canadian Screw Plant Montreal

Branch Offices:
Few York Boston Chicago Detroit Atlanta San Francisco
Warehouses--New York, Chicago With Foreign Representatives

Makers of Gridley Single and Multiple Spindle Automatic at Windsor, Vt., and Acme Automatics, Threading Dies and Screw Machine Products at Cleveland, Ohio.

ADVERTISING to be successful does not necessarily have to produce a basketful of inquiries every day.

The best advertising is the kind that leaves an indelible, ineffaceable impression of the goods advertised on the minds of the greatest possible number of probable buyers, present and future.

Foundry Equipment For Sale

1—Henry Pridmore Roll Over Moulding Machine, 22" x 18"—8" drop.
1—Henry Pridmore Drop Plate Moulding Machine, 24" x 24"—8" Drop.
1—Foot Power Sprug Cutter, depth of throat 10" travel 1", 4" between jaws.
1—Foot Power Sprug Cutter, depth of throat 6", travel 1", 1" between jaws.
2—No. 275 Monarch Type Furnaces.
1—Rockwell Type Furnace, 600 pounds capacity.
1—Sherbrooke Machine Co., Roots Type Blower, outlet dia. 10".

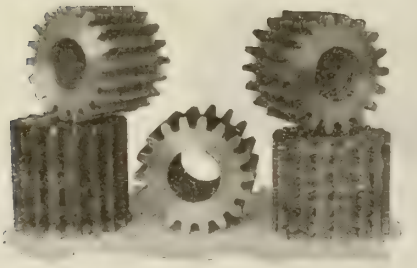
Standard Machinery & Supplies, Limited

261 Notre Dame St. West Montreal

Rawhide Cut Gears

Silent in operation
and durable.

Large sizes or small.



Tons

of Rawhide Gear blanks
in stock here
for your convenience.

Get our quotations.

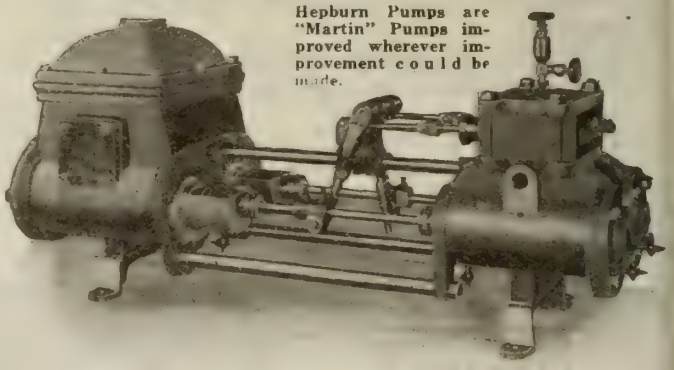
Hamilton Gear Co. Ltd.

Van Horne Street - TORONTO

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

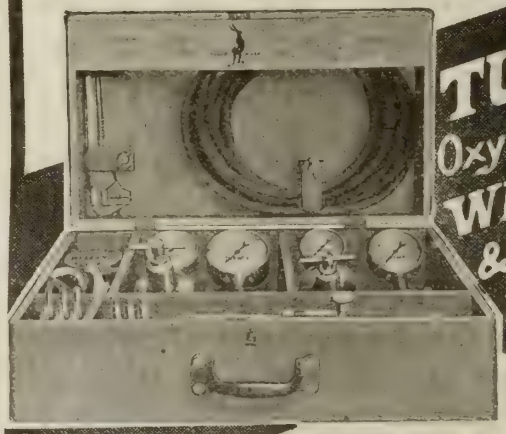
Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.



JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street Toronto, Ontario

For Repairing Broken Machinery or Tools of Medium Size



These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

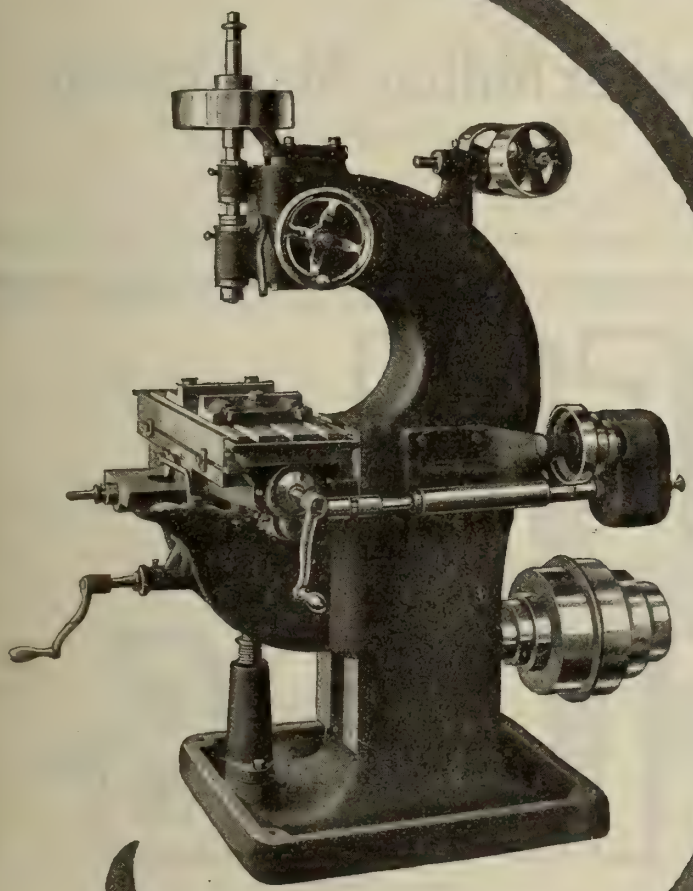
The Turner Brass Works

SYCAMORE, ILLINOIS, U.S.A.

BRISTOOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



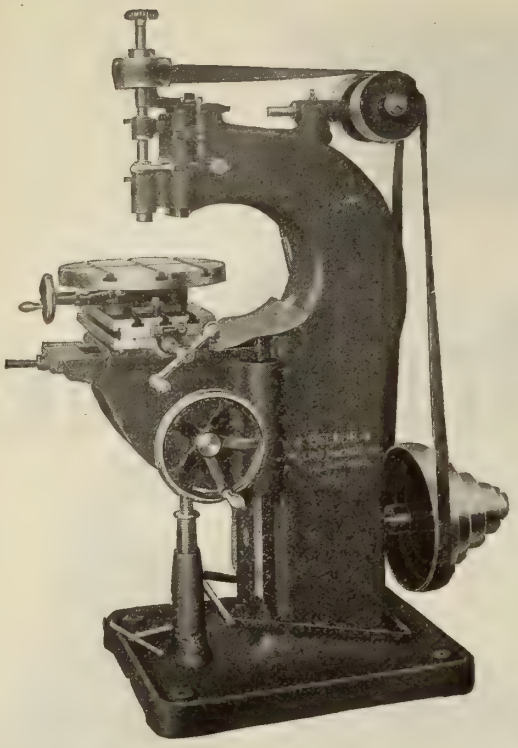
Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.



"THE MACHINE
THAT GIVES THE
SMOOTH FINISH"

BECKER
BELT DRIVEN
MILLERS

Have no hidden mechanisms in the frame requiring lubrication and there is a conspicuous absence of pilot wheels and crank levers which tend to confuse the operator.

All parts are easily accessible; feed changes are made while the cutter is working, thus enabling the operator to adjust the feed to exactness while under cut.

Write for circular 0-703 to-day.

Becker Milling Machine Co.

HYDE PARK, BOSTON, MASS.

A. R. Williams Machinery Co., Ltd., 64 Front St. W., Toronto
Rudel-Belnap Machinery Co., Ltd., 137 McGill St., Montreal

STEEL CASTINGS

Mild Steel, High Carbon Steel, Manganese Steel, Chrome Steel

We are manufacturers of Steel Castings running from ½ lb. to 5,000 lbs. each and are in good position to furnish prompt deliveries at moderate prices. Try us with your next order.

The Wm. Kennedy & Sons, Limited, Owen Sound

ESTABLISHED 1860

Don't Keep It--Sell It

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue TORONTO, ONT.

Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press
WILLIAM PERRIN LIMITED
TORONTO

Let them know it's there

In complimenting us upon the results secured from their advertisement in the classified section, one advertiser said:

> **"Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."**

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

Canadian Machinery
Classified Advertising Section
143 University Ave., TORONTO

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8. hole.

EMERY FLOUR AND WASHED FLOUR

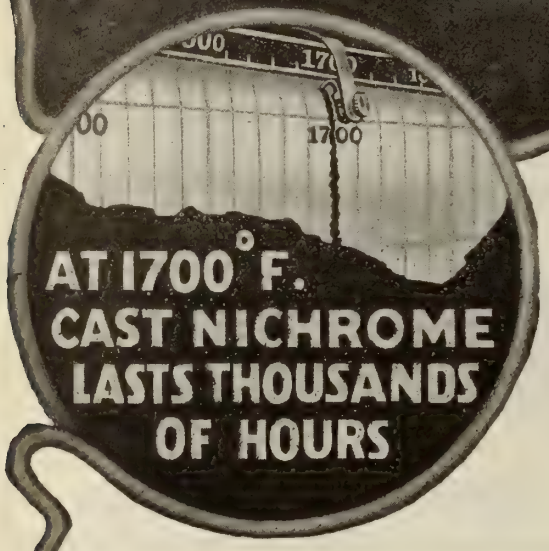
EMERY, GLASS, FLINT, GARNET, CORUNDUM, CARBORUNDUM — PAPER AND CLOTH — IN SHEETS, ROLLS, DISCS, BANDS, STRIPS and TAPES, &c.

John Oakey & Sons

LIMITED
WELLINGTON MILLS
LONDON, S.E. 1., ENGLAND

NICHROME
the Casting Durable

AT 1700° F.
TENSILE STRENGTH
24,500 LB. PER SQ. IN.



AT 1700° F.
CAST NICHROME
LASTS THOUSANDS
OF HOURS

Annealing and Carburizing Boxes of Cast Nichrome

Being much more durable at high temperatures, boxes made of cast Nichrome are superior to those of cast steel.

A steel box must be made thick to allow for the reduction of thickness caused by scaling or oxidation, each time the box is heated. The walls of a steel box, ¾ in. thick, will be only ¼ in. thick, or less, after repeated heating.

There is no loss with a Nichrome box, the walls are therefore made thinner, thus increasing the conductivity of heating.

Nichrome is cast in various shapes, and in any weight up to 1200 lbs. It is exceptionally adapted for annealing and carburizing pots, heating retorts, cyanide hardening pots, and lead tempering pots.

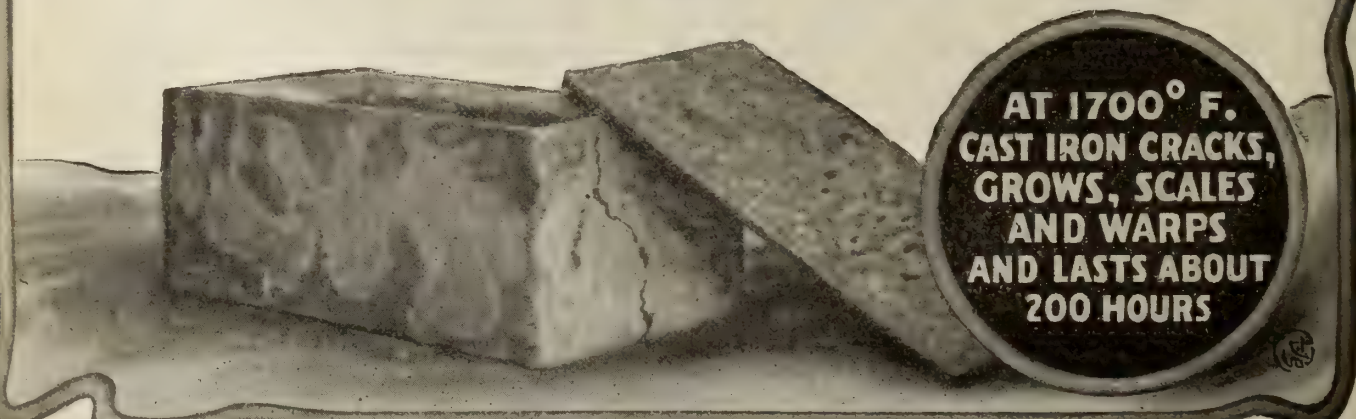
Write for further particulars. Manufactured under Henderson Patents.

CANADIAN DRIVER-HARRIS CO., Ltd.

WESTERN OFFICE AND DEPOT
CHICAGO
26 So. JEFFERSON ST

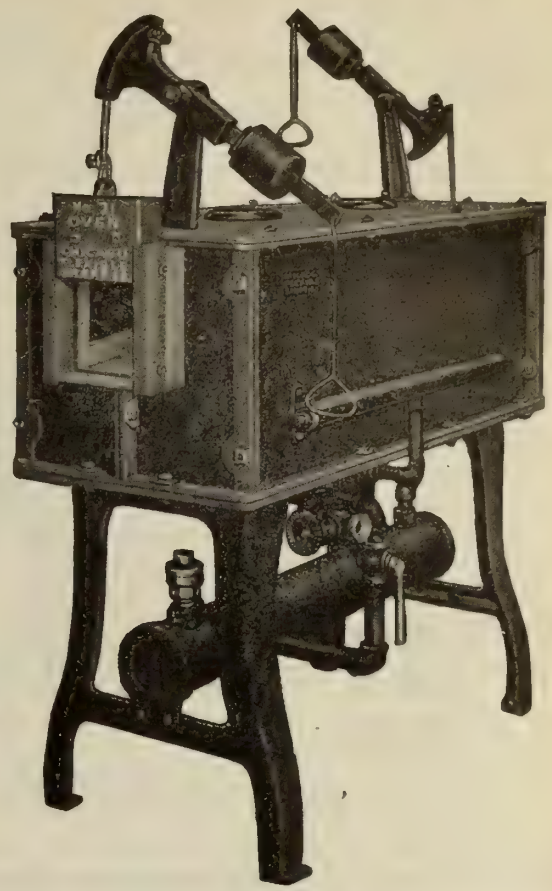
WALKERVILLE, ONT.
CANADA
AMERICAN OFFICE AND WORKS
HARRISON, N. J.

BRITISH WORKS
MANCHESTER
ENGLAND



AT 1700° F.
CAST IRON CRACKS,
GROWS, SCALES
AND WARPS
AND LASTS ABOUT
200 HOURS

Heat-Control of Stewart Oven-Furnaces



War-taught lessons in scientific metallurgy abolished the "rule-of-thumb"–once for all.

The pyrometer, not the "wizardry" of the self-satisfied color-expert, is now in charge.

This new order-of-things calls for Heat Treating, annealing and carbonizing furnaces that permit of

Accurate Control of Temperatures

And Stewart Indirect-Heat Furnaces are equal to the most rigid requirements in this direction.

This control is partly a matter of scientific and accurate mixing of gas and air before it is admitted to the combustion chamber.

Partly due to the placing, spacing and direction of the non-carbonizing Burners used on all Stewart Furnaces.

Partly to the scientific relationship of chamber-area to port-hole areas.

Partly to the shape and position of Hearth.

Partly to the fact that the quality and thickness of our linings and the sturdy strength of our frames and casing all contribute to the permanent *tightness* of Stewart Furnaces.

All these, and many other features—in combination—place Stewart Furnaces in a class by themselves: recognized for their accuracy, dependability, and great endurance.

Send for our New Catalog and get the whole story

CHICAGO FLEXIBLE SHAFT CO.

1148 So. Central Ave. :: :: :: CHICAGO

CONSOLIDATED

All the energy of America's most modern machine shop and foundry is concentrated upon one product.

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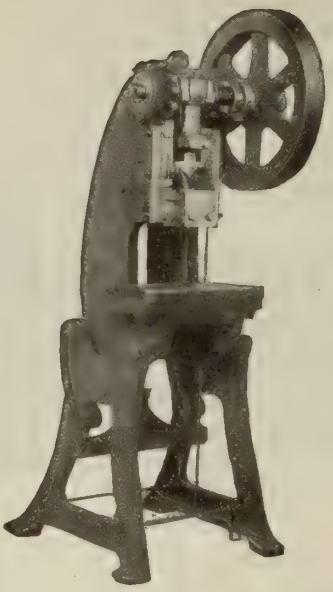
CONSOLIDATED POWER PRESSES



CONSOLIDATED PRESS CO.

HASTINGS - MICHIGAN

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One Customer Says:

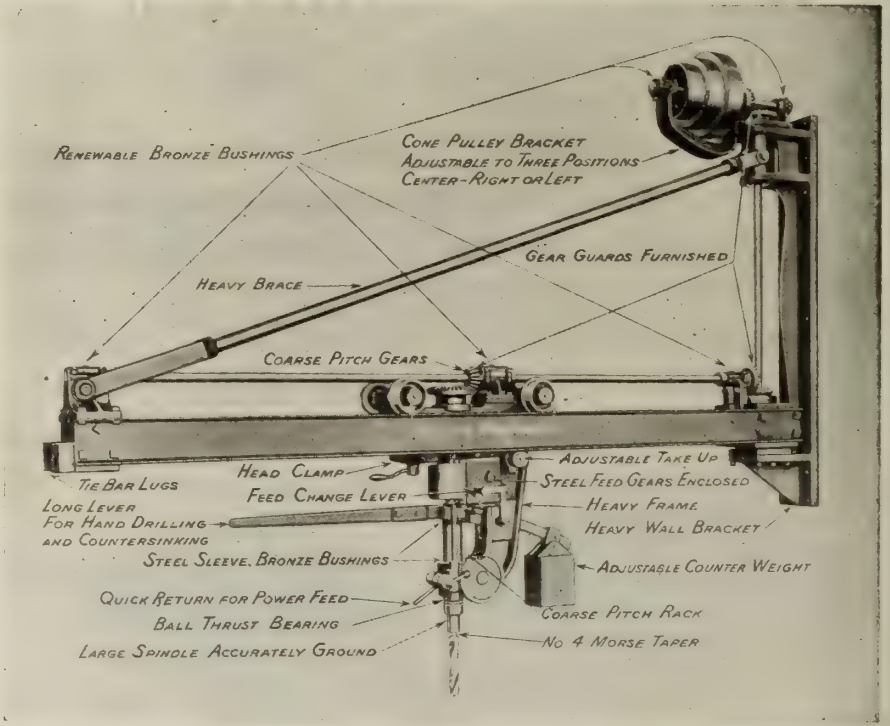
"These machines were put in operation immediately upon arrival, have been producing ten hours per day every day since, and we have never experienced a bit of trouble with same." We know you will appreciate what this means in any shop, and believe this is the sort of machine you are looking for. We consider the machine the finest in its line on the market to-day, and believe an installation would save money for you in the cost of your production.

Our illustrated bulletin will interest you, giving detailed information.

MADE IN FOUR STANDARD SIZES

Rated size	Drills to center of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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THE LATHE OF SIMPLIFIED ACCURACY

Will prove its economical worth to any user.
We invite comparison in swing, weight and accuracy.
We know of no simpler operated Lathe made.

No overhang to any style.
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No waste material.
Only 3 levers in head.
Repairs practically nil.
Everything proportionate.
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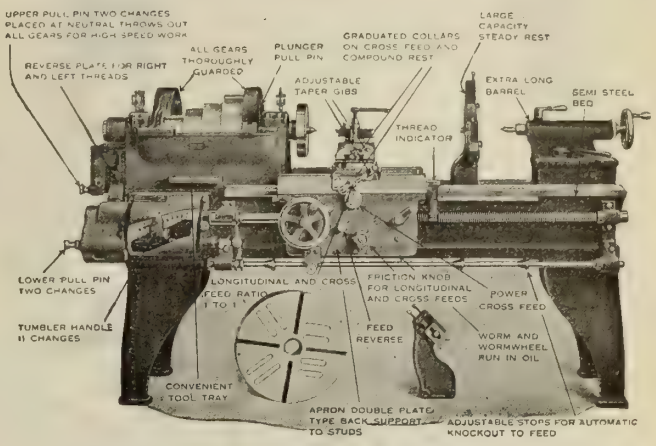


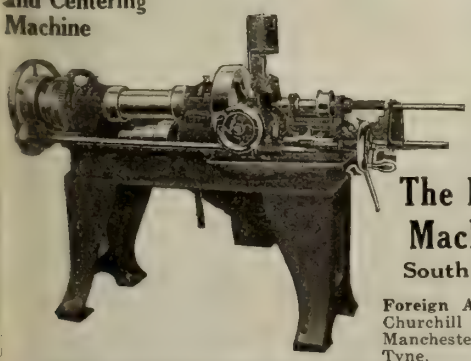
CISCO 14 and 16-inch Engine Lathe

The Cisco Machine Tool Company, Cincinnati, U.S.A.

Builders of **14"-16"-18"-20"-24" Engine and Tool Room Lathes, Cone or Motor Driven, Belt or Motor Driven Geared Head**

One Cuts Up
Another Cuts Down
and
They Both Cut
At Once

Hurlbut, Rogers Cutting-off and Centering Machine



Here's Real Economy

This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools—one cutting up and the other cutting down; each holding the work against the other. What is the result?—**the production is doubled and the cost is cut in half.** Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

Let us hear from you and we will give you the full story of its ability.

The Hurlbut, Rogers Machine Company

South Sudbury Mass.

Foreign Agents — England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow, Newcastle-on-Tyne.

60 Rivets in a Minute

Faster if the work can be fed faster.
But at least 60 every minute.
And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

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Rivet Spinning Machines

handle any rivet up to ¼-in. shank.
If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.
The Grant Book called "Perfect Riveting" tells how to give an extra appearance of quality to your product. For your copy

Write to-day

GRANT MFG. & MACHINE COMPANY

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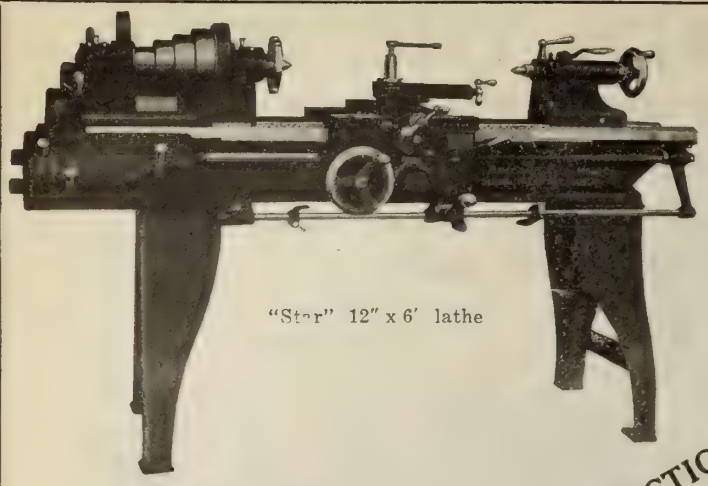

"Star" 12" x 6' lathe

Economical in first cost, operation, maintenance and floor space.

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"STAR" LATHES

THE SENECA FALLS MFG. CO., INC., 366 W. Fall St., Seneca Falls, N.Y.

STAR TRADE MARK REGISTERED

9"-11"-12"-13" swing with a full line of attachments.

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Send blue prints for estimates.

The Dunbar Brothers Co.

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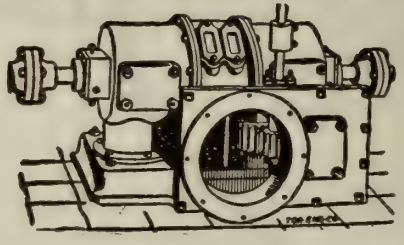

Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

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J. C. WILSON & CO.

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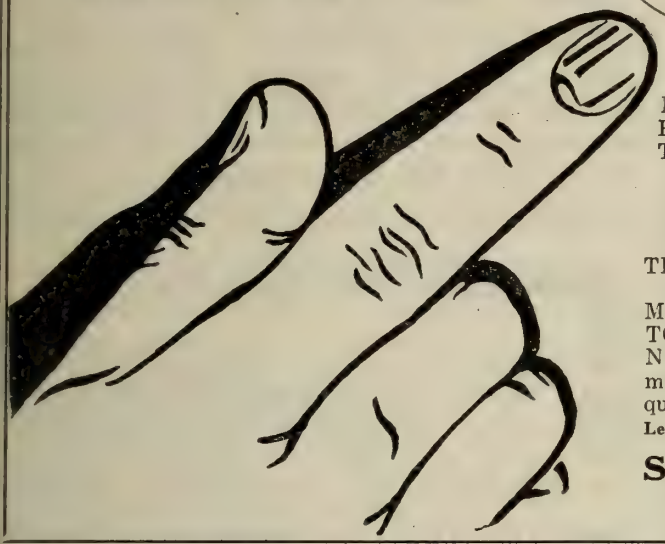
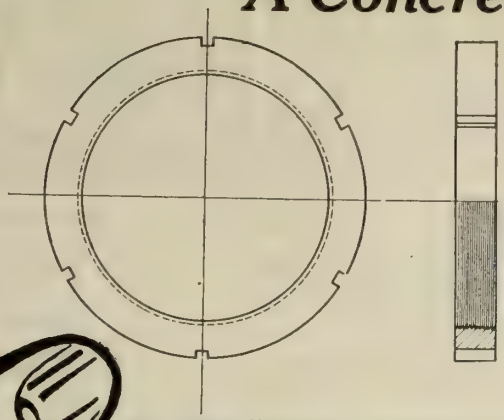
Smalley-General Thread Miller Saves Time on Main Spindle Nut Work



A Concrete Example



A vital factor in competition to-day is speed in production. You need the Smalley-General Thread Miller for quantity work. Speed, convenience and accuracy are the features of this modern cost-cutter. The following time-study illustrates what it will do:

MACHINE—Smalley-General Thread Miller No. 2.
PIECE MACHINED—Main spindle nut.
THREAD—Diameter, 8″; length, 1¼″; 8 pitch U.S. Standard.
1. Work chucked.
2. Threaded surface milled from rough.
3. One side faced.
4. Put on mandrel. Turn other face and outside.

TIME—Milling operation, 1 min. 45 sec. Milling feed, 14.3″ per min.
MATERIAL—Cast iron.
TOTAL TIME in thread miller, floor to floor, 3¼ min.
NOTE—Smalley-General Thread Miller Method involves no more chuckings than in a lathe and saves much time. Also quality of work better.

Let us tell you more about the "Smalley."

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Bay City, Michigan
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Screw Machine Products
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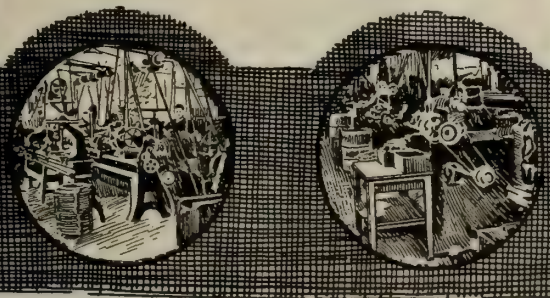
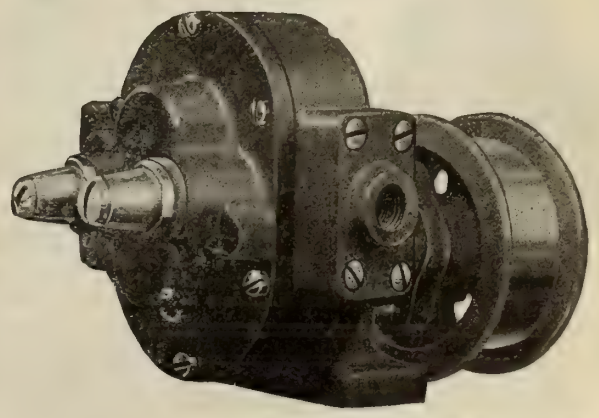


Lubricant TRAHERN Pumps



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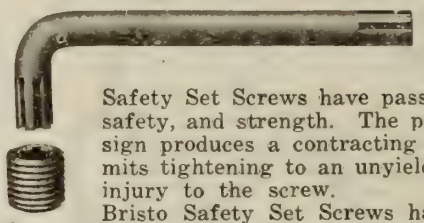
WHAT SET SCREWS DO YOU USE ?



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Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.
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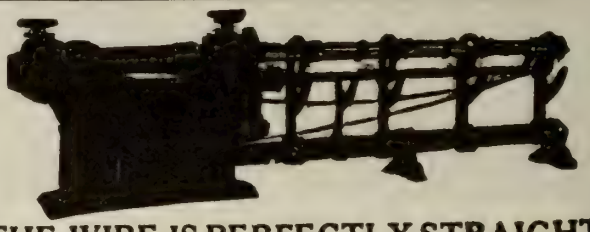

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and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.
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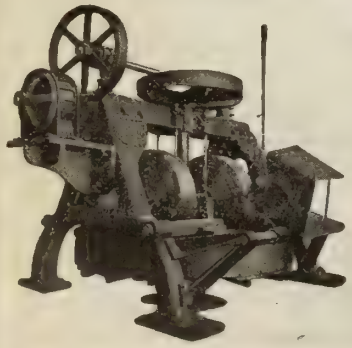

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Unloading Device
Motor or Belt Drive

The Frost Mfg. Co.
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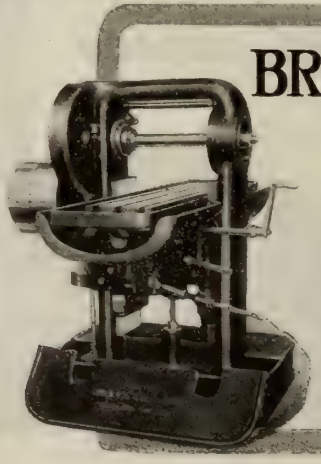

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This Miller is breaking production records wherever introduced. It handles work no other machine of its size can touch and it does perfectly accurate work. Rigid, powerful, accurate.
We should like to show how "Briggs" adaptability and convenience can better output and lower costs for you. Get in touch with us.

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ARMSTRONG TOOL HOLDERS
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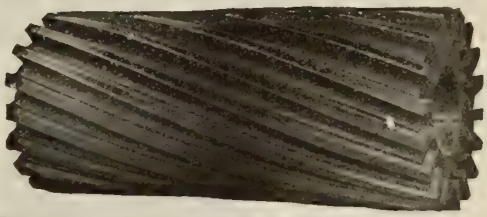
Taylor-Newbold Milling Cutters

Fast Cutting
Powerful



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4-in. Diameter for General Use.
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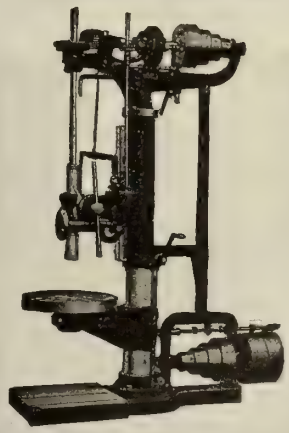

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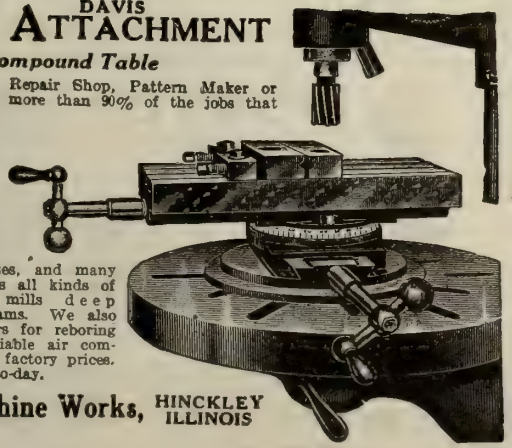

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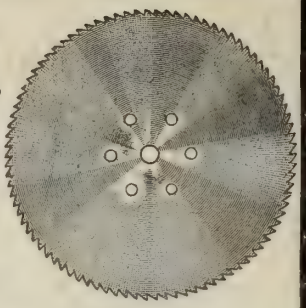

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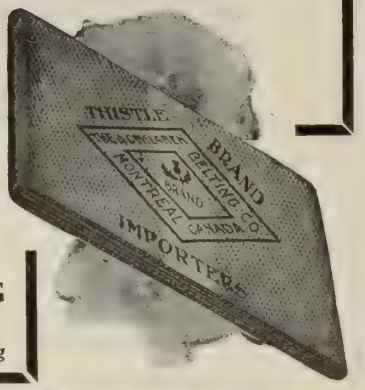

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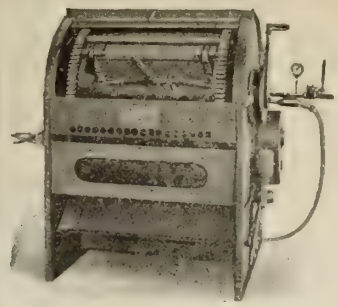

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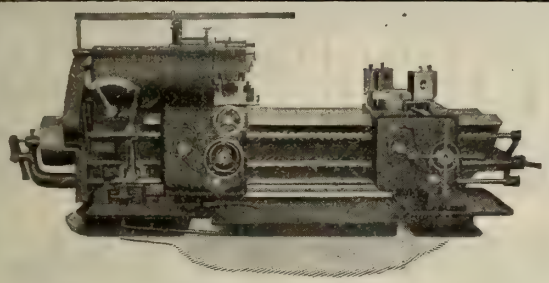

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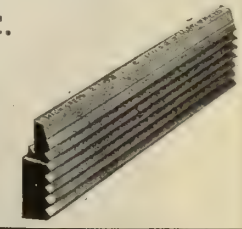

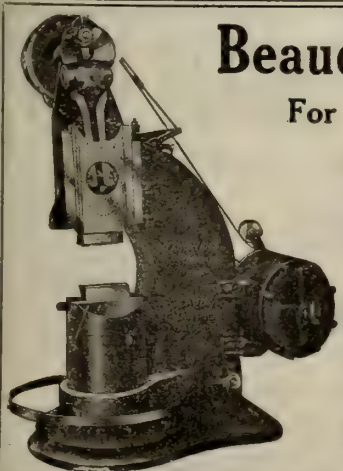

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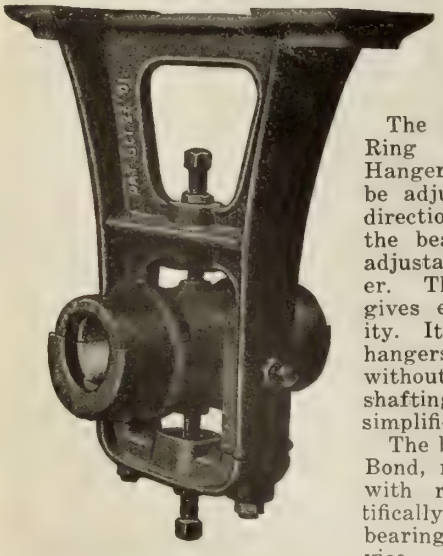

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Norton, Ralph B., Agent, Montreal.

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General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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Bertram & Sons Co., John, Dundas.
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Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
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Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

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Thomas Elevator Co., Chicago, Ill.

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MacGovern & Co., Montreal. Que.
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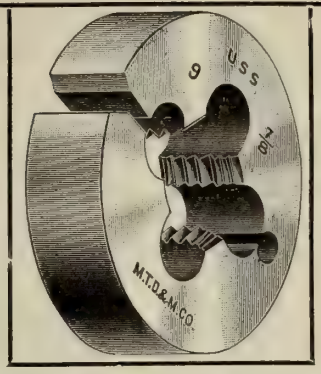
"MORSE"

TAPS & DIES



ARE UNEXCELLED FOR QUALITY AND WORKMANSHIP. THEY NOT ONLY CUT CLEAN, BUT ALSO HAVE THE "MORSE" DURABILITY.

ANY STYLE—ANY THREAD

MORSE TWIST DRILL AND MACHINE COMPANY

NEW BEDFORD MASS, U.S.A.

CLECO AIR HOSE FITTINGS

Valves, Couplings, Clamps, Nipples, Menders, Hose

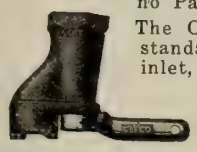
Everything required from "Pipe Line" to "Air" Tool

All Fittings Furnished are Interchangeable and Air-Tight

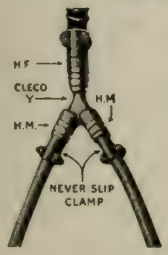
CLECO AIR-SEATED VALVES

The CLECO Air Valve has but three parts: Body, Valve Plug and Handle; no Packing required, has Waste arrangement.

The CLECO Valve, style P.O., is made in sizes ½-inch to 1½-inches, with standard pipe thread. Style F.O. is made in one size only; 1-inch pipe thread inlet, and ¾-inch Female Bowes Coupling Outlet and is interchangeable with Male Ends from ¼-inch to ¾-inch,



CLECO "Y" HOSE FITTINGS



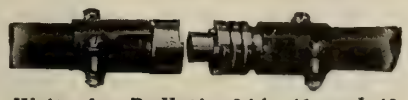
The Hose Section illustrated shows "Y" Fitting connected. The "Y" permits use of two Leader Hose Lines and Two Air Tools. Designed for Ship Yards use. Are made in four styles with Male or Female Outlets or Inlets and interchange with Bowes Male or Female coupling ends; sizes ¼-inch to ¾-inch inclusive. The two "Y" fittings illustrated are the plain style. The other two styles are each equipped with a valve having same features as Cleco Air Valves described above.

Y-Fittings may also be used in Boiler and Locomotive Shops.

BOWES AIR HOSE COUPLINGS

Standard Equipment Everywhere.

The Bowes is instantly connected or disconnected by ¼-turn.



The Bowes is absolutely Air-Tight under all pressures.

Write for Bulletin 34A, 41 and 43

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St. Lawrence Welding Co., Montreal.
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Welland Motor & Machine Co., Welland, Ont.
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COOLERS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Williams & Wilson, Ltd., Montreal, Que

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COVERS, OIL HOLE
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Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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Oliver Machinery Co. Grand Rapids, Mich

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Garvin Machine Co., New York.
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Wells Bros. of Canada, Galt, Ont.

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Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
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Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
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National Automatic Tool Co.,
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Rockford Drilling Mach Co., Rockford, Ill

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
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Williams & Wilson, Limited, Montreal.

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Canadian Fairbanks-Morse Co., Montreal.
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Be Sure You're *Right*—Then Go Ahead

Getting the right thread lead instantly, and maintaining a constant check upon it, minimizes the possibilities of delays in assembling and reduces the number of parts scrapped through incorrect measurements.

B-T Thread Indicators detect errors of one thousandth of an inch from correct lead. They are easily read—absolutely accurate—and can be used for testing odd pitches, as well as external and internal threads.

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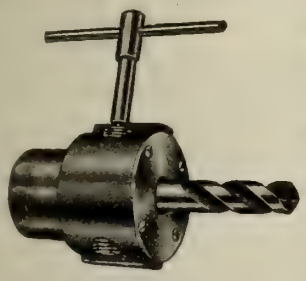
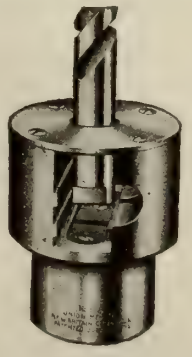


POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



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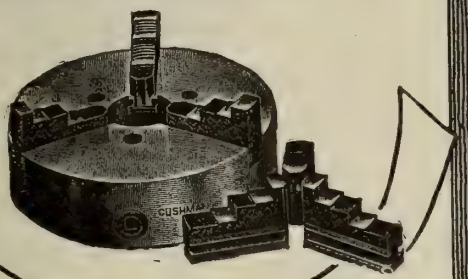

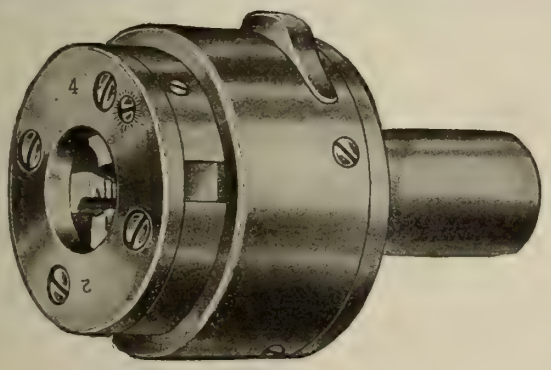

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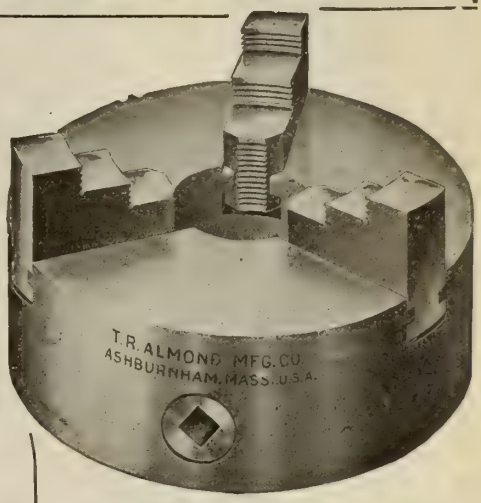

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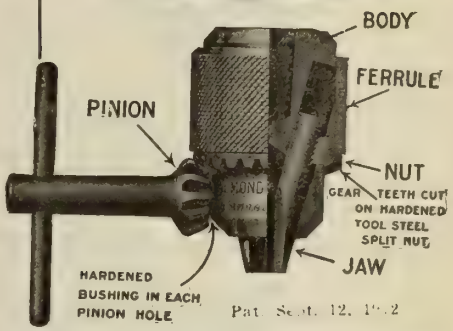

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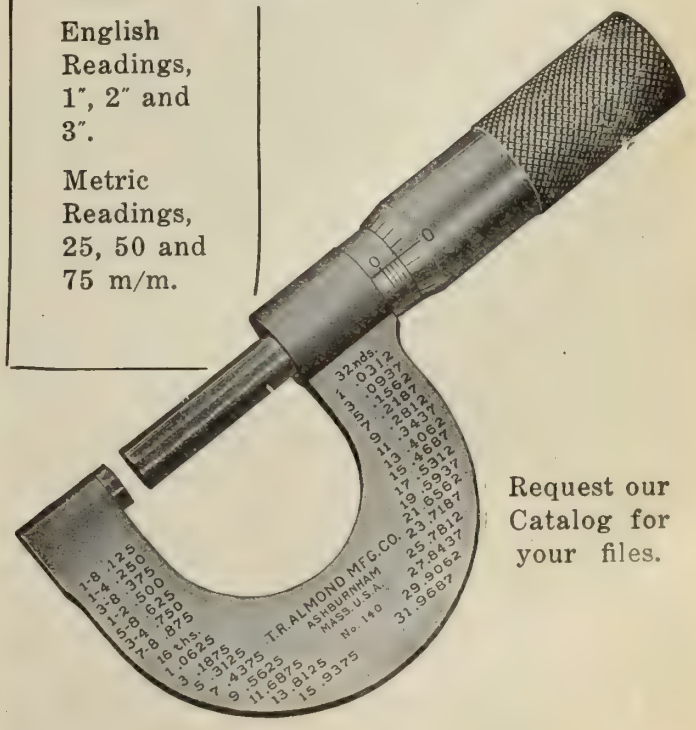

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JACKS, PNEUMATIC
Northern Crane Works, Walkerville.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

JOINTERS
Gray Ball Bearing Co., Ltd., Toronto.

JIGS, TOOLS, ETC.
Brown Engineering Corp., Toronto.
Elliott & Whitehall Mach. Tool Co., Galt.
Gisholt Machine Co., Madison, Wis.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES
Canada Foundries & Forgings, Welland.

KEY SEATERS
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal.

KEYS, MACHINE
Whitney Mfg. Co., Hartford, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Sheldons, Limited, Galt, Ont.

KNIFE GRINDERS
Gray Ball Bearing Co., Ltd., Toronto.

LABELS AND TAGS
Matthews & Co., Jas. H., Pittsburgh, Pa.

LABORATORIES, INSPECTION AND TESTING (See Chemists)

LADLES, FOUNDRY
Northern Crane Works, Walkerville.

LACING MACHINES
Clipper Belt Lacer Co., Grand Rapids, M.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal.

LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester.

LATHES, BORING
Bridgeford Mach. Tool Works, Rochester.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
J. G. Blount & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, BAND TURNING
Roelofson Machine & Tool Co., Toronto.

LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Chicago, Ill.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Wks., Rochester.
Canada Mach'y Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, Ohio.
Wickes Bros., Saginaw, Mich.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Kennedy & Sons, Wm., Owen Sound, Ont.
R. McDougall Co., Galt.
Miles-Bement-Pond Co., New York.
Reed-Prentice Co., Worcester, Mass.
Smalley-General Co., Inc., Bay City, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Sidney Tool Co., Sidney, Ohio.
Standard Machy. & Supplies, Ltd., Montreal, Que.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Wood Turret Machine Co., Brazil, Ind.

LATHES, METAL TURNING
Cisco Machine Tool Co., Cincinnati, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, POLISHING
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SINGLE PURPOSE
Baxter & Co., Ltd., J. R., Montreal, Que.
Bertram & Sons Co., John, Dundas, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Hepburn, Ltd., John T., Toronto, Ont.
Roelofson Mach. & Tool Co., Toronto.
Whitehead, Son & Co., W. T., Montreal.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SCREW CUTTING
Bertram & Sons Co., John, Dundas, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & S'ply Co., G. F., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Wickes Bros., Saginaw, Mich.
Hepburn Ltd., John T., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SPEED
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, TOOL ROOM
Cisco Machine & Tool Co., Cincinnati, O.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, TURRET, HAND, HORIZONTAL
Acme Machine Tool Co., Cincinnati, O.
Bertram & Sons Co., John, Dundas, Ont.
Blount & Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence.
Can Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Dodge, Inc., H. C., Boston, Mass.
Foss Mchy. & S'ply Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co. Elkart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
LeBlond Mch. Tool Co., R. K., Cincinnati
Mulliner-Enlund Tool Co., Syracuse, N.Y.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Canada, Galt, Ont.
Warner & Swasey Co., Cleveland, Ohio.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Wood Turret Mach. Co., Brazil, Ind.

LEAD BURNING
St. Lawrence Welding Co., Montreal.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LIFTS, PNEUMATIC
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

LINK BELTING
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOADERS, WAGON AND TRUCK
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Wire & Iron Gds. Co., Hamilton.
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Cataract Refining & Mfg. Co., Toronto.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne.

LUBRICATORS
Trahern Pump Co., Rockford, Ill.

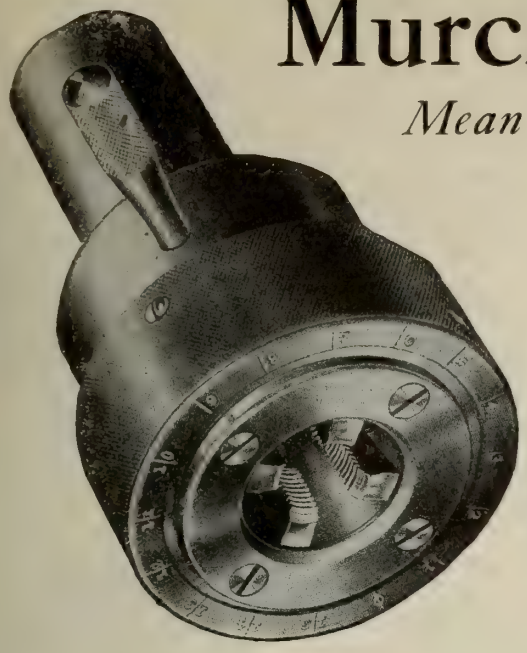
LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

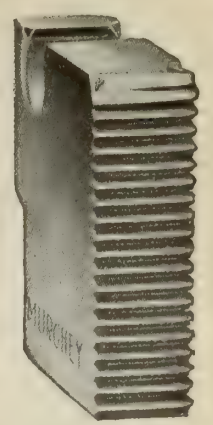
MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

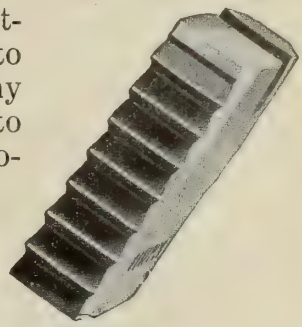
MACHINERY, CORNER AND BENDING
Peck, Stow & Wilcox, Southington, Conn.

Murchey Chasers

Mean Quick Deliveries







Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?

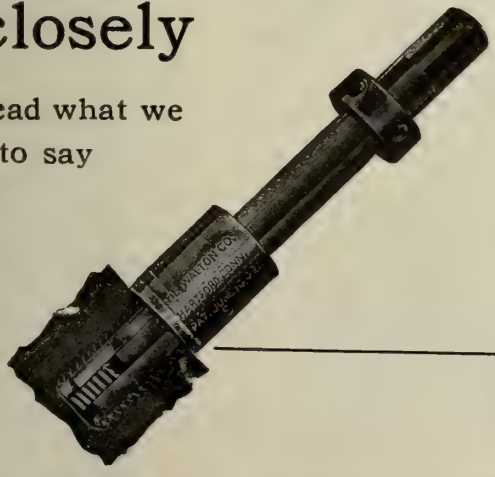
Send for a Murchey Tap or Die on approval and give it a trial. You will then secure actual proof of its value to you.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France.

Look at this again —closely

and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find the Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company

Hartford, Conn.

BUYERS' DIRECTORY

MILLING ARBORS
Kearney & Trecker Co., Milwaukee, Wis.

MACHINERY DEALERS
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Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY, HAMMER AND NAIL
Garlock-Walker Machy. Co., Toronto, Ont.

MACHINERY GUARDS (See Guards)
MACHINERY REPAIRS
Marten Mach. Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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National Automatic Tool Co., Rich'd, Ind.

MACHINERY, TRANSMISSION (POWER)
Morse Chain Co., Ithaca, New York.

MACHINES, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

MACHINES, ROLLING, BENDING
Stoll Co., Inc., The D. H., Buffalo, N.Y.

MACHINES, RUNNING, BALANCING
Norton Grinding Co., Worcester, Mass.

MACHINES, MULTI-BORING
National Automatic Tool Co., Richmond.

MACHINES, SHOP WORK
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MACHINISTS' SCALES, SMALL TOOLS AND SUPPLIES
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Rice Lewis & Son, Toronto, Ont.
MacGovern & Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MACHINE TOOLS
Williams & Wilson, Ltd., Montreal, Que.

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Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Pritchard-Andrews Co. of Can., Ottawa.
Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Perrin, Wm. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MASKS, WELDING, SMOKE, FUME, GAS, ETC.
Strong, Kennard & Nutt Co., Cleveland.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser & Co., S. F., Inc., Fort Wayne.

MEASURING TAPES AND RULES
Chesterman & Co., Jas., Ltd., Sheffield.

METALLURGISTS
Toronto Testing Laboratory, Ltd., Toronto.

METAL SAWS
Simonds Mfg. Co., Fitchburg, Mass.
Hoefer Mfg. Co., Freeport, Ill.

METAL SAWS, POWER
Hoefer Mfg. Co., Freeport, Ill.

METALS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Dom. Iron & Wrecking Co., Ltd., Montreal
Enushevsky & Son, B., Toronto, Ont.
Internat'al Metal & Trading Co., Montreal
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Su'plies Ltd., Montreal
United Brass & Lead, Ltd., Toronto.

METAL STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS
Can. Cartridge Co., Hamilton, Ont.

METERS, WATER
Can. Cartridge Co., Hamilton, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser & Co., Inc., S. F., Toronto, Ont.

MICROMETERS
Almond Mfg. Co., T. R., Ashburnham, M.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co. Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Williams Machy Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co. of Canada, Toronto.

MOULDS, RUBBER
Elliott & Whitehall Mch. & Tool Co., Galt

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MULTI-DRILLING MACHINERY, VERTICAL AND HORIZONTAL
Nat. Automatic Tool Co., Richmond, Ind.

MULTI-BORING MACHINES
Nat. Automatic Tool Co., Richmond, Ind.

MULTI-TAPPING MACHINERY, VERTICAL AND HORIZONTAL
Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL
Brown's Copper & Brass Roller Mills, New Toronto, Ont.

NAILS
Graham Nail Works (operated by Canada Metal Co., Ltd.), Toronto.
Page Steel & Wire Co., Adrian, Mich.

NAIL SETS
Morrow Screw & Nut Co., John, Ingersoll.

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Boker & Co., Inc., H., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
Comstedt, J. F. A., New York City, N.Y.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Morrow Screw & Nut, Ltd., J., Ingersoll.
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
United Brass & Lead Ltd., Toronto.
Wilkinson & Kompass, Hamilton.

NUT BURRING MACHINES
National Machy. Co., Tiffin, Ohio.

NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Qu

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.
Sheldons, Ltd., Galt, Ont.

OIL STONES
Aikenhead Hardware Co., Toronto, On
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, On

OPENING DIE HEADS
Greenfield Tap & Die Corp, Greenfield
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford
MacKinnon Steel Co., Sherbooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford

OXY-ACETYLENE WELDING AND CUTTING
Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

OXY-ACETYLENE WELDING AND CUTTING PLANT
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.
[illegible]ter & Co., Ltd., J. R., Montreal.
Graton & Knight Mfg. Co., Worcester, M.
Perrin, Ltd., William, Toronto.

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

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Bertrams, Ltd., Edinburgh, Scotland.
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
Page Steel & Wire Co., Adrian, Mich.

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MARKERS' LATHES
Oliver Machy. Co., Grand Rapids, Mich.

PATTERN MAKERS' VISES
Oliver Machy. Co., Grand Rapids, Mich.

PATTERN SHOP SUPPLIES
Oliver Machy. Co., Grand Rapids, Mich.

PATENT SOLICITORS
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Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Dominion Pattern Works, Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.
Greenleafs, Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

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Can. Link-Belt Co., Toronto, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
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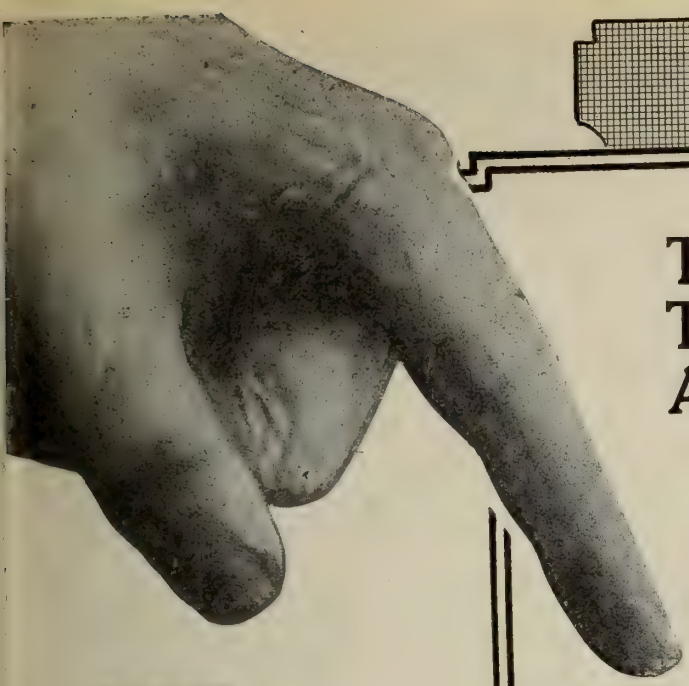

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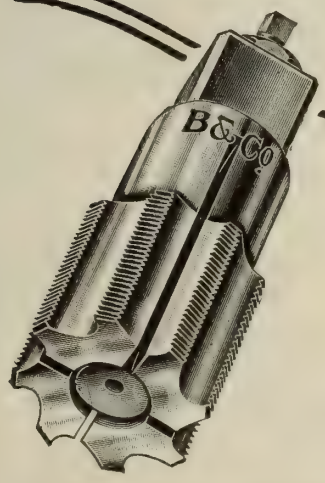

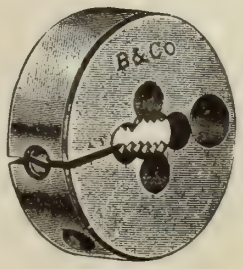

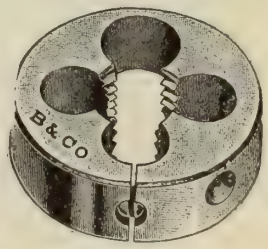

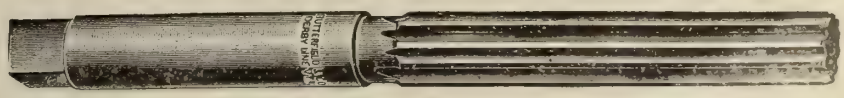

Butterfield & Co., Inc.

Rock Island, P.Q.

Toronto Office: 220 King Street West

BUYERS' DIRECTORY

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Clipper Belt Lacer Co., Grand Rapids.

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International Malleable Iron Co., Guelph.

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Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
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Landis Machine Co., Waynesboro, Pa.
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Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

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Wells Bros. of Canada, Galt, Ont.

PIPE DIES
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Wells Bros. of Canada, Galt, Ont.

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Wells Bros. of Canada, Galt, Ont.

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Armstrong Bros. Tool Co., Chicago.

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Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Hamilton Mach. Tool Co., Hamilton, Ohio
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Hamilton Mach. Tool Co., Hamilton, Ohio
Niles-Bement-Pond Co., New York.
Steptoe, The John Co., Cincinnati, Ohio.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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Quickwork Co., St. Marys, Ohio.

POWER TRANSMISSION MCHY.
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MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

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Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Garlock-Walker Machinery Co., Toronto.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, William R., Ltd., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.

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Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
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Toledo Machine & Tool Co., Toledo.

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Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
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Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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PRESSES, POWER
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Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
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Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
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Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

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American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.
Standard Mach. & S'plies Ltd., Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, BELT
American Pulley Co., Philadelphia, Pa.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

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Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Oberdorfer Brass Co., M. L., Syracuse.
Pratt & Whitney Co., Dundas, Ont.
Sheldons, Ltd., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, ALL KINDS
Darling Bros., Ltd., Montreal, Que.
Perrin, Ltd., William R., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
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Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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PUMPS, HAND, FOR OIL AND GASOLINE
Bowser & Co., Inc., S. F., Fort Wayne.

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Bowser & Co., Inc., S. F., Fort Wayne.

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Bowser & Co., Inc., S. F., Fort Wayne.

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Trahern Pump Co., Rockford, Ill.
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MacGovern & Co., Montreal, Que.
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Graton & Knight Mfg. Co., Worcester.

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W. H. Banfield & Sons, Toronto.
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Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
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Marten Machine Co., Hamilton, Ont.
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Pratt & Whitney Co., Dundas, Ont.
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Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

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Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes & Co, Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Wickes & Co., Saginaw, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

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Shore Instrument & Mfg. Co., New York.
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Niles-Bement-Pond Co., New York.

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Niles-Bement-Pond Co., New York.

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Wickes & Co., Saginaw, Mich.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont
Whitman & Barnes Mfg. Co., St. Catharines.
Wilt Twist Drill Co., Walkerville, Ont.

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Cleveland Twist Drill Co., Cleveland.
Kelly Reamer Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Illinois Tool Works, Chicago, Ill.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
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Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

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Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

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Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

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Morrow Screw & Nut Co., John, Ingersoll.

REAMERS, PIPE, SHELL

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Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

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Garlock-Walker Machinery Co., Toronto.

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Taylor Instrument Co., Rochester, N.Y.

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Steel Co. of Canada, Ltd., Hamilton.

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Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

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Can. Ingersoll-Rand Co., Montreal.
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Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

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High-Speed Hammer Co., Rochester.
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Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME

Can. Driver-Harris Co., Ltd., Walkerville.

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Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

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Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Driver-Harris Co., Ltd., Walkerville.

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National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
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SCREW COLLARS

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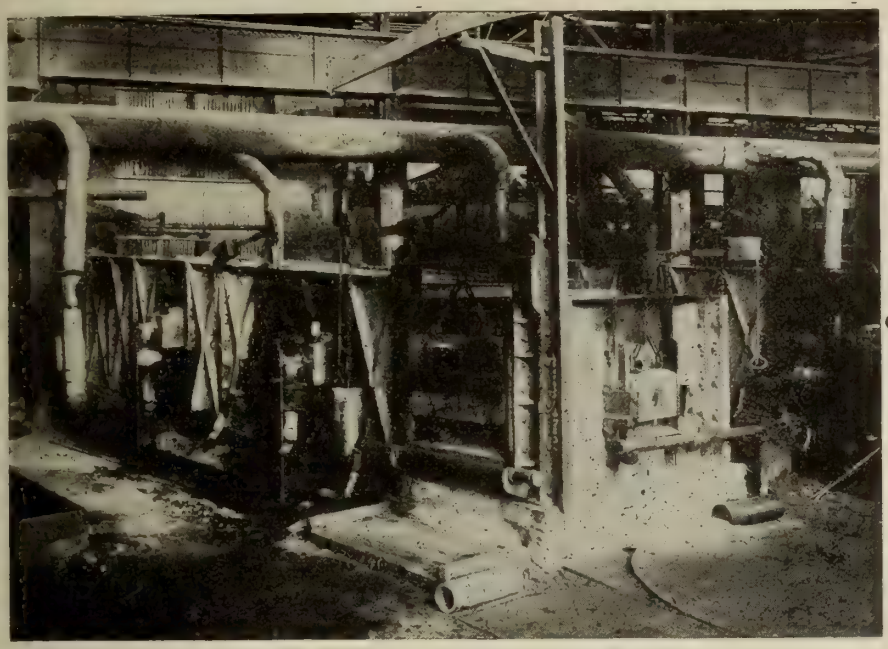

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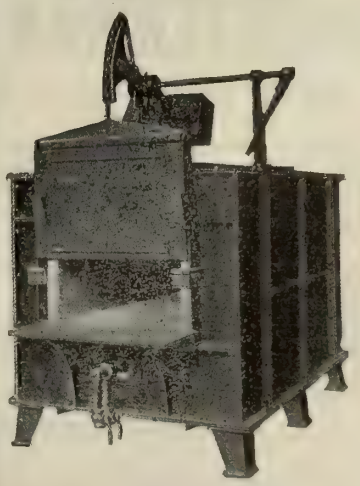

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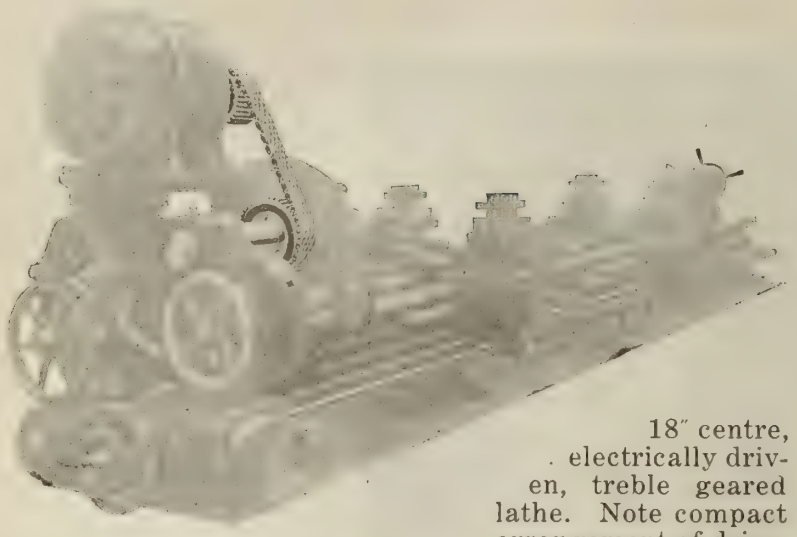

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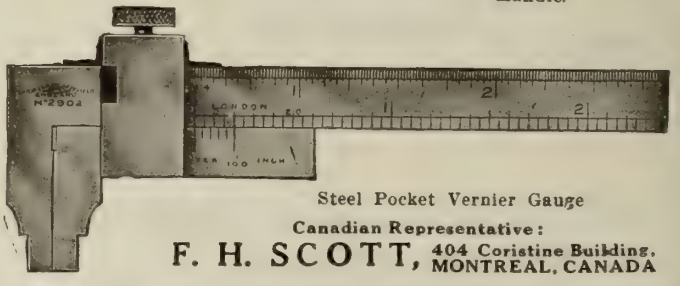

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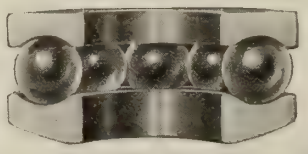

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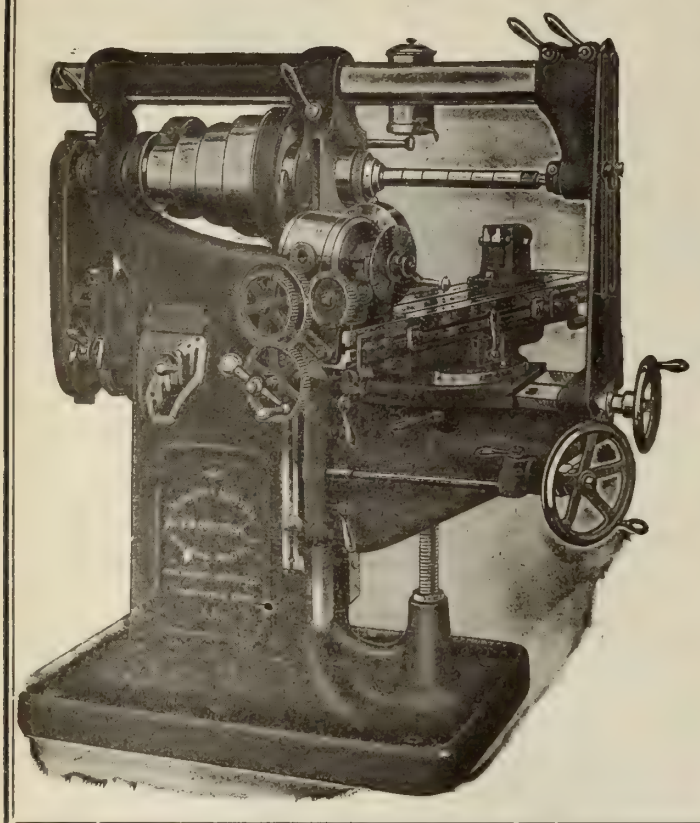

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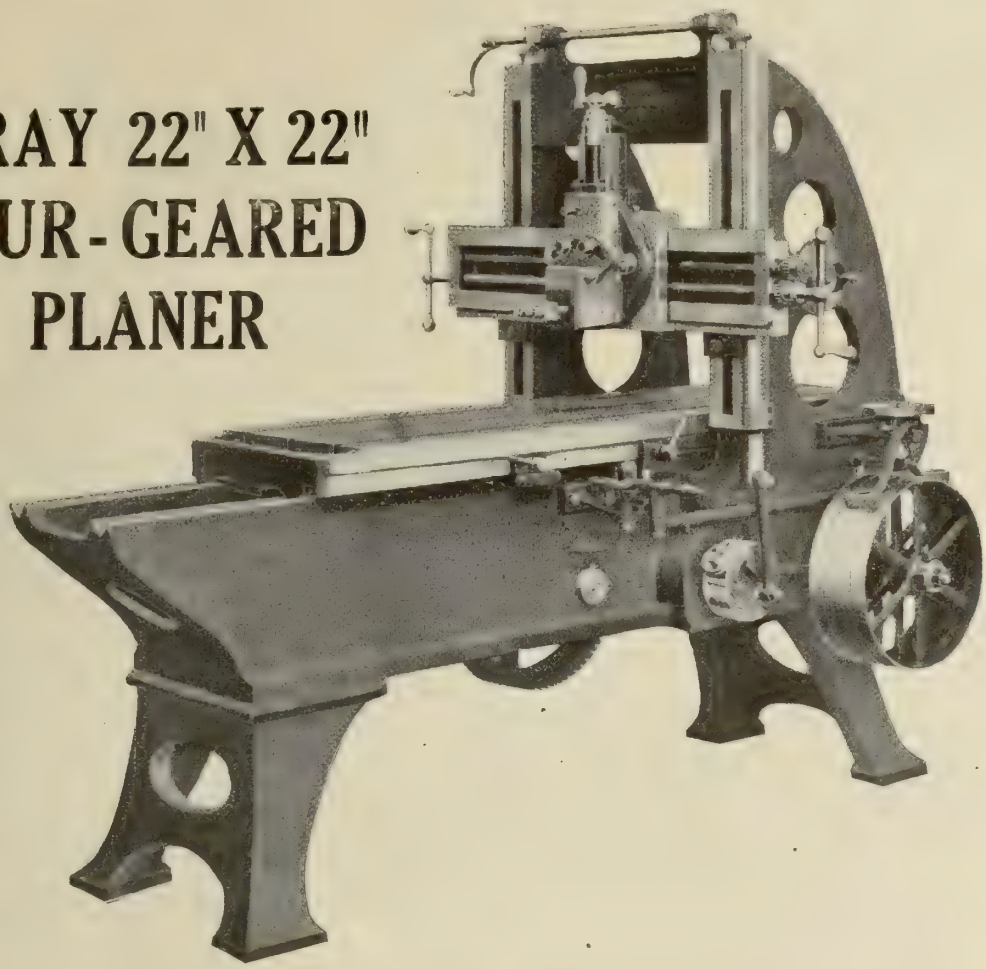

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In designing this tool the parts have been so proportioned and the metal so distributed that the planer is quick acting and simple in operation, and yet sufficiently stiff, strong and powerful to perform a great portion of the work for which larger, heavier and more clumsy planers are ordinarily used.

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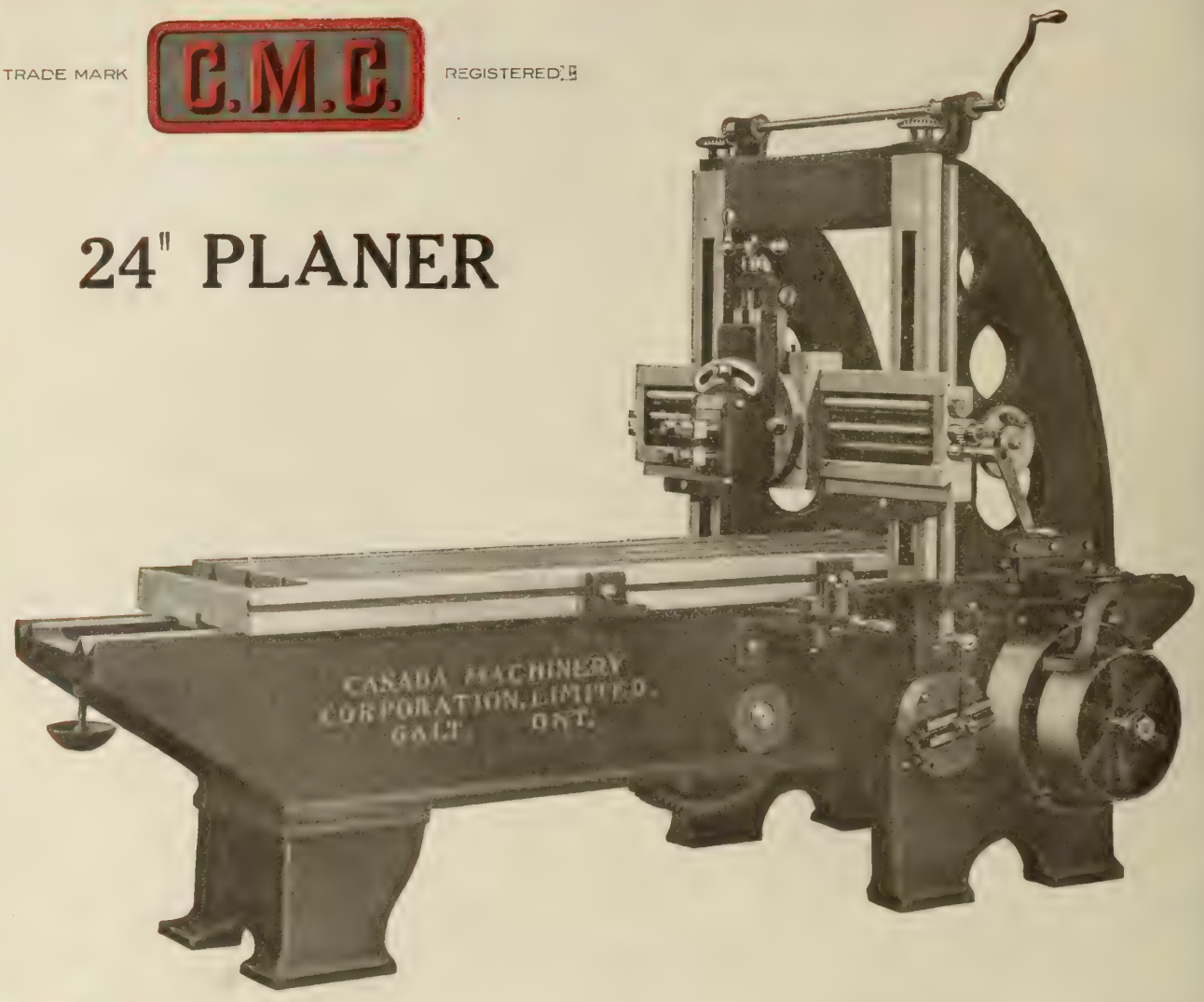

OUR PLANER is built to combine solidity with convenience and speed of operation. An unstinted, yet judicious use of metal gives the machine an absolute rigidity under the heaviest cuts, while the operating mechanism and adjustments are as simple, effective and convenient as possible.

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

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Gray Planers are built by a firm that makes nothing but planers. They are given the entire time and attention of a large organization —and their performance shows it.

The parts are so proportioned and the metal so distributed that the planer is quick acting and simple in operation, and yet sufficiently stiff, strong and powerful to perform a great portion of the work for which larger, heavier and more clumsy planers are ordinarily used.

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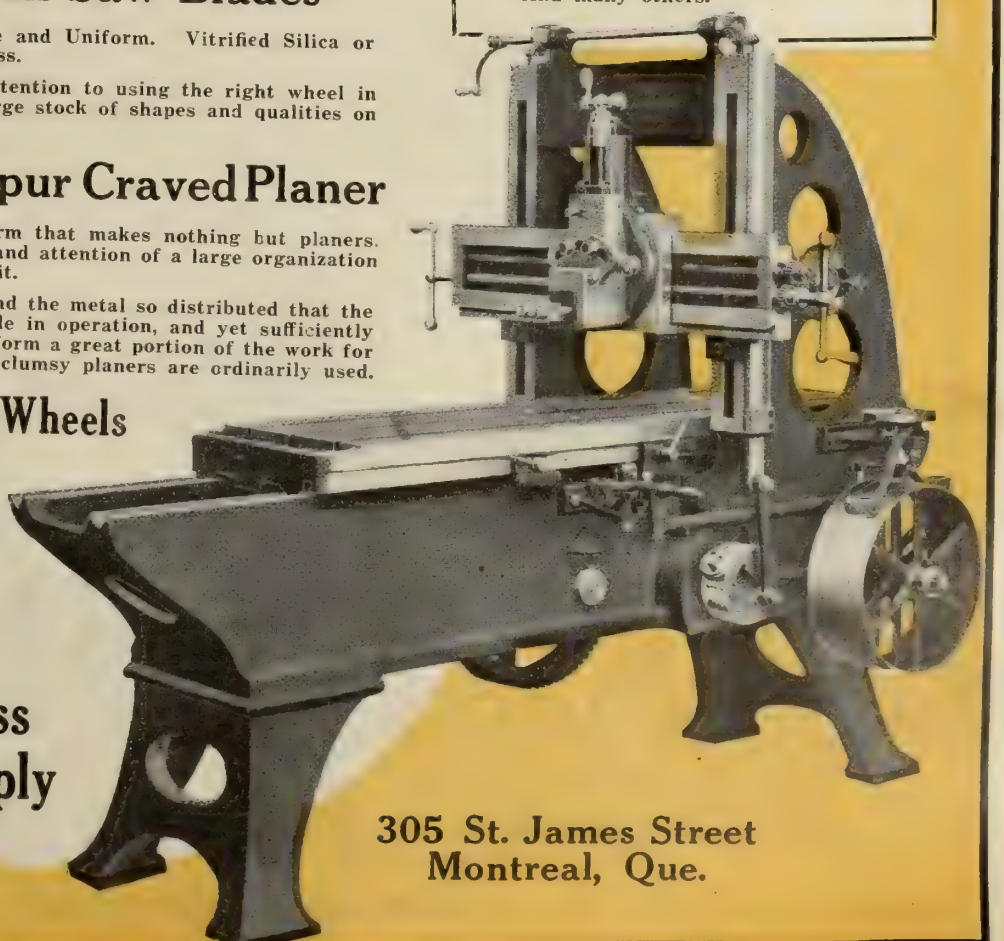

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P. & W. Combination Lathe Knurling Tools

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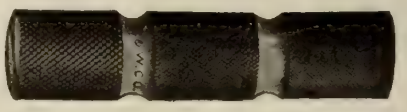
It carries three pitches of knurls fine, medium and coarse, as shown in sample. This does away with necessity of having three holders or of changing knurls where but one holder is available. Same knurls can be used in this holder as are used in our regular Lathe Knurling Tool.



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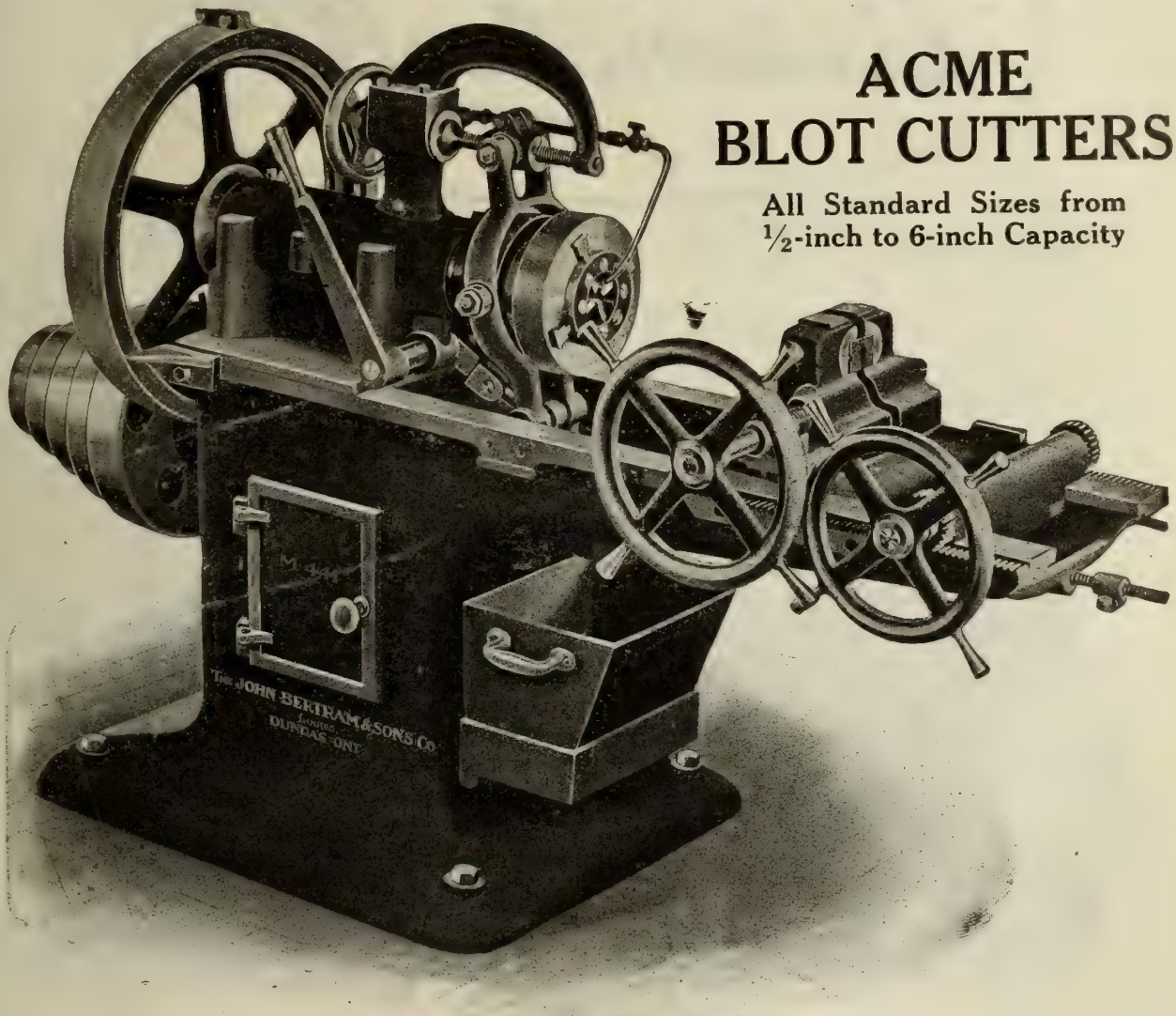

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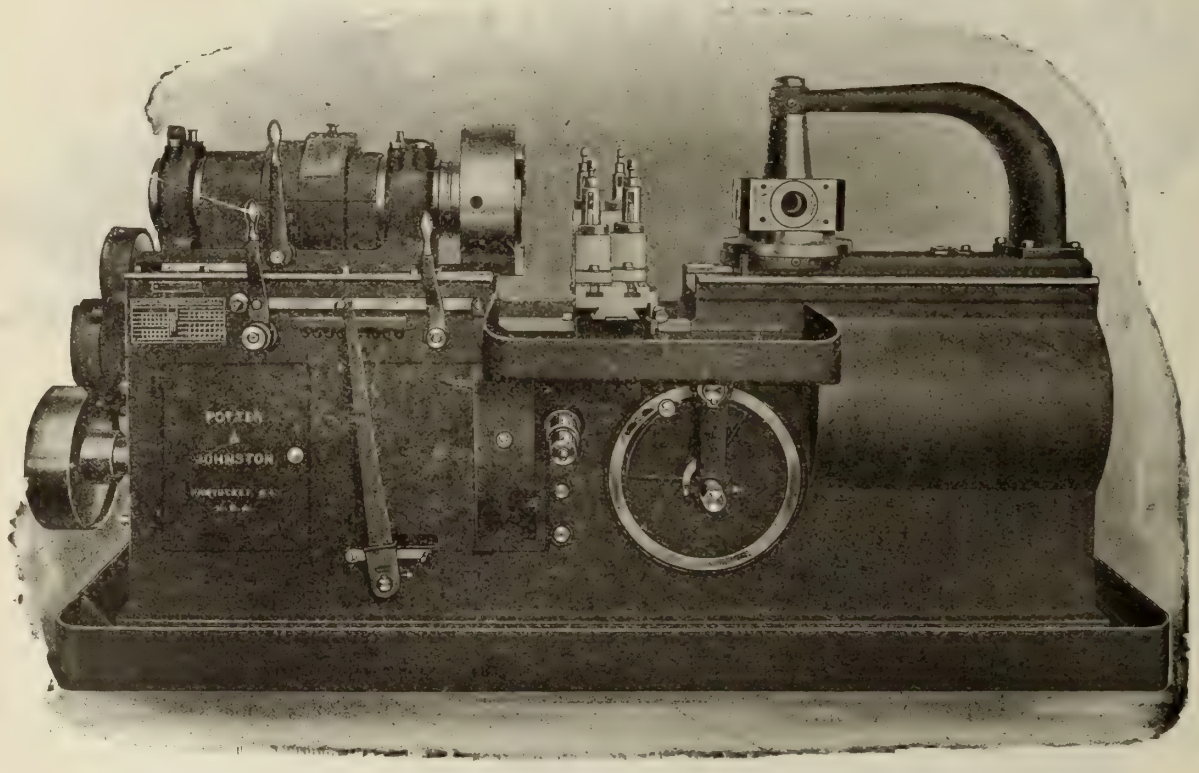
"Do it Automatically"

You, too, Can Adopt this Method



6A — MANUFACTURING AUTOMATIC

When, back in the Middle Ages, a Frenchman mounted a piece of wood between two supports in such a way that it could be revolved against a cutting edge, the history of machine tools began.

With from two to a dozen cutting tools in simultaneous operation, with the operator only required to place the piece in the chuck and remove the finished piece, the machine tool has reached its highest development from a labor-saving, time-saving standpoint in the Potter & Johnston Manufacturing Automatic.

More and more shops, big, progressive shops, are realizing this fact; that they cannot do their manufacturing work so economically in any other way as on the Potter & Johnston Manufacturing Automatics. Some shops have fifty of these machines in use, some seventy-five or a hundred, and even three hundred. In one shop—think of it. Why don't you adopt that "Do It Automatically" method. **Ask for Bulletin 39.**

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Railway
Pressed and Drift Spikes
Tacks
Shoe Nails
Steel and Copper Rivets
Burrs

Purchase the Products of Canadian Mills

TO uphold the Glory we have jointly earned—to honor our noble dead—to comfort the wounded, and extend to the men returned the hand of prosperous welcome, we must cast aside all forebodings and face the future with unbounded courage and confidence and, without a shadow of doubt, declare to the World that this Nation, which was so quickly and successfully transformed to a War basis, can be depended upon to revert to Peace conditions with equal success. The buyer and seller must recognize their duty to the Nation and co-operate fully to the end that all products that can be produced in Canada by Canadian workmen shall not be purchased elsewhere.

OUR Duty is plain; Canada with Canadian labor and capital can produce, manufacture and distribute products sufficient to keep the wheels of industry turning to the limit. The song of Prosperity and Happiness should ring out all over the land. Let us sincerely pledge to the extent of our needs, to purchase materials produced in Canada by Canadian Workmen, and the result of our efforts will return to us the Blessings of a Prosperous and Happy Nation.

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Staples
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Bars Blooms Billets
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SLABS,
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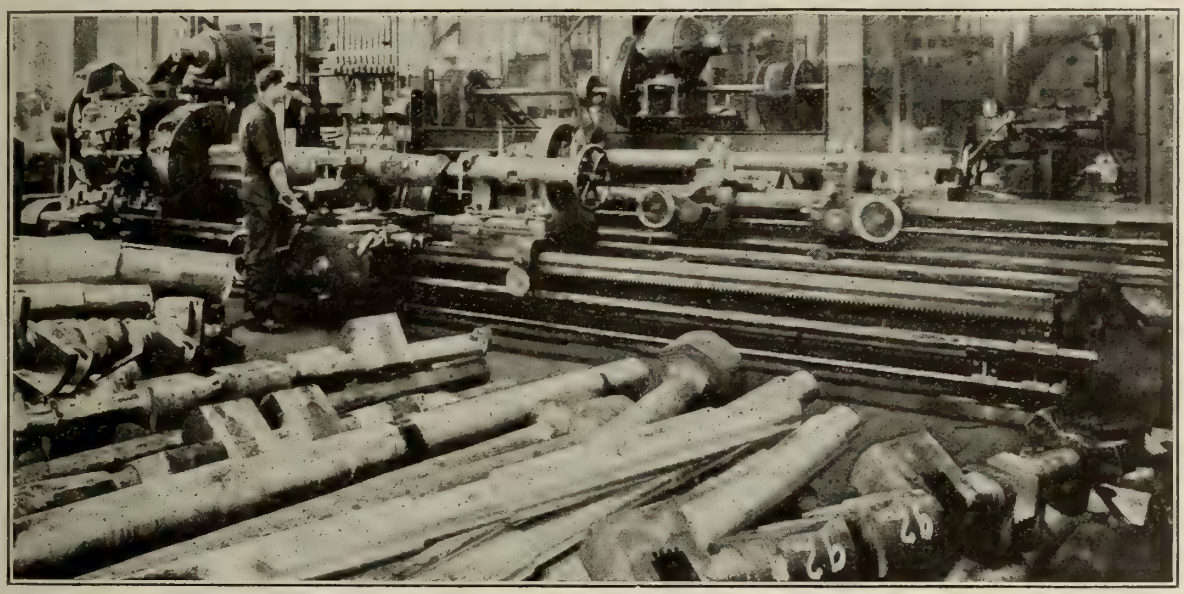
IRON, BRASS AND BRONZE CASTINGS

Sulphuric Acid. Nitre Cake.

General View of the Plant of the Algoma Steel Corporation from the Waterfront.

BRIDGEFORD

Heavy Duty Lathes



The above photograph shows a Bridgeford 27″ Manufacturing Lathe finish boring a cast-iron transmission housing for the new Fordson Tractor.

The diameter of housing is 19⅛″ and the limits of accuracy are .002″.

Maximum production is a requirement in the Ford plant and that is why a Bridgeford was selected to do the work. The Bridgeford turns out 30 pieces per day of 8 hours, which is excellent production.

There's a Bridgeford for every heavy duty lathe requirement. Bridgefords are in operation in all parts of the world on all kinds of duty. The line includes Heavy Geared Head Engine Lathes from 24″ to 72″ swing, Cone Driven Engine Lathes, Axle and Journal Truing Lathes and Manufacturing Lathes of 27″ and 30″ Swing.

Send for interesting data on Bridgeford Lathes.
We are in a position to make prompt deliveries.

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Manufacturers of Heavy Duty Lathes for more than 20 years

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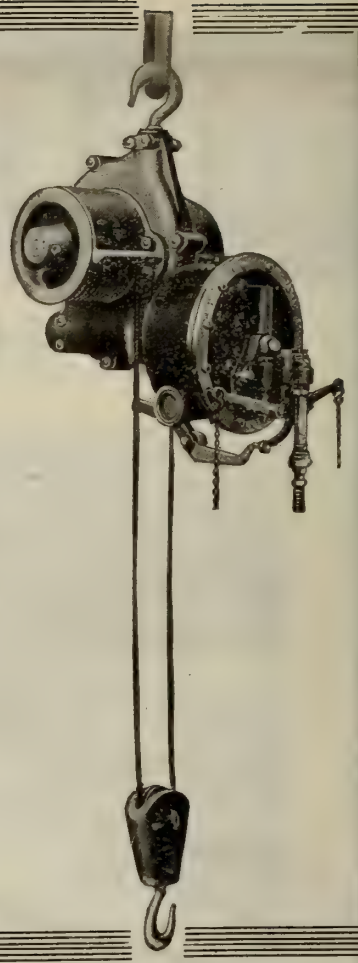
Less Overhead Expense



Whenever a strong, dependable hoist is needed, the "Imperial" air motor hoist fills the bill.

Few Parts Mean Less Trouble
The "Imperial" has few parts

The motor is completely balanced; the sensitive control allows the load to be raised or lowered a fraction of an inch at a time. Ball and roller bearings and thorough lubrication insure long wear.

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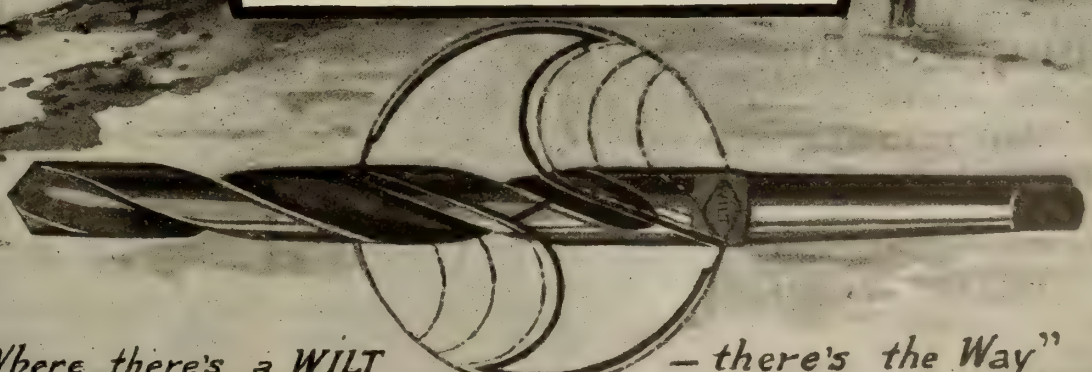
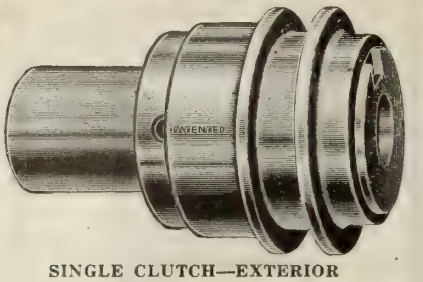


"Where there's a WILT — there's the Way"

THE JOHNSON FRICTION CLUTCH



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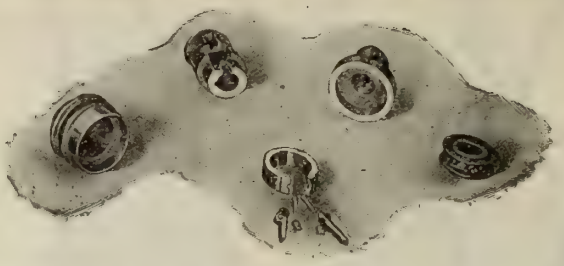

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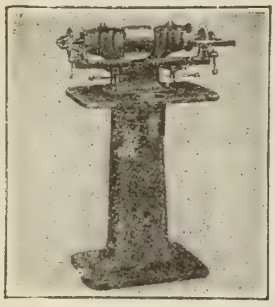

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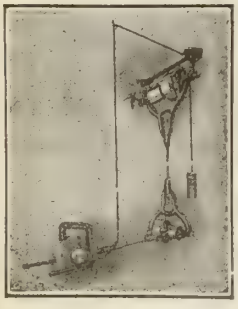
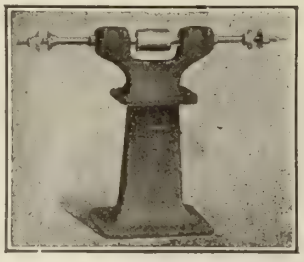


Swing Grinder



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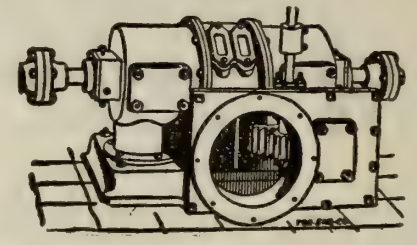

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Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

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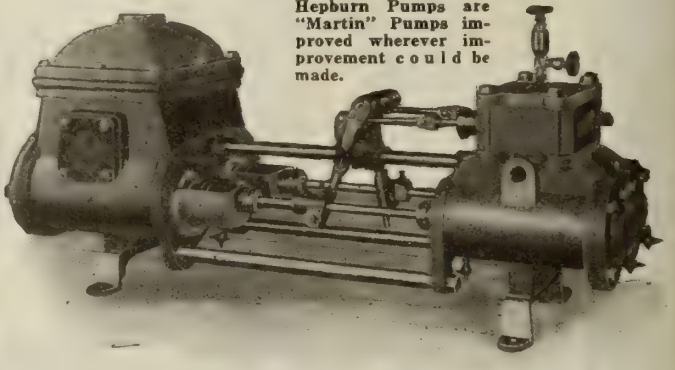
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



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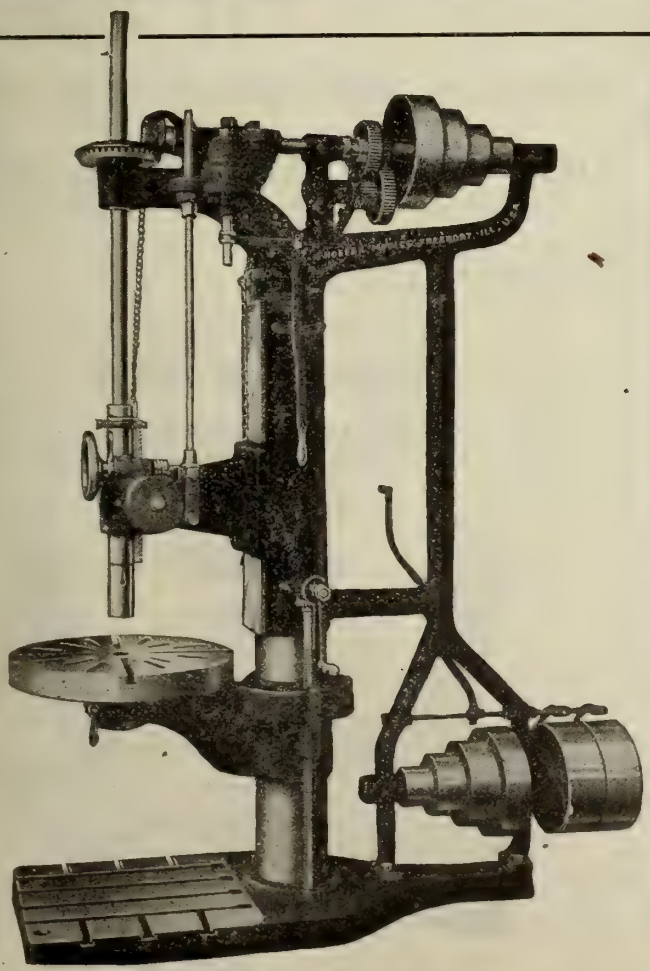

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And know-how is a lot different from know-it-all. The Hoefer engineers are eternally plugging away to make a better driller.

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Regardless of the size of the press, drilling is possible to a fine degree of precision, provided you use Hoefer Drillers, the recognized standard for a quarter of a century.

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They are:

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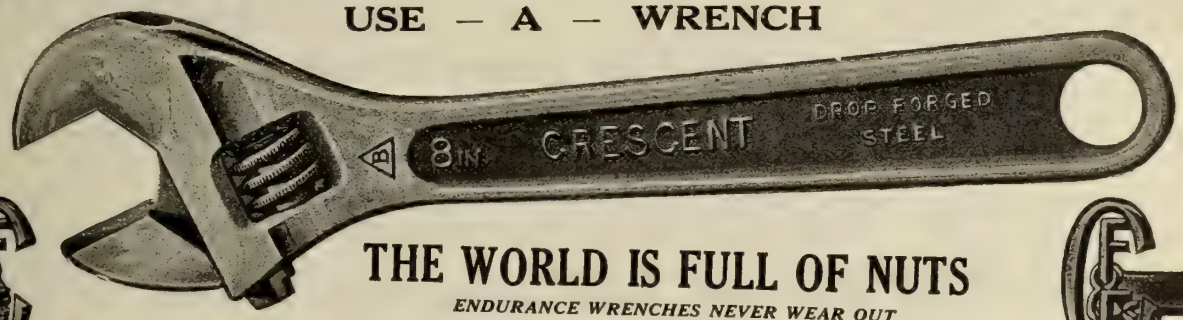

THE WORLD IS FULL OF NUTS
ENDURANCE WRENCHES NEVER WEAR OUT
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"ARGO" BRAND *HIGH-SPEED* STEEL

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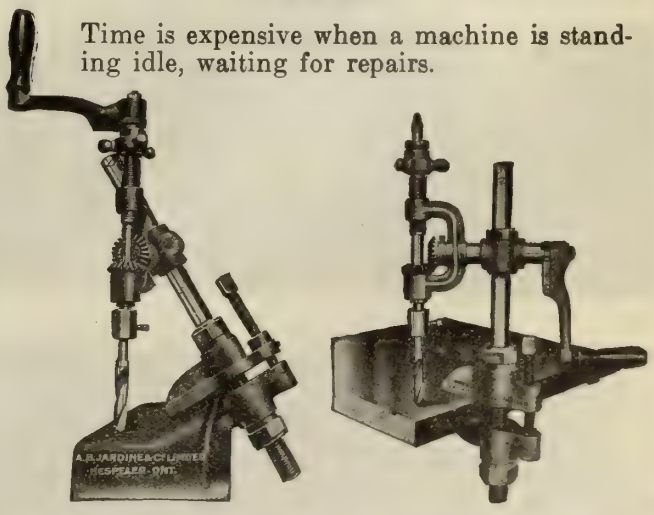
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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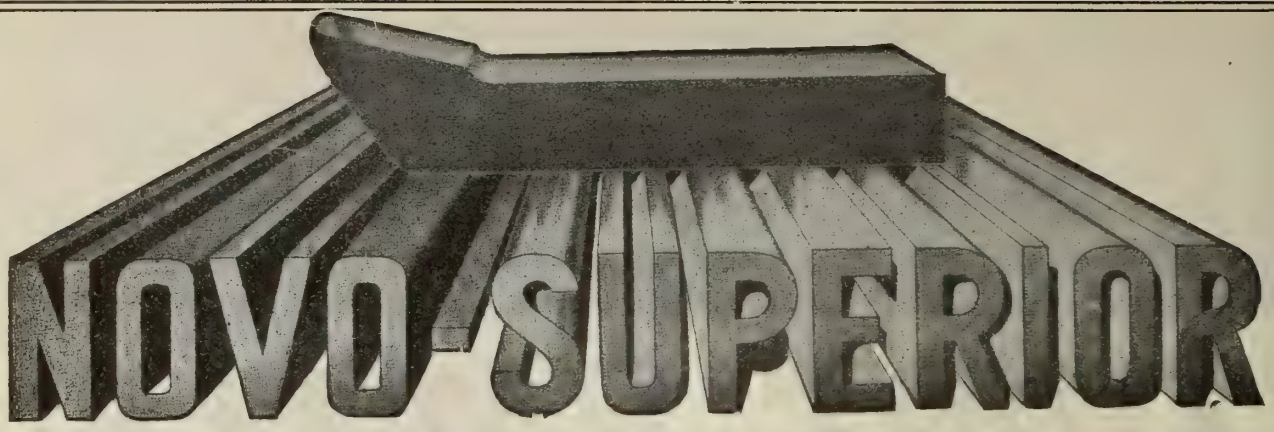

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Hoyt Metals have been used with great success for many years.
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We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

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High Speed Metal Cutting Machine

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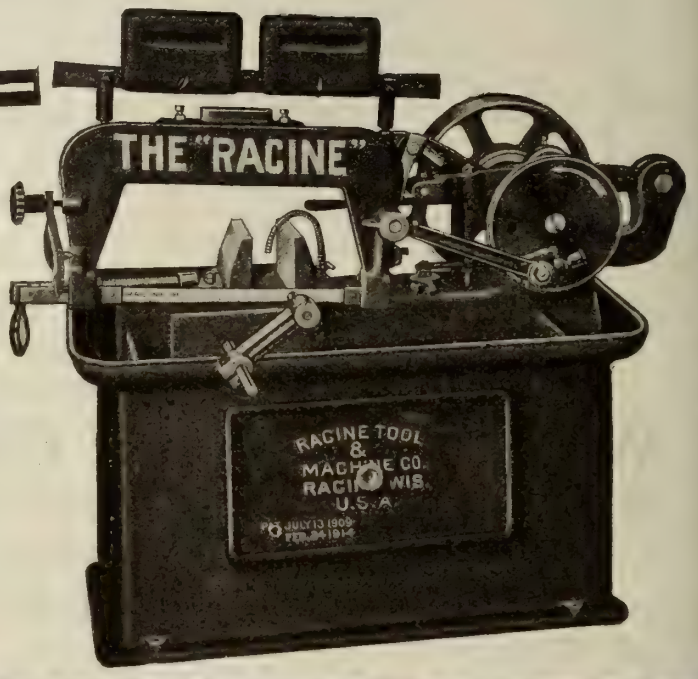
This is the only machine in the World that has an ABSOLUTELY POSITIVE AUTOMATIC LIFTING DEVICE, a feature secured by patents. Another feature is the rigid saw frame guide. These two assets combine to give long life to the cutting blades and save a lot of money.



"THE RACINE" minimizes wastage, cuts accurately and with great speed. Then they are easy and cheap to operate. These features are appreciated by the best shops everywhere and that's why "THE RACINE" sets the "Standard the World Over." Write for full particulars.

Use "RACINE" H.S. Tungsten-Power Blades.

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HACK SAW BLADES

UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co Limited

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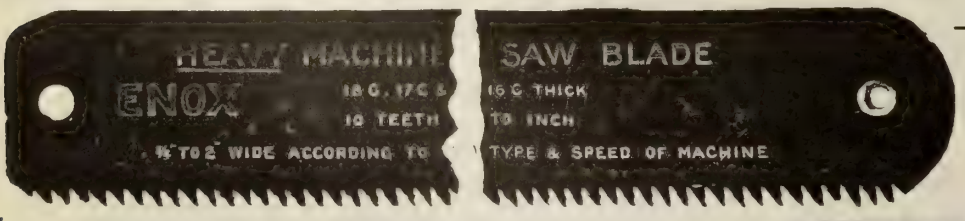

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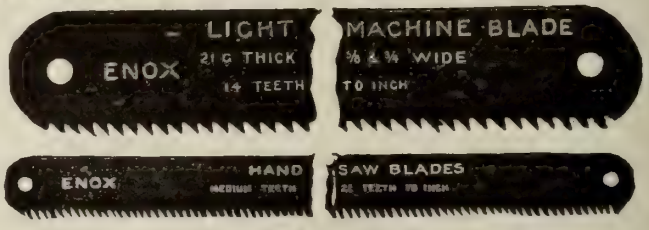
Hacksaw Blades

ARE THE BEST



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AN ENTIRELY BRITISH COMPANY

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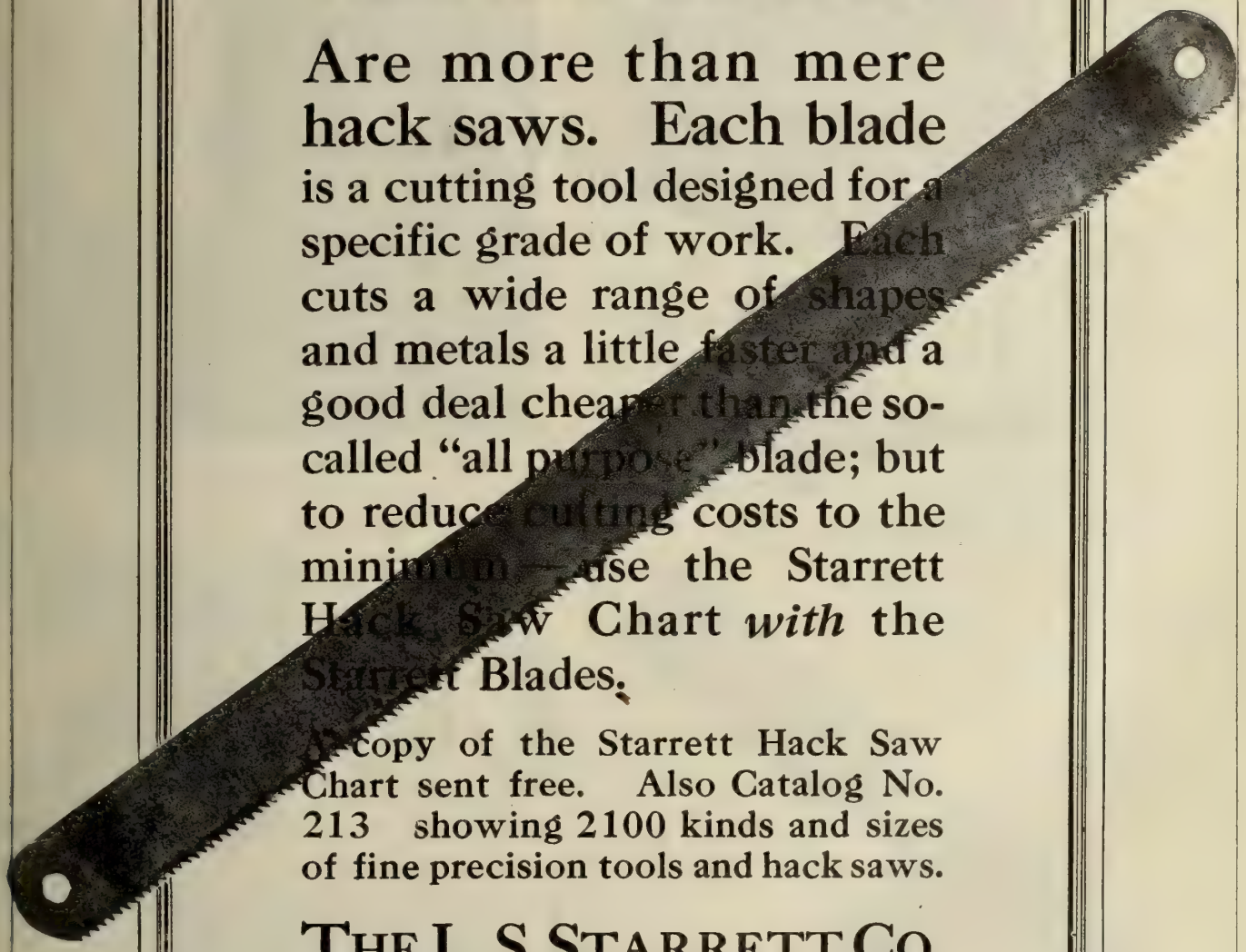
Starrett Hack Saws



Are more than mere hack saws. Each blade is a cutting tool designed for a specific grade of work. Each cuts a wide range of shapes and metals a little faster and a good deal cheaper than the so-called "all purpose" blade; but to reduce cutting costs to the minimum—use the Starrett Hack Saw Chart *with* the Starrett Blades.

A copy of the Starrett Hack Saw Chart sent free. Also Catalog No. 213 showing 2100 kinds and sizes of fine precision tools and hack saws.

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THE WORLD'S GREATEST TOOLMAKERS
Manufacturers of Hack Saws Unexcelled

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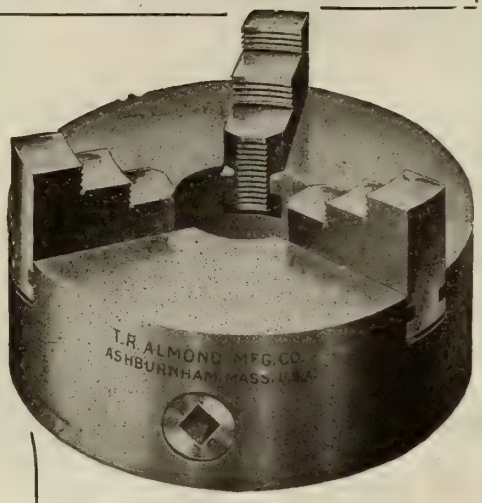
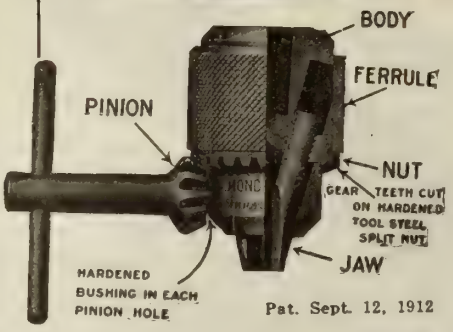
STARRETT HACK SAWS CUT QUICKER LAST LONGER

ALMOND
CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5", 6", 7½", 9" and 12".



Geared Nut Drill Chucks, in various capacities, 0" to 1".



Pat. Sept. 12, 1912

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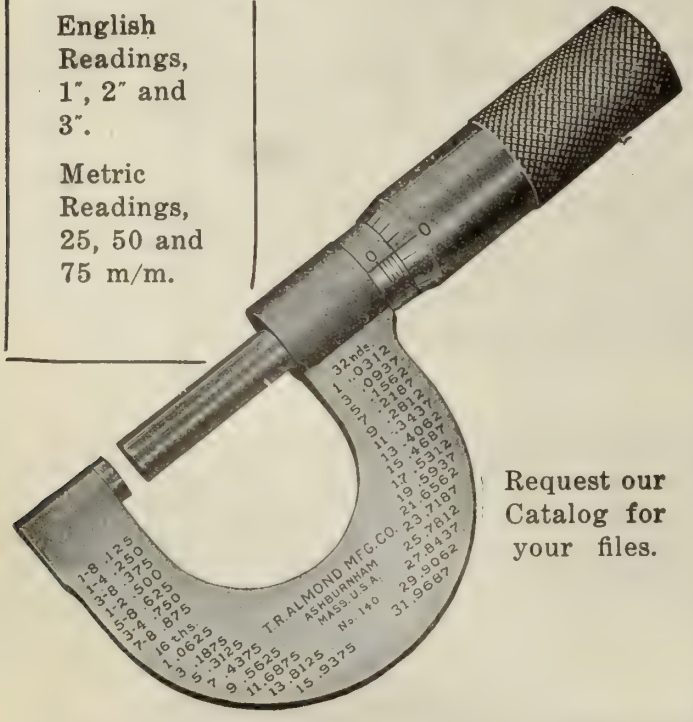
English Readings, 1", 2" and 3".

Metric Readings, 25, 50 and 75 m/m.



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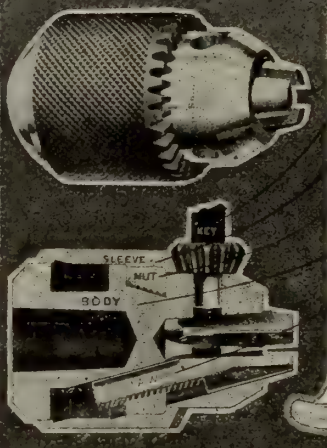
JACOBS IMPROVED DRILL CHUCK



Gripping Features

Key quickly and firmly tightens jaws.

Toothed sleeve superior to other chucks.

This nut insures accurate operation of the jaws.

Body — Durable — Sturdy — Compact.

The jaw always firmly clamps the tool accurately on center.

THE JACOBS MFG. CO.
HARTFORD, CONN. U.S.A.

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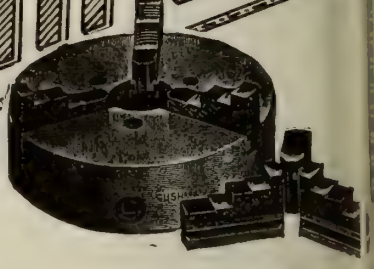


The "Cushman" Chuck of to-day is the fruit of nearly sixty years of Chuck building

And right from the start in 1862, they have been known throughout the industry for their high quality Material and Workmanship.

The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

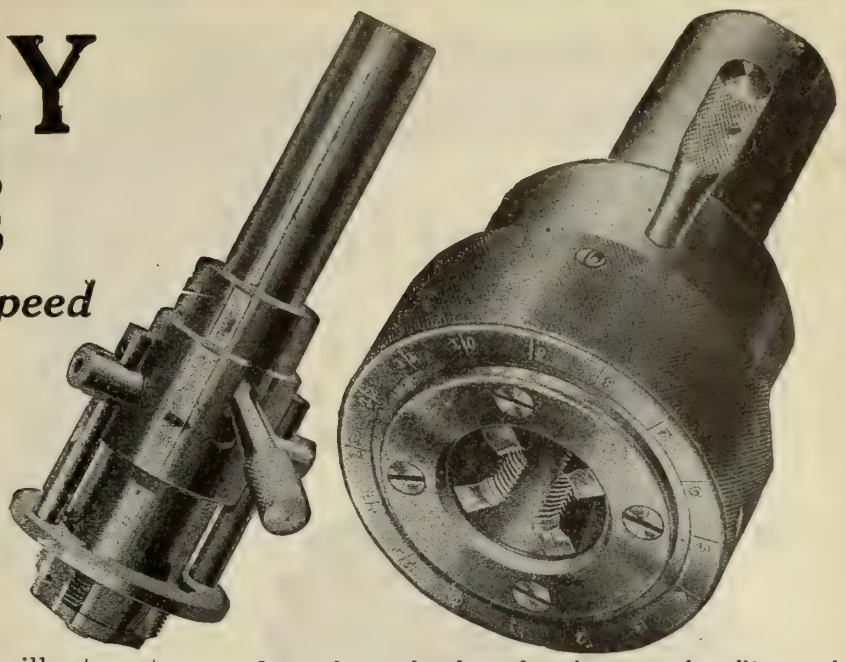
Cushman Chuck, Hartford, Co. Conn

CHUCKS

MURCHEY

COLLAPSING TAPS and SELF-OPENING DIES

Promote Accuracy and Speed



MURCHEY Collapsing Taps and Self-Opening Dies are cleared free from the thread instantly, preventing all danger of stripping, besides cutting time for production in half. **Thus you are sure of greater accuracy and greater production.** Murchey Tools are speeding production in all parts of the country on tapping machines, drill presses, monitor machines, boring mills, turret lathes, and all other machines to which taps or dies may be attached.

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Die Head Cuts Perfect Threads

The H. & G. Die Head illustrated is only 3⅝" outside diameter, yet it will cut from the smallest up to 1" standard thread and up to 1⅛" fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or aeroplane plant for certainty.

Made in 9/16", 1", 1½" and 2" sizes.

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Getting the right thread lead instantly, and maintaining a constant check upon it, minimizes the possibilities of delays in assembling and reduces the number of parts scrapped through incorrect measurements.

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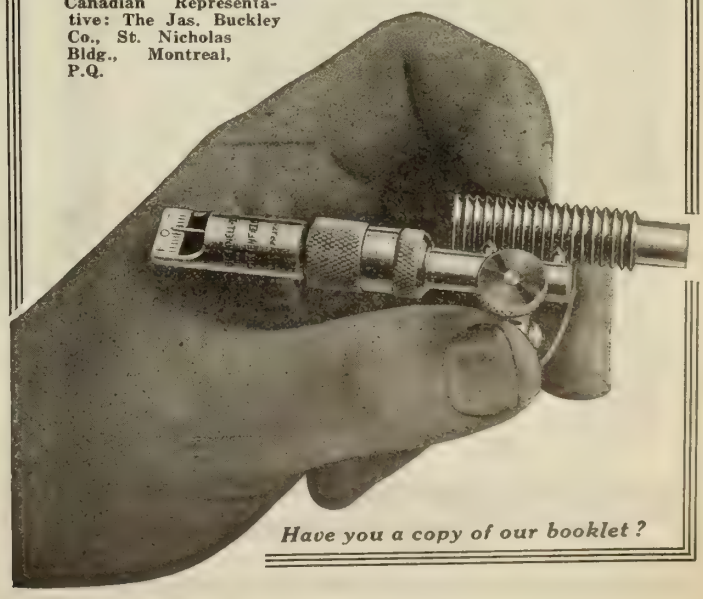
Canadian Representative: The Jas. Buckley Co., St. Nicholas Bldg., Montreal, P.Q.



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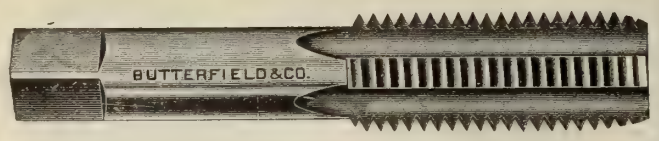

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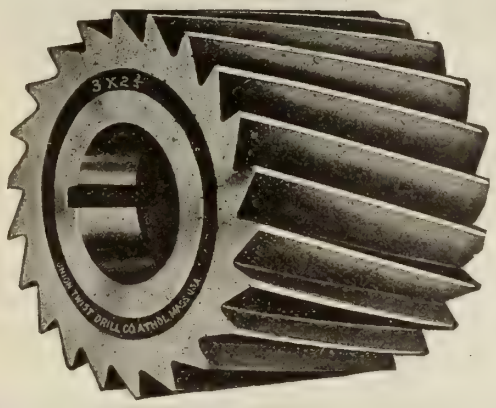

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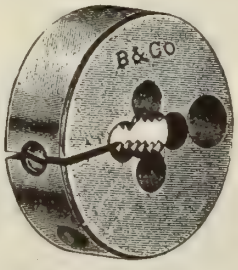

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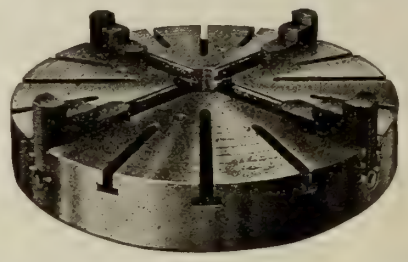

It has an iron body, and is made heavy and strong. The double bearing ribs for the jaws make a stiffer chuck for heavy work than the ordinary single rib type.

The screws are also of the "socket" type and operate in hardened steel thrusts, which also add to the strength and stiffness of a chuck that is designed for **heavy duty.**

The jaws are wide and the screws are correspondingly large.

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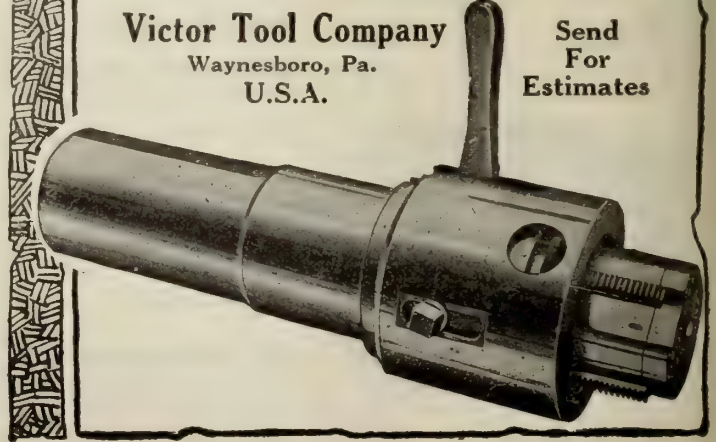

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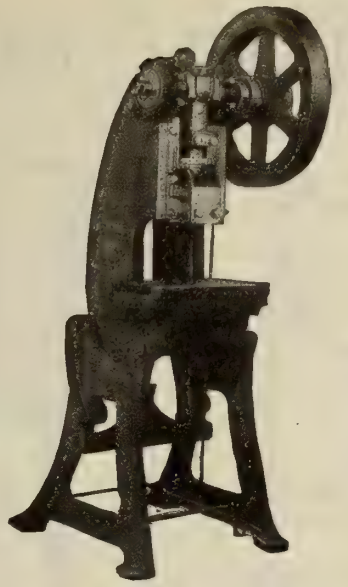

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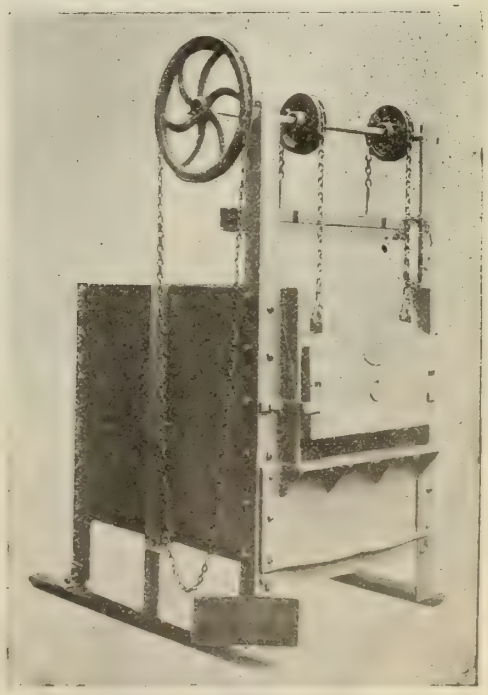

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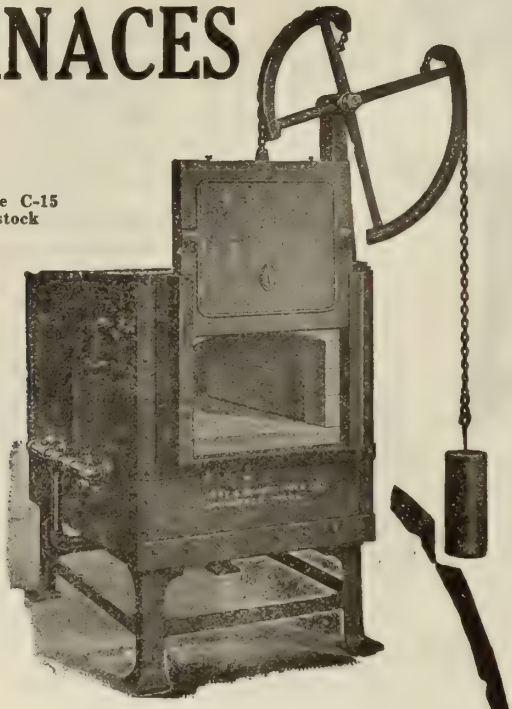

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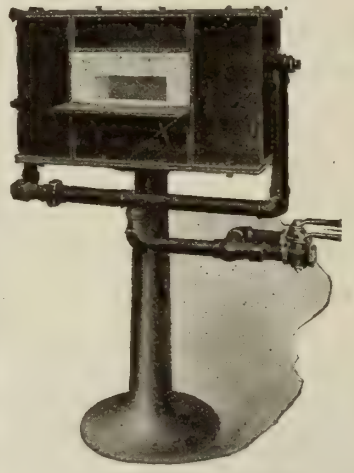

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Furnaces built for special requirements

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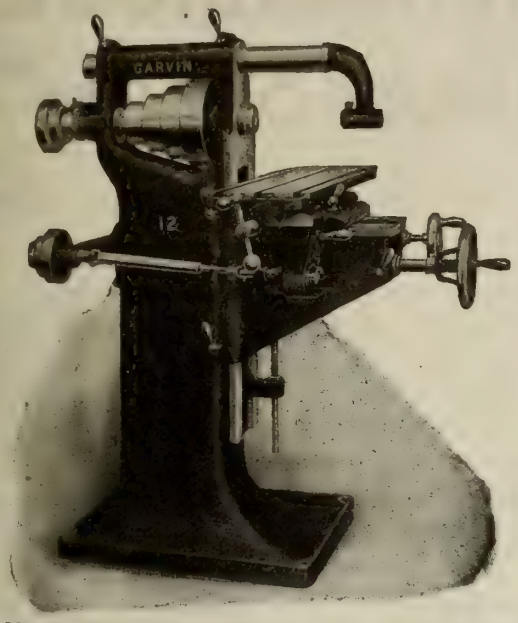

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NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments .....18 x 6 x 15 in.

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"These machines were put in operation immediately upon arrival, have been producing ten hours per day every day since, and we have never experienced a bit of trouble with same." We know you will appreciate what this means in any shop, and believe this is the sort of machine you are looking for. We consider the machine the finest in its line on the market to-day, and believe an installation would save money for you in the cost of your production.

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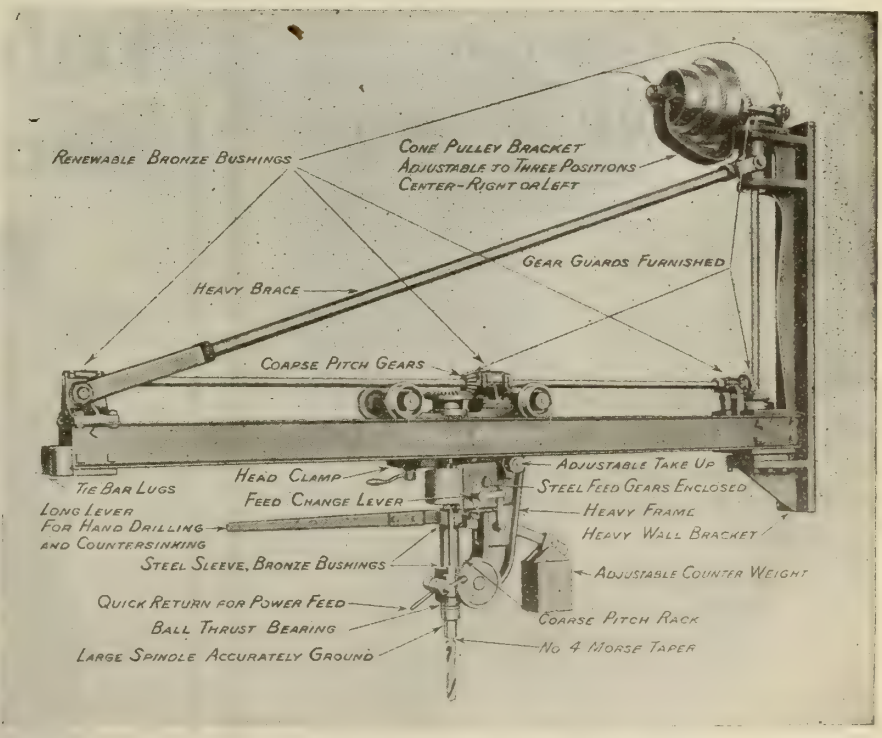
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

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Registered U.S. Patent Office

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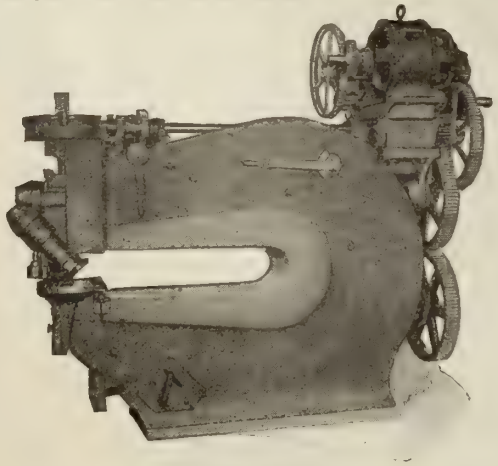
Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



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Eliminates Oxyacetylene Cutting and Plate Planing

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Boys on Grant Riveters accomplish two and three times as much perfect riveting as an equal number of men using ordinary machines.

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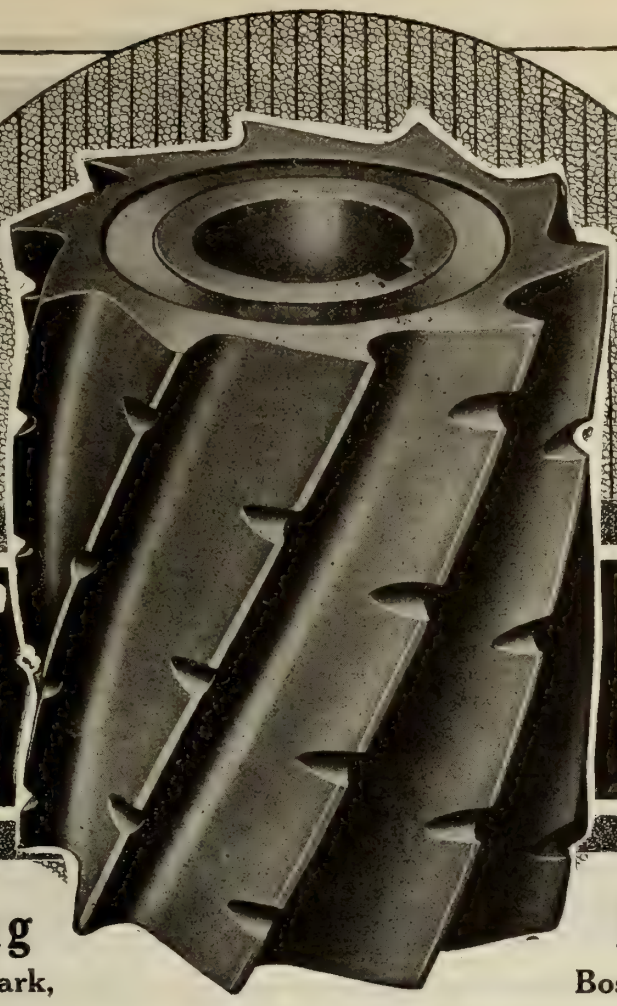

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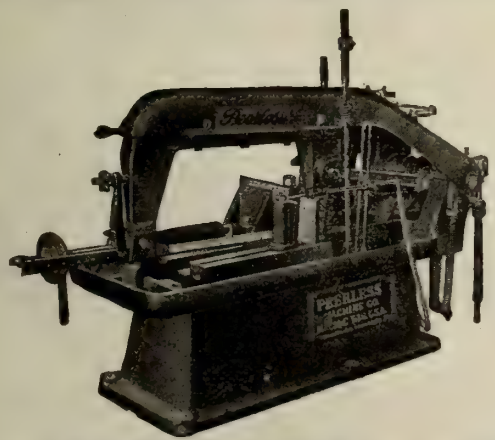

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Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

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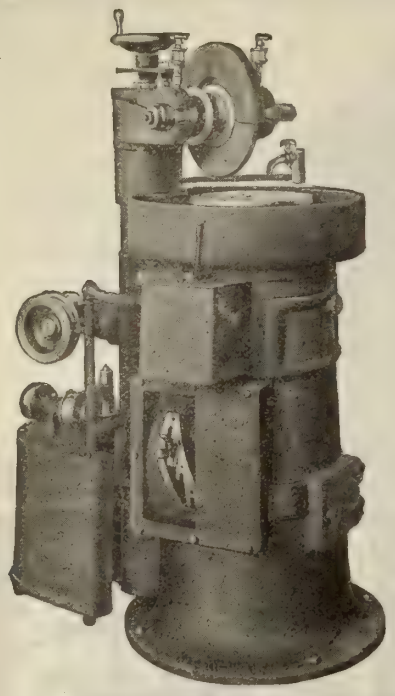

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Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

Bristol Rotary Surface Grinders are made in several types and sizes and are regularly equipped with 8-in., 12-in., and 16-in. magnetic chucks, either belt or motor driven and for dry or wet grinding.

Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

Grinds within .0004 in. of absolute Accuracy

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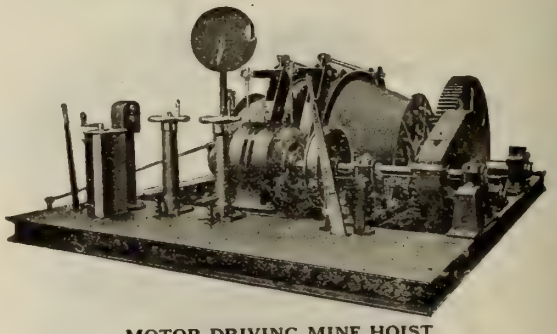

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The "Gun" Tap holds all records for accuracy, speed and durability. Its shearing cut requires a minimum of driving power and is self-cleaning—it shoots the chips ahead.

The "Gun" Tap maintains its size and lead in any material.

The Acorn Die

The Acorn Die is capable of a minute adjustment, holds its lead with accuracy, is absolutely rigid while cutting and will outwear a number of ordinary dies.

Nicely illustrated booklets describing the "Gun" Tap and the Acorn Die will be sent on request. Also new No. 40 Small Tools Catalog.

Wells Brothers Company of Canada Limited
GALT, CANADA
Canadian factory of the
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98

Notes On Grinding
NORTON COMPANY, WORCESTER, MASS.

No. 63A

Automatic
vs.
Hand Feeding

A great many operators are indifferent about the method of feeding the wheel into the work, and this attitude brings varying results in the finish ground product. There is entirely too much tendency on the part of those operating grinding machines to use a hand feed in bringing the wheel in. This results in irregular feeding and calls for undue service from the wheel.

In previous articles it has been pointed out that the relation of wheel speed to work speed and the amount of feed are responsible entirely for the degree of efficiency with which that wheel operates. If this hand feeding, which varies from time to time, is persisted in, naturally the wheel, under certain conditions will not act efficiently. Those conditions arise when the wheel is fed too deeply into the work for the grain and grade and speeds used.

All good grinding machines are provided with automatic feeds and these automatic feeds are so arranged as to regulate the amount of feed that the wheel advances with each revolution of the work, or each stroke of the table, there being different kinds of feeds which carry either at each end of the stroke of the table or at each revolution of the work. These predetermined and regular advancements of the wheel allow such a wheel to act under its normal and effective conditions, resulting in a greater output, longer life of wheel and increased quality of product.

Many times chatter marks can be traced to hand feeding. The operator may be pressed for large production and brings his wheel in rapidly, in order that he may perform with his hands other operations, such as dogging the work. This allows the wheel to fill with steel and cut irregularly on the face. When the cut is allowed to die out, chatter marks, mottles, or blemishes in the work are produced.

Production is also affected by these conditions. It is universally true that where the automatic feed is adhered to religiously, production is at its highest point and quality is always the best.

Alundum wheels of the vitrified process are recommended for the internal grinding of hard and soft steel.

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Grinding Wheel Plants, Worcester, Mass.

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FOR TRUEING GRINDING WHEELS
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The photograph, taken in the plant of the Torbensen Gear & Axle Company, shows a Norton Machine grinding the tapers for axle bearings of two-ton truck.

The limit of tolerance is .0005 in.

The material is chrome vanadium steel.

The size: rough, 2.190; finished, 2.165.

The output: 75 per 10-hour day.

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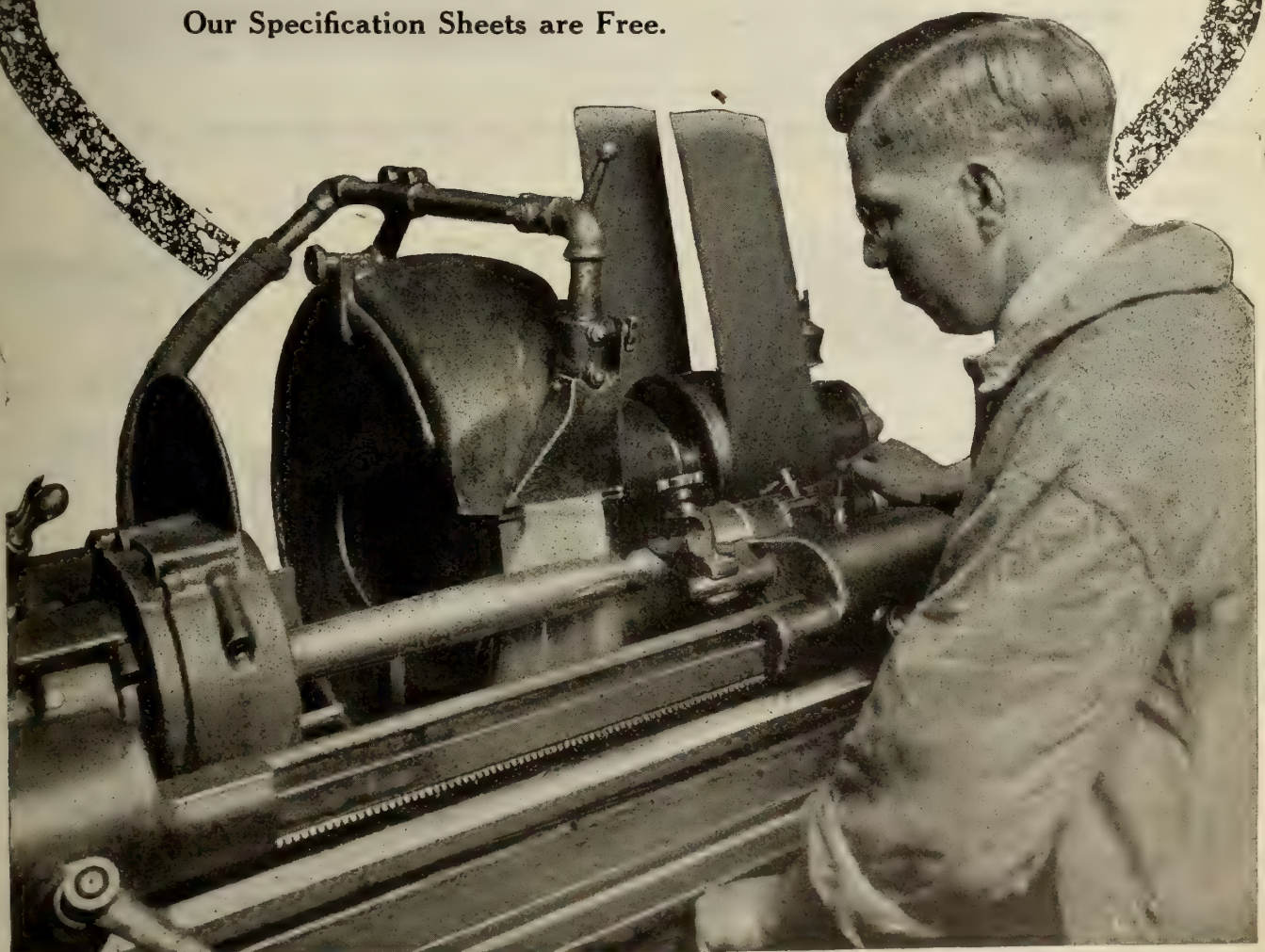
N-202



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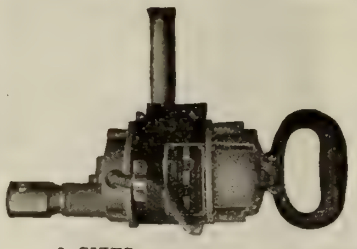

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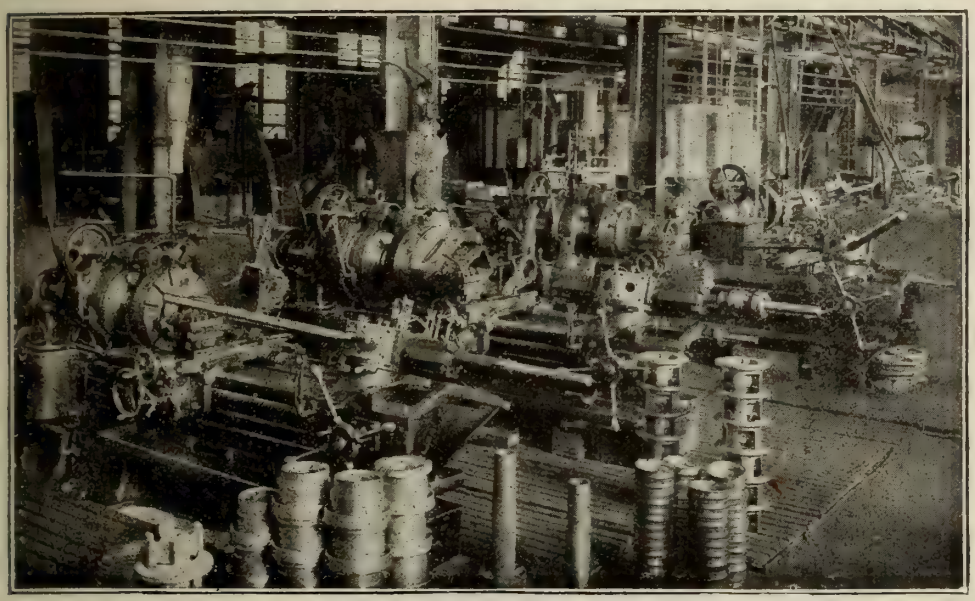

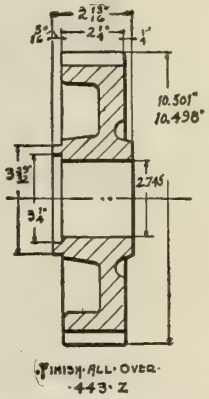

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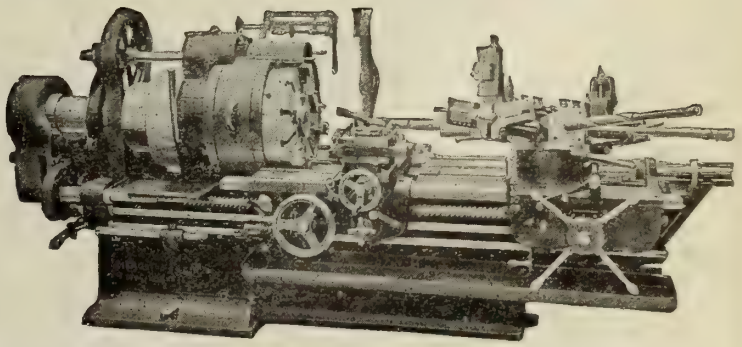

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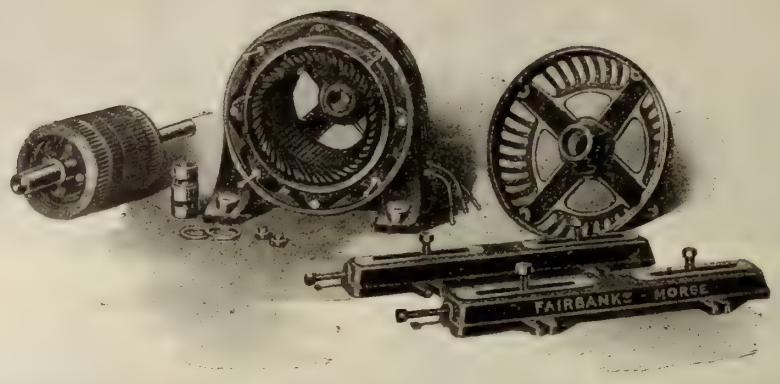

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 4 Toronto, July 24, 1919

Building 5-inch Gun Mounts at Brantford

Close Limits Were Absolutely Essential on This Work—First-Class Tool Equipment, Together With Special Machines and Fixtures, Made Such a Condition Possible—This Article Will Appear in Two Parts

By J. H. MOORE, Associate Editor Canadian Machinery

HOW many readers of CANADIAN MACHINERY know that for the past 2 or 3 years, right up in Brantford, Ontario, a large, up to the minute machine tool plant has been turning out 5-in. Naval Gun Mounts for Uncle Sam's Navy? Not many, I'll warrant, and yet such is the case.

To confine the main information to its briefest form, let us just state at the commencement of this article that the firm spoken of is the Dominion Steel Products Company, of Brantford, and the work and its procedure of manufacture, refects great credit to the above firm for the way the product is being handled.

The machine tool equipment in this plant is a positive treat, and if the writer does not enter into each particular tool throughout the plant, it is not from lack of enthusiasm, but rather through lack of space in an article of this nature. He will, however, try, in as far as possible, to give readers a good idea of the general main operations, and method of manufacturing this gun mount, so asking readers to remember that this article s subject to check from the U. S. authorities, therefore all definite dimensions or detailed drawings and sketches are omitted.

We will now go on to the article itself, and to form a good idea of what we propose following up let us look at Fig. 1, which shows a mount practically completed.

This view is shown with a two-fold purpose, first to bring to the reader's eye a general assembled view of the product about to be discussed, and second, to explain points on the photograph. We will not however touch on these points for the present, but ask the readers to simply study the photo for a general idea only, and to remember that the portion marked A is called the stand, the portion B the carriage, and the portion C the slide.

These three portions are the main castings on this product, so now since readers are no doubt familiar with its general appearance we will pass on to the portion A, the stand, and follow up its operations.

The first few operations are completed on Bertram vertical boring mills, the first of these operations being facing off the bottom. The next operation in sequence is illustrated at Fig. 2.

This operation consists of boring and turning to the various diameters, double heads being used as can be seen from the photograph. In the next operation a bronze ring is shrunk on the portion

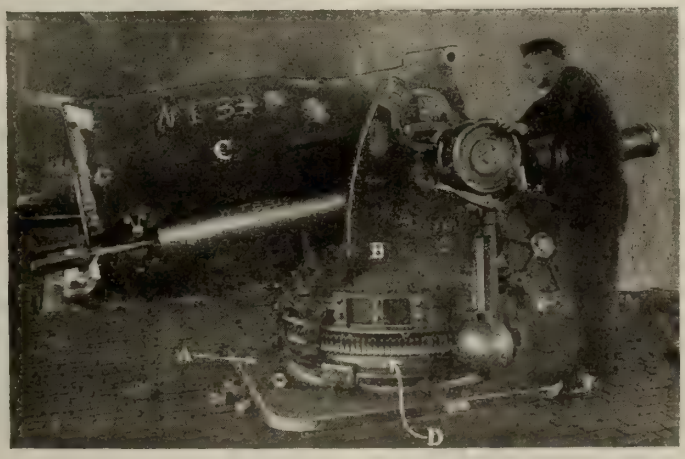


FIG. 1.—GENERAL VIEW OF THE MOUNT.

A, and turned to size right in place on the mill. The other remaining operations are the standard style of milling and drilling, so no further mention of these is made, except to say that before completion, the roller race seat is scraped in carefully to allow the same to run correctly.

The Training Circle

In Fig. 7, we show the operator at work cutting the training circle already spoken of. This is a very important and interesting operation, and some particulars as to the style of machine tool used, the time spent on the operation, etc., etc., will not be amiss. First the piece itself is made of cast steel. The machine used is a gear cutting machine, made by the Jones Superior Co., of Chicago, Ill. There are 135 teeth in this circle of 1 in. circular pitch. The work is cut with a Brown and Sharpe hob running at 76 in. per minute. Lard oil is used as a lubricant, and the time spent in cutting one of these circles is only 5 hrs., which is splendid time as readers will no doubt agree. The work comes to this machine direct from the lathe. The contour of the worm is machined out, but otherwise no previous gear cutting work has been done on this piece. Of course readers can understand that the circle turns slowly around as the hob revolves, the teeth being cut deeper each revolution.

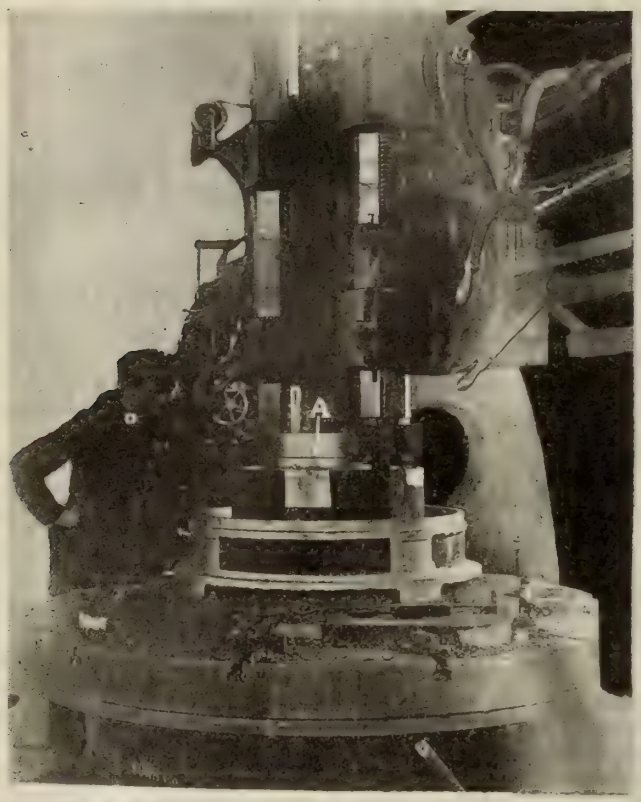
The Carriage

We will now pass on to the carriage, and its various stages of manufacture. The very first stage is the laying out process. In fact this laying out operation is the first stage of operation on all the larger castings, including the stand we have already described. First the casting is painted with a whitening compound as shown at Fig. 3, when the various lines, centre punch marks, etc., are laid out. In this photo you will note the heavy angle plate, used in conjunction with large hand marker. The workman simply gets the angle plate in proper position on the layout table, places the marker against the face of the angle plate, and drawing it down the plate, describes with the point of the marker whatever line he desires. In the case shown on the photograph he is drawing in the line designating the centre of the carriage. To watch this fellow at work is a treat, for he has become so accustomed to his work, that what to the average workmen would be a painstaking and ardous task, is to him

a mere matter of routine work. Readers will note the huge surface gauge used on this work, and the proportion of the workman to the casting of the carriage, will give some idea of its relative size.

Immediately the carriage is laid out, it is picked up on an electric crane, and taken direct to the boring mills, which start the first actual machining operation. Two 7-ft. Bertram Vertical Boring Mills handle these carriages, and they are placed in a large special designed jig for the purpose.

They next go to the radial drill, and have some rough drilling operations performed on them, but as this is standard work, no special mention of these operations is made.



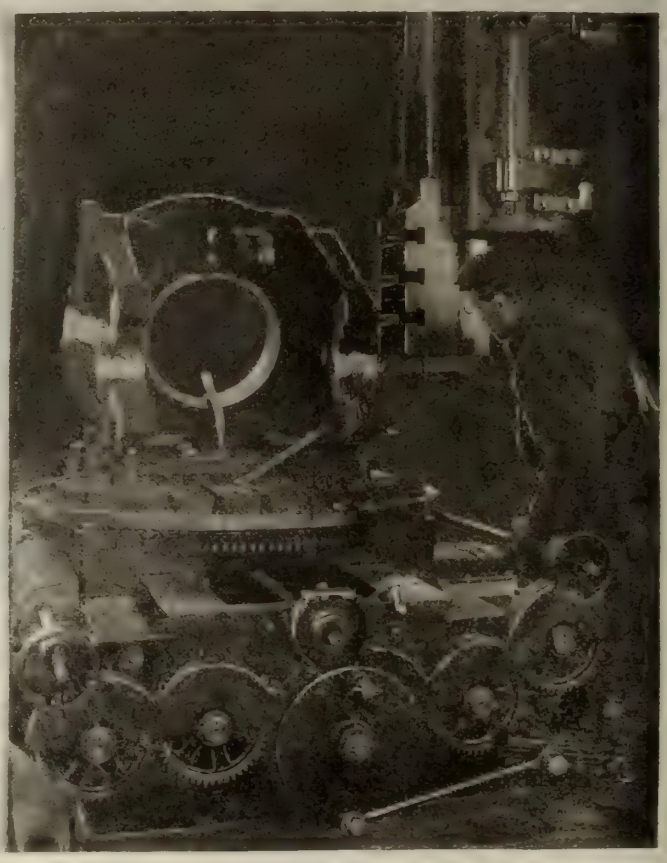


FIG. 2.—BORING AND TURNING THE STAND.
FIG. 4.—FACING THE TRUNNION BEARINGS.

FIG. 3.—LAYING OFF THE CARRIAGE.
FIG. 5.—SLOTTING OPERATION ON THE CARRIAGE.

They are now moved to a huge 24-in. C. M. C. slotter such as shown at Fig. 5, where various operations are performed

as follows. The sides of the trunnion bearings are machined as shown on the photo, and also the bearings are slotted out to suit the caps for same. The portion marked A on Fig. 3 is also machined on this slotter, the gearing mechanism shown on Fig. 5 allowing for the turning of the slotter table at the proper speed to make a complete circle at the proper relative speed to the ram and cutting tool of the slotter. The time taken on these operations varies with amount of stock to be removed so no mention of actual operation time is given.

The doors B (see Fig. 3 once more) are also milled, for these must be absolutely water tight when the door covers go on.

The carriage is now moved to a battery of five 6 ft. x 6 ft. Landis horizontal boring mills.

Various operations are performed on these machines, but as we cannot enter into too much detail without occupying an enormous amount of space, we take up only one operation on these machines, namely the boring of the trunnion bearings after the caps have been placed in position, also the facing of these caps and bearings.

The boring of the trunnion bearing holes is of course done with the usual boring tool and bar, while the facing is done by means of two heads shown in Fig. 4. The operation is self-explanatory for the average machinist knows how such a style of facing head works. A very notable feature about these machines is this: that each machine is kept in perfect condition, in fact the same may be said of every machine in this plant, for the tolerances allowed in the various operations are so small that it is an absolute necessity that all machines be kept in the pink of condition. Another feature in these mills is that each mill has been specially fitted with a vernier attachment, which guarantees the working to very close limits with perfect safety. This vernier scale is attached to the cross feed of the machine.

There are, of course, other operations in these carriages before its completion, but we have touched on the principal ones to give readers a fair idea of the work involved.

The Slide

This piece is of course laid out first, after which it goes to a huge planer, and various operations are performed, but as these are of the usual nature we pass on to the actual boring operations.

The slide is now moved to a specially adapted Le Blond Lathe, and the centre hole is rough bored. After this preliminary operation it is moved to the machine shown at Fig. 6. This was built by the Conradson Machine Co., of Green Bay, Wis., and detailed attention to its construction is well worth while. The machine consists of three independent drives, namely the main spindle, and the two side spindles, one of which is clearly shown at A. It will be noticed that two independent motors drive these side spindles. Briefly the action of operation is as follows: The main spindle finish bores the centre hole, which receives the gun barrel, while the two side spindles with the aid of special turning heads B, turn the two trunnions, as can be clearly seen from the photo. It can be noticed that the complete slide is enclosed in a special jig for the purpose, in fact it is the splendid system of jigging as adopted by this concern that makes the turning out of this product such a success.

Two bronze bushes are now pressed into this finished bore, a long, and a short one, the former being towards the outside portion of the slide when assembled. These bushes are of course machined in other operations, but again we do not touch on these points simply because the work is of the usual style, and therefore of no special interest to the reader. After these bushings are in place, they are finished bored right in position in the slide. To do this they are placed in a special jig, and bored in a lathe as shown at Fig. 9.

It will be noticed that this jig is so constructed that the work is supported directly from the trunnion bearings which have already been turned. In fact to be exact, various other operations have ensued before this operation takes place, but we show it now for convenience, besides, we wish to refer to this view a little later as readers will discover later on in the article. But to continue on the finish boring of these bushes. The style of boring head as employed can be plainly noted, so no further comment on this point is necessary.

We would like however to call readers' attention to the parts marked A and B on this photo. At these points can be fastened a connecting rod, which pulls the saddle up and down at the proper speed to groove the bush for oiling purposes.

This idea cannot be as clearly illustrated as could be desired, but readers by following the description can see how the scheme works out. In the direct centre line, (not seen on photo) but about the position A is a crank, with T slot cut across its face. The action is now perhaps self-explanatory to many readers who have run shapers at some time or other, for the action of the stroke is similar. By connecting the rod between the permanent bolt B, and the sliding bolt on this disc A, the stroke can be altered to suit requirements. The worm shown at C is connected to a worm wheel, and the rate is such as to give the desired spiral twist to the grooving. This idea is adopted at various points throughout the plant, not always by means of worm and worm wheel, but in some cases by compounding trains of spur gears.

Special Profiling Machine

We will now refer the reader back to Fig. 9 for a definite purpose, namely to call his attention to the portion of slide marked D. This operation is known as the knife edge bearing support, and is a very important operation, as the bearing which goes into this seat takes the complete weight of the gun. For the present let us content ourselves by studying its general shape and appearance.

To machine this portion a special portable profiler was made as shown at Fig. 8. This machine in itself is worthy of special atention. First, the slide itself rests on a special jig plate. The portable combination table and head is now placed directly over the trunnion bearing. This table has a hole in it the correct size to accomplish this object. Of course, the idea is now clear as the machine is now ready for work. First the portion to be machined is milled to width, then to length. It is now faced to height, and a radius milled on the sides. The portion of slot cut into the trunnion is now machined. Of course, as can be seen, an independent self-contained motor drives the machine. This idea goes to show just what can be done by the making

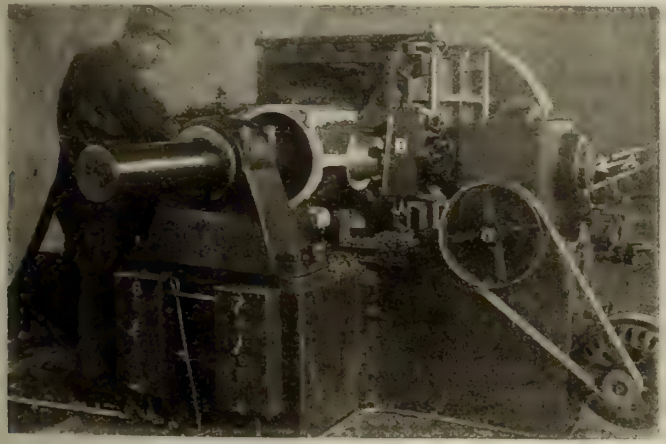


FIG. 6.—BORING CENTRE HOLE AND TURNING TRUNNIONS.

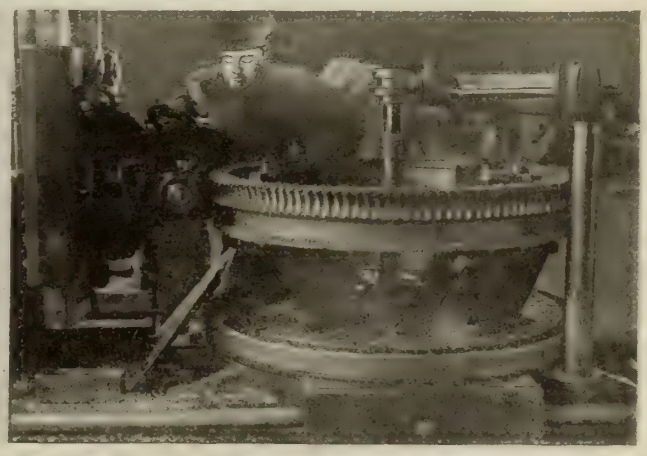


FIG. 7.—CUTTING THE TRAINING CIRCLE.

FIG. 9—BORING THE BRONZE BUSH.

FIG. 8—PROFILING THE KNIFE EDGE BEARING.

of special machinery for a special purpose.

Slide Operations

We cannot attempt to speak of all slide operations, but we shall show one more, namely the boring of the recoil cylinder. In this operation the clearance of the recoil spring cylinders is machined. The method of machining is the usual boring bar and tool equipment, the reason for the photograph, being to show the construction of the jig. On this page are three bushings on each and to guide the boring bar, the centre one now in operation being the recoil cylinder hole, the other two (one on each side) being the guide holes for bar, when the clearance for the recoil spring cylinder is being machined. Throughout the description of these operations we have not strictly adhered to the regular sequence of operations, but we have tried to speak of them in the easiest manner to be followed by the reader, as after all this style will no doubt appeal more to the general reader. Owing to the extreme length of this article we have divided it into two parts, and at this point we will drop the article for the present, but will start next issue from the point where we left off, and will continue until the completion of these mounts ready for shipment, together with other various operations involved.

Telford and Macadam, both English engineers, introduced certain principles of road-building in 1800 which are, to a great extent, the basis of modern construction.

COPRA INDUSTRY

By L. P.

IT IS the irony of fate that, while the Occident is on short commons of oils and all fat products, the Orient has a plentiful supply, of which it cannot dispose advantageously. In British Malaya, for example, the lack of shipping has militated against the copra industry.

Mr. L. Lewton-Brain, Director of Agriculture, Federated Malay States, in his annual report states that shipping difficulties caused the local price of copra to remain very low throughout 1917, and both estates and small holdings have suffered considerably. One result has been that a large number of cocoanut trees, particularly in the State of Perak, were cut out, and an enactment had to be passed to prevent a recurrence of this, except in special conditions. The price of nuts remained fairly high in the inland markets, but very low in the coast districts.

Another result has been that a discussion has arisen on the possibility of the extension of the local oil-expressing industry. So far no definite scheme has been put forward, though, as all cocoanut estates are keenly interested, it is to be expected that some scheme will be evolved before the expiry of the current year.

Upon reference to the summary of the foreign imports and exports of the Straits Settlements and British Malaya for 1917, we find that the total export of copra last year from the Malay Peninsula is given at 77,900 tons, against 73,236 tons in the previous year; but whereas the value of the 1916 export is returned as £1,407,309, the value of the larger export in 1917 is given as £1,190,-314. The export of cocoanut oil in 1917 is given as £1,190,314. The export of cocoanut oil amounted to 5,891 tons in 1916, valued at £285,373.

In view of the possibility of the African oil palm coming into prominence as a plantation crop in Malaya an experiment consisting of fifteen tests has been planned by the F. M. S. Agricultural Department, in order to determine the best method of promoting more rapid germination of the seed. The palms near the agricultural offices at Kuala Lumpur showed good growth for the year. Many enquiries were received regarding the cultivation of this crop, and the required information was given by the Department.

Frequently when visitors are invited to a factory restaurant for lunch there is some embarrassment caused when the check is issued.

This is avoided at the Ferro Machine Company by issuing complimentary lunch tickets to visitors. These are taken up by the cashier and charged to the company.

Not only does this system do away with embarrassment but is in accordance with the hospitality usually extended to such visitors.

The New Moffat Electric Steel Furnace

Features of Design Which Make For Economy in Operation and Refractory Endurance Are Incorporated—The Arrangement of Electrodes is Also of Interest

By W. F. SUTHERLAND

RECENT developments in the smelting of iron ores by a duplex process employing the electric furnace as the final step for the melting of sponge were described in the April 3 issue of CANADIAN MACHINERY by J. W. Moffat. While the electric furnace which will be used in this duplex process may be of any type, it is of interest to note that Mr. Moffat has developed a design for the refining of steel which is capable of very economical operation.

In some respects this electric furnace resembles the three-phase types now in common use, the three electrodes projecting into the bath from above. Usually in such furnaces, however, the refractory lining of the walls and the shell are circular in shape, and the electrodes are arranged one at each angle of an equilateral triangle equidistant from the walls.

In the operation of such furnaces trouble is frequently encountered by reason of the crescent-shaped masses of partially fused raw material found clinging to the walls between the electrodes, this material being thickest at the point midway between any two electrodes. These masses are often difficult to get into the bath, as in their partially fused state they adhere to the colder wall of the furnace. In endeavoring to remove them by mechanical means, injury is often done to the lining of the furnace, portions being carried away and into the bath.

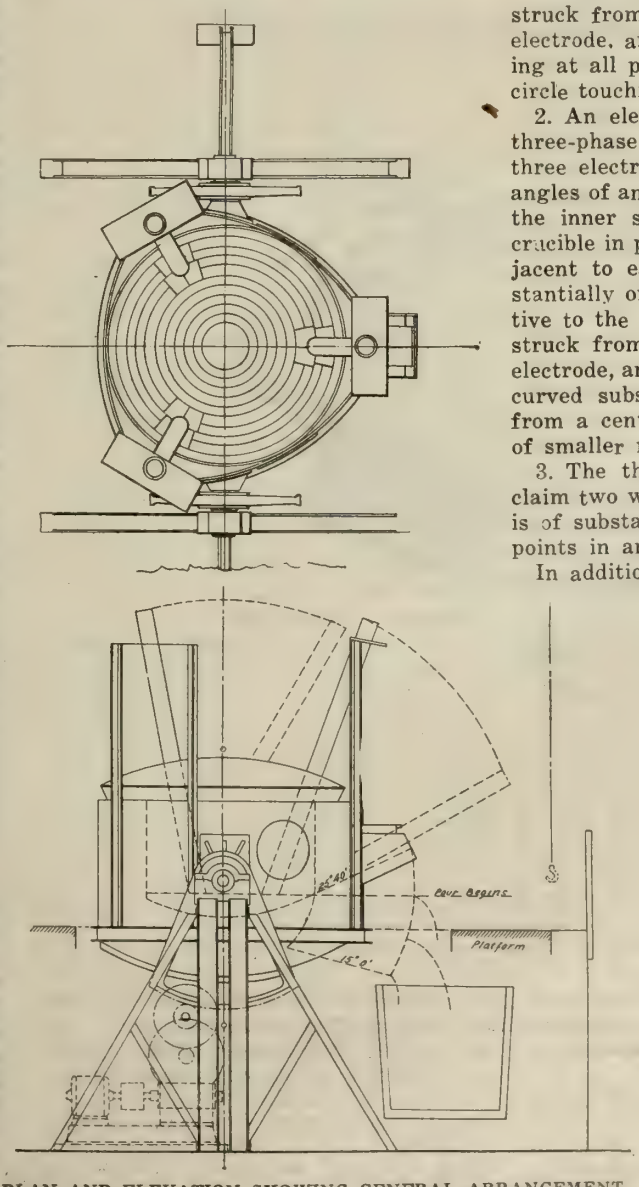
The more usual practice is to increase the input of electrical energy and to melt off the partially fused material. This procedure, however, increases the length of time for the manufacuring of the steel, often as much as one-half hour in a heat which should be taken off in about four hours, and means an increased cost amounting to 12 to 15%. The practice is also objectionable, as it leads to overheating the already fused material in the bath, and also to the overheating of the furnace walls nearest the electrodes.

New Design

In the design developed by Mr. Moffat, for which patents have been recently issued, these difficulties in operation have been overcome by shaping the body to conform to the lines of current flow in the bath of molten metal. The characteristics of current flow in a flat plate or an approximation thereto are well known, and the current is distributed throughout the metal, the lines of equal current density being in the form of current arcs from pole to pole.

The shape of the walls is well illustrated in the accompanying diagrams, and it will be seen that the walls are brought inward between electrodes in such a fashion that no cold spot occurs, and the growth of partially fused nodules of metal avoided. In other words, the furnace walls are so shaped as to conform to the isothermal lines of temperature in the furnace.

It is also found that to secure the best results in wall life, that the wall itself should be of equal thickness at all points in any horizontal plane, and by so arranging it, the radiation is the same at all points, thus rendering it impossible for any one point of the inner lining to become heated to a higher temperature than other parts of the same wall. In this way the overheating of portions of the wall is avoided, and one of the most fruitful causes of short refractory life avoided.



PLAN AND ELEVATION SHOWING GENERAL ARRANGEMENT.

The claims made for this furnace in the patent specifications, are of interest, and are given below.

1. An electric furnace, operating with three-phase current, and provided with three electrodes arranged in plan at the angles of an equilateral triangle, in which the inner surface of the wall of the crucible in plan is shaped as follows: Adjacent to each electrode curved substantially on an arc of small radius relative to the spacing of the electrodes and struck from a centre in the axis of the electrode, and between the electrodes lying at all points within a circumscribing circle touching each of the arcs.

2. An electric furnace, operating with three-phase current and provided with three electrodes arranged in plan at the angles of an equilateral triangle, in which the inner surface of the wall of the crucible in plan is shaped as follows: Adjacent to each electrode curved substantially on an arc of small radius relative to the spacing of the electrodes and struck from a centre in the axis of the electrode, and between any two electrodes curved substantially on an arc struck from a centre adjacent the opposite arc of smaller radius.

3. The third claim is a repetition of claim two with the addition that the wall is of substantially equal thickness at all points in any horizontal plane.

In addition to the above operating advantages, the shape lends itself to the securing of a number of other important advantages. The lining is built up entirely of key and wedge bricks. This results in their being held rigidly in place relative to one another, and they are, in consequence, unable to work inwards to the open space of the bath. The bottom is an inverted arch formed with an outer lining of arch brick, silica or fire-brick, and an inner lining of magnesia key brick on top of which may be placed another course like that last, or a burnt-in bottom of grain magnesite may be used of equal thickness.

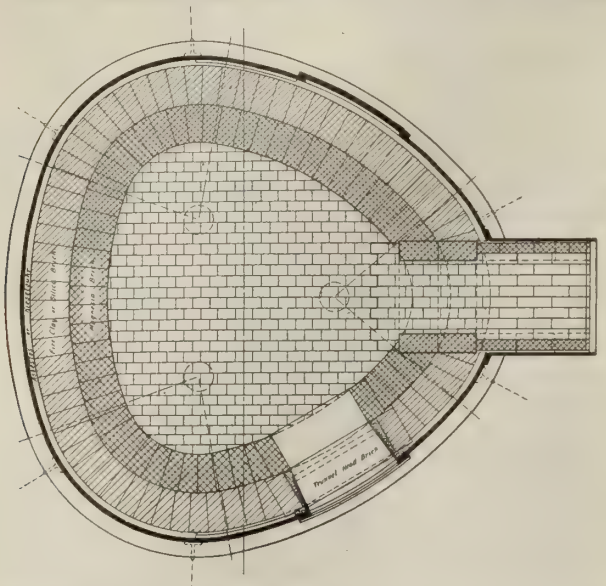
If the operator in taking a heat is careless and not watching his slag, there is no fear of a run-out caused by a brick floating up, as they are all keyed.

The Roof

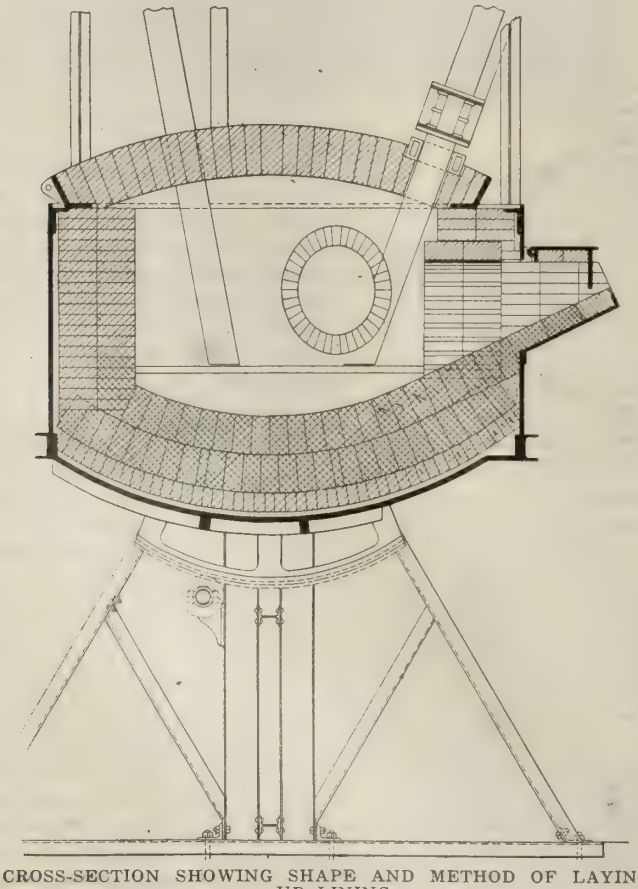
When the furnace requires a new roof it can readily be placed in position with the aid of a crane in about one-half hour, owing to the convenient arrangement of the electrode guides.

On each electrode two upright guides are spaced equidistant from the electrode opening in the roof. At the top of these uprights the guides pass downward at an angle of 70°, and are fastened to the roof cooling casting inserted in a gain made in the roof brick around the electrode opening. These guides are hinged at the top of the uprights.

When a new roof is to be placed in position two bolts are loosened, and after the electrode has been raised to clear the roof all that is required is to lift the roof cooling casting about two inches, enough to clear the gain in the roof, and the whole assembly can be swung out of the way of the old roof being taken off and the new one being placed in position.



SECTIONAL PLAN SHOWING SHAPE AND METHOD OF LAYING UP LINING.



CROSS-SECTION SHOWING SHAPE AND METHOD OF LAYING UP LINING.

SCIENTIFIC RESEARCH

The Special Committee on Scientific Research deserves and requires generous encouragement and financial support from the Government. Under the sanction of the Research Council Act of 1917, and by means of the Honorary Advisory Council for scientific and industrial research a survey of the field has been made. Time has come when further steps must be taken and additional financial support be available if Canada is to keep pace and make a proper use of its assets.

We have no institution corresponding to the Bureau of Standards at Washington, so are dependent on U. S. and other countries for information and guidance in matters which vitally concern her industries. The committee recommends the establishment of a Dominion Bureau of Standards. Concerted and continued efforts should be made to place before the people the facts concerning scientific research and the advantages of national support thereof. The committee does not feel they have had sufficient time to digest evidence and so forth to make definite suggestions, and asks to be reappointed as early as possible next session to give the matter further consideration. They ask that their proceedings be printed for distribution and be put in the sessional journals.

There are, for instance, 1,500 square miles of tar sands in Northern Alberta near Port McMurray in a stratum from four to ten feet thick, and the tar in the deposit ranges in concentration from ten to eighty per cent. The tar sand was used to pave a street in Edmonton, which pavement has been in satisfactory use for five or six years. The quantity of sand mixed with the tar is a handicap, as, if transported long distances, the sand would be a serious factor in the freight charges. A grant was made to determine a cheap method of separating the tar from the sand on a large scale, but, owing to the impossibility of finding scientific and specially qualified engineering experts, nothing has yet been done.

SAFEGUARDING BAR STORAGE

In storing steel bars it is quite common to stand them on end in special racks. For that matter this is one of the most economical and space-saving methods of storing. These round bars, however, unless the workers are quite careful, are apt to fall over.

To prevent this, one firm has placed a bar across the front of each rack. This can be lifted up out of the way when it is necessary to take out steel bars and then placed back in position before the worker leaves the storage rack. Perhaps some such method as this would make the bar storage safer in your plant.

British Mission to Canada.—The National Union of Manufacturers of Great Britain is proposing to send six of its most prominent members to Canada to study conditions, and obtain information relative to the furtherance of British export trade to Canada.

The Scope of the Works Laboratory

The Relations Which Should Exist Between a Works Laboratory Are Herein Ably Discussed—This Paper Formed an Interesting Subject Before the Birmingham Section of the Institution of Mechanical Engineers

By MR. BARCLAY

THE relations which should exist between a works laboratory were very ably dealt with in the paper which Mr. Barclay read before the Birmingham section some time ago. Mr. Barclay has certainly earned the gratitude of all existing and potential works chemists for the very eloquent way in which he described some of the directions in which a works laboratory could be of real practical use to industries. This paper is the result of a suggestion thrown out during the reply to a somewhat lengthy discussion, and is not therefore to be regarded as a separate dissertation, but rather as a further contribution to that discussion. It is not overstepping the mark to say that the future industrial prosperity and commercial supremacy of our whole Empire depends to a vary large extent upon the application of science to industry, but nevertheless it is a somewhat appalling thought that only the shock of the most disastrous war which has ever stemmed the tide of civilization could bring home to industry the desirability of a closer union with science. Even now it is doubtful if the advantages to be gained from a proper application of science to industry are recognized to anything like the extent they should be. The view "of course it is the patriotic thing nowa-days to employ Doctors of Science and those sort of people, but when the war is over we shall be able to do without them" has been expressed. This is no doubt an extreme case, and it is exceedingly gratifying to report such a feeling does not exist in the metallurgical and engineering industries. In these industries, at least, there can be no doubt that the laboratory has come to stay. And why? Because it has proved its value. The fact that the laboratory has come to stay because it has proved its value is a most important one, which should be taken to heart not only by the captains of industry, but also by the laboratory workers. Since, therefore, there is in one section of industry an undisputed demand for trained scientific workers, it is highly desirable that the demand should be catered for as widely as possible. In this connection it is quite futile to quote as examples Germany and America, for granting the fact that a closer application of scientific principles has contributed to their rapid rise in the industrial and commercial worlds, their cases are not parallel with ours. The great Anglo-Saxon stock from which we have sprung has always been a pioneering race with originality for its most powerful characteristic, and to graft on to that character the Teutonic attributes of copying and exploiting would be a great national disaster. Rather let us seek out some method of our own, and in its development use our natural judgment in determining the modifications which seem to be advisable in view of what has occurred in other countries. They have undoubtedly made mistakes by which we should profit, for herein lies the key of progress. Perfection is an ideal which can only be striven after; it is not within human capacity to attain it, and after all, the perfect world would probably be a poor sort of a place to live in.

The statement of the problem is very simple—on the one hand we have that most fascinating study, science, and on the other hand industry, on which our greatness as a nation depends, for after all it is the industry of a nation and not its "will to conquer" which determines its ultimate greatness; the problem is to determine how the two can be harnessed together so as to be of the maximum use to each other. We hear so much of the benefits which will accrue to industry by the application of science to it, that we are apt to overlook the fact that industry has been of incalculable help in scientific development by supplying it with many complex and fascinating problems, and the recognition of this fact by the scientific worker is of equal importance, with the recognition by the manufacturer of the benefits which his particular industry will derive through the assistance of science. Obviously the first thing to do is to provide a laboratory; not a very difficult matter in these days, when manufacturers are even prepared to co-operate in their upkeep. At the very outset it is essential to confine our attention to some particular type of laboratory, for since there are over 20 different branches of industrial chemical activity, it might be assumed that there must be essential differences between the functions of the laboratory in a fine chemical works and that in an engineering works; but a closer inquiry indicates that the differences are only in matters of detail. Differences in detail will always occur; for if they arise in no other way the human element will create them. In such an inquiry as this we can only consider general principles and leave details to look after themselves; far too many promising schemes are nipped in the bud by a too early attention to detail. To avoid confusion, however, our attention will be confined entirely to the type which should be formed in works engaged in the production or use of metals, for both these works will require laboratories of similar type and equipment. It is not within the scope of this paper to discuss design and equipment: these will depend largely on the staff, for each man will have his own particular method of attacking a problem put to him. The equipment, however, should include a technical library, and the staff should have access to current technical literature in all languages which they are capable of reading. Mr. Barclay has already outlined the work which a laboratory should undertake—in brief, his paper means that the works laboratory should be held responsible for the quality of the raw material and materials incidental to manufacture coming into the works, and also for the quality of the finished products. Such responsibility should have a very wide interpretation, probably wider than many chiefs of laboratories would like to see. It should not merely consist in writing out analytical reports and consigning them with a sigh of relief to some poor overworked works manager. Such procedure usually results in their being lost amongst other documents which are apt to accumulate on his desk. Properly interpreted there can be no question as to the utility of analyses, and wrongly interpreted they are worse than useless because they mislead, and the proper interpretation of analyses can only be done properly by some responsible member of the laboratory staff. I remember some time ago listening to a most interesting lecture on "The Worries of a Works Manager" before one of our engineering societies. The lecture was quite a long one, but in spite of this there was no mention of the interpretation of chemical analyses. In cases of doubt as to the quality of raw materials it should be one of the duties of the laboratory to take up the question directly with the suppliers, and not through the intermediary of a third party. Then less would be heard of such foolish actions as the rejection of a batch of material because analysis shows it to contain 0.033 per cent. of a certain impurity, while the specification demands that it shall contain not more than 0.030 per cent. Such an arrangement would prevent woeful misinterpretation of results, and incidentally would cut down the amount of transport carried out on the material, for there can be no doubt that such material frequently finds its way back again to the user, disguised under another batch number—a fate it so justly merits after rejection

*Paper read before the Institute of Metals on Wednesday, March 20, 1919.

on such trivial grounds. In addition there is the added advantage that the laboratory would take greater care in sampling and carrying out its tests. In cases where works are enabled to afford the luxury of a buyer, such a scheme need not necessarily cause clashing between the laboratory and the purchasing department. Their duties should be clearly defined; the laboratory should control quality, and the purchasing department should control prices after the quality has been settled. In a good organization there is ample scope for both departments, and they should be encouraged to work in closest co-operation. It frequently happens in a works that unnecessarily high prices are paid for certain materials because of groundless fears of using cheaper ones, whilst on the other hand false motives of economy in purchase often lead to vastly increased costs of production. In this respect the laboratory can be of immense practical use in making a study of the effects of variation in composition and physical condition upon the costs of production, and for this purpose a knowledge of prices is absolutely essential.

Another function of the laboratory should be to carry out research with the objects of discovering new products and processes and of introducing improvements into existing ones, and this function is the one most likely to appeal to the trained scientific mind. This branch of the work will include the investigation and rectification of faults. The last function is one which has already been dealt with by Mr. Barclay, and is the one which gave rise to the controversy in the discussion of his paper. Direct control should be exercised over all processes of a purely chemical or metallurgical nature, such as smelting, refining, remelting, annealing, heat treatment, electroplating, and so on. The determination of the extent to which the laboratory should exercise control is a very moot point. Certainly the laboratory should determine and directly control the methods which are to be adopted, but as to whether it should go further and control the questions of labor and costs is a very difficult question to answer at the present time. It depends so much on the personality of the laboratory staff. In the present state of evolution there can be few highly-trained scientific workers who have had the necessary years of experience to deal adequately with the thorny problems of labor. But the time will surely come when the complete control will have to be placed in the hands of the laboratory —the laws of evolution demand it. At the present time, however, there are very few works laboratories which have evolved sufficiently to take complete control, and it would not be fair to them to add to their already multitudious duties. But it is not so much the object of this paper to dilate on the possibilities of works laboratories as to indicate to them, and also to manufacturers, the methods by which those possibilities can be developed. The possibilities of a works laboratory are unlimited if the conditions are right and its work is allowed to develop on natural lines. Swamping at the outset is fatal.

Now there is a desire on the part of manufacturers to possess laboratories with an efficient staff, and there is the will to succeed on the part of the staff. So long as the two can adopt the right attitude towards each other success is assured. Right from the outset the laboratory staff should recognize that the works is not a philanthropic institution. The success of the laboratory depends upon its being able to turn its activities and accumulated knowledge into money, and is not in any way proportional to the product of the number of chemical estimations and the number of mechanical tests it can do in a specified time. Nor is success even determined by the sharpness and beauty of its photomicrographs. They are facetiously compared with the moon. The laboratory must be a really live institution, with a determination to get right down to rock-bottom facts. It does not assist the man in the works in the slightest degree to receive a report typed on a fancy sheet of paper over a flourishing signature explaining that a certain piece of metal has failed because "a microscopic investigation under a linear magnification of 1,000 diameters, of a longitudinal section after etching in a 2 per cent. solution of metanitrobenzol - sulphonic acid in iso-amyl alcohol indicates that the 'gamma' solid solution has not completely split up into the 'alpha' and 'beta' phases." Unless the laboratory can determine the real cause of the failure and indicate how such defects can be avoided in future, it has failed in its functions. It must get into touch with actual working conditions, learn the language of the works, and exert a friendly educating influence. Its attitude towards the workmen must be a sympathetic one, and endeavors should be made to bring about improvements by assisting the natural processes of evolution which we cannot fail to see going on around us. The writer of a leading article in "The Metal Industry" has pointed out that "a great deal of harm has been done in the past through the scornful contempt with which many skilled workmen have been regarded by enthusiastic university men and chemists." Rather should they marvel that such progress has been made under such trying conditions. There are always good reasons for carrying out operations in a certain way, although there may be still better ones for doing them in different ways. The resentful attitude towards changing long-established customs is a perfectly natural and honest one, and Mr. Heathcote was quite right in regarding with suspicion the man who does not start off by opposing suggested alterations. Experience is a most valuable factor and should be given most serious consideration, and until the laboratory has gained the confidence and co-operation of the practical man it has still a long way to go before it can reach the pinnacle of its utility. The practical man can give invaluable help in working out little details which are essential to the success of any scheme, and once his confidence is gained he becomes a most useful constructive critic. Not that there is any truth at all in the mouldy old adage, "an ounce of practice is worth a ton of theory." This is usually the last resource of the individual whose reasoning faculties are exhausted. The age when theory and practice were considered antagonistic is as dead as the dodo. Theory and practice must work hand in hand, and if the practice is successful and the theory does not fit in with it, then must the theory be "modified" or consigned to the scrap-heap, where it will not be lonely. The staff of a laboratory must get out into the works and make a detailed study of things as they are and why they are as they are, for only in this way can any real and lasting improvements be effected. It is frequently thrown at scientific men in general, and the chemist in particular, that they are woefully lacking in tact, sense of proportion, common sense, knowledge of the human element, and so on. But all these faculties can be acquired to a very large extent, and the method of doing it is to practise self-control. A man who can manage himself is on the right road, and has made a good start towards the management of others. The main value of experience lies in the knowledge of the human element which can be gained thereby.

In the discussion of Mr. Barclay's paper, Mr. Heathcote very wisely pointed out that when a laboratory is installed in a works, not only is the laboratory being tested, but simultaneously a test is being made of the fitness of the works to possess a laboratory, and very frequently the failure or incomplete success is due entirely to the attitude of the works. But it is not intended to arraign manufacturers for their past sins—it would take to long. Past sins are generally the result of ignorance, and the time will be much better spent in attempting to educate manufacturers in the way they should use a laboratory, and the treatment which they should mete out to it. Just as a plea has been put forward to the laboratory to adopt a sympathetic attitude to the works, so must the works extend a sympathetic and welcoming hand to the laboratory. The manufacturer must be imbued with the right scientific spirit, and must be prepared to take the laboratory into his fullest confidence. It must be recognized that the task set is a most complex and difficult one, and one which is not rendered simpler by the fact that its activities are bound to meet with a certain amount of opposition born of prejudice. The scientific worker must be given a status which is at least equal to that of the barrister, lawyer, or doctor. And, after all, why should it not be so, for is not his training as rigorous? The manufacturer must recognize that to the scientific worker a knowledge of chemistry, physics, the principles of engineer-

ing, mathematics, metallurgy, drawing, geology, and modern languages are absolutely essential. Is the man who has the intellect and patience to acquire a knowledge of these subjects to be treated lightly? Mr. Heathcote was quite right when he said that omniscience was demanded of a works chemist. Under existing conditions a chemist was expected to possess, in addition to his knowledge, common sense, adaptability, powers of observation, intuition, and a hundred and one other faculties which are commonly regarded as the gifts of nature. If he does not happen to possess them he is voted a failure and treated with scorn. To a very large extent the scientific worker has never been given the opportunity to develop these faculties. How often is the complaint heard that a chemist of undoubted ability, able to make important discoveries and is yet incompetent to put them on a sound commercial basis. Should this count to his discredit? Certainly not, particularly when it usually acts to his own personal disadvantage. Business ability should no more be demanded in a scientific investigator than should scientific ability be demanded of a sales manager. The very existence of commercial ability almost postulates an inferior degree of scientific ability, because commercial ability demands as its reward financial success, which has certainly not been afforded by a scientific career up to the present. The application of science to industry is in the process of evolution; at the present time the demand for the scientific worker exceeds the supply, and the best way out of the difficulty is for the manufacturers themselves to take a hand in the proper training of promising material. Then we shall hear very much less of the ineffectiveness of the scientific worker, because the manufacturer will take care that the product he has helped to mould shall have suitable opportunities to develop those faculties which the chemist is blamed for not possessing. In the past low wages to the chemist have been the rule. Considerable complaints have been raised from time to time against this, but it ought to be more widely understood that the scientific worker's objection is not so much against low wages but against the fact that his abilities have not been given proper scope so that he could prove his true economic value. Modern industrial conditions demand capital, brains, and labor, and the impression that they are antagonistic is just as fallacious as the idea of science opposing practice. Rightly or wrongly, there is a considerable feeling in the country that in the past more than the due share of the reward has accrued to capital. Already there is a movement on foot for a closer union between labor and the brain workers of the country The best and most lasting reforms are those which come from within—a fact which capital would be very wise to take to heart. But this is diverging somewhat from the subject, but in regard to the question of financial reward it is important to bear in mind that it is most desirable that the possibilities for the scientific worker in this respect should be such as to attract the highest type of brain into the profession. Another important point is that the laboratory staff should consist of a sufficient number of men of the right type, men of proper training, to take advantage of the opportunities to be offered to them. And even when all these things have been attained the laboratory must not be expected to perform miracles in the tying of a cravat. The development of new, and the improvement of old, processes demands research, often of a most intricate and difficult nature, and it is given to few manufacturers to realize the difficulties of research, even when the research is assisted by the element of luck. The completion of every piece of research renders succeeding ones more and more difficult, and it must not be forgotten that once a research is brought to a successful issue its results stand for all time.

The success of a laboratory depends therefore on:—

1. Possession of a proper equipment, which includes an ample number of properly trained scientific workers.

2. Mutual existence of the right attitude of mind between the works and the laboratory.

3. Complete confidence and sympathetic assistance of the management, more particularly with regard to those matters requiring what may be described as commercial ability for want of a better term.

It is not intended to say very much with regard to the training of chemists, although it is pretty obvious that this will exert a large if not deciding interest on the degree of success. The subject was very thoroughly threshed out in the Journal of the Society of Chemical Industry in 1908. Difficulties have arisen in the discussion of the subject, because manufacturers complain of teaching institutions being too academic and expect them to turn out finished technologists. Even if this were possible, it would take from ten to fifteen years, during which time the opportunity of becoming acquainted with the human element is cut down to a minimum. Teaching institutions can do their best work by giving their students a thorough groundwork in the fundamental principles of chemistry on a very broad basis. This in itself is no light task, demanding as it does a contemporary grounding in general physics and mathematics. A man with a good all-round training will be competent to take a post in any of the numerous branches of industry. At the conclusion of the training, which will take three years at the least, a certain amount of original research work should be necessary for the granting of the diploma. The final training of the trained chemist into a technologist cannot be carried out in a teaching institution. The necessary practical bias can be introduced into training by the introduction on to the teaching staff of highly qualified men who have made good in industry, and by insisting on the necessity for real practical experience on the part of the teachers. Serious consideration should not be given to the charge that chemists lack commercial and controlling ability. Up to the present time they have had little or no opportunity of demonstrating whether they possess it or not. If it so happened that some particular individual did not possess such ability, it is certain that he would be given neither chance nor assistance to develop it. If the desire of industry for the assistance of scientific knowledge is real its duty is clear. It must take a definite and positive interest in the training of the potential technologist, not only in assisting teaching institutions, in the acquirement of a staff, but also in promoting and influencing research. But certainly its most important function lies in the direction of the provision of adequate scope and opportunities for the industrial laboratories.

STORING AIR IN THE EARTH

A novel method of providing a receiver of unusually large capacity for compressed air was described by Mr. N. Knapp in the course of the discussion of a paper on natural gas storage, read before the American Institute of Mining and Metallurgical Engineers. Mr. Knapp required a supply of compressed air for working pumps used to raise oil from wells and for blowing out the oil from the wells directly. He connected up an old exhausted well to the air compressors, and for a period of seven years used the well as an air receiver. With this storage system, many times the capacity of the air compressor could be used for short intervals without any appreciable loss of air pressure, and when no air was being used there was no appreciable gain in pressure. Two two-stage compressors were used with approximately 200 horsepower gas engine capacity, running twenty-four hours per day. The original rock pressure of the depleted sand was 305 lb., and the open flow capacity of the well as a gasser was about 2,000,000 cubic feet per twenty-four hours. When the air was pumped into the well, the gas had been used down to a rock pressure of 115 lb., the production was small and the gas was wet and troublesome to use. In the course of a few months' use of the compressors, a rock pressure of 290 lb. of air was developed and there was no water trouble. The extent of the sand used for air storage was small, probably not over 20 or 25 acres, as shown by dry holes and exhausted wells. The thickness of the porous gas sand probably did not exceed 7 ft. The occasional gas sands of this region, Mr. Knapp imagines, were like isolated hillocks of sand resting on the salt-water sand that underlaid the whole country. The depth to the gas sand was about 800 ft., and it underlaid the oil sand.

WHAT OUR READERS THINK AND DO

PULLING HOOK, WHICH PREVENTS SMASHED FINGERS

By S. T. Barnum

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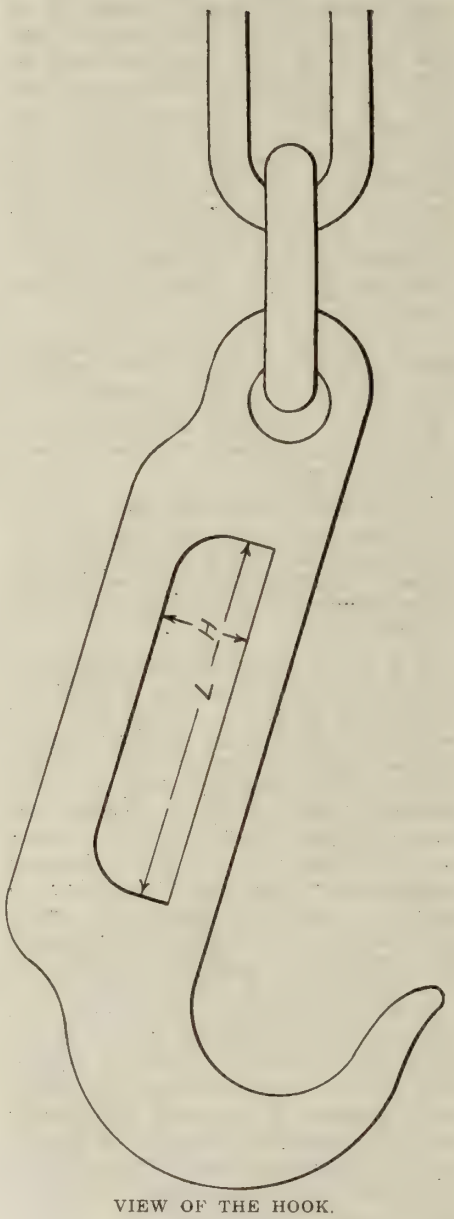
When hooks of the ordinary design are used on the end of a chain or line for pulling things around by power—by horsepower, cranes or hoists—accidents occur frequently. The man whose work it is to engage the hook in the object to be pulled becomes careless and, in an endeavor to catch the hook in the hole which is to receive it, will—as the pulling line is being drawn away from him—take a chance and try to effect an engagement "on the fly." Sometimes his hand may be wedged between the hook and the object and smashed fingers will result. Occasionally the fingers thus injured must be amputated.

With a hook made in accordance with the design suggested in the illustration, such accidents are, largely, prevented. The "safety first" hook shown has a finger hole whereby it may be held and which disposes the fingers in such a position that they are not likely to be caught and mutilated.

The proportions of such a hook should vary in accordance with the work to be handled. For heavy work a relatively large hook is, obviously, necessary, while for light pulls a small one will suffice. In any case, the length of the finger opening (L, Fig. 1) should be sufficiently long, about 4 in., so that the fingers may be readily inserted in it. Correspondingly, the height (H, Fig. 1) should be at least 1½ in. Satisfactory hooks of this character, where the service is not too severe, may be cut and forged from sheet steel plate.



VIEW OF THE HOOK.

TO STRENGTHEN AN AXLE BY REMOVING METAL

By A. J. GRAY

We were having continuous trouble with the axle of a logging car. The axle apparently gradually fatigued and broke off on the outside of the bearing close to the collar as shown in Figure 1.

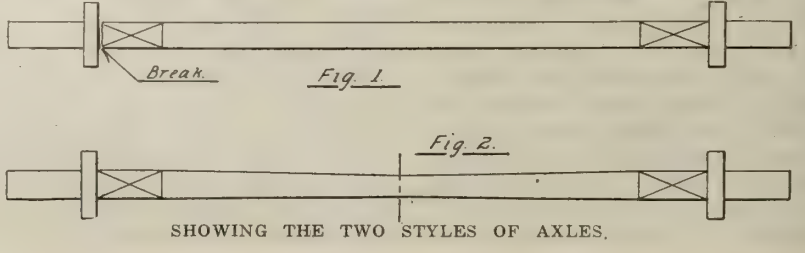
The roadway is not as smooth as might be, and the continual pound had a hammering effect that caused the break, in spite of the fact that the axle had a more than sufficient factor of safety to take care of all the dead load.

The trouble was remedied by tapering the axle to the centre, as shown in Figure 2.

The explanation of the fact of removing the metal from the centre of the axle having a strengthening effect is found when it is understood that the reason for failure was the hammering on the axle caused by the poor road-bed. The force tending to cause fracture would be the foot-pounds of energy that has to be absorbed at the neck of the axle where the break occurred.

Energy is a combination of two factors. That is, energy = force × space. It will follow that the greater the space moved through the less will be the force of resistance caused in absorbing the energy.

This explains the fact of the axle as made to Figure 2 being the strongest, as in giving slightly at the centre it allows more give at the neck, which is equivalent to a greater space moved through to absorb the same amount of energy of the pounding, thus producing less strain in the metal of the axle.



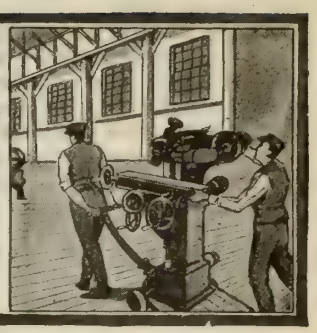
SHOWING THE TWO STYLES OF AXLES.

VENTILATING OLD BUILDINGS

Many times the ventilation of a factory is not considered when the building is built. This is particularly true of old buildings. In other cases a top floor, which has always been in use as a warehouse, is necessarily turned over to factory purposes. In such makeshifts, light and ventilation are often inadequate.

In one plant, the top floor of which was not well ventilated, the heat during the summer months prevented the workers from applying themselves steadily. To better this condition large square shafts or pent houses were built in the roof. Each of these shafts was about 20 feet square—the size of a bay. They were fitted with windows which could be easily opened, thereby making not only excellent ventilators but also letting in much natural light. The fresh air and light improved working conditions by reducing discomfort.

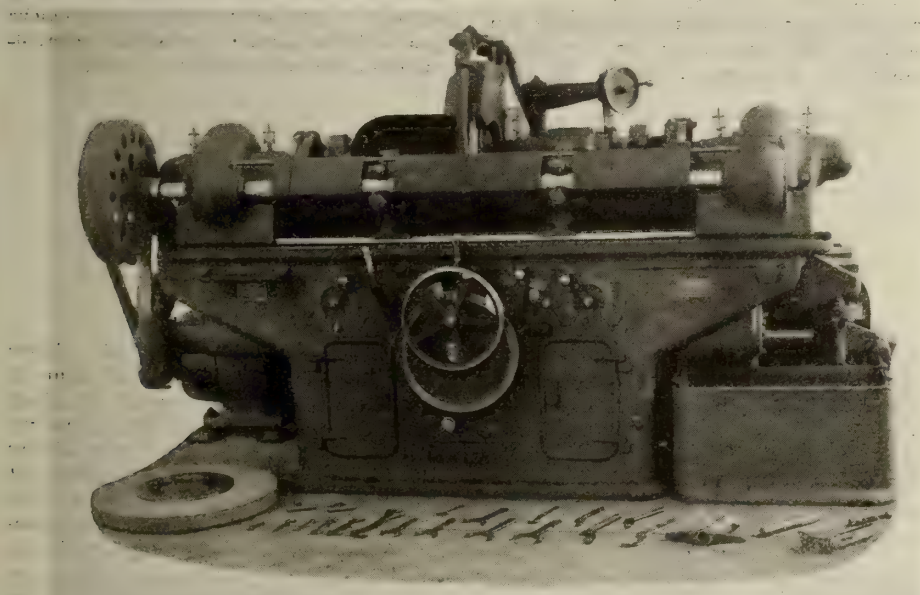
DEVELOPMENTS IN SHOP EQUIPMENT



LANDIS GRINDER

A VERY rigid type of machine, built for accurate crank pin grinding on airplane, automobile and other gas engine shafts. No offset centres are required with these machines, the work being held by quickly-operated holders at both ends.

The crank shafts are driven from both ends, the right-hand and left-hand crank heads being geared together. The different throws are obtained on the adjustable heads from a sliding adjustment of the crank carrying fixtures which are mounted on the ends of the crank head spindles. This is micrometer adjustment,



GENERAL VIEW OF MACHINE.

operated by a screw and having a graduated dial in connection with it.

For multiple throw shafts, the pins are ground in exact relation with each other, and to accomplish this, one of the carrying fixtures is provided with a gauging block, made to suit the throw angles of the crank shafts.

The crank-carrying fixtures will be equipped with a swiveling index, when preferred to the standard gauging block. This swivel is graduated to give all of the regular throw angles. Also, when desired, fixed throw heads will be furnished instead of adjustable heads. For manufacturing large quantities of crank shafts having the same throw, the fixed throw is often preferred.

Accurate alignment of the crank carrying fixtures is accomplished by a simple adjustment of two screws carried in the hub of the spindle gear mounted on the spindle in each head. Another function of these screws is to hold the gear in a positive relation to the shaft, taking the place of the customary key. When the crank heads covers are removed these screws are easily accessible. Counter weights for the work are fastened to each side of the spindle gear, between the spindle bearings, and in a position where they will not influence the end of the spindle.

The crank head spindles are large in diameter and are provided with long phosphor bronze bearings, which are adjustable for wear. The spindle gear is mounted on a tapered portion of the spindle between the spindle bearings. This arrangement eliminates the possibility of influencing the end of the spindle through the spindle drive and also permits the mounting of work carrying fixtures directly on the end of the spindle and close to the spindle bearings.

The rigid main drive shaft operates the crank heads through a steel sleeve carried in each head, and the gear that drives the large spindle gear is mounted on this sleeve. The driving shaft and sleeves are fitted together with taper keys. When it is desired to slide the heads along the shaft to suit the length of the work, the taper keys are released by a simple screw adjustment, after which the keys are again tightened, thus doing away with the possibility of play between the shaft and sleeve. These taper keys can also be used for securing a fine adjustment when aligning the two crank heads.

The driving sleeve is mounted in bronze bearings, one at each end of the sleeve, and the driving gear is mounted on a taper between the bearings. The gear is drawn up on the taper by a nut on the sleeve, effectively preventing any looseness between the joint. This gear, like the spindle gear, is also fitted with adjusting screws instead of a key for positive location of the gear on the driving sleeve. Both gears in the crank heads run in an oil bath, thus creating smooth action and prolonging the life of the gears.

The work table swivels for grinding tapers.

The work speed changes are made by the shifting of a belt on cone pulleys, through the movement of a single lever.

The grinding wheel head is massive and rigid and mounted to slide on a large V and a flat guide. The spindle is of special steel and runs in bronze bearings which are adjustable for wear. The grinding wheel driving belt is always kept under uniform tension by an automatic tightener, which also takes up the stretch of the belt.

Feeding of the grinding wheel to the work either by hand or automatic. The automatic feed can be set to reduce the diameter of the work from .00025 in. to .007 in. at each reversal of the wheel carriage. The machine is equipped regularly with hand feed only, and the automatic feed is furnished when specified.

The grinding wheel traverse feed is automatic, and all of the respective speeds are obtained by the shifting of a belt on cone pulleys by the movement of a single lever. The grinding wheel tarries automatically at the reversing points, permitting the wheel to grind itself clear at shoulders before reversing.

A spacing bar arrangement for quickly locating the grinding wheel to suit the crank pin locations is supplied with the machine when specified. This device is a great time saver when grinding the same crankshaft in large quantities. The same machine can be equipped with spacing bars for several different types of

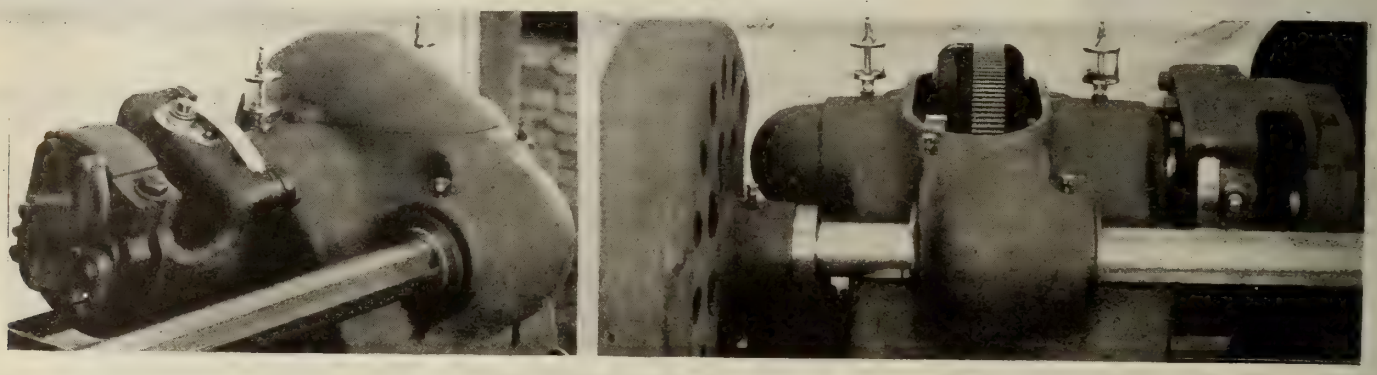
crank shaft as it is very easy to change the spacing bars.

All crank-grinding machines are provided with a lever for connecting and disconnecting the carriage traverse. When spacing bar arrangement is included, this lever has the additional function of engaging the plunger in the spacing bar slots. The spacing bar and the power wheel traverse cannot be engaged at the same time. The crank grinding machine, whether with or without spacing bar, is always provided with a safety device for preventing the power traverse to run into the crank shaft.

The grinding wheel truing fixtures regularly furnished, are used for truing either the face or sides of the wheel. A radial wheel truing fixture, which is suited for truing the face of the wheel, also for forming corners to an exact radius for grinding fillets up to ½ in. radius, will also be provided on special order.

The rests support the work at two points, in front and underneath. The supports are adjusted independently of each other, which is essential to grinding work true. The support adjusting screws have stops which can be set to limit the movement of the rest jaws.

The pump is of the centrifugal type, the bearings of which do not come in contact with the water. The case in which the fan revolves is always immersed, hence no priming is necessary.



TWO CLOSE-UP VIEWS OF MACHINE.

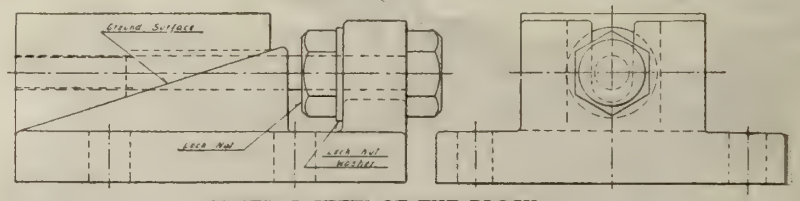
MANHATTAN UNIVERSAL CASTING GRINDING MACHINE

THE Manhattan Machine and Tool Works, 42-50 Market Ave., N. W., Grand Rapids, Mich., has recently placed on the market the universal casting grinding machine shown in the illustration. It is stated that the machine is easy and rapid to operate under the varying conditions such as are met in everyday use, and that its rigidity, strength and flexibility are notable features. The universal movement is obtained by a universal coupling and sleeve, which gives a freedom of movement without undue loss of power. The long handle gives the operator a good leverage, so that the pressure applied to the grinding wheel can be easily regulated. Lubrication is taken care of by wick oilers and drip cups. The standard equipment consists of countershaft, counterweight, two pulleys for the counterweight cable and the machine itself.

GENERAL VIEW OF THE MACHINE.

CINCINNATI PLANER LEVELING BLOCK

An improved type of leveling block for use in setting up planers has recently ben placed on the market by the Cincinnati Planer Co., Cincinnati, Ohio. It is a matter of general knowledge that a planer must be set up on a perfectly level and rigid foundation in order for it to continue to give satisfactory service; and under the severe conditions of load and vibration to which the foundation blocks used for supporting machines of this type are subjected, trouble has often been experienced through their showing a tendency to shift, even where the precaution has been taken of grouting the blocks in concrete. Any such shifting of the blocks upon which a planer is mounted naturally throws the machine out of level.



GENERAL VIEW OF THE BLOCK.

The new style of Cincinnati planer leveling block is so designed that it eliminates the cause of trouble to which reference has been made. This improved block consists of a baseplate and a sliding member which is actuated by a draw-bolt that is furnished with a thread of fine pitch, a lock-nut and a washer. The baseplate is cast with a wide flange, and it is drilled with four 1-inch holes which are found to be of great assistance in helping to grout the block in place. The inclined surfaces of both the baseplate and sliding member are ground to a perfectly smooth surface, so that they slide freely on each other; and this feature in conjunction with the fine pitch of the thread of the draw-bolt greatly facilitates the making of accurate adjustments. The draw-bolt is ⅞ inch in diameter and it is threaded for practically its entire length in order to accommodate the lock-nut. The design of the block is worked out in such a way that 2½ inches of the thread on the bolt are engaged at all times, so that ample holding power is assured. With a block of this kind, accurate settings can be easily made, after which the lock-nuts are tightened so that vibration will not tend to cause the blocks to shift and throw the planer out of level.

Worth-While Information From Many Points

In one second an auto traveling at 20 miles per hour will cover a distance of 29 feet, at 25 miles 36 feet, and at 30 miles per hour 44 feet will be covered.

* * *

Sandpaper can be used much more effectively for removing the insulation from wire than your pocket knife. With the right hand, pull the wire through a small double strip of sandpaper held between the thumb and forefinger of the left hand.

* * *

Look out for doctor fees soaring in the near future, now that a start has been made in using an airplane for professional calls. Dr. Frank A. Brewster, of Beaver City, Neb., as the distinction of being the first physician to adopt this method of transit.

* * *

The tallest people in the British Isles are to be found in the district of Galloway, in South Scotland, where records of the stature gives an average height of five feet ten inches. The shortest stature is found in Wales and southwest England.

* * *

Half a mile underground in a Western mine there is a large blazing electric sign, which simply shrieks at you the words "Safety First." You cannot help but pay attention to this warning, for the fact that you are down in the bowels of the earth sort of brings to your mind the extra need of care.

* * *

The manila hemp, or abaca, as it is known in its native land, is a great source of income to the Philippine Islands. The sum received yearly from its sale amounts to $20,000,000. The hemp, of course, is used in making the better class of rope, usually known as manilla.

* * *

Tanks have had some funny uses, but listen to these: At Brest, American soldiers turned the sod for tennis courts with the aid of a tank. At London, tanks made ideal grandstands; while last, but not least, at Limerick, Ireland, tanks were called out to preserve the peace while the remains of a Sinn-Fein hunger strike was carried to the grave.

* * *

Since the armistice brought hostilities to an end it has been learned that the morale of the popu(lation of Lille was maintained by news given from a French wireless station hidden from the Germans, according to "Wireless Age." Good news spread quickly through underground channels. The people knew that 10,000 American soldiers were arriving daily. Airplanes also dropped many leaflets, which were eagerly taken despite German efforts to prevent their distribution.

* * *

After the electrically heated clothes for airmen comes the electrically heated quilt for hospital patients, and invalids taking outdoor treatment. Very fine and pliable resistance coils are used, and it is said that a temperature of 90 degrees can be obtained in half an hour, and maintained continuously thereafter with a small expenditure of current.

* * *

Recently a baby tank started out in the interest of the American Victory Loan to reach the summit of Pike's Peak In many places it encountered drifts of snow ten feet deep. The tank itself weighed 13,600 pounds, yet still plowed merrily on until a tract plate broke. This finished the trip, so, although they did not reach Pike's Peak, they did the other thing, namely, bust.

* * *

On the sead bed at the head of the Persian Gulf, deep under many fathoms of salt water, there are springs of pure, clear, fresh water. Divers, with goatskin bags, descend and bring this to the surface, their equipment being the same as that of the pearl fishers. This is a stone to sink them, held between the feet, and the ability to stay under water from 2 to 3 minutes without injury.

* * *

The best way to save small pieces of magnet wire, which have served their purpose in connecting some apparatus, is to coil the wire in the form of a spring closely wound on a pencil or some similar object. When ready for use again, the coil of wire can be stretched to the required length. The spring of wire helps to make better contact. Connections made in this manner are also much neater than when the wire is strung out haphazardly.

* * *

To fasten the loose end of a spool of magnet wire, double back enough of the loose end to reach around the coil, stick this doubled back end through the loop formed by the doubling and bend over. This is a much better way to keep the wire from uncoiling than merely raising a turn slightly and sticking the loose end under it. If a kink appears in the wire, it should be carefully straightened before proceeding.

* * *

The "Daily Mail" reports that on September 22nd last, direct wireless communication between Great Britain and Australia was established, when two messages from the Premier and from Sir Joseph Cook were received by the Amalgamated Wireless Company of Australasia from the new station at Carnar. It is stated that the messages received at Sydney were perfectly clear and distinct, despite direct transmission over 12,000 miles.

* * *

The war has shown the Australians that they have capabilities which were never used in pre-war days. They are now manufacturing clothes and boots of an excellent quality at prices about 33 1-3 per cent. less than the same quality of goods made in Canada and the United States. The cloth is of a soft, smooth texture, containing a large percentage of pure wool.

* * *

H. H. Kohlsaat, one time owner of the Chicago "Times-Herald," was one of the first public men on this continent to interest himself in the automobile, and in the summer of 1895, offered prizes for the purpose of "promoting, encouraging, and stimulating the invention, development, perfection, and general adoption of the motor vehicle." He offered prizes aggregating thousands of dollars, and the prizes were based on the following: (a) practical construction; (b) speed; (c) cost; (d) economy; (e) general appearance.

* * *

There is now invented a machine that pulls flax mechanically. This is an English device and can be operated by horsepower or tractor. It looks like a huge sprocket, with the circumference braced by three powerful iron spokes, and a caterpillar tread running out to a smaller sprocket. As it rolls forward the machine gathers a section of the standing flax plants. The seed bolls come between two prongs. The diggers now penertate the soil and tear up the plant by the roots. Next the uprooted flax is carried over top of machine to an endless belt, which rolls the flax over until it drops on the ground behind. There it is left to dry.

* * *

Thomas A. Edison, the electrical wizard, was the first well-known American to prophesy that the automobile would revolutionize transportation. Nearly twenty-five years ago, he is quoted in a New York paper as saying: "Ten years from now we will be able to buy a horseless vehicle for what you would have to pay to-day for a wagon and a pair of horses. The money spent on the upkeep of the horses will be saved. A great invention, which facilitates commerce, enriches a country just as much as a discovery of gold." Looking back from the pinnacle of 1919 automobile development, it must be a source of great satisfaction to know his prediction was conservative rather than radical.

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Go It, Governor!

ON the Fourth of July speech-making is as great a national industry in United States as it is in Orange centres here on the 12th of the same month.

And so it was that Governor Coolidge, of Massachusetts, in his home town of Northampton, on July 4, said this:—

> "The Americans are not a fighting people, but when there is a just cause they answer the call, and take up arms for the right. **We have saved France, rescued Belgium, defended Italy, and saved England its one thousand years of civilization."**

Good boy, Governor! In the words of the small boy, you were going some!

But, say, Governor, did it ever occur to you that brainier, brighter and bigger men than you have long since ceased any show of boasting? The nations that paid the awful price for world freedom are bowed in solemn and magnificent thanks, all too eloquent to permit of any loud-mouthed explosions.

Helping Coal to be Dear

ALREADY the public are being told that coal is going to be very dear this winter, and also very hard to get.

This would take place likely at any rate, but the education of the public must go on, apparently, through the insertion of such news. It may interest readers to know they will be mulcted an extra four or five dollars per ton for their coal this winter, but it also helps to make the way easy for all and sundry who have to do with the setting of the price.

The truth is that the prices will get up high enough without any tinkering assistance on the part of the press.

Already officials of the U.S. Government are quoted as follows:—

> "Coal men fear the situation may get away from them, and that prices may rise five or six dollars a ton."

If there is a danger of the situation running wild, the Government can check it if it so desires. During the war the price of pig iron and steel started to run wild. The Government found it easy enough to fix the price of iron and to say that 3c should be the outside figure for ship plate.

Any sort of a nag will run away if they take off the halter, show it a lot of green grass and oats ahead, and then hit it a kick. In fact, a nag that would not run under such circumstances would not be worth worrying about.

Coal companies and kindred agencies are somewhat the same. Take the restraint off, show them where they can bulge with money, and let the dear general public start to clamor for coal.

Will prices go up under such circumstances?

Just as sure as the nag would bolt for the hay and the grass in one case, the prices will bolt for the higher peg in the other.

Henry Ford in Court

IN a large number of the daily papers there have appeared editorial comments, some at considerable length, concerning what Henry Ford has said and admitted in the witness box in his suit against the Chicago *Tribune*. No doubt Ford has told enough to make it certain that he is not a keen student of political science nor historical matters.

These articles for the most part are concerned in taking a fall out of Henry Ford, largely because he admitted he did not know at times what he was talking about.

Are there never occasions when the same daily papers discuss subjects in a way well calculated to make the informed reader see they do not know what they are talking about?

Many Canadian editors discuss the problems of the British navy, and many of them have never sniffed salt water.

They pile into long-distance discussions at times of semi-technical matters in a way that shows how barren they are of even the fundamentals of their subject.

Why not take Henry Ford in his own back yard, namely, as a manufacturer and an organizing genius?

Why not take him as an employer who long ago put in a $5 per day wage, then a $6 and $7?

It is somewhat of a knot-hole vision to size up a successful man entirely on a matter and in a field where he is admittedly not a specialist.

IF THAT peace celebration on Saturday could only have included industrial peace as well it would have been a celebration well worth cheering for.

* * *

THE British sovereign is now worth only $4.25 in United States. Rather alarming, but then it's no worse than what has happened to our own dollar. It's wizened up to about 30 cents.

* * *

WHAT kind of men are your apprentices turning out to be? Are they good mechanics? Are they in demand in other shops? Have they gone on to be foremen and superintendents? Look this matter over and remember your shop has a responsibility in connection with every apprentice you turn out. Very often a shop is judged by its graduates.

* * *

CANADIAN MACHINERY'S drafting course had over 20 students sending in their work regularly for examination, and the number is constantly increasing. Some of those following the course are from the Maritime Provinces, Chicago, Hartford, in the United States, and the rest in the industrial centres of Ontario. In many cases shops are subscribing for the paper for their apprentices to study. This we take as the greatest compliment that can be paid to a technical paper.

Is the Draughtsman's Profession Crowded

BY ENGINEER

THE anxious parent, looking for an opening in life for his ambitious offspring, may perhaps be seized with the idea of making him a draughtsman. The profession on the surface looks attractive. The hours are not long, the work is performed amid clean and well-lighted surroundings, and the youth does not have to soil his delicate hands by handling greasy machinery, or heavy tools.

Then, when his apprenticeship is over, he can obtain fairly lucrative work, without much difficulty. When we say fairly lucrative, we mean he can earn a little less than the average machinist, and his status will be, from an employer's point of view, a little below the machinist.

Many employers quite frankly look upon a draughtsman as a necessary evil, and his work as non-productive. in some cases this is true, and the product of the drawing office is more in the nature of a record than a guide. The writer remembers well the case of a large pulp mill, where new gears were designed by the patternmaker, and the sketches for the drawing office made from the finished wheel. The necessary evil was well exemplified in this case. True, the patternmaker could have made the drawings also, but his time was too valuable.

What is the Reason?

The cause of this lack of status of a branch of engineering that should stand high, can be found in two things. One of these is the looseness of the use of the term "draughtsman," and the second is the training or lack of training that the apprentice draughtsman receives.

The dictionary defines a draughtsman as one who draws machinery, or drafts pleas, or generally, one who makes drawings. That description fits the majority of the men engaged as draughtsmen, and therein lies the root of the trouble.

The ability to draw is the first requisite of the draughtsman, but by no means the only one. In the engineering world, the term daughtsman should cover the description of one who can evolve a design, making all the necessary calculations, and having a full understanding of the operations and difficulties of the actual making, from the patternmaker's, molder's, and machinist's point of view.

How many men calling themselves draughtmen can fill the above qualifications? A small minority, it would seem, and these are usually known as designers, not draughtsmen. Here then, we have a distinct branch. Then again there is what is known as the detailer. He takes the general design of a machine or engine, and fills in the details. Then there is the man who never does anything but tracing. These three classes are all too often lumped under the general term draughtsman, and this fact makes it more difficult for the few who are really draughtsmen in the engineering sense of the word, as against the dictionary definition, to get a suitable reward for their abilities.

What is the Training?

Where do all these detailers and tracers come from? They are being turned out daily after spending four more or less valuable years in a drawing office, learning to be draughtsmen (?). What is the usual course of instruction that the apprentice goes through? Different firms have different methods, but a fair sample probably is as follows:—

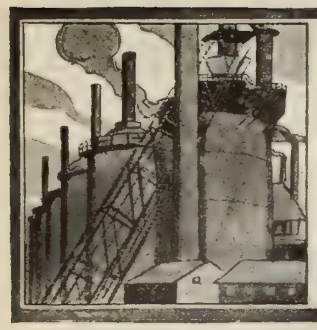
The first job will be filing drawings, and making himself generally useful. He has about one month of this, and on the whole, it is a time well spent, as it will give the neophyte an idea of routine. Then he will spend two to three months on the blue print making, either by machine light or sunlight. The utility of this is open to doubt, if the object of his training is to make him an engineer. A few days to give him the idea of how it is done would be ample, as it is not the work for a skilled man in any case. From this he will go to the drawing board, where he will take up the work of tracing, first small details, and then the general assembly tracings. This work will make him proficient in the use of instruments and teach him to be neat, and he will spend a period of probably one year on this work, perhaps longer.

Up to this time, unless he is ambitious and has an opportunity of attending technical classes, he will have acquired practically no knowledge of the things he is tracing. He may have walked through the shops, and observed different things in the making, and connected them in his mind with the tracings he has been making. Or he may not. It is quite likely no one will bother him enough to find out. However, he eventually gets to the stage of making drawings of details and small sketches, made from the rough sketches of the designers, and from that to the making of assembly drawings. Now after having spent four years of his life, what is he? Not an engineer, not a designer. He may know something about shop work. Quite likely he does not. What will he develop into? If as before said, he is blessed with ambition, he will get out of the drawing office as fast as he can, and get a course in the shops, to find out something of what he has been drawing. He will also take a course of mathematics, sufficient to enable him to grasp the fundamental ideas that make the finished article possible. Most likely, he will remain where he is, and add another unit to the army of necessary evils!

Is the apprentice to blame, or is it the system? Emphatically the system. A boy who is going to become a draughtsman, in the true sense, is going to be a mechanical engineer. Then he should be trained as such. His first entrance should be into the shop, and not the machine shop particularly. He should have an opportunity of a period in the pattern shop, not to become an expert manipulator of a patternmaker's tools, but to find out how patterns for different jobs are made and why. Then into the machine shop, to become familiar with the different machines and their uses, and the particular jobs that can be done in them. The erecting shop should follow, after which he would be in good shape to learn the art of designing. During this time the apprentice's mathematical education should be developed, and after a period of say two and one-half years spent in this way, a further two and one-half years could be profitably spent in the drawing office. This period would be valuable to him, and owing to the knowledge acquired, to his employer. A course of training of this kind would have two excellent effects. It would eliminate quite a number of those who choose the drawing office for its comparative ease and lack of unpleasant surroundings, and automatically raise the standard of those who remain. The employers would know they were getting better men, and the men themselves could organize to improve their status in the engineering world. "'Tis a consummation devoutly to be wished."

Furthermore, a man trained in this way would not be confined to the particular work carried on by the shop he was trained in. His knowledge of engineering practice and his developments of mathematics would enable him with a little study, to take up any branch of engineering design which he might wish to specialize in, or he might develop into an all-round man in all branches of mechanical engineering.

Five years is none too long a time to learn a profession, if it is to be a profession. Furthermore, such a course would ensure that in a short time there would be only one answer to the question of "Is the profession overcrowded?" and that would be an emphatic "No."



MARKET DEVELOPMENTS

Metals Advancing Sharply in Busy Market

All Grades of Copper Go Up This Week—Scrap Dealers Paying Better Prices—The Used Machine Still a Big Factor in the Sale of Equipment

IT is not very often that the scrap metal market is called on to provide the best news for the week, but such is the case this time. The big dealers in Toronto marked the whole list up this week, special attention being paid to anything in the line of copper. The metal market regards it as certain that there will be a big export demand for copper very soon, and as there is not a great quantity being produced owing to labor troubles, the prices are due to go higher. Not only that, there is a demand for scrap metal. The foundries and the steel mills are buying material now and there is a lot of business moving.

Machine tool dealers still have to contend with the problem of getting the buying public away from the used machine tools that came on to the market when war work ceased. Many of the inquiries that come to the dealers contain the request that prices should be quoted on used as well as new machinery. There has been no concerted action on the part of the dealers in regard to the policy to be followed on the taking in of used material. Some firms are always in the market for it, and as a result other dealers, against their wishes, must figure on taking away old equipment if they are going to sell new.

One thing that makes used equipment attractive is the price of the new material. Prices are not far from 100 per cent. above pre-war days, and even now talk comes of increases. Some of the big shops have given a shorter work-day with the old wages, which amounts to an increase in costs, and the makers threaten to pass it on in the way of higher selling figures.

Pittsburgh steel mills report that they continue to work nearer to capacity. Plate is probably the weakest spot in the steel market at the moment. Reports indicate that while 2.65 is the nominal quotation, there are cases where as low as 2.50 has been the price at which a fairly good tonnage would be closed.

MONTREAL REPORTS BUYING IS STILL DONE ON RATHER SMALL SCALE

Special to CANADIAN MACHINERY.

MONTREAL, Que., July 24.—Trade improvement is undoubtedly more general throughout the district, and activity is gradually increasing in volume in the many industries of the country. Labor disturbances are still a factor in business circles, but disputes in the metal working trades are being adjusted to the satisfaction of all parties. The recent strike at the Vickers plant, which has just been settled, will affect the operations to some extent, and fewer launchings will take place this year than were expected. The announcement that the steel plate mill at Sydney will be completed, has created a waning interest in steel circles, but there appears to be few who think it will have much effect on local conditions. The price agreed on by the Government will mean that the output at that figure will almost all be absorbed for Government purposes, as a price of $3.65 is rather high in face of the quotations of the American mills. That this condition may come about is seen in the announcement this week that additional contracts for steel vessels have been made with some of the leading shipyards. Dealers here are more hopeful of the early future than they were a few weeks ago, but no heavy buying, as yet, is coming to the surface, although the regular business is improving slowly, the present demand still being such as to cover immediate needs only. Labor appears to be the keystone of true conditions and unrest must become history before any real signs of concentrated reconstruction will develop. As a dealer here remarked: "This factor of labor is the hinge upon which all things swing. Manufacturers are exhibiting no undue haste in getting back into harness, being content to carry on while these clouds remain upon the horizon. Until some general adjustment is made any extreme signs of exceptional activity might act as a signal for further unrest and demands of workers." Some little business has been done in structural materials, but general activity of a light nature is the rule. Machine-tool demand is quiet, but sufficient to maintain the interest of the trade. Metals show a steady return to normal with the market strong. Old materials are not active, but a light, steady demand is reported.

Copper Strength a Feature

Copper continues to hold the interest of the trade, due to the steady domestic demand and the possible developments arising out of the changed conditions of world commerce. Germany will probably be a large buyer in this respect and copper will be a commodity of which she will require considerable quantity from the United States. With the exception of tin the metal market is quite strong. Brass interests are buying more freely and the demand for spelter is steadily growing. The lead situation here is firmer, following the American advance, but dealers are holding to the previous quotation of 7 cents per lb. Sales are not heavy, but the demand is steady. Antimony and aluminum continue unchanged. All metal prices are firm at last week's quotations.

Scrap Strong, But Less Active

The strength of the scrap market is maintained despite the slight decline in general activity. The iron and steel trade is demanding larger quantities of scrap and the movement appears to in-

dicate that business will be steady from now on. Metal scraps are holding the leading position and buying is on a larger scale than for some weeks back. The fact that trade with Germany is open again and the knowledge that she is depleted of this metal, is a large factor in holding the market at the present high level. No price changes are recorded this week, and the present market is very firm.

SCRAP METAL IS MARKED WELL UP

Biggest Increases That Have Been Registered for Many Months—Peace Signing Has Helped.

TORONTO.—Judging by the way in which the scrap metal market has shoved up prices it is willing to pay for material, the belief is gaining that the turn has been made in the road, and that business is going to get going in earnest. The scrap market can hardly be termed a chronic optimist either, for as a general thing they are not exactly keen to admit that business is good.

It is perhaps hard to lay a finger on specific instances in the markets this week where improvements are in order, or where more business has been done this week than for a certain stated period in the corresponding week. But there is an undoubted feeling in business circles that things are fundamentally strong, and that there is a real recovery in the market. It may be that the signing of peace has had something to do with it, as it means that there are markets open now that have been closed. This has a large effect on the metal markets, especially copper, as it is known that Germany will have to be a heavy purchaser of this metal.

The Second-Hand Stuff

"Look at this," said a well-known machinery dealer to a representative of this paper this morning, as he passed over a request for quotations on a certain amount of equipment.

There was a foot-note that spoiled the business from the standpoint of the keen salesman, and it was this: "We would refer prices on used equipment, as we are told there is considerable of this to be had in very fair shape."

"Some dealers state that they do not have much trouble in meeting the request for second-hand or used material," continued the dealer, "but I can tell you we are up against it all the time on this point, and I am inclined to take with a grain of salt all these statements about not having to contend with the man who has it in his head that the market is full of bargains in machines that have only been used for a couple of days or a week, or that have never been taken out of the cratings at all. As a matter of fact, the best of this stuff has been picked over some time ago, but there are occasional lots that keep coming on the market. We cannot state that this business has been as serious as we contemplated when the war ceased, but at the same time it has been constantly with us. The trouble is that if one dealer refuses to take the used material another comes along who will do business on that line and seems anxious to. If there had been some understanding among the dealers on this point it would have saved a lot of trouble, but it has gone so far now that there is no chance of this. It is not bothering us any more than the rest of the trade, but at the same time we will be pleased enough when the war shop stuff and used equipment idea is a little more backed off than it is now and has been ever since the announcement came that the fighting had ceased."

The automobile business in Ontario continues to buy material. This is not only in the shops where cars are being made, but in repair shops as well. Many of the better garages are in the field, putting in a certain amount of equipment, and in many cases they have taken on machinery that saw some service in the war shops. This is a line of business that is bound to increase. One has only to stop and reckon the number of decent sized garages there are. There is a certain amount of equipment they can readily use, and they are showing a tendency to secure it.

Some slight improvement is noticed in supplies, although it must be said that the volume of business in this department is still light. Many of the shops around here that would, under ordinary circumstances, be large users, are still tied up by the strike, and the every-day wear and tear is absent, so it is that the list of supplies called for for replacement purposes is small.

No Large Buying

Isolated cases are reported of fair-sized offers for plate, tubes and bars, but the buying can still be described as spotty rather than general. A dealer who does a lot of buying in the New York market, speaking to MACHINERY this week of conditions there, stated that he considered plate as the only weak spot in the market at present. He said that there had been a great increase in some districts of plate mill capacity in the war months, and it was a big undertaking now to book enough business to keep up to the capacity. In other lines the markets were particularly strong, and he bore out a statement that was made in these columns a few weeks ago that many of the concessions that had been given for some time past were being withdrawn by the mills, and that further some of the mills were now out of the market, being well filled with orders for some time.

Scrap Market Jumps

It has been months since there has been such a forward movement in the prices of what dealers will pay for material as is announced this week. Some weeks ago Montreal marked material well up, and this week Toronto has gone in the same direction. Some of the more noticeable increases are, of course, taking place in the coppers, which are very strong for the moment. In fact it is not possible just now to contract for fourth quarter under 26c. Light copper is marked up from 12 to 13¾, crucible from 15 to 18. Similar increases are noticed in heavy copper and copper wire. Wrought iron axles are up $5 per ton.

"What's the reason?" was the question that MACHINERY asked this morning when the new prices were announced.

"Reason enough," was the reply. "There is a much better feeling in the market, no matter how you look at it. There seems to be a conviction that things have definitely turned for the better. Business is good, and when we say that we mean just exactly what we say. We are both buying and selling in good volume. Foundries and mills in this country are taking on material more than for some time past. As far as the increases in copper are concerned there is a feeling that Germany will be in the market for a lot of this material, and there is no danger of her dominating the situation. The scrap metal market is better right now than it has been for a long time past," he concluded.

POINTS IN WEEK'S MARKETING NOTES

American Steel & Tin Plate Co. reports that last week was the largest booking in the history of the company.

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Scrap metal prices have been marked up all around in Toronto markets, and there is a lot of buying and selling taking place.

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That Germany will be in the market for copper and other metals is one of the reasons attributed for the higher prices quoted.

—

The oil industry is keeping many of the U. S. pipe mills running to capacity.

—

That the second-hand equipment idea still stands in the way of the sale of much new machinery is the statement of one well-known machinery dealer.

—

The demand for structurals is not much improved, while Pittsburgh reports state the demand for plates is wretchedly small in proportion to capacity. As a result there is still a tendency to shade plate prices, and it is stated that as low as 2.50 has been named for some orders.

It is not generally known that an airplane camera weighs forty-four pounds, complete, and is made of aluminum throughout. The lens has a focal length of twenty inches, which means it can take a photograph from a great height without distortion. From 1-90th to 1-30th of a second is the usual exposure given the picture. The film roll is operated by a wind motor, and the film is long enough to take approximately 100 exposures.

PITTSBURGH REPORTS THAT IN SOME CASES AS LOW AS 2.50 IS PLATE PRICE

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., July 24.—There has been a slight increase in steel mill operations, taking the country as a whole, since the first of the month, when the rate was about 70 per cent. of capacity. That rate had represented a sharp increase, as the low point of the year in operation, about the middle of May, represented barely more than 50 per cent. of capacity.

There have been further gains this month in the volume of orders placed, but these gains are chiefly finished steel lines, upon which mills are already well sold up, and thus the increased buying results more in the piling up of tonnage on books for forward delivery than in an increase in the rate of production. This condition is particularly the case in lap weld pipe and in sheets, though it obtains to a limited extent also in merchant bars.

Unfinished and Finished Steel Capacity

As is fairly well understood in the trade an abnormal alignment exists as to capacity available for the production of steel and capacity for the refinishing of steel, from the ingot or bloom through to the merchantable products, bars, shapes, sheets, pipes, wire, etc. This arises from the steel making capacity having increased 40 per cent. since 1914, largely due to the demand for shell steel, while there was not corresponding expansion in finishing capacity, except in plates. Accordingly it would be difficult for the steel industry to work up to operating at capacity, on the basis of ingot capacity, which is used in figuring the percentages mentioned above, unless the orders for finished steel products were distributed to fit exactly the capacities in the different finishing departments. Some estimates are that with further expansion in demand between 85 and 90 per cent. of the steel making capacity can be utilized.

Mills that have an excess of steel producing capacity are, of course, considering the matter of adding finishing capacity to take care of the additional steel making capacity. The alternative to abandon some of the steel making capacity is altogether unthinkable. A case of this sort is that of the American Rolling Mill Co., Middletown, Ohio, which increased its steel making capacity very considerably during the war, and furnished large quantities of shell steel. This company has adopted plans for extensive additions to finishing capacity, and is now in the market for the requisite buildings, involving 3,200 tons of fabricated steel.

Heavy Bookings in Some Lines

For the last week for which the compilation is available, the American Sheet and Tin Plate Co. reports the largest bookings it has had for any week in its history, barring only one week in the fore part of last year. The compilation refers not to contracts entered but to actual shipping orders entered, including specifications against contracts. The bookings were heavy in both sheets and tin plates. The National Tube Company booked in the first half of July a tonnage somewhat in excess of its entire capacity for a month. In both instances deliveries on most of the tonnage booked will be deferred weeks or months. In some sizes of lap weld pipe orders now entered cannot be shipped before November or December. Butt weld orders, on the other hand, can be filled promptly, and indeed are being filled to an extent from stocks accumulated earlier in the year.

The extremely heavy demand that has existed for months for line piping and other oil country goods is looked askance by some pipe mills as being due to an oil boom that cannot possibly continue indefinitely. It certainly seems strange that there should be so heavy a demand as to fill the lap weld departments of the pipe mills, when other users of lap weld pipe have been buying very sparingly indeed. The attitude is reflected in the failure of other pipe mills to follow the price advance announced early in the month by the Wheeling Steel & Iron Co., 2½ points on butt weld and 5 points on lap weld, about $5 and $10 per net ton respectively.

Demand Spreading

For several months past the condition as to steel demand has been that of certain lines of consumption being very active and others being very quiet, a natural enough situation when the country is recovering from war time conditions, as some lines of activity can return to normal sooner than others. For several months the leading lines in the matter of buying steel were the petroleum industry and the automobile trade. The sheet mills found a few months ago that they were receiving a moderate volume of business in the aggregate, equal, to say, 60 per cent. of capacity, but nearly all the tonnage was from the automobile trade. If their other customers had bought with corresponding freedom the mills would have been oversold. Now the sheet mills find their orders very much better distributed, as all their customers are buying with more or less freedom. In particular there is now a good demand for sheets involved in the building trades, as for instance for sheets for making metal lath.

A similar spread in demand is observed by the merchant bar mills. For a time the only branch of their business really active was represented by their cold drawn steel customers, who were fairly busy making material for the automobile and associated trades. Now, however, other customers of the bar mills have been coming into the market more freely, including the agricultural implement makers and machinery builders generally, while there is a better demand for concrete reinforcing bars.

Demand for structural steel, however, still lags, although it is improving, and demand for plates is wretchedly small in proportion to capacity. Plate mills attached to pipe works have a fair volume of work in making plates for large pipe and there has been an active demand from the oil trade, involved in tanks for oil storage and in small boilers for field work, the kind that can be rolled over the ground by a team to a point otherwise inaccessible. Most lines of plate consumption show decided inactivity, and even demand for shipbuilding is unsatisfactory as the shipyards are still drawing from accumulations. As a result of these conditions the regular or official price of plates, 2.65c, continues to be shaded very frequently, generally by $3 a ton or to 2.50c, while other finished steel products show scarcely any deviations from the regular prices, those that became effective March 21.

Decline in Chain

While the producers of finished steel and the producers of most manufactured steel products, such as rivets, bolts and nuts, cold rolled steel, etc., have been doing team work and holding prices quite well, a disturbance has occurred in the chain trade. The American Chain Co., the largest producer, feeling that it was not getting the share of the total business to which it was entitled, recently made sweeping reductions in prices of ordinary or black chain, much to the surprise of other producers. They accepted the reductions, of course, but for a time considered the advisability of rejoining by making other reductions, as in bright chain, for instance, but this idea was abandoned. The reductions on black chain included a reduction in the base price, on one inch proof coil chain, from 6.50c to 6.75c, reductions also in most of the extras for size, and reductions in the extra for BB and BBB quality, whereby the average reduction on an assortment probably runs from $25 to $30 per net ton.

NEW YORK HEARS INCREASE LIKELY

Special to CANADIAN MACHINERY.

NEW YORK, July 24.—The machine-tool market is making gains in more ways than one. For instance, for some time past the great bulk of the buying has been done by one branch of the industry, viz., the automotive factories. They "came back" quickly as soon as the armistice was signed, and bought heavily. This was true not only of the existing shops, but of factories that were brought into existence after the signing of the armistice. In fact, the auto business has been kind to the machine-tool trade.

One of the best features to come to notice lately is that the buying of tools is becoming more general, and inquiries are coming from a much wider field than formerly.

One New York manufacturer has signed up a good-sized order of 42 large lathes for the Washington naval ordnance plant, the price being close to three-quarters of a million dollars.

French works have inquiries in the market here for equipment for the Creusot Works. It is stated that the erection of a very large steam turbine plant is contemplated.

Cincinnati tool builders, discussing price prospects, state that an advance in some lines is far more likely to take place than a decrease. A shorter working day has been put in force at the old rate of wages. There is a scarcity in some of the shops of skilled labor. This works out in several ways. For instance, New England shops are getting a large amount of work that cannot be handled in the other centres.

FURNACES ARE NOT ANXIOUS TO BOOK ANY BUINESS NOW FOR 1920

SOME very large tonnages of iron have been disposed of at the furnaces and prices show a firmer trend.

Pittsburgh.—The Carnegie Steel Co. has added two stacks, and have thirty-six in blast now, intending to add two more next week. By August 1 this company will have forty of its fifty-nine stacks active.

Boston.—Pig iron trading is dull. Fourth quarter prices look firmer. In spite of high freights southern iron is holding its own in the market here.

New York.—First half of 1920 is being covered now in many instances, and export business is a large factor in the dealings. Another furnace at Port Henry will blow in about the end of July.

Buffalo.—Buyers are wanting iron now where a few months ago they would not take it. Two big interests are out of the market now, showing no anxiety over quoting on 1920 business.

Cleveland.—Makers are now shipping more than their output, which is making a reduction in the stock they had piled.

Chicago.—Deliveries are complained of, and as users have bought short for some time, there may be yards where pig will be out or scarce.

Cincinnati.—Low-priced iron for third-quarter shipment is wholly absorbed. Southern stocks selling at $25 have left the market.

St. Louis.—Furnaces are not trying hard to sell as they can readily dispose of their output. They are not booking for 1920 orders.

THE DEALERS HOLDING THEIR SCRAP AND PRICES ARE CLIMBING AS RESULT

SCRAP metal users in Canada and the United States are coming into the market freely, and prices are stronger.

Chicago.—Scrap of all sorts goes up from 50c to $2 per ton. Dealers are not keen on selling, expecting higher prices.

New York.—Yardmen and scrap collectors are holding back and forcing prices up. Tonnage moving is not large.

Boston.—Large sales are going to stove foundries. This is the best business in scrap metal which is otherwise rather dull.

Philadelphia.—Prices are mounting, but selling is small.

Pittsburgh.—Steel manufacturers are in the market in a large way. At one plant 28 cars were rejected as being below grade.

Buffalo.—Heavy melting is in demand, and dealers are not selling it in quantity. Good demand for all grades this week.

Cleveland.—An offer of $21 delivered has been turned down for heavy melting. Dealers look for a shortage and higher prices as many yards are bare.

STANDARDIZATION OF CHAINS

The unprecedented demands of the Allied Governments for driving chains for all purposes during the period of the war, made it necessary for the British Driving Chain Manufacturers to collaborate in order to use the whole of their resources to the best advantage. As a result, the needs were met, both as regards quantity of production and quality of products. The benefits accruing from co-operation were so marked that a permanent association has now been formed.

The main object of the association is to foster and develop the use and application of chain gearing, the value of which is not yet fully appreciated by power users. In view of this, and in the face of competition with other forms of transmission, it is the policy of the association to keep down the cost of chain driving to the user. This will be attained by:

1.—Standardization of chains wheels and chain wheel cutters to ensure interchangeability.

2.—Elimination of unnecessary sizes of chains, which have been a source of confusion and difficulty to the user.

3.—The increase in output resulting from the above.

4.—The more comprehensive research made possible by co-operation.

The association is composed of the following: Alfred Appleby Chain Co., Tilton Rd., Birmingham; Brampton Bros., Ltd., Oliver St. Works, Birmingham; "The Coventry" Chain Co., Ltd., Spon End Works, Coventry; Hans Renold, Ltd., Didsbury, Manchester.

GRAMMATICAL

Highlanders have the habit, when talking their English, such as it is, of interjecting the personal pronoun "he" when not required, such as "The King he has come," instead of "The King has come." Often, in consequence, a sentence or expression is rendered exceedingly ludicrous, as the sequel will show:

A gentleman of high standing tells us that he had the pleasure of listening to the sermons of an exceptionally clever divine (let his identity and locality remain a secret), and recently he began his discourse thus: "My friends, you will find the subject of my discourse this evening in the first Epistle General of the Apostle Peter, the fifth chapter and the eighth verse, in the words, 'The devil he goeth about like a roaring lion, seeking whom he may devour.' Now, my friends, with your leave, we will divide the subject of our text this evening into four heads. Firstly, we shall endeavor to ascertain 'Who the devil he was'; secondly, we will inquire into his geographical position, namely, 'Where the devil he was' and 'Where the devil he was going'; thirdly, and this of a somewhat personal character, 'Who the devil he was seeking'; and fourthly and lastly, we shall endeavor to solve a question which has never yet been solved, 'What the devil he was roaring about.'"

STORING LARGE QUANTITIES OF COAL

The problem of storing immense quantities of coal—10,000 tons or more—has always been a serious and expensive one. Railroads and power plants, and large industrial plants requiring coke, must always have large coal reserves. Many plants use the bucket and derrick method constantly to move the coal in order to prevent combustion and fire. This describes a method that has proved extremely successful.

The greatest danger connected with storing coal is in the slow combustion which takes place and is not detected until the odor of sulphuric fumes becomes noticeable. When this action begins the coal should be redistributed so that the pressure existing on the heating layer is removed. In some cases the entire coal pile would have to be turned over, since the greatest pressure is on the bottom, thus requiring quick action and the expenditure of a large sum of money. Any scheme whereby an increase of temperature in the coal pile can be detected, or by which it can be retarded or prevented, will therefore be a saving. To accomplish the first objective an electrical thermometer system was installed, with the temperature indicating instrument or pyrometer in the engineer's office. Switches were so arranged that the temperature of predetermined locations in the coal pile could be obtained almost instantly. The second objective was obtained by reducing the pressure on the heated layer, removing all the coal at that particular point if necessary. A temperature of 250 deg. F (120 deg.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross	
Lake copper	$24 40	$26 00
Electro copper	23 00	26 00
Castings, copper	23 00	24 50
Tin	55 00	54 00
Spelter	9 50	8 50
Lead	7 00	7 00
Antimony	9 50	9 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$13 50	$13 75
Copper, crucible	17 25	18 00
Copper, heavy	17 50	18 00
Copper wire	17 50	18 00
No. 1 machine composition	13 50	16 75
New brass cuttings	10 00	10 75
Red brass cuttings	11 75	14 75
Yellow brass turnings	8 50	9 00
Light brass	7 00	7 00
Medium brass	8 00	7 75
Scrap zinc	5 50	6.00
Heavy lead	5 00	5 25
Tea lead	4 00	3 50
Aluminum	16 00	18 00
	Per Ton.	Net.
Heavy melting steel	12 00	13 50
Shell turnings	7 00	6 00
Boiler plate	12 00	11 00
Axles (wrought iron)	17 00	20 00
Rails	12 00	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe wrought	9 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	5 50	6 00
Stove plate	15 00	13 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sies up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, al sizes	40 plus 10
3-fluted drills, plus	10
Jobbers' and letter sizes	40 plus 10
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 50
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill ..... list plus 5%
At warehouse ..... list plus 25%
Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings. 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized. class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head.28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S.	.....	7 50
Premier, 10¾ oz.	.....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	.....
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	...
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated.

C.) was assumed to be the safe internal temperature; if the pyrometer showed a close approach to this figure, the coal at this point was immediately removed to the point nearest the place of consumption. This involved little additional expense in operating costs, as the coal would eventually find its way there anyway. This is not true of the "turn-the-coal-over" method, especially if the storage place is limited.

To keep within the safe temperature limits the coal, as consumed, was removed from the top in two-foot layers with a gradual slope toward the point of consumption. The removal of the two feet of coal reduced the lowest layer from the pressure of the removed weight, and the gradual slope made the work of the men with loaded wheelbarrows less than if a perfect level was retained.

Ten thousand tons of coal piled 12 ft. high meant that a ground area of 33,350 square feet would be required, assuming a value of 50 lb. per cubic foot. A trackage of 400 feet permitted the unloading of coal on a plot 350 by 100 feet. For satisfactory detection of heat changes in the coal to be stored on this plot it was decided to place pyod receptacles (thermocouples) in rows of fifteen. The receptacles were constructed of 1-inch wrought-iron pipe, welded to a point at the end, which entered the coal pile. The exposed end was fitted with a self-closing cap to prevent the entrance of any substance which might interefere with the ready insertion of the pyods. Fifteen pyods were used. The wiring to the engineer's office, however, was of a permanent nature from a central location on the coal pile. From this point lines radiated to the portable pyods.

The pyod receptacles were numbered 1 to 15 on each row, which had a distinguishing letter. The switches in the engineer's office were numbered and lettered in a manner to correspond with the pyod receptacles. This plan permitted an attendant to place the pyods in the desired receptacles, and the engineer to observe and record in the station log, in numerical order, the temperature readings of the coal at the different points. After placing the last of the pyods in row "A," the attendant immediately commenced transferring them to row "B" in numerical sequence. The time was considered sufficient for the pyod to adjust itself to the various temperatures encountered, inasmuch as the temperature to be measured already existed in the pockets formed by the pyod receptacles. Thus an unbroken operation can be carried out in the shortest possible period of time. After the temperature existing in the last pyod receptacle was read all the pyods were transferred to centrally located receptacles, as it was assumed that this would be in the vicinity of the greatest possible heat generation, inasmuch as they are the farthest removed from the cooling effect of the air.

CONFERENCE ON LIMIT GAUGES

By H. J.

A conference on the question of limit gauges for general engineering work was held recently by the British Engineering Standards Association at the Institution of Civil Engineers, at which Sir Richard Glazebrook presided. The paramount necessity from a national point of view of a standard system of such gauges for general engineering work has been emphasized by the experience of the war. The immense amount of interchangeable parts required, owing to the abnormal demands made during the war, has brought this question very much into prominence. With the return of peace, it is realized that competition will be very strenuous. Repetition work is absolutely necessary, and if the manufacturers of the country can be persuaded to adopt a system of limit gauging, not only will the character of their work be improved, but their output will be increased. About fifty people were present, chiefly manufacturing engineers.

Two important points were brought out during the discussion; in fact, they were thought by some of those present to strike the keynote of the situation. One laid stress on the necessity for publicity and educational work, and the other emphasized the importance of securing that any system recommended should be a development of and not incompatible with, the systems at present in use in the various factories. This latter point, it was felt, would need careful investigation, there being little definite knowledge as to the number of firms throughout the country using systems which would be affected by a new scheme.

The chairman stated that the conference had been called together to gain some general idea of the views of the manufacturers as to the principles which should, in their opinion, underlie a system of limit gauging for general engineering work; to learn their own experience, and to discover by means of a properly organized investigation into the subject how far they consider it would be possible to co-ordinate existing practices so as to evolve a standard system which could be used satisfactorily by all concerned.

The meeting discussed at length the following points. A general expression of opinion was asked for in each case, not as constituting a definite decision, but rather as affording some indication as to the trend of opinion in regard to the main points at issue: (1) Should the hole or the shaft be taken as the basis. It was agreed that the hole should be the basis; (2) Disposition of limits. Two main proposals were discussed: (1) That the mean dimension of the hole should be its nominal size, the tolerances being both positive and negative; (2) That the minimum dimension of the hole should be the nominal size, the tolerances being positive. Apart from theoretical considerations, the choice of the mean size as the nominal was urged for the reason that as this system was already employed in the principal existing systems, it would be more likely to gain a general adoption than would the other. The voting, however, out of forty-six present, showed twenty-three in favor of taking the minimum hole as standard, as against sixteen in favor of taking the mean.

Qualities of Work

(3) The general feeling was that four or five qualities of work would be sufficient, qualities of work being taken to mean degrees of fineness of tolerance. Some present considered more to be necessary, others thought three sufficient.

Classes of Fit

(4) It was agreed that the following three classes of fit would be needed, i.e., running fits, transition fits, and interference fits. It was emphasized, however, that it would not be necessary to arrange for all the qualities of work in each class of fit.

Allowances

(5) The question as to whether the basis of the system should be the minimum or mean allowance in the case both of running and obstruction fits received considerable attention, and was left for more detailed consideration. As regards the basis for laying down tolerances and allowances for running and transition fits, it was agreed that further experimental work was needed before this could be finally settled, but the feeling was expressed that the formula:

$$\text{Allowance} = a + b\sqrt{D},$$

a and b being suitable constants and D the diameter, might be accepted provisionally. In applying such a law the tolerance would naturally increase by a series of steps, its amount being constant over a given range of diameter and increasing by some definite step at the end of the range. It was generally agreed that for most qualities of work the steps should be limited to multiples of two or four ten-thousandths of an inch, while not excluding multiples of one ten-thousandth in the finer qualities of work, and the ranges formed by the series .1, .2. .3, .4, for an inch were thought to be suitable for running and transition fits. It was thought that interference or obstruction fits should increase proportionally to the diameter.

Procedure

(6) The question has hitherto been considered by a sub-committee of the sectional committee on machine parts, their gauging and nomenclature, and at the close of the conference the meeting was asked as to whether it considered it would be desirable for a larger and more representative committee to be formed for the sub-committee to report to in order to obtain the widest publicity possible for the work and the fullest measure of support for the recommendations when issued. It was agreed that such a course would be beneficial as safeguarding all interests, and a scheme by which, pending the formation of this sectional committee, the present sub-committee should be reorganized with the addition of a number of manufacturing engineers, and given the power to appoint panel or small committees of experts to commence the detailed work, has now been sanctioned by the main committee of the association, and is being put into operation.

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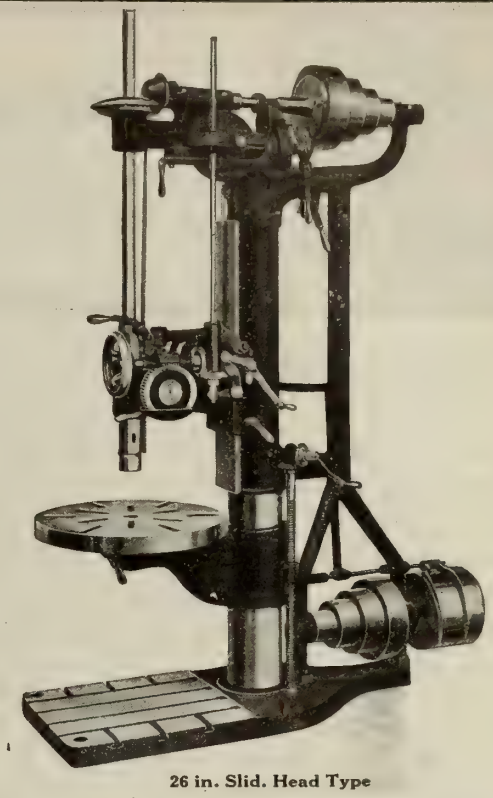

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manufacture only the highest grade of Screws, Nuts and Drills and every piece is guaranteed or you get your money back.

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Ask your jobber for Ingersoll Files "The better kind." 1

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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

The J. C. Wilson Mfg. Co., Ltd., Belleville, Ont, is in the market for a 6 to 8-ft. vertical boring mill.

Brickmaking in Manchuria.—In Kaiuan, Manchuria, a company has recently been organized with a capital of $50,000, to manufacture bricks.

Substation Expands.—The Toronto Hydro-Electric Commission has purchased the property at 27 and 29 Nelson Street, for the purpose of extending the substation at Duncan Street.

Saw Mill Burns.—The saw mill of Mr. Musclow, situated at Musclow, North Hastings, was completely destroyed by fire recently. The loss is a total one and is not covered by insurance.

New Brantford Shop—The Allied Aeroplanes, Ltd., Brantford, Ont., has been incorporated with a capital stock of $40,000 by John Dowling, Brantford, Ont.; Bryan Dowling and others of Toronto, to manufacture aeroplanes, engines, etc.

To Spend Large Sum.—The expenditure of a sum of $2,500,000 is contemplated by the Beaver Wood Fibre Company in the expansion of the Thorold plant, as well as building a duplicate of the Ottawa plant to take care of the increased Canadian and export business.

The Newmarket Explosion.—The inquest on the victims of the explosion at the factory of Wm. Cane & Sons, Newmarket, has been postponed until July 25th next to allow of the experts making a thorough analysis of the water used in the boilers, which is supposed to have been responsible for the accident.

Increasing Yard Area.—The large farm of A. Weaver, on the Niagara River frontier, nine miles from the International Bridge, has been secured by a party of Toronto realty dealers. It is understood that the ground will be used for extending the yard holdings of the Canadian Niagara Bridge Company.

To be Completed.—By August 1 it is expected that the contractors will be able to hand over the St. John Valley Railway to the Dominion Government, to be operated as part of the Canadian National Railways. Hon. W. F. Jones, president of the St. John & Quebec Railway Company, has made this announcement.

New Machine Shop.—Contracts have been let by the Lang Manufacturing Co., of Guelph, for the erection of a new machine shop to be built on the Harris St. side of their present factory. This is necessary owing to the expansion of their business, which is increasing at a rapid pace. The firm, which conducts a general machine shop business, purpose taking up other lines when they have the new premises available.

Embargo on Freight.—The United States Railroad Administration has issued orders for an embargo on all coastwise freight traffic, due to the congestion caused by the marine strike. Much perishable freight is already piled up at Atlantic and Gulf ports, and the secretary of the Seamen's Union claims that the entire shipping of the country will be tied up within the next two weeks if a settlement is not reached.

Contract Let.—The General Motors of Canada, Ltd., has awarded the general contract for a factory at Oshawa, Ont., to cost $1,000,000 to the Canadian Stewart Co., foot of Cherry street, Toronto. It will consist of an assembling building, four stories, 40 x 80 ft., of reinforced concrete; shipping building, 80 x 200 ft.; storage building, four stories, 80 x 800 ft.; enameling building, 80 x 300 ft., three stories.

New Industry for Miramichi.—Mr. H. W. Mobbs of Kettering, England, president of the largest last company in the United Kingdom, is looking into the prospect of starting a last-making industry on the Miramichi. If they can get the stumpage at reasonable rates they propose to establish mills to handle 3,000,000 feet of lumber. This would be sawn, shaped and seasoned, leaving only the final operations to be done in England. The lumber required is rock maple.

Trade With New Zealand.—Mr. Beddoe, trade commissioner for Canada in New Zealand, who is on a visit here, gave some illuminating figures on the development of trade in the last few years. Since 1900 the exports from Canada to New Zealand have increased from 150,000 pounds sterling to 1,000,000 pounds a year. The exports from New Zealand have grown from 100,000 pounds to over 1,000,000 pounds sterling. Mr. Beddoe is here with the object of familiarizing himself with conditions in Canada after the war.

To Try New Boilers.—In order to try out the Spencer heating boilers equipped with self-feeding furnaces, which have been successful in Hamilton schools, the Board of Education of Toronto departed from their usual rule of accepting the lowest tender. The difference in the bids was as follows: Tubular boilers, $12,300; brickwork, $6,100. Spencer boilers, $15,500; brickwork, $7,375. The installation in Toronto will be in Howard Park School.

Imports Decrease.—Trade returns for the three months ending June 30th, show a great decrease in imports compared to the corresponding three months last year. The total value of imports last year was $250,527,808, while the value for this year was only $200,615,514, the decrease being $49,912,294. Domestic exports for the three months this year were $244,096,793, and for last year $258,673,479, a decrease of $14,576,681. The trade as a whole decreased by $59,108,602, the figures for this year being $455,746,463, and in 1918, $514,746,065.

Beating Great Britain.—The fact of large orders going to Canada and the United States from the South African Government, was the cause of enquiry in the British House of Commons by Mr. R. P. Houston, member for Liverpool. These orders were for 44,000 tons of rails, 1,000 cars, 250 trucks, and 70 locomotives. The Colonial Under Secretary in reply stated that some of the orders had been placed prior to the signing of the armistice, when Great Britain was not in a position to supply railway material. British prices and dates of delivery on the locomotives were unsuitable.

MARINE

Buffalo.—Several of the crews of ships leaving the Great Lakes for European waters are refusing to sign for any further distance than Montreal, owing to the strike of shipworkers on the Atlantic coast.

C.P.R. Ordered to Start.—The Canadian Pacific Railway Co. has been ordered by the Dominion Railway Board to begin the construction of its new terminals at Kingston not later than May 20, 1920.

Montreal.—The "Canadian Volunteer," the first of the Government vessels to make the trip from Vancouver to the United Kingdom, will soon be followed by the "Canadian Trooper." The Wallace Shipyards expect to deliver this vessel about August 7.

Lumber Price Investigation.—The contractors in the district of Calgary have been notified by Premier Sir Robert Borden that their demand for an investigation into the price of lumber will receive his immediate attention. An en-

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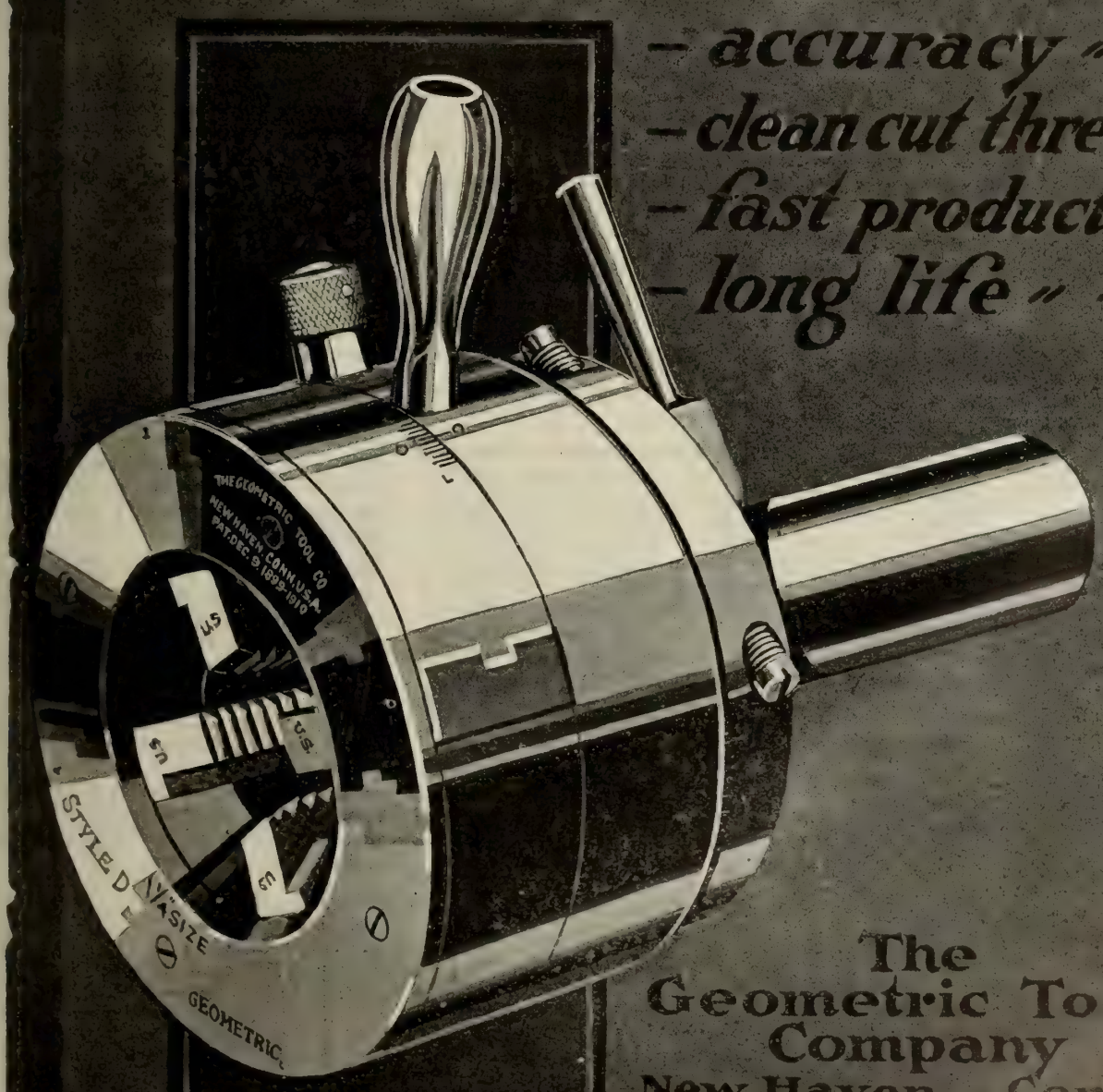
– accuracy " "
– clean cut threads
– fast production
– long life " " "



The Geometric Tool Company
New Haven, Conn.

Canadian Agents:
Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

quiry into the price of linseed oil and paint is also demanded.

Vancouver.—The last of the Lyall ships will have been probably launuched by the 22nd July, and no further vessels are expected to be built in the yards. The total tonnage of wooden vessels constructed amounts to 37,800 tons, some of which is at sea and some still at the fitting out wharves. Six of the ships were for the Imperial Munitions Board.

London.—The Shipping Engineering and Machinery Exhibition that will be open in September will afford the public an opportunity to see the luxury and ease of sea travel. Everything of interest from a marine engineering standpoint will also be on view, and there will be no exhibits of enemy origin in the exhibition.

St. Johns.—High freights offering to Buenos Ayres and other southern points have denuded the market of steamer offerings, but there are plenty of sailing vessels. They are getting from 345 shillings to 350 shillings for transatlantic cargoes per standard. Lumber mills are all busy, with good prospects for future business.

St. Thomas.—Negotiations are going forward between the St. Thomas Board of Trade and representatives of the Cleveland Transportation Company with a view to the resumption of the service between Port Stanley and Cleveland. This was discontinued during the war on account of the restrictions on the higher expenses. It is hoped to start the service at the end of July.

New York.—According to a statement by the American Steamship Association no strike-breakers will be employed to man ships affected by the marine strike, the association stating that they prefer to let the ships remain idle. The strikers say that if an agreement is not speedily reached they will appeal to seamen's labor organizations in Great Britain to take similar action.

Cleveland.—The freight situation is quiet. There is not much grain movement and tonnage is freely offered for ore. Small carriers and line boats are taking all the grain that is offering. Sales have been light in the ore trade but a better buying movement is looked for by the end of the month. The movement of coal from the Pittsburgh district is also light and vessels have frequently to call at two ports to make their full cargo.

New Westminster.—The Poplar Island Shipyard of the New Westminster Construction Company has been permanently closed down as far as the company is concerned. The company are outfitting the remaining French vessels, but they have no more building contracts in sight, and they are selling out all their equipment. The opinion of Mr. H. M. Fullerton, the secretary-treasurer of the company, is that the wooden shipbuilding business is done.

Chair Works Changes Hands. — The Canada Last Co., of Toronto, has purchased the works of the Preston Chair Co. from the corporation of Galt. The company went into liquidation, owing the municipality the sum of $19,153, and the price paid the corporation by the Canada Last Co. was $21,000, which clears the town of any loss. The new owners will spend a considerable sum in improving the property, and will employ from 40 to 50 hands.

Ashtabula.—The coal steamer, "Dundurn" was lost by foundering near the breakwater at Ashtabula, Ohio, in a heavy storm. The "Dundurn," which was owned by the Canada Steamship Lines, was 186 feet long by 30 feet beam, and 12 feet deep, and was well known on the lakes. She was on the Hamilton to Montreal trade under the late Capt. Cooney for some years. Two of the crew were drowned when the vessel went under.

Boston—The steamer "Governor Cobb," Boston to Yarmouth, N.S., went aground on Green Island in a thick fog. She had 500 passengers aboard. She floated on the flood tide and proceeded to Yarmouth under her own steam. Green Island is three miles east, nine degrees north of Gannet Rock, and nine miles due south of Yarmouth, and is a small rock about 50 feet high. It is surrounded by detached rocks, and on the south side ledges stretch out to sea for about half a mile. The remaining shores of the island are very steep.

Canadian War Inventions.—There is a department at Argyll House, London, which has been instituted to deal with Canadian war inventions. A large number of devices have been submitted, of which a fair proportion were found to be of practical utility. Chief among these may be mentioned the following: Improvement to gas masks, of which about three million were manufactured, by Lieut C. Rosling, C.E.; Lewis magazine loader and improvements to Colt machine gun, invented by Major H. R. Northover, M.C.O.B.E., both of which were used. and a bomb dropper invented by Lieut. Col. W. F. Kemp, D.S.O. The inventions cover appliances all the way from a combination turf cutter and conveyer to an auxiliary field kitchen.

PERSONAL

Mr. W. B. Roberts, who has just returend from England where he held the rank of Lieut. Commander (Engr.) in the Royal Navy, has been appointed chief inspector for Saskatchewan and Alberta, for the General Accident Insurance Co., boiler department. Mr. Roberts, before going overseas, represented the company in that territory for about two years. He was connected with the Manchester Steam Users' Association for a period of five years, where his opportunities to obtain expert knowledge of boiler questions was unlimited. Besides his naval experience, he was in the mercantile marine for some years, and holds the extra first-class certificate of the British B. of T. He should be a great acquisition to the engineering fraternity of the prairie provinces.

INCORPORATIONS

The Chas. H. Russel Co., Ltd., has been incorporated with a capital stock of $20,000. divided into 200 shares of $100 each, with head offices at Montreal, to carry on a general lumber business.

The Maritime Paper Co., Ltd., with head offices in Moncton, N.B., has been incorporated to carry on a general paper manufacturing business. The capital stock will be $100,000, divided into 1,000 shares of $100 each.

Hugh Doheny & Co., Ltd., have been incorporated with a capital stock of $2,000,000, divided into 20,000 shares of $100 each, and head offices in Montreal, to carry on the business of general contractors and engineers.

The United Portland Cement Co., Ltd., has been incorporated with head offices at the town of Brantford, to manufacture and sell Portland Cement. The stock of the company is $200,000, divided into 2,000 shares of $100 each.

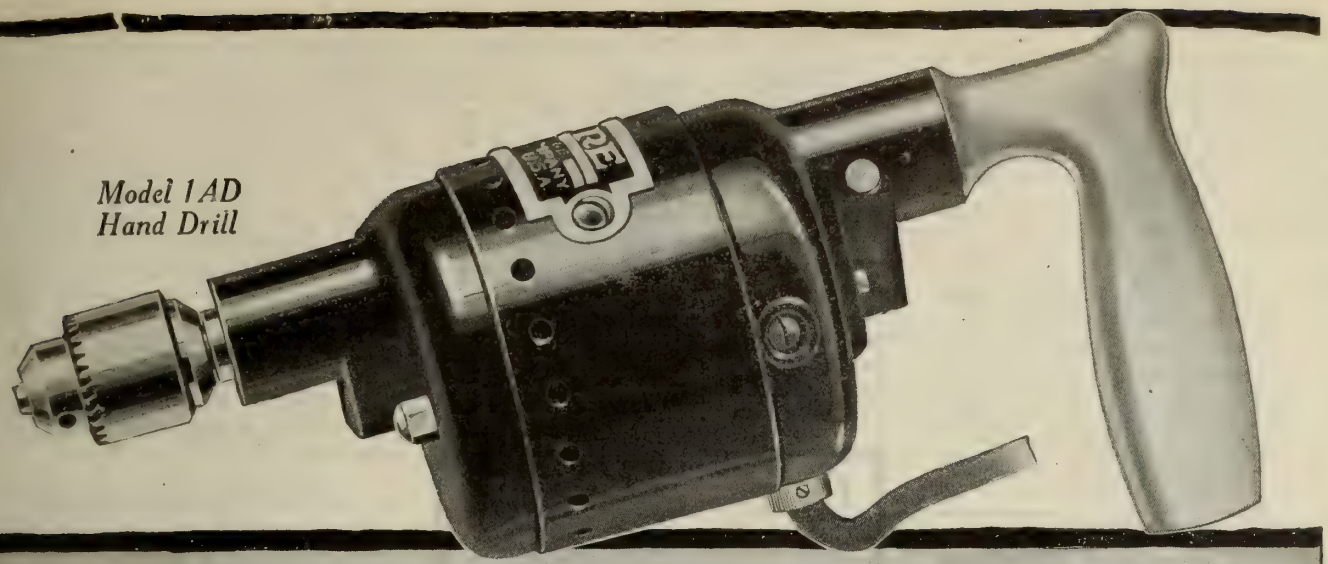
The Chase Tractors Corporation, Ltd., has been organized with a capital of $2,000,000, divided into 20,000 shares of $100 each, with head offices in Toronto, to carry on the business of steel founders, mechanical engineers and general manufacturers.

H. Corke & Co., Ltd., have been incorporated with a capital stock of $100,000, divided into 400 shares of $25 each, to carry on the business now carried on by H. Corke & Co., Georgetown, manufacturing woollens and cottons.

The Battery Engineering and Supply Co., Ltd., with head offices in Ottawa, has been incorporated with a capital stock of $50,000, divided into 500 shares of $100 each. The company will manufacture all kinds of electrical appliances and automobile engines.

The Continental Storage Battery Co., Ltd., has been incorporated with a capital stock of $50,000, divided into 500 shares of $100 each, the head office being in Ottawa. The object of the company will be to make and sell batteries, and deal in automobiles and supplies generally.

The International Coal and Coke Co. has been incorporated with a capital stock of $3,000,000. divided into three million shares of $1 each, with headquarters in Coleman, Alta. The company will do a general business in coal



Model 1AD Hand Drill

MODEL 1AD Hand Drill

Length—10 inches.

Weight—4¾ pounds.

Capacity—Steel, brass, aluminum and alloys, 0 to $\frac{3}{16}$ inches.

Motor—Universal, operates on either direct or alternating current. Diameter of motor 3⅜ inches.

Spindle—Offset from center $\frac{25}{32}$ inches.

Drive—Helical gears.

Handle—Aluminum. Complete with 10 foot cord, plug, switch and chuck. Jacobs chucks used as regular equipment.

MODEL 2AD Sensitive Drill

Height—18 ins. **Weight** 18 lbs.

Stroke—3¼ ins. **Feed**—Rack and pinion. Helical gear drive.

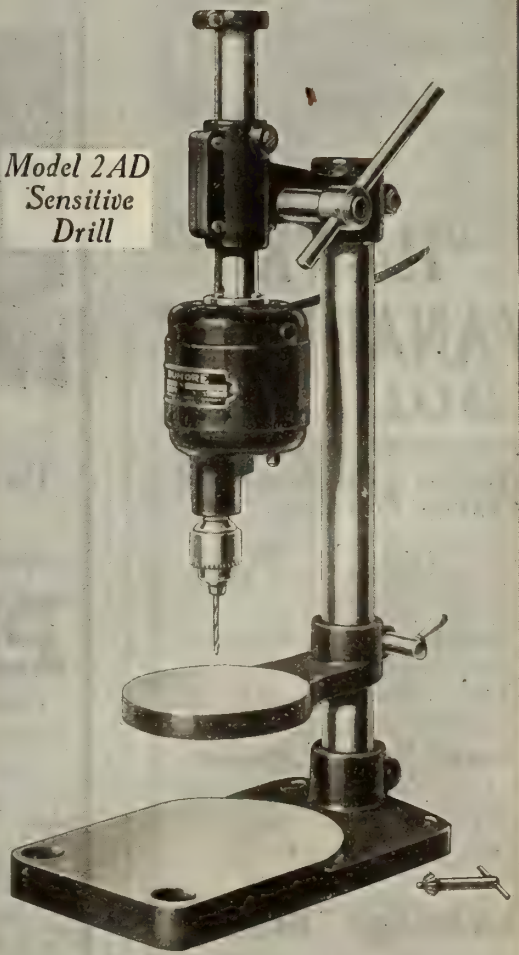
Capacity—Steel, brass aluminum and alloys, 0 to $\frac{3}{16}$ inch. Drills to center of 7½ inch piece.

Motor—Universal, operates on either direct or alternating current. **Diameter**—3⅜ inches.

Spindle—Offset from center $\frac{25}{32}$ inches.

Thrust—Ball bearing.

Table—Adjustable, may be raised, lowered or swung entirely out of the way. Complete with 10 foot cord, plug, switch and chuck. Jacobs chucks used as regular equipment.



Model 2AD Sensitive Drill

Wisconsin Electric Company

2913 Street Racine, Wisconsin

DUMORE GEARED ELECTRIC DRILLS

and oil lands, coal, coke and oil, and general mining operations.

The Automatic Gauge and Supply Co., Ltd., has been incorporated with a capital stock of $100,000, divided into 1,000 shares of $100 each, with head offices in Montreal, the object of the company being to carry on a general automobile business, and especially to exploit a patent gasoline indicator.

WAGES OF SHEET AND TIN MILL WORKERS REDUCED

Youngstown, Ohio.—Sheet and tin mill operatives will sustain another wage reduction during July and August as a result of the bi-monthly examination of selected sales sheets in this city July 12. The average price of Nos. 26, 27 and 28 gage black sheets shipped by the mills in May and June was found to be $4.35 per 100 lb. This will effect a reduction of 4½ per cent. in the wages of sheet mill hands, as compared with the rate in May and June. At the May settlement the average price of black sheets of 26, 27 and 28 gage was $4.50, and the latest examination discloses therefore a reduction of 15c per 100 lb.

The average price on shipments of tin plate per base box during May and June was $6.90, as against $7.15 for March and April. This reduction of 25c per base box means a reduction of five per cent., for tin mill workers. During the Atlantic City conference to establish an annual wage scale, which fixes a basis for the bi-monthly settlements, the sheet mill crew, except the roller, heater, rougher and shearsman, received an advance on the base rate of from 5 to 10 per cent. The reduction of 4½ per cent. is therefore a full loss for the higher paid men and takes away for the two-month period about half the increase granted those lower paid.

This is the third wage cut this year in both sheet and tin divisions, the first one coming at the March settlement, when sheet operatives were cut 10½ per cent. and tin mill hands 8 per cent. At that time, the settlement was based on an average selling price of $4.90 for sheets and $7.45 for tin plate.

FURNACES INSTALLED

The Electric Furnace Co., of Alliance, Ohio, has just installed a battery of two Baily Electric Furnaces at the Capital Brass Works, Detroit, Mich. These furnaces are the standard 105 k.w. tilting type, with hearth capacities of 1,500 pounds each. They will be used for melting yellow brass scrap and borings in the foundry.

The Buick Motor Co., Flint, Mich., has just purchased a second Baily Electric Furnace for melting phosphor bronze. The furnace is of the tilting type, rated at 1,500 pounds hearth capacity, and an electrical capacity of 105 k.w.

The Akron Bronze and Aluminum Co., Akron, Ohio, has installed a 50 k.w. rectangular tilting type Baily Electric Furnace in its jobbing foundry. This furnace has a hearth capacity of 300 to 500 pounds and will be used for a wide variety of compositions. Heats will range from 100 to 500 pounds, and will include gun metal, phosphor bronze, red and yellow brass.

Surplus In United States Has Been Disposed of In Short Order

The U. S. Government surplus of copper, which producers agreed to market within 15 months, has all been sold, only three months being required to accomplish the task. Originally placed at 140,000,000 pounds, the Government holdings were actually less than 100,000,000 pounds and practically every one of the leading producers took a proportionate part to work in with his own sales.

May Purchase Towers.—It is reported that the Nova Scotia Steel and Coal Company have started negotiations for the purchase of the coaling towers at the Halifax terminals, now the property of the British Ministry of Shipping, and also for the purchase of a large supply of coal now on the piers.

New Quarters.—The International Machinery and Supply Company have acquired a four storey building at 421 St. James Street, Montreal, and in a short time will remove from their present office. The new building will have a floor space of about 7,000 square feet, and in addition to their present activities the firm will start an electrical department. R. J. Hiller will be the manager of the new department.

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TO ENLARGE STEEL PLANT

It has been decided by the Lake Superior Corporation to begin work immediately on an extension of the rail mill of the Algoma Steel Co.'s plant at Sault Ste. Marie, Ont.

The purpose of the extension is to make possible the production of structural steel up to 23 inches. Work will be begun at once, and the extension will cost several hundred thousand dollars. It is exected to be completed by November. It has been stated that this is but the first step in a considerable development of the plant, with a view to further caring for the Canadian market for this form of steel product, and that the ultimate scheme will be on a large scale. The present extension is not made with any understanding with the Dominion Government, but is said to be based on the expectations of the market for Canadian produced steel, which is expected to extend on a large scale. The rail mill of the Algoma Steel Co. is now running at about 46 per cent. capacity, and the other portions of the steel plant are going at about full capacity.

Open Toronto Office.—An uptown office was opened recently in 303 Royal Bank building, Toronto, by the Cataract Refining Co., of Buffalo. The warehouse of the company is on the Don esplanade. Mr. F. M. Deer is in charge of the new office, and plans are being made to still more thoroughly cover the Canadian market by the company's representatives.

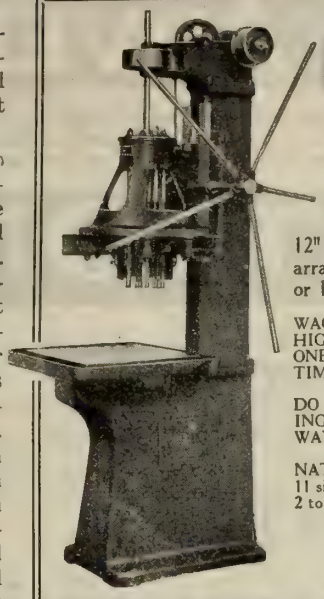
Grant for Smelter.—A delegation waited on Premier Oliver of British Columbia with a request for a loan of $300,000 for the purpose of establishing a Rotherd electric smelting plant in the province. The deputation was headed by Mayor Vance, of North Vancouver, and Reeve Fletcher, of Point Grey. Samples of steel were shown to the Ministers, and they were informed that the high grade exhibits had been made from the ore in the space of four hours. The delegation were promised that a full investigation would be made into the project by the Minister of Mines.

ENGINEERING

Sold Equipment.—The Beaver Engineering Company of Montreal have disposed of nearly all their equipment and will shortly be out of business.

Montreal.—Further developments of the water powers of the St. Maurice River is being considered by the St. Maurice Paper Company. It is understood that the company has leased two sites on the river known as Les Forges and La Gabelle, and it is intended to combine these two, which will give a head of 33 feet, and increase the power now available about 40,000 horsepower.

Extensive preparations are now under way for the Jacques Cartier centennial to be held next month in Montreal. This celebration will last for eight days, from August 9th to the 17th inclusive. An industrial fair will be held in connection with the event and to this end exhibition stalls are now being erected on Fletcher's Field, where the main festivities will take place. It is anticipated that the Prince of Wales will unveil the monument during his visit to the city.



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Tenders will be received by the undersigned Commissioners up till 2 o'clock p.m. Saturday, the 26th day of July, 1919, for the repair to the 3-4 Sideroad and 8-9 Concession drain, in the Township of Brooke, County of Lambton. Estimate cost of excavation, $9,600. Contractors must furnish security for the completion of the work. Plans and specifications may be seen at the office of the Clerk, Lot 16, Con. 9, Brooke Township. Lowest or any tender not necessarily accepted.

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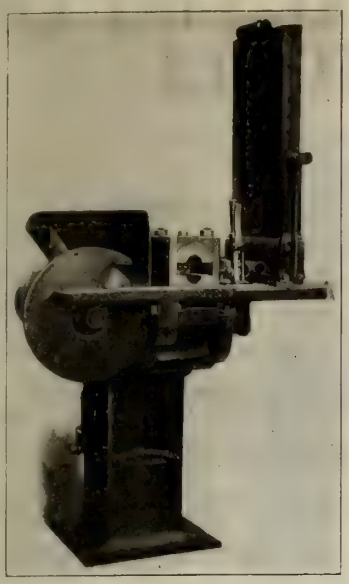

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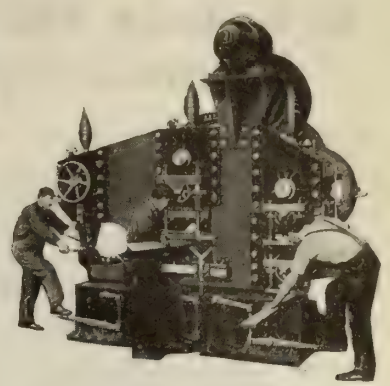

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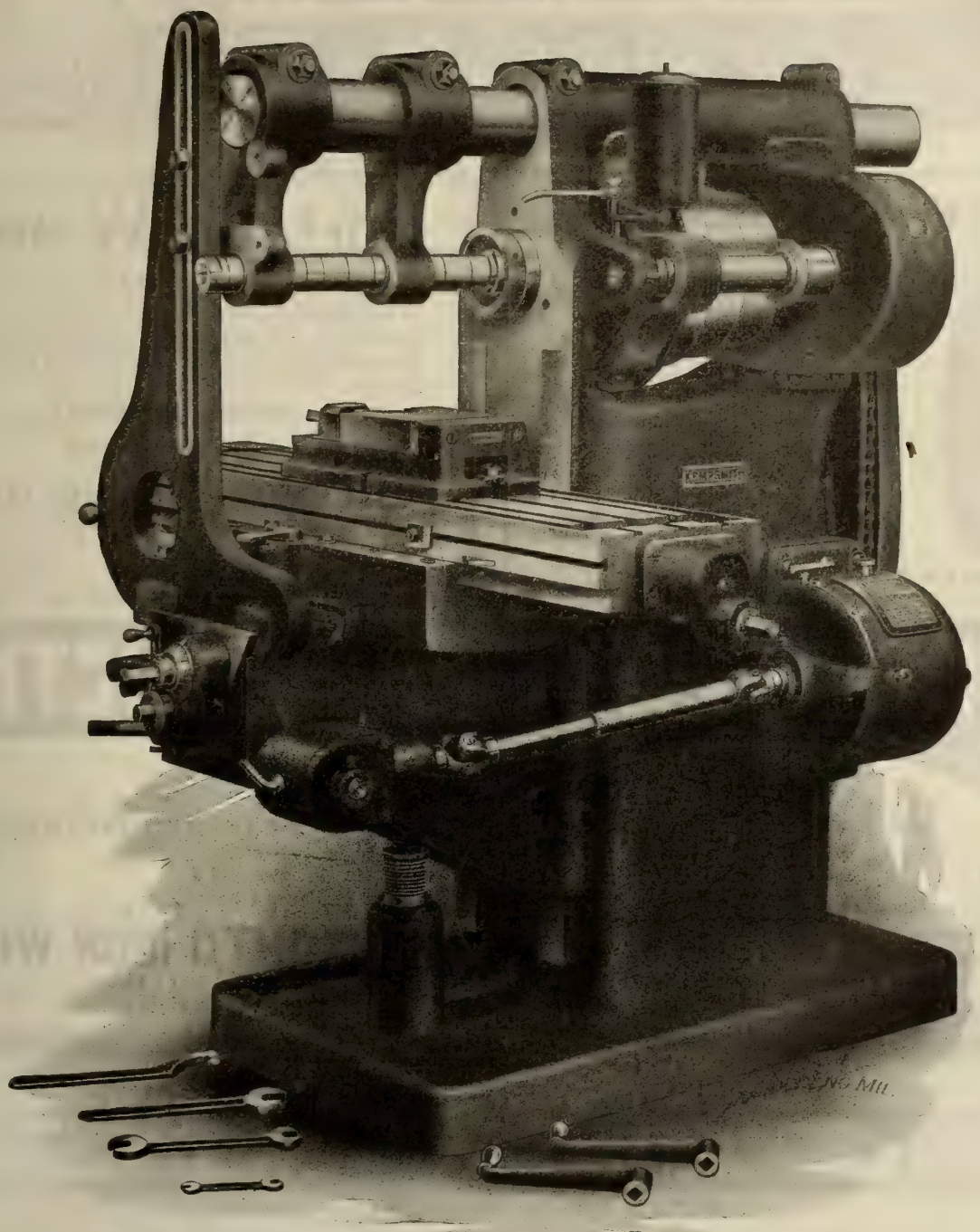

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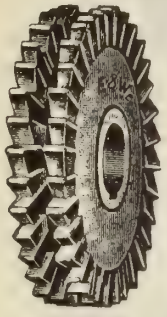

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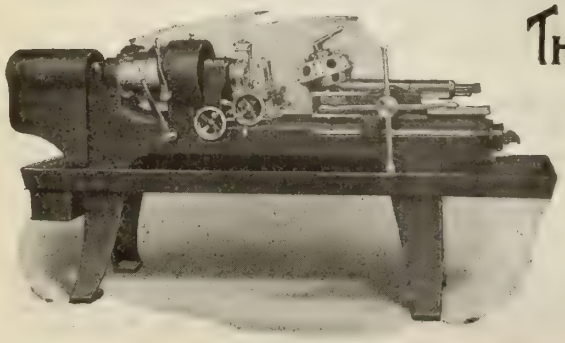

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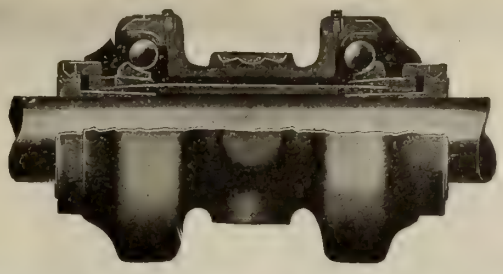

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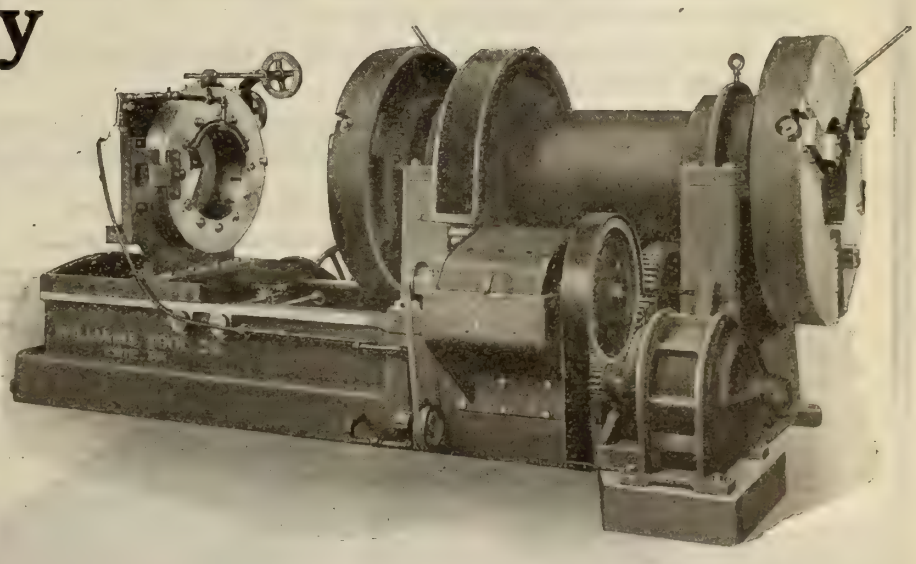

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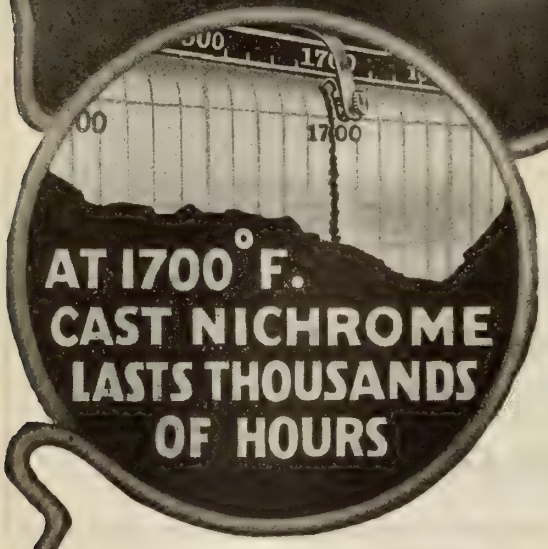

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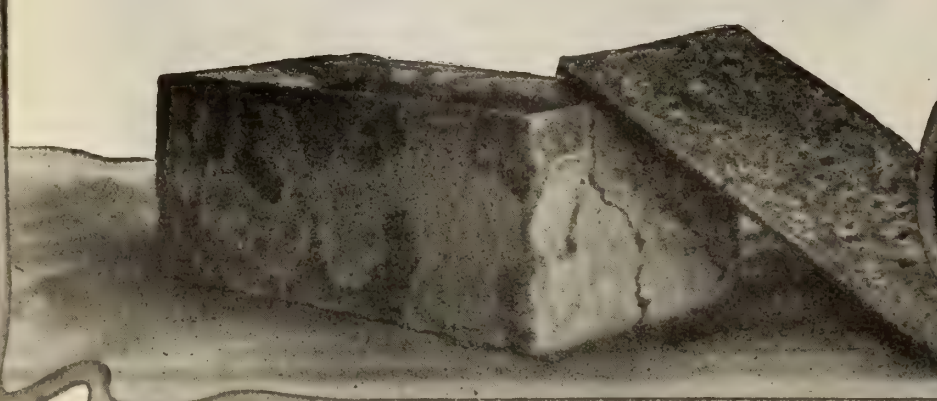

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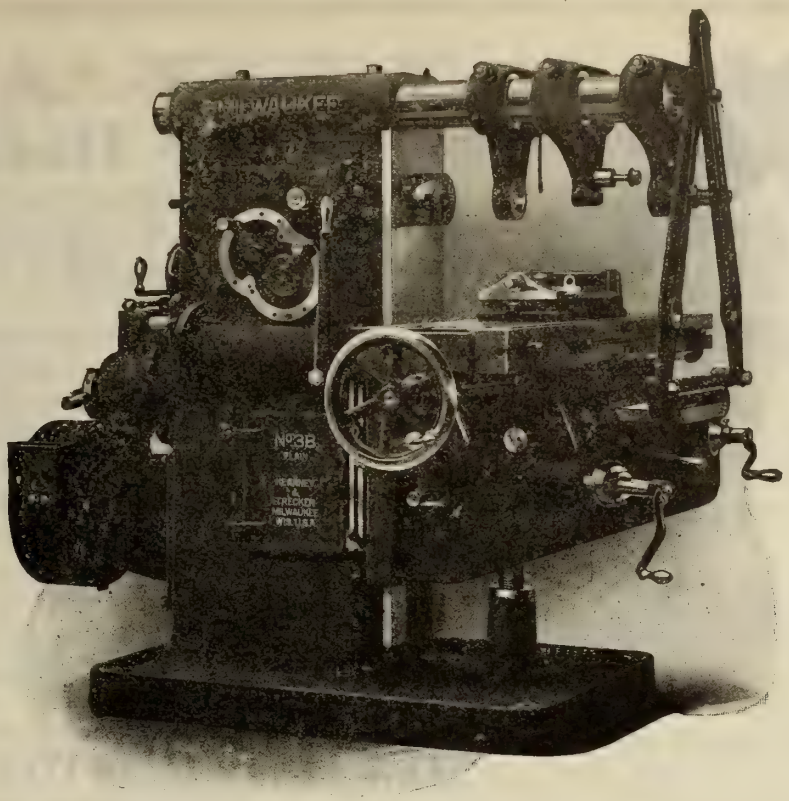

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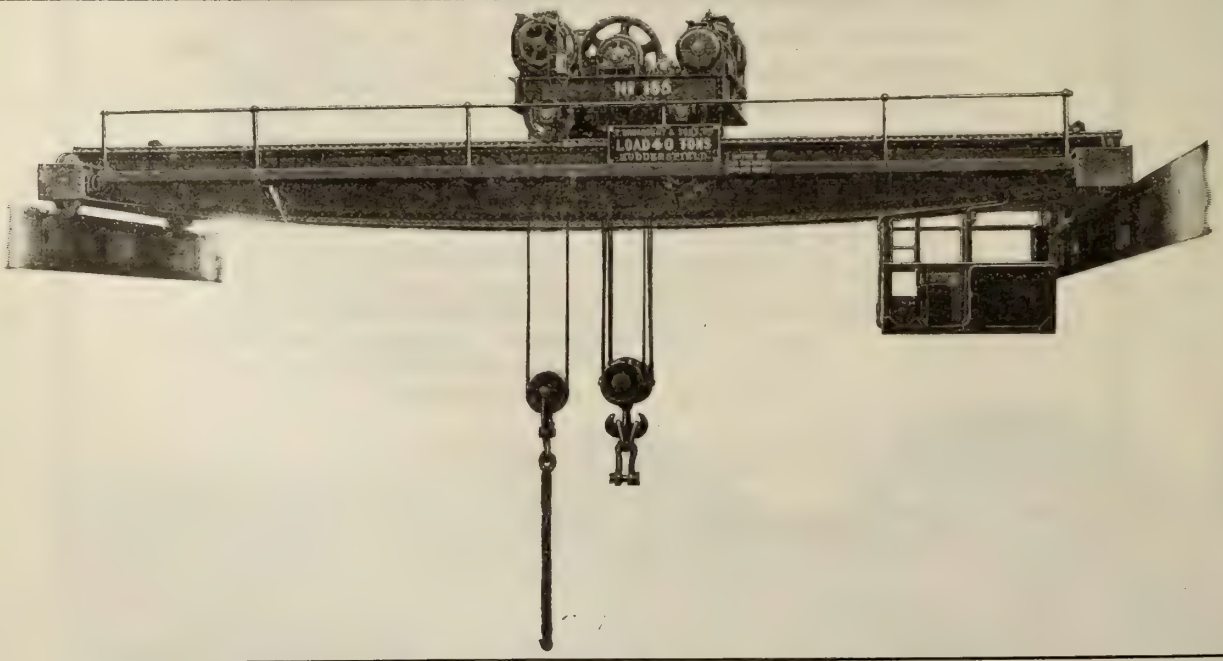

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This article was written for the purpose of letting the other provinces know that the feeling exists but it will be of intense interest to people in the Maritimes. Be sure to read it—"The Spirit of the Maritimes."

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An article on the political aspect of the Eastern Provinces and the achievements of their leading statesmen.

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An extremely interesting description of the measures that were taken to patrol and guard the Atlantic seaboard during the war.

Bonar Law, the man from the Maritimes, who has been the able lieutenant of Lloyd George at all crises in Great Britain, appears on the cover in a handsome three-color reproduction.

Other Big Features of the Number

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Here are a few of the articles in this splendid department chosen as the best published during the past month in all magazines:

- Finding Husbands For Three Million Women.
- Will England Become an Agricultural Country?
- Germany Can be Prosperous Under the Peace Terms.
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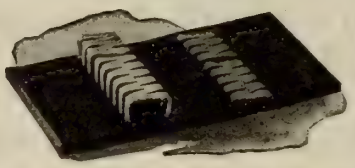

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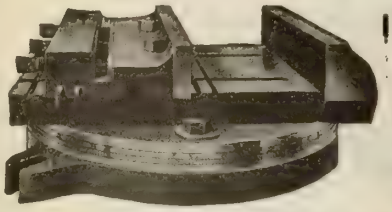

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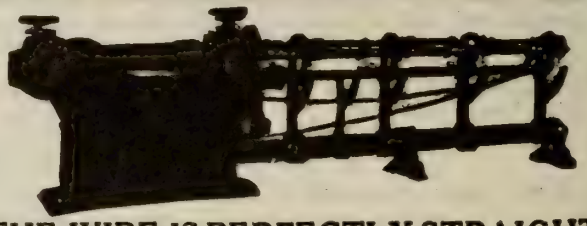

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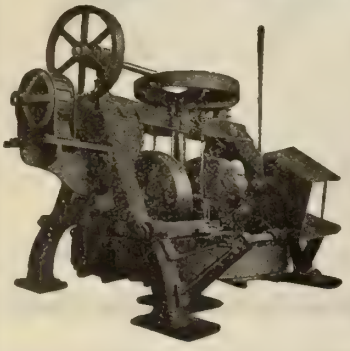

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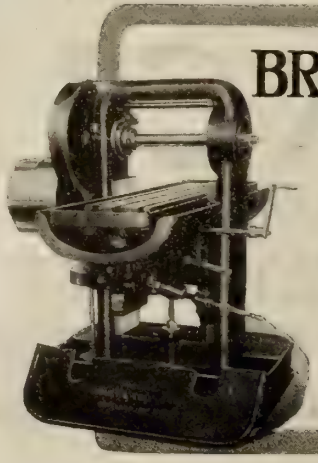

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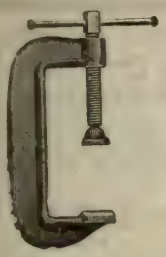

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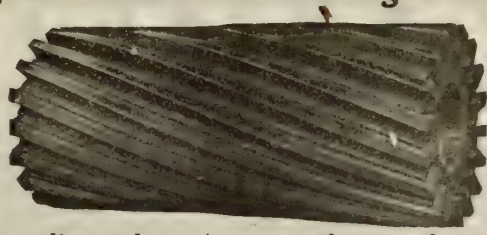

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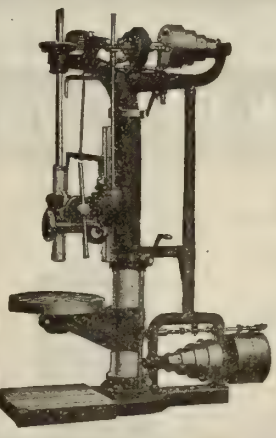

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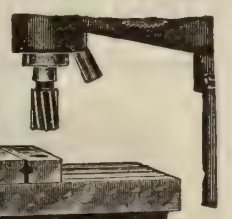

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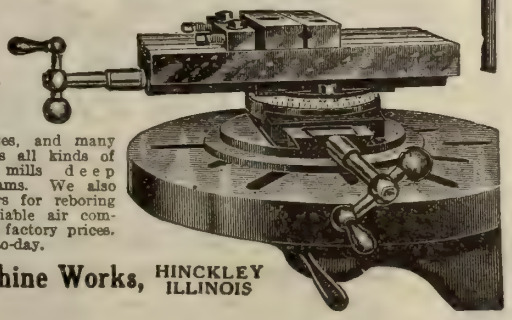

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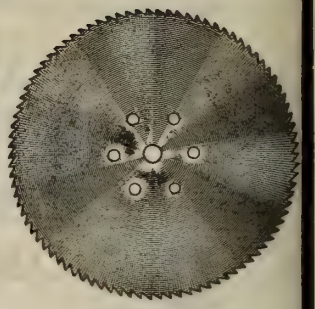

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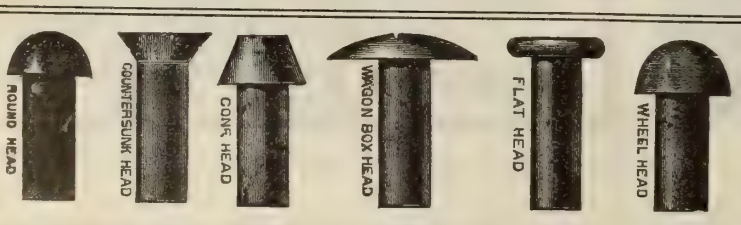

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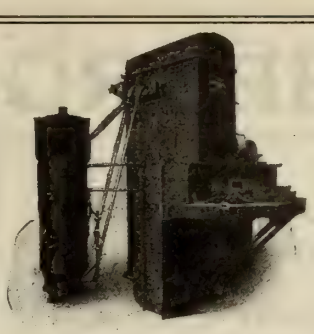

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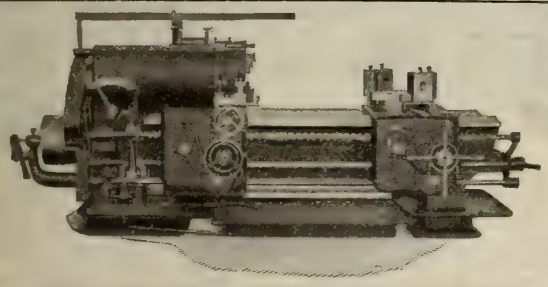

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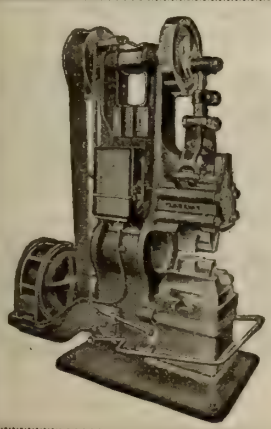

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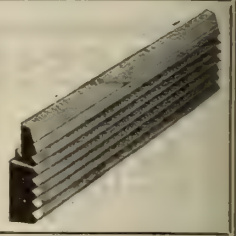

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William & Wilson, Ltd., Montreal.

ACETYLENE
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

ACETYLENE GENERATORS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

ACORN DIE AND HOLDERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

ACCUMULATORS, HYDRAULIC
Canadian Fairbanks-Morse Co., Montreal
Garlock-Walker Mach'y. Co., Toronto.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal.

AIR COMPRESSORS
Darling Bros., Ltd., Montreal, Que.
Williams & Wilson, Ltd., Montreal.

AIR CYLINDERS
Smalley-General Co., Bay City, Mich.

AIR RECEIVERS
Can. Ingersoll-Rand Co., Sherbrooke, P.Q.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal.
Williams & Wilson, Ltd., Montreal.
Welding & Supplies Co., Montreal, Que.

AIR WASHERS
Can. Blower & Forge Co., Kitchener.

ALUMINUM
Canada Metal Co., Toronto.
United Brass and Lead Ltd., Toronto.
Tallman Brass & Metal Co., Hamilton.
Williams & Wilson, Ltd., Montreal.

ALLOY, STEEL
Armstrong, Whitworth of Can., Montreal.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
General Steel Co., Milwaukee, Wis.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing, Montreal.
Vanadium Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

ARBORS
Canadian Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Garlock-Walker Machinery Co., Toronto
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Limited, Montreal

ARCHITECTURAL IRON
Page Steel & Wire Co., Adrian, Mich.

ARRESTERS, DUST
Northern Crane Wks., Walkerville, Ont.
Pangborn Corporation, Hagerstown, Md.

AUTOGENOUS WELDING AND CUTTING-PLANTS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
St. Lawrence Welding Co., Montreal
Welding & Supplies Co., Montreal, Que.

AUTOMATIC MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garlock-Walker Machy. Co., Toronto.
Gardner & Son, Robert, Montreal.
National Acme Co., Cleveland, Windsor
Pratt & Whitney Co., Dundas, Ont.
Roelofson Machine & Tool Co., Toronto.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que

AUTOMATIC METAL CUTTING-OFF MACHINES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros., of Can., Galt, Ont.
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Toronto.
G. F. Foss Mchy. & Sply. Co., Montreal.

AUTO SHEET METAL MACHINERY
Quickwork Co., St. Marys, Ohio.

AUXILIARY HEADS
Hoefer Mfg. Co., Freeport, Ill.

BABBITT METAL
Canada Metal Co., Ltd., Toronto, Ont.
Hoyt Metal Co., Ltd., Toronto.
Magnolia Metal Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal.

BAND SAWS
Oliver Machy. Co., Grand Rapids, Mich.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal
Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto
The Gray Ball Bearing Co., Ltd., Toronto
Morrow Screw & Nut Co., John, Ingersoll
Rochester Ball Bearing Co., Rochester.
Williams & Wilson, Ltd., Montreal, Que

BALLS, STEEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Gray Ball Bearing Co., Ltd., Toronto.
Boker & Co., Inc., Montreal, Que.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Limited, Montreal

BALLS, BURNISHING
Gray Ball Bearing Co. Ltd., Toronto.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

BARRELS, SAND-BLAST
Pangborn Corp., Hagerstown, Md.

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont.
Northern Crane Works, Walkerville, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie

BEADING MACHINES
Quickwork Co., St. Marys, Ohio.

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
G. F. Foss Mchy. & Sply. Co., Montreal.
Graton & Knight Mfg., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids

BELTING, BALATA
Baxter & Co., Ltd., J. R., Montreal
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co., Montreal.

BELTING, CHAIN
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Montreal.
Baxter & Co., Ltd., J. R., Montreal.
Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Graton & Knight Mfg., Worcester, Mass.
Jones & Glassco, Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice, Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.

BELTING, WOVEN
Baxter & Co., Ltd., J. R., Montreal.
Federal Engineering Co., Ltd., Toronto

BENDING ROLLS, PLUTE & AUGH
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Garlock-Walker Mach. Co., Toronto.
Williams & Wilson, Ltd., Montreal.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto.
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

BLACKSMITH WORK
James Ballantyne, Montreal.
The Thos. Pink Co., Ltd., Pembroke.

BLANKING
Hy. Hope & Sons of Can., Ltd., Peterboro

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.
Wickes Bros., Saginaw, Mich.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield. Mass

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield. Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Giddings & Lewis Mfg. Co., Fond du Lac, Wis.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHROME VANADIUM STEEL
J. F. A. Comstedt, New York City, N.Y
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

CHROME NICKEL STEEL
J. F. A. Comstedt, New York City, N.Y.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL AND TAP
Swedish Gage Co., New York, N.Y.

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WRENCH
Thomas Elevator Co., Chicago, Ill.

CHUCKING MACHINES
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., Inc., Fort Wayne, Ind.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Jones & Glassco, Montreal, Que.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positivte Clutch & Pulley Wks., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston,
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Fairquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Banfield, W. H., & Sons, Toronto.
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

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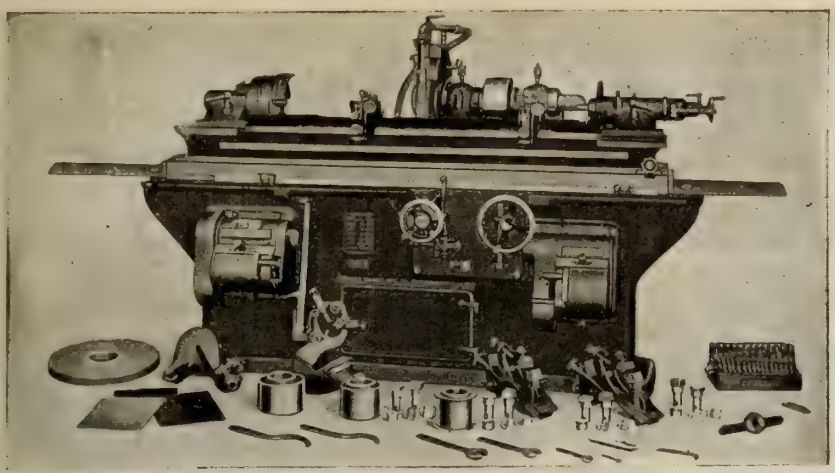

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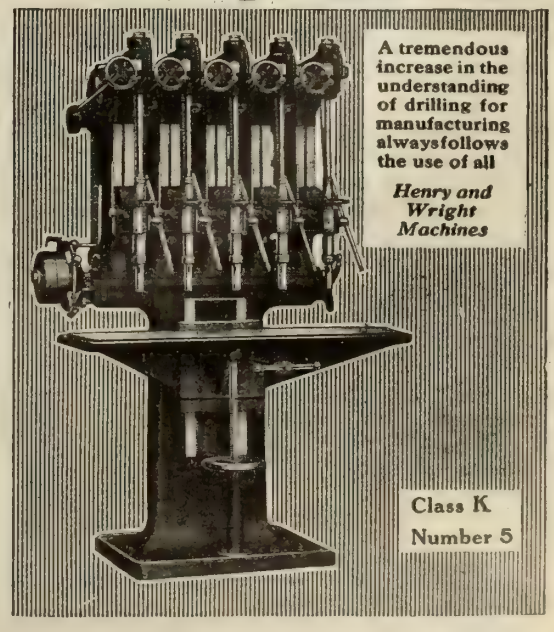

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Electric Steel & Metals, Ltd., Welland.
General Steel Co., Milwaukee, Wis.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.
Can. Driver-Harris Co., Walkerville, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS
Baxter & Co., Ltd., J. R., Montreal.
Brantford Emery Wheel Co., Brantford, Canada
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Trueing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINE LATHES
Oliver Machy. Co., Grand Rapids, Mich.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRUSION DIE STEEL
J. F. A. Comstedt, New York City, N.Y.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EXTRA TOOL STEEL
J. F. A. Comstedt, New York City, N.Y.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Strong, Kennard & Nutt Co., Cleveland.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., S. F., Fort Wayne, Ind.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRST AID CABINETS
Strong, Kennard & Nutt Co., Cleveland.

FIRE BRICKS
Harbison-Walker Refractories Co., of Canada, Montreal, Que.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON
Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Victoria Foundry Co., Ottawa.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL
Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
H. Hope & Sons of Can., Ltd., Peterboro

FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FOUNTAINS, DRINKING
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield.
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL,
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING
Standard Fuel Engr. Co., Detroit, Mich.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE TANKS
Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING
Bowser & Co., S. F., Inc., Fort Wayne.

GAUGES
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, FUSE HOLE
Windsor Mach. & Tool Co., Windsor, Ont.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochester.

GEAR BOXES, REDUCTION
Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN
Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GENERATORS, ELECTRIC
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Toronto

GENERATORS, MOTOR
A. R. Williams Machry. Co., Toronto.
Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

GERMAN SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC
Strong, Kennard & Nutt Co., Cleveland.

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich

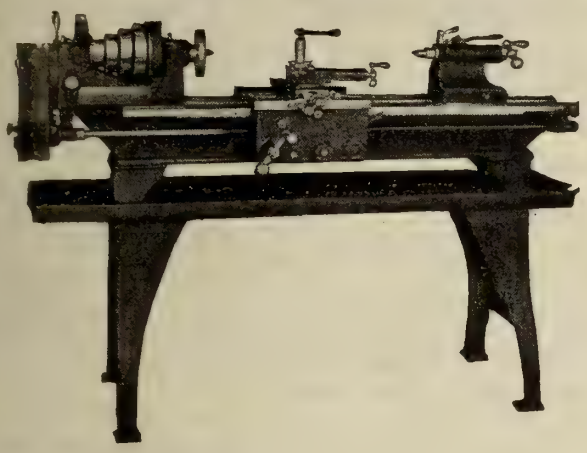
GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GOVERNOR, WATER WHEEL
Wilson & Co., J. C., Belleville, Ont.

GRAPHITE
Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES
Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal.

With saving in floor space goes saving in first cost for the "Star" Lathe is *moderate in price.*



Remember, "Star" Lathes are not big lathes. They require little power. This saving has been as much as 40 per cent. in many cases.

"STAR" LATHES

Accurate, Rigid Economical

Users of "Star" Lathes find a large gain from their operating simplicity. Inexperienced help quickly learn to operate "Star" Lathes. Do you realize the saving this means with the scarcity of unskilled labor? 9", 11", 12" and 13" sizes.

The Seneca Falls Mfg. Co. INC.

366 W. Falls St. Seneca Falls, N.Y.

Thor

CHIPPING HAMMERS

Drilling in concrete with a size D hammer with a hexagon nozzle. Will drill a hole one inch in diameter, at the rate of one inch per minute.

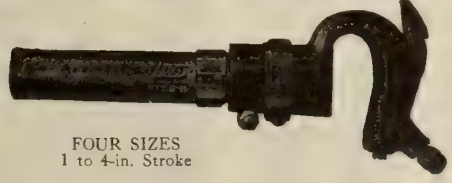
Thor Predominates wherever clippers are used because:

1st. The main valve is large in size and durable, being of the balanced type and having a bearing surface of three square inches.

2nd. Two square inches of the bearing surface retain the lubrication constantly, as no air passes over to blow the oil off.

3rd. The handle is equipped with a self-seating throttle valve, which eliminates all leaks.

4th. The barrel and all working parts are hardened and ground and the hammer is practically free from vibration.



FOUR SIZES
1 to 4-in. Stroke

Riveting Base Plates with size B hammer. Let our service engineer call at your plant and explain the various uses to which these hammers can be adapted, and how to obtain the best results on your particular work.

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General Offices: 600 West Jackson Blvd., CHICAGO, U.S.A.

CANADIAN OFFICES: 334 St. James St., MONTREAL; 32 Front St., TORONTO; 123 Bannatyne Ave. E., WINNIPEG; 1142 Homer St., VANCOUVER

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal.

GRINDERS, CUTTER
Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garvin Machine Co., New York
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
LeBlond Mch. Tool Co., R. K., Cincinnati
Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal.

GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, DRILL
Aikenhead Hardware Co., Toronto.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal.

GRINDERS, CYLINDER, INTERNAL
Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply. Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Perfect Machine Co., Galt, Ont.
Williams & Wilson, Ltd., Montreal.

GRINDERS, PORTABLE, ELECTRIC, HAND, TOOL POST, FLOOR AND BENCH
Baird Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Electrical Tool Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Wisconsin Electric Co., Inc., Racine, Wis.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Grant Mfg. & Mach. Co., Bridgeport, Conn
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
United States Elec. Tool Co., Cincinnati.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.
Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, HOLE, HOLE AND FACE AND DEEP HOLE
Bryant Chucking Grinder Co., Springfield, Vermont.

GRINDERS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
MacGovern & Co., Montreal, Que.

GRINDERS, ROTARY SURFACE
Bristol Machine Tool Co., Bristol, Conn.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, & Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.
Wing & Son, J. E., Hamilton, Ont.

GRINDERS, UNIVERSAL, PLAIN
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

GRINDERS, VERTICAL, SURFACE
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Reed-Prentice Co., Worcester, Mass.
Gisholt Machine Co., Madison, Wis.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME
Can. Fairbanks-Morse Co., Montreal.
Cincinnati Elec. Tool Co., Cincinnati. O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford, Ont.
LeBlond Mch. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York, N.Y.
Norton Grinding Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wiss.
Williams & Wilson, Ltd., Montreal.

GRINDING MACHINES, CAR WHEEL, CUTTER. CYLINDRICAL, CRANKSHAFT
Norton Grinding Co., Worcester, Mass.

GRINDING WHEELS
Aikenhead Hardware Co., Toronto, Ont.
Baxter Co., Ltd., J. R., Montreal, Que.
Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Norton Co., Worcester, Mass.

GRIT, ANGULAR
Pittsburgh Crushed Steel Co., Pittsburgh.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods, Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland.

GUN AND AMMUNITION SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

GUN TAPS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

HACK SAW BLADES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baxter & Co., Ltd., J. R., Montreal, Que.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply. Co., G. F., Montreal
Fry's (London), Ltd., London, England.
Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
McKenzie Machy. Co., D., Guelph, Ont.
Peerless Machine Co., Racine, Wis.
Perfect Machine Co., Galt, Ont.
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.

HAMMERS (DROP), MOTOR AND BELT DRIVEN
Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

HAMMERS, HELVE POWER
Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal.

HAMMERS, CHIPPING, CAULKING, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

HAMMERS, MARKING
Matthews & Co., Jas. H., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE
Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, STEAM
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAMMERS, SHELL NOSING
Beaudry & Co., Inc., Boston, Mass.

HAND PLANERS
Oliver Mchry. Co., Grand Rapids, Mich.

HAND LEATHERS OR PADS
Graton & Knight Mfg. Co., Montreal.

HANGERS, SHAFT
Algoma Steel Corp., Sault Ste. Marie.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Standard Pressed Steel Co., Philadelphia.
Williams & Wilson, Limited, Montreal.

HARDNESS TESTING INSTRUMENTS
Shore Instrument & Mfg. Co., New York

HEAD, AUXILIARY
Hoefer Mfg. Co., Freeport, Ill.

HEATING AND VENTILATING ENGINEERS
Can. Blower & Forge Co., Kitchener, Ont.

HEATING AND PLUMBING CONTRACTS
Ballantyne, James, Montreal.

HEAT TREATMENT OF STEEL
Gray Ball Bearing Co., Ltd., Toronto.

HEAT GAUGES, HARDENING AND ANNEALING
Shore Instrument & Mfg. Co., New York.

HELMETS, SANDBLAST, AMMONIA
Strong, Kennard & Nutt Co., Cleveland.

HIGH SPEED STEEL
Comstedt, J. F. A., New York City.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

HIGH SPEED TOOL ROOM DRILLS
Albany Hardware Spec. Co., Albany, Wis.

HIGH SPEED TOOL METAL
Comstedt, J. F. A., New York City.

HINGE MACHINERY
Baird Machine Co., Bridgeport, Conn.
Illinois Tool Works, Chicago, Ill.

HINGES
London Bolt & Hinge Wks., London, Ont.

HOBS
Greenfield Tap & Die Co., Greenfield, Mass
Illinois Tool Works, Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

HOISTS, AIR
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTING AND CONVEYING MACHINERY AND ENGINES
Can. Link-Belt Co., Toronto, Ont.
Can. Matthews Gravity Carrier Co., Toronto
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
Jones & Glassco, Montreal.
MacGovern & Co., Montreal, Que.
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Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

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Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago.
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Kennedy & Sons, Owen Sound, Ont.
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Northern Crane Works, Walkerville, Ont.
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Matthews & Co., Jas. H., Pittsburgh, P

HOLDERS, ELECTRIC
Electric Steels & Metals, Ltd., Welland

HOOKS, BELT LACING
Clipper Belt Lacer Co., Grand Rapids.

HOPPERS
MacKinnon Steel Co., Ltd., Sherbrooke
Dominion Bridge Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto, On

HOSE, PNEUMATIC
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Cleveland Pneumatic Tool Co. of Canada Toronto.
Garlock-Walker Machinery Co., Toronto
Independent Pneumatic Tool Co., Chicago
Wells Bros. Co. of Canada, Galt, Ont.

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Pangborn Corporation, Hagerstown, Md.

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Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.
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HYDROMETERS
Taylor Instrument Co., Rochester, N.Y

HYGROMETERS
Taylor Instrument Co., Rochester, N.Y

HYGRODEIKS
Taylor Instrument Co., Rochester, N.Y

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Starrett Co., L. S., Athol, Mass.

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Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal.

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INGOTS, STEEL
Nova Scotia Stl. & Coal Co., New Glasgow

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Quickwork Co., St. Marys, Ohio.

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Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont
Williams & Wilson, Limited, Montreal.

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Northern Crane Works, Walkerville.

JACKS, PIT AND TRACK
Canadian Fairbanks-Morse Co., Montreal.
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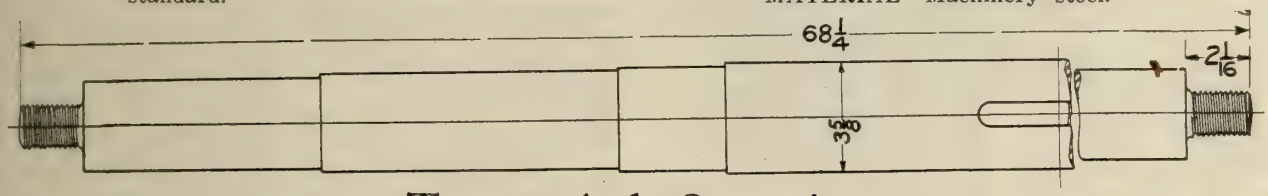
MATERIAL—Machinery steel.



Tractor Axle Operation

TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the center and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

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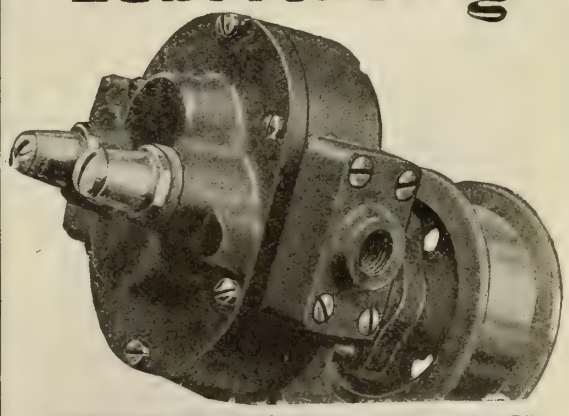

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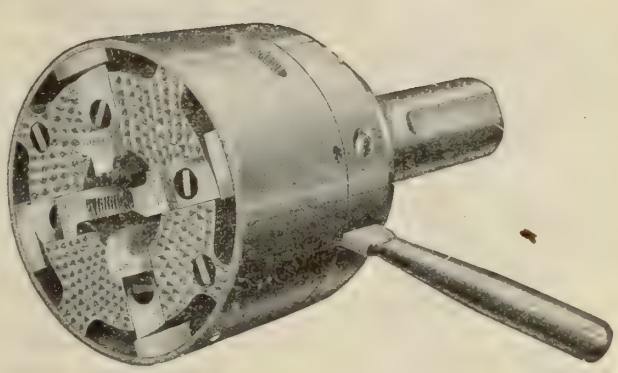

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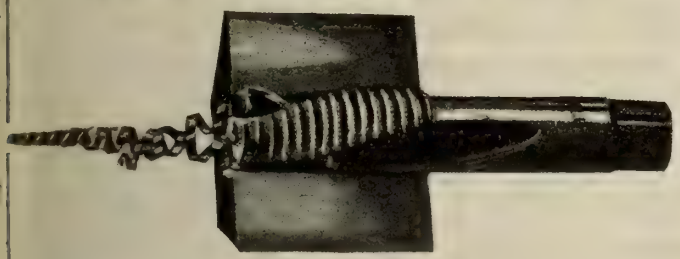

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makes tapping a pleasure

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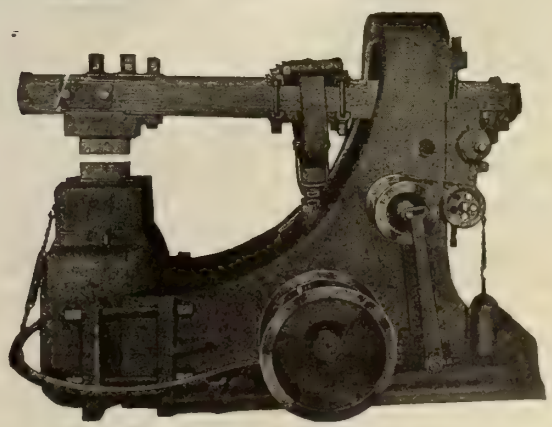

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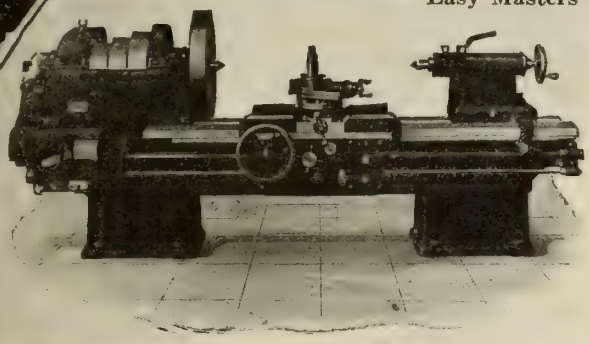

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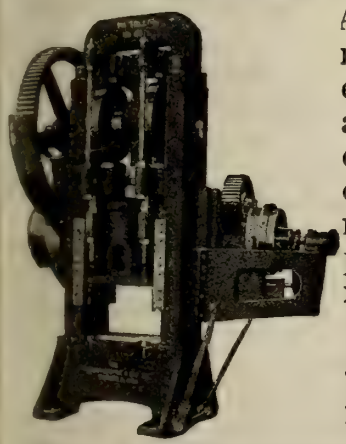

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Baxter & Co., Ltd., J. R., Montreal.
H. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, BOILER
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.

REAMERS, HAND
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS EXPANDING
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMERS, TAPER, BRIDGE
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

REAMERS, JOBBERS
Morrow Screw & Nut Co., John, Ingersoll.

REAMERS, PIPE, SHELL
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

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Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland.

RIVETS, TUBULAR, BIFURCATED
Parmenter & Bulloch Co., Gananoque.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETS, IRON, COPPER, BRASS
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

RODS, ROPE AND SPRING
General Steel Co., Milwaukee.
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROPE, GALX, MONEL METAL, BRONZE
Can. Driver-Harris Co., Ltd., Walkerville.

ROPE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
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ROOF COOLERS
Electric Steels & Metals, Ltd., Welland.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

RUBBER MILL DRIVES
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

SAND BLAST MACHINES
Pangborn Corporation, Hagerstown, Md.

SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDING MACHINES
Canada Machinery Corp., Galt.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)
Hunter Saw & Mach. Co., Pittsburgh, Pa.
Tabor Mfg. Co., Philadelphia, Pa.

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Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINE PRODUCTS
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John Morrow Screw & Nut Co., Ingersoll
United Brass & Lead, Ltd., Toronto.

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Can. Fairbanks-Morse Co., Montreal.
H. C. Dodge, Inc, Boston, Mass
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que

SCREW MACHINES, AUTOMATIC MULTIPLE SPINDLE
National Acme Co., Cleveland, Ohio.

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John Morrow Screw & Nut Co., Ingersoll
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREWS, COLLAR
John Morrow Screw & Nut Co., Ingersoll

SCREW COLLARS
John Morrow Screw & Nut Co., Ingersoll

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREW SLOTTERS
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
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J. Morrow Screw & Nut Co., Ingersoll, Ont

SCREWS, SET, MILLED, HEADLESS
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SCREWS, MACHINE, CAP, SPECIAL
J. Morrow Screw & Nut Co., Ingersoll, Ont

SCREWS SAFETY, SET AND HOLLOW SET
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SCREWS, WRENCH, BENCH, STOOL
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Pratt & Whitney Co., Dundas.
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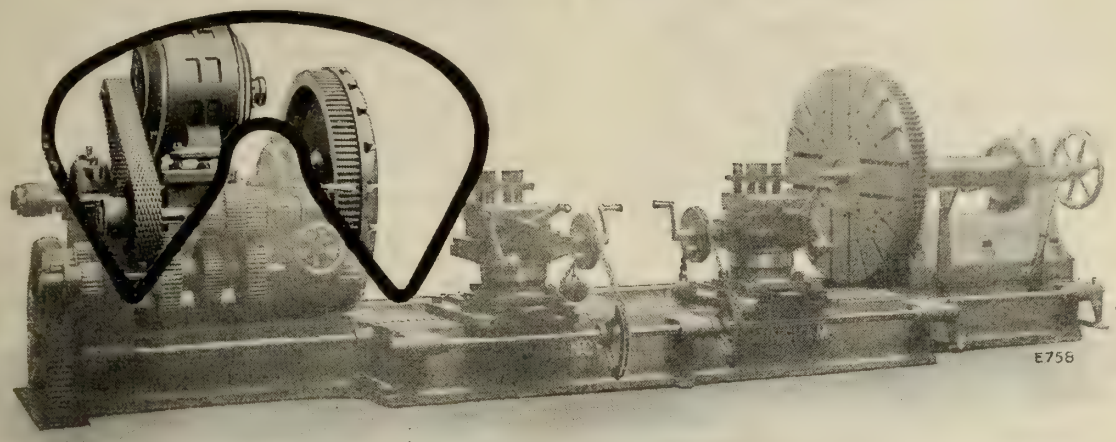

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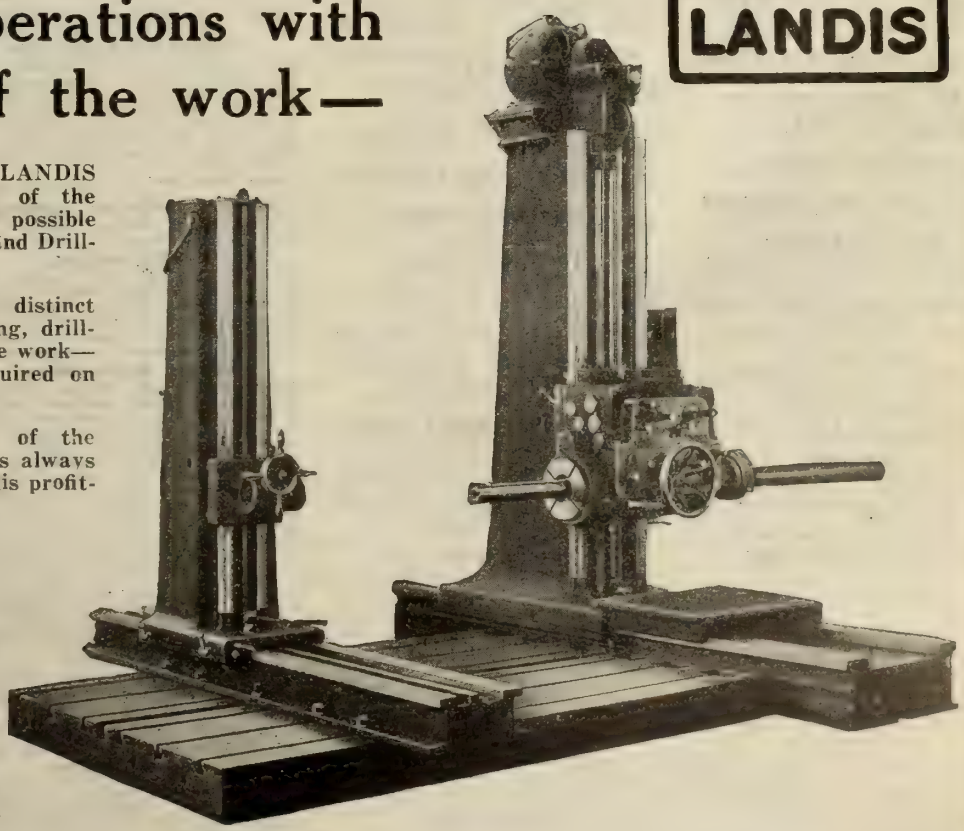

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Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

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Toledo Machine & Tool Co., Toledo, O.
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Toledo Machine & Tool Co., Toledo, Ohio.

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Can. Driver-Harris Co., Ltd., Walkerville.

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Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
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High-Speed Hammer Co., Rochester, N.Y.

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Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.
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Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

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Katie Foundry, Galt, Ont.

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Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
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Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
United Brass & Lead Ltd., Toronto.

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Jones & Glassco, Montreal.

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Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto,
Jas. Steele, Ltd., Guelph, Ont.

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Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
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John H. Hall & Sons, Brantford.
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Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Marten Machine Co., Hamilton, Ont.
Reed-Prentice C., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
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Philadelphia Gear Works, Philadelphia.
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Katie Foundry, Galt, Ont.

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Peck, Stow & Wilcox Co., Southington, Conn.

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SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

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Wells Bros. of Can., Galt, Ont.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

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Dom. Forge & Stamping Co., Walkerville
Hope & Sons, Henry, of Canada, Peterboro, Ont.
Homer & Wilson, Hamilton, Ont.

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Gray Ball Bearing Co., Ltd., Toronto.

STAMPING MACHINERY
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Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

STAMPS, STEEL ALPHABET, FIGURES
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Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STAPLE MACHINES
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SPEED LATHES
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Rochester Ball Bearing Co., Rochester.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

SURFACES
Oliver Mach. Co., Grand Rapids, Mich.

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Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL CASTINGS
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Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
Swedish Crucible Steel Co., Windsor.

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Can. Drawn Steel Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Po.

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Wm. Atkins & Co., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., J., New York.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Plewes, Ltd, Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.

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Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Joilette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York.

STEEL, CRUSHED
Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL, ROCK DRILL
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Kayser-Ellison & Co., Ltd., Montreal.
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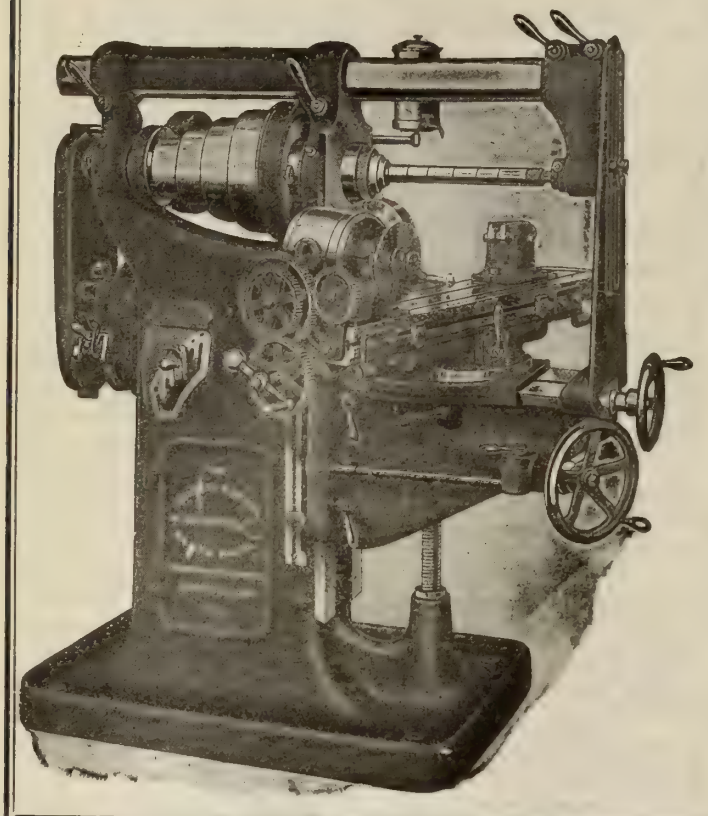

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(Patented May 28, 1918)

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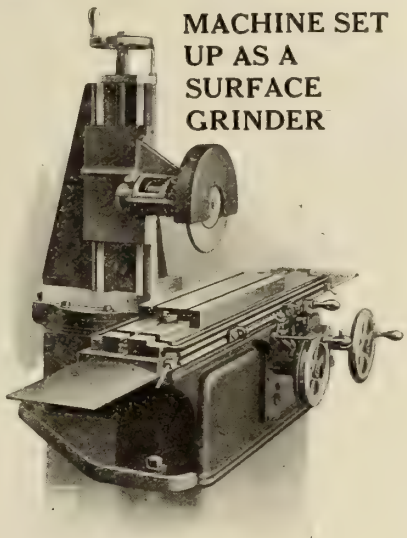

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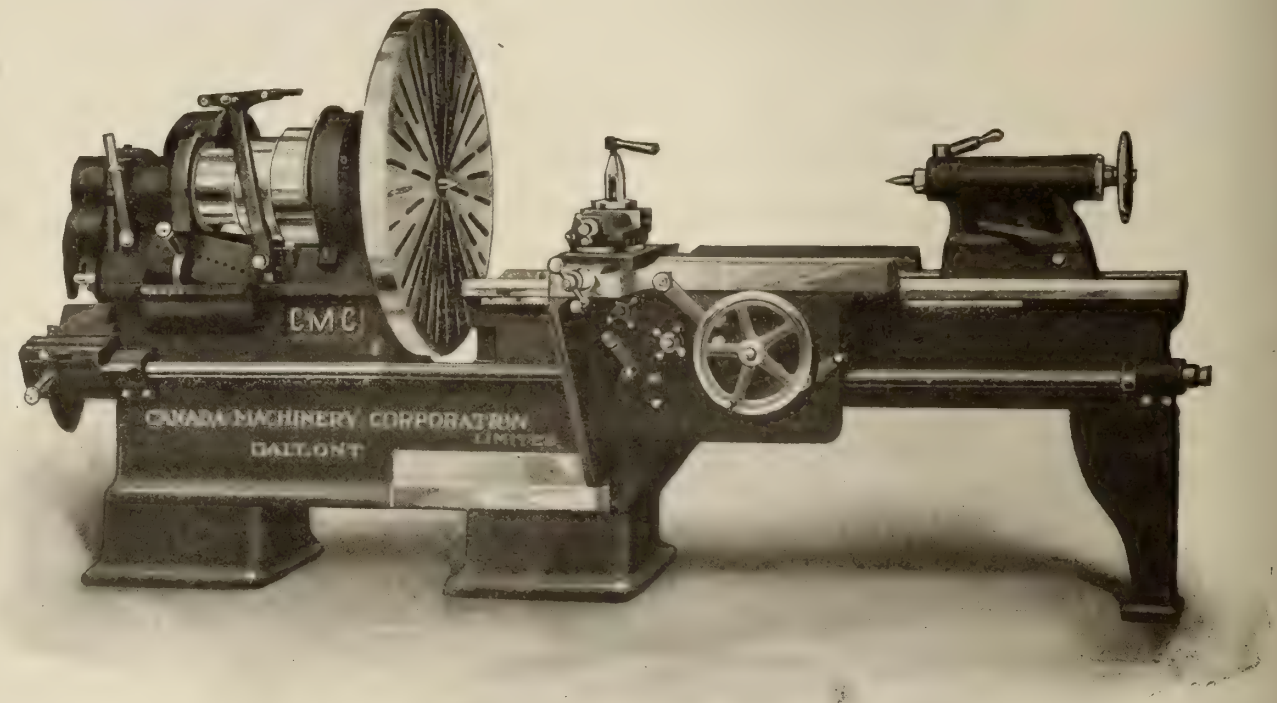

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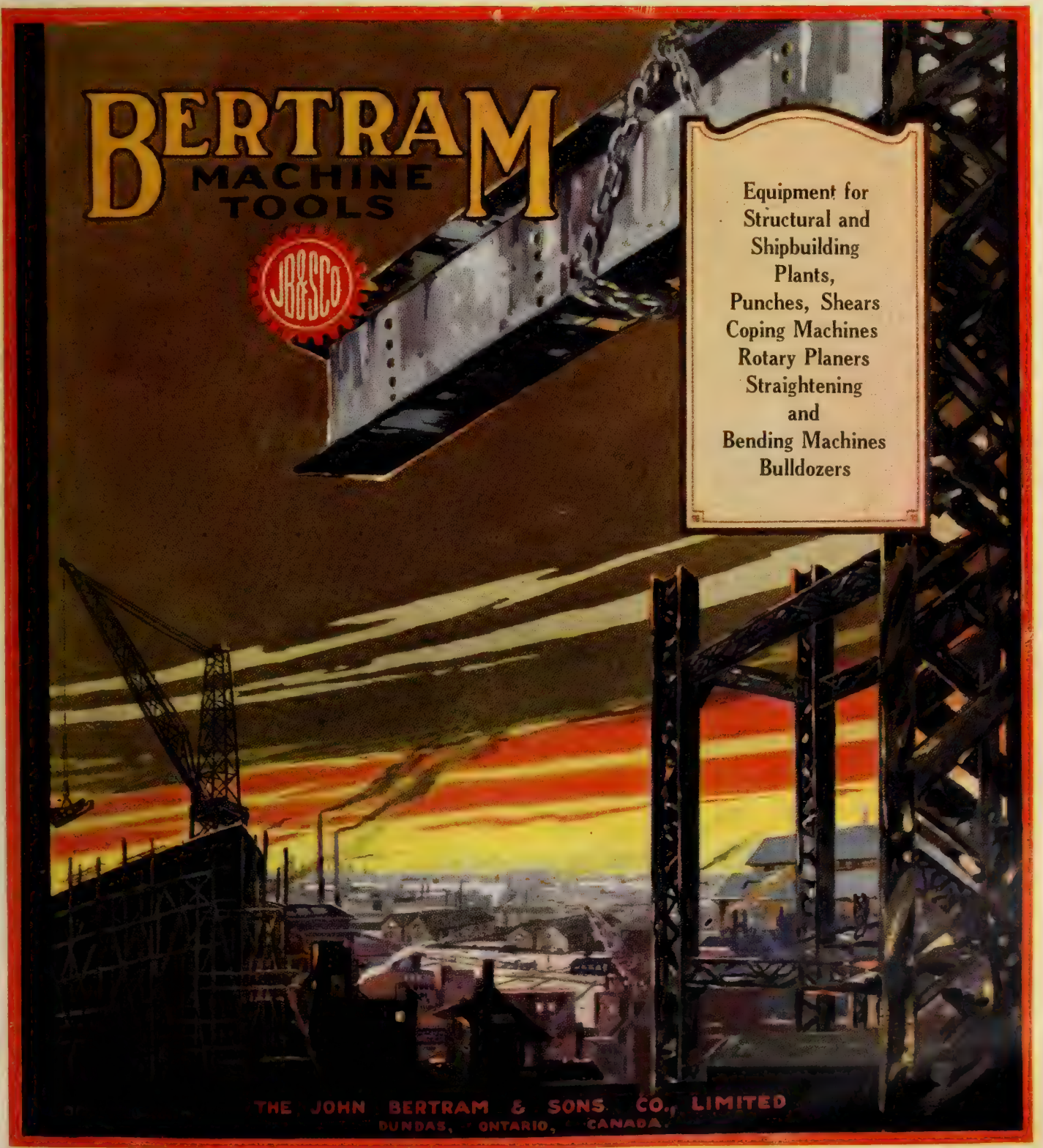

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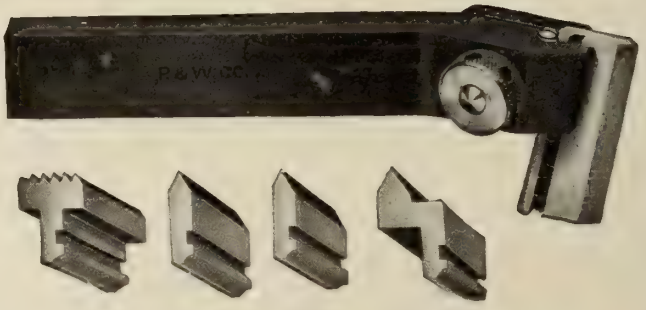

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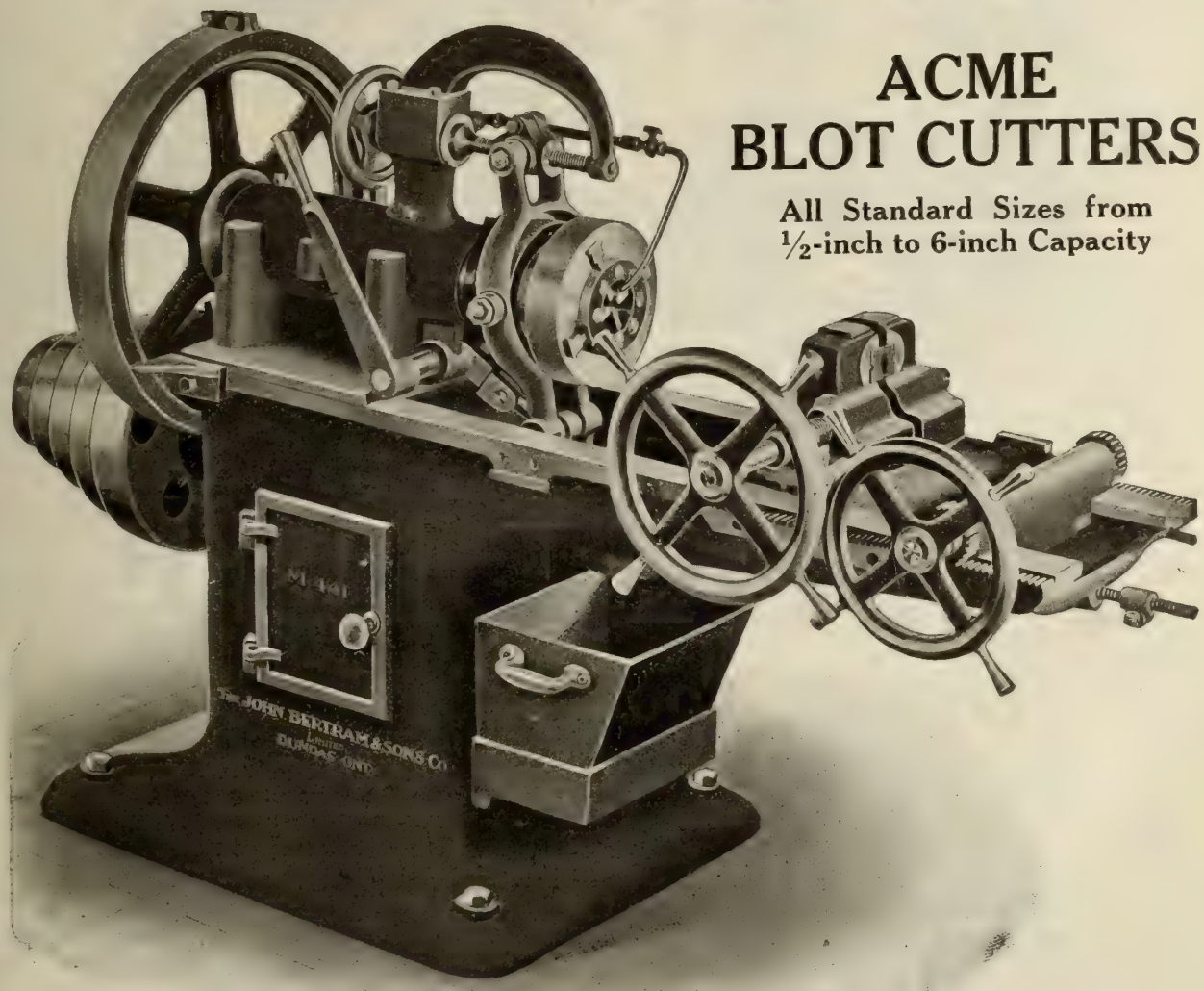

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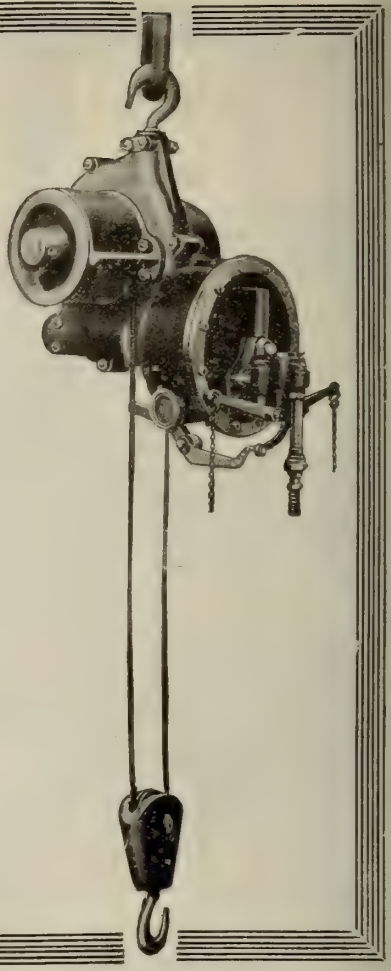

Few Parts Mean Less Trouble
The "Imperial" has few parts

The motor is completely balanced; the sensitive control allows the load to be raised or lowered a fraction of an inch at a time. Ball and roller bearings and thorough lubrication insure long wear.

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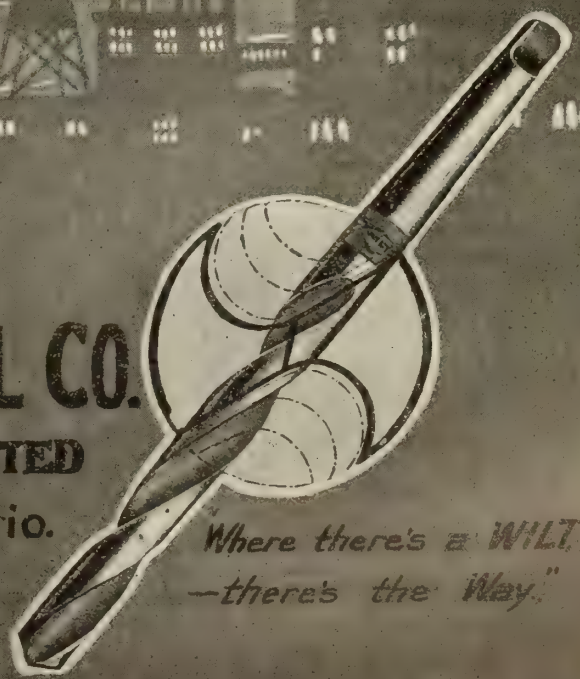

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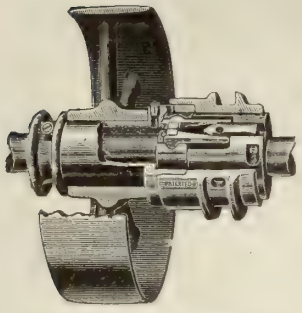

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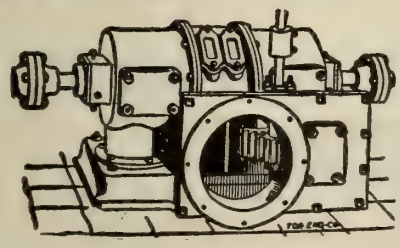

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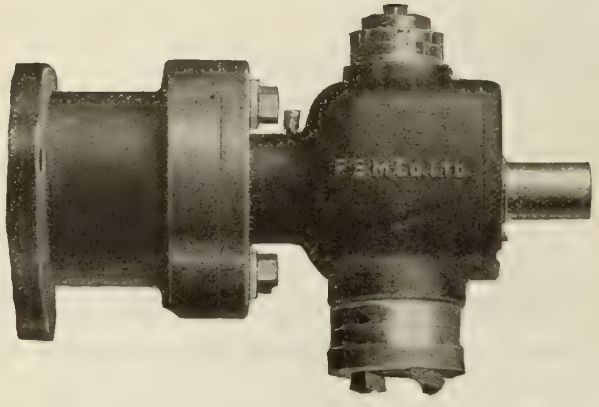

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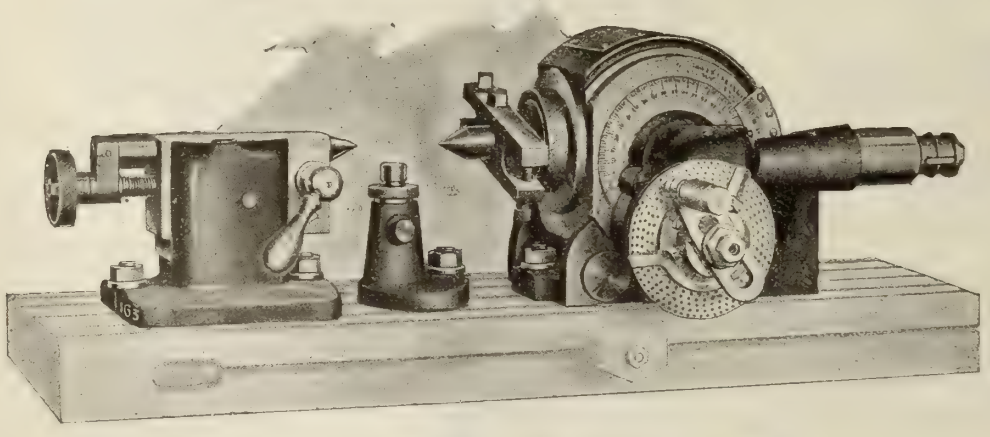

The care used in the building of Ford-Smith Dividing Heads is a fair gage of the workmanship in the entire machine. Each head is thoroughly tested for accuracy so that every finished head comes within the closest practice limits, giving satisfactory results.

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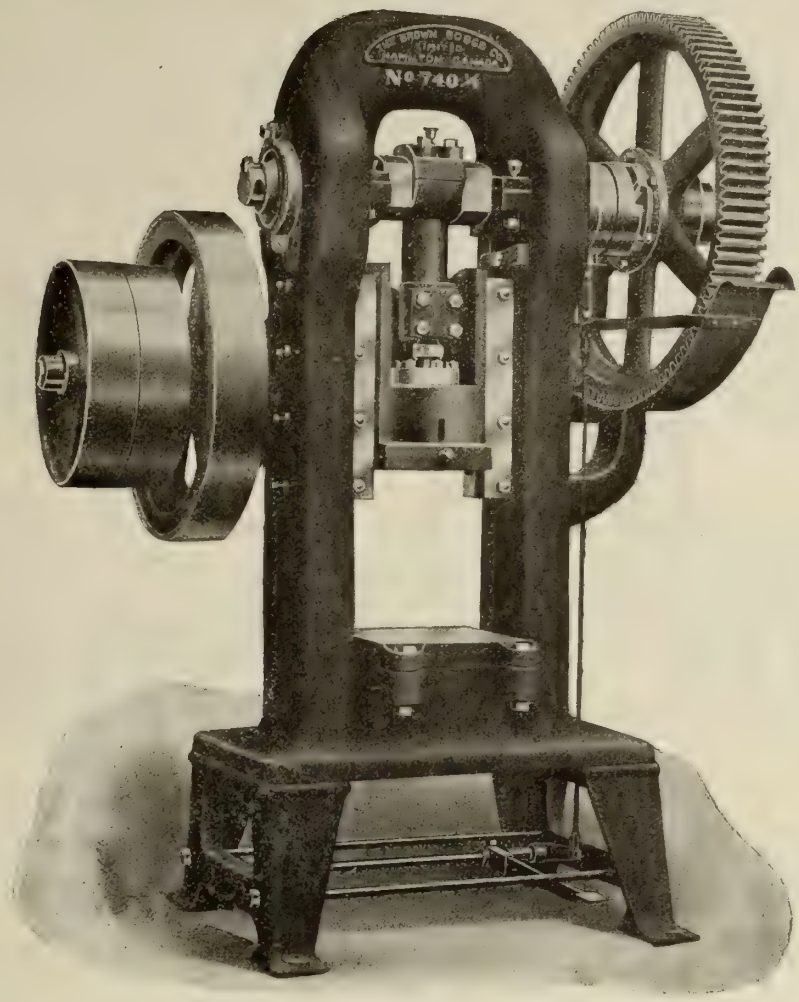

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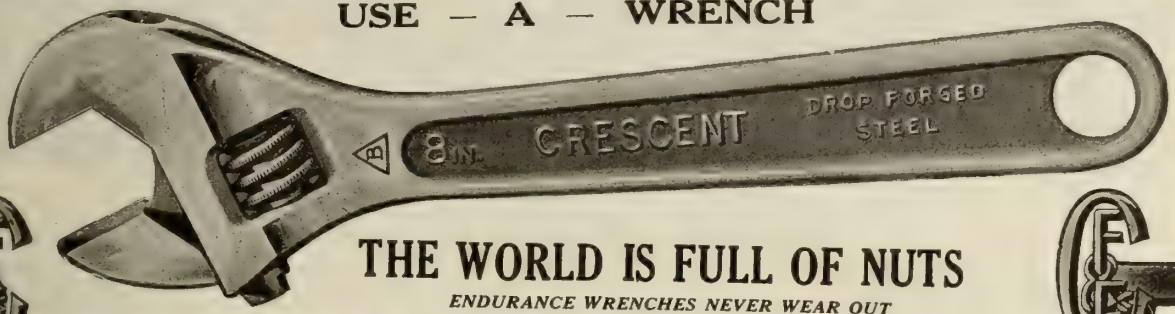

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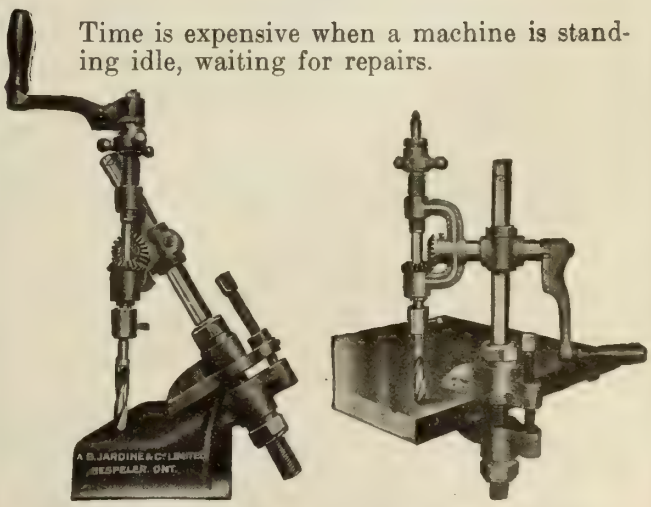

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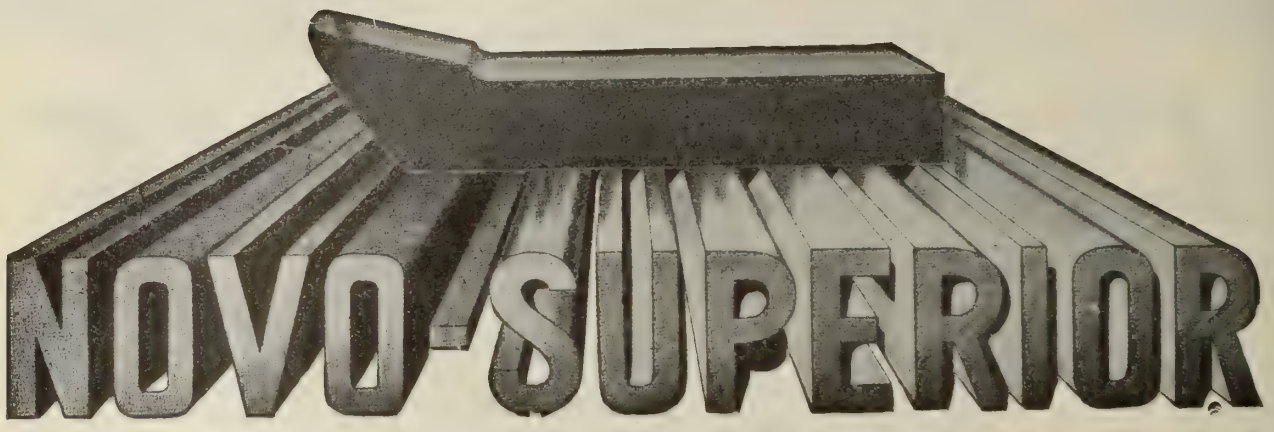

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with head office at the above address in Montreal.

The new company will be operated as a distinctly Canadian corporation, at the same time being closely affiliated with H. Boker & Co., Inc., of New York, representing the latter in Canada.

The Pilot Steel & Tool Co., Ltd., as the Canadian representative of H. Boker & Co., Inc., New York, will act as sole agents in Canada for the entire output of Jonas & Colver, Ltd., Sheffield, England, makers of Novo Superior High Speed Steel, Novo High Speed Steel, Intra Steel, Hot and Cold Rolled Tool Steel, Circular Saws, Planer Knives, Files, etc.

All of the other lines formerly handled by H. Boker & Co., Inc., Canada, such as Gibraltar Steel, Deo Steel, Ico Steel, Music Wire, Resistance Wire, Steel Balls, Nickel Alloys, Twist Drills, Reamers, Milling Cutters, Hack Saw Blades, Small Tools, etc., will be continued to be stocked and supplied by the new company.

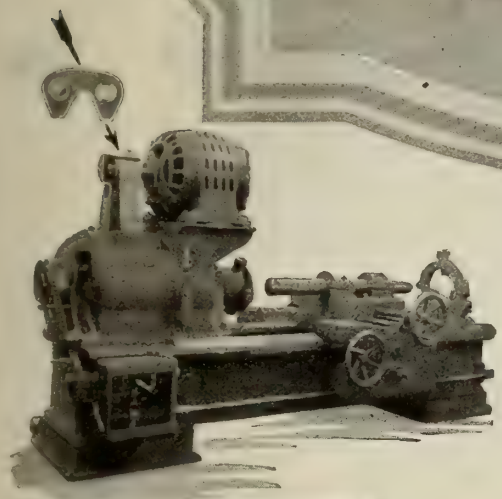
The Directorate of the Pilot Steel & Tool Co., Ltd., will be practically identical with that of the old company.

Mr. F. E. Rejall, who has been Canadian manager for a great number of years, will henceforth act as vice-president and director, and continue the management as heretofore, thus assuring a continuance of reliable and faithful service.

Yours truly,

H. BOKER & CO., INC.

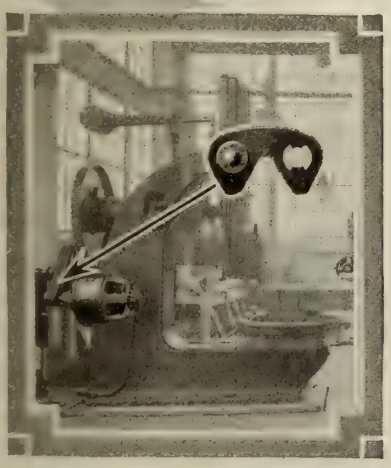
PILOT STEEL & TOOL COMPANY, LIMITED.



Equip Efficient Tools with Efficient Drives

HIGHLY efficient tools are purchased to perform certain operations at a lower cost.

Effective as those machines may be, their maximum efficiency is largely dependent upon the form of drive used.



Link-Belt Silent Chain Drives deliver 98.2% of the power to the driven machine. There's no slippage of belts—no waiting for belt repairs—no inferiority of product due to ununiform application of power.

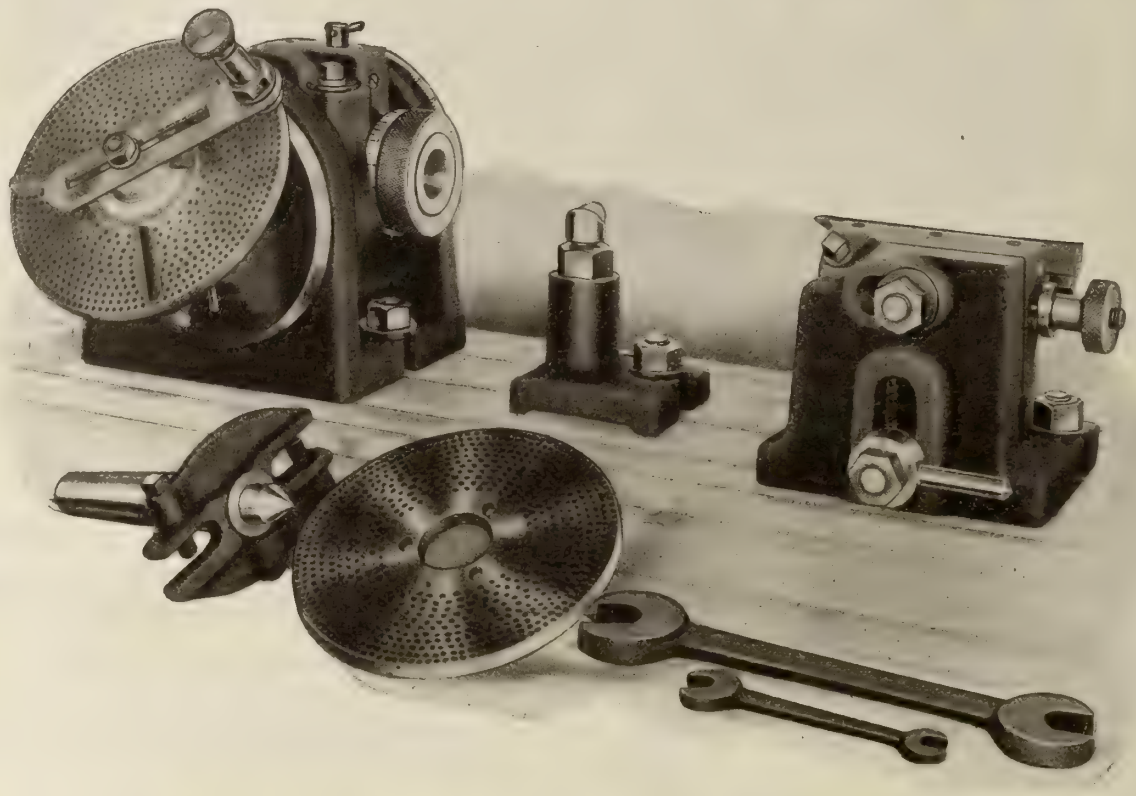
Every revolution of the motor shaft registers a like revolution of the driven shaft. Speeds are uniform. Greater speed reductions are possible. A better product results.

For Link-Belt Silent Chain Drives are "flexible as a belt—positive as a gear—more efficient than either". Write for our 40-page Machine Tool Drive Book No. 312. Shows many applications and gives full details.

CANADIAN LINK-BELT COMPANY
LIMITED
WELLINGTON AND PETER STREETS, TORONTO

LINK-BELT
SILENT CHAIN DRIVES

KEMP



A KEMPSMITH dividing head is included as regular equipment on every Kempsmith Universal Milling Machine.

Kempsmith Dividing Heads are sturdy, easy to operate and lasting.

They are accurate because of their design and because they are built that way.

Special features include large worm gear, single piece feed worm shaft and worm, powerful clamping devices and side center tailstock.

A copy of our special treatise on the Universal Dividing Head will be furnished on request.

FOREIGN REPRESENTATIVES:

Barandiaran & Co., 3 Alameda, San Sebastian, Spain; Edgar Bloxham, 12 Rue du Delta, Paris, France; D. Drury & Co., 1-2 Central House, Main St., Johannesburg, S. Africa; American Trading Co., Tokyo, Japan; Nielsen & Winther, Copenhagen, Denmark; Parke & Lacy Co., Ltd., 60 Clarence Street, Sydney, N. S. W., Australia; Selson Engineering Company, 85 Queen Victoria Street, London, E. C., England, and 19 Via Botero, Turin, Italy; Spliethoff, Beeuwkes & Company, Leuhaven, W. Z., 159 Rotterdam, Holland.

CANADIAN REPRESENTATIVES:

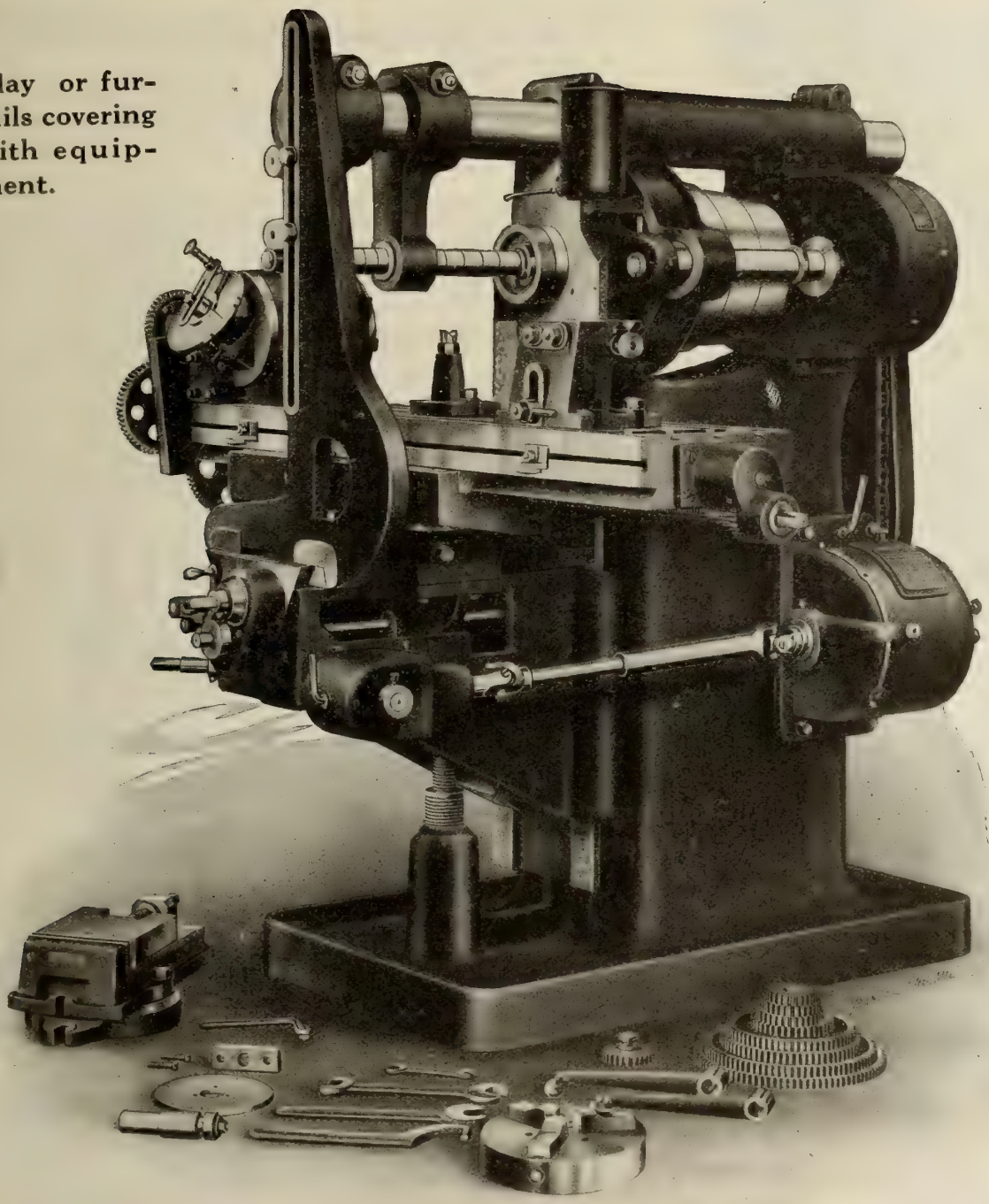
Geo. F. Foss Machy. Co., 305 St. James Street, Montreal; General Supply Co., 38 Toronto Street, Toronto, Ontario; General Supply Co., 356 Sparks Street, Ottawa, Ontario.

The Kempsmith

Milwaukee,

SMITH

Write today or further details covering Kempsmith equipment.

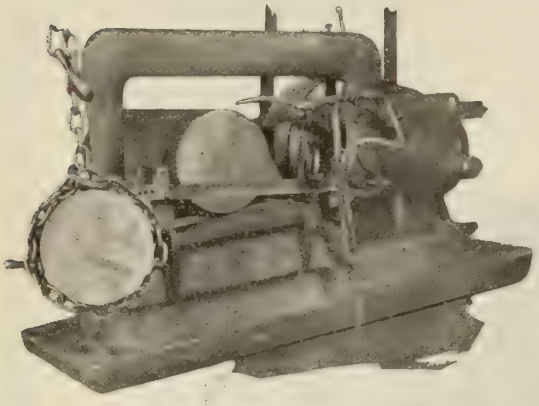


KEMPSMITH No. 3 Universal Milling Machine
Double Back Geared

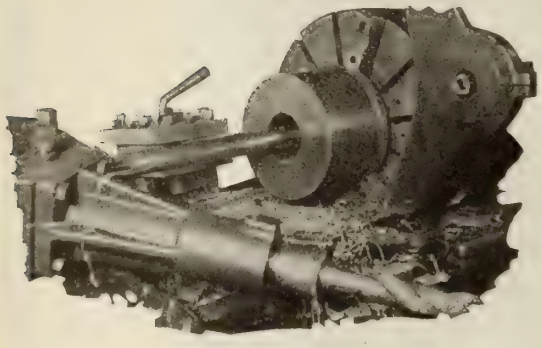
Mfg. Co.
Wis., U. S. A.

STEEL SPUR PINIONS

Showing the operations in their production



First, the blank is sawn off a forged bar. We carry a large stock of open hearth rounds up to sixteen inches diameter.



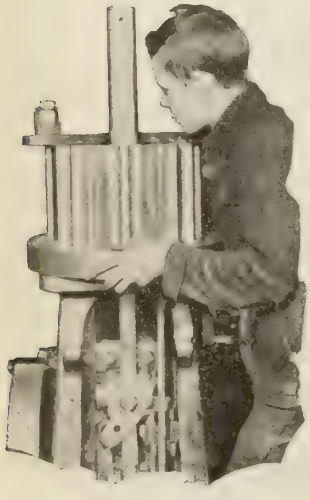
Turning the blank for pinion in chuck on heavy turret lathe.

Write or wire

HAMILTON GEAR CO. LTD.

Van Horne St., TORONTO

Cutting the teeth on a Brown & Sharpe No. 6 Gear Cutter.



Cutting Key Way on M. & M. "Giant" Key Seater,

A careful final inspection protects you in the quality of Hamilton Gears you purchase.

STELLITE

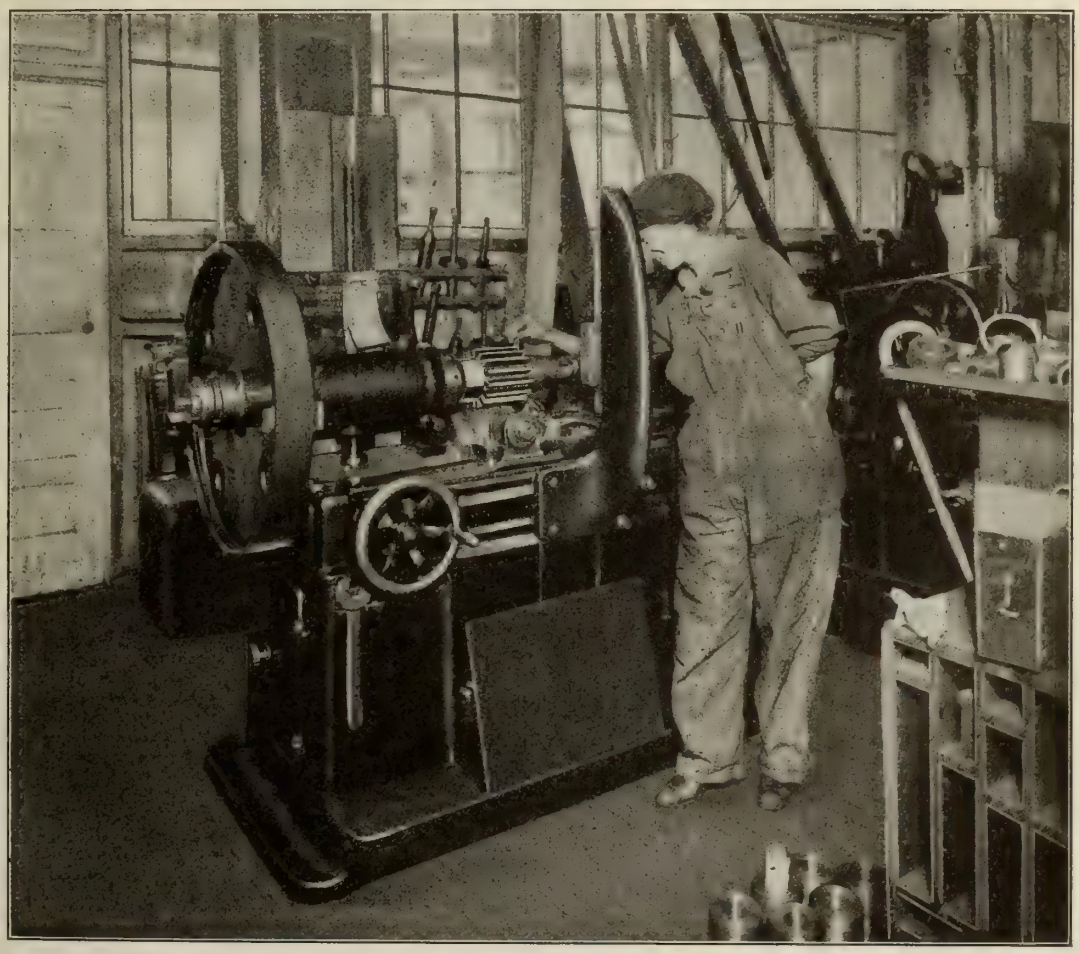
"Not Steel but its Master"

Increase Your Production

without new equipment or additional help

by using

"STELLITE" CUTTING TOOLS



The above cut illustrates a No. 4 Pitch Built-up Stellite Milling Cutter milling gears at the plant of the Hamilton Gear & Machinery Co., Ltd., Toronto.
Speed of Cutter 80 R.P.M. Feed 2 7-32 inch. per minute.
The life of the Stellite Cutter is longer than H.S. and the initial cost is lower.

Stellite in bars with tool holder is cheaper than best tool steel, production and life considered. Better write now.

Made in Canada

Deloro Smelting and Refining Company, Limited

Head Office and Works, DELORO, ONT.

TORONTO
200 King Street West

MONTREAL
315 Craig Street West

"WACO"

High Speed Steel

REGISTERED

"WACO"

TRADE MARKS

"Double Waco" Quality—for Quick Production Work.

"Turtle Brand"—High-class Tool Steels, Files and Drills.

Wortle Plates for Wire Drawers.

MANUFACTURED BY

WM. ATKINS & COMPANY, LIMITED

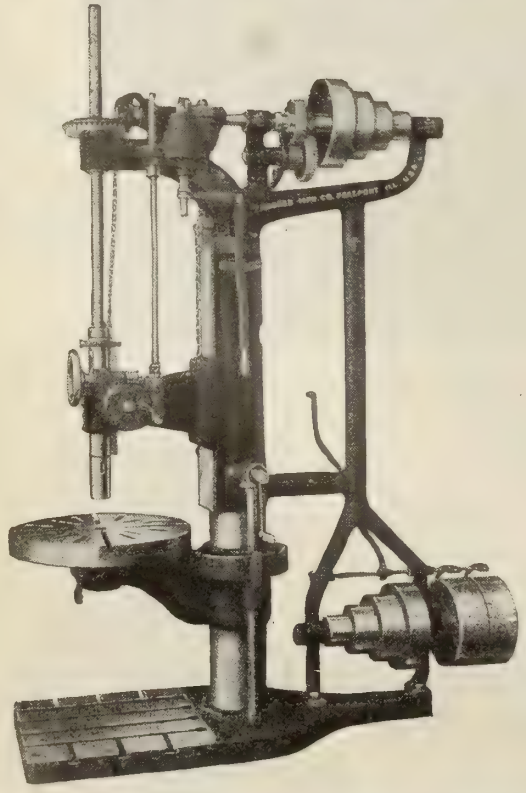
RELIANCE STEEL WORKS Established 1870 SHEFFIELD, ENGLAND

Sole Representatives for Canada:

MARSHALL, SON & BUNNEY

39 Richmond Street East - - - TORONTO, ONT.

The Driller for Exact Work



HOEFER

Enable Your Workmen to Eliminate Spoilage

The Hoefer Driller is pre-eminently the one to be found in the best plants. "It's almost as good as a Hoefer," so often heard in the machine and tool trade, indicates the position held by Hoefer Drillers.

Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

Twenty-five Years on Market

Twenty-five years making drillers has given Hoefer the "Know-how." The Hoefer Drillers are used by many of America's leading manufacturers. Equip your factory the Hoefer way. Take any kind of a drilling problem you have to the Hoefer Manufacturing Company, and the Company's experts can tell you how it was solved by other men, some of whom you may know.

Investigate now. Write to-day for catalog. The Hoefer engineers are at your service.

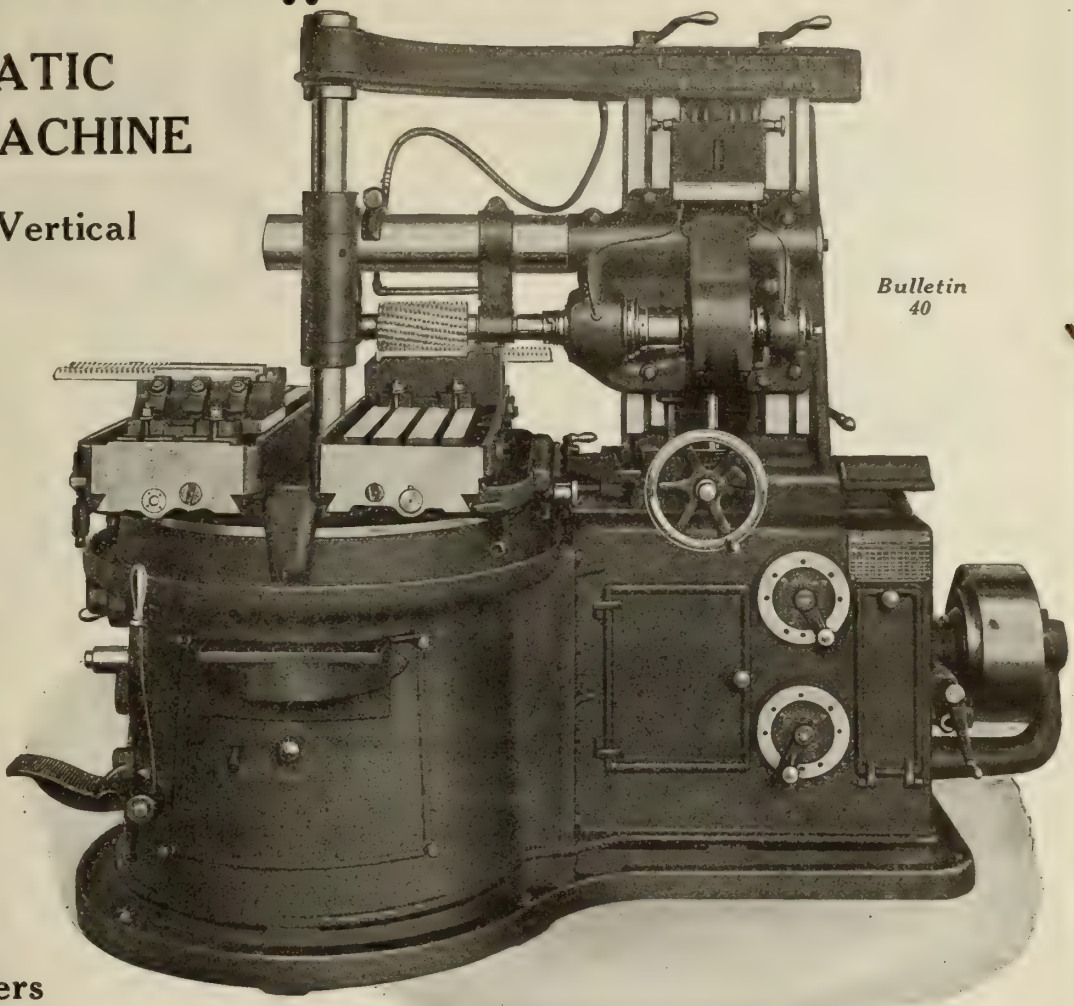
HOEFER MFG. CO.

FREEPORT, ILL.

POTTER & JOHNSTON

AUTOMATIC MILLING MACHINE

Horizontal---Vertical



Bulletin 40

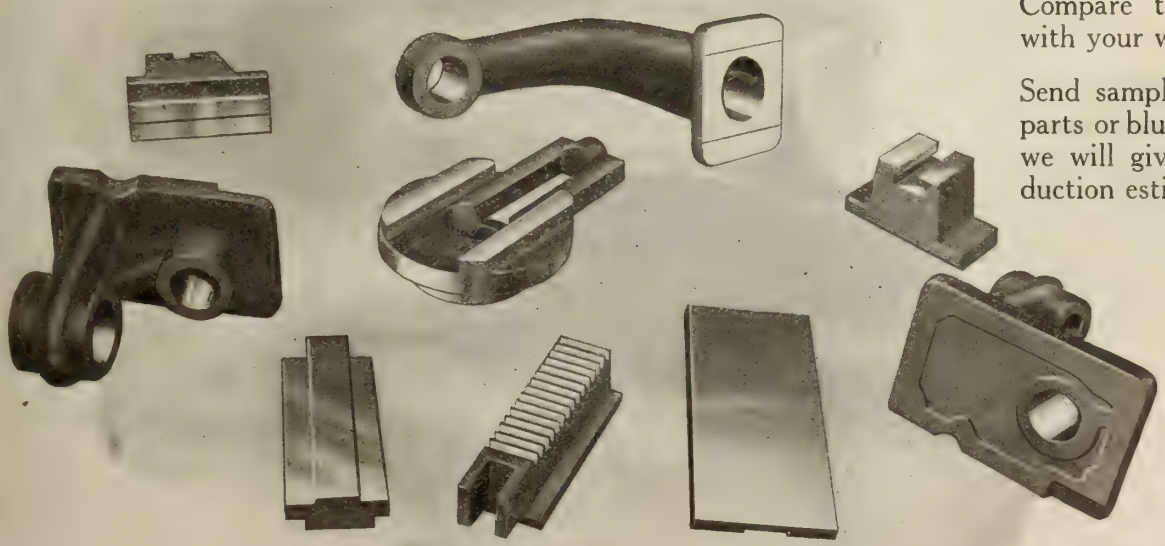
Continuous Milling

The operator is loading one fixture while the cutter operates on the other. No lost time due to machine idleness, therefore

Increased Production

16 Table Feeds 7/8 to 12 5/16. Length of Table Feed 29 inches. 12 Spindle Speeds, 20 to 180 R.P.M.

Typical Jobs for the
Automatic Millers



Compare these parts with your work.

Send samples of your parts or blue prints and we will give you production estimate.

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LTD.

Head Office: 1501 Royal Bank Building, Toronto, Canada Works and Warehouse: Galt, Ont., Canada

MEN whose souls have been tried in the Crucible of War Time Service will not easily forget those forces, either Human or Mechanical, which were instrumental in achieving Victory.

"Red Cut Superior"

The Nationally Known FIRST QUALITY

HIGH SPEED STEEL

Is a Fighter for Efficiency in Peace Times and War Times.

Are your Tools made of "Red Cut"?

VANADIUM-ALLOYS STEEL CO.

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BOSTON
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The Scientific Metallic Blasting Abrasive—

ANGULAR GRIT

One ton of ANGULAR GRIT equals carloads of sand. Its angular and irregular cutting points clean raw castings and forgings quicker and better than either sand or shot.

No dust, no sand bins or sand dryers are necessary where ANGULAR GRIT is used.

Trade Mark Reg. U.S. Pat. Office

Cuts Sand-Blast Costs

Give ANGULAR GRIT a trial and note the difference between it and shot Globules or sand which you may be using. You'll save much labor and reduce your blasting cost anywhere from 20% to 80%.

Pittsburgh Crushed Steel Co.

Established 1888

PITTSBURGH, PA., U.S.A.

Canadian Representatives:
Williams & Wilson Ltd.
Montreal, P.Q.

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

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MONTREAL

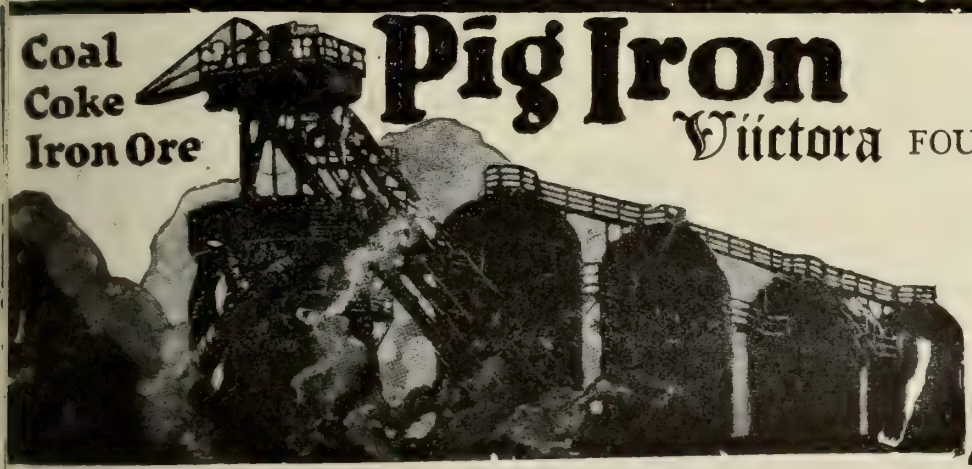
Steel Ingots
by the
HARMET
Liquid Process

Coal
Coke
Iron Ore

Pig Iron

Victora FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada



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FIRTH'S Speedicut HIGH SPEED Steel

Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England

CANADIAN WAREHOUSES | 449 St. Paul St. West, MONTREAL
79 West Adelaide St., TORONTO

J. A. SHERWOOD
Canadian Manager

A WALL RADIAL DRILL

That Puts Dollars in Your Pockets

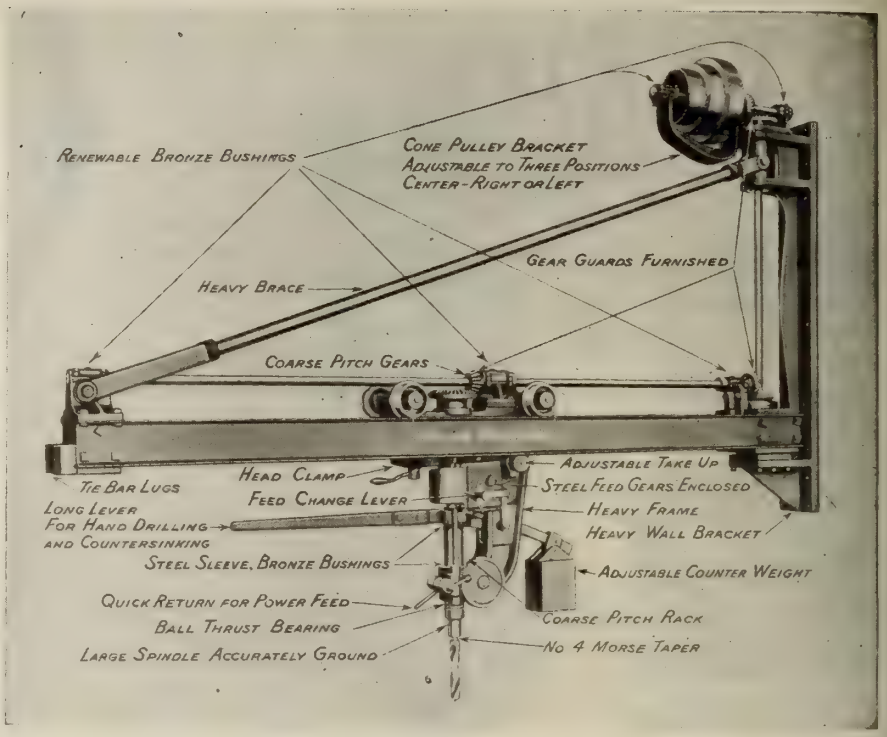
Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions, in your pocket by the installation of this machine.

Send for Detailed Bulletin

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue **BOSTON, MASS.**

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.

Annual sales over $5,000,000.

Hoyt Metal Co., Toronto

New York, N.Y. London, Eng. St. Louis, Mo.

THE

TRADE K–T A IE MARK

FOUNDRY

GALT - ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. **We can advise you** and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

Equipment of Proved Quality

CURTIS Easy Rolling Cranes and Trolleys—Steel Air Hoists—and Controlled Splash Oiling Air Compressors—have proved their effectiveness during many years' actual operation. In leading foundries they have demonstrated their economy, dependability and freedom from trouble.

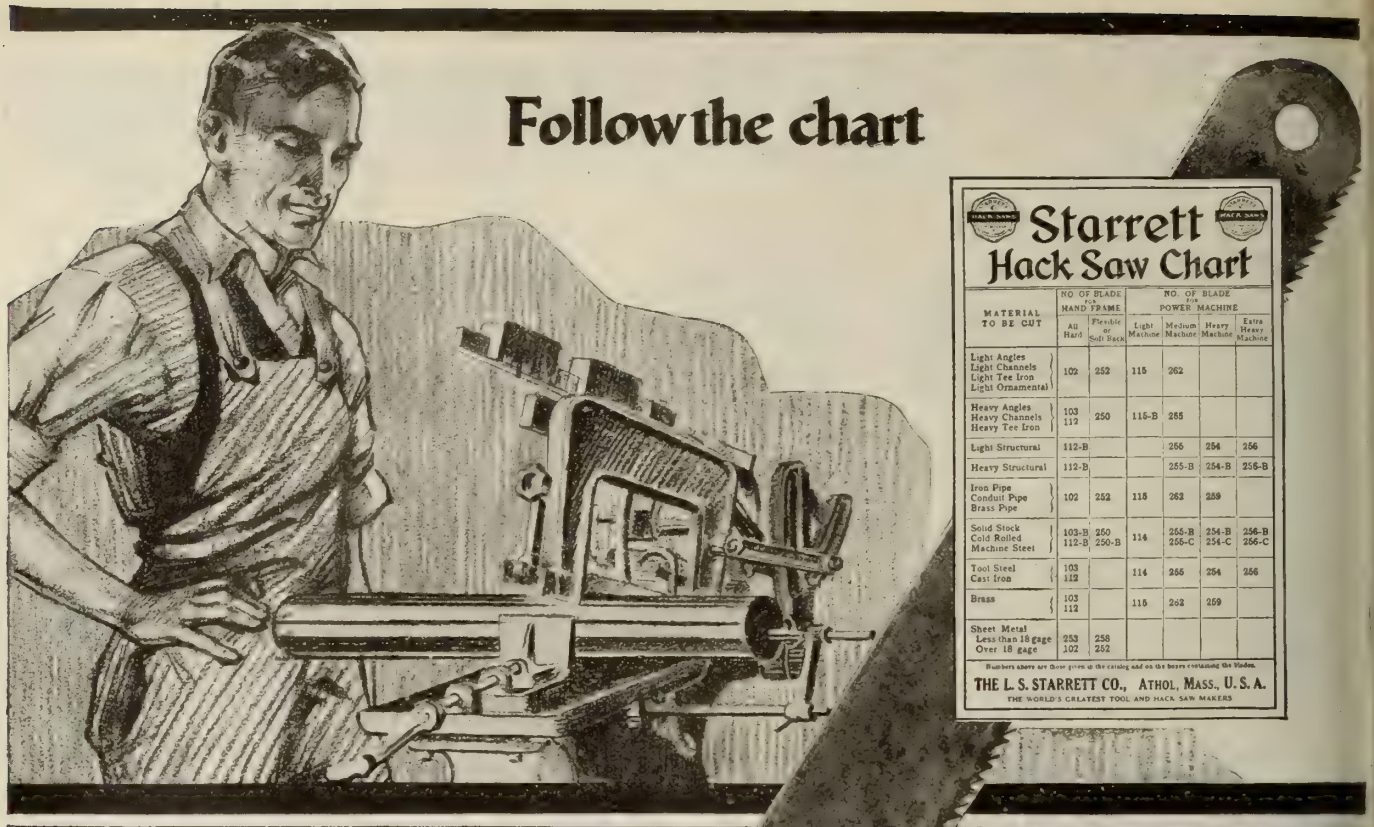
They are the result of over 25 years' experience in the manufacture of this particular kind of equipment. Good material, correct design and conscientious workmanship assure safe and dependable service under the most exacting operating conditions. Our engineering department is ready to study your problems and recommend equipment best suited to your needs.

Illustrated literature covering mechanical features and other details of Curtis equipment will be sent at your request.

CURTIS PNEUMATIC MACHINERY CO.
1585 Kienlen Avenue St. Louis, U. S. A.

Branch Office:
532-A Hudson Terminal
New York City

CURTIS Products



Follow the chart

Starrett Hack Saw Chart

MATERIAL TO BE CUT	NO. OF BLADE FOR HAND FRAME		NO. OF BLADE FOR POWER MACHINE			
	All Hard	Flexible or Soft Back	Light Machine	Medium Machine	Heavy Machine	Extra Heavy Machine
Light Angles, Light Channels, Light Tee Iron, Light Ornamental	102	252	115	262		
Heavy Angles, Heavy Channels, Heavy Tee Iron	103, 112	250	115-B	265		
Light Structural	112-B			266	254	256
Heavy Structural	112-B			265-B	254-B	256-B
Iron Pipe, Conduit Pipe, Brass Pipe	102	252	115	263	259	
Solid Stock, Cold Rolled, Machine Steel	103-B, 112-B	250, 250-B	114	265-B, 265-C	254-B, 254-C	256-B, 256-C
Tool Steel, Cast Iron	103, 112		114	265	254	256
Brass	103, 112		115	262	259	
Sheet Metal: Less than 18 gage	253	258				
Sheet Metal: Over 18 gage	102	252				

Numbers above are those given in the catalog and on the boxes containing the blades.

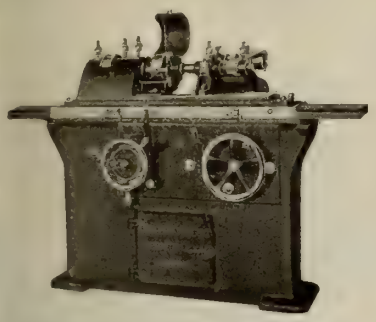
THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.
THE WORLD'S GREATEST TOOL AND HACK SAW MAKERS

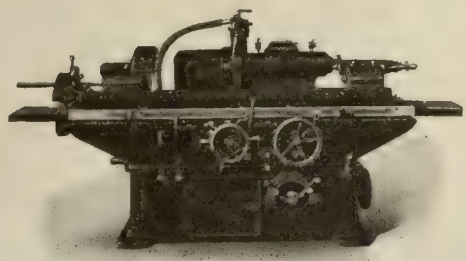
Watch the cost per cut and the cutting cost per job will take care of itself. Different metals, cut at different speeds need different blades. Follow the Starrett Hack Saw Chart and for economy's sake use

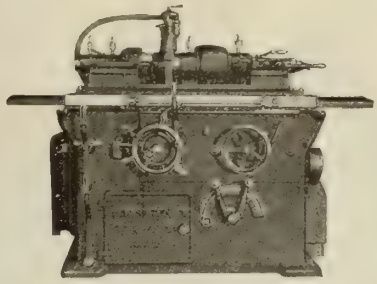
Starrett Hack Saws

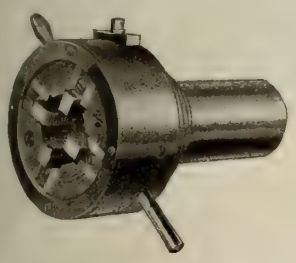
STARRETT HACK SAWS CUT QUICKER & LAST LONGER

42-953









MODERN TOOLS

MAKE BUSINESS HUM

The Modern Line supplies indispensable aid in business progress. Modern Tools are precision tools of the finest quality, noted for accuracy, dependability, volume of output and durability. We make:

—Modern Plain Grinders
10 sizes—8″ x 18″ to 16″ x 60″.

—Modern Internal Grinders
One model with fixtures in 3 sizes.

—Modern Universal Grinders
Normal range 13″ to 40″.

—Modern Chaser Grinders
For any chasers with parallel sides and general tool room work.

—Modern Self-Opening Die Heads
18 sizes—for threads up to 7 inches.

—Modern "Magic" Chucks
For quick change of tools on live spindle machine.

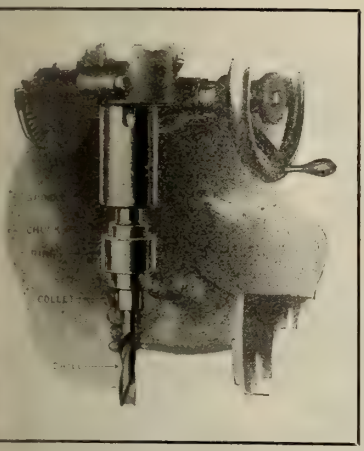
—Modern Collapsible Taps
3 sizes—Will tap holes ¾″ to 3″.

—Modern Tapping Attachments
For driving tools "through" or "to bottom."

All are tools of widespread use in the States—all have enviable records for reducing costs and speeding up production.

Send for technical bulletin of any which may interest you.

Send us your specifications and blue prints for data on your particular kind of work.



INDUSTRIAL REVIVAL DEPENDS ON YOU

Start your own ball a-rolling.

Remember the order you give goes to the man who buys from the chap who orders from you.

MODERN TOOL CO.

Main Office and Works: **ERIE, PA.** STATE AND PEACH STS.

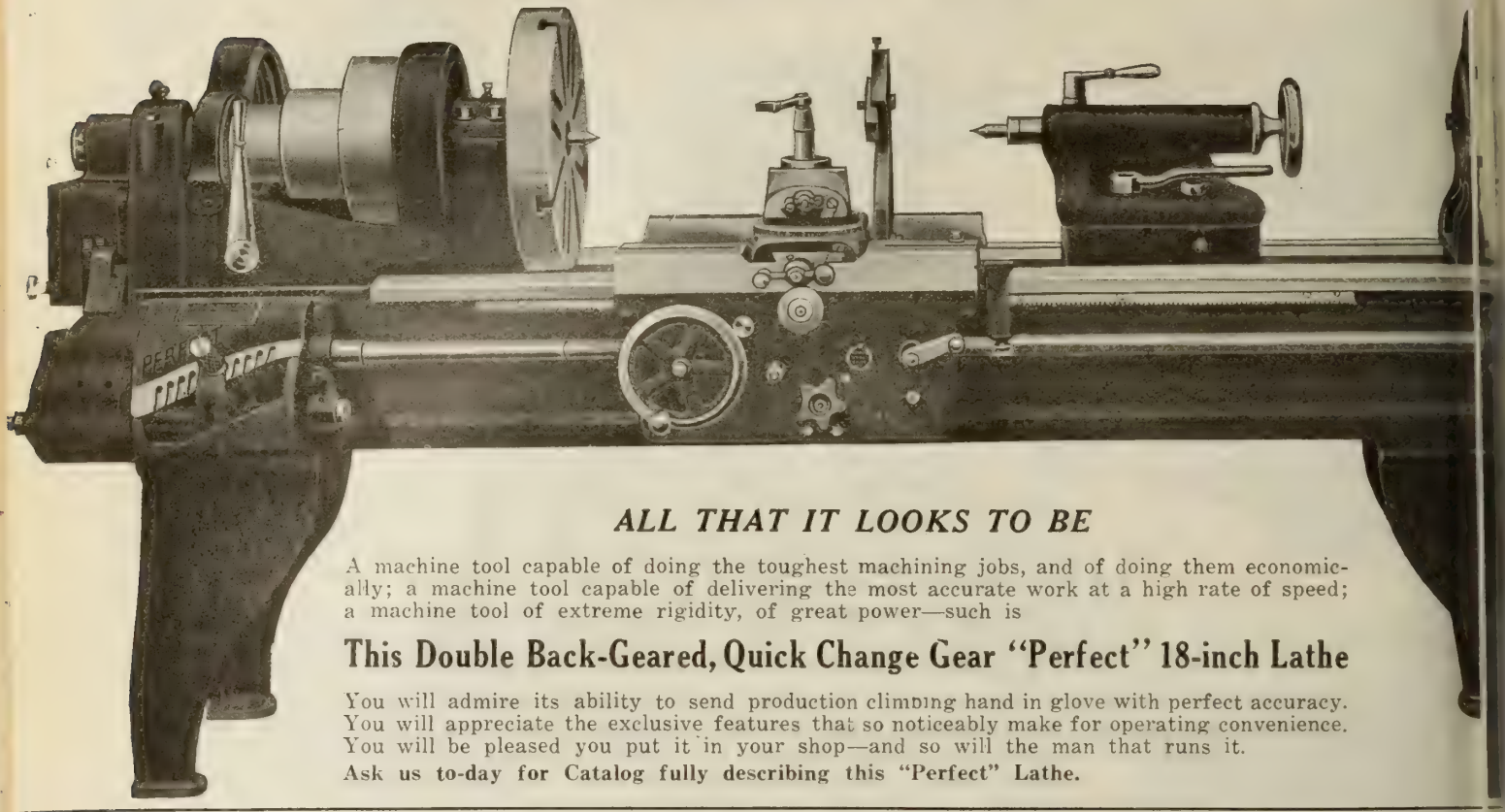
Canadian Agents: Rudel-Belnap Machinery Co., Limited, Toronto and Montreal

Branch Offices:

New York, N.Y., 2 Rector St.
Chicago, Ill., 32 N. Clinton St.
Cleveland, Ohio, Guardian Bldg.
Detroit, Mich., 1223 Dime Bank Bldg.
Cincinnati, Ohio, 2 Greenwood Office Exch.
Export Department, 2 Rector St., N.Y.C.

THE PERFECT 18-INCH LATHE

"THE TOOL WITH THE APPETITE"



ALL THAT IT LOOKS TO BE

A machine tool capable of doing the toughest machining jobs, and of doing them economically; a machine tool capable of delivering the most accurate work at a high rate of speed; a machine tool of extreme rigidity, of great power—such is

This Double Back-Geared, Quick Change Gear "Perfect" 18-inch Lathe

You will admire its ability to send production climbing hand in glove with perfect accuracy. You will appreciate the exclusive features that so noticeably make for operating convenience. You will be pleased you put it in your shop—and so will the man that runs it.

Ask us to-day for Catalog fully describing this "Perfect" Lathe.

SCREW CUTTING ENGINE LATHE WITH GAP

Accurate. Convenient Design.

Small consumption of Power and Low Price.

A Lathe in a class by itself.

Perfect Machine Co.

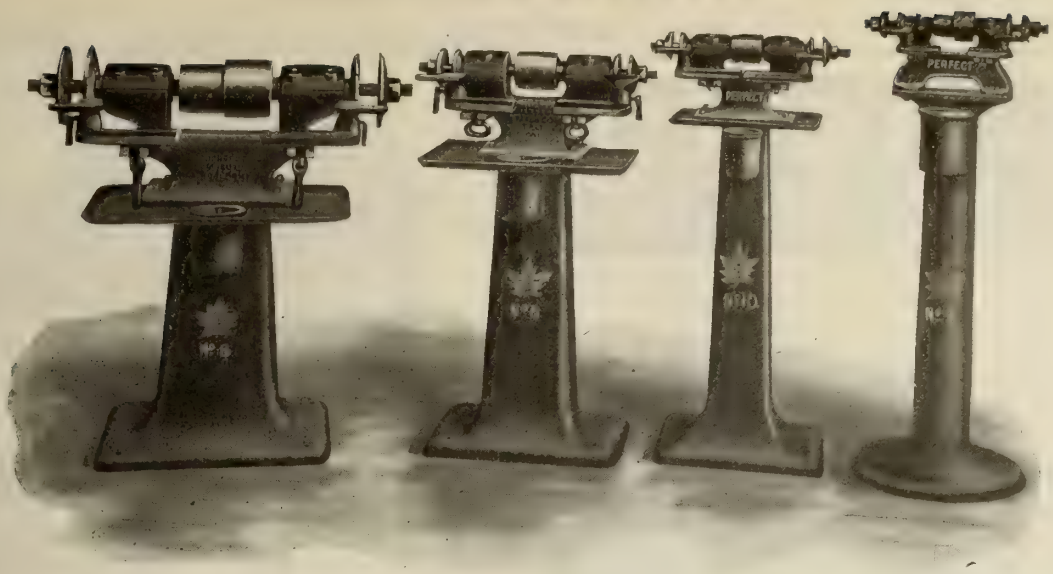
GALT, ONT., CANADA

Made by Canadian workmen employed by Canadian firm better and cheaper than any imported tools. For sale by all up-to-date machinery dealers.

Just the Tool for Machine Shops, Experimental Shops, Technical Schools, Garages, Etc.

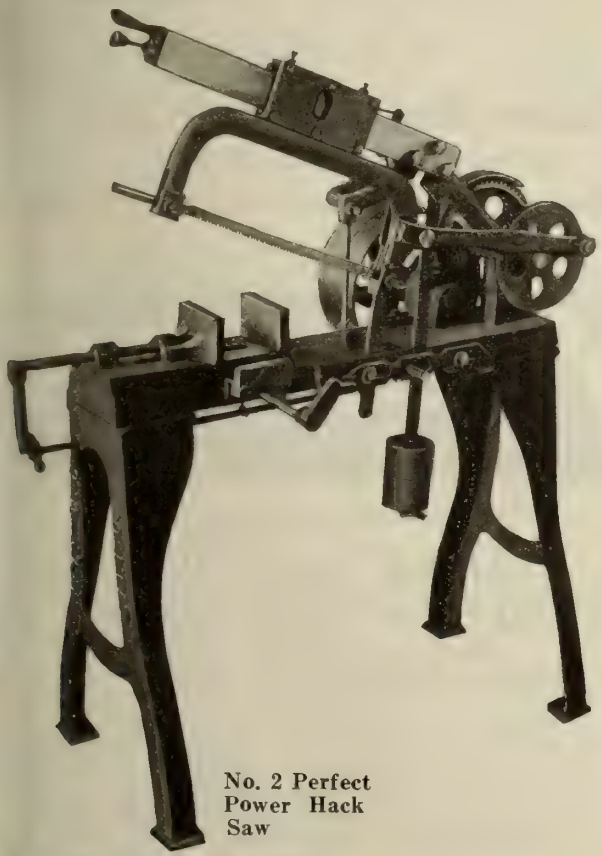
Built in 2 sizes, 12″ and 14″ swing, 6′ and 8′ Bed.

WE GUARANTEE EVERY TOOL WE MAKE.



These grinders have stood the test, they're rigid. The wick oiling device can't go wrong. They're built right, with the proper material, by expert workmen.

Guards and Exhaust Hoods furnished on request. The Heads alone can be used for Bench Grinders. The ordinary tight and loose pulley C.S. furnished unless otherwise ordered.



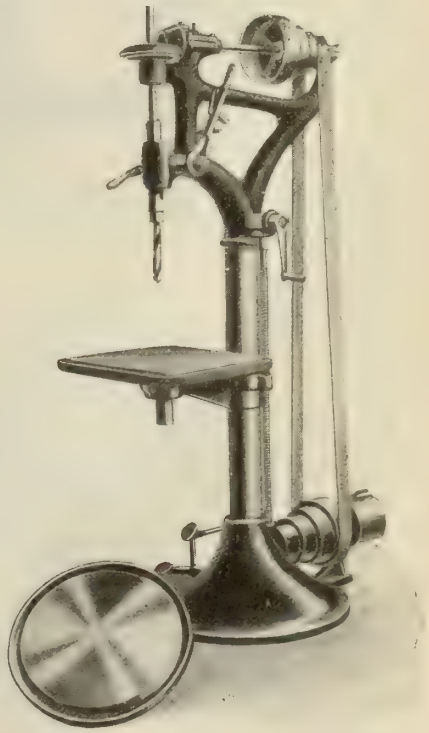
No. 2 Perfect Power Hack Saw

Length of blade, 10″ to 12″.
Stroke of blade, 6″.
Cutting capacity, 5″ x 5″.
Tight and loose pulleys, 10″ diam., ¾″ face.
Geared 3 to 1.
Swivel vise adjustable to 45 degrees angle.
Vise jaws 3″ high, 4½″ wide, 6″ opening.
Floor space, 17 x 36.
Net weight, 190 lbs.

Perfect No. 14 Drill

A high class drilling Machine. Speed 2,000 R.P.M., drills from 0 to ½″.

Looks Right
Acts Right
because it's built right.



Perfect No. 19 Drill

Geared 2 to 1 and is driven by a 2″ flat belt. It has lots of power, handles a drill from 0 to 29 32.

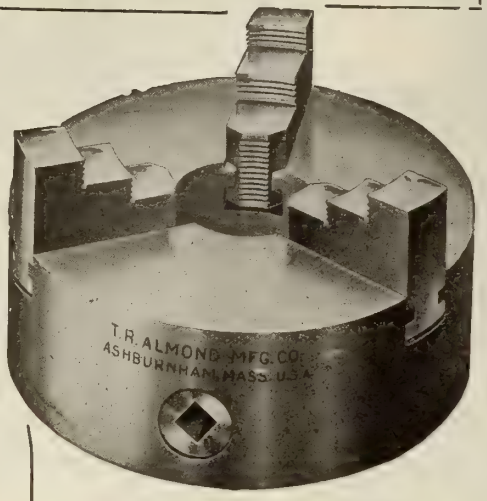
This is a good tool, you don't realize it until you compare it with other 18″ or 20″ drills.

PERFECTLY BUILT BY EXPERT WORKMEN.
WE GUARANTEE EVERY TOOL WE MAKE.

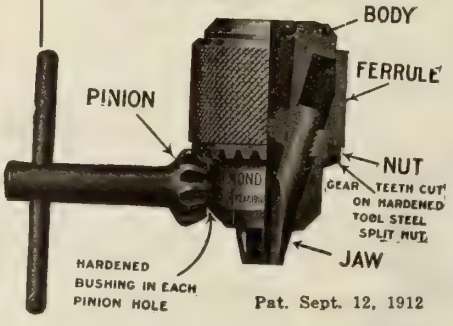
Perfect Machine Company, Galt, Ont.

ALMOND
CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5″, 6″, 7½″, 9″ and 12″.



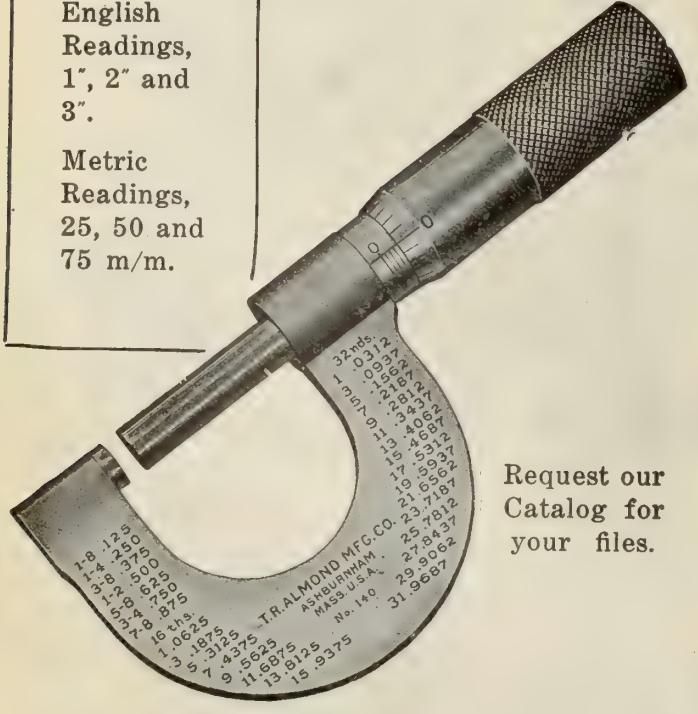
Geared Nut Drill Chucks, in various capacities, 0″ to 1″.



Micrometer Calipers—

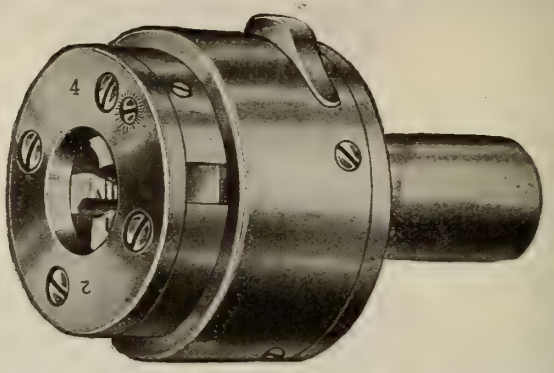
English Readings, 1″, 2″ and 3″.

Metric Readings, 25, 50 and 75 m/m.



Request our Catalog for your files.

T. R. ALMOND MFG. CO.
6 Maple Avenue, Ashburnham, Mass.



H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16″, 1″, 1¼″ and 1½″.

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

CUSHMAN

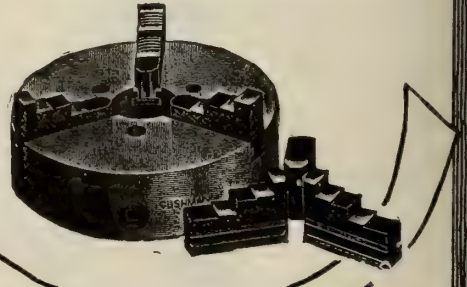
We've been Manufacturing

Nothing but Chucks and Their Accessories

FOR NEARLY 60 YEARS
AND OUR PRODUCTS SHOW IT

Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

Let us send you our catalogue.
Cushman Chuck Co., Hartford, Conn., U.S.A.



"B-T" Reverse Tapping Attachment

Saves Tap, Time and Trouble

That is what the "B-T" Reverse Tapping Attachment does. It eliminates the necessity of reversing the machine spindle. Simply raising the spindle reverses the tap—the machine, meanwhile, goes ahead at full forward speed.

A reverse speed twice that of the tapping speed is given by an internal gear drive. It is friction driven—automatically adjusted by the amount of pressure the operator puts on the drill spindle. It saves taps, trouble, time and money.

Can also be had with positive drive. Both plain and friction chucks are fitted with jaws to grip round and square end of tap.

Get the details—In our Bulletin.
Write to-day.

BICKNELL - THOMAS CO.

GREENFIELD, MASS., U.S.A.

CANADIAN REPRESENTATIVE - THE JAS. BUCKLEY CO., ST. NICHOLAS BLDG., MONTREAL, P.Q.

Another Broken Tap!

Same old story: tap running at high speed—meets hard spot in metal—strain too much for tap—*snap*—get a new tap. Happens every day unless you use

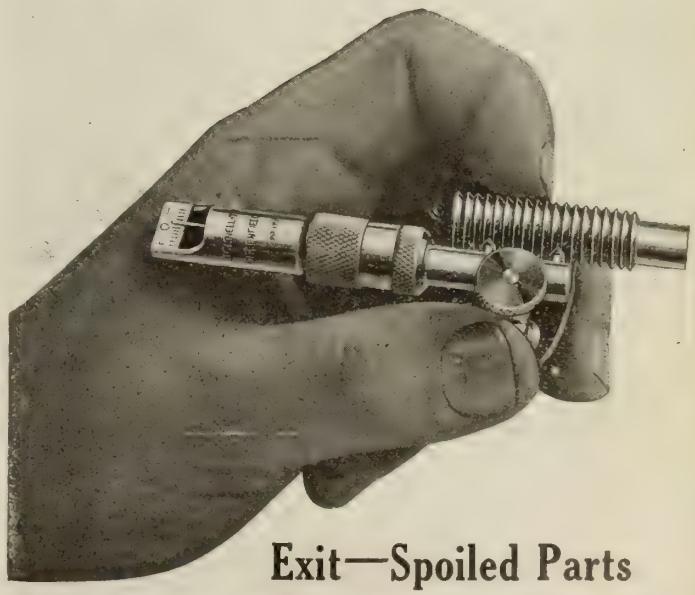
Bicknell-Thomas Friction Chucks

The instant the tap binds with a "B-T" the friction grip holding the tap slips, relieving overstrain, and prevents tap twist or breakage.

Compact; used on multiple-spindle drills and many other machines. Five sizes ⅛"—1"; either straight or Morse Taper Shanks.

How would you like to try one?

B-T THREAD LEAD INDICATOR



Exit—Spoiled Parts

Did you ever have to scrap a threaded part because of incorrect measurement in lead. Were you ever forced, during a rush job, to thread a part over again, because it didn't fit as it should?

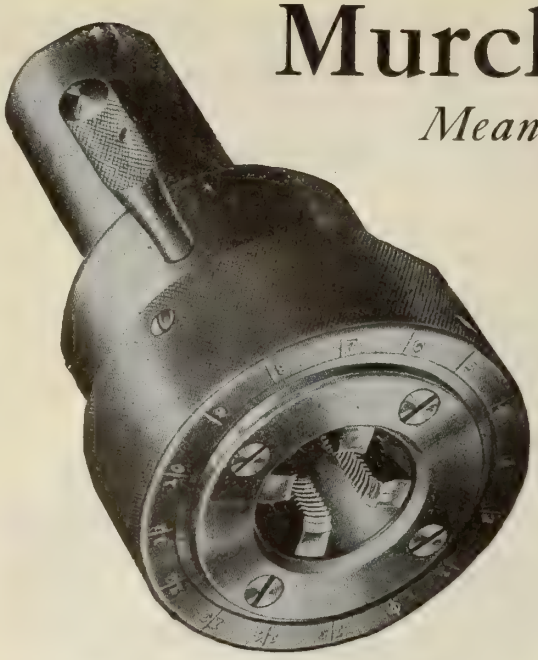
B-T THREAD INDICATORS

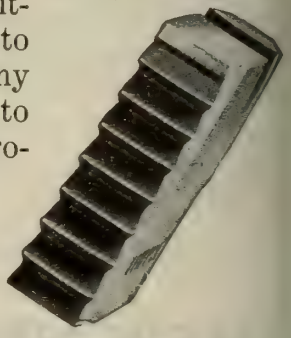
enable you to get the right thread lead instantly and maintain a constant check upon it. They will detect errors of one thousandth of an inch—can be used for testing odd and even pitches, as well as internal and external threads.

SEND FOR OUR BOOKLET.

Murchey Chasers

Mean Quick Deliveries





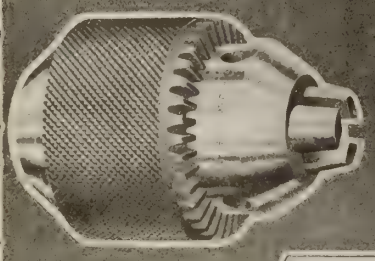
Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?

Send for a Murchey Tap or Die on approval and give it a trial. You will then secure actual proof of its value to you.

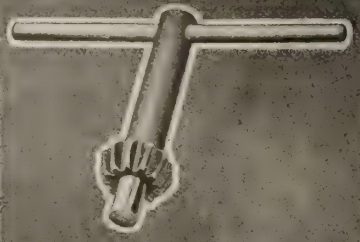
Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France.

Jacobs
IMPROVED
DRILL CHUCK

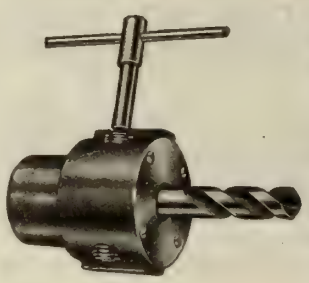


World Famous



The secret of their success is no secret at all, its merely their Superiority

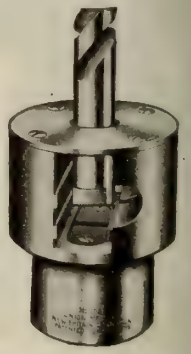
JACOBS MFG. CO
HARTFORD CONN.
U.S.A.



UNION

POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.

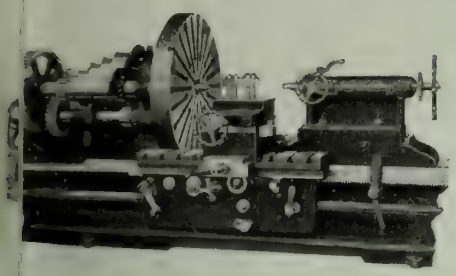


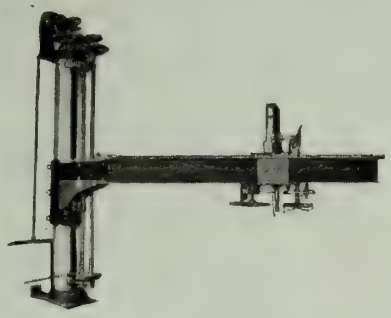
UNION Manufacturing Co.

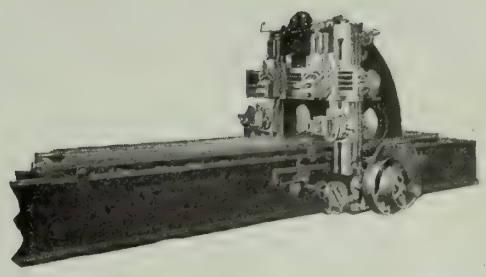
New Britain, Conn.

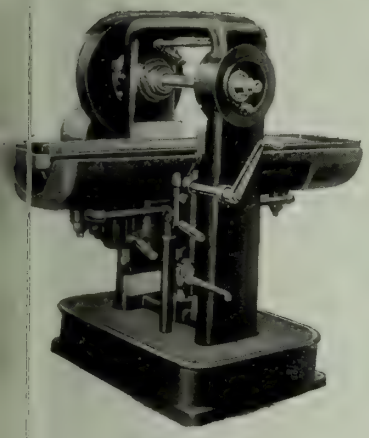
New York 26 Cortland St.

Makers of a complete line of chucks



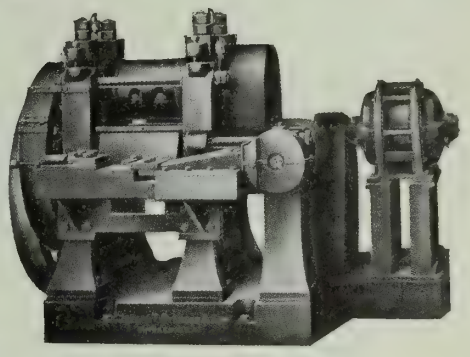


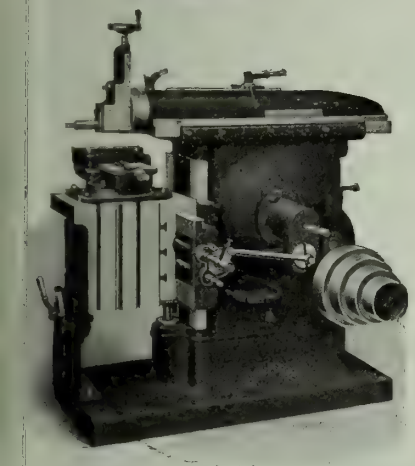




Metal Working Machinery

for any operation

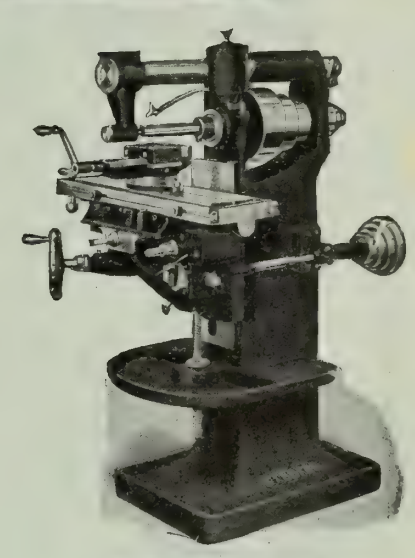




IF YOU WANT

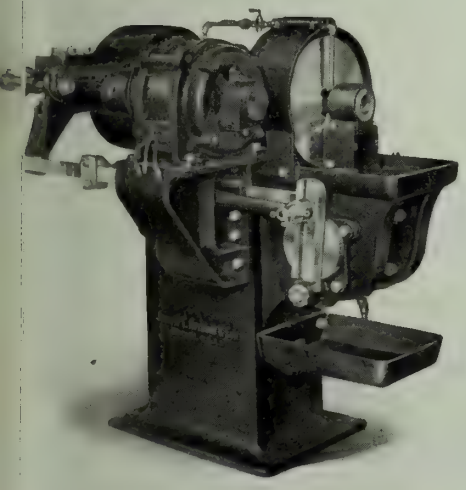
Machine Tools

NEW OR USED

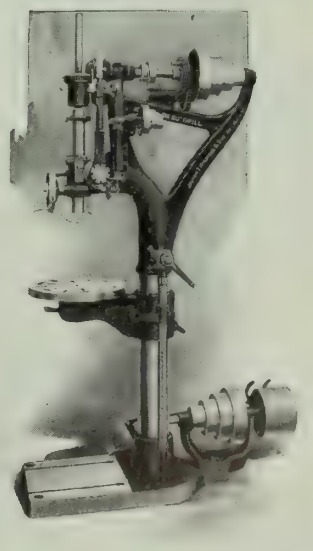


Complete equipment for Boiler Shops, Structural Steel Works, Railroad Spring Shops, Flue Shops, or Machinery for any other purpose, or Woodworking Machinery of any kind

Get Our Quotations



Illustrations show a few of our machines for immediate shipment



Garlock-Walker Machinery Company, Limited

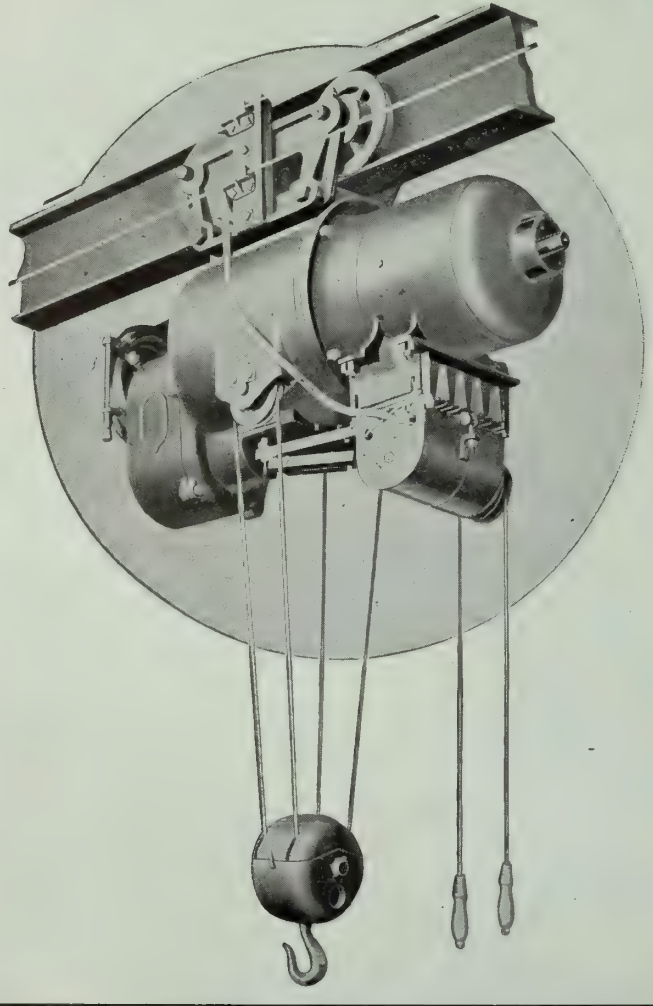
32 Front Street West,

MONTREAL TORONTO WINNIPEG

"Everything in Woodworking and Metal Working Machinery"

The Atlantic Foundry Co., Akron, Ohio.

"AMERICAN" ELECTRIC HOISTS AND CRANES



Standard Electric Travelling Cranes, Wall, Jib and Gantry Cranes, and Mono-rail Systems to meet every requirement.

Special Features:

Totally enclosed motors and gears, heat treated gears, hardened shafts, and Hyatt roller bearings.

If standard equipment does not meet your requirements, we will build a special one that will.

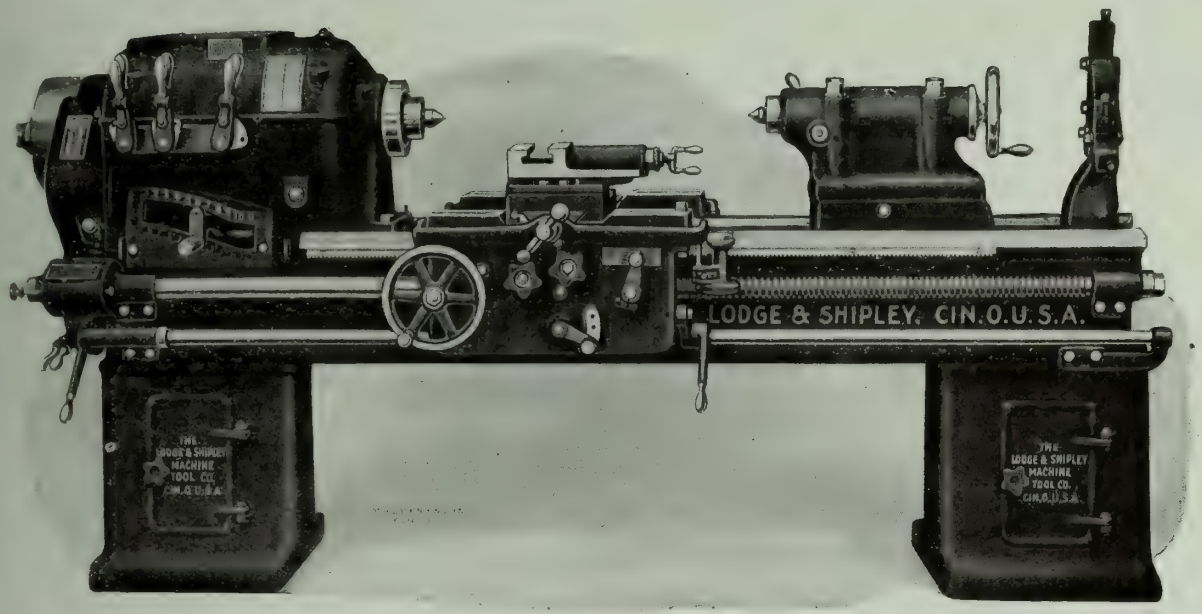
May we submit an estimate covering your requirements.

The Barber-Foster Engineering Co.
602-3 Swetland Bldg. Cleveland, Ohio
New York Pittsburgh Atlanta Detroit San Francisco

Canadian Sales Agents

Garlock-Walker Machinery Company, Limited
32 FRONT ST. WEST
MONTREAL TORONTO WINNIPEG

LODGE & SHIPLEY LATHES



The LODGE & SHIPLEY Lathe is well engineered and well built—each unit designed to insure long life and service, with economy and efficiency in operation. LATHE BUYERS: The name LODGE & SHIPLEY has always stood for the best in lathes—the positive vouched-for dependability of the LODGE & SHIPLEY Lathe, and also for the years of experience in lathe building.

"LATHES—GOOD LATHES ONLY"

The best reasons for equipping a plant with LODGE & SHIPLEY Lathes are because of their—

Power and Rigidity
Uniform and Permanent Alignment
Convenience of Operation
Unusually Efficient and Economical Service.

They will bring these advantages to your shop.

Write for complete information and Catalogue

Garlock-Walker Machinery Company, Limited

32 Front Street West,

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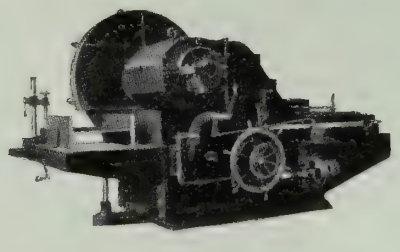
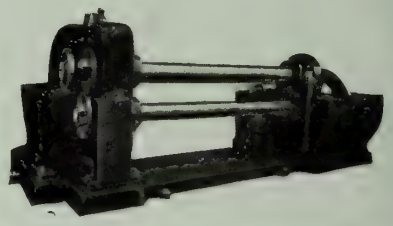
"Everything in Woodworking and Metal Working Machinery"

Machine Tools and Metal Working Machiner



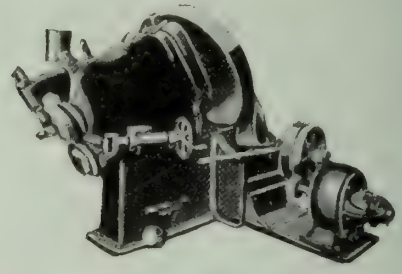
No. 4 High Speed Friction Saw

The Ryerson High Speed Friction Saw is designed for rapid cutting of steel shapes of all kinds. It is made in various sizes with capacity up to largest section rolled.



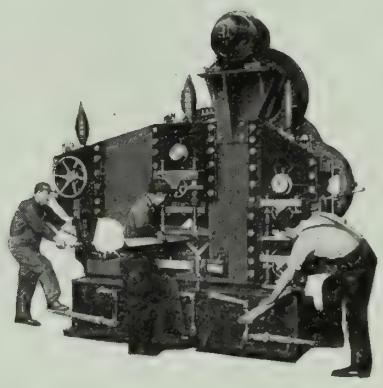
Lennox Double Housing Rotary Splitting Shear

This machine is designed for straight shearing of sheets and plates up to 1½" thick, and will cut through the center of a 20' plate. It will also shear round, square or flat bars.



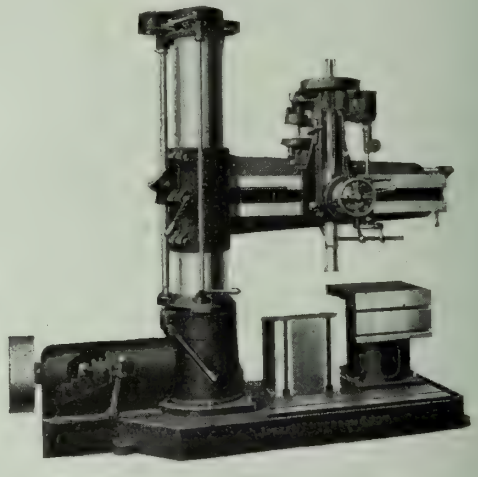
Lennox Rotary Bevel Shear

This is the most efficient machine now on the market for beveling irregular and curved sheets, boiler heads, flanges, dome sheets, plates, angles, etc. It is made in various sizes up to 1¼" capacity.

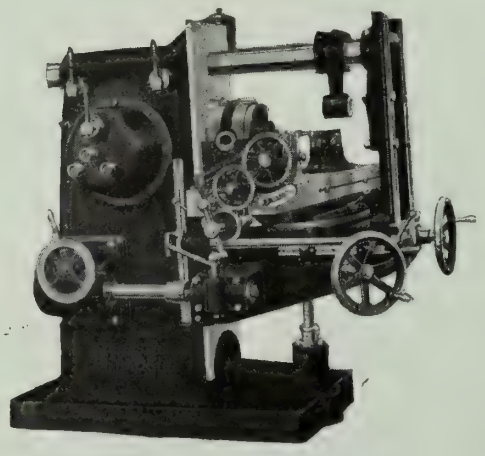


Ryerson Quintuple Combination Punching and Shearing Machine

These machines are built in different sizes and in various combinations for punching, plate, bar, angle and beam shearing, notching and coping work. It will handle this work without the necessity of interchanging attachments.



Ryerson 4" Plain Radial Drilling Machine

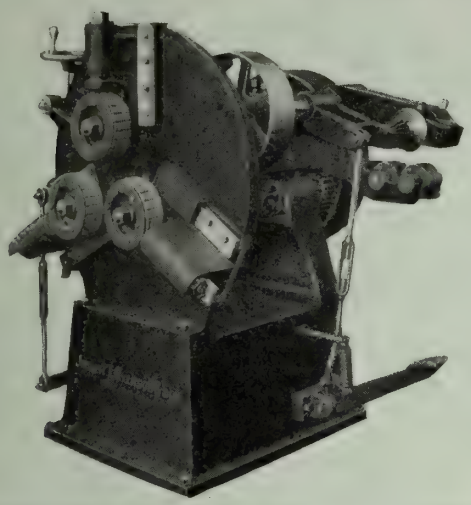


No. 3½ Ryerson---Conradson High Power Single Pulley Drive Universal Milling Machine

GARLOCK-WALKER MACHINERY CO. LIMITED
G&W MACHINERY
TORONTO MONTREAL WINNIPEG
REPRESENTATIVES OF
JOSEPH T. RYERSON & SON
CHICAGO, ILLINOIS, U. S. A.
RYERSON SPECIAL MACHINERY AND MACHINE TOOLS.

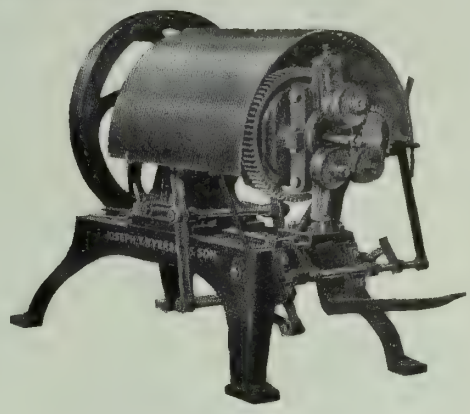
The Sign of Service

Flue Shop Machinery



Ryerson Improved Universal Flue Cleaning Machine

This machine will clean and cut tubes, both standard and superheater, up to 6″ diameter.

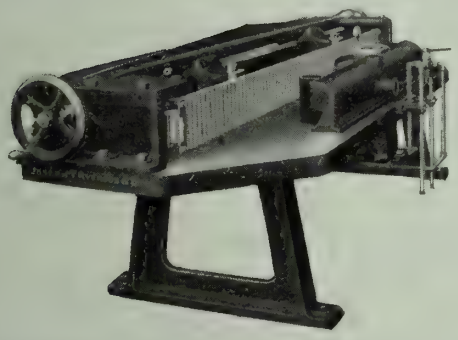


Hartz Flue Welding Machine

The Hartz Flue Welding Machine will handle either standard or superheater tubes with equal facility and economy. The tubes are welded on the roller principle and interchanging attachments can be furnished for the scarfing work.

Spring Shop Machinery

We can furnish complete equipment for cleaning and repairing boiler flues, and will furnish a layout to suit any shop conditions.

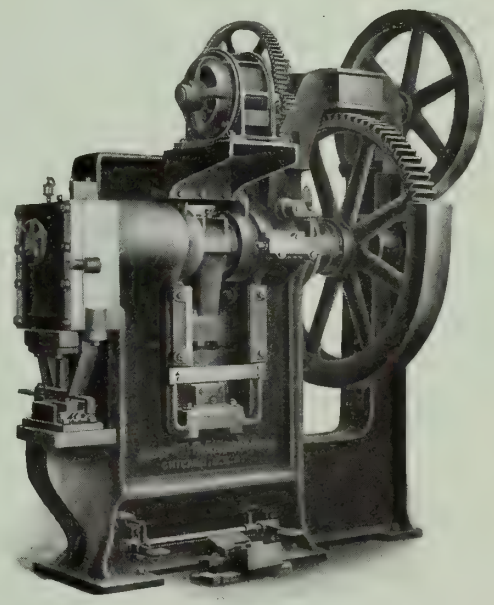


Ryerson Riegel Universal Elliptic Spring Forming Machine

This is the most improved type of Spring Former now on the market.

This Combined Shearing and Hot Punching Machine is designed for cold shearing spring stock and for hot punching slots for inside hangers as well as notching outside hangers.

We can furnish a complete line of spring shop machinery and will furnish plans and layout of a modern spring shop upon request.



Combined Shearing and Hot Punching Machine

GARLOCK-WALKER MACHINERY CO. LIMITED
G&W MACHINERY
TORONTO MONTREAL WINNIPEG
REPRESENTATIVES OF
JOSEPH T. RYERSON & SON
CHICAGO, ILLINOIS, U. S. A.
RYERSON SPECIAL MACHINERY AND MACHINE TOOLS

The Sign of Service

Write for Complete Descriptive Bulletins and Prices

Compare these Specifications:

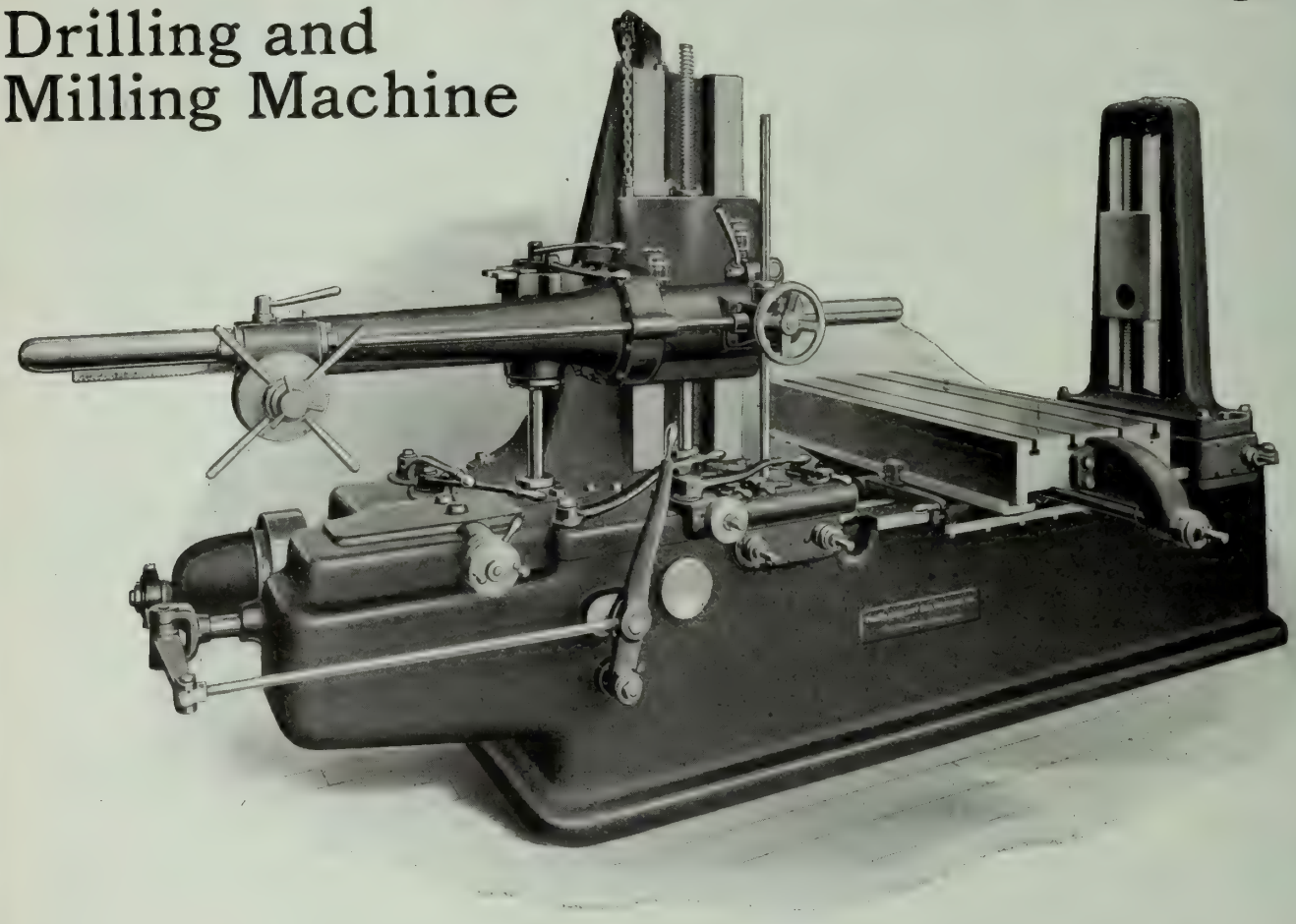
No. Machine	1
Diameter of Spindle	3⅛"
Travel of Spindle	30"
Spindle bored Morse Taper No.	5
Number of spindle speed changes	12
Ranges of spindle speeds in R.P.M.	16 to 196
Number of feed changes to spindle or table	9
Number of feed changes to spindle or table with back gears	18
Ranges of feed in inches per each revolution of spindle	.003" to .518"
Working surface of table	24" x 54"
Automatic longitudinal feed to table	36"
Automatic transverse feed or parallel movement of table with bed	37"
Maximum distance spindle nose to outboard bearing	5' 6"
Maximum distance top of plain working table to center of spindle	28"
Mixmum distance top of bed to top of table	10"
Diameter constant speed friction drive pulley	14"
Width of driving belt	4"
Speed of friction driving pulley (revolution per min.)	350
Weight crated domestic shipment (standard length) approx.	11600 lbs
Weight extra length of bed	1000 lbs.
Weight boxed for sea shipment (Approximate)	14000 lbs
H. P. motor recommended	5

Speed constant from 900 to 1200.

We prefer these standard motor speeds to obtain proper speed and feed ratios.

Other attachments such as circular swiveling table, auxiliary table, star feed and inserted tooth face milling cutters are furnished as extras.

The New "B.-E." Horizontal, Boring, Drilling and Milling Machine



The* Horizontal *Mill and Drill with the highest working efficiency. Note the one-piece deep base of a box pattern strengthening the bed where the greatest stress and strain exist.

Spindle Saddle is designed with a liberal surface on the face of the column, a long, narrow guiding edge, with single screw adjustable taper gib, for adjustments on one side and a square lock form with gib on the other side. This construction will always maintain and insure a perfect alignment for the spindle saddle.

CONVENIENCE AND SAFETY

is provided for the operator by placing all of the controlling levers to the front of the machine and high enough so he has no occasion to stoop or reach beyond that of his normal working position.

Garlock-Walker Machinery Company, Limited

32 Front Street, West

MONTREAL TORONTO WINNIPEG

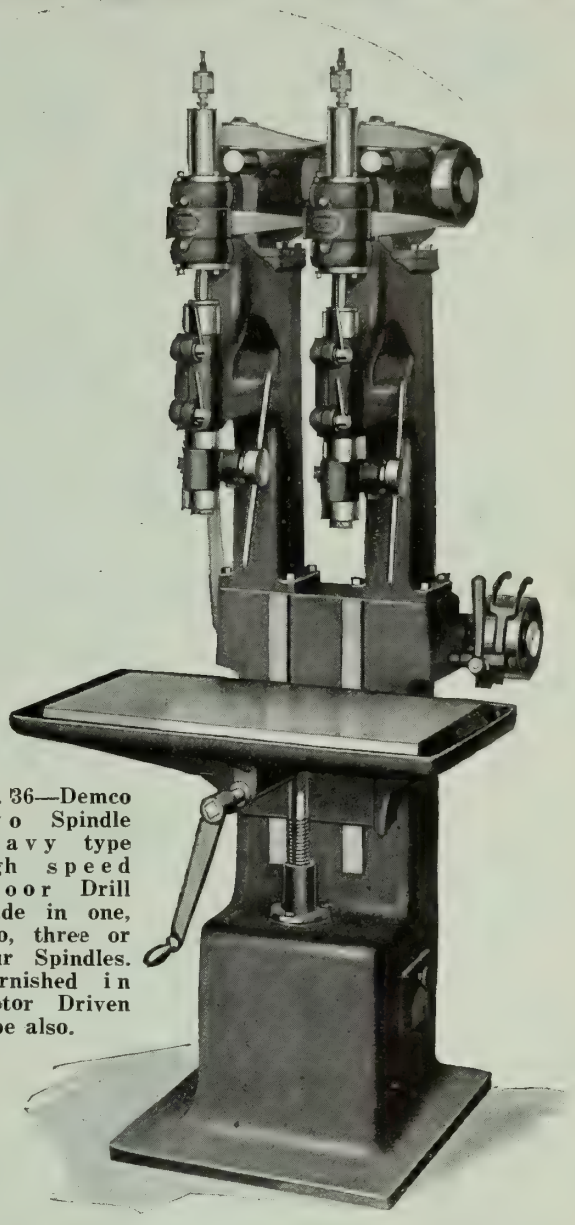
Noteworthy Features of

Demco
High Speed Ball Bearing
Drills

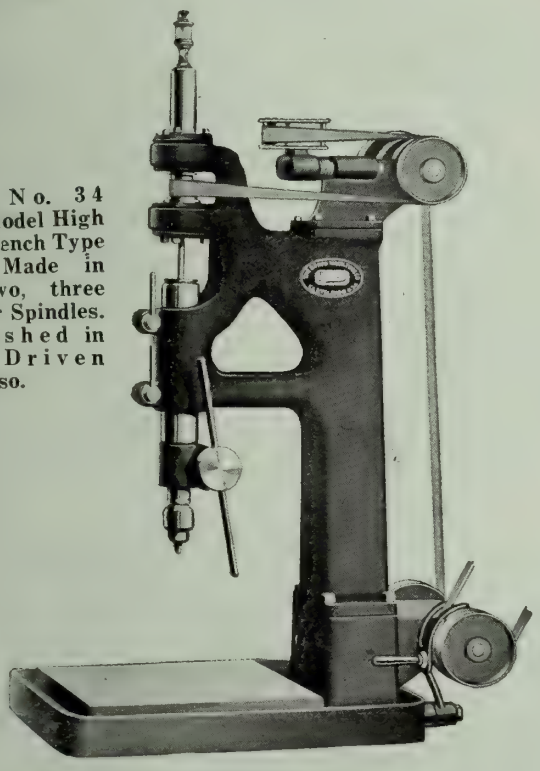
ALL moving parts are perfectly balanced and equipped with "Norma" Annular Ball Bearings, while a special automatic belt take up is provided to keep the belt in contact with pulley at all times.

The lack of vibration obtained by this design permits operating at a maximum speed of 12,000 R.P.M. This high speed avoids the necessity of unduly forcing the drill into the material and reduces drill breakage to a minimum.

Bench and Floor drills are made with 1, 2, 3 or 4 spindles. Choice of four different types of spindles is also provided.



No. 36—Demco two Spindle heavy type high speed Floor Drill made in one, two, three or four Spindles. Furnished in Motor Driven type also.



Demco No. 34 heavy Model High Speed Bench Type Drill. Made in one, two, three and four Spindles. Furnished in Motor Driven Type also.

THESE drills are made with the countershaft at right angles to the spindle arm and they are particularly adapted for driving by belt from overhead lineshafts.

They have the same characteristics and improvements as all other Heavy Type Demco Drills and are equally capable of producing a large volume of exceptionally high class work.

Garlock-Walker Machinery Company, Limited

32 Front Street West,

MONTREAL TORONTO WINNIPEG

"Everything in Woodworking and Metal Working Machinery"

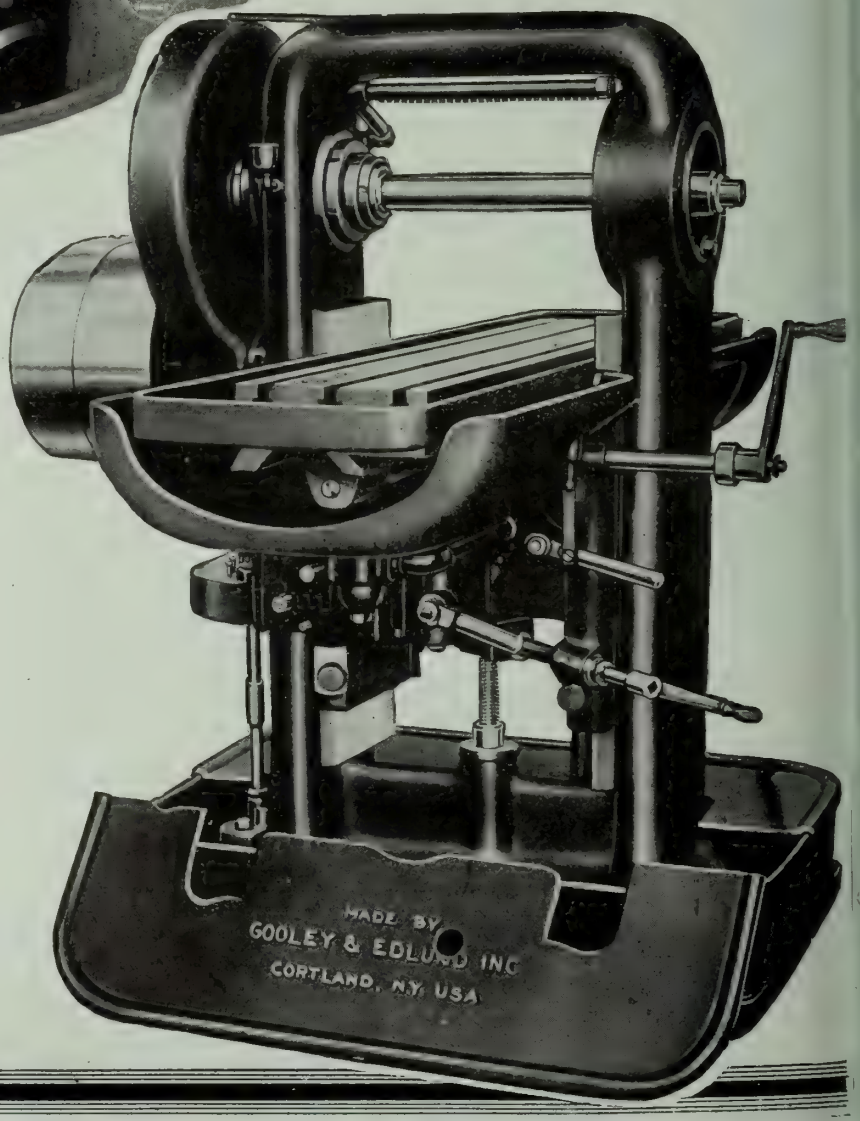
BRIGGS MILLER

Breaking Production Records

Forcing the feed on the "BRIGGS" to an extent impossible on any other machine.

THE photograph shows twelve belt lacer jaws clamped together on the table of a Briggs Milling Machine, where two straddle-mounted cutters mill the channels at one setting, though the stock is cold rolled steel, one inch thick. 15 minutes completes the operation, this speed being attained by forcing the feed to an extent impossible with any other milling machine. There is no chatter—the surface is "finished" when it comes from the machine.

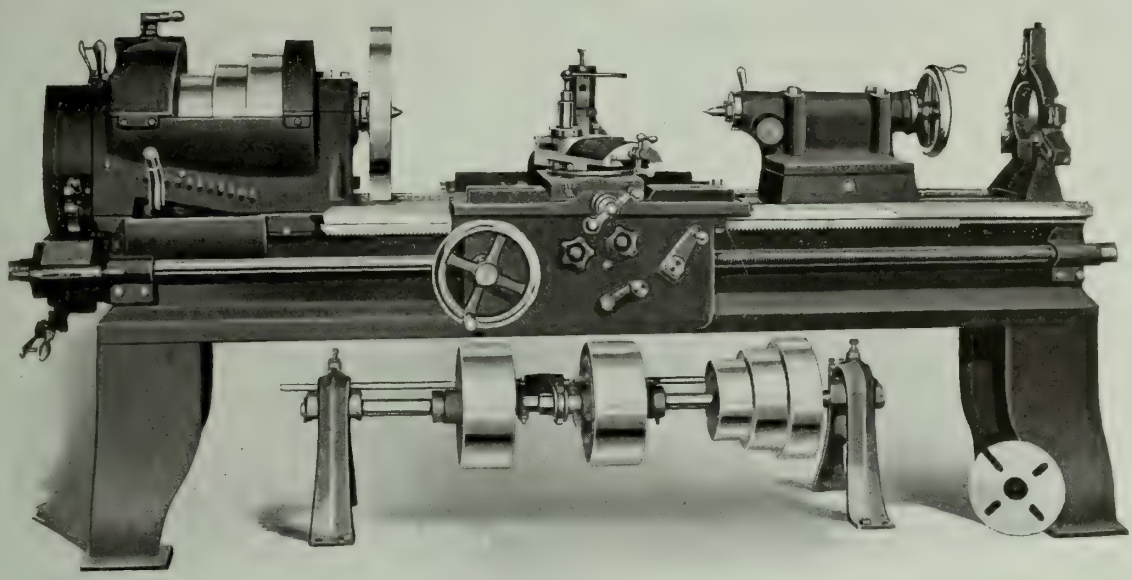
Rigid, powerful and easy to operate. Takes wide, deep cuts without showing least signs of distress, and will produce accurate work when running at a high rate of speed.



Gooley & Edlund, Inc.
Cortland, N.Y., U.S.A.

Representatives
Garlock-Walker Machinery Co.
32 Front St. W. -- TORONTO

RAE LATHES AND SHAPERS



18-in. QUICK CHANGE D.B.G. LATHE

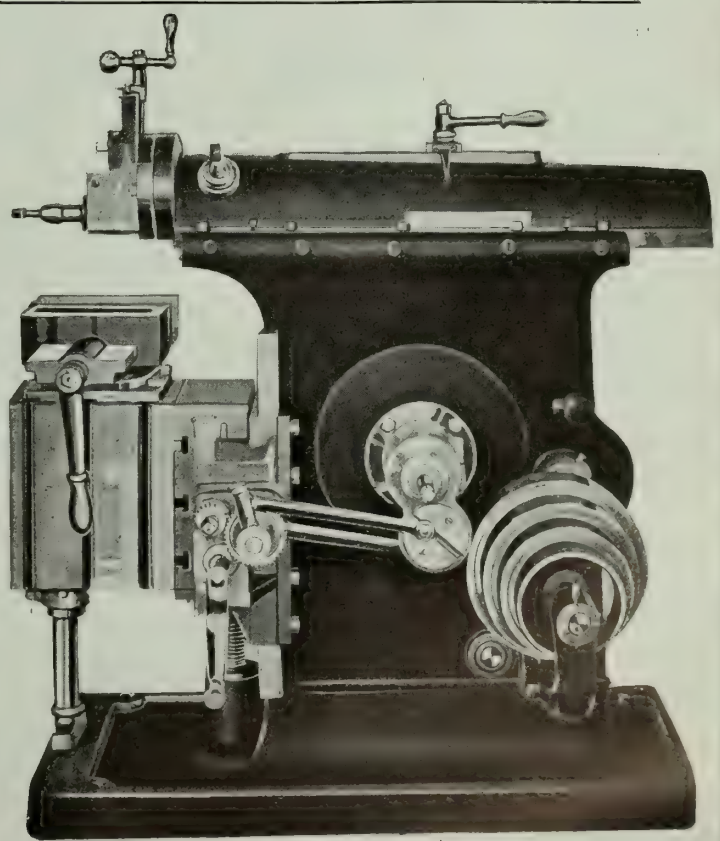
Special large spindle bearings and webbed headstock insures rigidity and permanent alignment. It will stand up, stay fit at the lowest maintenance cost.

DIMENSIONS

Swing-over Shears, 19½"
Width of Belt, 3"
1st Back Gear Ratio 3.26 to 1
2nd Back Gear Ratio 10.36 to 1.
Front Spindle Bearing 3¼" x 5 9-16
Rear Spindle Bearing 2⅜ x 3 13-16
Hole through Spindle 1 9-16
Cone Pulley Diameters 12", 10", 8"
Countershaft Driving Pulleys 5" x 12"
Lead Screw Threads, per in. 4
Beds all standard lengths.

Rae 16" Back Geared Crank Shaper

Actual stroke 18". Powerfully geared with eight speed changes.



These machines built by the Rae Machine Tool Works, Hamilton, Ont., will surely interest the many who prefer machines "Made in Canada."
Delivery from our Toronto warehouse.

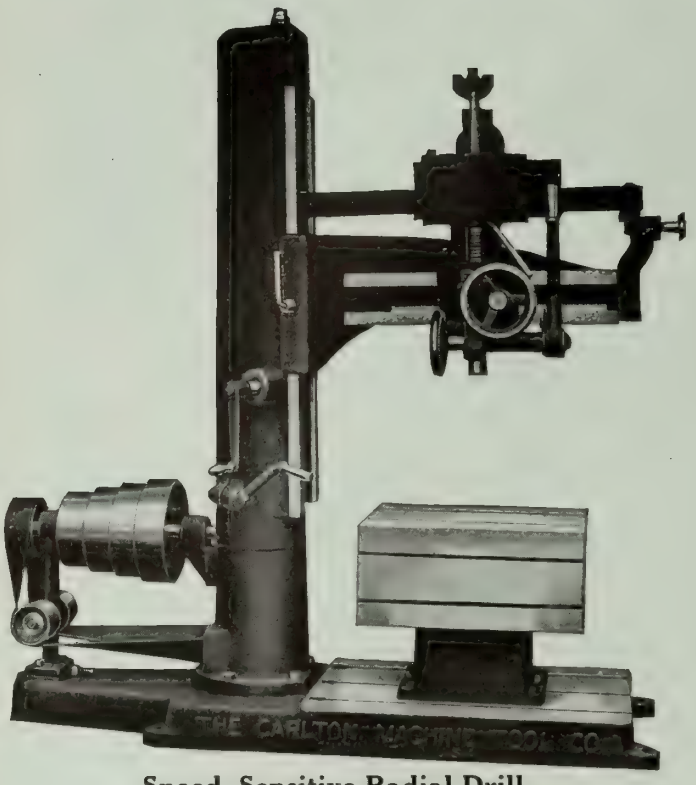
Write for full particulars

Garlock-Walker Machinery Company, Limited

32 Front St. West

Montreal TORONTO Winnipeg

CARLTON RADIAL DRILLS



Speed, Sensitive Radial Drill,
2½—3—3½—4 ft. sizes.

Sixty Seven Holes Drilled and Tapped in Twenty Minutes is "Going Some"

Holes are not all the same size either.

This is **day-in** and **day-out** production record on crank cases for the *Dayton Kelly Springfield* one ton truck.

The CARLTON MACHINE TOOL COMPANY'S Speedy, Sensitive Radial Drill handles this kind of work for the majority of Canadian and American manufacturers at a profit. It will do the same for YOU. It is a rapid, accurate producer with distinctive advantages for drilling up to 1 in. in steel.

Carlton manufactures RADIALS with CONE or GEAR BOX DRIVE with arms up to four foot swing.

Let us tell you about Carlton Drills

Garlock Walker Machinery Company, Limited

32 Front Street West

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"Everything in Wood-working and Metal-working Machinery"

FITCHBURG

PLAIN CYLINDRICAL GRINDING MACHINES

Model "A" 6" x 20"

Other Sizes

4" x 20"

8" x 36" 12" x 36"

8" x 54" 12" x 54"

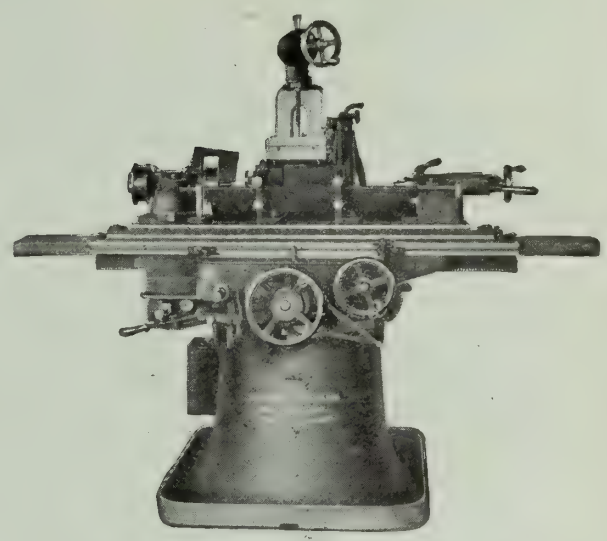
FITCHBURG GRINDING MCH. CO.

FITCHBURG, MASS., U.S.A.

BATH

UNIVERSAL GRINDING MACHINES

Adaptable to any Grinding Job



No. 1 10" x 20"
No. 2 10" x 25"
No. 2½ 10" x 36"

No. 2 and 2½ are furnished to order with 12" swing

BUILT BY

UNIVERSAL GRINDING MACHINE CO.

FITCHBURG, MASS., U.S.A.

You should have our descriptive catalogues on these grinders

SEE THESE MACHINES AT OUR EXHIBIT AT THE CANADIAN NATIONAL EXHIBITION

GARLOCK-WALKER MACHINERY COMPANY LIMITED

32 Front St. West

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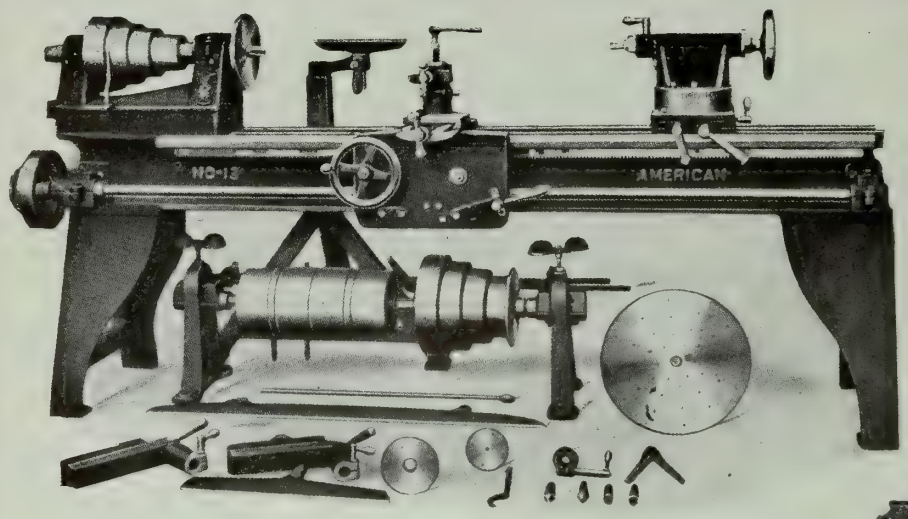
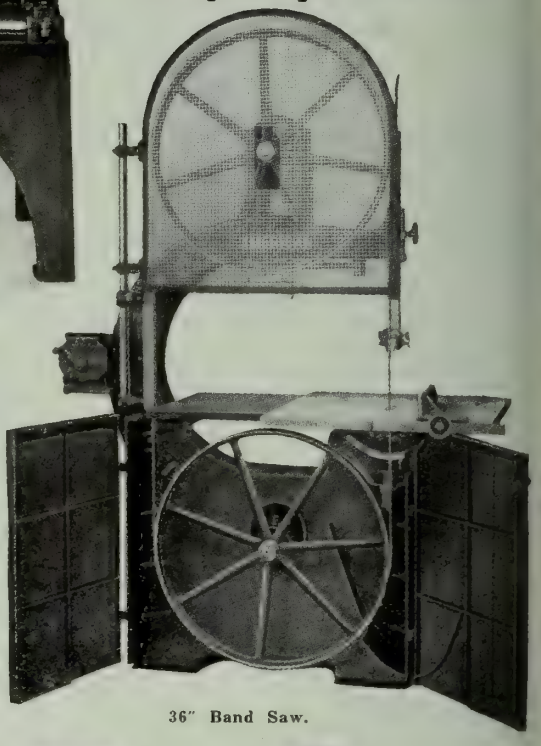
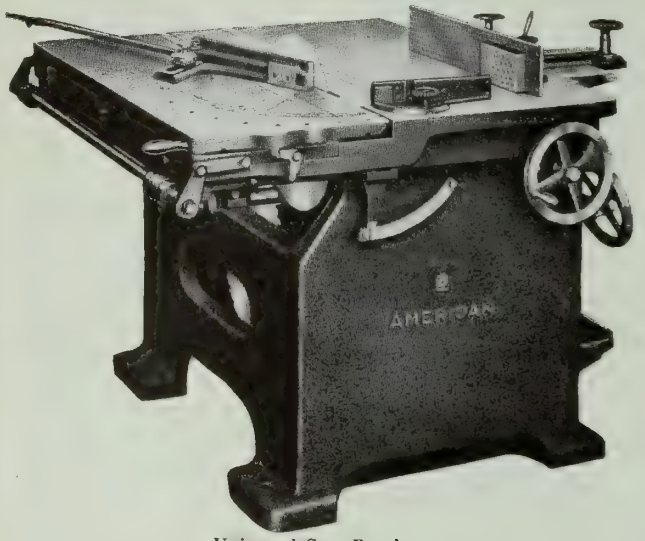
Pattern Shop Equipment



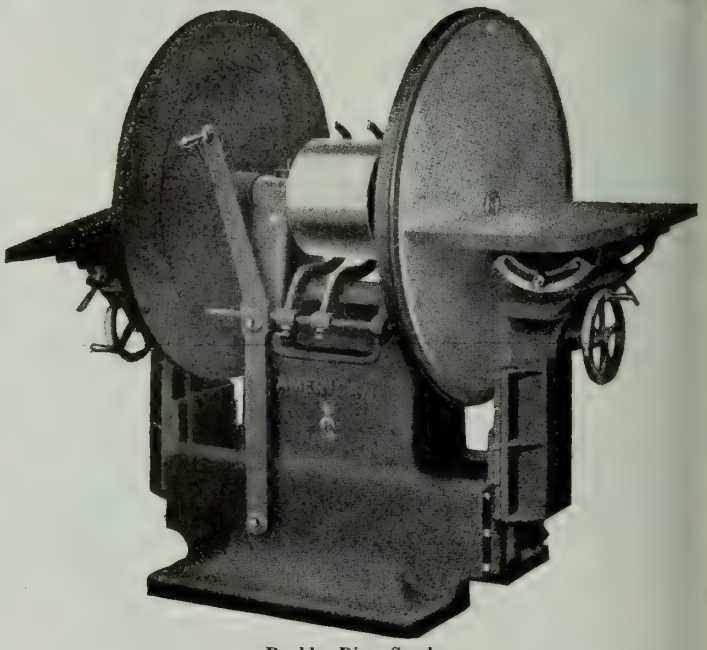
Pattern Makers' Lathe.



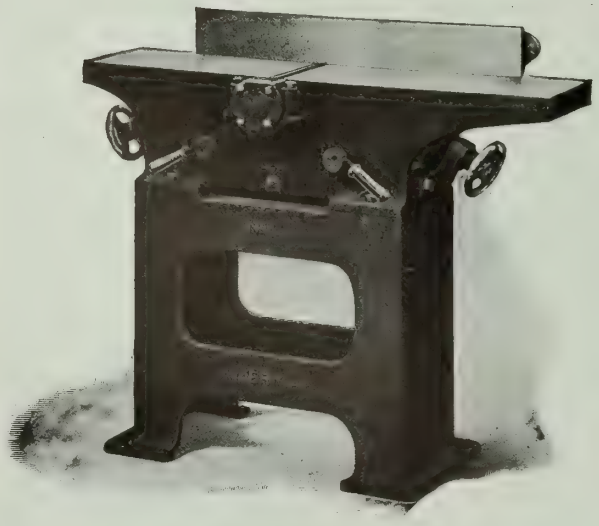
36" Band Saw.



Universal Saw Bench.



Double Disc Sander.



Bench Jointer.

A few Wood-Working Tools for Your Pattern Shop

Garlock-Walker Machinery Company, Limited

32 Front Street West

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EVERYTHING IN WOOD-WORKING AND METAL-WORKING MACHINERY

The City of Welland

Offers Every Advantage to Industry

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Electric Power at Lowest Cost.

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Industrial Commissioner
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Drills, high-speed and carbon
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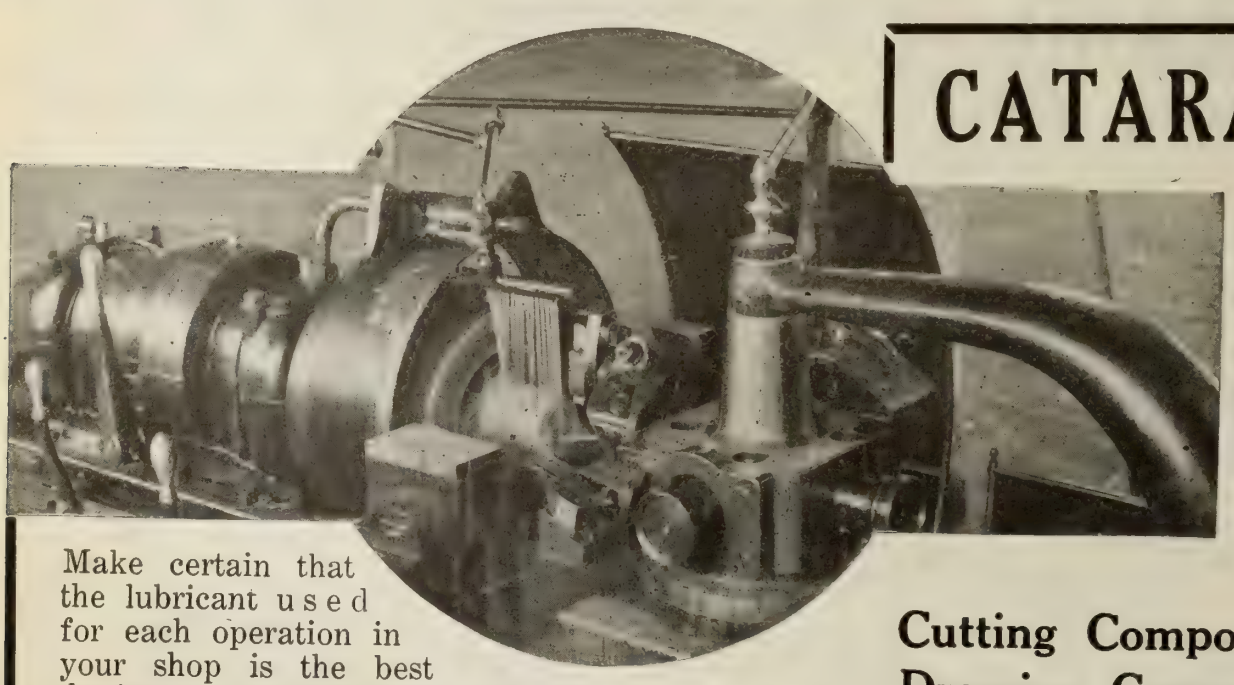
Combined Drills and Countersinks
Jacobs Drill Chucks

The J.A.M. TAYLOR TOOL CO.
STAIR BUILDING, TORONTO

CATARACT



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Make certain that the lubricant used for each operation in your shop is the best obtainable for the purpose. Otherwise your men and your tools and your machines work at a disadvantage.

Write us to-day that we may demonstrate how Cataract Lubricants can increase production and reduce cost in your plant.

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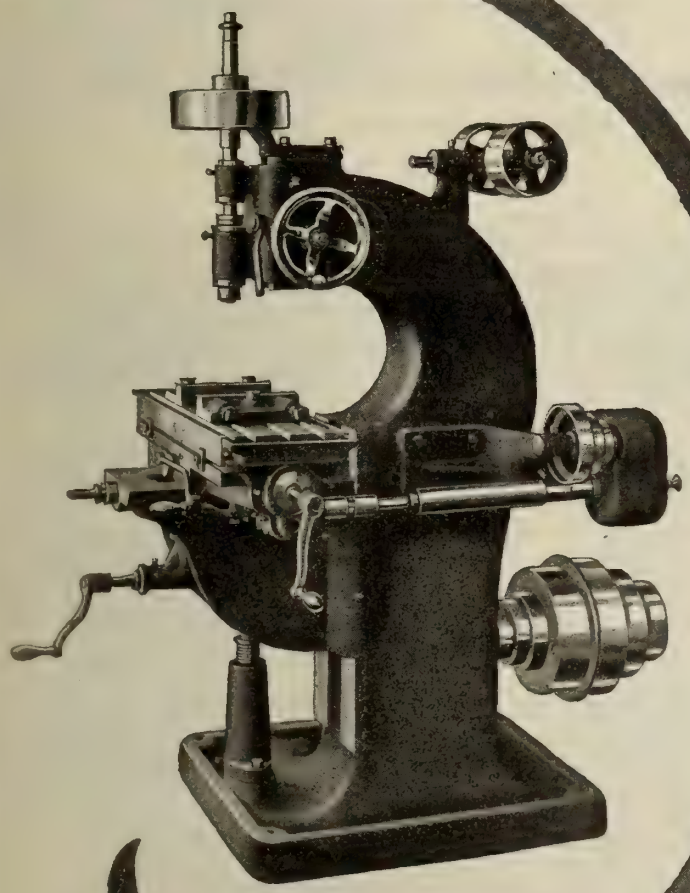
Cataract Refining Company, Limited - Toronto, Ont.

BRISTOOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
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"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
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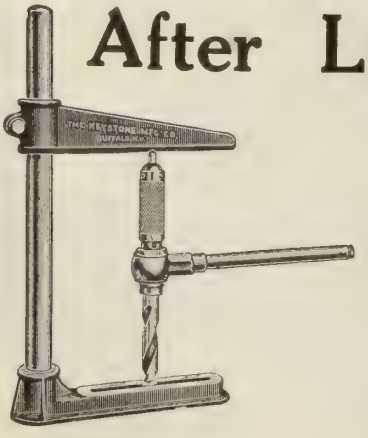
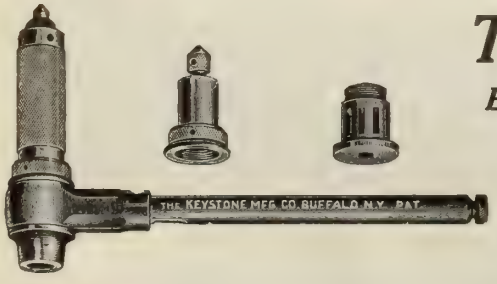
"Keystone Quality" Will Still be There After Long Use Has Worn Away The Name



We like to think of that.

We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

Write for name of nearest dealer.



The Keystone Mfg. Company
Buffalo, N.Y., U.S.A.

Equipment of the "HISCO" Plant

Includes everything essential to the perfection of its product.

The plant is equipped with most up-to-date testing scales for hardness, as well as physical properties tests. Therefore, every heat of steel that is poured is subject to scientifical test.

The pattern department is capable of handling work to any specifications or blue prints.

Anything that can be cast in steel—describes the capacity of the Hisco Plant.

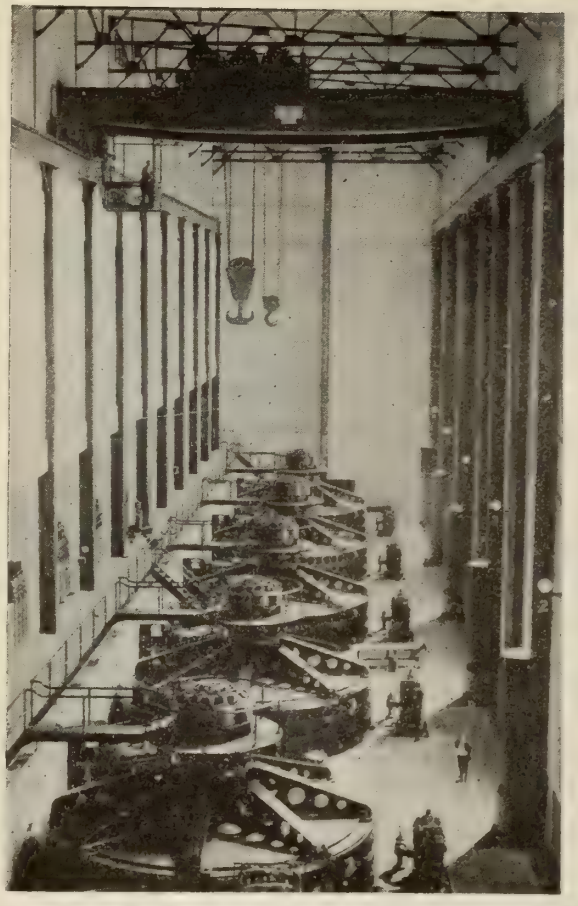
The "HISCO" Laboratory

Material used is not a matter of speculation. It is the product of the most up-to-date equipped plant in America operated under expert supervision of European and American steel makers.

Send your specifications or blue prints to a plant capable of the highest class workmanship.

Hull Iron & Steel Foundries, Limited

HULL, CANADA



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Capacities: 2 Tons to 200 Tons

BRIDGE CRANES for all purposes

Including Power House, Foundry, Shop, Steel Works and other uses

Also

REVOLVING TOWER CRANES

for Shipbuilding and Fitting-out Berths

DOMINION BRIDGE COMPANY, LIMITED

Head Office: Montreal, P.Q.

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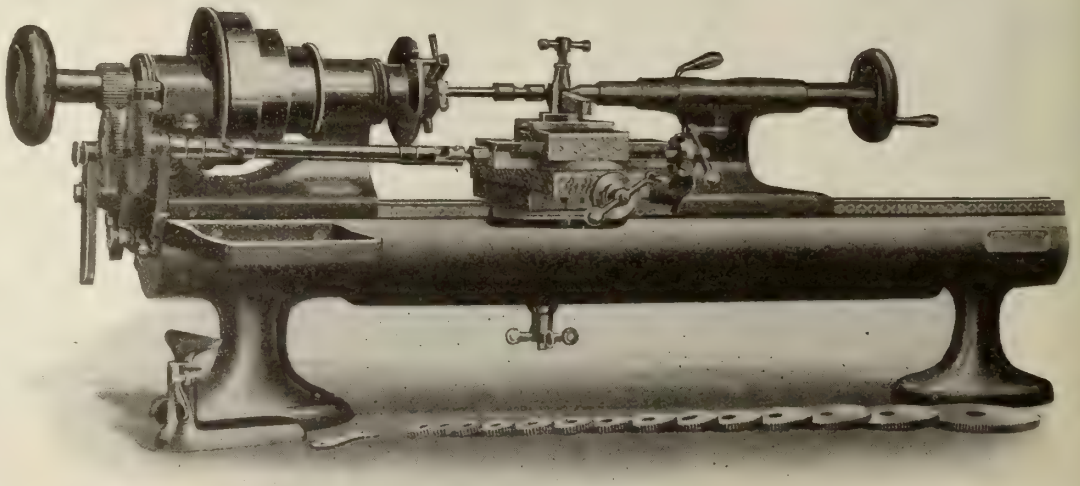
Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



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ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

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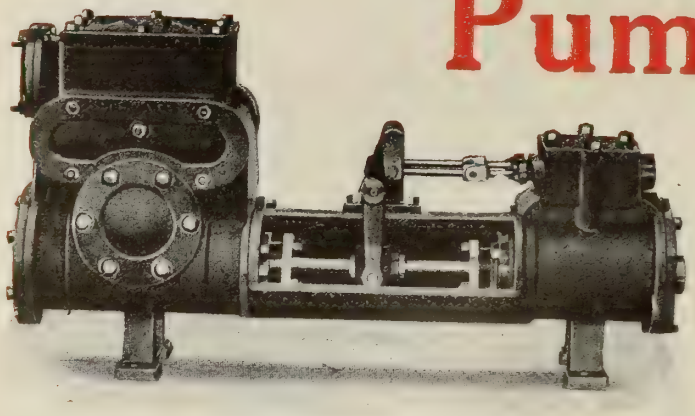
Convenient to important centres in Canada and United States.
About 60% of mechanics own their own homes.
Ideal conditions for laborers.
Excellent schools. Over $160,000 being spent this year for new schools.

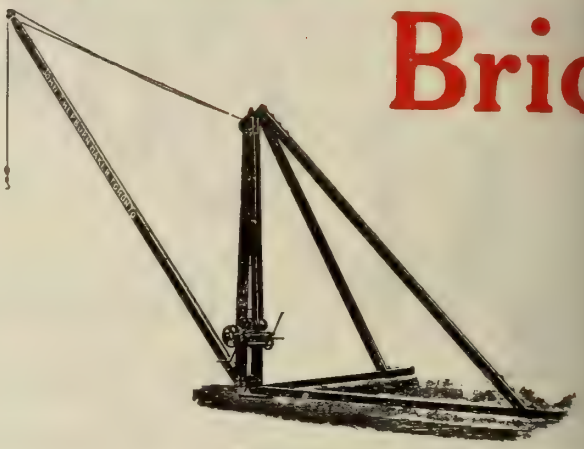
Complete details upon request. Write the Secretary, Board of Trade

St. Catharines, Ontario

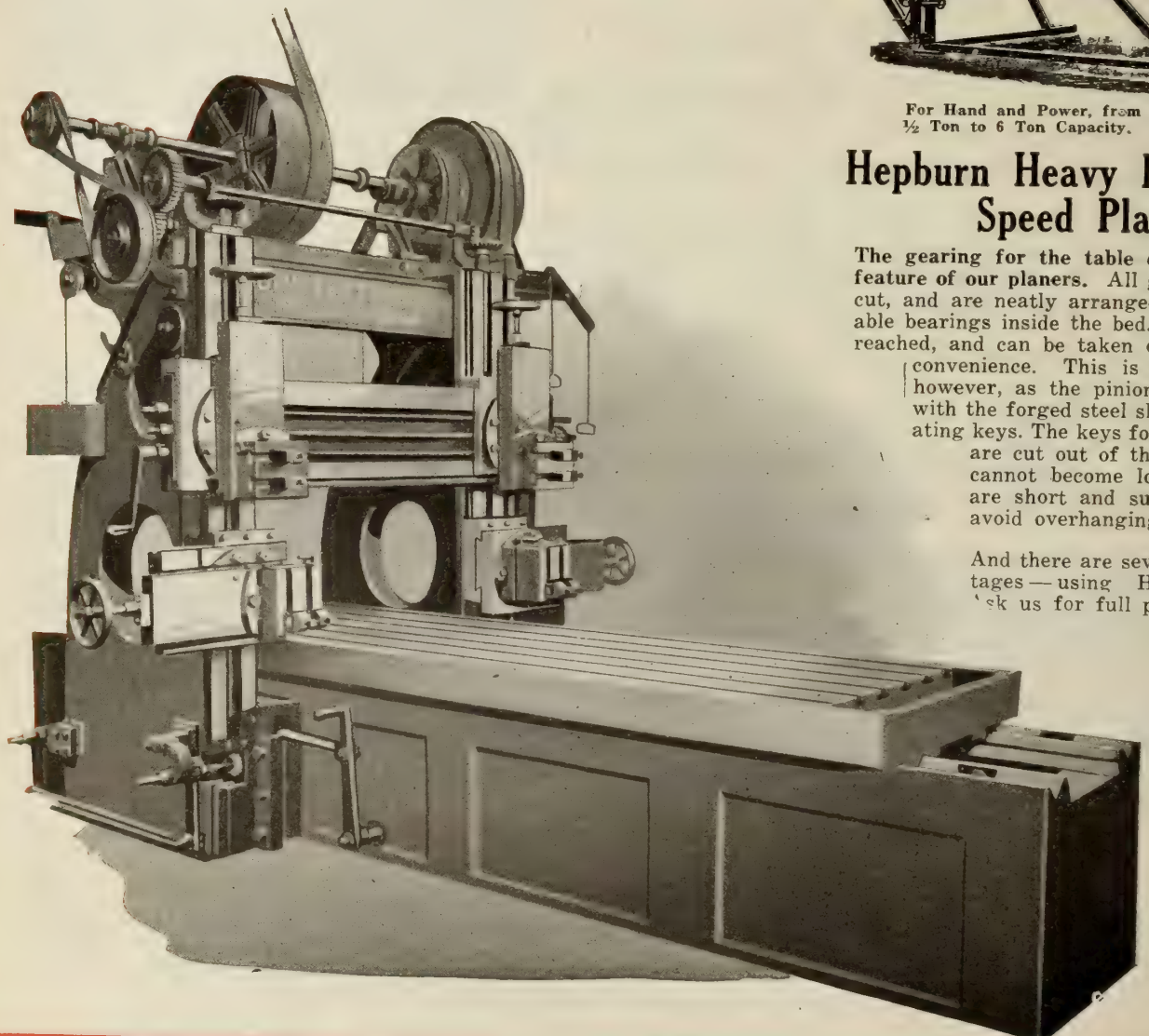
Pumps, Planers, Grey Iron Contractors' Brick



Boiler Feed Pump With Cast Iron Stretcher Rigid and Efficient



For Hand and Power, from ½ Ton to 6 Ton Capacity.

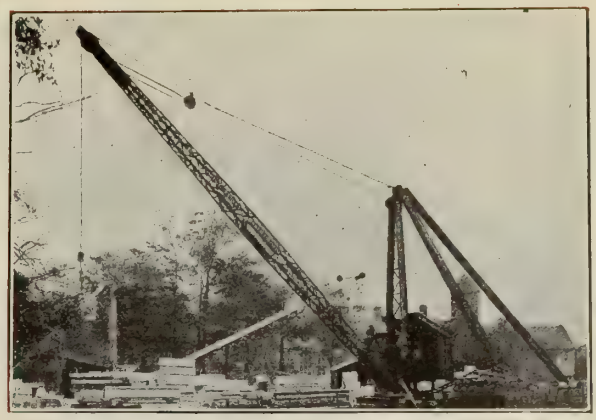


Hepburn Heavy Duty H[igh] Speed Planer

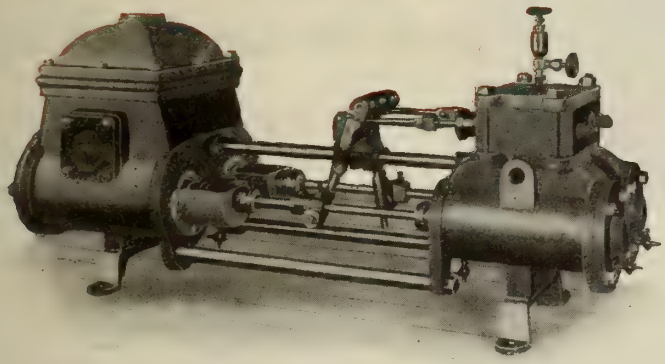
The gearing for the table drive is a s[pecial] feature of our planers. All gears are m[achine] cut, and are neatly arranged between r[ugged] able bearings inside the bed. They are s[o] reached, and can be taken out with lit[tle] convenience. This is rarely nece[ssary] however, as the pinions are made [solid] with the forged steel shafts, thus e[limi]ating keys. The keys for the large w[heels] are cut out of the solid shaf[t] cannot become loose. The s[hafts] are short and supported so [as to] avoid overhanging.

And there are several other a[d]tages — using Hepburn Pl[aners] Ask us for full particulars.

Gear Cutting
Castings
Machinery
Machinery



Electric Derricks, suitable for stone yards and quarries. Sizes up to 6 tons. Booms up to 70 feet long.



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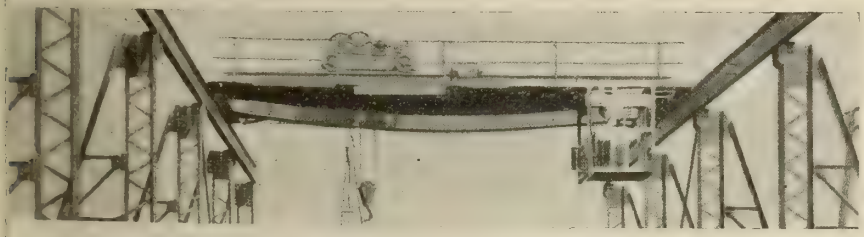
Hydrants

Made for City of Toronto and York Township.

Up-to-the-minute design and top-notch quality is our motto and our products show it. If you require anything in the above-mentioned lines, do not hesitate to write us for the fullest information.

All inquiries receive our prompt and careful attention.



Electric Overhead Cranes, up to 25 tons capacity.

Valves

Made for City of Toronto and York Township.

JOHN T. HEPBURN, LIMITED

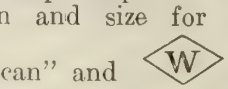
Engineers and Iron Founders

18-60 VAN HORNE STREET, TORONTO, ONT.

An actual photograph of Williams' Superior Wrenches taken from the height of the 57th story of the Woolworth Building, during construction; 750 feet above City Hall Park, New York City. Star in picture: Singer Building, 41 stories in height.

Williams' Superior Drop-Forged Wrenches

A BIG business, like a big building, requires a broad and sound foundation. For nearly half a century we have been designing and developing standard line of *Superior* Drop-Forged Wrenches. We now make and carry regularly 40 Patterns in about 1,000 sizes, with openings from 3/16 to 7⅝ inches, ready for prompt shipment—something *Standard* in design and size for every recognized trade need.

Our trade-marks, "Vulcan" and  and "Agrippa," are known the world over wherever machinery or tools are used. They stand for *Superior* quality—the kind that guarantees service under the most severe conditions, for they represent our constant effort to maintain the high standard of excellence that has long been established for Williams' product.

Specify Williams' Wrenches or Tools when you order, and get *Superior* quality.

Wrench Booklet on request.

J. H. Williams & Co.

"The Drop-Forging People"

45 Richards Street, Brooklyn, N.Y.

THE A. G. LOW CO., LTD., 45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Saskatchewan, Alberta, British Columbia.

CLEANLINESS CAPACITY

EFFICIENCY DURABILITY

A Time Tried and Proven Economy Bearing Primarily Built for Line Shafting

THE ESTEEM in which CHAPMAN DOUBLE BALL BEARINGS are held is born of a certain and intimate knowledge of their superiority in actual service and power saving ability, an estimation which is highest among over 4,000 plants using them.

A Few of the Many Well Known Plants Using Chapman Double Ball Bearings

Pierce-Arrow Motor Car Co.	Buffalo, N.Y.
Bethlehem Steel Co.	South Bethlehem, Pa.
Ford Motor Co.	Walkerville, Ont.
International Harvester Co.	Hamilton, Ont.
Goodyear Tire & Rubber Co.	Bowmanville, Ont.
Canadian Rand Co.	Sherbrooke, Que.

Chapman Double Ball Bearings are built so as to fit any hanger frame.
They reduce power costs 15% to 40%.
They are entirely drip proof.
They are dust and dirt proof.
Require lubrication once a year.
They increase production.

Send for Catalog No. 3-B and Proof

The Chapman Double Ball Bearing Co., Limited

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408 Shaughnessy Bldg., Montreal, Que.

The Transmission Ball Bearing Co., Inc.
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HIGH Grade **Steel Castings** of every description. Put our quality and service to the test and you'll be convinced that we offer the best.

Machinery Steel Castings

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Wearing parts for Gyratory Crushers, Dredger Pins and Bushes, etc., etc.

All Alloy Steel Castings.

Write for prices and particulars.

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FOR SMELTING FERRO ALLOYS AND REFINING STEEL

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WELLAND, ONTARIO

-And I Always Thought That Was A Good Tractor-

Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't en for that defective part, defective because it as improperly heat-treated.

makes no difference whether you manufacture actors or other machines or machine parts, unss you have the **right** heat-treating furnace the putation of your product is in constant jeopardy.

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GILBERT & BARKER
Heat-Treating Furnaces

sure uniform high quality of produce because ey are designed right and built right. The mbustion in a G. & B. Furnace is 100% effient, temperature control is one of the big feares, the heat is uniform **always**, the result is finished product of maximum tensile strength hich will stand up under the hardest usage.

ne operating cost of G. & B. Furnaces is exemely low.

nd for Bulletin 24. Let our Engineers suggest e furnace that is best suited to your requireents. .

o-day is a better day than to-morrow—write.

Gilbert & Barker Mfg. Co.

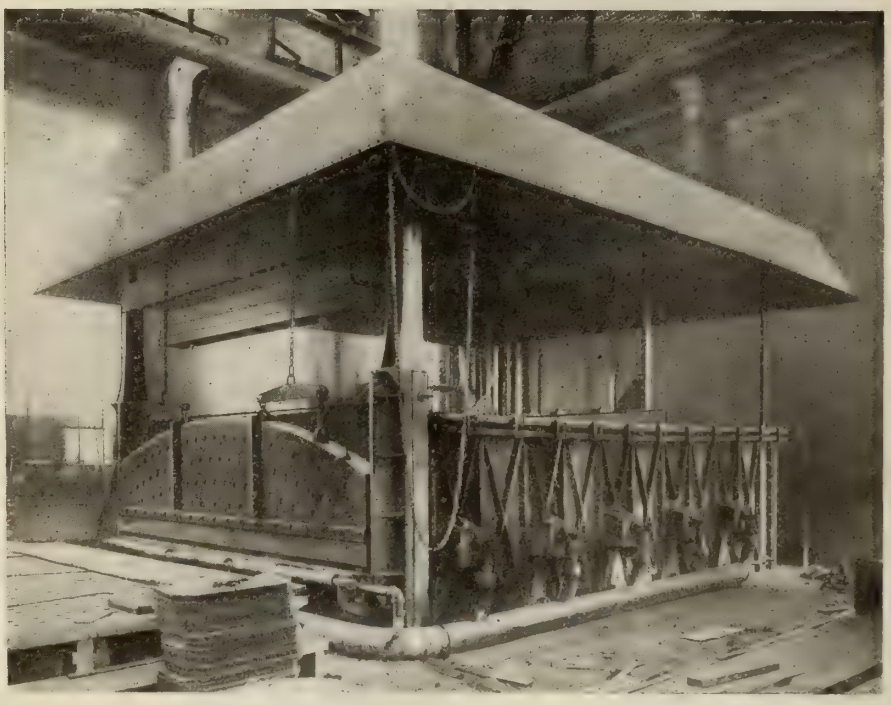
Established 1865

SPRINGFIELD, MASS., U.S.A.

New York Office: 26 Broadway

Canadian Agents:

Williams & Wilson, Limited, Montreal, Que.



Any Size

Illustration shows a Plate Heating Furnace installed in the plant of Canadian Vickers Ltd., Montreal.

Your proposition, if out of the ordinary, would be bettered by our co-operation. Get in touch with us.

Mechanical Engineering Co., Ltd.

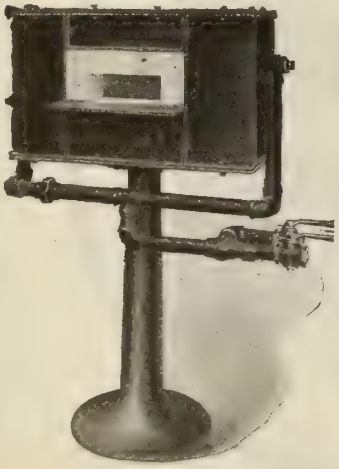
Room 308, Bank of Toronto Bldg., Montreal

Three Rivers, Que., Canada

STANDARD FURNACES

OIL or GAS

Prompt delivery on all tool room types



Cutting Tool Furnace

For

Annealing
Carbonizing
Hardening
High Speed Steel
Lead and Salt
Oil Tempering
Forging
Riveting

Furnaces built for special requirements

STANDARD FUEL ENGINEERING CO.
1646 Woodward Ave.
Detroit, Mich.

STANDARD FUEL ENGINEERING CO. DETROIT, MICH.

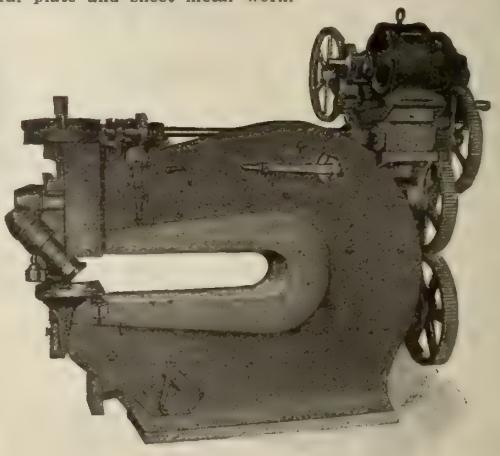
1

H. COLLIER SMITH
"QUICKWORK"
Registered U.S. Patent Office

ROTARY SHEARS

Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing

Write for Catalogue

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.

Power Press Bargains

Partial Selection from our Big Stock:

3—Used FERRACUTE D-201 Vertical Double-geared Straight-sided Single-action Redrawing Presses, having capacity for exerting pressure of 200 tons. Length of stroke, 10″. Distance between columns, 32″.

1—Used FERRACUTE D-151 Vertical Double-geared Straight-sided Single-action Redrawing Press, exerting 150 tons pressure. Length of stroke, 13″. Width between columns, 32″.

6—Used FERRACUTE DGG-56 Vertical Double-Geared Straight-sided Single-action Redrawing Presses; 5 of these presses have 18″ length of stroke and 1 has 20″ length of stroke. Distance between uprights, 30″.

7—Used FERRACUTE DGG-56 Vertical Double-Geared Straight-sided Single-action Redrawing Presses, exerting 100 tons pressure; 6 of these presses have 15″ length of stroke and 1 has 12″ length of stroke. Distance between housing, 30″.

6—Used FERRACUTE DGG-55 Vertical Double-geared Straight-sided Single-action Redrawing Presses, exerting 75 tons pressure. Three of these presses have 15″ length of stroke and three have 18″ length of stroke. Distance between housing, 26″.

1—Used FERRACUTE C-5 Open-back Inclinable Cutting Press, Direct Belt Drive., that is, not geared, having capacity for exerting about 50 tons pressure. Length of stroke 2″. Distance from centre of ram back to frame, 12″. Width of opening through back, 18½″. Height of opening through back 7½″.

3—Used FERRACUTE PAG-4 Geared Adjustable Bed Punching Presses, having capacity for exerting 50 tons pressure. Length of stroke, 2″. Distance from centre of ram back to frame, 8½″.

3—Used FERRACUTE PA-3 Adjustable-bed Punch Presses, not geared, having capacity for exerting about 35 tons pressure. Length of stroke, 2″. Distance from centre of ram back to frame, 7″.

1—Used BROWN-BOGGS No. 215 Inclinable Power Press. This is a geared press. Arranged with 24″ x 6″ pulley. Distance back from centre of slide, 9½″. Distance from bed to slide, when up, 13¾″. Width between gibs, 11⅞″. Length of stroke, 4″.

7—Used FERRACUTE D-45 Horizontal Double-end-Screw Press designed for deepening or redrawing sheet metal tubes and shells about 3″ diameter and 18″ deep. Capacity for exerting 100 tons pressure. Three of these presses have length of stroke of 36″ and 4 have length of stroke of 40″. Diameter of ram screw, 6½″. Diameter of side rods, 5″.

2—Used E. W. BLISS No. 60½ Vertical Geared Rack-driven Presses. Length of stroke, 36″.

3—Used FERRACUTE E-57 Vertical Geared Toggle Coining Presses. Length of stroke, 3″.

5—FERRACUTE E-56, Vertical Geared Toggle Coining Presses. Two of these machines have 3″ length of stroke and 3 of them have 2″ length of stroke.

4—Used No. 666 Vertical Geared Toggle Presses, manufactured by the TOLEDO MACHINE & TOOL COMPANY. Having 2¼″ length of stroke and capacity for exerting 1,000 tons pressure on ram.

NOTE:—The above presses were all operating on manufacture of Cartridge Cases when work stopped about nine months ago. They were purchased new from manufacturers from February, 1915, to September, 1915, and have had about two years' service. They were not used continually since being purchased. Some have been repaired and all have been kept in good running order—Examination can be made in Montreal.

TERMS:—25% with order balance against Bill of Lading.

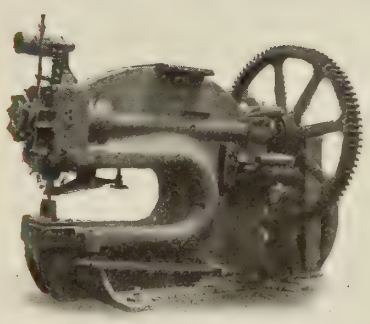
NOTE:—If these presses were to be shipped back to the United States there would be no duty to be paid—You would only require to add freight from Montreal to destination (except Brown-Boggs Press).

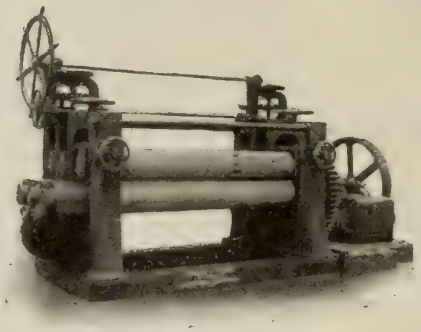
WILLIAMS & WILSON, LIMITED

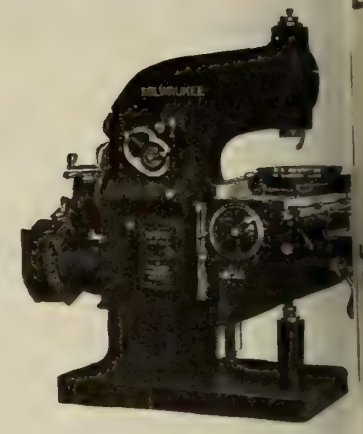
Cable Address "Willwills" Montreal, P.Q. Established 1891

84 INSPECTOR STREET

Where the Best in Machine







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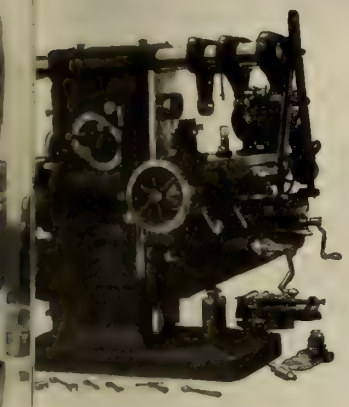

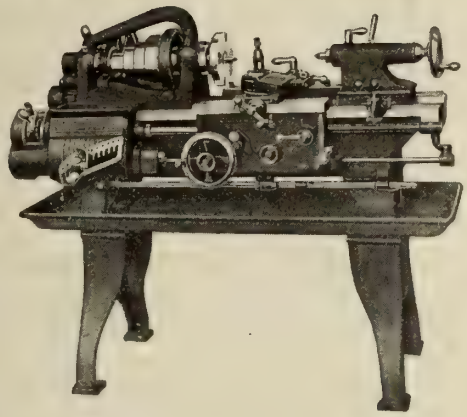

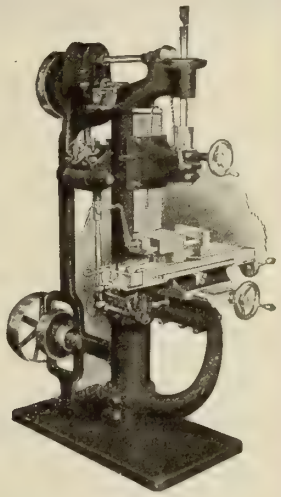

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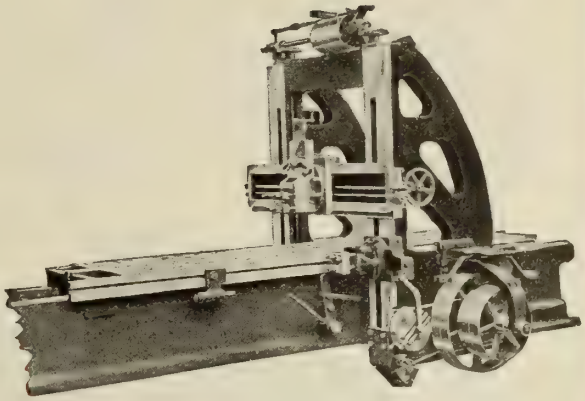
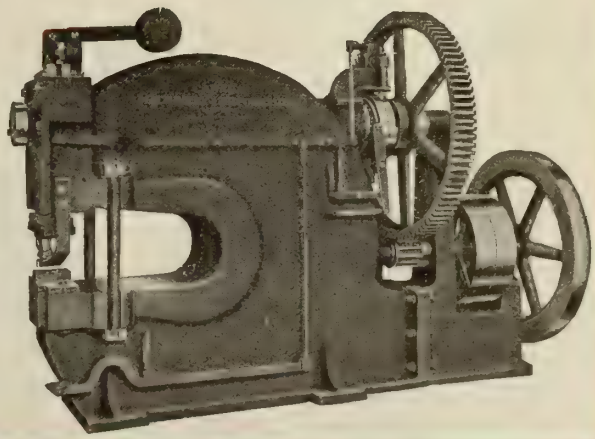
...p notch service and quality is a reputation ...as good for business.

...UR NEW BUILDING ...t 34 Inspector Street, Montreal

...ains a large stock of high quality, ...ible machine tools from which we can ...e immediate shipment.



Write us about any tool or tools in which you are interested and we'll gladly quote prices and deliveries.



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Absolute Satisfaction Guaranteed

...WILSON LIMITED ...P.Q. Established 1891

MACHINERY WILLIAMS & WILSON LIMITED MONTREAL

Used and New Machinery

Partial Selection From Our Big Stock:

PUMPS

One used 2" Downie Model A centrifugal pump.

Two size 5 Gould's centrifugal pump.

One size 2 Gould's direct motor driver centrifugal pump.

Two new Hydraulic Machinery Co. 4½" x 14" vertical hyd. pump.

One 6 x 4 x 6 Epping-Carpenter Duplex Steam Pump.

AIR COMPRESSORS

One 6 x 6 Nagle vertical air compressor.

One Canadian Ingersoll-Rand type R.P. 2, 29 x 12 x 16; 920 c.f.m. at 100 lbs. All in fine condition.

One used Jenkes Machine Co. class C B Air Compressor, size 10 x 10; capacity 190 c.f.m. Complete with unloading device.

One used Ingersoll-Rand class EL-1 Air Compressor, size 10 x 12; capacity 233 c.f.m. Complete with unloader. Practically new.

Two used Ingersoll-Rand 10 x 12 class E L-1 Air Compressors; capacity 275 to 290 c.f.m. at 100 lbs; 220 r.p.m. Complete with air receivers. All in fine condition.

One Canadian Ingersoll-Rand class P L B-2. Size 20 x 20 x 16; speed 225 r.p.m.; 1508 c.f.m.; 300 H.P. motor at 600 r.p.m. Motor pulley 31½".

ENGINE LATHES

Two used 26 x 10 C.M.C. quick change gear, 3 step cone, double backed gear.

Three 24 x 12 Whitcomb Blaisdell, practically new, quick change engine lathe. Four step cone, double backed gear, 4" belt.

One 22 x 10 Milwaukee engine lathe, three step cone, double back geared.

One 20 x 8' 6" Petrie heavy duty plain turning lathe, equal to new.

Three 20 x 8 C.M.C. standard engine lathe, three step cone, double back geared, in good condition, each lathe fitted with four jaw independent 14" chuck.

One new 18 x 8 Stevens standard engine lathe.

One used 18 x 8 Stevens standard engine lathe.

One used 18 x 8 Greaves-Klausman standard double back geared engine lathe.

One used 18 x 8 Mueller quick change gear engine lathe.

One used 18 x 8 Cincinnati quick change gear, three step cone, back geared engine lathe.

Two used 17 x 8 Sydney, very heavy duty, standard double back gear, in good shape and very heavy pattern.

One used 18 x 8 Milwaukee standard single back geared, having 12" independent chuck, in good condition.

One used 18 x 8 Milwaukee standard single back geared, having 12" independent chuck, and with taper attachment.

One used Hamilton 16 x 8 standard single back geared, type B, with 10" independent chuck fitted, in fine condition.

One old 16 x 8 McGregor-Gourlay engine lathe, good for someone wanting very cheap lathe.

One used 16 x 7 Hendey lathe, mounted in oil pan and with bracket for taper attachment, complete with regular equipment.

One 14 x 8 ft. Hendey used engine lathe; good condition.

TURRET LATHES

One used No. 6 Foster, geared friction head turret screw machine.

One used 24" Gisholt turret lathe, with taper attachment. Hole through spindle 4¼ inches, three step cone for 4 inch belt, chuck 24" diameter. Four square turret tool post.

Two 1⅝ x 7 New Britain six spindle automatic screw machines.

Ten No. 33 New Britain multiple spindle automatic chucking machines, equal to new.

DRILLING MACHINES.

One used 4' Bertram plain radial drilling machine, thoroughly overhauled and refitted.

One new 26" Aurora heavy type upright drilling machine.

Three new 20" C.M.C. upright drills.

Twenty used Henry and Wright No. A, class "B" ball-bearing sensitive drills. 15" swing.

100 Avey No. ½ single spindle ball bearing bench drills.

50 Avey No. ½ double spindle ball bearing bench drills.

Four used Leland and Gifford heavy duty ball bearing 14" two spindle sensitive drilling machines.

MILLING MACHINES

One new No. 3 Ford-Smith plain miller, 34 x 10 x 20.

One new No. 2 Ford-Smith full universal miller, 25 x 8 x 17.

One new No. 2 Ford-Smith plain miller, 24 x 7½ x 19.

One new No. 1 Dow plain miller, 24 x 7 x 18, all complete.

One used No. 1½ Rockford plain miller, having vertical milling attachment, also slotting attachment and universal dividing head in splendid condition.

Five used No 7 Becker Lincoln millers, with cabinet leg and oil pump, especially suited for key way cutting and manufacturing.

Six used No. 12 Pratt and Whitney Lincoln millers.

One used No. 1B Milwaukee universal miller, good condition.

GRINDING MACHINES

One used No. 2 Reid Bros. automatic surface grinder, complete with magnetic chuck, all in fine condition.

One used No. 3 Brown and Sharpe 12 x 40, universal grinder.

One used No. 70 Heald internal grinder, with type No. 7, style No. 1 head.

One used No. 1 Diamond automatic surface grinder. Range 24 x 12 x 9, with magnetic chuck.

One used No. 3 Wilmarth and Morman automatic surface grinder, with No. SF 8 x 20 D. and W. Fuse Co. magnetic chuck.

One ..o. 2 Brown and Sharpe used surface grinder, good condition.

One Landis used 10 x 30 plain grinder, good condition.

POWER PRESSES

Six used No. 18 Bliss fly wheel presses.

One used No. 73½ Bliss straight sided trimming press, fly wheel type, with side cutting off attachment.

One used 90-lb. Waterbury Farrell drop hammer, complete with power lifter counter shaft.

One used 120-lb. Waterbury Farrell drop hammer, complete with power lifter counter shaft.

One No. 4-A Styles adjustable bed power press, 4" stroke.

Two No. 8½ Zeh and Hahnemann patent percussion presses.

Two No. 10 Zeh and Hahnemann patent percussion presses.

Two No. 12 Zeh and Hahnemann patent percussion presses.

MISCELLANEOUS

Three 1" National triple head bolt cutters, capacity for threading ¼ to 1 inch diameter.

One 1½" National triple head bolt cutter, capacity up to 1½".

One Acme six spindle nut tapper, capacity ⅜ to 1 inch.

One 1¼ inch National semi-automatic nut burring machine, for burring all sizes from ⅝ to 1¼ inch.

One No. 1 Lapointe Brooching Machine, used, good condition.

One No. 3 Lapointe Brooching Machine, used, good condition.

FURNACES

Six Monarch No. 275 tilting crucible furnaces, in fine shape.

WILLIAMS & WILSON, LIMITED

Cable Address "Willwills" Montreal, P.Q. Established 1891

84 INSPECTOR STREET

STEEL PLATE CONSTRUCTION

We Design and Build

FOR

Oil Refineries
Oil Distributing Stations
Pulp and Paper Mills
Sugar Refineries
Packing Houses
Soap Works
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Cyanide Installations
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Blow-off Tanks
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Heavy and Light Steel Plate Work
erected anywhere.

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THE
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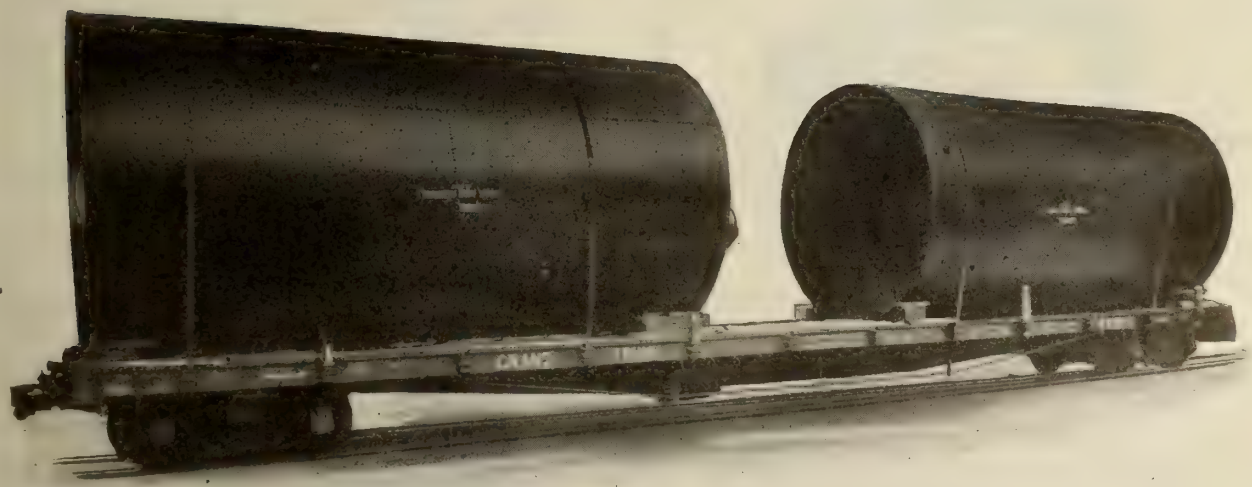
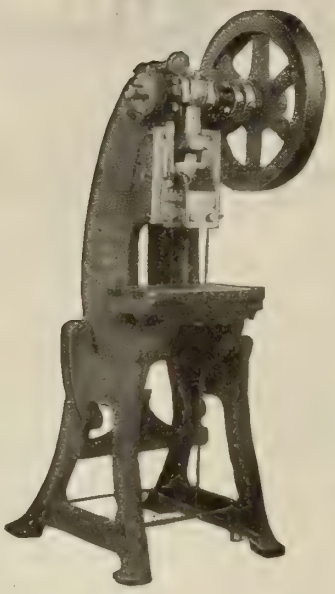
HEAD OFFICE: ROYAL BANK BLDG. TORONTO WORKS: CHERRY STREET



CONSOLIDATED

All the energy of America's most modern machine shop and foundry is concentrated upon one product.

CONSOLIDATED POWER PRESSES



CONSOLIDATED PRESS CO.

HASTINGS - MICHIGAN

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CONSOLIDATED

For trimming, stamping forging, punching, embossing.

Special presses are designed where the customer's requirements are unusual.

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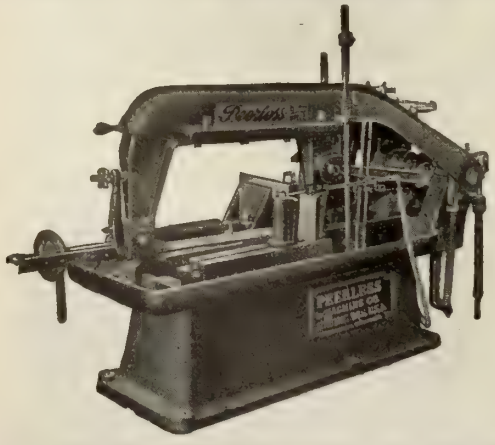
Peerless HIGH SPEED

Has Proven Its Efficiency Where Others Have Failed



DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN

Perfect Riveting

Send for "Perfect Riveting"

Provided its cost is the lowest possible, riveting so well done that it can't be improved upon, is perfect riveting.

Boys on Grant Riveters accomplish two and three times as much perfect riveting as an equal number of men using ordinary machines.

With the

GRANT

ROTARY VIBRATING RIVETER

rivets placed close up to the shoulder of the work are as rapidly spun, perfectly smooth as are rivets in easy-to-reach spots.

The Grant Mfg. and Machine Company

Holland Ave.

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KELLY "HOGS"

For Rough Boring Cylinders

HEAD WITH KEYWAY MOUNTED ON SPINDLE FOR THREADED SPINDLE

THE KELLY PRODUCTION KIND

Some of its Features:

RIGIDITY—Blades imbedded in a Steel Body, withstanding Cutting Strains.

ADJUSTMENT—Almost 1½" adjustment to every Head.

STANDARDIZING—Kelly Standard Dove-tailed High-Speed Blades used.

SAVING—Short Blades used, eliminating High-Speed Steel Expense.

FEEDING—Feeds six times that of a single Point Tool.

SERVICE—Repair Parts shipped on a moment's notice.

SATISFACTION—Repeat orders from Satisfied Customers.

PROMPT DELIVERIES -- *SEND FOR CATALOG J-4*

THE KELLY REAMER CO.

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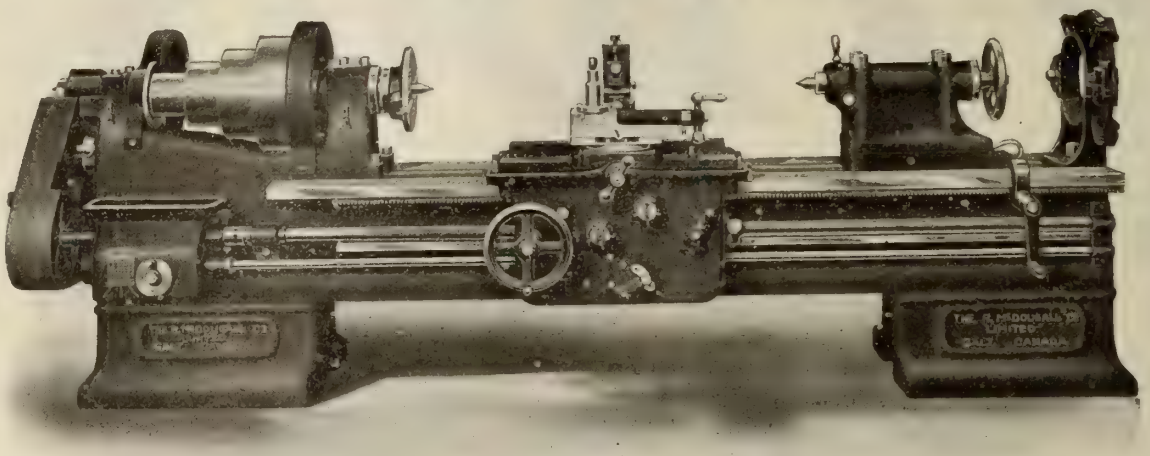
Every part of our Gap Lathes bears the "earmarks" of expert workmanship.

McDOUGALL GAP LATHES

And every feature is proof of our aim to produce a machine of unusual merit.



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Making Production Men Sit Up and Take Notice

You can't judge a tool by an occasional fine performance. But no production man can ignore the long series of extrardinary service records made by

DAVIDSONIZED High Speed Steel Tools

Here's another rhcent performance, stripped to the naked facts (name of plant on request):

Clevis Milling Job. Four side-milling cutters on arbor, each 6 in. x ½ in. x 1 in. Material: High Manganese Carbon Steel, forged stock. Standard production speed, 150 pieces per 8 hour day. Best previous tool performance: 800 to a grinding.

In the competitive tests, the two outer cutters on the arbor were Davidsonized Tools, and the two inner ones of a well known standard make.

One of the inner cutters had to be taken off after 726 pieces; the second did 750. *After these* 1476 *pieces,* at which point the test was discontinued, *both Davidsonized Cutters were still in practically as good condition as at the start.*

Apply this comparison to some jobs of your own and see what it would mean to you in terms of your own costs. Figure not only getting out the same work with one-half the number of grinders, but the saving in the overhead and labor items through reduction of take-down and setting-up time. Then write us for further particulars, or say when our representative may call.

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Main Office: 118-122 Maiden Lane, New York
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In Canada—The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Winnipeg.
In Scandinavia—Aktiebolaget A. Bonthron Stockholm, Sweden.

Special Service

To Concerns Who Make Their Own Tools

We will supply Davidsonized High Speed Steel Blanks, semi-finished to within approximately .015 to .020, either soft annealed or hardened.

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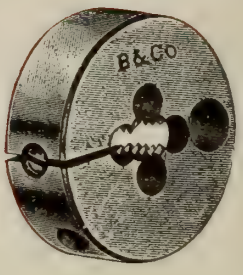

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Taps, Dies ar

Invest in Butterfield Quality—it will pay you big dividends **in service.**

Butterfield Tools take heavy cuts with an ease and speed that make the best of material look soft.

Tools That Retain Their Keen Edges After Long Usage

Butterfield & Co., Inc.

Toronto Office

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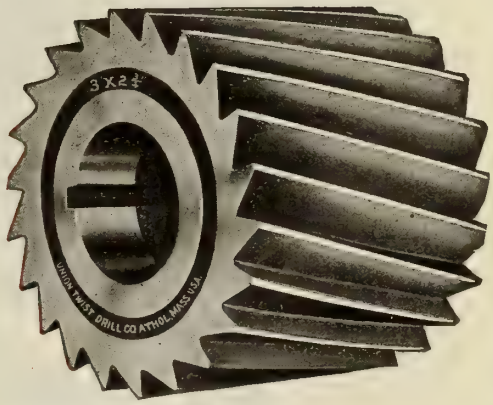

Reamers
Milling Cutters

The condition of the Butterfield line after long usage will convince you that it's made of unusually good material by men who know how.

Let us make you acquainted with it now by sending a trial order.

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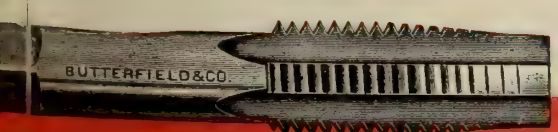

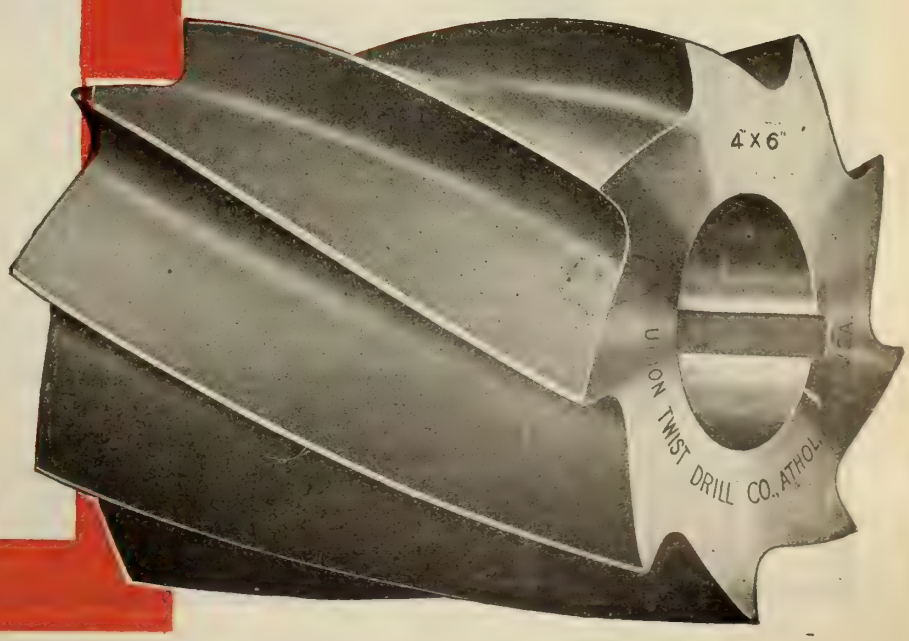

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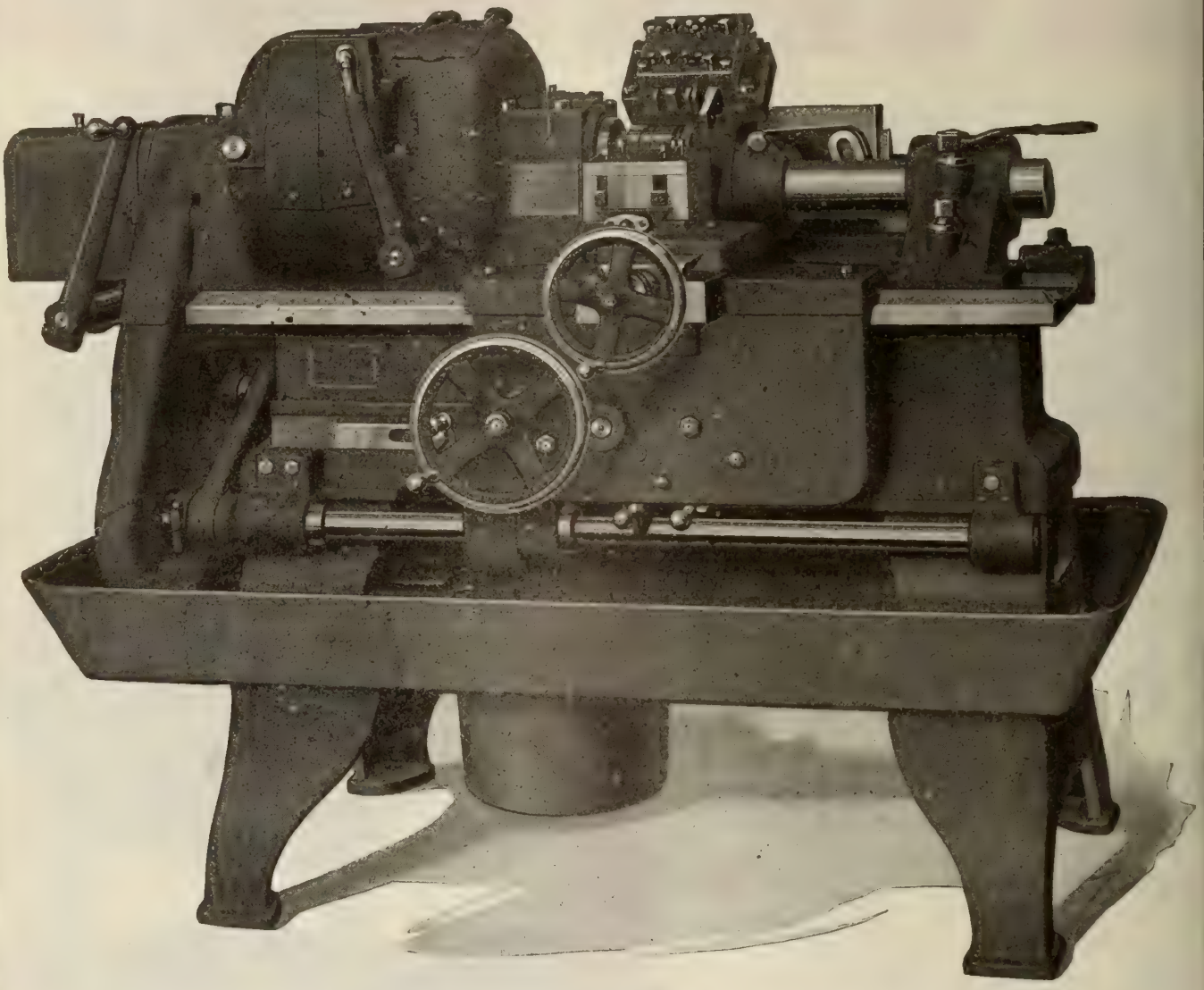

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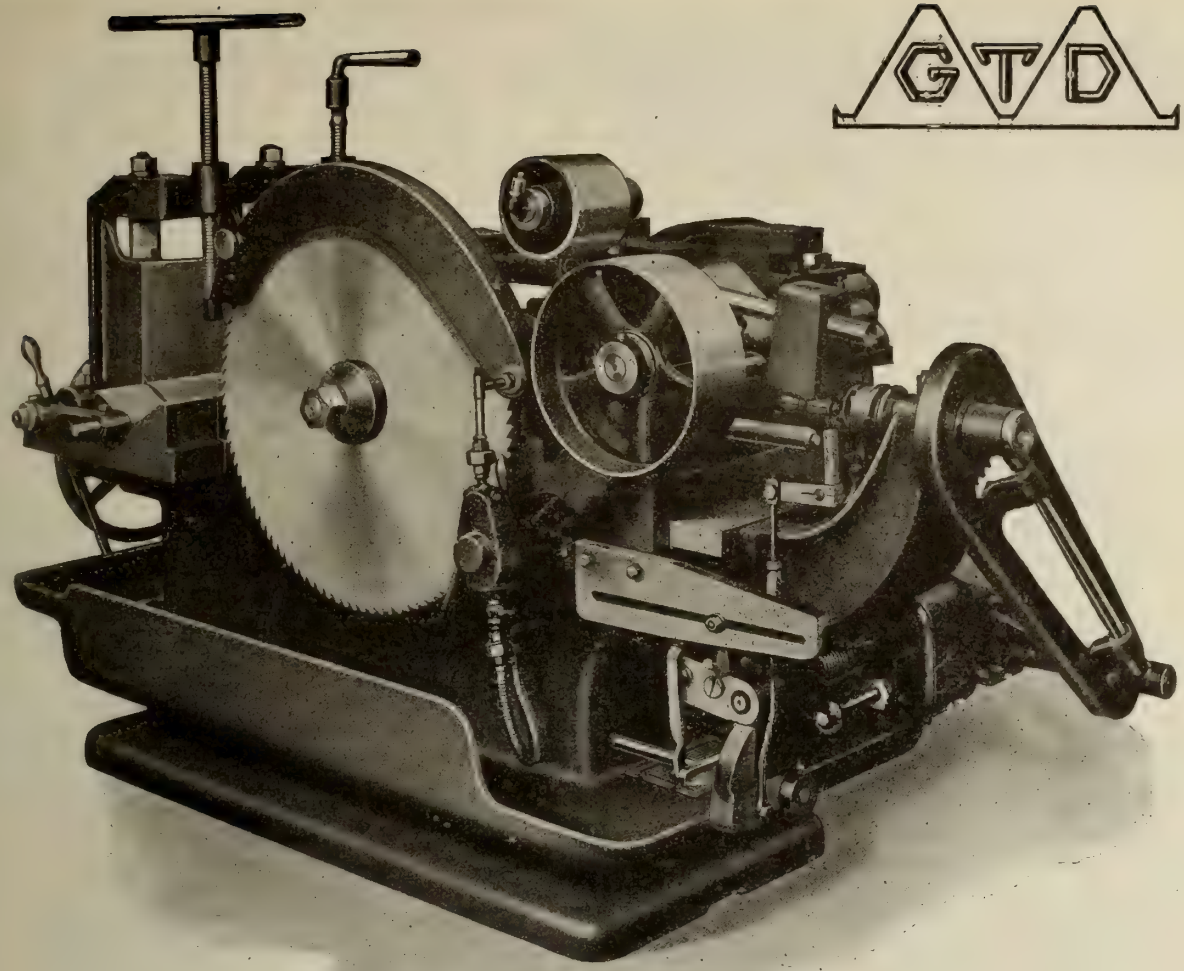

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Notes On Grinding
NORTON COMPANY. WORCESTER, MASS.

No. 66A

Crystolon Wheels for Snagging Brass and Bronze Castings

The physical properties of brasses and bronzes vary as do those of steel. An understanding of the effect of different metals on these properties is of interest and importance to those who are called upon to recommend grinding wheels for snagging castings made of brass or bronze.

Brass is an alloy of copper and zinc in varying proportions from 40 to 90% copper and for special uses other metals are added in small amounts. The tensile strength of copper is 26,000 pounds. This tensile strength is increased to 45,000 by the addition of 30% of zinc to the copper. As the alloy is changed to 50% of each, the tensile strength drops to 1,000 pounds. Since tensile strength is the property that resists the removal of material, a change in this property will, of course, affect the grade of the wheel necessary. With other factors remaining the same, the higher tensile strength will call for a harder wheel on snagging operations with sharp contacts and perhaps a softer wheel on snagging, broad contact, and on precision grinding.

Adding lead up to 3% makes a softer, weaker material which will be more apt to load a wheel and call for a structure that will break down more readily. A treated wheel should be tried on this material, if untreated wheels do not prove satisfactory. The filling used in a treated wheel becomes fluid during grinding and lubricates the cutting grain at exactly the point of contact.

Tin and manganese give a harder brass and may make the use of a harder wheel advisable for sharp contact and a softer wheel for broad contact.

Iron to the extent of 1 to 2% increases the tensile strength to 80,000 pounds and gives an iron that produces a very sound, uniform casting. Owing to this high tensile strength an alundum wheel may be found more efficient than Crystolon, as the latter, being brittle, may break down too fast to give best results.

Bronze is very similar to brass. Phosphorus, aluminum and manganese with copper produce bronzes that have a high tensile strength, higher in some cases than 20 point carbon open hearth steel. This may also be an Alundum proposition.

A fairly large number of different grains and grades have been successfully used. This large variation is due to kind of material, condition of machines, speed of wheels, operator, size of castings, condition of castings as they come from the foundry, and many other factors.

Crystolon wheels 24 grade Q and 30 grade P are more often tried and more often successful than the others. We would recommend these two wheels for trial first, unless some local conditions made the trial of some harder or softer wheel advisable.

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B. Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

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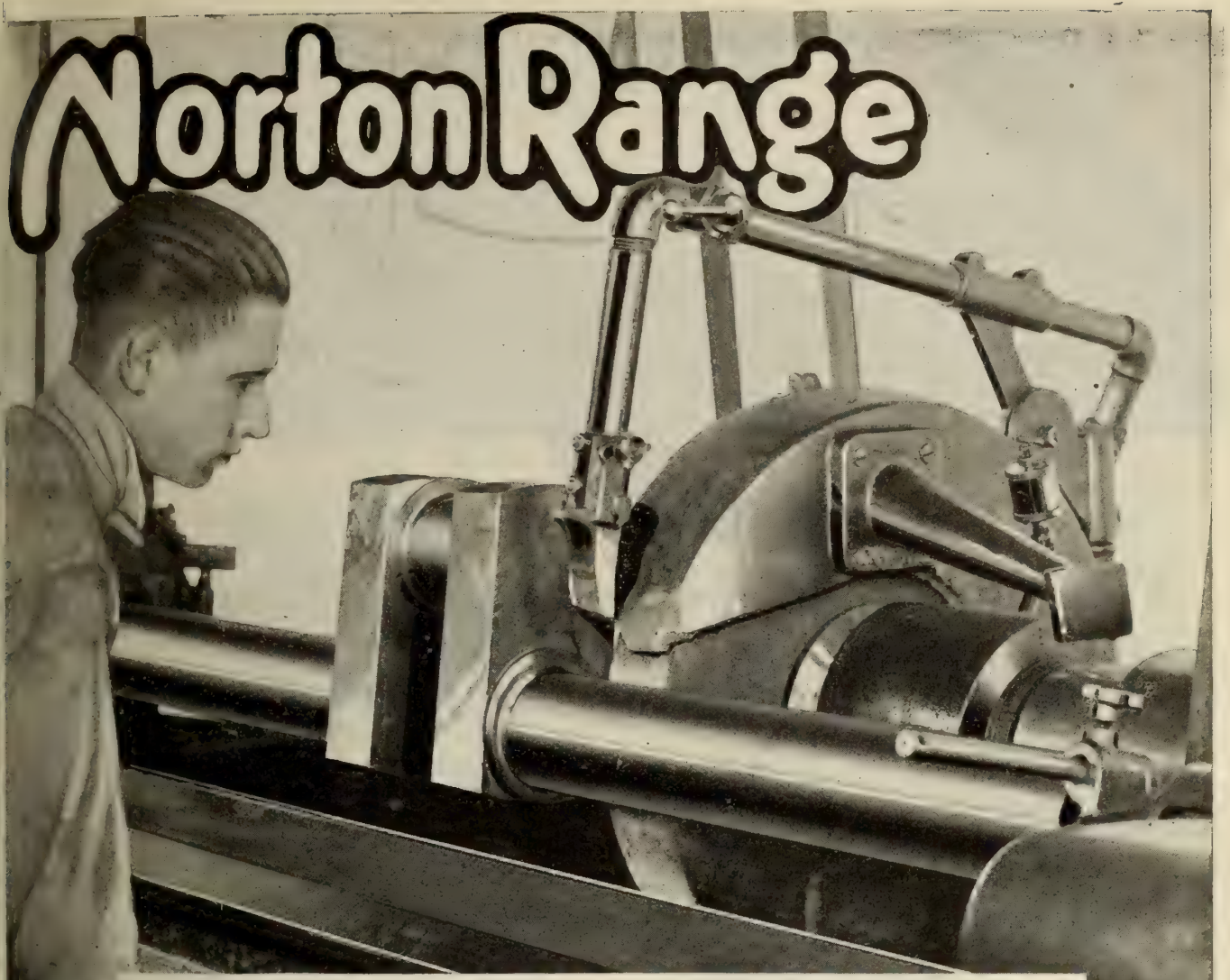

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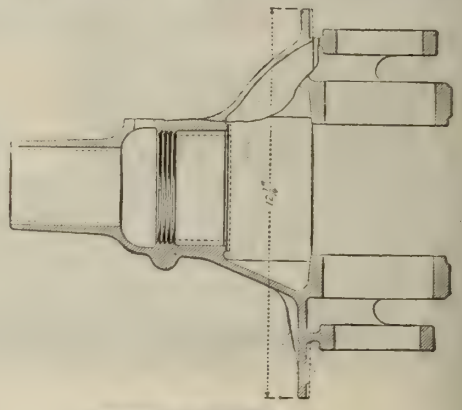

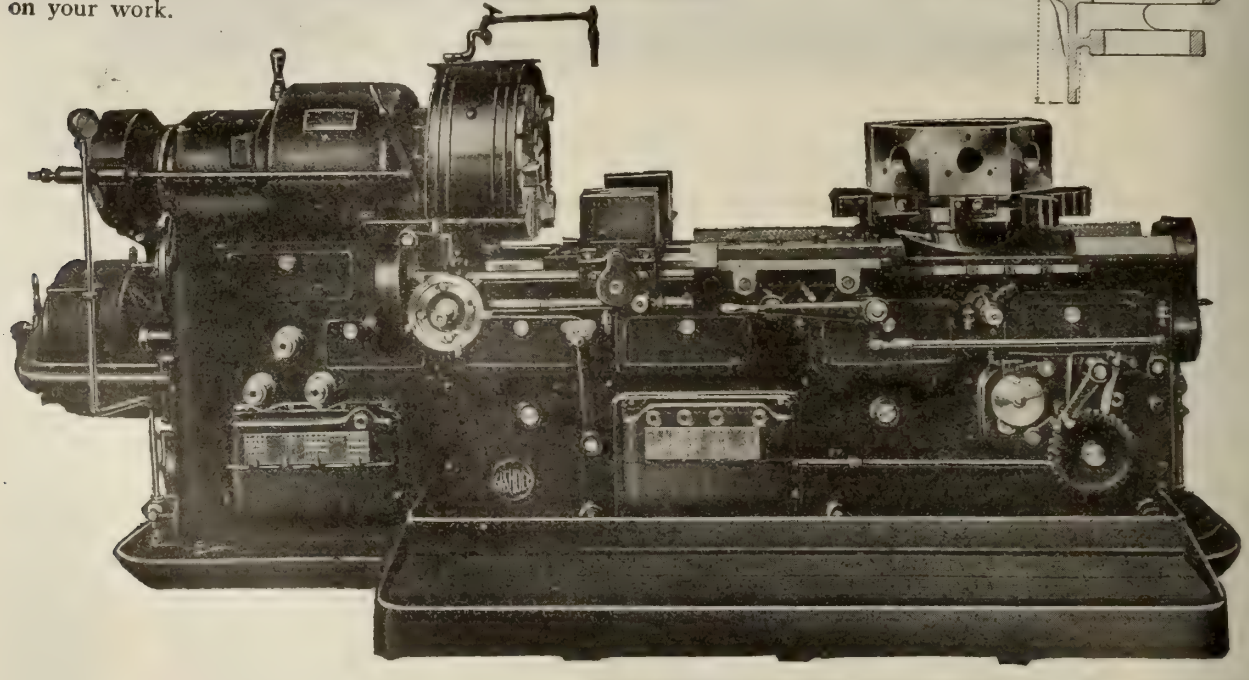

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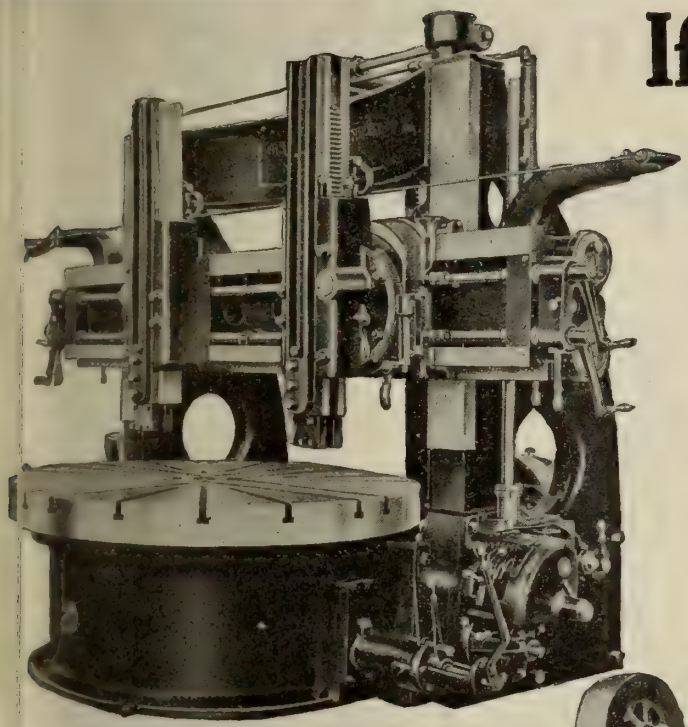

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A trip through the Gisholt works is our best exhibit. It is impossible to view our facilities and study our engineering methods without becoming convinced that these factors are working for you.

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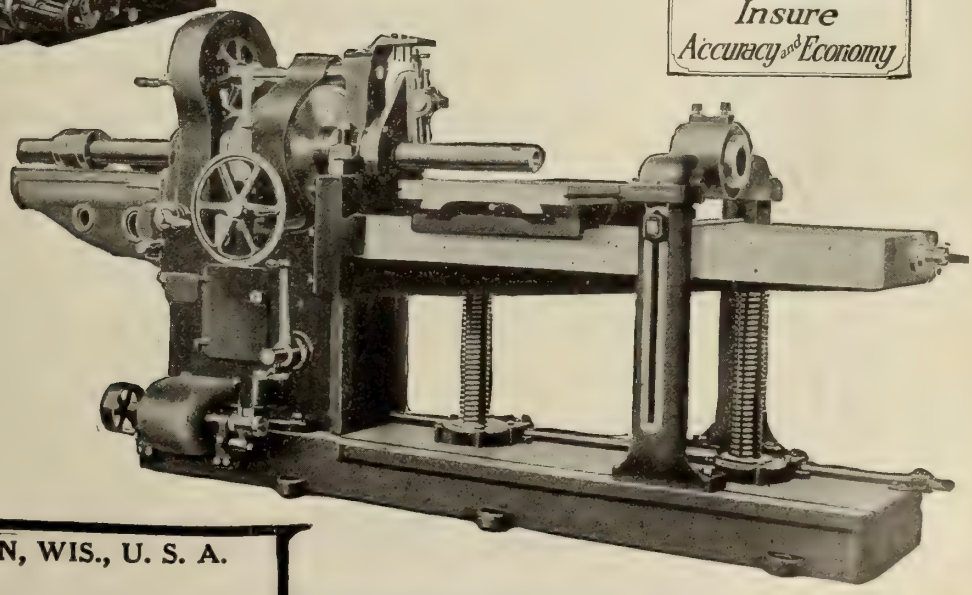

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 5 Toronto, July 31, 1919.

Do You Know Any of These Three Chaps?

HE occupied a fairly large place in the community. He was a manufacturer in a good way, and what he had to say about conditions generally carried some weight. In fact what HE SAID had quite a bit to do with what the community believed.

On this particular day this HE SAID individual stood on the corner just before parting company with the bank manager.

Of course the banker wanted to know his ideas about credits and the outlook in general. It was not possible to hear all that HE SAID, but such words as strikes, no output, hard winter, failures, high costs, were easy to hear. In fact, a person would not need to be an eavesdropper at all to get a whole earfull of real honest-to-goodness blue-ruin talk.

The banker went his way and HE SAID went his. Just as the banker was about to enter his office he met the man who used to attend to the furnaces in winter. Instead of saying, "Good morning, Joe," he stopped and asked Joe how things were going with him. "Fine," replied Joe as a starter. "Working every day at bigger pay than I ever hoped to get. My boy got back from France three months ago and he's working in the same shop. If you want to know how we're doing just take a glance at my savings account. It's right in your own bank here," and Joe was off with a smile.

And quite unconsciously Joe, the former furnace man, had put the axe into the burdock bush that HE SAID had planted in the mind of the banker.

Now as a matter of fact HE SAID was only a very ordinary individual.

Any croaker who decorates a sugar barrel in the old corner grocery could have handed out just as fine a line of headed-for-the-bow-wows talk. It does not require brains—it does not require courage, nor vision, nor executive capacity. Simply a wagging tongue and a bit of an audience—the rest is easy.

Nothing more was needed than that the tongue should wag and the audience not ask any pertinent questions that would confuse the wagger.

HE SAID lives in a good many Canadian centres. He is telling that coal is going to be very high this winter; that there will be an awful lot of people out looking for work; that building is almost at a standstill; that costs are high; that there is industrial unrest; that buying is from hand-to-mouth, and that our money is at a stiff discount in the United States markets.

Unfortunately there is no legal way of dealing with HE SAID. Certain animals can be muzzled during the hot days of August, but there is no muzzle for HE SAID. He is at liberty to go his way, throwing out doubt here and fear some place else.

The antidote lies in Joe, the former furnace man—Joe, the apostle of good news—Joe, the chap who knows enough to stay everlastingly at the harvest while the cutting is good.

If Joe gets along to boot HE SAID out of his job, he will buttonhole the banker and say that in spite of strikes, reported crop shortage, high costs, and all these things, that retail buying is heavy and payments good—that the world is short of scores of lines that must be grown or manufactured—that many big buildings must be gone on with very shortly—that failures of responsible firms are almost unknown—that Bolshevism has got a black eye—that the costs of the rest of the world are just as high or higher than ours.

Yes, Joe, the former furnace man, would have given the banker a real vision. He would have jumped into his mental horizon and shoved it back a couple of miles. The chances are that Joe would put more blue sky and sunshine into the banker's ideas than could have been hatched under any other circumstances.

Now, this is not visionary. HE SAID, Joe and the banker are real people, and they have been discussing real Canadian conditions.

They represent three conditions and classes in Canadian business. Sift them out and see where you fit in.

The *"Our Company"* Idea In the Establishment

Aiming to Create a Wholesome Atmosphere Where Strikes Are Unknown and Not Wanted—Some Ideas That Are Bringing Results and Which Are Well Worth Passing On to Others

By A. R. KENNEDY, Editor Canadian Machinery

Respectable Company:—

I send you heartful thanks for the flowers which were received on Saturday, and I am much better now.

I greet all those in the office and also Adam.

(Signed)

W. PANEK.

SUCH is the certificate of good character that one busy industrial concern in Hamilton prizes as highly as anything that has come its way. This particular certificate is not an embossed affair, neither is it framed, but it tells, in the heartfelt words of one of the foreign employees, just what the Benefit Club of the workers had done for him. His child had died, and the Club had seen to it that there was a decent funeral, with a generous showing of flowers. They had succeeded in making that poor lone foreigner know that they cared for him. The "Adam" mentioned, by the way, was the foreman.

Does this sort of work pay? Well, if you doubt it, a visit to the office and works of the Dominion Sheet Metal Corporation, in the industrial east end of Hamilton, will do considerable to iron out any skepticism that may linger in your system. The office is not far from the factory, and I mean that in more ways than one, both in distance and feeling and understanding. It was about 96 in the shade the day I was at the works, but there was ice water out in the factory just the same as in the office—in fact it didn't take long to "feel" that there wasn't much need of a strong organization in the works to see to it that the men got a square deal from the office. And there was a little notice posted up just outside the superintendent's office announcing that on a recent date the wages of all the men in the place would be advanced two cents an hour. No, there hadn't been a strike, not even a threat, nor yet a deputation from the men. Business warranted it, the men deserved it, and what more should be necessary?

Perhaps a Bit Modest

A. T. Enlow, the president and general manager of the company, is no theorist about conditions in the industrial world. He likes to turn on the steam and see how it works in reality.

But he has imperfections. From the standpoint of the interviewer he's too modest. He likes to soft pedal the stuff that would make a story stand right up. He seems to have a large-sized and very wholesome regard for the feelings of any of the men who have been helped a bit by the plans he has put into operation. We'll not use the word "schemes" in connection with anything that has been done at the Sheet Metal's plant, because there is nothing of the "scheme" idea about them. As far as I could judge there were straight, honest-to-goodness proposals, and there was "something in it" every time for the men in the shop.

Mr. Enlow probably has several reasons for the manner in which he conducts his business. One of them is that he likes to do it. Another is, so I was told by a friend of his, that in the beginning of his own career in business he was gouged pretty hard by the money-grabbing sort of employers, followed later by contact with big-hearted, noble-souled types and it aroused in him a determination, if the opportunity ever afforded, to employ the latter system. Then, too, and Mr. Enlow will admit this, he considers there is a large element of self-preservation in it, as far as the company is concerned. He is anxious to build up that greatest of all things, an organization from the office right through the factory that's working, and intends to keep on working for "our" company.

Not An Old Company

The Dominion Sheet Metal Corporation is not an old concern. It started to operate in 1915. The business is growing nicely, and a nice addition is planned for this year. Through all the time from the start to the present there has not been a man laid off, and the employees

PLANT OF THE DOMINION SHEET METAL CORPORATION, HAMILTON, AS IT WILL APPEAR WHEN THE ADDITION ACROSS THE FRONT IS COMPLETED THIS SEASON.

who hold stock have never been told that the dividend for the quarter or for the year has to be "passed."

To get at the thing right it might be well to start from the beginning. I'm not particularly interested here in the growth of the concern in a dollars and cents way, but more in tracing what can be found of the new feeling that must come more and more to the front in the industrial world. In 1916, it was decided to make a start with a five per cent. bonus to all who were in the employ of the firm on the 20th of December. Made a nice little Christmas present, and likely served as the corner stone for the many other things that followed.

1917.—The same five per cent. bonus was continued, and this time the staff were given an additional yearly bonus. The "Benefit Club" was also born this year, but the workings and particulars of this will be given later.

1918—Ten per cent. bonus to all; yearly bonus to staff; Benefit Club work enlarged; Garden Club and a tonnage bonus to the shop force.

1919—Staff bonus, tonnage bonus, the yearly per cent. will be paid, Benefit Club doing more and better work; stock offered to employees on very generous terms, and vacations for all with the time paid for by the company.

The Benefit Club Idea

Taking the name from the well-known brand of the shop, "Premier," the name of the Benefit Club is the "Premier." "All the employees put in fifty cents a month each," stated Mr. Enlow. "In fact it is no use having a benefit club if the men do not put some of their own money in. The company's share in the work comes from putting in the bonuses of the men who quit before the year is up. We simply take the yearly pay roll. We know what the total on that should be for bonuses, and we know what we have paid out. The difference goes to the Benefit Club. In 1917, we put in $780 and in 1918, $1,800. In this way the company does not gain in any way by an employee leaving."

At the outset plans were laid for quite an imposing set of rules and regulations. But then it was decided to try something simpler, and now, as far as I can gather, the rules and regulations state that the Premier Benefit Club exists for "social and beneficial purposes." Well that's pretty broad and pretty general. In fact it might be said that the sky's the limit as far as being confined in any one direction. But it works at any rate, and the letter quoted at the first of this article shows how the work is reaching home in a very certain and a very much appreciated way. This Premier Benefit Club does a number of things that it would be very hard to set down rules and regulations for. There are times, as in every other community, that the stork sees fit to visit the homes of some of the members. And after that call is over it is quite necessary and proper that a bit of a chariot be provided for the new arrival. Such cases have been attended to by the Premier Benefit Club. It would be mighty hard to draw up a set of rules which would cover such a happening, but without too many rules it is easy. Then again when a wedding takes place it is necessary—desirable at least—that something should be done. The committee thinks it over, and goes to it. When the "flu" came along there were, in the latter stages of the epidemic, several homes of employees invaded by the malady, and little ones were taken. There was nothing in the constitution either to hinder or suggest what action should be taken. But there was something better, the will to do the right thing. And so it was that on several occasions a good burial was made possible, and there was a nice showing of flowers, and nothing is more sacred, especially to the heart of the foreigner, than that a funeral from his house shall be conducted decently and in good order. There are a dozen more ways of looking after men than simply seeing that they draw a certain limited amount when they are sick, and the Premier Benefit Club is finding this out, and having a good time from it in the meantime.

The capacity of the galvanizing plant—for galvanizing is really the first and last work of the plant—is thirty tons per machine per day.

By careful planning and close application it is possible to shove the lid off that limit by quite a fair margin. So it was that early in 1918 a bonus was planned for the men engaged in the galvanizing operations. This worked well, but it was not broad enough. "All the men in the shop could not work on that particular operation," stated Mr. Enlow, "and so we recognized that they could all hinder or help the output. So we simply made the bonus applicable to the whole shop. As soon as the 30-ton output for the day has been reached we pay one cent per hour for each additional ton. That is, if the output for the day is 35 tons, the men in the shop get an extra five cents per hour for that day. I guess it averages about $10 per month to each man. And here is a little something," laughed Mr. Enlow, "that others may not have found out yet in the payment of bonuses. Put the bonus in a separate envelope. You know there are a good many married men in every shop, and good, well-trained chaps that they are, they like to present the pay envelope unbroken at the house. And they like to have this little bonus as something entirely their own. It is a good plan to keep the bonus separate. It takes only a little bit of work, the men want it that way, so that way it is around here."

Yearly Bonus to Staff

Depending on efficiency and service, there is a bonus paid to the staff, the exact figures of which, of course, are not for publication. I saw some of the figures though, and it is sufficient to say that they are large enough to earn the name of bonuses.

"You know," continued the president of the company, "it does not do to let a good man get away from you too easily. So we pay the bonus according to worth and service. We are starting now to pay quarterly instead of annually. We find that is far more popular with the men. It may amount to about the same in a year, but it comes four times as often and very often comes just when it is needed. For instance, a bonus payment coming due at this time of year is going to help quite a bit when a chap is considering what he and his wife and family are going to do about the holiday business."

Holidays For All Concerned

The company is adding another sprout to the tree this year in vacations for all. That is just what it means.

Several years ago, after the Sheet Metal Corporation got established in Hamilton, they bought a piece of land in the best hunting ground of Northern Ontario. A car was sent up in that direction with a goodly supply of their own material and a snug little cabin was set up in the woods. The superintendent was asked to keep an eye out during the season for the men in the plant who were doing good work. Well, along in the fall the list was made out and the lucky, but deserving dozen, were told to quit work and get ready. The company staked them to the grub pile. a chef, dogs, guide, guns and ammunition, and they set forth to shoot up the North for a couple of weeks in the hunting season. I haven't time here to tell just what the men say of this trip. But it was not only a good time for the dozen, it was the planting time for the general holiday seed.

"After these men had gone," remarked Mr. Enlow, "I thought it over again, and it occurred to me that they can't all be stars. There must always be the average man, just as deserving as the other chap who is perhaps a little more brilliant. So this year we are going on with the hunting expedition plan just the same, but we are going to give every person a week off with full pay."

Selling Stock to Employees

If the agreement between the company and the employees, presented below, is carefully read, it will be seen that there is an effort made to make it possible for the employee to get his stock paid for quickly by crediting him with the earnings of a like amount of common stock. He is really earning 14 per cent. on his stock during the period of payment. He is guaranteed eight per cent. after that, and a desire on the part of the company to protect itself against anything unseen that may happen in the future keeps it from putting in writing any further promises. The desire is there, and it would not be surprising if better than eight per cent. were done after the stock is paid up, although it must be admitted that there are mighty few eight per cent. propositions available at the present time.

Here is a copy of the application for preferred stock of the company. Just to show how it works out the blanks have been filled in as though the amount were five shares:

Applicants For Preferred Stock

June 28, 1919.

To Employees of Dominion Sheet Metal Corporation, Ltd.

Kindly note conditions of this issue and signify your consent to same by signing this agreement in duplicate, retaining one copy.

Your allotment is 5 shares.

The certificates will be dated June 1st, 1919, and carry regular 2 per cent. quarterly dividends from that date.

You agree to pay $10.00 each month beginning June, 1919, which payment is to be applied against total of $500.00 in purchase thereof.

In addition dividends of 2 per cent. will be credited as declared and paid by Dominion Sheet Metal Corporation, Ltd. No interest will be charged on unpaid balances under this agreement.

At the close of our fiscal years, November 30th, 1919 and 1920, you will receive credit to correspond to the annual rate of dividend paid on the same number of common shares of the Corporation's stock, and quarterly during 1921 at the quarterly rate paid on Corporation's Common Stock until final payment is made.

When final payment is made the stock will be delivered to you by Dominion Sheet Metal Corporation, Ltd., and thenceforth will carry regular quarterly dividends as paid on Corporation's Preferred Stock.

Prior to final payment, or on termination of your employment before final payment, you shall be entitled to transfer your interest to any other employee who will agree to pay balance on original terms, and who shall receive the same dividends and credits, or to sell stock to anyone not an employee provided said purchaser pays balance due to Dominion Sheet Metal Corporation in one payment forthwith, and who shall thereafter receive regular dividends as declared and paid on preferred stock.

It is agreed that Dominion Sheet Metal Corporation, Ltd., shall retain stock in their keeping until final payment.

The employees subscribed under this plan for one hundred and eighty shares, against which one hundred shares, par value $10,000, were allotted for the initial issue.

The Housing Problem

Eight of the company's sixty employees who were confirmed "tenants" bought houses during the past two years. There would undoubtedly have been more if the company's list of employees had been larger. But it is growing. Mr. Enlow can hardly hide the fact that he is just a little bit proud of the class of houses that his men are getting. He doesn't like the "housing" scheme in the ordinary sense of the word. I don't think he would like to have the employees of the Dominion Sheet Metal Corporation living in a row of houses all the same, with no front yards, and no back yards and no play ground but the street. "The average value of the eight houses of employees who went into the housing business this year was $4,400," stated Mr. Enlow. The company has no housing scheme, in the generally accepted meaning of the term, but I happen to know that Mr. Enlow makes it his business to find out how and where the men in the shop live. He has gone to more than half a dozen this year and advised them to buy. When that big problem of making the first payment so that there should be no second mortgage has come up the president has done the solving. These eight required an average of $560 to finance the start. They got what they needed. They went in and bought the house they wanted in the district they wanted. They didn't have to buy where the company wanted to build, nor did they have to locate across from the shop. The houses are pretty well distributed. Four of the eight don't owe Mr. Enlow any money now, and the other four are coming along splendidly with their monthly payments. There is no set policy for the company in this regard, but there's something quite a bit better, for here's what the president of the concern told me: "You can't have contented and happy conditions in a shop until you have your men living in good homes under good circumstances. The men don't live in the factory all the time, and a home life has a lot to do with the efficiency of the man."

And there are other things that go on around the plant at Hamilton, but they are not going to be printed in full here. But there is a good feeling in the office toward the factory, and there is a good feeling in the factory toward the office. That place is going to grow. If it doesn't then all the laws of right and wrong must be shot to pieces. There is a nice addition going on this year, right across the front of the premises. It is shown in the picture of the works in this article.

Out of it all Mr. Enlow is getting something bigger than dollars or dividends. I imagine that at times he has a pretty good session watching these plans work out, and I know that the letter from the foreigner, Panek, in which he addressed the concern as "Respectable Company," was remarkably well preserved.

"Any trouble in keeping our hands here? Not now, or even when the munition making was on," said Mr. Enlow in conclusion. "We feel that we are under a moral obligation to keep our men at work steadily. This plan of laying men off just as soon as work falls off a little is not right. It sets the worker back too far. It is the steady position with good conditions that will hold your men and secure results. When munition making was on we used to have foreigners right at our office door trying to take our men away to jobs where they promised them twice as much on piece work. Some went but they came back and we took them on, and they are still here. I would not say that all the things we try out are practicable all over, but they work here."

There's somewhat of a wholesome philosophy to the entire surroundings at the Dominion Sheet Metal Corporation. It's not bound up with red tape. I imagine that if any man in the plant had a complaint that could not be adjusted with the foreman or the superintendent, he wouldn't have much trouble getting a hearing with the president. The atmosphere is not there for breeding trouble. Although none of the company officials said so, it looks as though they had decided to go ahead and get something better rather than wait around for something worse to arrive.

Steel Mill Electric Drive

During the war many steel mills which had hitherto been steam-engine-driven substituted electric drive for all additions to existing plant. The fact that electrical equipment could be put in quickly and at smaller expense was responsible principally for this change. The electric drive has been fully justified, and the writer looks forwards to an increase in the electrical operation of the steel mills. A more common use of central-station power has been made during the war period in particular. It has been a factor in facilitating installations and also offers many advantages in reduction of first cost of plant, reduced cost of operation, and in permitting greater flexibility of plant layout for future improvements. More than 50 per cent. of the motor equipment installed during the last two years use central-station power and more than 60 per cent. are 60-cycle units. The tendency toward the adoption of 60-cycle apparatus as a standard is very marked. —Brent Wiley in the "Review," May 10, 1919.

Goldenrod not responsible for hay fever.—A protest has recently been raised against the time-honored project of adopting the goldenrod as the national flower of the United States, on the ground that this plant is a cause of hay fever and hence nothing ought to be done that would encourage it prevalence. A statement has now been issued by Dr. W. Scheppegrell, on behalf of the American Hay-fever Prevention Association, in defense of the goldenrod. It is asserted that while the pollen of the goldenrod may cause trouble when applied directly to the nostrils or used in large quantities for room decorations, as a cause of hay fever out of doors it is absolutely negligible. "It is one of our most beautiful flowers," says Dr. Scheppegrell, "and well merits its selection as the national flower of the United States."

The Arctic Night

Viewed solely as a matter of optics, the Arctic night is as dark as any night. Explorers in high latitudes say, however, that there are many alleviations of the obscurity. The stars flash keenly, the moon comes along in a regular succession of phases, the snow surface relieves the gloom under conditions of the utmost absence of light, and the aurora borealis is the finest kind of illuminant. Explorers all agree that their men pass the winter night without much difficulty if only there are means of amusement.

It is estimated that at the present rate of consumption the United States can make its coal deposits last till the year 2300. England claims their supply is sufficient for three hundreds, and still the coal goes up in price. However, we should worry, for while the price is high, we at least know coal will not flicker out before we shuffle off.

Sir Robert Borden, the Premier of Canada, in a statement dealing with the natural resources, of the Dominion, emphasizes the great source of potential energy in the form of water power. On the River St. Lawrence alone, between Lake Ontario and Montreal, he estimated that Canada has the opportunity of developing 2,500,000 h.p. The Premier's statement says in part: "This asset has already been considerably developed, especially in the Provinces of Ontario and Quebec. It lends itself to the development not only of manufacturing industries but of agriculture. Conducted to the rural districts by great distributing lines, it is employed on the farms in many useful services. The opportunity which it gives for industrial development is almost beyond imagination."

British Geological Society admits women members.—Another of the leading scientific societies of Great Britain, the Geological Society, has decided to admit women as fellows. This step has been considered by the society on three previous occasions, with negative results.

The Department of Agriculture has started a campaign against careless threshermen. It wants only "clean straw ricks" left of the greatest grain crop the nation has known, so the threshermen will be aided by the Government to develop efficiency and avoid loss in separating the wheat from the chaff. Records of the Department reveal startling losses of grain "through avoidable waste of the threshermen." Tests made in "just ordinary" crop years show that an average of from 25,000,000 to 27,000,000 bushels is thus thrown away.

—Darling in Detroit "News."

Preparing for the Deluge.

RECOGNIZING THE HUMAN SIDE OF INDUSTRY

Bridging the Gap Between Office and Shop is Worth a Great Effort.

By A. R. Kennedy.

One view of the First Food at Cost Cafeteria at Massey-Harris Plant, Toronto.

THE Massey-Harris Co. have considered a large number of plans for bringing the men in the shop closer to the management, and likewise the management closer to the men in the shop. A large number of plans were considered, and a large number were thrown aside. The plan now has settled down principally to two plans—(1) The industrial council and (2) the selling of stock at very advantageous terms to men in the works. The plans cover the works at Toronto and Brantford, also the associate companies, the Verity Plow Company at Brantford, and the Bain Wagon Company at Woodstock.

The Industrial Council

Mr. J. N. Shenstone, vice-president of the Massey-Harris Co., discussed the matter at some length with CANADIAN MACHINERY. "We do not claim that all the ideas in the industrial council originated here," he stated. "We went over a large number of plans, and wherever we found a good idea we simply wrote and thanked the firm that originated it. One thing that was uppermost in the mind of the whole management was this," continued Mr. Shenstone, "it may have come as a result of the war, but we are certain that the men in the shops are entitled to a greater share in the profits of industry. And along with this we want them to feel a greater responsibility for the carrying on of the work. Under the plans we now have inaugurated the management expects the representatives from the shops to suggest improvements in working conditions. If things are not right we want them to come right out and say where they are wrong, and wherein they can be benefited. The same thing applies to sanitary and other conditions. We want the men to help us to make the conditions desirable ones in which to work. We realize that there are obstacles in the way of forming and operating an industrial council, but we are determined to make an honest effort to bring about a feeling of mutual satisfaction. It is well worth the effort, because without such a feeling existing results can never be secured.

Yes, the Women Vote

"The plan we are working on now," continued Mr. Shenstone, "in regard to selling stock in the company is simply a continuation of the scheme that has been in effect for some time. For several years after the formation of the company all the shares were held by the founders and their families. Some ten or twelve years ago the share list was considerably expanded by the sale of several large blocks of stock. At that time we thought it would be well to interest some of the heads of departments, and they were able to secure their stock on very advantageous terms. This plan has been going on since, and now with the latest effort we have some 400 shareholders, including branch managers, sales staff, heads of departments, mechanics, and office staff. It is impossible to see how much this list will expand, but we want it to grow. When conditions become settled the number should increase to at least one thousand, and we do not want it to stop there."

The Offer of the Company

In a notice sent out on the 28th of May the company states:—

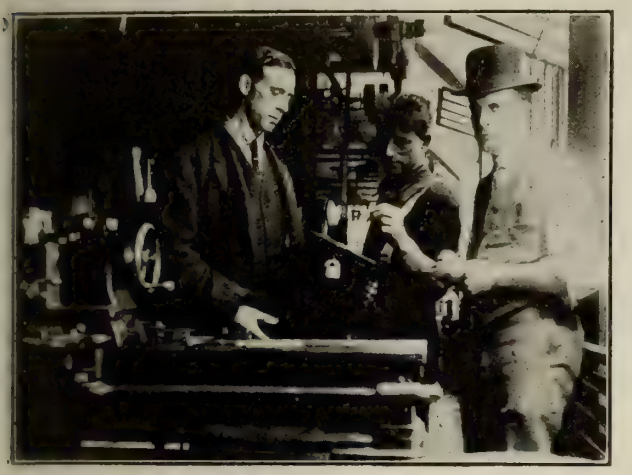
"The directors are strongly of the opinion that the interests of the Company and its employees are interdependent and are, therefore, desirous that the share list should include many more of the men and women on its staff in the various branches and factories.

"From our experience with the sale of Victory Bonds, we believe that a large number may be able to buy some shares at once, paying cash for them and adding to them from time to time as they can save additional money. We realize, however, that it would not be possible for many to purchase shares in the ordinary way, and pay cash for them, but we feel sure a large percentage of our employees could buy a moderate number of shares and pay for them on extended terms of payment.

"In order to provide an investment for those who have some money saved and to promote thrift among others, at the anuual meeting of the company,

held in April last, the shareholders authorized the directors to set aside $500,000 par value of the Company's treasury stock for sale to employees who have been in the Company's employ for two years or more, and who are not receiving, in wages or salary, more than $2,000 annually.

"It was decided that these shares might be sold, when necessary, on very advantageous terms to the purchaser, namely, on a basis of par ($100 per share) 10 per cent. to be paid in cash with the application, and 10 per cent. monthly thereafter, interest at the rate of 6 per cent. per annum to be allowed on all payments. Thus any payment made on account of the purchase of shares will earn interest at the rate of 6 per cent. per annum from the day it is paid in. Purchases under the instalment plan will be limited to 10 shares. Any shares paid for



Voting for Shop Representative

in cash will have right to dividends from date of payment. The stock that is thus being offered for purchase is exactly the same as that held by all the present shareholders without any restrictions beyond those applying to the present holders. The directors are greatly in hopes that under these favorable conditions, the employee shareholders will reach into the thousands instead of hundreds, as at present."

The Working of the Industrial Council

The industrial council and its workings is well set forth in a neat booklet prepared by the company. In short, the idea is that there shall be representatives duly nominated and balloted for in the various departments, with an equal number named by the management. The purpose is explained as follows:—

Massey-Harris Co., Ltd., and its employees, adopt this plan of a council in order to provide effective communication and means of contact between the employees and the management on matters pertaining to industrial relations so as to establish these relations upon a definite and durable basis of mutual understanding and confidence and to promote the common welfare.

The council shall consider questions of policy relating to wages, hours, employment and working conditions, works, practice and rules, safety and prevention of accidents, sanitation and health, and other similar matters of mutual interest.

For this purpose the employees and the management shall have equal representation on the council.

The council shall be concerned solely with shaping the policies of the company relating to the matters mentioned above. When the policy of the company as to any of these matters has been settled by the council, its execution shall remain with the management, but the manner of such execution may at any time be a subject for the consideration of the council.

The Organization of the Council

There shall be organized at each factory a council composed of representatives of the employees and of the management.

Employees shall elect from among their own number duly authorized representatives, to act on their behalf on matters of special interest to employees and of general concern to the company.

The management representatives shall be appointed by the management and shall not exceed the representatives of the employees in number.

The representatives of the employees and of the management shall have an equal voice and voting power in considering matters coming before the council. Through this council any employee or group of employees or the management may at any time present suggestions, requests or grievances with the certainty of a full and fair hearing. Matters which cannot be thus disposed of may, as hereinafter provided, by mutual consent, be submitted to impartial arbitration.

Number of Representatives

The basis of representation shall normally be one employee representative to every one hundred and fifty to two hundred employees, but in no case shall there be less than three employee representatives in the council.

Each works shall be divided into voting divisions in such a way that the several departments and crafts may be fairly represented.

In any works where 100, or over, women are employed there

Cafeteria of Massey-Harris Co., at Their Toronto Works—Capable of Handling 700 People—A Very Good Meal Can be Served Here for 22 Cents.

The Industrial Council of the Massey-Harris Co. in Session—Photo Taken at the Toronto Office at a Regular Meeting.

shall be a woman representative on the council, to be elected from among themselves, by the women employees who shall form a voting division for that purpose. Women employees in any works where less than 100 women are employed will vote for the men representatives in their respective voting divisions.

Who is Eligible?

Employees who are Canadians or British subjects by birth or naturalization, twenty-one years old or over, and who have been continuously in the service of the works for two years immediately prior to nomination shall be eligible for nomination as employee representatives. Provided that any time lost in military service, sickness or lack of employment for which the employee is not responsible is not to be reckoned.

Foremen, assistant foremen and other persons having the power of employment or discharge shall not be eligible for nomination.

Nomination and Election

Nominations and elections of employee representatives shall be by secret ballot and be held semi-annually in the months of June and December.

Nominations and elections shall be conducted by the employees themselves with only such assistance from the management as may be required.

All employees, both men and women, who are 18 years of age and over, shall be entitled to vote, except foremen, assistant foremen and other persons having the right of employment or discharge.

On the date fixed for nominations a secret vote will be taken. A blank ballot stating the number of representatives to be nominated from his voting division will be offered to each duly qualified employee present on the day of the nomination.

The employee will write on his ballot the name of the person he desires to nominate. If his voting division is to elect one representative, then one name shall be written on the ballot; if his voting division is to elect two representatives then two names, and so on.

Each employee will deposit his ballot in a locked box, carried by a scrutineer representing the employees who shall be accompanied by a time-keeper.

In voting divisions from which one representative is to be elected the two persons receiving the highest number of votes shall be declared nominated. If any voting division is to elect two representatives, then the four persons receiving the highest number of votes shall be declared nominated, and so on.

Three days after the voting for nominations has taken place the voting for election (by secret ballot) shall be held in the same manner as the voting for nominations, except that at the election only the names of the persons who have been nominated shall appear on the ballots and only these persons can be voted for.

The representatives of the management on the council will be appointed by the management promptly after the election of the employees' representatives. The number of management representatives on the council shall not exceed the number of elected employee representatives.

Method of Organization

The management will name a person to act as chairman of the council. A secretary shall be appointed by the works manager or superintendent of the works. Neither the chairman nor the secretary shall have a vote.

The company will provide at its expense places for meetings of the council and its sub-committees.

Employees' representatives on the council shall receive their regular pay from the company during such absence from work as this service actually requires.

Employees attending any meetings at the request of the council, or any sub-committee, shall receive their regular pay from the company for such time as they are actually and necessarily absent from work on this account.

How the Council Works

Any employee or group of employees who have been unable to make an adjustment of any matter with the foreman of the work on which he or they are engaged and who desire to bring such matter before the council may present it to the secretary of the council either personally or through their representative. The secretary shall first ascertain whether the matter has been properly presented through the proper channels

to the superintendent, and if not he will see that this is properly done.

If the matter is not satisfactorily disposed of in this manner, the secretary shall submit a written statement of the matter to each member of the council at least three days before the next regular meeting.

Any employee or group of employees thus referring a matter to the council shall have an opportunity to appear before it and present the case. Any such group of employees shall select not more than three spokesmen from their own number to appear before the council.

The council may call any employee before it to give information regarding any matter under consideration. The council, or any sub-committee appointed by it for that purpose, may go in a body to any part of the works to make investigations.

When the council reaches an agreement on any matter, its recommendation shall be referred to the works manager and superintendent for execution, except that if the works manager and superintendent considers it of such importance as to require the attention of the general officers, it shall be immediately referred to the President of the company who may either approve the recommendation of the council and order its immediate execution by the works manager and superintendent or proceed with further consideration of the matter as hereinafter provided.

In case of a tie vote in the council it shall be in order to re-open the discussion and to offer substitute or compromise recommendations, on which the votes shall be taken in the same manner as above provided.

Further Provisions

If after further consideration, the vote in the council remains a tie, then the matter shall, at the request of either the employee representatives or the management representatives, be referred to the President of the company.

The President, or his specially appointed representative, may confer with the council as a whole or any sub-committee thereof, or any group of employee representatives, at such time and place and in such manner, as in his opinion, will best serve to bring out all the facts in the case.

Within ten days after the matter has been referred to him, the President shall either:

(a) Propose a settlement thereof, or

(b) Refer the matter directly to the general council to be formed as hereinafter provided for.

If the President proposes a settlement and it is not satisfactory to a majority of the employee representatives, and if after a further five days, no agreement has been reached, then the President may, if he deems advisable, refer the matter to a general council to be formed as hereinafter provided.

If the President decides not to refer the matter to a general council, or if upon reference to the general council the vote is a tie, then the matter may, by mutual agreement of the President and a majority of the employee representatives, be submitted to arbitration as hereinafter provided.

The General Council

Whenever in the opinion of the President any matter coming before any council affects other works of the company or the works of our affiliated companies, the Verity Plow Co., of Brantford, and the Bain Wagon Co., of Woodstock, he may call a general council and thereafter the local council shall take no further action thereon.

In the formation of a general council the works of the Verity Plow Co., Ltd., at Brantford, Ont., and the works of the Bain Wagon Co., Ltd., at Woodstock, Ont., shall be considered as units or works of the Massey-Harris Co., Ltd.

The general council shall be formed in the following manner: —The President shall issue a notice designating the several works which he deems jointly interested. Thereupon the employee representatives at each of the works designated shall elect two or more of their own number to act as members of the general council. There shall be one such member of the general council for each 500 employees or major fraction thereof except that no works shall have less than two employee representatives in the general council.

The management representatives in the general council shall be appointed by the President and shall not exceed the number of employee representatives.

Reasonable travelling expenses, including hotel bills, of representatives serving on a general council, shall be paid by the company.

If the general council is unable to reach an agreement as to any matter it may, by mutual agreement of a majority of both the employee representatives and the management representatives, be submitted to arbitration.

All decisions of any general council or of any arbitrator or arbitrators shall be binding upon all the works originally designated by the President as being jointly interested. Any such decision may be made retroactive.

Independence of Action

Every representative serving on any council or general council shall be free to discharge his duties in an independent manner

The Noon-Hour Crowds Pouring Into the Massey-Harris Cafeteria—Patronized by Men and Women Alike.

without fear that his individual relations with the company may be affected by any action taken by him in good faith in his representative capacity. To insure to each representative his right to such independent action he shall have the right to appeal directly to the President, the council, or the general council, for relief from any alleged discrimination against him, and if the decision is not satisfactory to him, then to have the question settled by an arbitrator selected by mutual agreement.

The representation of employees herein provided shall in no way abridge or conflict with the right of employees to membership in any labor or other lawful organization.

The Massey-Harris Cafeteria

To the man who has become accustomed to looking for eating places in the down-town section of the larger centres, the bill of fare that is hung up in the Massey-Harris Cafeteria looks as though the prayer of the poet had been answered when he asked, "Backward, turn backward, oh Time in thy flight." For here he sees in front of him the makings of a perfectly good dinner for between 25 and 30 cents. When you go into the average restaurant down-town you pay for what you eat at a pace quite in keeping with the best traditions of the high cost of living. But here is what the writer saw in the Massey-Harris place:—

Vegetable soup	5c
Fried fish	12c
Baked beans	10c
Meat pie	12c
Potatoes	3c
Green peas	4c
Cake	5c
Pie	5c
Tea or coffee	3c
Milk	5c
Ice cream	5c

Bread and butter are free.

Just out of curiosity we noted the prices that were charged in one of the much-patronized down-town restaurants, comparing them with the Massey-Harris list. The helpings at the latter place are not skimpy. They are as large, or larger than one gets in the down-town section. But here are some of the prices compared:—

	M.-H.	Down-town
Soup	5c	20c
Fried fish	12c	35c
Baked beans	10c	35c
Meat pie	12c	35c
Green peas	4c	10c
Cake	5c	10c
Pie	5c	10c
Ice cream	5c	10c

Here, then, are eight items that Massey-Harris sell for 58 cents, while the down-town places get $1.65 for the same items. What's the difference? Simply this. The Massey-Harris Company do not plan to make a cent out of their cafeteria. They are satisfied to break even. Whether they do or not I am not prepared to state, nor would the officials say so. And the big eating house on King street is the equal of anything to be seen down-town. It will take in a crowd of between seven and eight hundred. The service is quick and the food good. Everything is clean, bright and attractive. Canary birds in cages are to be seen at a couple of dozen points. There is a rule to restrict smoking until 12.25, when the men are at liberty to light up and blaze away with their tobacco. There is a small stand in the room where tobacco can be secured, and also a few of the leading and more approved sorts of confections. No money is made on these sales, the idea being to break even on them. The chairs used are the variety seen in the lunch-rooms with the arm of the chair converted into the table. A number of square tables seating four are also to be noticed. These not only serve the purpose of a place to eat, but as soon as this is done with they are in demand when the pack of cards is brought out for a few hands before the noon hour is over.

In behind the scenes everything around the place is clean and bright and sweet. Good, plain ingredients are used in the preparation of the food, and all the cooking is done under wholesome conditions. There are no dark, smoky kitchens, no back lanes with garbage cans at the door. The cooking for this big factory dining-room is done with as much care and attention as could be given any place. The way in which it is patronized is the best evidence that it is a square deal and a success.

A cubic inch of coal pulverized so that 95 per cent. will pass through a 100-mesh screen will contain over two hundred million particles, none of which will be greater than one one-hundreth inch cube, and a larger percentage will be less than one six-hundreth of an inch cube.

A simple cable conductor has been in use for some time past, in Germany and other European countries. It consists merely of a flat metallic tube in which a series of notches are made with a special tool, after the two ends of the cable to be joined are properly inserted. The contact is said to be perfect, and the grip is such that the cable breaks before the connector gives away.

Montreal has a street cleaning device which sweeps the dirt to one side of the thoroughfare, where it is taken up by suction into a machine following up. Another feature of the road-sweeping scheme, is that sprinklers in front of each machine lay down the dust. Proving that ingenuity and machinery in unison make a wonderful combination.

Noise has no terrors for the new Magnavox anti-noise transmitter, which was used on all the airplanes of the United States Navy. This device was patented nearly two years ago, but only recently released for commercial purposes. No helmet is necessary for the listener, but still the voice is distinct whether one or one hundred miles away. E. S. Prideman, and P. L. Jensen are the inventors of this interesting telephone aid.

Nearly all animals are said to be better swimmers than man, and to take to the water naturally. The rhinoceros and hippopotamus are wonderful swimmers and divers, while the Indian elephant crosses great rivers with heavy loads. The elk keeps its head above water and crosses directly from bank to bank to avoid turning. The reindeer, on the other hand, turns as often as it likes, keeping its head only a little above the water. But of all swimmers, of all climes, the best, though not the swiftest, is the polar bear, which passes half its time in the water, swimming and diving.

The Eiffel Tower, the tallest structure in the world, was erected by Alexander Eiffel, a French engineer, for the exposition of 1889 at Paris. It stands in the Champ de Mars, and is 984 feet high (429 feet higher than the Washington Monument). The base is a square of 112 yards, from each corner of which rise the four curving supports of interlaced iron-work. At a height of 590 feet these merge into a single shaft. There are three platforms at various heights, to which the ascent is made by elevators or staircases—1,927 steps in all. The total cost was over $1,000,000, of which the State contributed about $300,000. In 1909 the Tower became the property of the City of Paris.

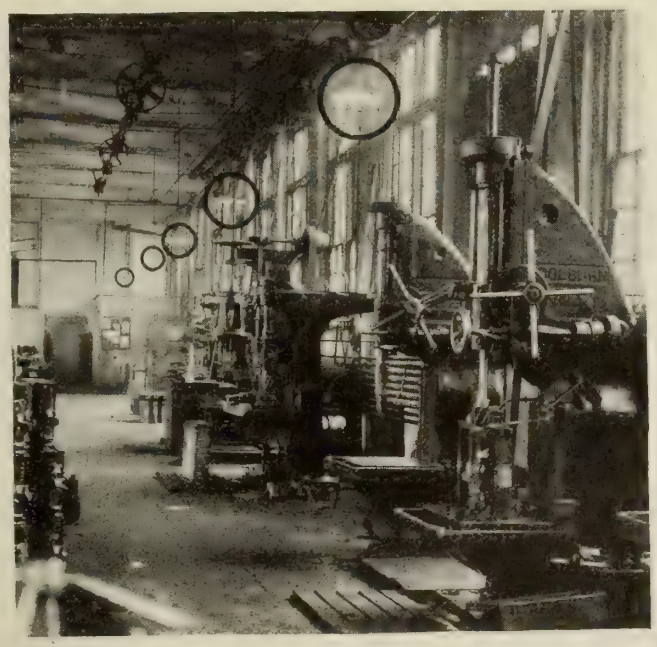
The Science of Efficient Shop Illumination

The Subject of Shop Lighting is a Very Vital One, For Without the Proper Illumination, Workmen Cannot be Expected to Produce Results, Either From a Quality or Quantity Standpoint

By A. W. SWAN

A GREAT deal has been written on the subject of illumination, usually with a free use of technical terms, and sometimes rather confusing to the non-technical manager and superintendent who are interested in having good lighting conditions in their plants. Further, the special bulletins issued by the electric manufacturing companies, while filled with very valuable material, usually recommend the installation of some form of semi-indirect or indirect lighting, which is as a rule expensive to instal. Now, it is quite possible to have a very efficient lighting scheme, and having nearly all the advantages of the more expensive schemes, at no advance in cost over the ordinary shop lighting scheme, simply by re-arranging existing units.

The science of shop illumination, reduced to its elements, is simply a matter of two factors, illumination per square foot, and absence of glare. The illumination per square foot depends again on two factors, the distance apart of the lamps and the power of the units. Taking illumination first, the choice is evidently between having low-power units close together or high-power units farther apart. While the general illumination is more uniform with the first system, it is also very expensive from the renewal standpoint; on the other hand, with very high-power units, such as the arc lamp, the difference between the best-lighted sections and the poorest-lighted sections is very great, and this is of great importance in the machine shop. Although it is sometimes possible to arrange for a machine shop being lighted entirely without the use of drop lights at the machine tools, this is not as a rule possible in the ordinary shop with its belting, etc., and low-power drop lights are necessary at the individual machine tools, particularly where the work is at all fine. At the time of the Russian 75-mm. shell contract, which was distributed throughout the Eastern States in 1916, the Government inspection bureau was not allowed to work in the evenings, although the lighting was excellent; and where parts are ground to limits of 1/1000", for instance, it is evident that even with the best general illumination, there must be provision for drop lights at the machine.



NOTE THE POSITION OF THE LIGHTS.

From all these standpoints it appears that a shop lighting system having 200-watt lamps for main lighting, with 25-watt drop lights has much to commend it, and as a matter of fact, this is a system in general use. But it is one thing to have the right power lights, and another to have them spaced correctly. The average machine shop has the machine tools arranged in aisles back-to-back; the lights are conveniently arranged with one row per double row of machine tools. Without going into the matter of candle-power per square foot, it will be found that with a spacing of 15 ft. between rows, having the lamps 15 ft. apart in the rows gives very satisfactory results in the ordinary machine shop.

The principal objection raised to the use of bare lamps, particularly of the modern high-power Mazda, is that they cause glare. However, this objection can be met by suspending the lamps at the right height and using the correct reflectors. The sensation of glare is caused by looking directly at any very brilliant object, therefore, any lamp of high brilliancy coming within the ordinary range of vision must be shielded from direct view. But the ordinary range of vision is not far from the horizontal, any very brilliant light directly overhead, or almost directly overhead, does not cause much trouble from glare as it is outside the ordinary range. On the other hand, owing to perspective, the further off the object the nearer it is to the apparent level of the eye; or in other words, a bare light which will not be annoying to the workman almost directly underneath will be troublesome to his neighbor further down the shop. It follows from this that if bare lamps are used, they must be used with some type of reflector that will shield them from those not directly beneath them. This is readily accomplished by the use of flat bowl reflectors, where the edge of the bowl is slightly below the tip of the lamp. Such a reflector cuts off no light from those directly beneath, but the lamp is above their normal range of vision, and will cause little annoyance. On the other hand, the reflector bowl will shield the eyes of workers in other parts of the shop. An important point is, of course, that the that the lamps should be suspended at the correct height; if too high, the reflectors will have to enclose the lamps more than at a moderate height. As a matter of fact, the best height both for general illumination and lack of glare seems to be about 10 feet.

The accompanying photograph shows plainly the type of installation described. It will be noticed that the flat bowl reflector cuts off all direct view of the more distant lamps, and even in those nearer, only the lower part of the lamp bulb is visible. Those almost directly overhead would be visible, of course—if one cared to look at them, but the range of the camera represents quite well the normal human range, and any lamp that cannot be seen in the photograph is not likely to be harmful.

Of course, such an installation leaves a good deal to be done in the way of providing perfect illumination; glare can never be avoided where bare lights are used, but the installation illustrated gives very good results; it is very economical—the reflectors are of metal and practically everlasting, and the general effect is quite pleasant.

Making *Foundry* More Attractive

BETTER and More Wholesome Shop and Working Conditions Would Do Much to Make the Foundry a More Attractive Place in Which to Work.

By F. H. BELL,
Editor Canadian Foundryman

Old Egyptian picture showing Molders or Iron Workers at their work—about the time of Thothmes III., 1490 B.C.

IS there any good reason why work in a foundry should not be carried on in surroundings far more cleanly, bright and wholesome than in the majority of shops at the present time?

It is a hard matter to get apprentices for the foundry. Men who are in the trade do not, in many cases, advise their boys to follow in their footsteps.

What is the remedy? Why not consider better shop conditions, better ventilation, better facilities for the handling of heavier work?

There has been a falling off of moulding shop apprentices—almost to the zero point in many cases, and some of the large employers go as far as to state that it will be a matter only of a few years until the molding business is largely in the hands of foreigners.

In order to properly comprehend the significance of the subject under discussion, it would be as well to first consider the origin of the term "foundry," which has its derivation in the word "found"—to begin, to establish, to originate, to endow, etc. Thus a foundry is a place where things are begun, or established, or originated, or endowed, or in other words, where they are founded. The man who operates a foundry is a founder because he does founding, which is to say, he produces the foundation on which the machine, or implement, or device is founded or built.

From time immemorial the founder has held a prominent place in providing mankind with implements of every description, but never to a greater extent than to-day; the only difference being in the manner in which his services were appreciated in olden times compared with what they are to-day.

Undoubtedly the metal workers spoken of in the Scriptures and in other ancient histories were founders in the same sense as the term "founder" is used to-day, notably they melted their metal and poured it into molds rather than forging it into the required shape. Wrought iron, which is to say, "worked iron," is the product of later ages and is of comparatively modern origin.

Goldsmiths, silversmiths, coppersmiths, etc., were of necessity melters of these metals, so likewise were all the workers in metals of any kind, all of whom bore the name of "smith." The esteem in which the metal-"smiths" were held and the extent to which the trade was practised may be judged by the extent to which the name smith has been perpetuated. The smiths of ancient days were of no greater necessity than the molders and founders (as they are now known) are to-day, and if they are not now held in the same esteem as formerly the fault rests entirely with themselves, and the object of this letter is to interest, not only the managers of foundries, but those who are employed therein, either as practical molders or helpers, or in any way connected with the foundry.

Some of the Old Methods

Of the methods employed by the ancient smiths, or the shop equipment at their disposal we have very little knowledge, but the Egyptian wall painting shown in the engraving in the heading probably gives as reliable an idea as can be found. The fire was built in a slightly depressed place in the ground; a forced draft was given to the fires by an attendant on either side, who worked the bellows which were placed on the ground in such a manner that they would blow the fire. The attendants worked the bellows by standing on them and alternately throwing their weight from one foot to the other and pulling up the bellows with a rope as the weight was relieved, thus permitting the instruments to be filled and emptied alternately. The little figure opposite the smith's head was probably for fuel or water.

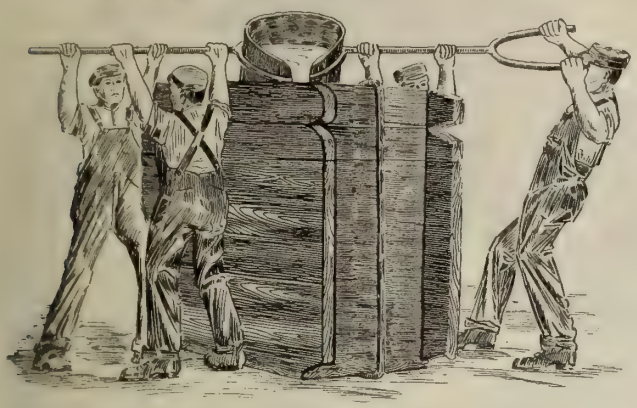
The smiths of those days, no doubt, worked hard and became tired, but the work was likely done out-of-doors, and the men would work up healthy appetites and restful sleep. The present-day molders are placed in a different position and should be treated with even more consideration.

The Molder of To-Day

As things are now, to be a first-class molder and founder is an accomplishment which, as has been frequently pointed out, calls for several distinct characteristics in the makeup of the man. He must be physically able-bodied and muscular, otherwise the work will be a lifelong drag. He must, like all other craftsmen, be mechanically inclined, else he will never be able to comprehend the "why and wherefore" of the different traits or features of his trade. He must be artistically inclined, otherwise he will not be able to make such jobs as have to be done without a perfect pattern, and if his aim is to be a top-notcher, capable of taking charge, he must be in the scientific class in order to master the intricacies of the furnace in the melting of his metals.

To secure boys who will ultimately emerge from their apprenticeship with all of these natural propensities properly developed and with a will to enter upon life's journey in the foundry, the foundryman must realize that he has on his hands a problem which will be hard to solve unless he makes the environments of the foundry such as will attract the proper class of boys. It cannot be expected

that in this 20th century, when so many opportunities are offered to the youth of our country that young men and boys can be found who will voluntarily tolerate a life such as the molders of the immediate past were wont



HOW HIGH MOLDS ARE USUALLY POURED.

to endure. The requirements of the present and the future are that the foundry must be kept up to the same standard as other industrial institutions both as regards healthy surroundings and labor-saving equipment.

The Place of Machinery

The expression "labor-saving" can be translated into two different conceptions. The one is to utilize machinery to replace the man wherever an opportunity offers, while the other is to make the necessary labor of the man the least laborious possible. The first conception is usually adopted by the modern foundryman while the latter is

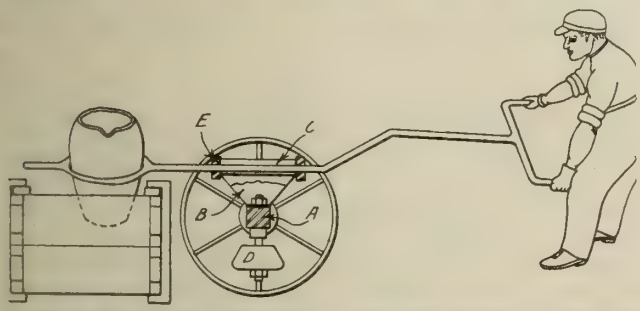
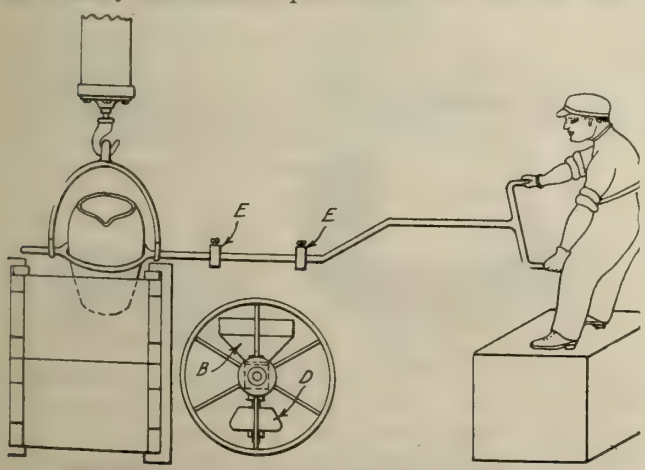


FIG. SHOWING SUPPLY LADLE ARRANGEMENT. A IS THE AXLE. B IS SUPPORT FOR SHANKS. C IS SLAT IN WHICH SHANK RESTS. D IS WEIGHT TO KEEP B IN PROPER POSITION. E IS COLLAR TO KEEP LADLE IN PROPER LOCATION.

seldom considered. There are many improvements which could be introduced into the foundry to make it more attractive, and now that the reconstruction period is at hand and the world must needs be run on a different basis, the foundry must take its place with the others and wake

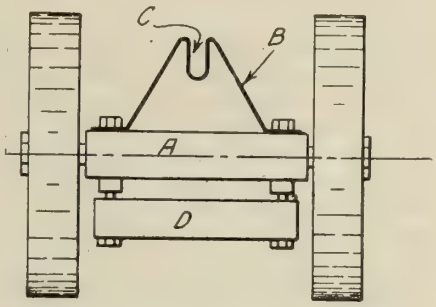


SHOWING LADLE HOISTED TO POUR HIGH MOLD.

up. Labor-saving appliances which will increase the output of each man will, of course, always be in order but the desire of the writer is to inspire interest in the installation of labor-saving devices for the saving of the labor exacted from each man. Perhaps a few illustrations of what molders have to endure would make more clear the need for improvements.

Things That Should Not Be

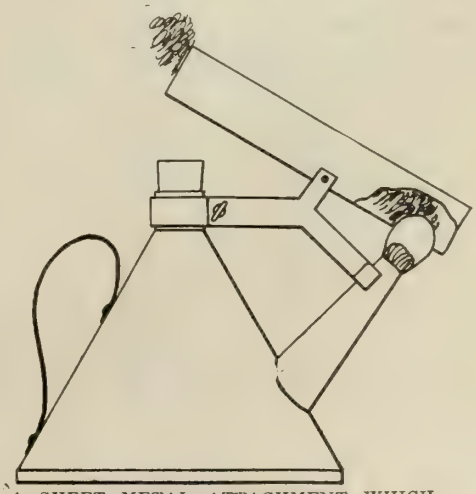
In Fig. 2 will be seen a common way of pouring a high mold. A cable hanging over a grooved pulley attached to the roof would be an improvement to this, but inexpensive pouring devices are on the market which can be used on jobs such as this or they can be used for pouring snap molds. Sulky ladles similar to Fig. 3 are in use in a limited number of places, but should be more generally used. They are so arranged that they can be used in pouring molds of from a few inches high up to 18 or 20 inches, or they can be lifted from the wheels by any kind of a device and used for pouring very high molds. In Fig. 4 is a sample of what the molder



SHOWING END VIEW OF DETAILS.

has to put up with in many a foundry. These foundry torches are actually on the market for molders' use. They consist of an iron oil can with a wick made of several strands of candle wicking shoved down into the spout, a bon-fire is lit on the end which sticks out, and as it burns away it is pulled up with the assistance of a nail.

Pages might be written on what could be done to ease the molder's burden, but the molder can do his



A SHEET METAL ATTACHMENT WHICH WOULD CARRY AWAY THE SMOKE.

share of work if the shop is made fit to work in. "Cleanliness is next to Godliness" and it is as easily accomplished in the foundry as in the office. The first thing to do is to clean it up, after which keep it clean. Wash the windows and keep them washed. Repair the broken windows and the misfitting doors and keep them repaired, and put in a proper heating and ventilating system.

In Fig. 5 will be seen a ventilator such as can be used

in the gable. These ventilators are used in rubber factories, tanneries, soap factories and kindred places for the purpose of carrying off foul smells, and if used in the foundry would carry away the gas and smoke and dust, so that the men could work in comfort, and also that the shop would fill up with fresh aid which could be properly heated. If a little more consideration were given to the systematizing of the working programme it would be quite possible to make it pleasant for everyone concerned.

No molder should ever be allowed to shake out or cut over sand heaps. This does not mean that he is handing over the hard work to some less fortunate person. It simply means that if a fresh man with a dry shirt comes into the shop after the molders are gone he can open all the doors and windows and start the rotary ventilator and suck all the steam and dust out of the shop. This will not do him any harm because he has not been sweating and he is amply working as though out of doors.

Once the foundryman awakens to the need of labor-saving devices not only to take the place of the men he dispensed with but also of labor-saving and health-saving devices for the ones he retains, he will have no further need of fear regarding his future supply of molders. Even though the molding machine became so perfected that a common laborer could do certain jobs, it must be borne in mind that the commonest kind of a common laborer is generally pretty hard pressed for employment when he hits the foundry, but

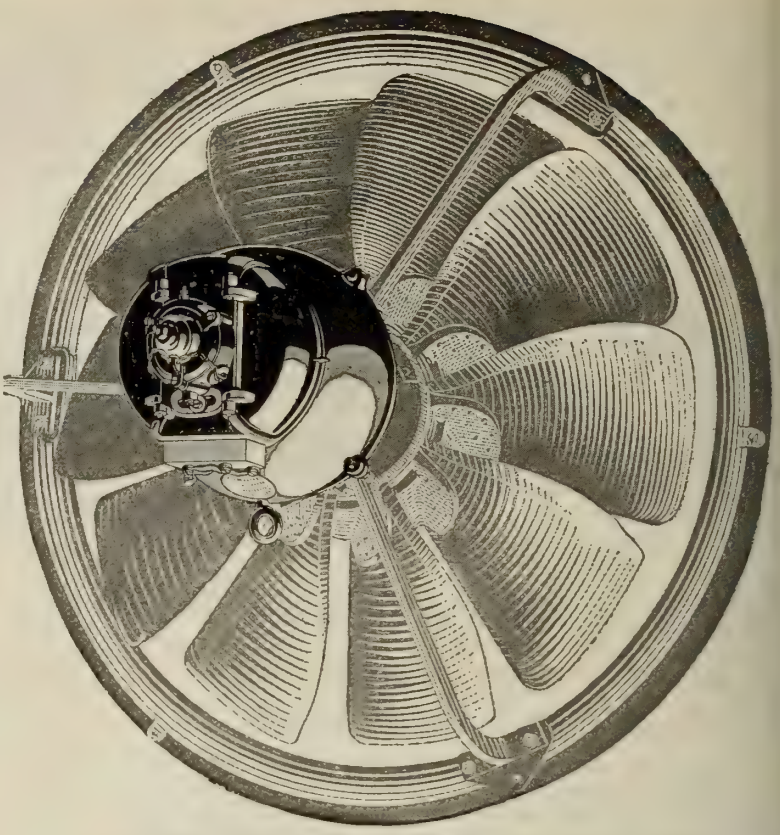
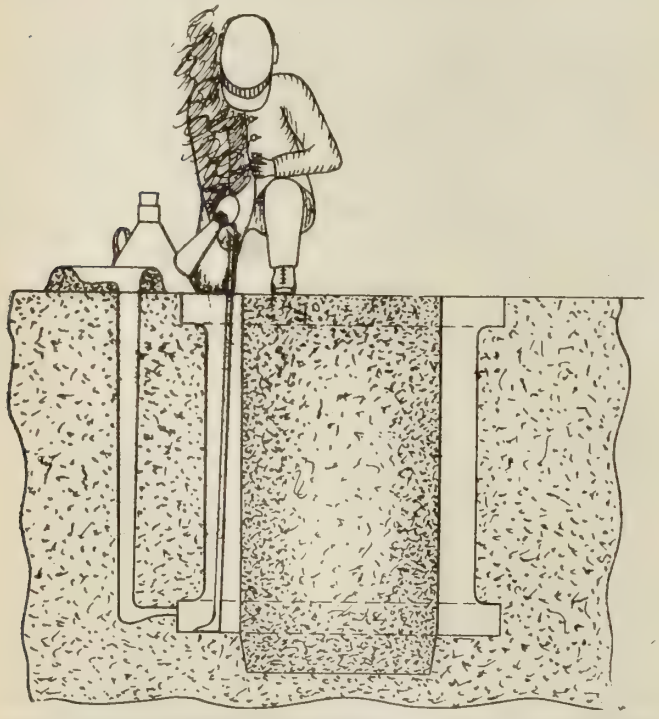


FIG. 5—TYPE OF VENTILATOR THAT WOULD MAKE BETTER CONDITIONS IN THE FOUNDRY.



THE USUAL METHOD OF LIGHTING A DEEP MOLD. THE FUMES FROM THE OIL LAMP ALL COME UP IN THE MOLDER'S FACE.

there is certainly no excuse for this state of affairs as foundry work is one of the noblest and most interesting of occupations.

A cubic inch of solid coal has a superficial area of 6 sq. in.—but the combined area of an equal weight of pulverized coal is over 30 sq. ft. or an increase in area of approximately 700 times.

It often happens that some obstruction prevents the turning of a monkey wrench though the jaws fit the nut. A novel form of adjustable wrench has its head pivoted in the handle, with a ratchet connection. This not only allows the tool to be used at eight different angles, but makes effective even a very limited movement of the handle. The ratchet, which works either way, is locked or released by pressing on a small dog located where the user's thumb naturally rests.

—"Evening News" (London).

SHE'S SORRY NOW SHE PATTED IT.

Holland is finding it is easier said than done to get rid of the ex-Kaiser.

Do You Know Exactly What Your Product Costs?

Suppose You Were Asked the Question Stated Above, Could You in All Honesty State a Definite Figure Showing Your Loss or Gain? If You Cannot, There is Something Wrong

IT is not the writer's intention to carry readers through a long-winded dissertation on production figures, nor does he intend going into any elaborate system of keeping track of such costs, but it is his intention and purpose to place before readers in as concise a manner as possible a series of graphical solutions to the cost problem.

Before touching on these graphs, however, let us consider for a moment what we mean when we speak of the cost of a product.

The essential aim and incentive of all manufacturers is to turn out their product at the greatest possible profit. This, of course, is exactly as it should be, but once more let us consider just what the word PROFIT means.

In the writer's opinion it is the difference between the selling price and the manufacturing cost of the article, irrespective of the nature of the article. The selling price in turn is based on the production cost, therefore to sell intelligently one must know thoroughly and accurately the cost of manufacture.

There are, however, some executives still left who stick to the old rule-of-thumb method, namely, to sell their product at some certain price, simply because their competitor does so, or worse still, to sell just a little lower than their competitor, with the idea of grabbing up all the orders.

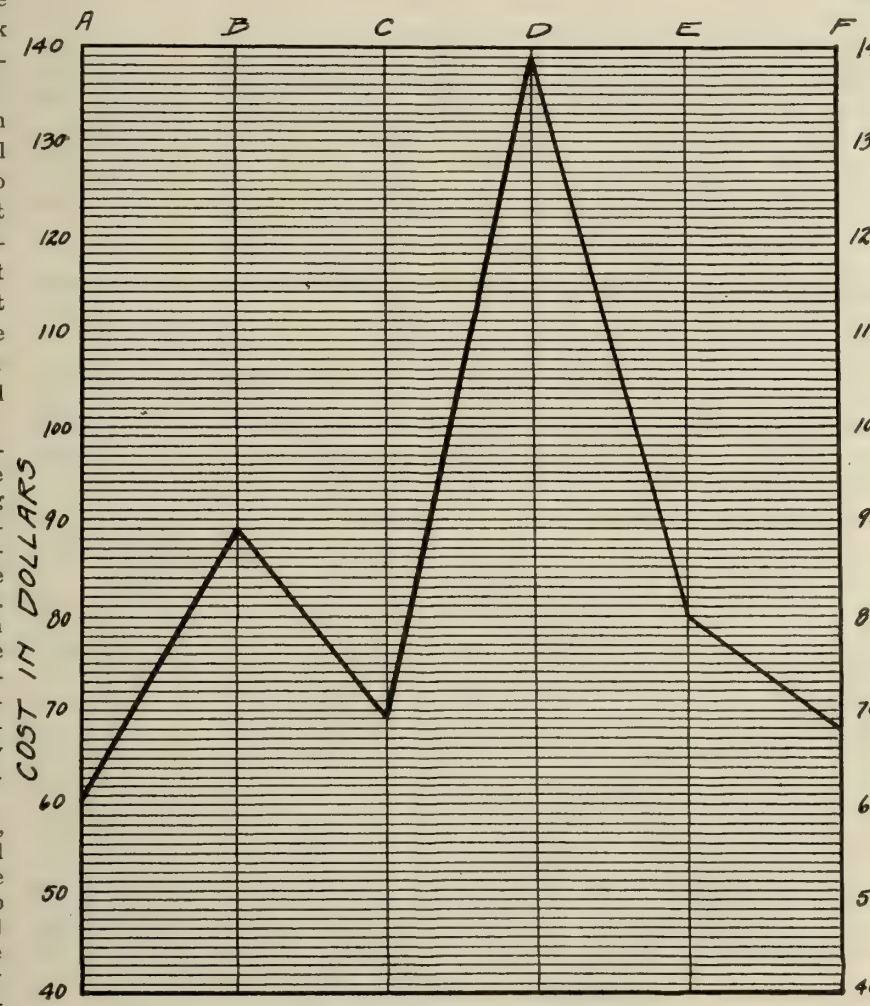


FIG. 1.—ILLUSTRATING HOW THE PLANING COSTS SHOWED UP.

The worst feature of all is that this method is usually adopted without any certain knowledge of costs. True they may assume certain factors, but they have no proven facts to set their prices from.

The chief reason for this pitfall existing, is the fact that the importance of a proper cost system is seldom properly realized in any plant. However, the day of watching the production cost is dawning, for interest is awakening as never before. Everywhere cost systems are being installed, and to-day there are few executives who do not at least possess the desire for a common-sense cost system. The chief trouble, however, seems to be in judging what a cost system really is.

The Fear of Red Tape

Often the fear of red tape, and the expense of maintaining it, deter too many from obtaining the goal of their desire. It is this very fact that accounts for so many unfinished, half-hearted attempts at cost systematizing at the present time.

There is no need of such a condition, for an effective and proven cost system can be easily maintained, if properly introduced. The clerical costs need not be high.

From this the writer does not infer that you hire cheap help, for such an idea is suicide to any cost system. Above all, secure competent men to handle your system, but watch that your system is kept within reasonable limits, and not made up of useless red tape. It is this dividing line which defines the real useful cost scheme from the elaborate, one method to cover all ideas.

There never was, and never will be one system to cover all branches of the trade, for each business has certain operations, and peculiarities, which must be met with, but from their own particular standpoint and angle.

No matter what the business, however, the executive sitting in his office examining the cost charts, should be able to visualize the shop conditions which they refer to, not alone the machines, but the men, the operations, and the materials, etc.

In this way loss of labor, careless expenditures, waste of material, poor equipment, losses of profit, and other matters, are brought clearly before the executive's eyes. Without a good cost system these matters would often take a long time indeed before cropping up for attention.

To get the very best value from any cost system we must first have a practical knowledge of the product, and its procedure of manufacture. The price of material, shop conditions, etc., must all

be thoroughly gone into, before attempting to start a rational method of keeping track of the work.

When a cost system is finally in operation, there is one essential to its success, and effectiveness, which is too seldom considered, namely, co-operation of the executive organization.

One Man Control Impossible

In a plant of any size it is impossible for one man to keep under his control all decision and action. He must gradually allow his subordinates to perform certain duties, as they show ability, which is only as it should be, for in this way each member will take a personal interest in the system's success.

There has been many a good system thrown into the discard through lack of co-operation.

Another evil which has caused the downfall of many a good cost system is that of impatience. By this the writer means impatience for results. Rome was not built in a day, we are told. Therefore it stands to reason that the same principle holds good for a cost system. Suppose, for instance, we take two plants, the first of which, although it adopted no cost system, still tried as much as possible to run on a systematic basis, the second never believed in cost systems, and what was more, believed any sort of system pure bunkum.

Which plant would show the quickest results providing a cost system was adopted?

Naturally, readers will say the first, because this shop was at least partly systematized, yet there are some people who would claim that each should show equally prompt results.

In other words, the worse condition the plant is in, previous to the adoption of the system, so in like proportion will the results take to show themselves. In the ordinary shop at least a year of hard work, and co-operation, is necessary to bring about tangible results.

The writer strongly emphasizes the point, namely, that no system, no matter how good, can work miracles. If previous to the installation of such system, the trend of work was carelessly attended to, it is only to be expected that some time must elapse before conditions change for the better. Common-sense will tell us that, and yet many a system has been thrown out because in a month's trial no appreciable result had come to the surface.

What then constitutes a correct cost system?

The writer would say, one which is proven cost system, so arranged tha we actually know and see direct ben fits, not theoretical ones.

It often happens that some scheme tried and proven successful in anothe plant, can by intelligent understandin of its basic principle, be so arranged an adapted to be successful in anothe plant, but in every case it should b recognized that we cannot take som system holus-bolus out of one plant, an dump it into another altogether differ ent line, without some modifications.

Before going into the subject o graphs, let us consider one more point namely, the correct type of man t handle such a system.

The writer personally believes th correct party for such a position is a efficiency engineer—but wait (for in m ears I hear numbers saying, "What, a efficiency engineer? Not on your life I've been stung once—never again." Unfortunately, many have been hood winked by so-called efficiency engineers but were they? In other words, wha constitutes the make-up of a **real effi ciency engineer?**

Webster defines efficiency as follows "Of being efficient, or producing an ef fect or effects, power or action. The

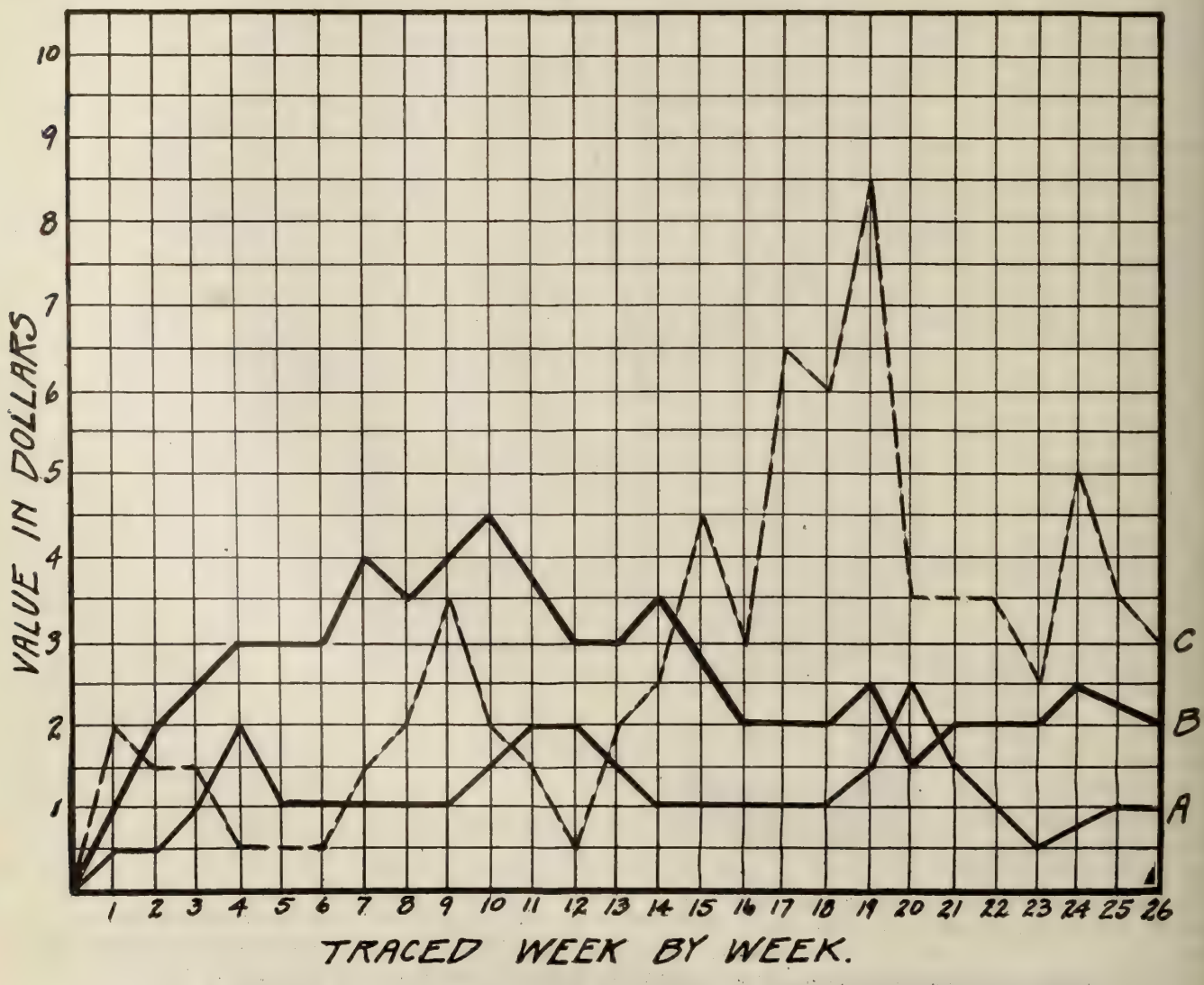


FIG. 2.—SHOWING UP CLEARLY THE WASTE IN MATERIAL BY THREE DIFFERENT DEPARTMENTS.

ergy or work that is got out of a machine," etc. We could go on indefinitely—but the main theme is results to a maximum point.

To obtain maximum results from all angles, the engineer must first be a practical man, who understands that these angles exist. For instance, we could not expect a man who has sat over a desk in a wholesale grocery office, to leave his position, step into a large machine plant, and bring this shop up to a maximum producing point, providing it was in bad shape of course.

This parallel may seem ridiculous, yet there are some fellows posing as efficiency engineers who have tried to rearrange business concerns, whose policy they have not even been familiar with.

The writer personally knew of one chap who was a machine efficiency expert (?). This fellow talked good, had a splendid appearance, and sure held the bluff down fine. This we give him credit for.

To see him stand at a machine chat-

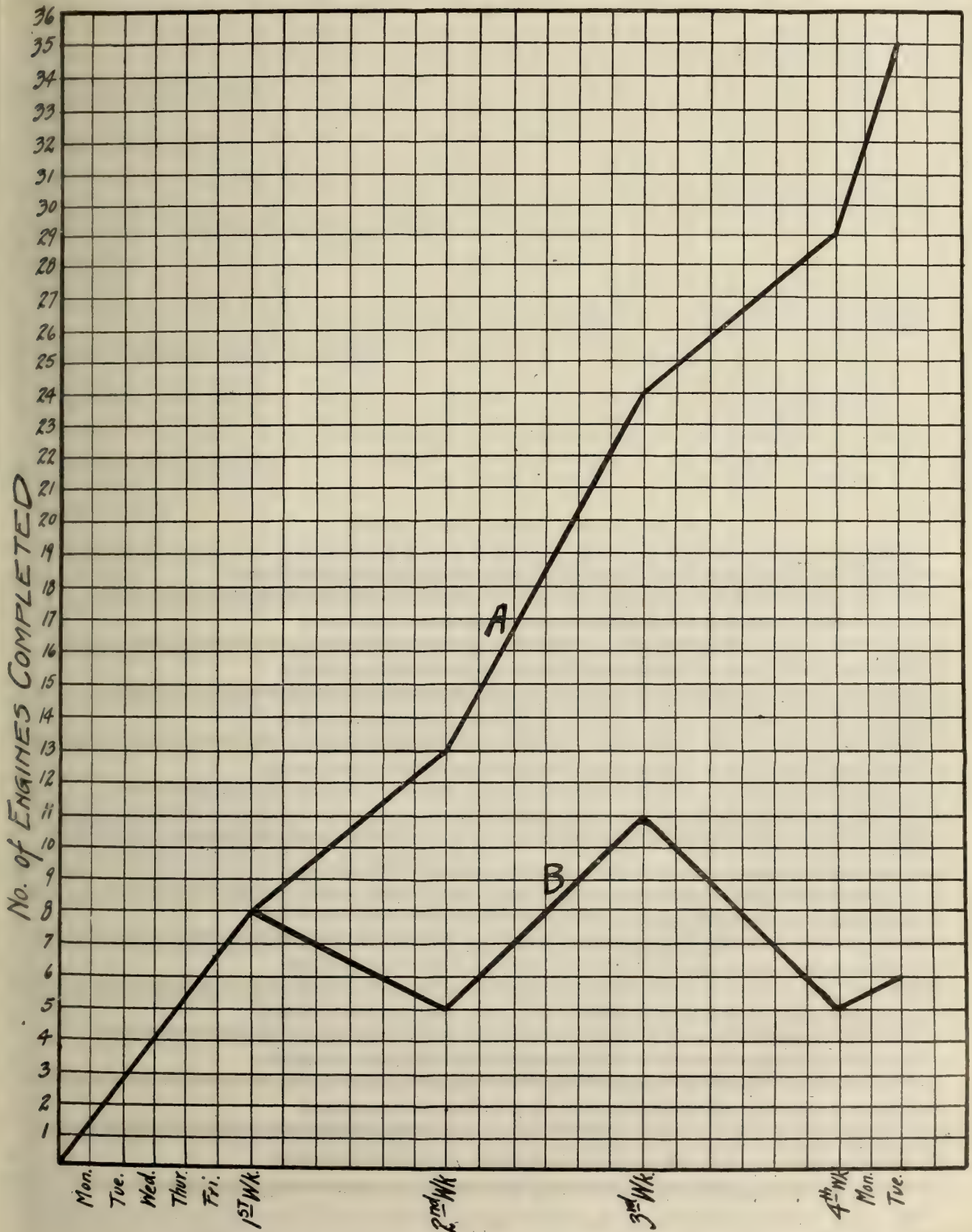


FIG. 3.—ILLUSTRATING THE FLUCTUATION WEEK BY WEEK, AND TOTAL PRODUCTION PER MONTH.

ting with a man was a treat. The operator felt good, so did the engineer, for he had his stop watch on the go at the proper moment, and later figured out the time of operation. It took the workmen some time to figure out why their time was being cut, until they suddenly caught Mr. Efficiency red-handed. Of course what happened is obvious and natural. They beat him up, which he deserved.

Granted that first this firm was wrong for employing such a method, and man, and second, that such a party as spoken of is a bad example, yet the point is this, that previous to his position with this firm he had run an Ice Cream Store, and read up books on the subject of efficiency in the meantime.

He went back to his business where he belonged, and his wife who had kept store for the time being scrubbed her floors once more.

But all this is deviating from the main point, namely, what is an efficiency engineer? In the writer's opinion it is a person thoroughly acquainted with all the ins and outs of the business which he proposes bringing up to a high standard of efficiency. A good practical man. If it is in the engineering line, he should be a thorough, highly educated mechanic, both in theory and practical knowledge. His scope should include the pattern shop, foundry, machine shop, routing in all its phases, etc., etc. It is the fact that he possesses these qualities, which distinguishes him from the ordinary mechanical superintendent, who might be an ideal mechanical man, but mighty short on theory, and lacking in imaginative qualities.

Taking it for granted that readers are in accordance with the writer, we will go on with the subject of graphical solutions of manufacturing cost. No attempt will be made to show a complete cost system. Such an article would cover more space than herewith laid out, but we will cover important ground with the following five graphs, or charts as they might be called. For illustrative purposes the writer has drawn on his personal experiences in the gas engine, and machine tool trade, and quotes figures which he has actually proved to be correct, practical figures, and not merely theoretical. This is especially true of the chart showing the difference in costs, with and without jigs, for the work.

In a certain manufacturing concern, producing a well-known type of machine tool, the cost was proving exceedingly high. No actual trace was being kept of these costs, but the end of the year showed plainly something was radically wrong, so the result was that charts were prepared of the various operations throughout this tool's manufacture, to see where the trouble lay.

Planing, shaping, drilling, milling, assembling, etc., etc., were all covered, and figure 1 illustrates how the planing operation showed up. These machines were (as is usually the case) turned out in batches under various numbers. The graph was made to accommodate this fact. Referring to the illustration we see that on the vertical scale we have the cost in dollars, while the horizontal scale is marked A.B.C.D.E.F. Each of these letters represent an order number, and of course a batch of machines.

From a low record cost of $60.00, these costs soared to $139.00. Impossible you say—yet such was actually the case. Of course after seeing such results, trouble ensued, and no wonder, for plainly something was very far wrong. It later developed that the planer hands were not evenly matched as regards ability. Readers might reasonably enquire—then why were they allowed to stay? This also cropped up on further enquiry, namely that they were friends of the foreman's. All this sounds fishy, but it actually happened. For obvious reasons the writer cannot give this definite information.

Of course this state of affairs was remedied at once, with the result that the operation cost became normal once more and stayed there. Without some cost system, this item would have been exceedingly hard to trace, in fact might never have been traced to the exact source where most of the trouble lay.

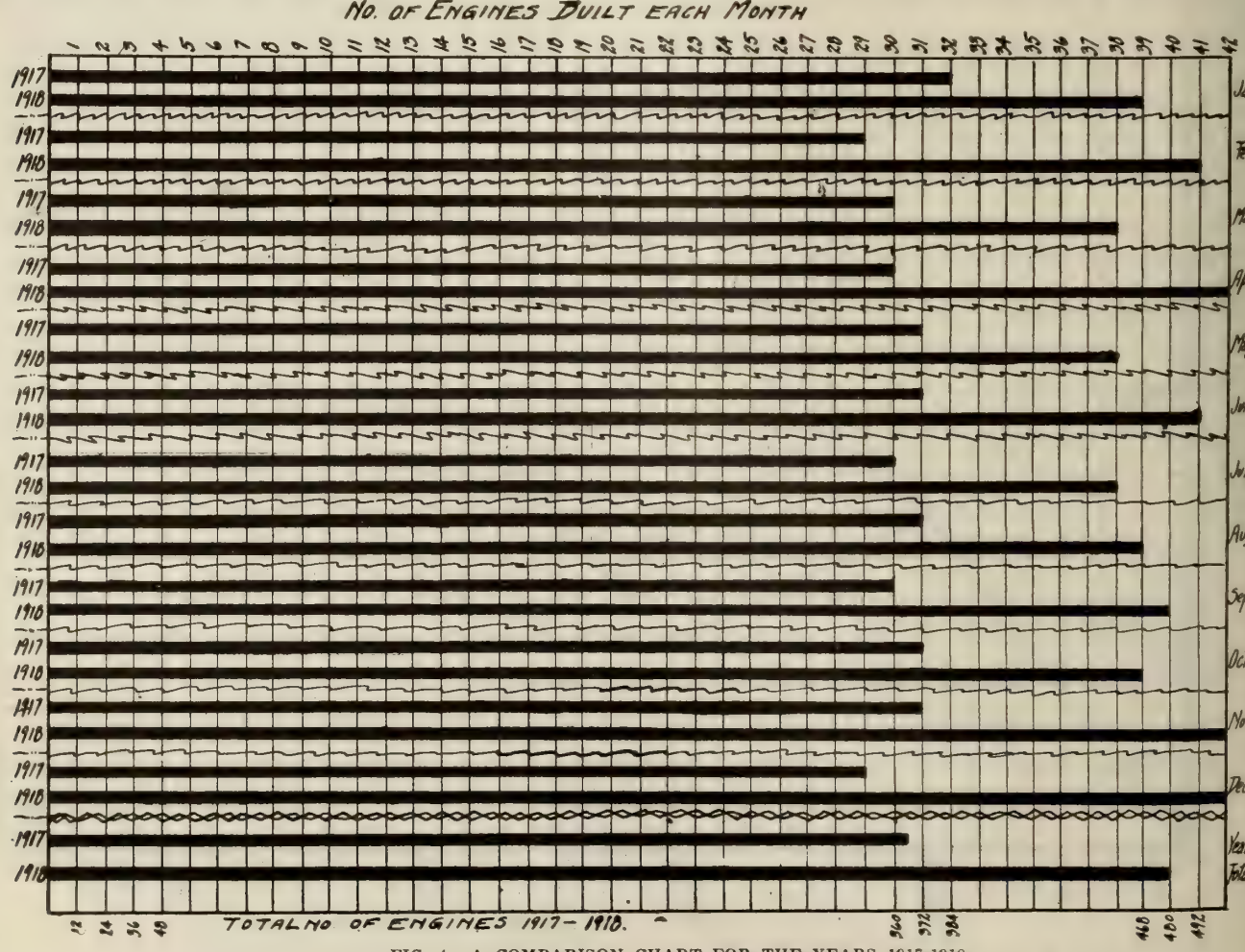


FIG. 4.—A COMPARISON CHART FOR THE YEARS 1917-1918.

The other operation charts also showed a variation in costs, but not so marked as the particular chart illustrated. Every chart on each operation was studied carefully, with the final result that this machine tool spoken of was manufactured at much less cost than formerly. Each department was placed under careful check, and production soared accordingly.

Another source of annoyance to this firm was the great amount of scrap or spoiled work. This item did not begin to show itself until the cost system got into operation. Fig. 2 shows the results in three departments.

As can be noticed the horizontal scale illustrates a half year's work or 26 weeks, while the vertical scale represents the value in dollars. The line A represents the drilling department, the line B the shaping and planing depts., and the line C the lathe department. The chart illustrates clearly that the lathe department was the chief offender as regards spoiled work, one particular week reaching a maximum of $8.50. Investigation proved that carelessness on the part of one particular workman was the whole trouble. Therefore the department itself was not to blame, but only an individual, which proves it never pays to come too hastily to conclusions, but rather it pays to investigate with an honest attempt at discovery, rather than an idea of calling some particular department over the coals. The other departments were likewise gone into, with the result that less spoiled material was turned out by this firm.

We will now go into another business altogether, namely, a firm engaged in the manufacture of gasoline engines. Things were not looking any too bright for this concern, as production seemed very erratic, and costs exceedingly high. A cost system was started and the first chart made was that of the production of engines week by week. Fig 3 illustrates this graph clearly. As can be noticed the vertical line represents the

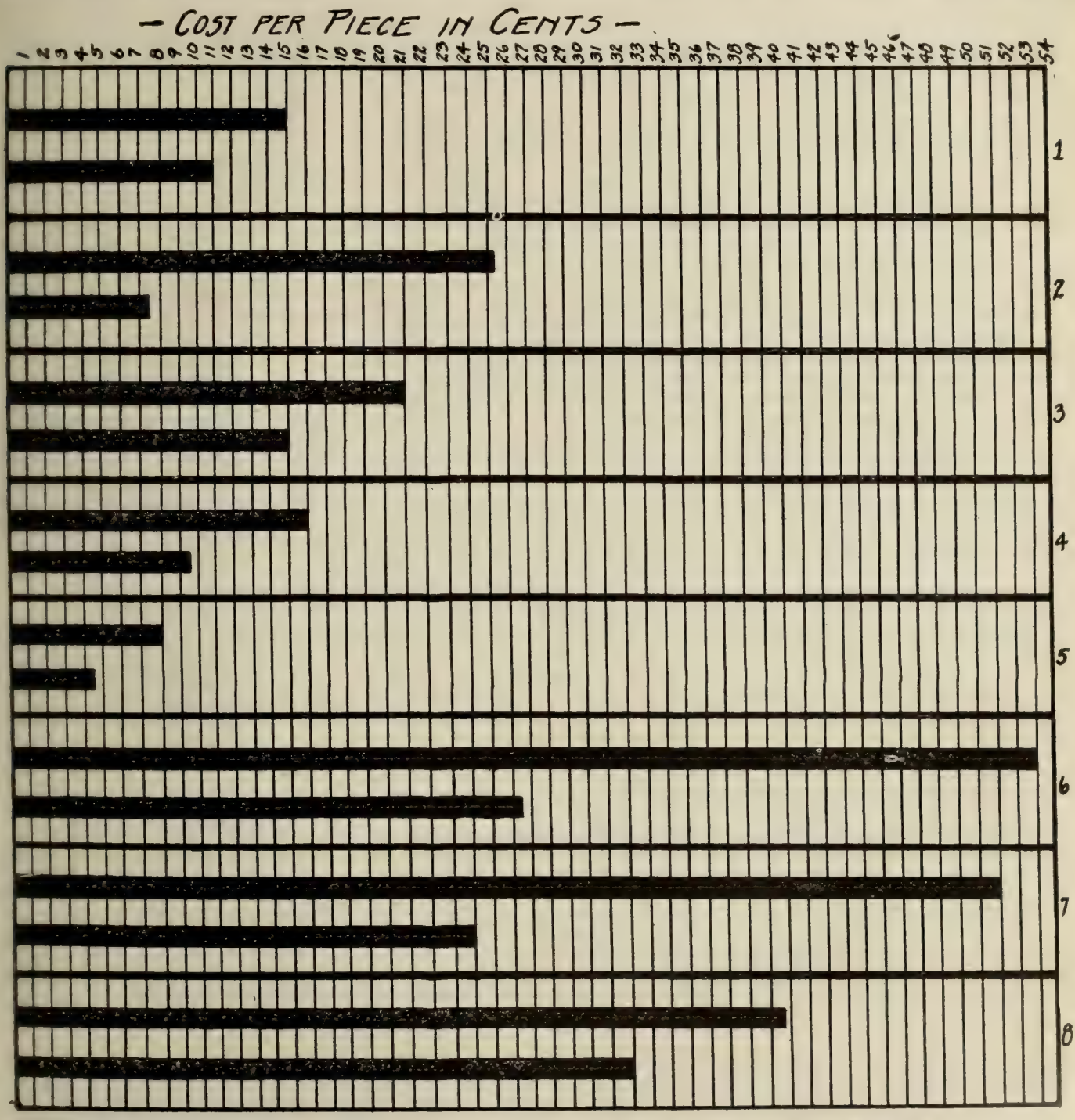


FIG. 5.—ILLUSTRATING THE POINT THAT THE INSTALLATION OF PROPER JIGS IS A PAYING PROPOSITION.

number of engines completed, while the horizontal scale shows the weeks in the month. One of these charts was prepared for each month. In the particular month shown on chart there were two working days over the four weeks.

The line A designates the gradual step in production as follows: eight engines the first week, five the second week, making a total of thirteen and so on, up to a total production for the month of 35 engines.

The lower line B represents the fluctation of production, week by week. To illustrate that it is sometimes a very little matter which hinders production, let us comment still a little further on this chart.

From 5 engines to 11 engines, between the second and third weeks, seems quite a difference, yet this was easily explained after investigation. It was through no fault of the assemblers that this difference occurred, but rather that the work from the various departments was not coming in as it should be. The result was that each assembler naturally slackened up during the week that insufficient parts were coming through.

But look what happened when the parts came through faster. Assembling soared to eleven engines, proving that with a proper study of routing operations throughout the shop, production could increase all around. Later on this theory proved a fact, and before long 18 engines were being turned out each week.

At the completion of the year 1918 a chart was made to show the differences between the years 1917 and 1918 production, with the result shown at Fig. 4.

Instead of a total of 365 engines per year, 480 engines were completed in 1918, making an increase of 115 engines, which was not so bad for the first year's improvement.

Of course, various changes throughout the plant were helpful in bringing these results about, one of the most important of which was the installation of a good practical jig and fixture plan. Wherever thought advisable a jig was made for a piece, where, perhaps, before no such fixture existed, or if it did, it was some poorly constructed affair that hindered rather than helped.

After every jig was designed and put into actual operation, close tab was kept on the new operation cost. This in turn was compared with the former cost. From these two costs a chart was made to show the difference. The result is illustrated at Fig. 5.

Here we see that the horizontal chart designates the cost per piece in cents, while the vertical chart represents by 1, 2, 3, 4, etc., a separate jig for each section. Section 1 represents a drilling jig installed on the connecting rod. Where before this piece cost 15 cents, it was made for 11 cents after the jig was used.

Section 2 represents a milling jig on the same piece, and shows what an enormous difference can be made by a really efficient jig. From a cost of 25½ cents, this piece came down to 7½ cents. These figures were carefully checked and are absolutely correct.

This can be carried right down the line, but we will only take one more example, namely, section 6. This operation was the milling of a certain portion on the cylinder. From 53 cents, the cost was reduced to 26¼ cents, with only an expenditure of $12.00 for a new fixture. In other words, the fixture was more than paid for in the first day's run.

The writer could go on with such examples indefinitely, but he has shown what he believes positive proof, that a cost system, if intelligently handled, is an absolute necessity and a wonderful money saver. In no case shown has he quoted any elaborate schemes, but rather a common-sense method of going after the trouble. These charts will no doubt suggest others equally applicable, perhaps not to the same lines, but to the machine trade generally.

Disraeli had it right when he remarked that "Economy does not consist in the reckless reduction of estimates. On the contrary, such a course almost necessarily tends to increased expenditures. There can be no economy where there is no efficiency."

With these concluding remarks the author will close his article, merely suggesting that when looking around for a cost system, look around also for the correct man to handle it. The practical system, combined with the practical efficiency engineer, cannot help but prove a winner. One without the other is useless, but combined they make a valuable asset to any business.

SOME SPEED

Miss Margaret B. Owen, who now holds the world's championship for speed on the typewriter, certainly tickled the old keyboard, for she pounded out 137 words a minute for one hour. This means she had to hit the keys 12 times every second, which is faster than the ordinary person can dictate. It took seven years of determined struggle before she attained this record.

HATS OFF TO HORSEMINT

Are you aware that when you use your tooth paste you are indebted to a weed called horsemint? This weed grows wild in great abundance in Wisconsin, and is used in tooth wash, and tooth paste almost exclusively. The next time you feel that clean, refreshed feeling of the mouth, praise the wild weed, horsemint.

STARTING EARLY

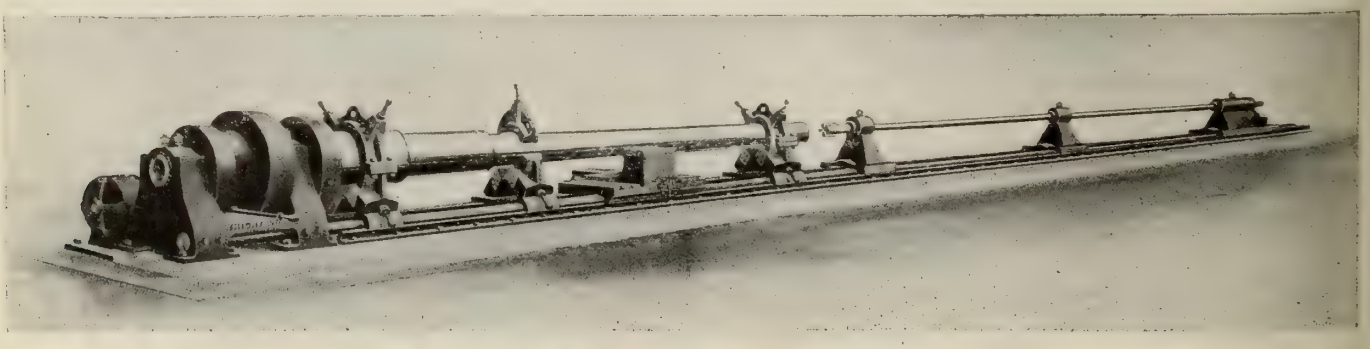
A Cincinnati high school lad, who is rather inclined to model building, has succeeded in building the following models: Submarine chasers, airplanes, and racing car. The car has only a wheelbase of six feet, and has a two-cylinder motor, yet is said to be able to travel at 70 miles per hour.

SOME DUEL

Out of Africa comes the thrilling story of how a lioness and a six cylinder car fought an exciting duel. The car and animal met head on, with the result that soon the lioness was no more. A dent in the car's radiator was the only damage to the car.

THE FIRST PAPER

What is believed to be the first daily paper published was called the "Daily Courant." England was its home, and it appeared in the form of a single sheet, printed on one side only. This paper appeared in the year 1702. Compare this with the paper of to-day, yet this occurred not much more than two centuries ago.—J.H.M.



NOTABLE GUN-BORING MACHINE ON CONCRETE BED.

They All Refer to the Labor Troubles Here

Industrial Leaders in Various Canadian Centres Say Strikes Are Causing Business Interests to Hold Back—Many United States Firms Are Coming to Canada Very Soon

WHEN the war ended last November business men looked with considerable uneasiness to the winter. A large part of the energies of our manufacturers had been diverted to the making of munitions, and in many cases manufacturers had given a heavy hostage to fortune by taking a chance on the war continuing for several years. It was with that expectation that the United States made their war plans.

Those who got into the game of munition making early in Canada were able to write off the heavy expenditure on plant and machinery which was, in large part, useless for peace purposes, and made a good deal of money. To those who began later, fortune was not so kind, and many actually suffered loss from the munition making business. For all there had to be a sudden reversion to peace production again, and even yet things have not begun to run smoothly in their old channels again. The expected trouble was not so severe last winter as was anticipated. The returned men were demobilized gradually, and the gratuity given them enabled them to tide over the winter. There is, as yet, no serious congestion of labor, although some people are looking with some anxiety to the coming six or eight months.

The labor disturbances throughout Canada have been a serious economic mistake. One of the most serious hindrance has been in the building trade. As Mr. Hobson, head of the Steel Company of Canada, pointed out to CANADIAN MACHINERY when interviewed at Hamilton a few days ago if labor does not get down to business soon there will be no building done this season, which will make things bad for next winter, whereas if the walls and rough work were finished now there would be inside work provided for next winter.

"Business conditions are improving steadily," said Mr. Hobson, "and a great deal depends on labor. The steel business is picking up in the United States, and that will likely be reflected here to some extent. Our largest blast furnaces have been under repair for some time and will be blown in again about the 20th of July. We got out of war work before the end came. Our war sales in November were only about 11½% of our output. We never refused to supply anything the Government wanted, but we did not seek war work.

"Everyone realized that it would take some time to get back to a peace basis, and I advised our shareholders of that as far back a 1916. When the war came there was really a much worse upset of conditions than there is now, and times were worse. Canada has a big task before her; but she has also more wealth than she ever dreamed she would have. Our employers took over two million dollars' worth of Victory Bonds. We should not have much trouble in coming back." Referring to the demands for wage increases, Mr. Hobson said: "There has been no demand made by our own men at all. It has been made by the agitators. Our doors are never closed to our workmen. Our men all went out at Swansea, but it was a sympathetic strike. They made no demand on us at all."

Getting Back to Old Shape

Mr. Pook, manager of the Canadian Westinghouse Company, said there was a very good feeling between employers and workmen in Hamilton. The manufacturers and labor people had got together. "We cannot always give them all they want, but in this plant if a man has any grievance I am always ready to talk it over with him. We have many old employees who have stayed by us, and I think they realize that they will get a square deal. At present we are working out a mutual benefit association which will provide cheap insurance.

"We are not completely over the period of readjustment in Canada since the war. It upset things considerably, as we had to have new standards; but we are getting back with satisfactory speed. After the armistice there was a slump in business, but it is coming back now. Even during the war-time rush we tried to keep up with our regular work. We made a great deal of machinery in the way of presses and work for ships, and tried to keep both ends going. The most of the shell machines were scrapped, although a few were rebuilt for rough work. In our case it was lack of business that kept us from getting back to stable conditions more quickly. We are not altogether through the readjustment period yet, but our people have been very reasonable, and we try to reciprocate. We have a 48-hour week here, working 8 6-10 hours for five days and 5 hours on Saturday. There does not seem to be much unemployment in our line. While we are not working full time, we expect that when the grain begins to move production will increase."

The Cause of Labor Unrest

Mr. John Muir, of Goold, Shapley, Muir, Brantford, has some very interesting views on the tariff and other questions, and has what would generally be called rather an unusual viewpoint for a manufacturer. Regarding labor and industrial conditions, he says there seems to be an abundance of labor but very little "labor trouble." Some months ago there was a good deal of agitation in Brantford, but it has quieted down. The manufacturers and the men have had frequent interviews and there was always a good spirit shown. "The unions are on to the Bolsheviki," said Mr. Muir, "and if they appeared here they would be chased out."

"The implement business is rather dull at present. There are bad reports from the West and we have not yet got settled down to proper export buiness conditions. One of the big causes of labor unrest has been that very high wages were made at munitions, and this demoralized conditions in other industries. We had good men here at $3.75 a day, and when we began to make munitions—for which work you could train any ordinary man in a week or so—they saw their fellow employees—green men—making six or seven dollars a day. This naturally caused dissatisfaction. The result was that we had to raise wages all around time after time. There were six munition plants in Brantford. When the munition work closed down there were a number of what might be called second-class men. When they were offered less pay than they had been making at munitions, some of them began to agitate.

"The attitude of the men with regard to agitation has been good, however. I'll tell you a story to illustrate it. Among the workmen we had was a Russian. When the war ended the men had a little dinner among themselves at which this man was present. When the toast to the King was proposed he refused to stand up, and he did the same thing when "God Save the King" was sung. The result was that the men refused to work with him any more, and he had to get out. Some months afterwards he was around distributing seditious and Bolsheviki literature, but he made no headway. I believe in giving labor credit every time, and their attitude here has been good.

"Conditions in the West are pretty bad. I came back

from there three weeks ago. The C.N.R. was tied up with the labor trouble, and our different branches could not ship. Where the drouth was bad, we had orders not to ship goods unless it rained. When I came back I naturally decided we should go slow in manufacturing, which means a reduction of hands.

"It is up to the manufacturers to make every possible effort to get foreign trade, otherwise we shall have a dull winter. That, in my mind, is the solution for the labor question in Canada to-day. We are doing our utmost in that line and have arranged with a big Montreal firm to handle our lines for the Balkan business."

Getting Export Business

Col. Harry Cockshutt, of the Cockshutt Plow Co., says the class of labor they receive is none too plentiful. Their plant is now closed down for inventory, etc., but the prospects for future business are fairly good, though the effect of the crop failure will likely be felt later on.

"As we have attended strictly to our own business and not made munitions," said Col. Cockshutt, "the transition from war to peace did not affect us very much. We kept our organization intact as far as possible during the war.

"With trade conditions uncertain and unrest among labor it is necessary for business men to go carefully in all their undertakings. We find export business fairly good. We are shipping largely to Europe and have had a satisfactory business all through the war. There was a big demand for tractors for their greater production campaign in Great Britain. In that business it is largely a question of giving the people what they want. Their style of implement is very different from the Canadian demand, particularly in plows and cultivating tools. The mouldboard of their plow, for example, is different from the Canadian. The Canadian tractors are very acceptable to them and ours received the highest award at Dublin Fair. Before the war, the tractor plow was practically unknown there, but now there will be a big demand for it.

"Our business is about one-third in Eastern Canada, one-third in the West, and one-third export. In regard to the latter, we have not asked the Government to do anything for us, but have acted on our own initiative. We anticipate a good export trade, and are shipping twenty-one cars to England alone in the next ten days. If Canadian manufacturers want to do an export business they must follow it up personally, as they can then get first-hand information which they cannot get in any other way."

The Damage Done by the Strike

That the strike of the metal workers in Toronto and some of the other industrial centres has set business back the best part of a year is an opinion that is freely expressed in trade and business circles.

"Two weeks before the strike came there was a noticeable improvement in the steel trade," stated Mr. F. C. Brunke, manager of the U. S. Steel Products business in Toronto. "Buying was commencing then on a more generous scale, and there was a return of confidence in the stability of prices that had been absent for a long time. It seems likely that the strike will be settled, and work begun again, but the trouble is that the mischief has been done. Structural work, for instance, is off for the season. As a general thing structurals are put up in the building season, leaving a great deal of interior finishing to be done in the winter. There will be none of that work this winter, as it will hardly be possible now to place business at the mills and get structurals erected for winter completion."

There have been many instances, according to Mr. Brunke, to show that unfavorable events have been plentiful enough to impede the return of normal conditions in the steel market. "Following the signing of the armistice," he remarked, "many of the consumers were in doubt as to what lines to turn to, and even yet there are cases where this same state of mind prevails. 'Waiting' seemed to characterize everything during the first two or three months of the year, and there were several bank officials who came out about then with decidedly pessimistic interviews, which did not tend to improve matters at all. Then toward the end of February the talk of price-cutting began to disturb the market, and every rumor that came out tended to make the buyer of steel think he was making a serious mistake in going into the market. The automobile, stamping, forging and agricultural industries were the first to show signs of recovery, but of course, many of them were covered on their wants by yearly contracts. The month of May also saw the eyes of Canada turned to some extent to Washington to see what would be the outcome of the squabble between the steel mills and the U.S. Director-General of Railroads, who refused to recognize the fixed prices. The impression seemed to gain ground that this move was going to let prices drop to a very noticeable extent. A little survey of the situation would have shown the impossibility of this, but it all helped to hold back the volume of business that should be expected from Canada. It was just at this juncture, after the Washington affair was settled, that there was an improvement. For instance, we were ready to close a deal for the supply of raw material to a firm that was going to make automobile rims in Toronto. It would have been a nice business for the city, but the strike came and the promoters of the business simply cancelled everything. What has happened since then is fresh in the minds of all who have followed the trade.

"Against this, there is an improvement in the buying. During the month of July we booked one order for 15,000 tons, the largest single order since the signing of the armistice. It is particularly unfortunate that Canada has had the amount of labor unrest that has occurred this year. The people of United States take a greater interest in this matter than most people suppose. They watch these events very closely. The Republic has not had anything like the trouble that has been found in the Dominion since the conclusion of the war."

Mr. Brunke, in conclusion, pointed out that the steel trade in United States was in splendid shape, and that in several lines the mills were practically out of the market, being filled to and beyond capacity for months to come. This is especially true of the pipe mills, and semi-finished branches. Prices are firm, in some lines with a higher tendency. It is his opinion that nothing whatever is to be gained by staying out of the market in expectation of lower values.

U.S. Firms Coming to Canada

The future of Canada, industrially, seems to look bright to the outsider, judging from the number who are looking across this way from the other side of the border. Mr. C. W. Kirkpatrick, Commissioner of Industries and Publicity for Hamilton, informs CANADIAN MACHINERY that there is a very pronounced increase in interest among our neighbors regarding Canada. There have been scores of inquiries, and there have been seven new industries from the United States located in Hamilton this year, including the following: Hoover Suction Sweeper Co., of North Canton, Ill.; Beaver Motor Truck Co., Chicago; Quaker City Chemical Co. (a branch of O. F. Zurn & Co., Philadelphia), oils, greases, finishing, etc; Gerard Wire Tie Co., New York (this company is incorporated for $400,000 in Canada); Lynat & Co., of Philadelphia, hat linings.

"The prospects for the future are extremely good," says Mr. Kirkpatrick. "We have at least one hundred United States concerns now negotiating for locations in Canada. They are feeling their way now, with a view to locating within the year. The unsettled condition of the labor market is keeping them back somewhat. Thev are also waiting to see what the preferential tariff will be. If it is high, there will be a great deal of manufacturing done in Canada for export. The Hoover Sweeper Company came to Canada for that reason. They expect

an increase in the British preference. They were not looking to the local market.

Freedom From Strikes

"One thing that has helped us this year in Hamilton has been the freedom from strikes. I attribute this largely to the fact that the men own their homes and are, therefore, more contented. There has been no Bolshevism and no strikes this spring of any account. The manufacturers and labor leaders here are entitled to a great deal of credit for the way they have handled things. After the war they got together and discussed the situation in an informal way, and the factories were readjusted to meet whatever conditions might arise. Foreigners were gradually weeded out and their places taken by returned men. The foreigners had been reaping a harvest. They drifted away. When one was dropped from one factory he was not taken on at another. The foreign population in Hamilton to-day is not more than half what it was a year ago.

"The outlook here is very, very good; and if labor conditions become settled I think 1920 will be one of Canada's big years. The prospects for the coming winter are not so bright, but I hope that new industries coming in will be sufficient to absorb the surplus labor on the market in the fall. By that time the soldiers will have exhausted their gratuity and will want to go to work; and outdoor labor also will be looking for winter work inside. Moreover, manufacturers do not feel like taking future orders, owing to the uncertainty of conditions. But when we get through the winter I think everything will be all right.

"We are getting a good many inquiries from Great Britain for locations, and the first big industry came this year—Porritts & Spencer, Bury, Eng., makers of commercial felts, which are chiefly used in paper making plants. They make blankets also. They think Canada will be the paper-making country of the world in the future, and that they will find a market here for their whole product. They will export to Japan from here. The plant is a million dollar one and employs 500 hands. There are many inquiries from Great Britain, both direct and through their chambers of commerce."

Mosquitoes two million years old.—Writing on the probable antiquity of mosquitoes, as shown by the geological record, Prof. T. D. A. Cockerell, of the University of Colorado, states that the oldest forms positively identified as belonging to the genus Culex or other genera of the mosquito family have been found in Eocene rocks, and are probably about two million years old. A form known as Culex damnatorum was described by Scudder from the Green River beds of Wyoming. Another Eocene species has lately been discovered by Mr. D. E. Winchester, of the U.S. Geological Survey, near Cathedral Bluff, in western Colorado, and is to be called Culex winchesteri.

Experimental air-sounding apparatus has been installed by the British Air Ministry on a 10,000-ton transatlantic cargo boat as another item in its after-war flying programme. The Ministry hopes to make the experiment a valuable preparation for transatlantic flying, and also a thorough test of the four appliances used: Winch, wire, kite, and meteorograph. Two winches are used, as a matter of fact, one at the ship's bow and one at the stern, thus allowing the kites to be flown from either end to avoid entanglement with the rigging. The mooring cable, which will rise five miles into the clouds, is of fine steel, very similar to marine sounding cable. The kites themselves are collapsible and made of fine linen and bamboo in two types, the larger measuring about 8 ft. by 6 ft. And finally, the meteorograph, the brains of the apparatus, consists of a revolving drum on which pen points register variations in humidity, pressure, and velocity of the air. When actually making soundings, this instrument will be towed four or five miles above sea level in the bigger box kite, while the small pilot kite will fly 400 ft. nearer the ship.

Valued for its weather-resisting qualities, galvanized iron or steel has long been produced by dipping sheets of the metal into molten zinc, which deposits itself as a coating of small crystals or spangles. Occasionally, however, sheets have been produced with large spangles which, it was found, improved both the appearance and the non-corrosive qualities of the product, and hence increased the price it would bring. So one plant has raised the value of its output by treating high-grade molten steel with an alloy containing titanium before rolling it into sheets and subjecting it to the zinc bath. It is claimed that 75 per cent. of the treated sheets emerge from the bath with the large spangles desired.

Out of the war shortage of tin has come a new and successful substitute for babbitt as a bearing metal. It is composed almost wholly of lead, hardened by an electrical process. Its high manufacturing cost is more than compensated for by the low market price of lead compared with tin. The new metal shows a tensile strength of 13,000 lb., the figure for genuine babbitt being 11,000; and an elastic limit of 11,525 lb. as against 10,000 for babbitt. Its friction factor is very low. With a shaft running at 400 r.p.m. and a load of 1,000 lb. per sq. in., 150° was the highest temperature reached by the bearing.

Across 11 miles of rough country near Pittsburgh, Pa., is being constructed what is probably the largest gas line in the world. It will have a maximum diameter of 40 in., enabling it to convey 70,000,000 cu. ft. of gas daily from a by-product coke plant to three steel mills.

—Cassel in Chicago "Daily Journal."

The Fiddler Presents His Bill.

The Handling of Material in the Small Shop

The Solution to the Handling Problem is Often a Very Simple Matter if Thought Out Seriously—Here is One Example Where One Problem Was Very Easily Solved

THIS article does not pretend to cover the requirements of the large size, up-to-date plant, but rather applies to the small shop which cannot afford an elaborate crane system to handle their product from the shipping door or platform.

In a small shop, such as we wish to bring the readers' imagination, there is generally a monorail crane installed right down the centre of the shop. This crane is supposed to handle all work within the confines of the shop, irrespective of its position. This usually means that if the shop is rather wide, rollers are placed under the work, when the work is skidded over until it comes within reach of the crane.

They never seem to realize what an inconvenience this is nor the fact that good money is going to waste every time they adopt this near-sighted principle, and so they go on from day to day, merely making ends meet with only a fair profit.

To suggest an improvement is the start of a storm for you will, ten chances to one, hear them say that their shop is not large enough to warrant the expense of a better crane system.

They usually start to talk of the expense of an overhead crane, when often, even if they did desire to place such equipment in their shop they would find themselves without the necessary head room. Briefly they are stalling for wind and excuses and so they plug along under this load.

It never seems to enter their mind that even a monorail system can be installed to cover at little expense the entire floor area without the necessity of using the roller skids.

A PROBLEM IN LIFTING AND SHIFTING WHICH IS TOO OFTEN NEGLECTED.

A little careful thought, together with suggestions from the crane manufacturer, will often bring surprising results in efficient handling, yet the penny-wise, pound-foolish policy continues to exist.

This policy seems to be especially noticeable when it comes to the shipping department in the small shop. Usually the complete department consists of a door instead of a platform, and no mechanical means of transporting ma-

terial from the shop to wagon or vice-versa is supplied.

When the wagon is drawn up at the door this is the signal for three, four and sometimes six men to go out to the door and aid in the lift from the wagon to the door level. This distance is generally at least two feet, sometimes more, and as the material is often quite heavy the result is that the men return to their work in none too good condition, not to speak of the sore spot it always leaves in a man to think that, in a way, although he is employed as a tradesman, yet he is from time to time called upon to do the work of an ordinary laborer.

Another point not considered is the waste of good time. If the day is fine the men as a rule have a little chat, perhaps a smoke if the management is not too strict, and so the expense item mounts up. Year in, year out, this goes on, while if a system of some type was installed the wasted time alone would soon pay for the equipment.

A typical example is illustrated at Fig. 1. Here we see the old, old story. The small shop, with its side shipping door leading into the alleyway, the motor truck has drawn up with the box. That is usually the signal for the foreman to shout, 'Oh Jack, Bill, etc., etc., come and give us a lift, will you?"

But in this case the solution was different and sensible. This firm got tired of the lifting by hand stunt, so rigged up a Herbert Morris 1½ ton crane as shown at Fig. 2.

Of course the problem was solved so easily that no comment is necessary, in fact the solution was self-apparent from the very first. The only difficulty seems to be to convince the owner of the small shop that by installing such a scheme he will save money in the end.

So this article was prepared almost, we might say, as as illustrative moral lesson that it pays to handle your goods mechanically.

HERE IS THE SIMPLE SOLUTION THAT THE MORRIS CRANE CO. INSTALLED.

The Government of India has appointed G. T. Barlow, chief engineer for irrigation of the United Provinces, and J. Mears, electrical adviser to the Indian Government, to inquire into the country's water-power potentialities. They will personally inspect water-power sites and decide which ones are worthy of detailed investigation. This will be the first step in a thorough hydrographic survey in preparation for the eventual development of India's power resources to their fullest extent. The supply of coal is limited, and in view of the great industrial expansion expected in the next few years the investigation of alternative sources of energy has become a question of national importance.

That flowers sleep is evident to the most casual observer. The beautiful daisy opens at sunrise and closes at sunset, whence its name "Day's eye." The morning glory opens with the day. The "four o'clock" awakes at four o'clock in the morning, but closes its eyes in the middle of the day, and the dandelion is in full bloom only while there is strong light.

The Leaside Shops of Canadian National Railway

CAR SHOPS AND TRANSFER TABLE

Forge, Locomotive and Car Shops With Capacity of Ten Engines and Ten Cars Per Month—Round House Also is Provided With Ten Stalls—Interesting Machines in Locomotive Shops

By T. H. FENNER, Associate Editor

TO the citizens of Toronto the name of Leaside has become familiar during the past strenuous years. Though its appearance and the natural features of its approaches are of a bucolic rather than industrial cast, it has been associated with industry of a most concentrated kind. The Leaside Munition Co., one of the most efficient plants under the direction of the Imperial Munition Board, were busy turning out enormous quantities of shells of various calibres for a long period. Close by was the aviation camp of the R.A.F., and from this camp many courageous and expert flying men went forth to battle with the Hun.

Now that these activities are happily no longer required, it might be thought that Leaside would be allowed to sink back to its pastoral calm, disturbed by nothing but the searcher after a lot to build his house on. This is not the case. Leaside having once been the home of national enterprises is perpetuating its good work. On its sandy soil has been reared a collection of workshops, owned by the people of Canada, to care for and rejuvenate the locomotives and cars of Canada's National Railway.

The site has many features to recommend it as a railway shop location. Within about three miles of the end of the Yonge Street car line of the Toronto Street Railway, about one and a half miles from the Metropolitan car lines, with good roads leading to it, and directly on the main line of the Canadian Pacific Railway, it is easily approached. It is near a large centre of population, from which to draw its labor, and also possesses the advantage of having space in which to expand as expansion becomes necessary. There is plenty of land available for home building, and there can be no doubt that the coming of the railway shops will mean the building up of a residential district in the not far distant future. As other industries are locating in the neighborhood, the housing development is altogether likely.

At the present time a portion of the working forces are being accommodated in temporary quarters, bunks and beds fitted up in the round house building. When the round house is put into operation it will be no place to woo Morpheus, the snore of the human being is of but tiny proportions compared to the grunt of a tired locomotive.

The General Layout

The photograph showing the exterior of the buildings gives a good idea of their arrangement and extent. On the extreme right, outside the round house, is a turntable connecting with the main line and with the ten tracks leading up to the round house stalls. Directly behind the round house is the power plant, where the electric power, compressed air, heat and light are generated.

The central building is the office and store space. The office building is a three story erection, large enough to house the full clerical and executive staff. The portion of the building devoted to the stores is directly behind the office. It is of two storeys, and is equipped with a shipping platform extending the full length of the building. The tracks are depressed sufficiently to bring the platform of the cars level with the platform of the store room, to facilitate loading and unloading.

To the left of the office building is the locomotive shop, wherein is contained all the varied machine tools necessary to the work to be done. One side of the shop is devoted entirely to the locomotive pits, of which there are ten. Directly behind the locomotive shop is the transfer table, which is used for placing locomotives and cars respectively in their desired position in the shops. The car shop is behind the transfer table, and our illustration shows this plainly.

The forge shop is situated in front of the locomotive shop and directly in line with it. Narrow gauge tracks are laid in the forge to provide easy handling of material and between and through all shops the standard rails are laid.

On the ground between the shops and the main line a large sorting yard is being laid out, about ten sets of tracks being now in position.

The Forge Department

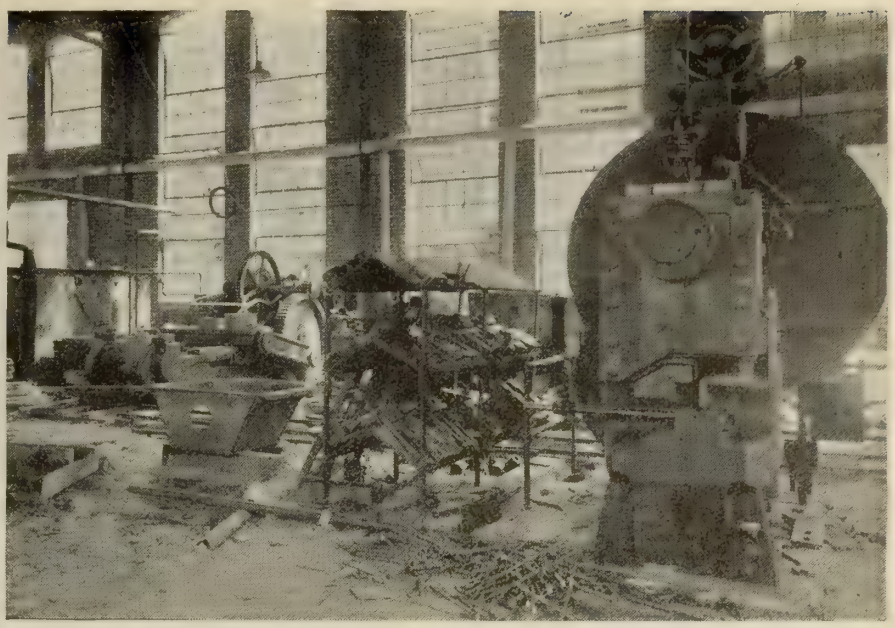
In a locomotive repair shop the forge department is the keystone. This is where the raw material, that will eventually become accurately machined and fitted parts of the great machine is re-

ROUND HOUSE, OFFICE, LOCO SHOP AND FORGE

eived. Here it is heated in oil and coal urnaces, hammered and beaten by hand nd steam power, crushed in a giant uildozer, to finally emerge as connect- ng rods, side rods, brackets, bolts, prings, spring bands, etc. Some pieces, uch as springs, are finished in the forge, while other parts are sent to the locomo- ive shops for machining and fitting.

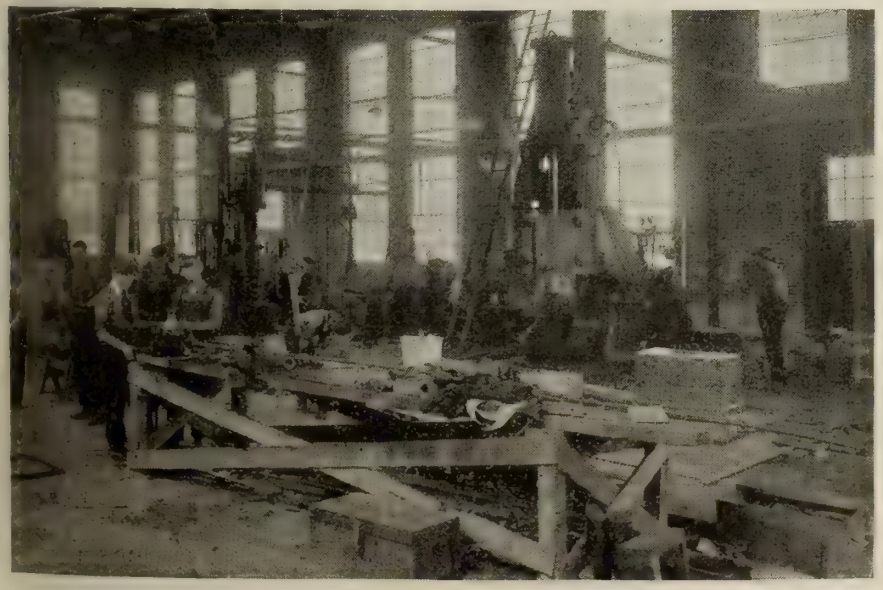
To perform all these operations quite number of tools are required, and killed operators to work them. The hop at the time of writing was not uite complete, some machines not hav- ng been put up as yet. However, work as being carried on briskly, and the wo views of the shop shown in our illus- ration give the reader a good concep- ion of the arrangement.

Down one side of the shop are the coal ires and hand anvils. The centre is de- oted to the hammers, and the other ide to the power machines and oil fur- naces. Entering the shop at the west nd, one sees the tool smith busily en- aged in fettling chisels and sets, etc., at fire on the left. Occupying the centre s a 300 lb. Beaudry motor driven ham- ner. This hammer, capable of deliver- ng blows rapidly, is a very useful tool or such jobs as small welds, making olts, pins, and light work of all descrip- ions. To the right of this is a small oil urnace in connection with a centre unching machine. The work done here s to make a pop in the flat leaf springs, hich serves the purpose of keeping them n alignment in the built-up spring. The it on the one spring fitting into the pop n the succeeding one. Close by this is a 6 in x 12 in. spring bander, working ith compressed air, its purpose being o press the heavy bands onto the springs hich hold the laminations together. his machine is made by Joseph T. Ry- rson, Chicago. Coming down the shop e next find an 8 in. x 1½ in. Bertram hearing machine, motor driven, which is lainly seen in the illustration. Against he wall, and not visible in the photo- raph, is a 2 in. Ajax bolt forging ma- hine, with its accompanying oil furnace. The 8 in. bulldozer can be plainly seen in the illustration, the heavy spur wheel and connecting rod conveying a good idea of the power of this machine. Alongside of the bulldozer is an oil fired furnance, for heating the work. On the occasion of the writer's visit the spring smith was using this furnace to temper and set the leaves of the laminated springs. The photograph taken from the other end of the shop shows the steam hammer, with the blacksmith's fires in the background. The large hammer in the foreground is a Niles-Bennet-Pond 3500 lb. hammer, while the smaller hammer in the centre is a Bertram 1500 lbs. The shop is lofty and well lighted, and there was a notable absence of the gas fumes that too often hang around a forge.



FORGE SHOP, SHOWING SHEARING MACHINE

This is really the foundation shop of a locomotive repair works, occupying the same relative place as the foundry would in a stove factory. As can be seen from the illustrations, ample space has been arranged around all the machines. The bench seen is, of course, only in use while the installation is being made.



FORGE SHOP, SHOWING LARGE HAMMER

The Locomotive Shop

From the forge the logical step is to the locomotive shop, pausing on the way to observe the huge stock of tires piled outside. One also notices the plate rack, where the boiler plates are stored. This is situated at the end of the building, where the least amount for handling will deliver them into the boiler making section of the shop.

Entering the shop, the thing that dominates the eye is the array of locomotives in different stages of dismantlement, occupying the whole of one side of the shops. There is something almost pathetic in their helpless state, contrasting so strongly with the idea of enormous power that a railroad engine usually conveys. There they stand, supported on huge blocks, with their natural means of locomotion torn from under them, while skilful locomotive doctors tear out, to replace in new strength, their innermost vitals.

These locomotives are up for what is known in the language of the road as a "general." Its full description is general overhaul. After a general, a locomotive is good, with the exception of minor running repairs, for a working stretch of from two to five years. The length of time will, of course, vary with the exactions of the service in which it is engaged.

When a locomotive is brought up to the shop for a general overhaul, it is first put over the jackpit. This pit contains a 200 ton electric jack made by the Whiting foundry. The uprights shown in the illustration form supports and guides to the two heavy cross beams, which are raised and lowered by the revolution of the heavy square threaded screws shown.

The locomotive being placed over the pit, the jack is raised till the frame of the engine is supported by the cross beams. The main bearings are then

VIEW FROM GALLERY IN LOCOMOTIVE SHOP

slacked off and the jack is elevated until the body of the locomotive is clear of the trucks. Side rods, conecting rods, eccentric rods, are all disconnected from the driving axle before the lift is made, leaving everything clear for the trucks to be run out.

The body of the engine is now resting on the jack, and in order to free the pit for another locomotive to come in, wooden blocking and low, strong trucks are brought into use. These trucks are run in on the rails and strong blocking built up on them to the locomotive frame. Lowering the jack, the weight is taken on the blocking. The trucks, carrying the locomotive, are then run out on to the transfer table, shown in our illustration. This table performs the service of placing the engines on any one of the ten tracks available. The transfer table carries its burden up to the required track, and permanent blocking is built up from the ground, and the frame wedged up till the weight is off the trucks. These can then be removed and used again for the same purpose on other trucks.

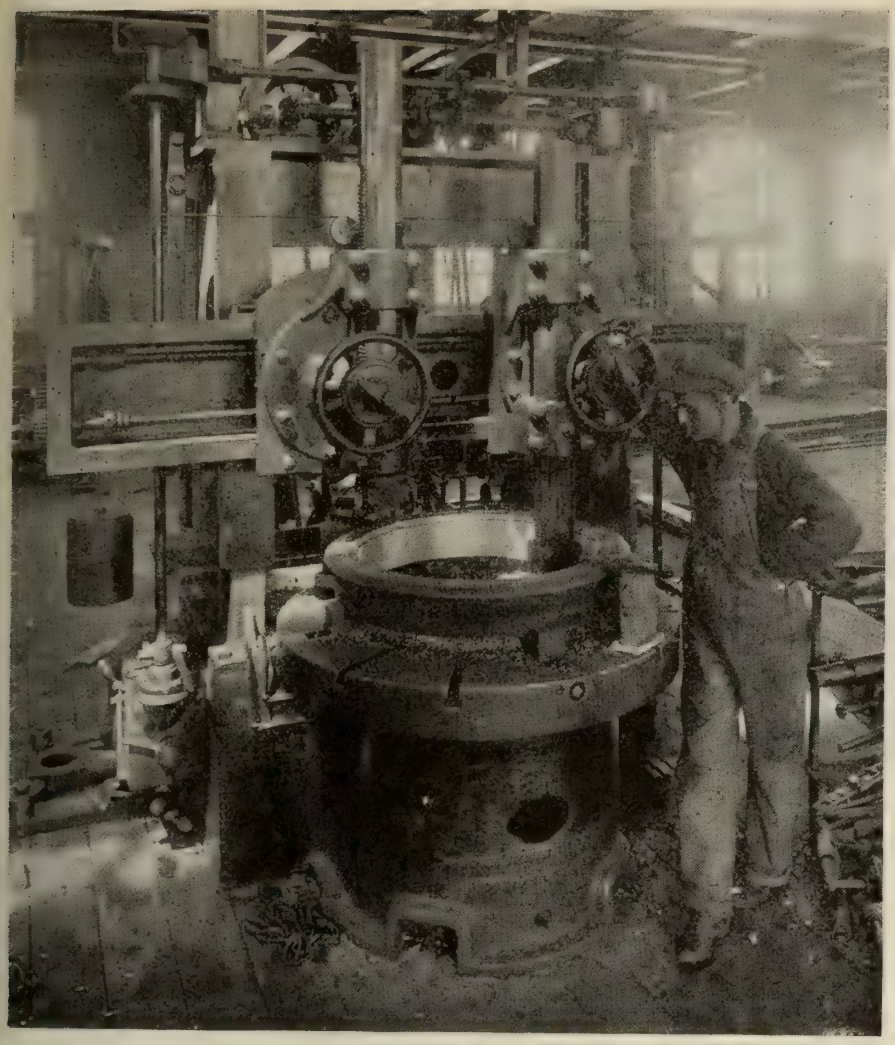
When set up on the permanent blocking work is commenced right away. The boiler will be examined thoroughly and all necessary repairs made. These will consist generally of new stay bolts in fire box, building up of any parts wasted by corrosion with the oxy-acetylene or electric process, removing the boiler tubes, and after cleaning, welding new ends on, if the condition justifies, or if not, putting new tubes in. While these are out the shell will be cleaned internally. The superheater will be gone over thoroughly, and in fact every part narrowly examined.

The engine will be taken apart in detail, cylinder covers removed, pistons drawn, piston withdrawn, in some cases the cylinders dismounted from the engine frame, guide plates, crossheads, side rods and eccentric straps and rods all taken down and examined carefully. Connecting rod and side rod ends will probably require new bushings, cylinders need boring out, new pins fitted here and there. In connection with the cylinder boring, the wirter noticed a very handy rig in the shape of a portable boring bar, driven by compressed air, and bolted on to the engine frame.

The air pump for the Westinghouse braking equipment is dismantled, and overhauled, and all the piping and brake gear likewise. A galley running the full length of one side of the locomotive shop has half of its space devoted to air brake repair and testing. This is, of course, one of the cardinal features of train equipment, and must always be kept up to the highest efficiency. Our illustration shows nine locomotives in process of a general overhaul, and on the second one the tubes can be seen being removed from the boiler.

All three welding processes are in use in the shops. A large motor, which had suffered the misfortune of having its supporting lugs broken off, was being repaired by the oxy-acetylene process. The thermit method is also very much in evidence, and our illustration shows a good example of this style of welding. A portable electric outfit supplied by the

BOILER DEPARTMENT—SHEAR AND PUNCH



BORING OUT TYRES

Lincoln Electric Co., was also seen in the shop.

The Boiler Department

One end of the locomotive shop is fitted to deal with the boiler repairs. There is a tube welding furnace, and welding hammer, where the tube ends are removed.

The rolls for bending boiler plate are here, and a large Canada Machinery Corporation combined punch and shears. This machine, with the men engaged in punching a plate, is plainly shown in our illustration. There is also a double-headed Landis threading machine, where stay bolts, studs, etc., are made. There is also a Jas. Crossen plate shear, Cleveland horizontal punch, and a John Bertram horizontal boring machine.

The Engine Department

Walking up the shop one comes to the motor driven wheel turning lathe, another Bertram tool. This machine is provided with two face plates and two tool holders. The wheels mounted in their axle are centred on the face plates and are turned up simultaneously for the tire to be fitted on.

Close by are located the fitting benches and lathes, where the link motion is fitted up. The link motion, of course, is the valve gear, such as rods, quadrants, valve blocks, pins. This is comparatively light work, mostly for straight lathe operations. There are two "Perfect" engine lathes and one Walcot. There is also a Walcot shaper, which was being used for shaping sides of connecting rod end brasses. Coming further up we come to the heavier tools. There is a Bullard vertical turret lathe, which is employed on piston valve liner work, a Canada Machine Corporation planer, which can be seen engaged on a cross-head guide plate, and a borer of the same make, boring out connecting rod brasses.

A good example of the heavier machine work is shown in our illustration of the Bertram double headed boring machine.

The shop is here divided by a track, for bringing in material from the forge. Crossing over this, we come to the connecting rod, side rod and piston department. The chuck and bottom brackets for main bearing boxes are planed and slotted here also. The machines here are representative. One notices a Bertram shaper, C.M.C. slotter, lathe by the same makers, and a battery of three quick acting drill presses by the Superior Machine Co., Kokomo, Ind.

An American Tool Works motor driven lathe is in use for turning the pistons, rods, axles and such heavy jobs. The large piston rings are bored and turned on a Bertram double headed vertical borer. Another Walcot shaper and engine lathe and a Perfect speed lathe are here. Heavy bolts are made on a Hartness flat turret lathe.

There is, of course, a tire pressing machine of the usual type, but we were not fortunate enough to see it in action. This machine is also a Bertram.

In our illustration showing the locomotives a foundation form can be seen in the foreground. This is for a coach wheel lathe, which will be supplied by Bertrams, who are also supplying an 84 in. boring mill. The Canada Machinery Corporation is furnishing a 48 in. planer.

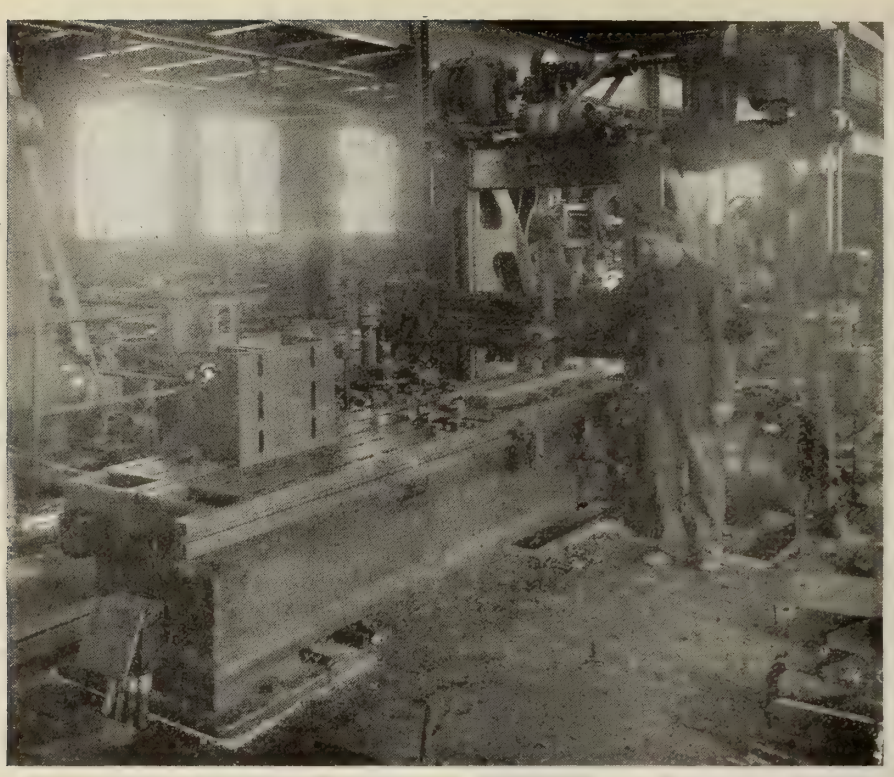
The locomotive shop is supplied by two Northern cranes, each of 15,000 lbs. capacity, and traversing the full length and width of the building.

The Car Shop

Leaving the locomotive shop regretfully, for there was much to interest the observer, and crossing over the transfer table, the car shop is reached. The tracks correspond with those of the locomotive shop, so that the transfer table is available for both departments.

One thing is noticeable immediately on entering the car shop. It is the excellent light available through the many windows and skylights. Light is, of

TURNING WHEEL RIMS



PLANING A GUIDE

course, a necessity here, where so much of the painting and decorating is done to the cars.

The cars that come to this haven are battered veterans. One with its vestibule all crushed in, reminds one of a broken nosed prize fighter. A second shows all one end badly burned up, probably due to an overheated cook stove, it being a dining car.

Most of the tracks in the shop are occupied, the cars on them undergoing repairs so extensive as to suggest in some cases rebuilding. The bodies are jacked up from the trucks and the trucks run out to have the wheels, frames, springs, etc., all examined and repaired. The body of the car is then gone over, all broken woodwork replaced or repaired, upholstery cleaned up, lavatory accommodation examined and renewed where necessary. Finally comes the painting and varnishing and then the car is ready to be put in service again.

A space is left at one end of the shop to accommodate the necessary woodworking machinery, which is similar to that in use in any establishment manufacturing cabinets, etc. All that is at present installed is a swing saw and rip saw. Ten cars a month can be received, overhauled and delivered when the shop is working at capacity.

The Power Plant

The power plant building is located at the rear of the round house, and is a one storey building with firing floor in the basement. The boiler room is situated at the end of the building, nearest to the main tracks, and on elevated track is provided leading to the concrete bunker. Cars of coal are run up this track, over the hatchway and dumped, thus saving any handling.

The boilers are of the Babcock & Wilcox type, four in number, installed in two batteries of 400 h.p. each. They are hand fired and fitted with Cyclone shaking and dumping grates. For returning condensation from the different buildings there in an installation of return steam traps, made by Geo. W. Cole Ltd. The pressure carried is 140 lbs. per sq. in.

The feed pump arrangements consist at present of three duplex outside packed Northey pumps, located in a pump room between boiler and engine room. Here is also the fire pump, which is of the usual underwriter approved type, made by the Canadian Allis Chalmers. It is 14 in. x 7 in. x 12 in., and has a capacity of 500 gallons per minute. There is also a condensing pump by Deane, Boston.

Ascending to the engine room level we find first the Ingersoll Rand unit, supplying the compressed air for the various shops. The capacity of this machine is 1,500 cubic feet of free air per minute, at a pressure of 100 lbs. per square inch. The cylinder dimensions are on the steam end, 14 inches by 24 inches, by 24 inch stroke. On the air side they are 22 inches by 13 inches, the stroke, of course, being the same. The speed of the machine is 170 r.p.m.

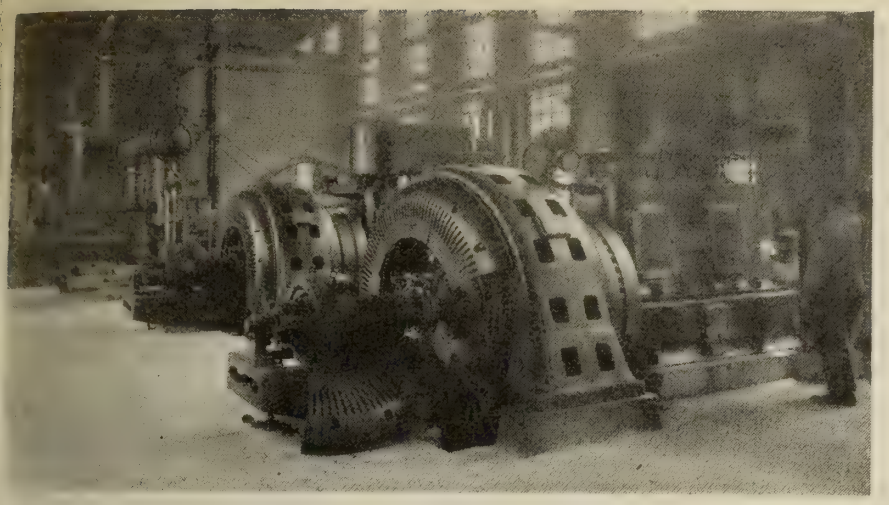
The electric generating units are two in number, and are alternating generators direct connected to vertical compound high speed engines. Both generators and engiens come from Old Country makers, the generators from Scotland and the engines from Lancashire.

The generators are manufactured by Bruce Peebles & Co., Ltd., Edinburgh, and are of the 2 phase, 25 cycle type, generating 360 k.v.a. at 375 r.p.m. The electrical pressure is 560 volts. The exciter for the field coils is connected on the generator shaft, and works at 30 volts and 130 amps.

THERMIT WELD ON LOCO FRAME

The engines are made by Brownet,

200-TON ELECTRIC JACK



DIRECT CONNECTED ALTERNATING GENERATOR

indley & Co., Patricroft, near Manchester. They are of the compound, ertical, high speed, enclosed type, work-ig at 140 lbs. pressure, and with forced ubrication.

For supplying direct current to the ariable speed motors, a C.G.E. motor enerator is installed of 185 h.p.

Tunnels are being constructed between he power house and the different shops o lay the steam piping, water and air ines. These are being carried at pres-nt on temporary trestles overhead.

The Round House

The round house is not really round, being constructed on an arc of a circle. There is, of course, a large turntable opposite, which connects with the main lines and the radial tracks leading to the locomotive stalls.

The house is divided into two sections of five stalls each, the total accommodation being for ten locomotives. This round house is not in use as yet, being occupied, as mentioned above, as a temporary hotel and store room.

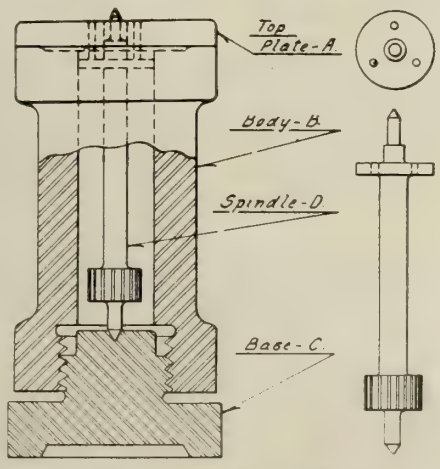
The shops as a whole will employ when complete and in full working trim about 700 men. A permanent industry of this kind must be of immense benefit to the district in which it is situated.

Later when the freight sorting yard is also in operation, Leaside will be an important point on the National Railway system, and will no doubt, engage in friendly rivalry with the Moncton shops for efficiency in their daily operation.

DRILL JIG FOR SPINDLE

The writer had a number of small gearing spindles to drill on the flange as per sketch. The spindles were part of a clock movement used in connection with electrical switchgear. The particulars of the jig are as follows:

A is the top plate made of cast steel, hardened and held in position on the body B with cheese, headed screws and dowel pins, the holes being too close together to allow separate bushes and thus dispense with the necessity of a top plate. The body B is of mild steel, screwed out at the bottom to take the base C and bored out to allow the spindle to drop into position for drilling. The base C is of mild steel, screwed to fit in the body B. As will be seen from the sketch, the base C has a hollow centre which locates the work and keeps it in position whilst being drilled. The screw on the base C is a coarse pitch and short, so that when the work is in the jig and the base screwed up, it just requires a couple of turns to lock it securely. I had intended making the



SECTIONAL VIEW OF THE JIG.

base and body in one piece and employing the same means of locking the spindle, as is used on the breech blocks of artillery, but abandoned it on account of the cost. The jig, as shown, proved very successful.

A certain American plan, which employs a considerable number of girls, were confronted with the problem that their female help complained that the men rushed and crushed them when making for the street cars in the evenings. The following notice was placed in a prominent position with splendid results: "Girl workers, comig in late, say they could not catch cars at the crosstown lines, because men from the plant rush the cars, and a woman might be badly hurt. Let's remember, fellows, that these girls are fellow-workers; some of them have to help support the family. Give them a chance and help them on the cars. It won't hold you back any, and it will be 'helping the other fellow' where it counts."

Since the beginning of the present year unemployment in Denmark has increased at such a rapid rate that it has come to overshadow all other problems. From a pre-war maximum of 50,000, the number of unemployed has increased until it now totals more than 63,000. The Government has been trying to meet the situation by the passage of laws for subsidizing labor union benefit funds, for establishing Government employment bureaus, and for lending money to communities in order to enable them to carry on public works. The Ministry of the Interior has called conferences between representatives of the trades unions and the employers' associations in the hope of reaching a solution of the problem.

A NEW USE FOR TRACTORS

Small tractors are proving of great value to the United States Government in drawing ashore their various seaplanes after their flights. This is a much handier method than wading in for them and pulling ashore, as was sometimes done. The field of usefulness for tractors of small build is practically limitless.

Peonage in Ecuador has recently been abolished by legislative decree. Prior to the passage of the decree, a peon was compelled to remain on an estate as long as he was indebted to the owner, a condition amounting virtually to slavery, since the owner could easily manage to keep the peon in a state of permanent indebtedness. The decree completed the emancipation of the peons by cancelling all their debts. A peon may now go where he pleases, work for whom he will, and enjoy equal rights with other citizens of the republic.

It isn't often that elephants are so numerous that they become a nuisance, but such is the case in a place called Addo Bush, near Port Elizabeth. The pesky animals will persist in spoiling all the farmers' efforts, and once in a while even get real wild and kill some people. The upshot is that the Government have decided to shoot them. This process, they figure, will take at least six months, and necessitate the erection of lofty observation towers. The younger elephants will be captured, if possible, and trained to haul logs in the forests, but the adults will simply be shot, and their meat consumed by the natives.

Getting Ready for the Shop Emergency

Every Well-Appointed Plant Must Have the Means to Deal Quickly and Efficiently With Any Mishap That May Be Encountered—How the Outfits Are Made Up

A FEW years ago when accidents occurred in the shop or factory intelligent first aid treatment was not possible. Training in first aid was lacking and equipment necessary for bandaging, treatment of wounds and burns and recovery from shock was in the majority of industries non-existent. Compensation costs, humanitarian motives and a growing appreciation of the necessity for avoiding loss to the individual and to the community have wrought an appreciable change, and today first aid, together with its more important corallary, accident prevention, is a very live topic.

Industrial accidents naturally vary in severity and in type with each industry considered, but, broadly speaking, may be classified as wounds and bruises, burns, poisoning and infection, electrical shock and those due to organic troubles particular to the patient himself. First aid appliances and remedies, then, should be ample enough and general enough in their nature to take care of practically all these features.

First Aid Cabinets or Boxes

For emergency work in the factory itself and where the factory is not of sufficient size to warrant a first aid room or hospital, cabinets or boxes are of much value and these should contain everything likely to be needed.

Bandages are an important essential, and several sizes should be included. Possibly the most used sizes are 2½ in., 1 in. and triangular bandages, and at least six of each kind should be on hand. The three-inch size is also frequently used.

Gauze and absorbent cotton are also very necessary, medicated gauze being especially useful. Several packages of each should also be kept on hand together with a spool of adhesive tape. The two-inch width is plenty wide enough and can be easily cut into smaller widths as required.

While at first sight safety pins may be considered an unusual part of first aid equipment, yet nothing is handier for fixing and fastening bandages in place.

Antiseptics should be carefully chosen for their efficacy and non-poisonous properties. Corrosive sublimate or bichloride of mercury should not be included, both on account of its poisonous properties and also of the frequency with which it may be purloined. Tincture of iodine, perhaps, is as useful as any, and hydrogen peroxide also comes in handy, while boracic acid makes one of the best antiseptics. Medical supply houses make a specialty of antiseptics for first aid work, and a number of excellent preparations are on the market, such as Triseptol, for washing wounds, etc., and Borofax, a borated ointment. One caution should here be observed. Never purchase ointments, etc., in jars, but always in collapsible tin tubes. The open jar may prove to be a dangerous source of infection, whereas in the tin tubes no infection from previous users need be feared.

Stimulants may be included to advantage and of these sal volatile, or smelling salts, and aromatic spirits of ammonia should always be on hand. Aromatic spirits of ammonia is especially valuable in case of faintness, and as a stimulant in case of shock from wounds, etc., if given with water. Ginger tablets are also of use.

Foreign bodies in the eye, when not deeply embedded, are most easily removed by means of oil, the oil being dropped into the eye under each lid and allowed to work itself out. Castor oil is excellent for this purpose and with it an eye-dropper and a package of camel's-hair brushes should be included.

With the above in a first aid kit should be included a pair of surgical scissors, a tourniquet for stopping the flow of blood, a first aid book, surgical needles and silk, and a pair of dressing forceps, a medicine glass and eye cup will complete the outfit.

The above list is quite complete and should be sufficient for the ordinary first aid kit. Space may some-

THE MASSEY-HARRIS CO. HAVE A WELL APPOINTED EMERGENCY STATION WELL FITTED UP.

times be saved by the use of compressed bandages and gauze, but while these may be used, compressed absorbent cotton has the very decided danger of possible infection from the operator's hands while being pulled out.

No mention has been made of remedies or first aid treatment for burns in the above. This, in some measure, is apart by itself as the likelihood of severe burns is not met with in all branches of industry. Where burns are likely to be encountered, carron oil or picric acid solution should always be on hand. Carron oil, an emulsion of limewater in linseed oil, forms an excellent and soothing first aid treatment, and at least a pint should be kept on hand with every first aid kit where burns are feared.

A precaution should be observed in its use. When a portion of the oil is used it is better to throw away the remainder and to replace it with a fresh sealed supply. This overcomes possible deterioration and infection of the old oil.

First aid outfits are usually put up by those making a specialty of their sale, in wall cabinets or tin boxes. The tin box for factory use is quite satisfactory and for small outfits a tin lunch box painted a good conspicuous red with a white cross stencilled on it is as satisfactory as any.

First Aid Rooms

While in the smaller factories and in the various departments of larger ones, the first aid kit meets many immediate needs, many companies are equipping first aid rooms for the employees where all treatment is given. And while in Ontario the Workman's Compensation Act requires service of this character in plants employing sufficient help, it is usually found that the equipment goes beyond the letter of the law, and is a credit in most cases to the factory where installed.

FIRST AID ROOM OF THE NORTON CO., CHIPPEWA. NOTE THE SCALES AND CHART FOR TESTING VISION.

The first essential is the choice of a well-lighted, airy room of sufficient size, centrally located and accessible. The walls should be painted in a light color, preferably a cream or white enamel, and made as attractive as possible. The floor, where much dirt and sand is liable to be tracked in, should be of battleship linoleum; hardwood marring and losing its finish too easily. Ample ventilation should be provided and windows and doors screened.

Equipment

Running water should be provided, hot and cold if possible. Some first aid rooms in addition to the usual wash basin of good size, are provided with a foot bath. A case in point is the first aid room of the Massey-Harris Co., Toronto, factory as will be seen from one of the illustrations.

An operating table should be provided. This need not have all the fixtures nor flexibility of those found in the operating rooms of hospitals, but should be strong and preferably made all of metal enamelled white.

A hospital cot covered with rubber sheeting over the bed clothes sometimes does service as a dressing table and is often found in addition to it. An instrument table is required. These tables are usually made up of a steel framework enamelled white and with plate glass or porcelain top and shelves. Their usefulness is seen in the illustration showing the Massey-Harris first aid room where bandages in glass jars, antiseptics and dressing basins are seen. Small instruments needed for ordinary accidents most likely to be met with are also kept on the table along with a tray of antiseptic solution.

Other fittings seen in this same room are a two-basin stand and an instrument and storage cabinet. It will be noticed that a small desk is also installed. This in itself is one of the most important features of the room, indicating, as it does, the necessity for careful records of every case no matter how small. Since records are necessary for the proper conducting of a first aid department, and since reports have to be made out to the Workman's Compensation Board, these two functions are combined and the clerical work minimized. In some factories and industries the report made out for office use and statistical reports differs only from the form required by the Board in being made out for all cases instead of only those coming under the Compensation Act. At the Massey-Harris plant Miss Cooper, first aid nurse, keeps a complete record of every case no matter how trivial the accident. This record is of material benefit where continued treatment is necessary.

In the treatment of burns medical practice, as developed by the war, has undergone great changes. The ambrine treatment devised by surgeons in France has worked wonders with cases heretofore considered hopeless. Burns which in the ordinary course of events would have resulted in hideous injuries are now healed up without a trace of scarring.

The treatment is simplicity itself. A mixture of parafine waxes mixed so as to secure a proper melting point in the original treatment were brushed on the injured surface and layers of gauze interspersed between applications. A recent development in this treatment does away with the use of a brush and the melted wax sprayed on by an atomizer which is particularly suited to the first aid station. Two types of these atomizers are in use, one a small one heated on an electric hot plate or other heater, and a larger size with a water jacket which insures even heating and keeps the wax hot longer. The J. F. Hartz Co., Toronto, handle a special burn dressing for use with these or other atomizers which was developed by Dr. Barthede Sandfort, a French military surgeon.

This compound becomes fluid at about 120° F., and is applied to the tissues at a temperature of about 140° F. to 150° F. When applied this dressing causes no incon-

venience but on the contrary relieves the acute pain caused by the burn.

The chief advantages of this treatment are in the ease in which the dressing may be removed without pain and without the tearing of newly-formed cells. Skin grafting is usually unnecessary.

In building up the dressing the wax is first applied, then a layer of gauze, more wax, gauze, absorbent cotton

EMERGENCY STATIONS APART FROM THE WORKS ARE ATTRACTIVE. THIS ILLUSTRATION SHOWS ONE BUILT BY THE TENNESSEE COAL, IRON AND RAILROAD CO. AT ENSLEY, ALA.

and gauze, thus building up a dressing which is mechanically strong.

Equipment and supplies for a first aid station will, of course, include all that has been mentioned for the small shop kits or cases only in a more complete fashion and in greater quantities. Other items which are usually found are hot water bottles, scissors, tweezers, artery forceps, etc. A more varied supply of drugs is found including laxatives, salines, such as citrate of magnesia and sodium phosphate. Mouth washes, nasal sprays, A. B. S. & C. tablets, etc. Stretchers are important and it is often a wise plan to have a number located at convenient points in the shop.

Accident Prevention

Accident prevention has largely outgrown the "Safety First" movement in which it largely had its origin and to-day the display of danger signs is only one phase of the work. While these in themselves are excellent and necessary, it is better still to eliminate as much as possible the occasion for their use. The elimination of hazards and the intelligent education of the employee in the exercise of care both for his own sake and for the sake of others is recognized as being of far more value.

Two heads are better than one and the most effective means of securing the interest of the employees and also the elimination of positive sources of accidents is to put it up to the employees themselves.

Companies having to do with the generation and distribution of electrical power are keenly alive to the necessity for accident prevention and first aid work, not that accidents are more frequent, but that they are more frequently severe and affect persons other than those causing them. A number of excellent organizations have been started for the prevention of accidents by these companies and one which is applicable to general manufacturing is herewith described.

In the first place about 75% of all accidents are due to the man himself, not, perhaps, entirely to his carelessness but to his deficient interest in their prevention. Five per cent. are due to the deficient guarding of machinery, live parts of electrical apparatus, etc. This also includes the accidents due to the removal of guards while working on a machine and their not being returned. Twenty per cent. of the accidents occurring are due to purely accidental causes over which no control or very little can be exercised. These proportions are those obtained by only one company, but may be taken as indicative of industry in general. The most striking lesson to be drawn from these figures is the large percentage of accidents due to the personal factor or the man himself. To effectively diminish the toll taken by industrial accidents it is, then, necessary to interest the man himself at the same time as provision is made for the elimination of the mechanical features of a plant tending to cause accidents.

The system worked out by this firm may be of some interest, and in its working out valuable features worthy of note are evident.

Organization was placed directly in charge of an outside engineer who made it a specialty. In addition to the preliminary work of organizing he has been retained to act in an advisory capacity, and is in attendance at every meeting of the various committees formed. Seven sub-committees were formed, each one representing a particular department or group of departments when they were of small size. The members of each committee were appointed to serve about six months by the head of the department who was also a member, permanent, and who acted as secretary. The chairman of all the sub-committees formed a central committee with more authority, and to whom questions of a responsible nature were referred. An executive committee, consisting of the higher members of the executive staff of the organization, was also formed. The members of the various sub-committees were chosen in such a manner that each represented between 10 and 15 employees. A general secretary and supervisor who served on all committees was very necessary to the co-ordination of the work and to its smooth operation.

The various sub-committees meet once a month and have authority to pass on all matters of safe practice which do not involve the expenditure of money. Suggestions are encouraged from members of the various departments and these are taken up by their sub-committee approved of, rejected or, if of sufficient importance, referred to the central committee.

The central committee is competent to obtain results by the expenditure of money in maintenance work. Recommendations involving expenditure chargeable to capital account, or questions involving radical changes in design or policy are referred to the executive committee or council for their approval.

Recommendations are encouraged from everybody and

LUNCH BUCKETS CAN BE WELL ADAPTED TO EMERGENCY KIT PURPOSES.

each suggestion received is numbered. The number consists of first the number of the sub-committee in which it originated, followed by a dash and then by a serial number which only applies to these suggestions from the sub-committee in question, thus 7—27. Persons originating suggestions which have been put into practice or

have been approved are thanked by a personal letter from the management of the company.

Meetings of the various committees are held once a month in the company's time. Business arising out of the previous meeting is dealt with first and then any suggestions for the elimination of hazards, bettering working conditions, etc., are dealt with, and either acted upon, held up for investigation, or are passed on to the next higher committee where it comes within their jurisdiction.

Every accident is discussed by the proper committee and if possible its cause ascertained. Where possible a remedy is suggested which will eliminate similar accidents in future. The remedy, however, may have to do with more care on the part of the employee, in which case the recommendation is worded to that effect and has the effect of making others more careful.

All accidents, no matter how trivial, are reported and a form similar to that required by the Workman's Compensation Act is used.

The central committee receives a report from all subcommittees and is thus kept fully informed of the activities of all departments. One very important feature of the work is seen in the way accountability is determined. An accident may be due to faulty design, and the injured person entirely free from carelessness. Where such is the case the department responsible for the poor design is held accountable, not necessarily the one in which the injured man worked.

The above arrangement is developed into a monthly accident bulletin arranged somewhat as follows.

Section or Department.	No. of accidents in % This year.	Last year.	Days Lost in % This year.	Last year.
1	10	10	5	10
2	15	15	10	5
3	10	10	10	15
4	15	15	30	15
5	25	15	20	10
6	10	25	10	20
7	15	10	10	10
	100%	100%	100%	100%

The figures used are illustrative only and do not represent actual results.

It may be mentioned that in this present case only two accidents occur in each month in which a day or more time is lost, out of a total staff of about five hundred.

It may be argued that many of the suggestions would be impractical and perhaps even foolish. This is far from the truth, for out of all suggestions received, 72 per cent. have been adopted in their entirety and only about five per cent. absolutely turned down. This is a remarkable showing and well attests to the soundness of the scheme.

THIS ILLUSTRATION SHOWS AN EXTREMELY WELL-EQUIPPED EMERGENCY STATION INSTALLED BY THE FEDERAL SHIPBUILDING CO. AT KEARNEY, N.J.

STEEL FURNITURE ENAMELLED WHITE HAS AN ATTRACTIVE APPEARANCE, AS WELL AS BEING SANITARY. THIS EMERGENCY STATION IS EQUIPPED BY THE AMERICAN STEEL AND WIRE CO.

Many of the suggestions have involved considerable expenditure and the number of things brought to light is truly surprising.

Plans for a tunnel under the English Channel, discussed so frequently during the last sixty-odd years, are now on the verge of materialization. It is announced that England and France are in perfect accord on the subject, and that war experiences have robbed its opponents of most of their contentions. From an engineering standpoint no serious difficulty is anticipated; through the impervious gray chalk underlying the channel bottom, electric drills will doubtless find easy and rapid passage. The plan calls for two 20-ft. tubes, side by side, connected at short intervals by cross openings. A drainage tunnel underneath disposes of seepage water. At the centre of its length the tunnel dips to its lowest grade for one mile, constituting a water lock which could be flooded from the shore in case of military necessity. The total length from near Dover to a point between Calais and Boulogne will be 30 miles, of which 22 will be 95 to 175 ft. below sea bottom. The channel's greatest depth over the proposed course is 180 ft. Estimates allow five years for completion, at a cost of $100,000,000. Electric trains will make the passage in 40 or 45 minutes, giving England direct access by rail to all parts of Europe.

A curious method of casting iron pipe, devised by a Brazilian engineer, has proven quite successful and is being commercially undertaken in this country and Canada. A rotary, water-cooled cylindrical mold receives the molten metal, no sand being used. The iron, at very high temperature, is poured through a funnel into a trough, which is immediately introduced into the revolving mold and turned over. Centrifugal force distributes the metal evenly, and as graduated ladles are used, there is no waste. The finished pipe is withdrawn a few seconds after the iron is poured, coming out lengthwise quite easily. The walls of pipe so cast are remarkably thin and uniform, and tests indicate greater strength and closer texture than result from ordinary casting in sand. Many experiments in centrifugal casting of iron pipe have previously been tried, but did not prove commercially practical. The success of this system is attributed to the cold mold and the instant withdrawal of the pipe, which hardens as soon as poured.

Shellac is often used on gaskets to make them adhere to the metal surface while assembling. Gaskets thus treated are rendered hard and brittle, and must be replaced when the parts are reassembled. Cup grease, smeared on the gasket, will serve the same purpose, and will keep the gasket soft and pliable.

Shop Transportation

HANDLING of Material Coming to Be Recognized as One of the Chief Factors in Efficient Shop Operation.

By J. H. MOORE,
Associate Editor, Canadian Machinery.

IN entering a subject of this nature, one cannot proceed with examples of shop transportation without just making it thoroughly clear what is meant by the term transportation. The meaning conveyed by this term is not confined to the moving of goods over considerable distances, but can be equally applied to the ordinary movements of shop routine.

It is a rather common occurrence to hear some executive remark that their plant is not large enough to warrant an investment in any form of shop haulage, but if they only realized it, the very fact that they are so prejudiced in their viewpoint may be the reason that their shop remains so small.

It may be a long stretch of imagination from shop haulage to automobile, yet for a moment let us consider the similarity. In the automobile field one can choose from the lowly and much abused flivver up to the various master sixes and eights in practically every style to suit the purse. The same condition exists in the transportation field to-day, for, depending on the size of your plant, there is a haulage system to suit your requirements.

It would be the height of folly for a small manufacturer to install an elaborate crane, trucking or conveyor system, but still that does not say he should remain out of the field entirely.

Let him weigh the matter carefully, study his own conditions with an unbiased mind, look around him and see what the other fellow has done, and then adopt whatever suits him best personally, in this way profiting by the experience of others.

But we hear him remark, "How can I best proceed to study this problem?"

The Total Cost of Production

Naturally the first question that arises in connection with a subject of this nature is how the total cost of production is affected by the methods employed in moving material within the plant, outside the plant, and, if necessary, to the freight termianl.

Ascertain how much time is consumed on actual manufacture, then investigate what time is taken up in handling. This applies to both the productive and non-productive forces. For instance a man at a machine might consume five seconds obtaining a piece of work, 2 seconds for the actual operation, and 6 seconds to dispose of the work. This shows that eight-tenths or 80 per cent. of this employee's time is consumed in handling.

From these observations it would naturally appear that in attacking this case in point, the handling time would be the big problem to overcome. Such an illustration as the above may seem exaggerated, but in actual experience it is often found that as high as 90 per cent. is lost by a careless system of handling.

IT IS OFTEN GOOD POLICY TO RUN THE FREIGHT CARS DIRECTLY INTO THE SHOP. THIS ILLUSTRATES THE PLANT OF WATEROUS ENGINE WORKS CO. AT BRANTFORD, CANADA, AND SHOWS THEIR METHOD OF MEETING THIS CONDITION.

To give a concrete example we quote the following case:

This particular operator, by the old system of handling, turned out 336 units of work each day, but by improving the handling detail alone, the operator turned out 584 pieces without any additional exertion in labor, proving that sometimes it is a very small matter which hinders production.

Another case showed that the cost of handling a particular product through a certain department was .59 per thousand pounds. By facilitating the handling of the productive operators alone, the cost was reduced to .12 per thousand pounds. From these two examples it is plain to be seen that the productive operator and his time of handling must be considered as well as the actual haulage cost.

What Equipment Shall I Use?

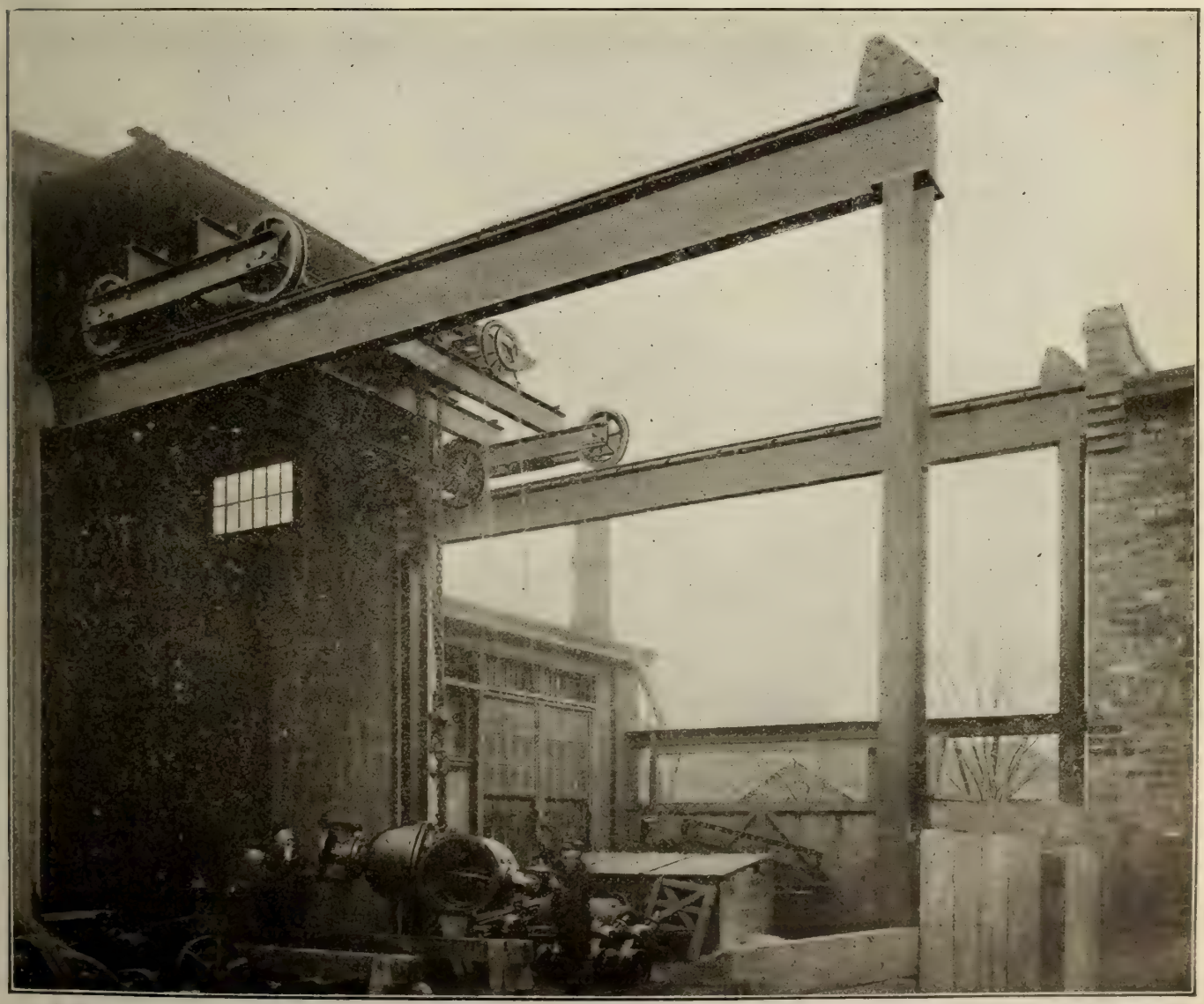
Once you have traced the leak, so to speak, in your methods, the next step is to select from the various items of handling equipment obtainable the particular type that is best adapted to your individual conditions and which will produce the best results at the same time eliminating the greatest amount of time and expense. This ought to be an easy matter, for any concern manufacturing such labor and time savers, are only too pleased, not only to send their descriptive matter upon request, but will even place their staff of expert transportation engineers at your disposal.

At this point, however, it is best to weigh all the various conditions carefully. Suppose, for instance, you find that new equipment of this nature will cost you possibly 30 to 40 per cent. of your estimated savings, and will reduce your handling cost 30 per cent. This looks splendid, but let us go still deeper into the subject.

We will suppose you consider other equipment, which will cost you 60 to 70 per cent. of the estimated savings, but which will save you 100 per cent. handling cost. Which is the better proposition? Of course, the latter installation in this case, which brings the matter up to a definite point, namely that a thorough investigation into the varous details surrounding your own particular problem is absolutely essential.

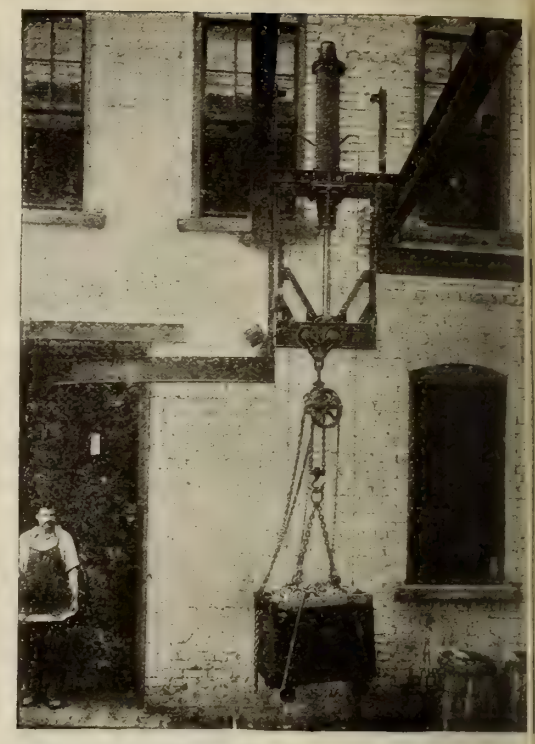
We know of one case where the actual saving in the handling question amounted to $750,000.00 per year in the plant of one corporation, while in several plants over $100,000.00 was saved every year by tackling this transportation bugbear. The wrong solution in any of these plants would have proved a serious affair, but the matter was attacked seriously and sensibly with the result that the installations were a perfect success.

We hear, in fancy, some one exclaim, "But these cases quoted are exceptionally large concerns." True, but everyone does not turn over such a large quantity of business as these concerns spoken of. This fact, however, does not deter you from saving in like proportion to your annual production, which brings us to the point once more



BY CONSTRUCTING YOUR BUILDING IN THE MANNER SHOWN YOUR CRANE DOES DOUBLE DUTY OF INSIDE AND OUTSIDE WORK. HERE WE SEE AN INSTALLATION OF A HERBERT MORRIS CRANE, 10-TON, TYPE G, MODEL. HERE IS A CASE WHERE FORETHOUGHT COUNTED.

THIS JIB CRANE IS ELECTRICALLY OPERATED AND SUITABLE UP TO LOADS OF 600 LBS. CRANES OF THIS NATURE WERE USED EXTENSIVELY IN ENGLAND DURING WAR TIME FOR SPEEDING UP PRODUCTION. THE CRANE RUNS ON NARROW GAUGE TRACKS OF 3 FT. 6 INCH. CENTRES.



HERE IS A VERY INTERESTING INSTALLATION OI SINGLE I BEAM TRACK SECTION LIFT, AS INSTALL BY THE CURTIS PNEUMATC CO. OF ST. LOUIS, U.S THE ADVANTAGES OF A SCHEME SUCH AS SHO ARE SELF-APPARENT, AS IT CAN BE USED IN MA DIFFERENT WAYS IN MOVING MATERIAL THROU OUT THE PLANT.

HERE IS A SPLENDID ELECTRIC CRANE INSTALLATION, FOL LOWED UP BY A WELL-KEPT STORAGE YARD. THE CRANE IS A NORTHERN CRANE.

of remarking, "Study your own particular problem, study it carefully, then act accordingly."

There are so many different kinds of movement time savers on the market to-day that to intelligently discuss the problem we had best consider a few of these one at a time.

The Crane

Perhaps the most widely used of all shop equipment is that of the crane, hand, electric and pneumatic. A plant to be up-to-date must have some system of crane installation to convey their work to and fro throughout the shop. In some cases the hand crane is found sufficient, but in other cases, especially where it would be difficult to reach with either an electric or hand crane, the pneumatic hoist, or air hoist as it is generally termed, becomes the favorite. From these observations we gather exactly the same conclusion as before, namely that your own particular condition is the problem to be considered.

To state definitely the actual saving by the use of cranes would indeed be an arduous task, but of one thing we feel sure, that without them, we would be in a sorry state. The saving differs with conditions, depending not only on the location, but the amount of thought which has been spent in their installation. A crane can be rendered practically valueless by poor judgment in installing. When considering such a problem, one cannot do better than first decide on the make and style of crane desired, then take the matter up with the firm manufacturing the product, who will be only too pleased to give the benefit of their former experiences together with suggestions.

There is another form of transportation which is used practically throughout the world, namely that of trucking. This can be either accomplished by hand or power, but in order to follow up our principle of discussing each system separately, let us consider:

The Hand-Operated Truck

These trucks have many uses, so many in fact that it is well nigh impossible to state them all in an article of this nature. Throughout shops of all kinds, in warehouses and at freight terminals you will see hundreds, yes thousands of these trucks in operation. In some cases they are used singly, while in other cases they are hooked up together as trailers, and pulled by means of the electric locomotive, which we will discuss later. But for this section let us quote an example of saving in hand truck handling.

In one plant recently investigated, which used over 30,000 four wheeled trucks, the estimated savings were approximately $750,000 per year, or 100 per cent. yearly returns on their investment.

The first question to decide in consulting a system of four wheeled trucks, to give moveable floor area, is the best designed truck to properly accommodate your product in its various forms. It is a foolish move to attempt to adopt some standard shape of truck if your product takes on different form to any great extent as it proceeds in its manufacture. If you do attempt to follow some standard your trucks will be only partially efficient. Ask yourself these questions:

UNFORTUNATELY SUCH AN IDEAL SYSTEM AS THIS DOES NOT EXIST IN THE AVERAGE MACHINE SHOP. IT IS USUALLY THE HABIT TO GET THE GANG TO HELP YOU LIFT THE WORK ONTO THE LATHE. THIS MORRIS TRIPE-GEAR CHAIN-BLOCK ELIMINATES THE TROUBLE, AND THE AUTOMATIC BRAKE ON SAME KEEPS THE PIECE SUSPENDED AT THE RIGHT HEIGHT TO SUIT THE OPERATOR. HERE IS A SCHEME WELL WORTH COPYING.

THESE FOUR-WHEELED TRUCKS ARE USED IN KNITTED GOODS TRUCKING TO GOOD ADVANTAGE. THIS TYPE OF TRUCK IS HANDLED BY THE EQUIPMENT MFG. CO., CLEVELAND, OHIO.

Should the trucks have ordinary flat platforms?

Should end racks be used?

Should your truck be totally enclosed or should there only be two or three sides to it?

Should the superstructure be solid or slatted?

Should shelves be provided, or should little compartments be made?

From these leads you can readily see the object of the cross-examination with yourself and shop conditions, for by spending a little time in this manner, you will increase to a great extent the efficiency of the truck.

The size of the truck is an important point, for that determines the quantity of product handled at each movement. Watch your clearances, also your heights. Another point which is not often considered is the question of floor surface. One cannot expect a truck or trucks to operate to best advantage if the floor surface on which they operate is not up to proper standard. Decide on the number of trucks you require to quickly handle your product for it is a penny wise and a pound foolish policy to cut down on the number of trucks and decrease their efficiency and cause congestion.

Since ball bearings have come into common use, the trucking problem has been greatly improved, for even with a heavy load on these trucks the design is so arranged that practically no effort is necessary to propel this type of vehicle.

The Electric Truck

The electric storage battery truck is too well known to need any introduction, for practically in every up-to-date plant one can see numbers of these very handy time savers in operation. There are two general types of these trucks for industrial uses. There is first the carrier truck, which takes its load from place to place, then there is the tractor type, which pulls loaded trucks, to whatever department is desired.

The principle of design is practically the same in both cases, electric motor supplied with current from storage batteries doing the driving. Generally the speed of these trucks is so controlled that they cannot travel at more than a predetermined rate. Steering is done by one hand, while the other is on the driving lever. If the driver moves his hand from the driving lever it immediately returns to neutral and the brakes are applied. But as we are not concerned so much in the design of these trucks as we are in their aid in reducing handling cost, let us consider a few examples of cost reducing.

Results That Count

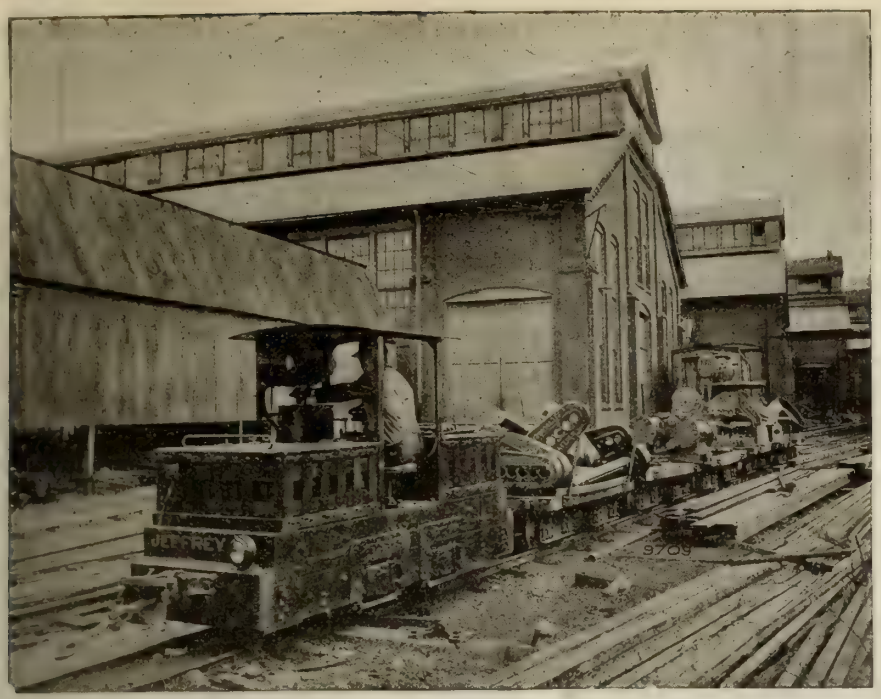
A certain agricultural implement manufacturer installed electric trucks with the following results: Six tractor trucks are now being used to convey raw material from one department to another, where formerly this work was done by 30 men. These new tractors draw an average load ranging from 4,000 to 8,000 pounds over floors of brick, wood blocks and steel plates. Some of the grades

AN ELECTRIC STORAGE BATTERY TRUCK HANDLING MATERIAL IN THE FORGE SHOP. THIS TYPE OF TRUCK IS HANDLED BY THE ELECTRIC STORAGE BATTERY CO. OF PHILADELPHIA.

are as steep as 17 degrees, and range from 25 to 100 feet in length. The speed of these trucks is approximately 4 miles per hour.

In an automobile factory the trucking gang was reduced by 64 men by the installation of eight trucks of various types, varying with the class of work to be done. The average load was not over 1,000 pounds, and the floor areas were good. The finished parts are now handled with less breakage and damage, also there is no congestion

HERE WE SEE A SELF-LOADING ELECTRIC TRUCK MADE BY THE ELWELL-PARKER CO. OF CLEVELAND, OHIO. THIS TRUCK IS OPERATED BY TWO MOTORS, ONE FOR PROPULSION, THE OTHER TO DRIVE THE ELEVATOR. ITS USES AND ADVANTAGES ARE SELF-APPARENT.



A HAULING SYSTEM SUCH AS SHOWN CANNOT HELP BUT REDUCE YOUR COSTS. THIS IS A JEFFERY STORAGE BATTERY LOCOMOTIVE IN USE AT THE OIL WELL SUPPLY CO., OIL CITY, PA. IT TRANSFERS ALL KINDS OF MATERIAL AROUND THEIR PLANT WITH SURPRISING SPEED.

of material as formerly. A saving of considerable amount was also experienced.

In a certain rubber company 16 trucks freed 160 men for other work. This tire company spoken of uses these trucks for handling all hauling in the plant from department to department. The loads run as high as 3,200 pounds, the length of haul varying from 600 to 1,200 feet. High speed is the rule in this plant, the trucks running from 8 to 12 miles per hour. There are no grades, and the floors are wood and concrete. Unnecessary to state a large saving was the result.

Examples such as these could be quoted indefinitely, but enough has been given to prove the point that in every case it pays to move your goods mechanically and systematically. There is no hard and fast rule as to whether a carrier truck or tractor truck is best. This matter rests entirely with your own particular plant and conditions. For short hauls where the routes are short and irregular, and where the driver can easily handle the loads, the carrier truck is the most common. For hauls following regular routes and where there is sufficient work to keep trucks going all the time, with loading and unloading gangs, the tractor seems best adapted to reduce to the greatest extent the trausportation cost.

It is estimated that for a 10-hour day, $1.20 will cover interest, depreciation and upkeep. Of course, this may run higher or lower, depending on conditions.

Much of the operation costs depends on the work being done and the time the truck is actually at work, that is moving material, and the time lost waiting for a load or to be unloaded as the case may be. Without fail watch this latter condition, for here is a great danger point for a leak in the general efficiency.

For heavier work, and run, on the same principle, we have the industrial locomotive. These run on regular small gauge tracks, and the saving which these locomotives accomplish is enormous. Storage batteries, as before, provide the driving power. This, of course, eliminates the fire risk and overcomes the smoke nuisance. Throughout this article are shown various installations of the type of transportation with actual figures of savings.

The Gravity System

There is another transportation system in wide use, namely that of moving material by gravity. It will perhaps be best to quote what one well known firm has to say regarding the system spoken of.

The gravity conveyor is the industrial roller coaster for carrying all kinds of products in every business. It operates for practically nothing, as it uses the free power of gravity, which is on the job 24 hours per day, and 365 days in the year.

To mention what products such gravity systems will convey would be impossible, for boxes, barrels, rolls of paper, brick, tile, lumber, and, in fact all products having at least one flat surface can be carried directly by this means. In the machine shop for instance small parts are placed in tool boxes, while in other plants rolls of cloth, or any products of irregular shape are used, the work is carried on trays, containers or pallets.

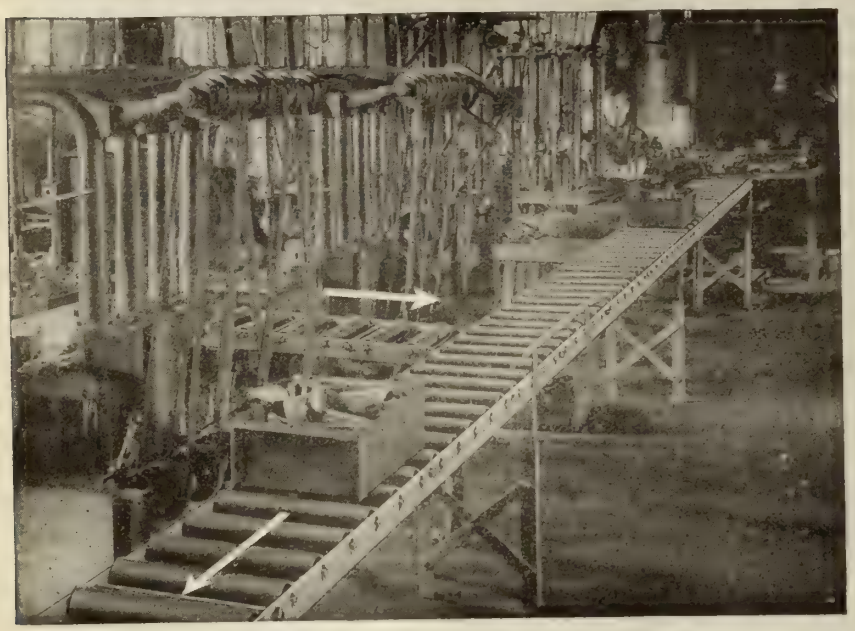
Of course to have an efficient system one must see to it that a system is installed where all rollers run freely on ball bearings. Should economy of space be important the conveyor can be suspended from the ceiling out of the way of machinery and workmen.

Another very strong point in favor of this transportation scheme is the fact that you can use portable sections almost anywhere. This comes in exceedingly handy when unloading cars, or piling cases in storage. These portions can also be provided with hinged sections, which can swing out of the way like a drawbridge when desired.

Curves hold no terrors for the gravity system, for the

THIS IS A CASE WHERE THE ONE MEANS OF TRANSPORTATION HELPS THE OTHER. HERE WE HAVE AN OVERHEAD CRANE WORKING IN CONJUNCTION WITH A JEFFERY INDUSTIAL LOCOMOTIVE. THESE ARE BOTH LABOR-SAVING DEVICES THAT NO LARGE INDUSTRIAL PLANT CAN AFFORD TO BE WITHOUT.

construction of a nice, sweeping curve by the roller system is a very easy matter. A big feature in favor of installing such a method is the small space taken up by the runways. These can easily be run between machines,



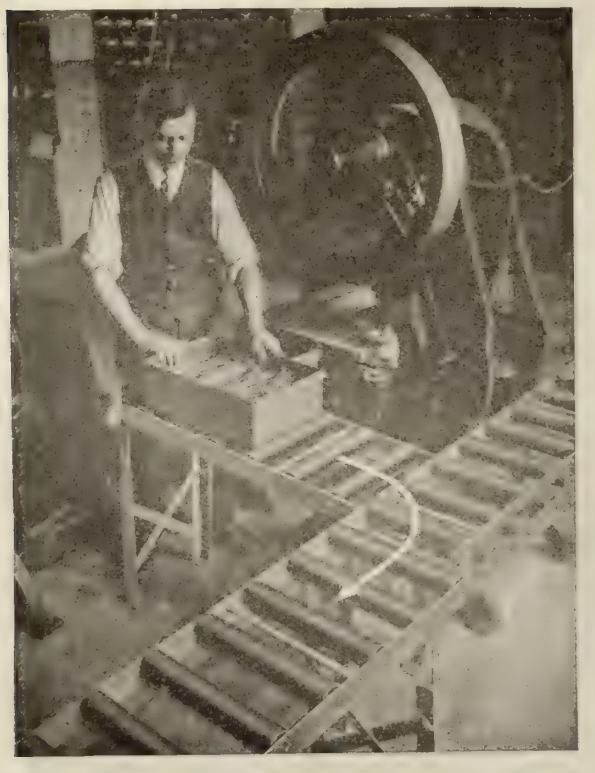
NO ACCUMULATION OF STOCK BETWEEN THESE MACHINES. LAMSON CONVEYORS CARRY TOTE BOXES OF MATERIAL FROM EVERY MACHINE DIRECT TO THE NEXT OPERATION. ONE CANNOT HELP BUT SAVE WITH SUCH A SYSTEM.

THESE CASE-HARDENING BOXES ARE STILL RED HOT BUT BY USE OF THE GRAVITY SYSTEM ARE EASY TO HANDLE. THIS TRACK AS SHOWN CARRIES THEM TO HARDENING TANK, ANOTHER TYPICAL LAMSON INSTALLATION.

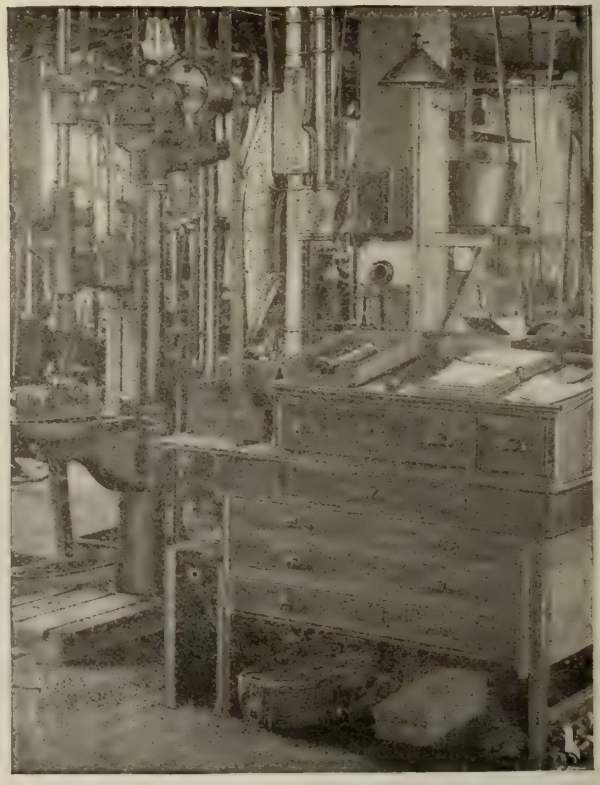
through partitions, around columns and obstructions, in fact they will carry your product wherever you want it.

Lowering devices, spiral chutes, spiral conveyors, boosters and elevators, all come within the scope of this gravity system. Each style has its own particular use and function. A study of the various illustrations throughout this article will really give a better conception to the reader than all the written descriptions are ever likely to do.

The gravity conveyor can be used out of doors to great advantage where rough products are handled. The food product plant, the general merchandise plant, the warehouse, the lumber plant, the department store and factory, the shipping department, the machine shop, the foundry, in fact practically all branches of industry have benefitted



THE OPERATOR OF THIS PRESS MERELY PLACES THE TOTE BOX ON THE CONVEYOR. THE LAMSON CONVEYOR DOES THE REST, AND THE OPERATOR NEVER NEEDS TO LEAVE HIS MACHINE.



THE FOREMAN OF THIS MACHINE SHOP IS IN INSTANT TOUCH WITH THE MAIN OFFICE AND WITH EVERY OTHER DEPARTMENT THROUGH USE OF THESE LAMSON PNEUMATIC TUBES.

by the use of this system. It might well be said that its uses are illimitable, which prompts us once more to remark that it depends entirely on your own particular problem, what system of transportation you install.

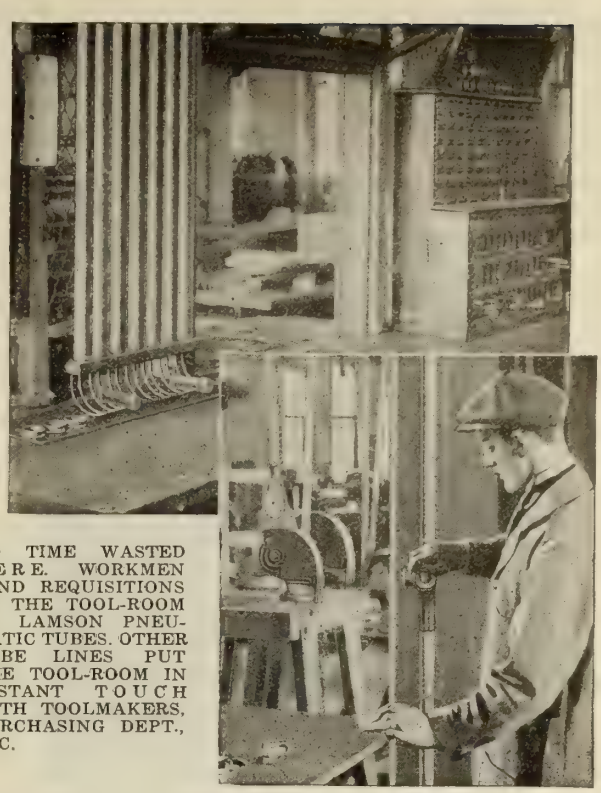
Various Styles, Systems

Then there is the pneumatic tube system of transporting the various papers, orders and materials with great speed from department to department. To go into a detailed description of this method in an article of this nature is impossible, for such a subject is a study in itself. The tube system instantly centralizes all departments. A point not generally known is the fact that these tubes are sometimes as large as 3 in. x 6 in., oval shape, for carrying objects larger than the ordinary letters and general

TOOLS BY THIS METHOD ARE CARRIED WITH LIGHTNING SPEED ABOUT THE MACHINE SHOP OR MANUFACTURING PLANT.

run of work. Tools to the machine shop are easily transported by this method, and the scheme is especially useful if the plant is large, and where a central office issues orders and instructions to the various departments. It practically links up the office and shop in such a manner that at a moment's notice they are in touch with each other if necessary. The use and extent of the tube system depends entirely on your plant conditions, and once more no hard and fast rule can be made in this regard.

Another system of trucking in great vogue is that of the elevating truck. No doubt many people will be surprised when they learn that this type of truck is not



NO TIME WASTED HERE. WORKMEN SEND REQUISITIONS TO THE TOOL-ROOM BY LAMSON PNEUMATIC TUBES. OTHER TUBE LINES PUT THE TOOL-ROOM IN INSTANT TOUCH WITH TOOLMAKERS, PURCHASING DEPT., ETC.

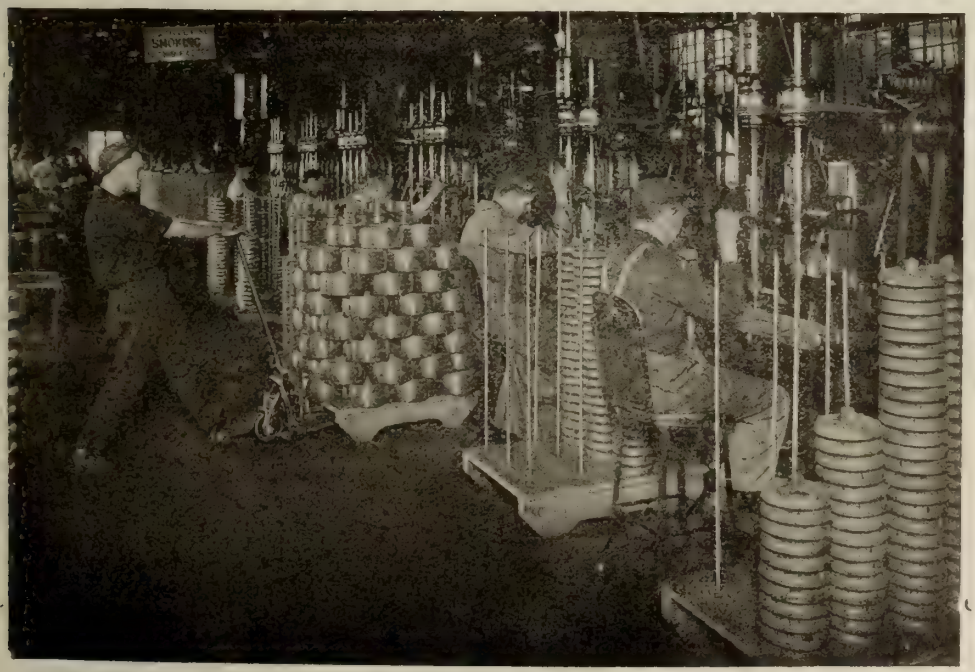
yet ten years old, yet they are widely distributed throughout the world. The first truck of such nature is said to have been built at the paper goods plant of the White & Wyckoff Mfg. Co., Holyoke, Mass., in 1911.

This initial start, meant later the building up of the Cowan Truck Co., Mr. H. W. Cowan being the gentleman who superintended the building of the first truck.

This type of cost-reducer was termed the Cowan Transveyor, and such it is still called. The cost of trucking by this system was reduced to a wonderful extent, in fact a comparison is not amiss but well worth while.

Formerly stock was moved on ordinary trucks which cost from $10 to $25 each, and a sufficient supply for an ordinary factory ran into a large investment. Furthermore, the use of the old style truck necessitated piling stock at start, piling from truck to floor at destination and piling into another truck at destination and piling onto another truck later, when stock was desired in other departments. With the Transveyor system every wooden platform costing $1.50 to $5 becomes a truck the moment the transveyor is pushed under it. There is no piling or rehandling at start or finish.

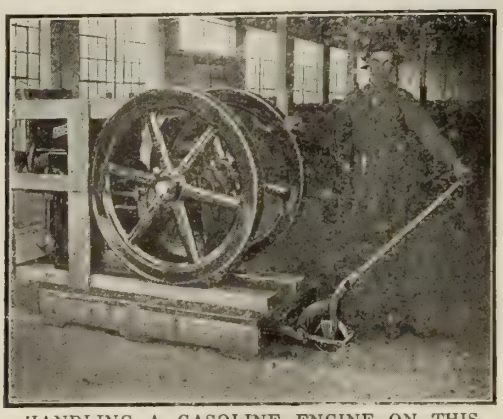
In addition to the economy of handling materials there is, too, a great saving of room as the empty platforms, really trucks, can be tested and piled high in a minimum space when not in use. This is really adding storage space or permitting more space for productive work, something which is not possible with the old style hand trucks.



A SYSTEM SUCH AS SHOWN OF THE COWAN TRANSVEYOR IS CREDITED WITH REDUCING THE TRUCK MEN 25%, STORAGE ROOM 50%, BREAKAGE TO ZERO, AND MAKING IT POSSIBLE TO REPLACE WITH CHEAPER LABOR.

The pleasing feature of the transveyor is that it starts immediately to lighten the labor and to reduce the cost of moving materials. In some factories the results secured in a single month repay the outlay on transveyors and platforms. After a short time other improvements are noticed such as a speeding up of the work in all departments, the promotion of system and cleanliness in the plant and the decrease of danger to stock by bursting water pipes, as the stock is removed from ordinary risk when piled on platforms instead of on the floor.

Although designed for use in paper plants the transveyor is widely used in plants of various kinds all over the world but especially so in the United States and Canada. Large fleets of elevating trucks may be seen hard at work in the largest industrial plants in these



HANDLING A GASOLINE ENGINE ON THIS TYPE OF TRUCK WITH PERFECT EASE.

countries and then again hundreds of small plants, especially machine shops are using a single transveyor daily. The device is used for practically the same purposes in all these places, namely to reduce the cost of moving material and to promote system.

To illustrate results which have been attained by the use of the elevating transveyor we quote the actual figures.

Mr. C. E. Stone, purchasing agent of the Chain Belt Co., says, "Seven men and ten ordinary trucks was our former need. Now five with the transvevyor system handles the work easily and saves us $1,050 yearly in labor cost alone.

YOU CANNOT HELP BUT NOTICE THE SAVING OF SPACE IN A SYSTEM SUCH AS ILLUSTRATED. NOTE THE ORDERLY APPEARANCE OF THE STORED WORK.

Terrance Scullin, master mechanic, Harvard shops of Cleveland Railway Co., comments as follows, "When we moved into new shops we needed equipment to facilitate quick handling of material in bulk to the various operations. Transveyors, because of their durability and ease of handling, made us quick to realize their value for our purpose."

Charles Kantenwein, foreman of the machine shop, The Winton Co., Cleveland, says, "Six Cowan Transveyors are now saving us $5,280 a year."

J. I. McCormick, engineer of methods of Republic Motor Truck Co., Inc., Alma, Mich., says, "The two transveyors and 200 skids cost less than half as much as trucks formerly used, and they reduced our trucking gang by 6 men, saving $5,400 a year, or over $16,000 to date."

These figures speak for themselves, and we leave the various illustrations of this system to speak with these figures.

It is hard to find any article used in industrial plants that became a success as quickly as the elevating truck and it will be just as difficult to find a plant that cannot make profitable use of the transveyor. Another point in its favor is that this style trucks are built in practically every style to take care of various conditions.

Another system of transportation is the tricycle method. This scheme is particularly adapted to the delivery of parcels too heavy for the pneumatic tube system yet too light for the trucking system. These tricycles are narrower and lighter than a truck, and are especially suitable for use in crowded aisles. The small cost is a big feature, and for mail delivery especially it is estimated that one tricycle carries eight times as much as one boy and makes the trip in less than half the time. In one plant alone these vehicles travelled a total of 14,295 miles.

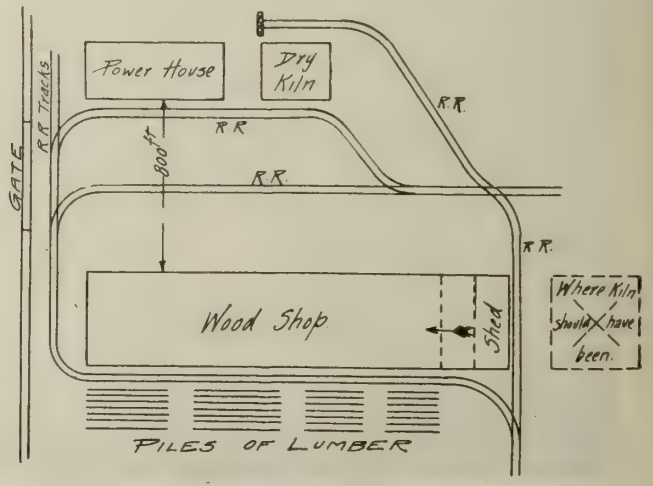
Girls in uniform often run these tricycles to good advantage, as they are light and easy to pedal. We show in the heading of this article an installation of such nature. Here again we realize that as a well known writer once said, "There is more than one way of skinning a cat. In other words the way to get over transportation problem depends on your conditions. Even after you have studied your conditions you will find yourself sometimes in a dilemma when you discover there is more than one way you could get around your trouble.

Caution, above everything else, is essential, for a step in the wrong direction means a loss of real money and time, not to speak of a user who would remark, "Transportation may be all right for others but not for me," while a step in the right direction means a saving in time and money, and an enthusiastic booster for transportataion methods.

The Danger Point

To illustrate the danger of choosing the wrong solution to your handling problem, the writer quotes two cases which came to his attention not so very long ago. The first case was as follows:

In a certain agricultural implement plant one of the products handled was that of long iron beams. To facilitate handling specially constructed trucks were made, but the fact was lost sight of that the problem of getting



PLAN VIEW OF THE ARRANGEMENT OF BUILDINGS.

these trucks into the elevator still remained. It was necessary to trannsport these beams up four stairs.

Too late they realized that while these trucks helped in certain ways, still the problem was not solved. Later it was solved in a very easy manner. An outside elevator, of double chain design, was made outside the building. At certain portions of the chain long hooks, or rests projected. Into these, lengthwise, were placed the beams. Upon reaching the proper height they went through a slot in the wall built specially to accommodate this work. The method proved highly satisfactory and saved this firm considerable money, not to speak of speeding up the work.

The next example, unfortunately, has not reached the stage of successful solution. To explain the blunder fully the writer has prepared a little sketch which is shown with this article to fully illustrate his point of view. Referring to this sketch readers can readily grasp the general lay-out of the buildings with which we are concerned.

In order to save steam pipes, this firm built their dry kiln near the power house, but in so doing proved the penny wise pound foolish theory. True, they saved in the amount of piping used, but since they have realized what an error they have made. Had they built the kiln at the portion marked with a cross on the sketch they would have saved themselves this extra handling trouble.

The kiln, however, went up near the power house, with the result that yearly this firm is losing considerable money, owing to the fact that the lumber must go through the following stages of transportation:

On entering the sidings on the cars it is first taken from the cars and hauled to the piling yard. Later it is taken from here to the dry kiln, a distance of over 1,000 feet, after which it is brought back over practically the same ground to the distributing shed. It is now passed into the wood shop itself, but not before all this wasted time, labor and expense has been spent on it. It will cost considerable money to construct a new building for kiln purposes, although, as this firm candidly admits, that is likely what it means in the end anyway.

From this illustration we cannot help but see that not only does the system of transportation enter into the solution, but also the routine of operations throughout the plant. It is sometimes good policy to change the system of routing to meet with the transportation system, should the corresponding result be worth while.

Which is the Most Profitable?

In an article such as this, dealing only with some various systems in use, we cannot attempt to advise which is most profitable. That problem is strictly up to you. What we will say, however, is this, that if you have no record of what your product is costing you to handle, ascertain this without delay, for it is a more serious matter than many imagine.

Having once discovered this point, then consider what it will cost you, should you adopt some method of transportation. Gather together data from the various firms throughout the country. You will find them eager to help you and the advice of their engineers is worth money to you. Having got this far, weigh the matter carefully, then decide on the scheme best suited to your requirements. Install this system, giving clear thought and judgment as to how it had best be installed to make it really efficient. After you have done this then you can sit back and feel sure that you are going to watch a transportation system in operation which is going to lower your handling costs and place more money for you in the treasury.

Throughout this article we have illustrated various installations together with data showing that mechanical means of transporting goods and material really brings results worth while.

We are indebted to the firms whose names are mentioned underneath the illustrations for the use of these photographs, and feel sure readers will benefit by a study of these illustrations.

VIEW IN A MUNITION SHOP, WHERE THIS TYPE OF TRUCK WAS USED TO SPLENDID ADVANTAGE.

Growth of The Geo. F. Foss Mach. & Supply Co.

Close of the War Brought a Situation That Led Them to Equip Plant For the Rebuilding of Used Machinery—Large Business Grows From Small Beginning

THE steady expansion of the Geo. F. Foss Machinery and Supply Co., Limited, of Montreal, has been an outstanding feature of the past eight years in machine-tool activities. Circumstances have proven a great ally in bringing the business up to its present high standard of service and efficiency, but it is mainly due to the ability and integrity of Geo. F. Foss and his able associates, that this firm now ranks as an equal to many of those of longer standing.

It was in the year 1911 when Geo. F. Foss, then a traveling salesman, decided to branch out on his own account, and, with Mr. M. A. Fuller, established the firm of Foss and Fuller, occupying a small office on St. James St., in the leading machine-tool district of Montreal. Success followed closely on the initial efforts of the new firm and at the termination of the first year's business, the interests of the junior member, Mr. M. A. Fuller, were purchased by Mr. H. W. Hill. Continued success followed the partnership of Foss and Hill, and in November, 1917, the interests of Mr. Hill were taken over by Geo. F. Foss, and the latter formed the incorporated company of the Geo. F. Foss Machinery and Supply Co., Limited.

For many months prior to the formation of the present company—during 1916 and 1917—the country's demands for machinery to take care of the munition requirements of the Empire, necessitated the concentrated efforts of every machinery house in Canada, in co-operation of manufacturers, for the scheduled production of shells and other war supplies. That the firm of George F. Foss Machinery and Supply Co. was among the leading houses in this respect was exemplified in the remarkable growth of the past two years. At the time the present company was incorporated they were housed on the ground floor of the four-storey building at 305 St. James St. The phenomenal development of the business, during the year 1917, meant that additional office and show-room space would have to be acquired for the steadily increasing business. Incidental to the formation of the present firm, therefore, the second, third and fourth floors of the building were taken over, and this extension provided further opportunity to entrench themselves into the goodwill of their customers, who had faithfully supported the sincere efforts in their behalf.

Another Development

The termination of the war and the cessation of all activity in connection with the manufacture of munitions created a situation unprecedented in the history of the machine-tool industry, where the country was virtually flooded with machinery of every description, and ranging from brand new tools to old and used equipment. The solution of the two extremes was a comparatively easy matter, as the first was taken care of in the usual way, while the latter was immediately relegated to the scrap heap, or sent to the cupola. The vital problem was the disposal of the tools that had seen varying periods of service in shell making and had destroyed their efficiency for ordinary domestic work. The volume of standard machine tools in this category was of considerable proportion, and something had to be done to reclaim such tools, and make them fit for useful service. To this end the Geo. F. Foss Machinery and Supply Co., Limited, have purchased a large building on Brennan

GEO. F. FOSS.

HEAD OFFICE AND WAREHOUSE OF THE GEO. F. FOSS MACHINERY & SUPPLY CO.

REBUILT MACHINERY WAREHOUSE OF THE SAME FIRM.

St., formerly owned by the Canada Metal Co., and after making extensive improvements to the property established a warehouse and machine shop and will devote it to the rebuilding of second-hand machine tools and other used equipment. The purpose of this new department is to overhaul such tools and make them as accurate as any new machine.

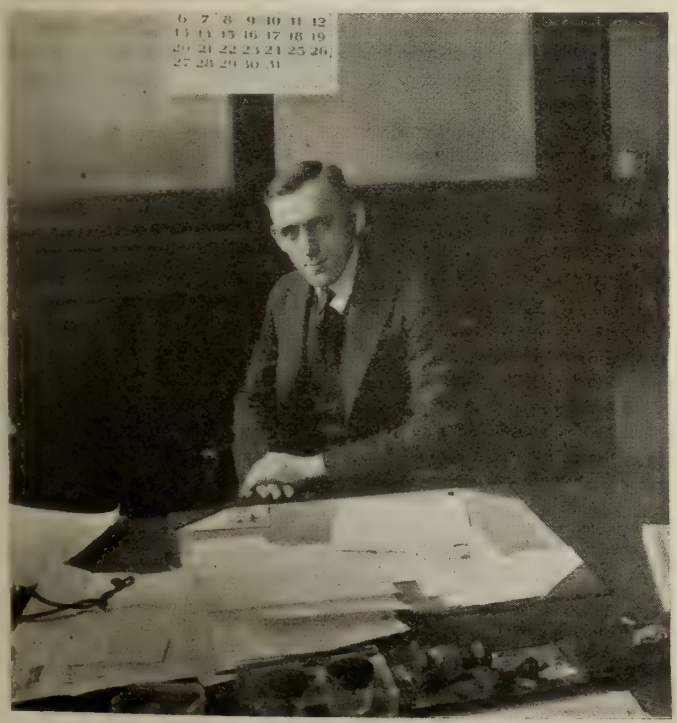
The firm now have ten traveling salesmen constantly on the road, covering the whole of Canada. They also have a branch established at Sault Ste. Marie under the supervision of R. H. Wood as general sales manager for Western Canada. The personnel of the firm is Geo. F. Foss, president; Chas. W. A. Moore, vice-president; W. A. Downing, advertising and small tool manager; A. G. Clarke, secretary-treasurer.

The Personnel of the Firm

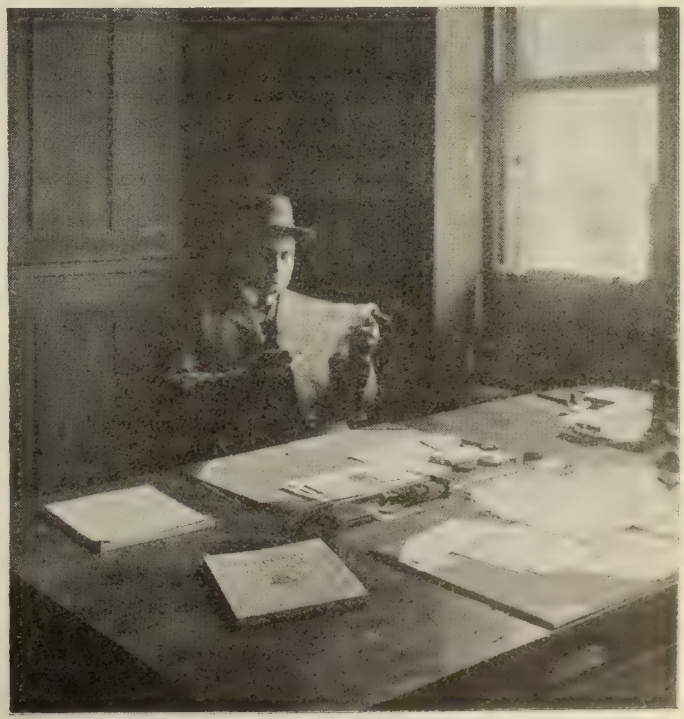
George Foote Foss is a Canadian by birth, being born in Sherbrooke, Que., in the year 1876. His early education and mechanical training was obtained through various scopes along the mechanical lines of machinery and electrical equipment. His business career started in the year 1911, entering into partnership with Mr. Fuller, and later forming the present company of the Geo. F. Foss Machinery & Supply Co., Limited, of which he is now president.

Chas. W. A. Moore, the manager of the machine tool department, is a Canadian, born in Toronto in 1880, but when yet a lad removed with his parents to the Town of Lachute, Que., where he obtained his early education. At the age of sixteen he came to Montreal, where he served in several of the more important machine shops for different periods. In 1906 he accepted the position of fore-

A. G. CLARKE, Accountant.



W. A. DOWNING.
Manager of Advertising and Small Tool Department.



CHAS. W. A. MOORE.
Vice-President and Manager of Machine Tool Department.

SMALL TOOL AND MILL SUPPLY DEPARTMENT.

GENERAL VIEW OF THE MACHINE TOOL DEPARTMENT.

man with the Allis-Chalmers-Bulloch Co., and after three years with this firm was appointed to the position of superintendent of the International Steel Co. of Montreal. He served in a similar capacity with the Buffalo Forge Co. and also with the Hall Engineering Co. of Montreal. In 1915 he became associated with the firm of Foss & Hill, and has been connected with this firm throughout its recent re-organization under the name of the Geo. F. Foss Machinery and Supply Company.

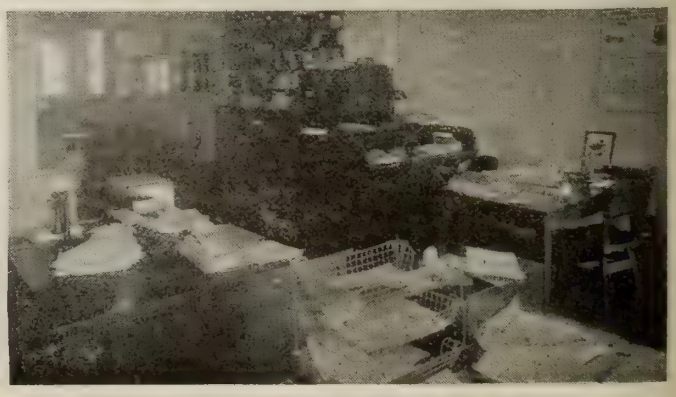
W. A. Downing, advertising and small tool department manager, is a native American, born in Waltham, Mass., 1888. His boyhood was spent in Waltham and Boston, and his engineering experience was obtained through many of the leading machinery manufacturers throughout the United States. He has specialized on small tool equipment, serving with many of the leading manufacturers. He became associated with the Geo F. Foss Machinery & Supply Company Limited, about three years ago and was placed in charge of the small tool department, being later appointed as advertising manager.

A. G. Clarke, accountant with the Geo F. Foss Machinery and Supply Company has had this position for the past five years. Prior to his present connection he was three years with the Amalgamated Asbestos Company, and three years with the Canadian Car Company, in a similar capacity.

Several times during the same season heavy floods lifted a large wooden pipe line, supplying a hydro-electric power station clear of its supports and battered it against its ballast bed. Yet examination at the end of the season showed that the pipe was perfectly sound and had retained its circular shape throughout. This is noteworthy, as the pipe was almost four feet in bore, was strengthened only by loops, and was anchored only at the intake. It seems to indicate, too, that wood-stave pipe is a great deal stronger than is generally supposed, and is well fitted for use in hydro-electric plants.

A new device for softening the seals of storage batteries by steam works automatically. A steam generator, a steaming box and a water supply tank are its essential parts. The generator consists of a small cylindrical tank placed over a little gas, oil, or gasoline stove. It contains a small float which operates a plunger to close the water in-take valve as soon as the water reaches a point about three inches from the bottom. In this manner the amount of water in the tank is automatically controlled to remain constant so long as the outside tank is replenished and the mechanic can put a battery in the steam box and leave it without attention while the seals are being softened, while he does other work.

ACCOUNTING DEPARTMENT.



OFFICE OF THE PURCHASING AGENT.

WELDING AND CUTTING

Interesting Examples of Welding and Cutting

Discussing the Oxy-Acetylene and Oxy-Hydrogen Methods, Together With Detailed Data, Covering the Examples Illustrated —The American and French Torches Are Described

By FRANK C. PERKINS

THE accompanying illustration, shows the cutting of a 36 in. shaft by means of an American cutting torch, developed at Boston, Mass., the details of construction being indicated in drawing, Fig. 2. The welding and cutting torches, noted in Figures 3 to 9, indicate the methods of oxy-acetylene welding with torches, developed at Bordeau, France, by Maurice Ledoux & Co.

This American cutting equipment is extensively used in steel foundries for cutting off risers from 6 in. to 26 in.; in larger forge shops to cut billets, shafts or squares out of crank shafts; in junk yards to cut up heavy stock. It is used on all warships liable to get into action for the quick removing of debris. A small investment of a few hundred dollars will save millions of dollars invested in a ship and many lives besides.

The pictures of the 36 inch cut show plainly how this torch just walks through these heavy thicknesses. These have been very successful hand cuts made on 26 in. solid and 36 in. hollow shafts. In short, the equipment has proven to be reliable and easy to run. Interesting speed tests made by operators of the Watertown Arsenal on 15 in. risers show cuts made in 9 and even 8½ minutes, the cuts being as clean as if cut by a saw—an excellent performance, as will be admitted.

The Boston Bulldog cutting equipment is a heavy duty equipment, therefore every part of it is specially constructed for this work. The regulator is one of exceptional dimensions. It carries a safety release built on the principle of a regulator, set to blow off at 250 lbs. pressure and is attached to a manifold so as to connect 4 oxygen cylinders with this one regulator. This produces an even flow of oxygen. As a combustible gas, hydrogen is preferable, as its chemical action is steadily keeping the slot clean which increases the cutting action of the oxygen. Oxy-hydrogen has a peculiar action on the tip holes, clogging their outlets up after a while, and for good working conditions, the hole outlets have to be reamed out once in a while in order to preserve their original width. Otherwise there is nothing to interfere with the perfect working.

The American welding torch is carefully designed, so that the mixing chamber mixes the oxygen coming through

CUTTING 36-INCH SHAFT WITH CUTTING TORCH DEVELOPED AT BOSTON, MASS., BY THE GENERAL WELDING AND EQUIPMENT CO.

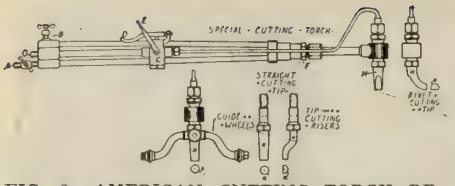


FIG. 2.—AMERICAN CUTTING TORCH DEVELOPED AT BOSTON, MASS.

the centre hole into which the acetylene is sprayed in through a number of fine side holes, thus producing a perfect mixture. The handle is screwed onto the torch base and can easily be removed by loosening a set screw. Four large vent holes are drilled through the base and the mixing chamber castings, so as to procure a perfect ventilation. The thread for acetylene is ¼ in. pipe and for the oxygen inlet ⅜ in. pipe, so that the hose cannot be connected wrong. The mixing chamber is far removed from the tip end or heat zone. The unmixed acetylene can therefore not get overheated and cause flash-backs through decomposing, nor can it get so hot as to carry in expansion and cause fluxions of the mixture, thus changing the character of the flame. The flame, once set neutral, will stay neutral, regardless of the varying heat at the tip end.

If it is desired to see the difference between a torch mixing in the head and one as shown, mixing far away from it, it is only necessary to try both on a deep, heavy break, where all the heat comes back on the torch end. The former will soon start flashing every few minutes, and the latter will operate without interruption. Naturally, the weld can then be made in less than half the time and with less than half the amount of gases. The flame will keep absolutely neutral and the weld will be strong and uniform. Rubbing the lighted tip against flat faces and showing that the tip will not flash, never proves how a torch will work under really trying conditions.

It is claimed to be a combination welding torch, that is, a torch base with two extensions is used, so as to have either a 16-inch long torch or a 22-inch long one. In special cases, a still longer extension can be supplied to make the torch 30 inches over all. Thus the operator can just connect that extension which is the most suitable for his work. There is no need of having several torches of different lengths. One torch base with the two or three extensions would practically give you two or three torches in one. Every length of torch is well-balanced, as the principal weight is in the handle and the torch end is so non-obstructive that even difficult spots can easily be reached. Each torch is supplied with a set of nine tips, able to do all possible work. Every tip can be regulated within wide limits from full heat down to ¼ heat without ceasing to work properly.

Aside from the gas consumption of the preheating flames, which is only a small percentage of the total consumption, the main expense is the oxygen used for the cutting and in order to get a real idea for this expense, it is necessary to start from the theoretically necessary amount of oxygen to burn the iron or steel out of a slot of a certain size, and to figure out how many cubic inches have to be burnt out. You then find that burning out a slot of ⅛ inch width in a 1 inch plate over the length of 1 foot, we have to use a minimum of 1.9 cubic feet of oxygen. For 2 inch plate it would be double and for other sizes in proportion. A 1-16 inch to 3-32 inch slot would be about the regular width when cutting thickness of 1 inch and over by hand.

For smaller stock and when cutting with a machine, this slot could be reduced less than 1-16 inch and therefore the theoretical consumptions cut down in proportion. All these finer cuts have to be made with specially fine type, which need special care to keep them in shape and must be operated by a first-class man. They show what can be done under special conditions, but would not prove a success when made by the average class of men.

This theoretical consumption is, of course, far below the amount you really consume, because it refers to pure oxygen and pure iron. Now, the commercial iron and steel contain carbon and sometimes special ingredients, as nickel, manganese, vanadium, etc. If the carbon goes to such a percentage as in cast iron the oxygen will not cut any more and from this you may see how the consumption of oxygen increases with the percentage of the ingredients. Furthermore, commercial oxygen is not absolutely pure, 99 per cent. being a good average for the electrolytic oxygen and 97 per cent. the average high mark for oxygen made from air. Practical tests with cutting show, however, that the oxygen consumption increases 25 per cent. if you cut with 97 per cent. pure oxygen against a 99 per cent. pure one.

Then there is some surplus of oxygen

FIG. 4.—FRENCH TORCHES OF MAURICE LEDOUX & CO., OF BORDEAUX.

FIG. 3.—OXY-ACETYLENE WELDING BY MAURICE LEDOUX & CO., BORDEAUX, FRANCE.

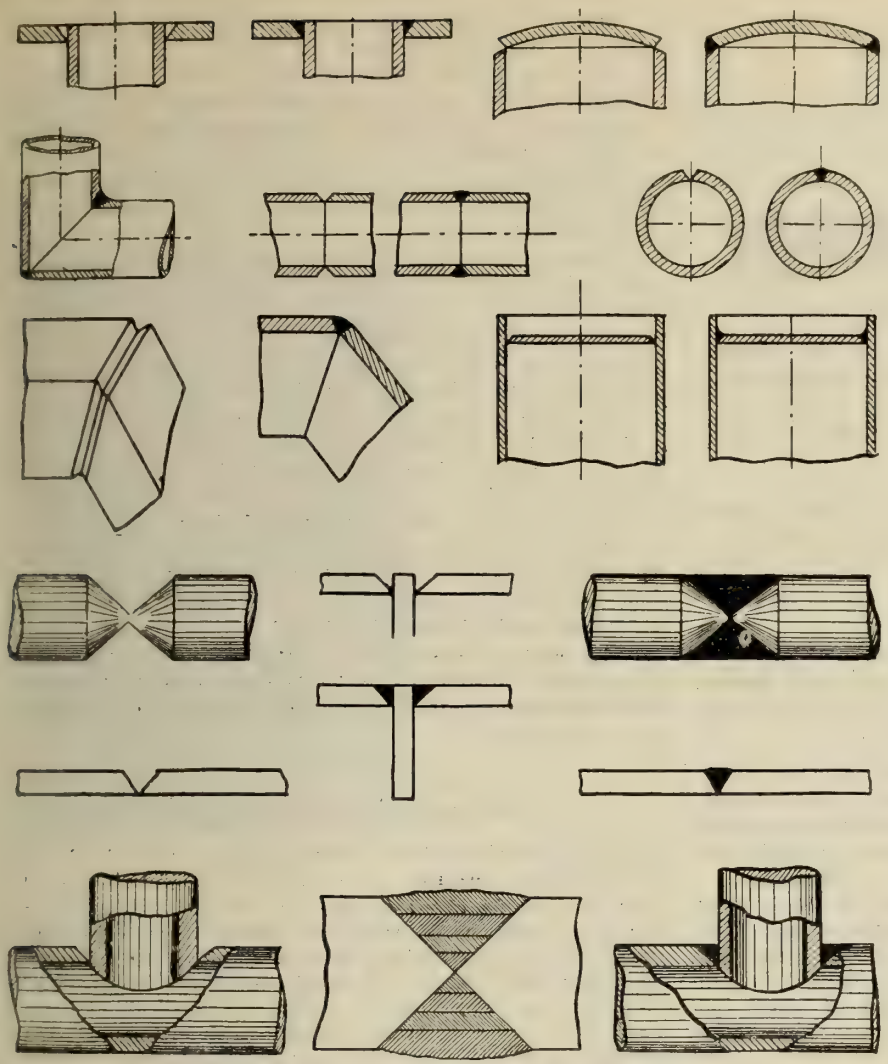


FIG. 5.—EXAMPLES OF FRENCH WELDING METHODS.

necessary to blow the burnt iron out of the slot. Then there is the human element. Some operators cut slower than others, or have an unsteady hand, which means a wider and longer cut. Others move the cutter too quickly and do not cut all the way through and have to cut parts over again. Others use pressures far in excess of what is needed and simply waste oxygen. Then a great deal depends on the kind of an oxygen reducing valve you are using. Only the best kind of valves feeding without vibrations, such as our double diaphragm valves with forcibly guided seats, are good and economical for cutting. Finally there is a great difference in consumption if the iron or steel is rusty or full of scale, or if you have to cut through several plates bolted or riveted together.

It is stated that the bulk of cutting is done with oxygen and acetylene as a preheating flame, and for thicknesses up to 1 in. and even 3 in. to 5 in. it might be handier; but when it comes to heavy cutting, from 5 in. and up, and hydrogen can be supplied at a reasonable price, hydrogen is preferable. Whenever it comes to heavy cutting, 8 in. and more, hydrogen should be used exclusively, if easily procurable. The oxy-hydrogen flame is not so easily adjustable as the oxy-acetylene flame, as the cone is difficult to see. Therefore, it is a little hard for the beginner to adjust the preheating flame right. In some instances hydrogen could be mixed with a small percent. of oil gas and then the cone comes out bright.

Another gas for cutting is the so-called "Drigas," a light oil-gas which does not liquefy when compressed into cylinders. It is good up to 8 in. cutting. In the natural gas district, natural gas can be used to advantage. Heavy thicknesses averaging between 2 in. and 5 in. can be cut with any of the mentioned gases, and it is more a calculation if these other gases can be as easily procured as acetylene, and if the price of the gases is favorable. If the price of acetylene is 2 cents per cubic foot, the other gases must not be higher than 1¼ cents per cubic foot, in order to compete commercially. For every heavy cutting, however, hydrogen is the only gas to use to advantage. For cutting in narrow places, as inside of boilers, many prefer compressed oil-gas, regardless of the thickness to be cut, as this gas has the lowest explosive range of any of the gases mentioned. Should a hose be damaged in these tight places and catch fire, it is better for the operator to face a lazy burning and very little explosive gas than acetylene or hydrogen.

Expensive brass and bronze brushings are often thrown out of production and consigned to the scrap pile at inspection benches on account of being turned undersize. These may be saved by building up the diameter with copper plating, the expense of so doing usually being slight in comparison with the value of the article.

The old Greek custom of hurling into space their spears, arrows, etc., by means of the catapult, is proving mighty handy in these modern days, for we now launch our airplanes by this same scheme. The catapult runs on a two-rail platform, and is operated by compressed air. The installation is used on board ships, and has proved a decided success.

When silver-plating steel or brass articles, much annoyance is caused by the scaling off of the silver during the burnishing process. This may be very easily avoided by immersing the article for a few minutes in a hot solution of potash or soda, and rinsing it without handling in water. It should then be dipped in dilute nitric acid, removed and scoured with a stiff brush or fine sand if necessary. Attach the wire, dip it again momentarily in the acid, pass it rapidly through clean water and immediately place it in the circuit in the bath.

Many mechanics have had their patience sorely tried when pouring lead around a wet or damp joint, to have it explode, or scatter from the steam generated by the heat of the lead. This blowing may be avoided by putting a small piece of resin into the ladle and permitting it to melt before pouring the lead.

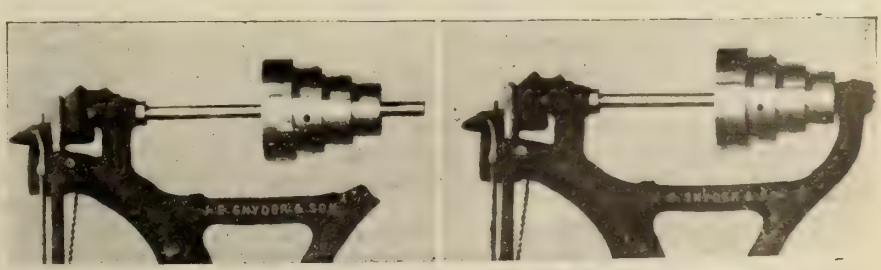


FIG. 6.—A DRILL PRESS HEAD, BEFORE AND AFTER WELDING.

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Let Us Get To Work

"WE had considered closing down until next season, but we have decided to go ahead just as soon as we can get the men back in the shop."

That is one of the finest speeches it has been our good fortune to hear for some time past. The firm in question had stated, not ten days ago, that the selling season was passing and they would have no particular call for their output now as it would be too late.

The closing of that shop for the rest of the season would have meant that hundreds of people would have to look elsewhere for employment. It would mean that a Canadian product would not be as definitely and as largely on the market next season. It would mean that a large and efficient organization would have been more or less disrupted.

But the place is going to work. Chances are that this morning the doors are open and things are getting under way.

In other words they are going to work.

We are suffering from lack of production.

Less production per capita is not going to help wear down the 4½ per cent. exchange rate that is smothering Canadian money in New York.

Less production per capita is not going to make conditions in the shop any better for the men who work there.

Less production means less to sell, less to put into the pay roll, less to expand with, less to build decent factories with, and less to go out and find new markets.

For almost five years we have been working at destruction. For six months thousands have held back owing to strikes. We are where we are in spite of conditions, rather than by their assistance.

Now, then, let us get to work. Tinkering with conditions can easily be carried to such lengths that the tinkers on both sides will find they are not able to step up and put the peg in when they wish to call a halt.

Creating New Conditions

THE striking machinists in Toronto and some of the other centres have returned to work. The strike was neither a total failure nor by any means anything approaching a success.

The best thing for both sides is to forget it and work as hard at building up conditions that will make strikes impossible, as they have in bringing about and fighting strikes.

There are new conditions coming into industrial life. Only the self-blinded cannot see them.

The manufacturer who is going to win is not going to run his shop on the card-index system.

A man has got to be something more than a number on the time clock.

If efficiency systems would bring about the best feelings between shop and office this would have been brought to pass long ago.

You say there are too many men in your shop to know them all. Perhaps, but that is no reason for not making the effort.

Do you enjoy the confidence of your men? Did you ever stop to inquire how they were getting along? Ever take an interest in anything that concerns them?

We know manufacturers who are having the best possible time by thinking about the men who are working in their shops. They go out of their way to become acquainted with their pay roll. Do they lose anything on this account? Just ask some of them.

They are getting something more than a day's work. They are nipping strike talk in the bud. They are building up an atmosphere where a strike would be regarded as injury in the house of a friend.

The employer can take the initial step in this direction. We believe in many cases he is willing to do it. The men will respond. Do not take it for granted that they will not.

Buried Treasure Again

THE uncovering of lost treasure from the bed of the ocean has exerted a fascination over the minds of men from early times. From day to day new schemes for salvaging sunken vessels are sprung on an expectant world, to dazzle susceptible minds for a few brief moments and then fade away from sight and memory. Most of these schemes would be perfectly practicable if it were not for certain fixed and immutable laws of nature. One of the most important of these is that every 2.3 feet depth of water exerts a pressure of 1 lb. per square inch on the surface of any object immersed in it, the effect of this pressure being to set very definite limits at which diving operations can be conducted.

One of the latest of these schemes has been evolved by the United States Ship Salvage Participating Syndicate. They have borrowed the famous tank from the battlefield, and are going to ask it to become an amphibious animal, and conduct constructive work on the bottom of the sea, instead of destructive work on the surface of the land. The tank can be built with strength to withstand the pressure of the sea at whatever depth it is necessary to operate. It will be directed from above electrically, and in order that the operators can see just what it is up to, an instrument called a "subsea visionscope" has been invented. The idea is that the tank will be lowered to the bottom of the sea, carrying wire cables, the ends of which are brought up to the surface on each side of the sunken vessel. All being ready, the operator on the surface applies the current, at the same time keeping a watchful eye directed down the subsea visionscope. The tank immediately gets busy burrowing under the wreck thus passing the cables under her bottom. Air containers are attached to the ends of the cable and inflated, upon which the buoyancy of these air vessels raises the vessel from the bottom.

Could anything be simpler?

Here is a chance for those who are getting bored with the tameness of the mining market to get a little quick action. The syndicate is going to be capitalized at $5,000,000, in $1 shares, so there is really no reason why everyone should not get in.

Now that one cannot put a little bet on an "also ran," the romantic interest of these salvage operations should have an appeal all its own.

Has Designed Many Cars

FEW automobile engineers can equal the record of J. G. Perrin, who has recently been appointed assistant general manager and chief engineer in charge of production of Willys-Overland, Limited, Toronto.

Like a good many men who have made their mark in America's third greatest industry, Mr. Perrin began his career in the bicycle business. He started with the H. A. Lozier Company, bicycle manufacturers, Toledo, Ohio, as a draughtsman. Later he went into the machine shop, and after serving there for a number of years, through various departments, he returned again to the engineering department. Shortly afterwards he became chief engineer of the company. In 1897 the Lozier steam carriage made its appearance and was the first of many famous cars to be designed by J. G. Perrin. The first fore-door car built in America, and the first streamline car were Perrin productions. Lozier cars of Perrin design figured prominently on the speed ovals of the world, and have captured "first money" time and again. Among the notable Lozier winnings was the Vanderbilt cup in 1911. Following this, Mr. Perrin was appointed vice-president and chief engineer over the combined works of the Lozier Motor Car Company of Detroit, Mich., and Plattsburg, N.Y.

J. G. PERRIN.

After twenty years' service with the Lozier Company, Mr. Perrin became chief engineer of the Timken Detroit Axle Company, where he remained until the war, when he was called to Washington as a member of the Aircraft Production Department. Through this work he came into touch with aircraft division of Willys-Overland, Limited. At the instance of that Company, and with the consent of the U.S. Government, Mr. Perrin assumed charge of the aircraft division of Willys-Overland, Limited, at Toronto. Before the close of the war his company were producing five complete eight-cylinder Sunbeam Arab airplane engines in an eight-hour working day. In this work Mr. Perrin achieved the distinction of winning the commendation of the Air Board, which was prompted by the high quality of the workmanship exhibited in these Canadian-built, British-designed airplane engines.

He is now devoting most of his time to the perfecting and production of the new "Overland 4" car, a light automobile that is expected to embody improvements of a rather revolutionary character.

A small electric water heater, only 12 in. high, is now manufactured for attachment to faucet, directly or with a rubber tube. The water then flows through porcelain tubes in which non-corrosive resistance coils heat it progressively to the required temperature. The faucet from which the heated water is finally drawn is so associated with the electric snap switch that the current is not turned on until the hot water is actually wanted. If cold water is desired, the faucet handle is thrown in a reverse direction, causing the water to flow through an unheated by-pass. The machine can heat about 30 gal. an hour, using either direct or alternating current.

Joins Rudel-Belnap

MAJOR T. E. Ryder, D.S.O., M.C., who has just recently returned from overseas after four years' service in France and Belgium with the Canadian Field and Siege Artillery, has been appointed general manager of the Rudel-Belnap Company, of Montreal and Toronto, with headquarters in Montreal.

MAJOR RYDER, D.S.O., M.C.

For over ten years prior to the outbreak of the war, Major Ryder was connected with the Canadian Fairbanks-Morse Company, and was in charge of their transmission business in Montreal until 1908, when he was sent to St. John, N.B., to open a new branch for the company, remaining as manager until he enlisted for overseas service in the fall of 1914.

Liners 1,000 Feet Long

EVIDENTLY the race for the blue ribbon of the Atlantic is not to be dropped. From Washington, D.C., comes the announcement by the United States shipping board that two vessels are to be built which will have larger dimensions and greater speed than any liner afloat. Their length will be 1,000 feet, beam 102 feet and depth 74 feet, with a gross tonnage of 55,000. The passenger accommodation will be for 1,000 saloon passengers, 800 second cabin and 1,200 steerage, while the crew will number 1,000. The vessels will be of 100,000 H.P., oil burning, and will have enough fuel capacity to enable them to make a round trip without taking in fuel. They are designed with a view of becoming commerce destroyers in time of war, and will have gun emplacements included in the structure.

Nothing is mentioned about the draft of water that these vessels will require, but it is significant that they will have a terminal at Montauk Point, 118 miles from New York city. The depth of the Ambrose Channel is forty feet, and a vessel of the size mentioned would have nothing to spare there. The "Lusitania" drew 35 feet 2 inches. This is the factor that limits the size of vessels more than any other. It is no use building a vessel that cannot find a harbor to go into, or that cannot be dry-docked owing to the lack of a dock large enough to take her. The question of speed involves two considerations, the one being the increased consumption of coal, and the other the saving in maintenance of passengers and crew by being one to two days less on the voyage. First cost is greater for the higher speed vessel owing to the greater weight of machinery required. If these ships are built it is quite likely that they will hold the laurels for some time, as the building of ships of extraordinary speed and huge dimensions is not likely to be attempted by other nations at present. These vessels are always a good deal of a luxury, and are almost invariably heavily subsidized by their Governments. The large-sized, moderate-speed vessel is another proposition, as space that is devoted to machinery in the high speed ship can be utilized for profitable purposes, the fuel consumption is considerably less, and the difference in time occupied not amounting to more than about 18 to 24 hours.

MARKET DEVELOPMENTS

Strike Settlement is Good Piece of News

Tool Room Output is Needed in Several Cases—Industries Have Decided to Go Ahead With New Lines—Metal Market Showing Great Deal of Strength in Many Lines

THE announcement that the machinists' strike has been concluded in Toronto and district is naturally good news to the machine tool trade. It may take some days to get things under way in some plants, but work will be facilitated in many ways in a short time. Tool room output is needed in several cases where new lines are contemplated. It has been necessary in some cases to send across the line for this, causing delay at a very inopportune time. Not only so, but several firms have changed the decision of some few weeks ago to shut down for the remainder of the season, and will, as soon as mechanically possible, go ahead with the turning out of new lines that should have been placed on the market this season. It will require some little confidence, but the decision has been made to go ahead and manufacture now, trusting to a vigorous selling campaign later on to see them safely through.

"The best week this year," was the manner in which one leading machine tool dealer referred to the business closed by his house during the past few days. The fact is that those who were waiting for lower prices before coming into the machine tool market are being left with very indefinite delivery dates and at prices higher then they could have secured shortly after the signing of the armistice. Increases have been made in several lines. In one case in particular quotations that were made to a large Canadian concern on chain blocks have been withdrawn. The figures were given in the middle of June, while now an $87 article has gone to $112, and others in proportion. Reductions have been made on high speed cutters, both Canadian and U.S. makes.

Buying of supplies is improving. The National railroads are in the market this week for 1,500 carbon drills and about 50 of the high speed variety.

The scrap metal market is showing exceptional strength. Machine scrap is very scarce, and the higher figures are not bringing out any offering to amount to anything. It was thought that war shop material would come in under this. It may be that higher prices will have to be offered. Coppers continue strong, and a slight advance has been made in tin for the first time in some weeks. Mills and foundries are buying heavily of scrap material, as many of them had bare yards, waiting for conditions to become a little more settled before stocking up.

CONFIDENCE MORE MARKED IN TRADING IN MONTREAL MARKET

Special to CANADIAN MACHINERY.

MONTREAL, Que., July 31.—We have all been looking forward for the turn in the tide that has been promised as a result of the signing of the peace treaty, but the change has been so gradual that it cannot be rightly said to be a turning point.

From every angle comes reports of better business; steel interests are encouraged by the better feeling that prevails, although no heavy buying is taking place. Sales of plates and shapes have shown a slight increase, but little attention is given to future requirements. Salesmen are again coming into their own and the question of the disposal of materials is again to the fore. Consumers are less concerned about delivery now but are reluctant to buy heavily for future needs. Machinery dealers are encouraged by the steady return to normal business. One large machine tool house here has established a well-equipped machine shop for the repair and rebuilding of used equipment. Sales of new tools are gradually increasing. A phase of activity that tends to keep metal shops active is the fact that manufacturing rights are being obtained in Canada for English and American lines, many of which are being assembled in a plant apart from those in which the various parts are made and machined, frequently several places being employed for turning out the work for the assembly shop. The metal market reflects the general activity in the better demand and higher prices quoted.

Old materials are moving more briskly and advances are general on a very strong market.

Better Demand Puts Metals Up

The anticipated requirements of Germany and Austria in respect to copper have had no direct effect on the present market, but the possibilities in this direction are undoubtedly an unconscious factor in the remarkable strength of copper. The export prospect, together with the fact that domestic demand is steadily growing, are the two prime factors in returning copper to the position it held during the last year of the war. One dealer here stated that he considers copper reasonably cheap at the existing price, in face of the general conditions that prevail in all circles. It would not be a surprise to him to see copper go still higher. Tin is quite active just now and although a better volume of metal has been coming into Canada, the consumption has apparently equalled the supply. The restriction on the imports that has been in force in the States since the termination of the war may soon be removed, as it is thought that the Government has disposed of nearly all the surplus metal held over since war demand ceased. This change will probably open the way for many months, but no sharp decline is expected here; in fact it may mean a stronger market here for a short period until a balance has been struck. Local price on tin is 57 cents per pound, a 2 cent advance on last week. Business activity generally is responsible for advances in other

metals. Spelter is up ½ cent, the quotations being 10 cents per pound. Lead at 7¼ cents is ¼ cent stronger. Antimony is up 1 cent, the price quoted being 10½ cents per pound.

New Demand Increasing

Activity in machine tools is gradually returning to a basis when competition is a contending factor. The volume of business is far from that of a year ago, but is of a kind that tends to stabilize the market. Whereas the average war demand was for machinery contracts running into hundreds of thousands of dollars, the wants of the manufacturer today are on a much more conservative basis, but the distribution is over a much greater area. This, in itself, is a more encouraging feature, as it indicates a steady return to normal conditions. Sales of second-hand equipment are still in front, but the percentage is gradually swinging around. The relative ratio at present is approximately 60 per cent. on used and 40 per cent. on new equipment, with the latter constantly increasing. Demand for supplies is steadily growing better, and confidence in the trade is much more general. One dealer here stated that during the next few months they expected business would pick up considerably.

Scraps Advance to Higher Levels

Without question the situation in respect to scrap conditions is of a very firm character, and the general movement of material, both buying and selling, is of considerable volume at the present time. Emphasis, however, may be placed on the fact that purchases by the consumer are principally for early requirements, future needs receiving little consideration. During the past week it was announced that several thousand tons of scrap was to be shipped to Britain in the space reserved for Government purposes. It seems that this material is war supplies, owned by the Government, and in some instances the scrap is in the form of finished and semi-finished shells. The entire market is featured by higher prices, the upward trend in copper and brass scraps being a special factor. The advance in copper during the past two weeks has been approximately 4 cents per pound, the present range being 17 cents for light, to 21½ cents for heavy and crucible. Brass scraps also show sharp advances, new cuttings are quoted at 13 cents, red brass turnings at 16 cents, yellow brass turnings and medium brass at 10 cents, and light brass at 9 cents per pound.

Galvanizing demand has caused zinc to go higher, an advance of 1 cent placing the present price at 6½ cents per pound.

Advances on iron and steel scraps are likewise general, the range being 30 cents per ton on machine shop turnings, $8 per ton on rails; the quotation on the latter being now $20 per long ton. Other advances will be noted in the selected market quotations.

POINTS IN WEEK'S MARKETING NOTES

Pittsburgh reports an increase in the volume of steel buying. Plate is the only spot where added strength is needed.

—

Some of the U. S. mills are quoting iron rods $5 per ton up. This will affect the wire mills very quickly.

—

The demand for semi-finished steel has been good. In fact some of the mills are out of the market for ingots and billets.

—

Scrap metal prices are strong. No. 1 machinery scrap is very scarce and the offerings for this are likely to go higher.

—

Tin for the first time in some weeks took a rise this week.

—

Copper continues to go up, both for scrap and new metal.

—

Montreal reports a much better feeling in trading, and buying well distributed over a large number of industries.

—

"The best week this year," is the way one machinery dealer sized up the trading of the past few days.

—

Many of the U. S. machine-tool makers are insisting that selling prices now shall be the price at time of delivery of the machine.

MUCH BETTER TONE IN MARKET

Dealers Report Selling as Improving—Metals Are Stronger and May Go Higher.

TORONTO.—For midsummer weather there is a good volume of business on record in this district. Buying is becoming more general, while a lot of prospective business and enquiries have been converted into orders during the week just closed.

The practical settlement of the strike in this district, while not having an immediate effect, will be felt before long. There is a danger that in some lines it will not be possible to recover this season as the time for selling and organizing the seasons' work has gone too far past. In other cases it is known that work will be started just as soon as it is possible to get the men working.

Selling Was Brisk

"We have closed the best week's business this year," is the way one manager sized up the situation. In this case the buying was more general than has been the case for some time. The orders did not come from any particular line, but were well distributed. Railroad equipment, automobile shops and other lines were represented in the lot.

There can be no doubt that the machine tool market is rising. This paper has no purpose in saying so apart from recording what has actually taken place. Some dealers announce a general ten per cent. increase. Some of the less wanted lines are not affected. Deliveries on new equipment are none too good, neither are they showing signs of improving. It may be a small exaggeration to say that a situation somewhat similar to the war period is approaching, but there are several ways in which such a claim can be justified. The machine tool builders, in many cases, have no stock on hand. They are working under high costs which are constantly increasing. They cannot promise deliveries, neither can they guarantee prices on delivery.

A representative of CANADIAN MACHINERY saw three letters that came to Toronto this morning from well-known firms in regard to various lines they make. The idea in all was the same, viz.: that they would not guarantee any quotation made after this date. The only thing to do is to give a price on the date of shipment. This applies to many lines. For instance chain blocks are up far above their pre-war figure. One Toronto firm quoted an Ontario motor company on a lot of these in month of June. Since then they have been advised that the price is cancelled. The Toronto firm was to-day trying to hustle the buyer a little in order to see if the old price could not be secured were the order placed at once. Nor was the increase a slight one. Equipment that was quoted at $87 will now be worth around $112. It is worth noting that chain blocks are still far in advance of old prices without any additions being built on the prices. They are coming more into use as labor-saving machinery is put in, and a shortage of labor and a desire on the part of the shops in many cases to make work lighter and more agreeable is leading to the installation of labor-saving devices. In pre-war days chain blocks used to sell at 25 per cent. off the list, while now the quotation is double the list and 25 per cent. on, 250 per cent. more.

The Matter of Exchange

One big Toronto house is using a rubber stamp now, and it reads as follows: "Owing to the increased rate of exchange it is necessary for us to charge, as extra, prevailing rate on all American goods at time of invoicing." The exchange, which is to-day around 4½ per cent., is coming more and more as a factor in trading. There are some instances where it is quite an item in favor of stocks that have been built up here when the rate was at a much lower figure.

Expect Improvement

The machinery trade looks for an improvement with the strike of the machinists in this district practically disposed of. There is one case in particular where the program for the year is going to be proceeded with, although it was

seriously thought the best thing would be to close up for the remainder of the season. However, the management has decided to go ahead and make the line decided on and then turn the sales force loose on the proposition. The opening up of these machine shops is going to make business better not only for the selling of machine tools but for the supply business, which for some weeks past has been lacking in the assistance it usually gets from the wear and tear of the daily grind.

Cutters Are Down

A considerable reduction has been made in the price of Canadian and U.S. high speed cutters. It is hard to state in terms of per cent. just what the cut has amounted to. In fact reckoning up just what did happen is rather a laborious piece of business, but it runs something like this. Previously a 3x2 high speed cutter has bee nselling at list, plus 2½ times the extra, and now the price is list plus one and a half times the extra. Now that sounds simple enough, but it works something like this on the size indicated. The list is $9 and the extra is $5.75, and two-and-a-half times that and you have $14.37; add in the original nine and the price for the Canadian drill is $23.37; for the U.S. product add another forty per cent. of the total, and it comes up to $32.71. The present method of reckoning takes the $9, adds $8.62 and comes to $17.62 for the Canadian product as against a former $23.37. It may be very convenient to keep the price list the same and simply change the extras on or off, as the case may be, but it is certainly not as plain a way of marking goods as sticking a 25c sign on a box of men's socks.

The Canadian National Railways are in the market again for a nice line of material. Their last inquiry is for small tools, mostly carbon drills. The total list calls for about 1,500 of these, while the list is completed by some 50 high speed drills. This is a nice list and the supply men are figuring pretty close on it.

The Scrap Metal Market

The scrap metal market in this district seems to be coming into better days. Certain it was that there was a long period of wandering in the wilderness after the war. Those who have bought right have had a fairly good chance to clean up on the situation, and a stiffening price always has a good tendency on the market. When prices look pointed upward those who have material are more inclined to sell, while those who need shipments are anxious to get into the market and have their requirements covered before another rise takes place. Buying seems to be quite general, although the steel interests are not taking on a great deal yet, their wants probably being well looked after for some time to come.

There has been no further change in the prices, and they stand where they were placed a week ago, but there is no getting away from the fact that there is more business moving. Machinery scrap, No. 1, is scarce, and it looks to be a safe guess that there will be a better price offered for this before long to see if it will have the effect of bringing any there may be into the market. It is not coming out at present quotations. There are a number of shell shops in the country yet that ought to furnish something for this class, although no doubt the hope is entertained that a sale for second hand machinery might be more advantageous. Some transportation concerns that had been holding back their offerings in hopes of better figures let go during the past week, and some good tonnages have been brought in from this source.

Coppers continue strong, and it looks as though the market for scrap metals of this sort might be marked up slightly before very long.

The Non-ferrous Market

There is a good demand in the market for all classes of materials and the trend is upward, finding vent in a higher rating for tin, copper and spelter, although there is a slight reaction in the price of the latter just now. Copper is quoted locally at 27c to-day. Tin, for the first time in some weeks, starts upward, making a 4c advance.

DEMAND IMPROVES FOR STEEL EVEN DURING THE SUMMER MONTHS

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., July 31.—The American Iron and Steel Institute has just given out the complete statistics of production of steel ingots and castings, rolled iron and steel, etc., in 1918. These statistics put the matter in a somewhat new light, by reason of the divergence between production of ingots and of rolled steel. During the year the trade had the benefit of monthly reports of the steel ingot production, and last April a preliminary statement of the year's total was given, agreeing almost precisely with the final total now given. It turns out, however, that the rolled steel output was a much smaller proportion of the ingot output than usual. This was due, of course, to the heavy cropping of ingots required by shell steel specifications, but so much was said about uses being found for discard steel that one had some reason to suppose that this heavy cropping would not operate to decrease greatly the production of finished rolled steel. If, for instance, one-third of the ingot was cropped, that steel would be lost as regards shell material, but if it was rolled into light rails, or angles for cots, or concrete reinforcing bars, it would constitute rolled steel. The fact, however, is that while in 1912 and 1913 the total output of finished rolled steel was 76 per cent. of the steel ingot production, in 1918 the proportion was only 69 per cent. That difference of 7 per cent. meant, on the 43,051,022 gross tons of ingots produced in 1918, no less than 3,000,000 gross tons of rolled steel, or 250,000 tons a month. This information helps to explain, to an extent, why the director of steel supply found the supply of steel so much below what he wanted, when nearly every month the statistics of ingot production seemed rather favorable.

The production of ingots in 1918 was 1 per cent. under that of 1917, while it was 4 per cent. above that of 1916. Thus the three great war years ran quite closely together. The 1918 production was 42 per cent. greater than the production in 1912 and 1913, years that showed practically the same tonnage, and by far the best tonnage years before the war. The rolled steel output in 1918 was 29,581,778 tons and the rolled iron output 1,573,976 tons. The rolled steel output was only 28 per cent. more than the 1912-13 output, while the rolled iron output actually showed a decrease of 5 per cent. from these pre-war years. The total of the two was 26 per cent. greater in 1918 than in 1912-13, while ingots showed an increase of 42 per cent

The production of sheared plates, ¼ in. and thicker, was 3,445,284 gross tons, or more than 2,000,000 tons increase over the 1913 output. This was due to the pressure for ship plates, and the increase was accomplished only by the building of many new plate mills. Some of the mills, however, were not completed until nearly the end of 1918, and thus the present capacity is much larger even than the heavy output in 1918. Undoubtedly there will be a surplus of plate rolling capacity for many years.

Production of shell steel is not shown in the statistics. The rolled rounds are included with "merchant bars," which showed a gain in 1918 of about 2,500,000 tons over the 1913 output, while the steel for forged shells was included with "rolled forging blooms and billets," which showed an increase of over 1,000,000 tons. As there was no other demand of importance that would swell the production of either merchant bars or forging steel, it may be assumed that the production of shell steel in the United States was somewhere in the neighborhood of 3,500,000 gross tons.

Other lines of rolled steel showed about the same tonnage in 1918 as in 1912 and 1913, except that some showed rather sharp decreases, rails, for instance, falling off about a million tons, to 2,540,892 tons.

Present Production

Production of steel ingots at present may be estimated as being at the rate of about 35,000,000 gross tons a year, which would be 71 or 72 per cent. of capacity, taking capacity at 49,000,000

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MORROW SCREWS MORROW

MORROW

Set and Cap Screws and Twist Drills may be had of the better jobbers in any part of Canada. The screws are made from material specially made for this purpose and each screw is threaded twice to give accuracy.

DRILLS

are manufactured from Jessops' steel (Sheffield, England). It is the highest quality obtainable. Our special temper gives you the perfect Drill which does more work with less regrinding.

SCREWS

Standard Cap and Set Screws or A.L.A.M. or S.A.E. carried in stock. Shipments at once.

ORKS AT INGERSOLL, CANADA

"Ingersoll Files Cut Faster a Wear Longer."

2

DRILLS FILES MORROW MORROW NUTS MORROW

If It's Machinery --- Write Williams Canada's Leading Machinery House

LATHES

1 New 14" x 7' HENDEY, taper attachment, oil pan, draw in attachment.
1 New 14" x 8' LEBLOND, with taper.
1 New 18" x 6' CISCO, double back gear, quick change gear, compound rest, taper attachment.
1 New 16" x 8' LEBLOND, double back gear, quick change gear.
4 New 19" x 10' LEBLOND, double friction back gear, quick change gear, compound rest.
2 New 18" x 8' LEBLOND, double friction back gear, quick change gear, compound rest.
1 New 18" x 8' BARNES, plain change gear, compound rest.
1 Used 16" x 6' PRATT & WHITNEY, with taper attachment.
1 Used 16" x 6' BLAISDELL, taper attachment.
1 Used 16" x 6' LEBLOND, compound rest plain change gears.
1 Used 16" x 6' C.M.C., double back gear, quick change gear, all rebuilt.
1 Used 16" x 6' McGREGOR-GOURLAY, quick change gear, double back gear, compound rest, draw in attachment and collets.
1 Used 16" x 6' CINCINNATI, double back gear, compound rest.
1 Used 16" x 8' AMERICAN, quick change gear, compound rest.
1 Used 16" x 8' MONARCH, double back gear, compound rest.
1 Used 18" x 8' BARNES, plain change gear, compound rest.
1 Used 18" x 8' CISCO, quick change gear, compound rest.
1 Used 20" x 8' LEBLOND, quick change gear, compound rest.
1 Used 20" x 10' LODGE & SHIPLEY, double back gear, quick change gear.
1 Used 20" x 10' REED-PRENTICE, all geared head, single belt drive.
1 Used 22" x 8' DAVENPORT, double back gear, plain change gear.
1 Used 20" x 10' DAVIS, plain change gear, compound rest.
1 Used 22" x 8' HAMILTON, plain change gear, compound rest.
3 Used 25" x 10' LEBLOND, heavy duty double friction, back gear, quick change gear and compound rest.
3 Used 24" x 10' MILWAUKEE, double back gear, quick change gear, compound rest.
1 Used 24" x 15' BERTRAM, plain change gear, compound rest.
12 Used 26" x 12' C.M.C., double back gear, quick change gear, compound rest.
11 Used 17" x 6' LEBLOND, manufacturing type, factory re-built.

GAP LATHES

1 Used 28" x 44" x 14' BERTRAM, plain and compound rests, power cross feed, 2⅛" hole in spindle.
1 Used 24" x 36" x 10' McKECHNIE-BERTRAM, plain change gears, compound rest.

TURRET LATHES

1 Used 24" DAVIS Chucking Lathe, back gear, quick change gear, power feed to turret and cross slide, oil pan and pump.
1 Used No. 6 BARDONS & OLIVER, power feed to turret, automatic chuck feed, oil pan and taper.
1 Used DRESES universal geared friction head Monitor Lathe, power feed to turret, chasing bar.
1 Used 14" WARNER & SWASEY, plain head, automatic chuck, with or without cut off slide.

SCREW MACHINES

1 New No. 3 STETCHER, 1¼" capacity, geared friction head, automatic chuck.
1 Used 1¼" capacity PRATT & WHITNEY.
1 Used 1¼" capacity, No. 4 BROWN & SHARPE, plain head.
1 Used No. 4 WOODS Tilted Turret, 1½" capacity.
1 Used No. 1 FOSTER, automatic chuck, cut off slide.
1 Used No. 2 FOSTER, plain head, automatic chuck, cut off slide.
1 Used No. 3 FOSTER, plain head, automatic chuck and cut off slide.

HEAVY DUTY DRILLS

6 No. 310 BAKER.
3 D-2 COLBORNE.
2 D-1 COLBORNE.
1 No. 315 BAKER.

MILLERS

New No. 2½ LEBLOND, full universal
New No. 3-H LEBLOND, full universal.
New No. 4 LEBLOND, full universal.
New No. 3 FORD-SMITH, full universal.
Used No. 3 BECKER, plain.
Used No. 3 KEMPSMITH, plain.
Used No. 4 LEBLOND, plain.

SHAPERS

1 New 16" KELLY.
1 Used 24" GOULD & EBERHARDT
1 Used 24" GOULD & EBERHARDT, power feed to head.
1 New 20" GOULD & EBERHARDT.
1 New 24" GOULD & EBERHARDT.

PLANERS

1 Nearly new 30" x 30" x 10' POWELL, two heads.
1 Used 26" x 26" x 8' LONDON, one head, heavy type.
1 Used 24" x 24" x 7' LONDON, one head, heavy pattern.
1 Used 24" x 24" x 6' McGREGOR-GOURLAY, one head, excellent condition.
1 New 24" x 24" x 6' WHITCOMB-BLAISDELL, second belt drive, one head on the rail.

DRILLING MACHINES

1 Used 14" ROCKFORD, gear driven
1 New 20" BARNES, back geared.
1 New 20" BUFFALO, back geared.
1 New 20" CANEDY-OTTO, back geared.
1 New 22" BARNES, sliding head, power feed, back geared.
1 New 26" BARNES, sliding head, power feed, back geared and with tapping attachment.
1 New 34" SUPERIOR, sliding head, power feed.
1 New 34" BARNES, sliding head, power feed.
1 Used 22½" BARNES, back gear, power feed.
1 Used 25" BARNES, back gear, power feed.
1 Used 26" BARNES, back geared, power feed.
1 Used 40" LONDON, heavy duty, power feed, back gear.
1 Used 24" BUFFALO, sliding head, power feed.

The above machines list only a small part of our stock and are ready for immediate delivery

The A. R. Williams Machinery Co., Limited

64 Front Street West

TORONTO, ONT.

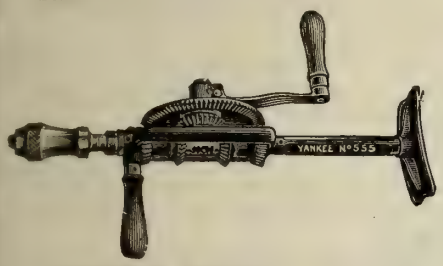
THE A. R. WILLIAMS MACHINERY Co. LTD

64 FRONT ST., W. TORONTO, ONT.

SALES SUPPLY DEPARTMENT SERVICE

MORE AND BETTER WORK

More and better work can be accomplished in garage, manufacturing plant or machine shop by the adding of time-saving tools. Tools that are always ready when required. Are real necessities in the plants that are making good under the stress of getting there in the winning of satisfied customers.



YANKEE BREAST DRILLS

TAPS AND DIES

The Garage or Machine Shop will find an inexpensive outfit that pays many times over its first initial cost. Obtainable in A.L.A.M., U.S.S. and "V" threads, having adjustable Dies. No work is out of range. Make your equipment complete with one of these sets.

CHUCKS

IMPERIAL CHUCKS are Canadian made and will meet the best expectations as to accuracy and ability to meet all conditions required of strong up-to-date chucks. These chucks will compare favorably with any chuck made of the four jaw Independent type.

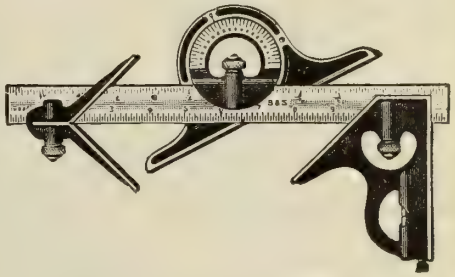
YANKEE TOOLS

No tools have advanced to meet the modern demand like YANKEE Tools. They are complete in every respect. Quality, workmanship, are always of first consideration in these tools. Once used they are found to be an absolute necessity, and are money and time savers many times over.

BROWN & SHARPE, AND STARRETT FINE TOOLS

Delivery on these tools still covers a period of six months to one year. Therefore, we would advise your ordering immediately. Machine manufacturing is fast coming back in a large way and the skilled mechanic will find it to his advantage to get our prices and look over our stock of the well-known Brown & Sharpe and Starrett Tools.

REECE'S SCREW PLATES

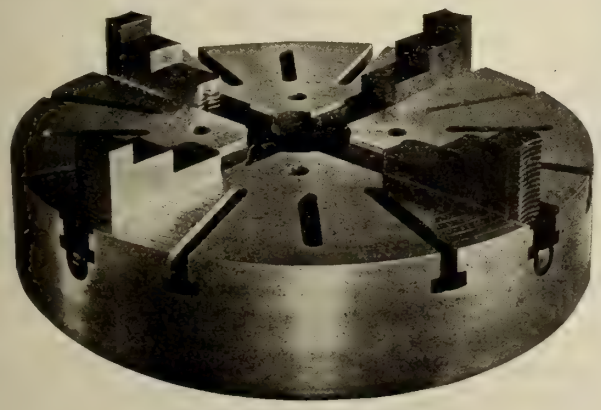


BROWN & SHARPE AND STARRETT MECHANICS' TOOLS

REED VISES

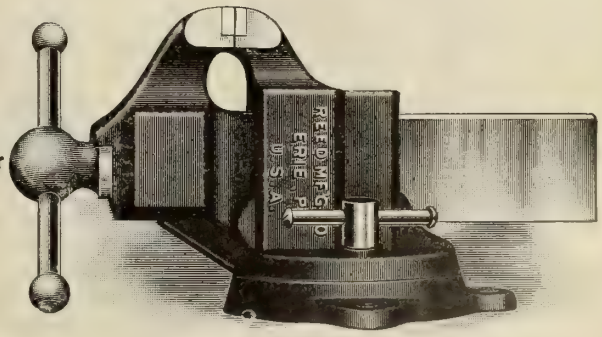
If there is a well known vise—it is the REED Vise, manufactured as it is under rigid inspection it is thoroughly guaranteed against defective or imperfect workmanship, and will unhesitatingly be replaced if it can be returned defective.

These vises are interchangeable and have been standardized by many of the large manufacturing plants. Your safety is in the REED vise.



IMPERIAL CHUCKS

Write Us For Circular And Prices.



REED VISES

Prices and No. 40 Catalog will be cheerfully given on request.

THE A. R. WILLIAMS MACHINERY CO., LTD., TORONTO, ONTARIO

tons. While a 35,000,000 ton rate would show quite a decrease from the 43,051,022 tons actually produced in 1918, the output of finished rolled steel would not show a corresponding discount, for it may be assumed that the proportion of rolled steel to ingots is back to the 76 per cent. recorded in 1912 and 1913, and thus it would be equal to a rate of about 26,500,000 tons at the present time, this comparing with the output of 29,581,778 tons in 1918. The difference is less than last year's output of shell steel, and thus one may say that in all rolled steel outside of shell steel the present production is at a greater rate than the average of 1918.

Steel Demand

Demand is improving somewhat, even in this summer period, usually so dull in the steel trade. Merchant steel bars are mentioned in particular. For some time there has been heavy demand from the cold drawn steel makers, producing shafting and screw stock, and now there is much more widespread demand, the current orders being not much below capacity. Demand for butt weld sizes of pipe continues to improve. As for lap weld, the mills are turning away more business than they accept, being filled up on account of the oil boom.

Export demand is not as heavy as a month ago. The slump in exchange is probably responsible for some of the decline in European buying. Japan and China are still mentioned as being the best buyers. In their case there is no difficulty about exchange, and transportation conditions are particularly good as the Japanese vessels operate under quite favorable conditions. While the export market is somewhat quieter, it is not expected that there will be any material decrease in exports over the average of the past few months, exports having been reported at about 400,000 gross tons a month, in pig iron, billets and finished steel products.

Prices

The balance of probability is that there will be no general advances in steel prices in the near future. All possibility of there being declines is regarded as removed. It is true that a few independent producers have been disposed to advance prices, but such advances when made have not been followed by others. It was July 10 when the Wheeling Steel & Iron Co. advanced butt weld pipe $5 a ton, and lap weld pipe $10, but up to date no other producer has advanced pipe. A fortnight ago the Youngstown Sheet & Tube Co. advanced nails 25c a keg, staples $2 a ton and the extra for coppering wire $5 a ton. A few days afterwards the Cambria Steel Co. made some advances in its wire products, but not the same advances as had been made by the Youngstown Co. Cambria advanced both polished and cemented coated nails 25c a keg, but also advanced plain and barb wire $2 a ton, products which the Youngstown Co. did not advance at all. The Steel Corporation continues to be opposed to the making of any price advances, at least before the end of the year.

MORE FURNACES ARE BEING BLOWN IN TO SUPPLY THE DEMAND FOR IRON

INQUIRIES and sales are brisk, some large orders having been booked during the week. Orders and shipments are generally beyond present production. Following are reports:

Pittsburgh.—Steel makers are coming to the furnaces for bessemer pig iron, and the indications are that the stocks on hand are being worked out. Sales of foundry and basic are limited. The Carnegie Steel Co. has blown in four furnaces during the past week.

Boston.—Sales are generally small, only one lot of any importance having been sold. Enquiry remains good. Total sales for New England for the week are around 7,000 tons. Enquiries for 1920 delivery are meeting with no response from the furnaces.

New York.—Last week's business for foundry iron was in the neighborhood of 25,000 tons, for this year's delivery. The New York Airbrake Co. placed orders for 10,000 tons. Numerous enquiries are out, with the result that the market has developed a strong tone.

Buffalo.—Furnaces are in a position where they are not looking for any business for the balance of the year. Two furnaces are booked up, and the others have only very small capacity left.

Philadelphia.—There is a good enquiry here, and some consumers are asking quotations for 1920 delivery. Furnaces are not keen about selling so far ahead. About 15,000 tons of foundry were sold during the week. Prices are very firm.

Cleveland.—With sales and shipments running ahead of furnace production, furnace stocks are getting low. One dealer sold about 32 000 tons last week, largely foundry, and about 6,000 tons of this were for 1920 delivery. An enquiry for from 50,000 to 75,000 tons basic came out during the week.

Cincinnati. — Southern furnaces are mostly quoting the regular schedule of $28 for this year's shipments. There is not much enquiry, but a buying movement is expected, with an advance in prices before long.

St. Louis.—There is a fair demand for small lots, sales averaging about the same as the past two weeks. Steel makers are not in the market, except for small lots of special grades for mixtures. Most consumers are covered for this year. Furnaces are waiting for higher prices before blowing in idle stacks.

Birmingham.—Stocks are being depleted rapidly in this district, and while sales are not large, prices are firmer. Production is being increased, and three more stacks will be repaired immediately.

Chicago—More stacks are being blown in, and six merchant stacks are now in operation. There has been an increase in the demand for pig iron. Labor troubles are having their effect on sales, as it is felt that were it not for this, some consumers would buy more heavily.

HEAVY MELTING IS IN DEMAND AND SCRAP VALUES ARE GOING UP

Buying is active all over the country and prices are rising accordingly. Following are reports from various centres in the United States:

Chicago.—Prices on all grades of scrap are rising, to the amount of $2 to $3 at a time. Heavy melting steel is expected to reach $25, and rerolling rails $30 per ton before the end of the year. Rolling mill grades are in good demand.

Boston.—Activity in steel making grades is in evidence, and the start of a buying movement has improved the tone of the market. Prices on all grades have advanced. Heavy melting steel has been sold at $20, and turnings have brought $11.

New York.—There is not a very active market, but there is a fair demand for most grades, and prices are holding firm, with a tendency to rise. Heavy melting steel has been sold to Pittsburgh buyers for $20.50 delivered, and is quoted $15.50 to $16 f.o.b. New York.

Philadelphia.—The market here is a little soft, with material in plenty, dealers buying only for shipment. Machine shop turnings and cast iron borings now quoted at $13.50 to $14.50.

Pittsburgh.—With heavy melting steel selling at $21.50, dealers are hoping to see it reach $25. Other steel making grades are active and firm in proportion, but foundry iron is only in small demand. Steel car wheels are quoted at $21.

Buffalo.—All steel making grades are in strong demand, dealers asking $18.50 for heavy melting steel. Mills are offering $18. Low phosphorus is quoted at $22 to $23.

Cleveland.—The market here is strong and active, demand for heavy melting steel, turnings and borings being particularly strong. Prices on all grades have advanced. Heavy melting steel is quoted at $21, with borings $15.50.

Cincinnati.—Steel mill scrap and cast scrap are in good demand, and dealers have advanced quotations on all grades. Considerable steel scrap for this year's delivery has been bought by semi-steel foundries.

St. Louis.—The market here is confined to transactions between dealers, the large consumers having good supplies. The Government are offering about 5,500 tons low phosphorus and shell ingots.

Birmingham. — Domestic market is weak, but an enquiry for heavy melting steel for export aroused considerable interest. Prices are softening, but slightly.

Aikenhead's
TAYLOR PORTABLE STEEL DERRICK

CONSTRUCTED OF MALLEABLE IRON AND STEEL

LIFTING CAPACITY
1,800 lbs.

WEIGHT 197 LBS.

This derrick is tested to hoist 1800 lbs. One man can operate it, but two, or even three men can man the cranks when desirable.

It can be used for hoisting building and roofing material, unloading railroad cars, hoisting ice, stone, marble, machinery, loading waggons, handling baled hay, and for any purpose where the load is required to be hoisted and swung. It swings a complete circle and is equipped with brake to control block.

THREE SPEEDS

ONE MAN	Single Speed Hoists, 300 lbs.....70 ft. per minute	ONE MAN
	Double Speed Hoists, 600 lbs. .....35 ft. per minute	
	Triple Speed Hoists, 900 lbs.....25 ft. per minute	

AIKENHEAD HARDWARE LIMITED

17 Temperance Street, Toronto

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$27 00	$27 00
Electro copper	26 00	27 00
Castings, copper	26 00	25 00
Tin	57 00	58 00
Spelter	10 00	10 00
Lead	7 25	7 00
Antimony	10 50	10 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

	Per 100 feet	
⅜ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$17 00	$13 75
Copper, crucible	21 50	18 00
Copper, heavy	21 50	18 00
Copper wire	21 50	18 00
No. 1 machine composition	18 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	16 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	9 00	7 00
Medium brass	10 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	5 00	5 25
Tea lead	4 00	3 50
Aluminum	18 00	18 00
	Per Ton.	Net.
Heavy melting steel	14 00	13 50
Shell turnings	7 00	6 00
Boiler plate	14 00	11 00
Axles (wrought iron)	20 00	20 00
Rails	20 00	13 50
Malleable scrap	16 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe wrought	11 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd. brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross to
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

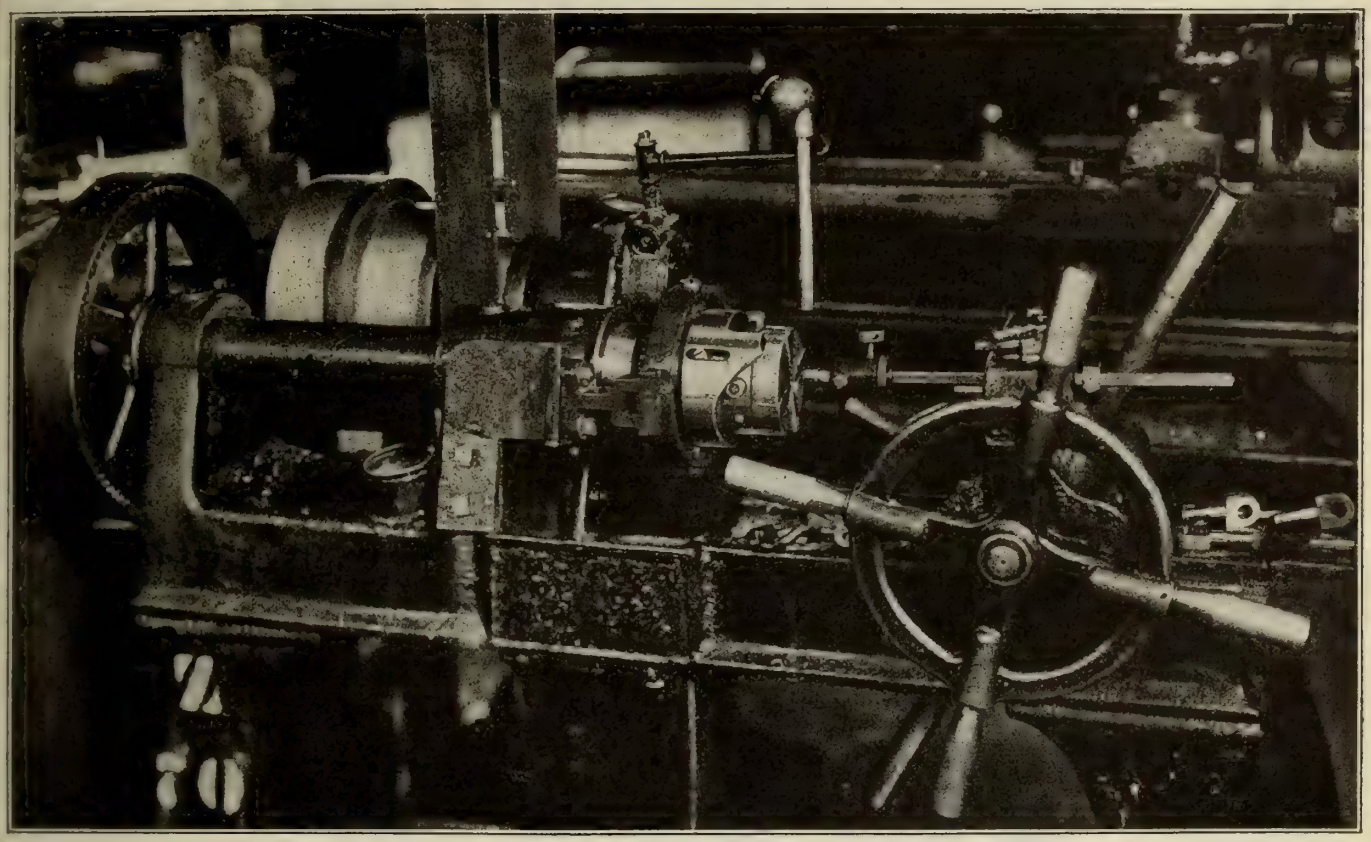
ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

BROUGHT UP TO DATE



This old Bolt Cutter has been turned into an up-to-date Threading Machine by the application of a Geometric Die Head.

The Connecticut Telephone Company removed from this Bolt Cutter the solid die head with which it was equipped, and put in its place a Geometric Self-opening Die Head of the type regularly furnished on the Geometric Threading Machine.

Thread is 7-16″ diameter, 14 U.S.S., about 1″ long, on switchboard terminals of a high class copper casting.

The best part of it is, that besides getting clean, sharp threads, they have increased the work about six times over what was being accomplished with a solid die head.

Has any threading operation been given the right chance unless a Geometric figures in it?

The Geometric Tool Company, New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal.
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 10
Linseed oil, raw, single bbls.	1 70
Linseed oil, boiled, single bbls.	1 73
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sies up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, al sizes	40 plus 10
3-fluted drills, plus	10
Jobbers' and letter sizes	40 plus 10
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 50
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill ..... list plus 5%
At warehouse ..... list plus 25%
Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head.28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S.	.....	7 50
Premier, 10¾ oz.	.....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto les 10.

OILS AND COMPOUNDS.

Castor oil, per lb.	.....
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.23
Ammonium carbonate	...
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.35
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	1.80
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated

"The Quality Line"

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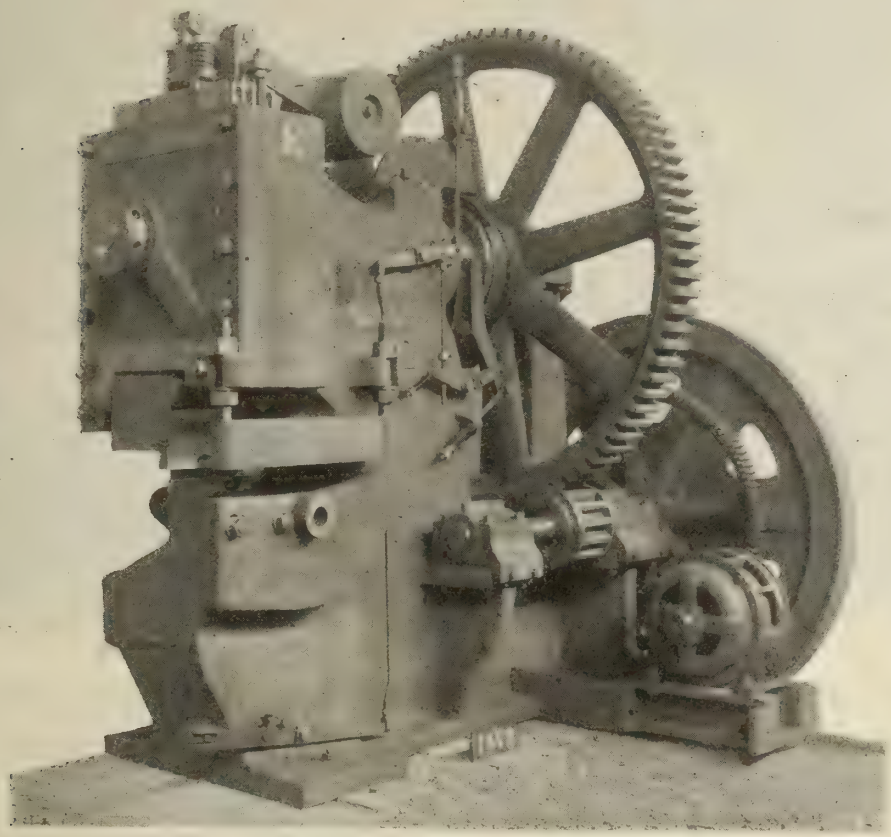
Machinery Equipment for Rolling Mills Bridge and Structural Works



Machinery Equipment for Steel Car Plants and Shipyards

No. E. OPEN THROAT BAR IRON SHEAR
Capacity 11" x 2¼" Flat, 4" Round, 3 ." Square

All machines are built of same high-grade workmanship and material that have given the "L&A" product a recognized standard of quality for over 50 years.

May we send you our big catalogue.

The Long & Allstatter Co.

Established 1856

American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

Incorporated 1878

Canadian Agents:
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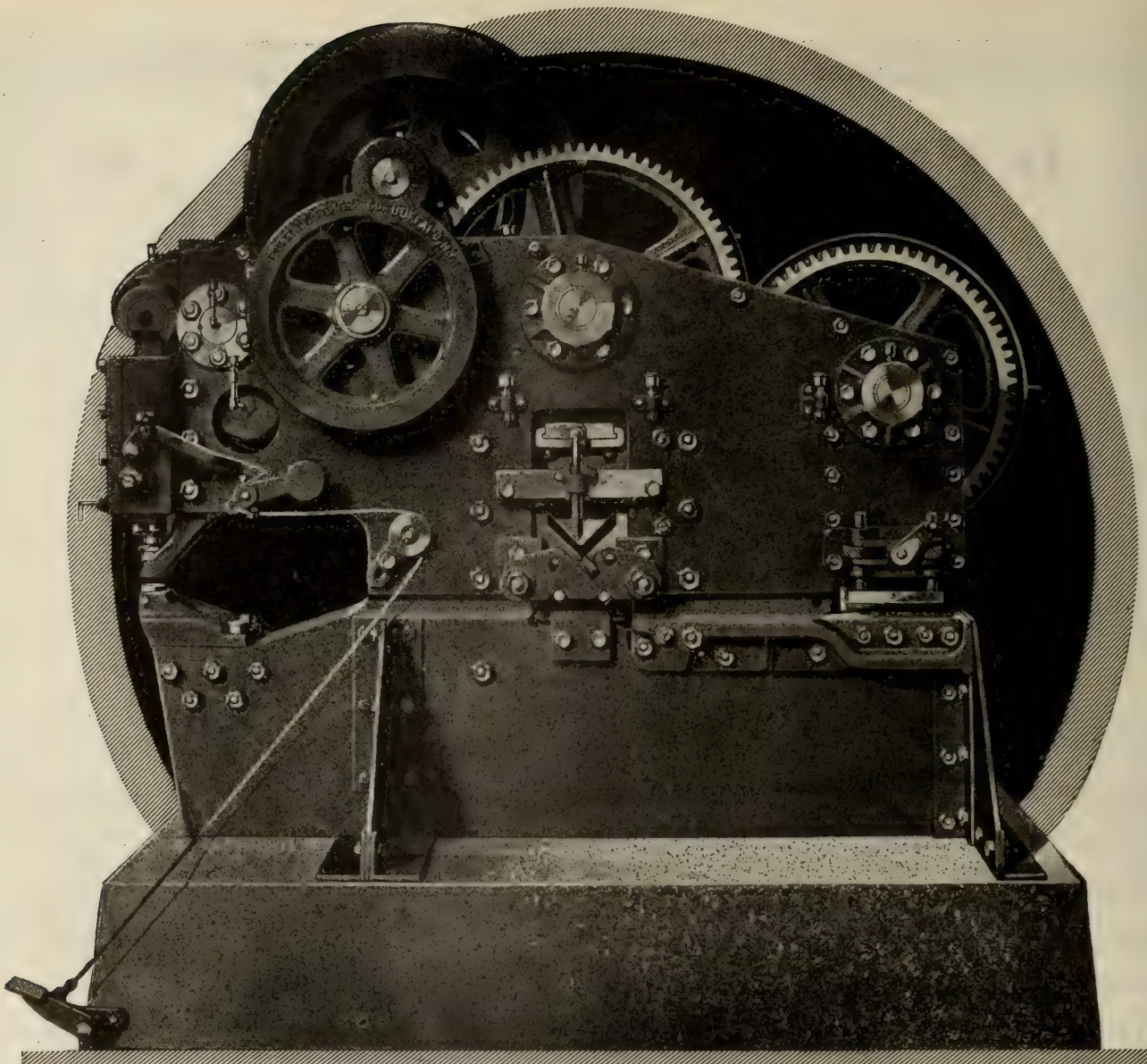
Toronto Montreal



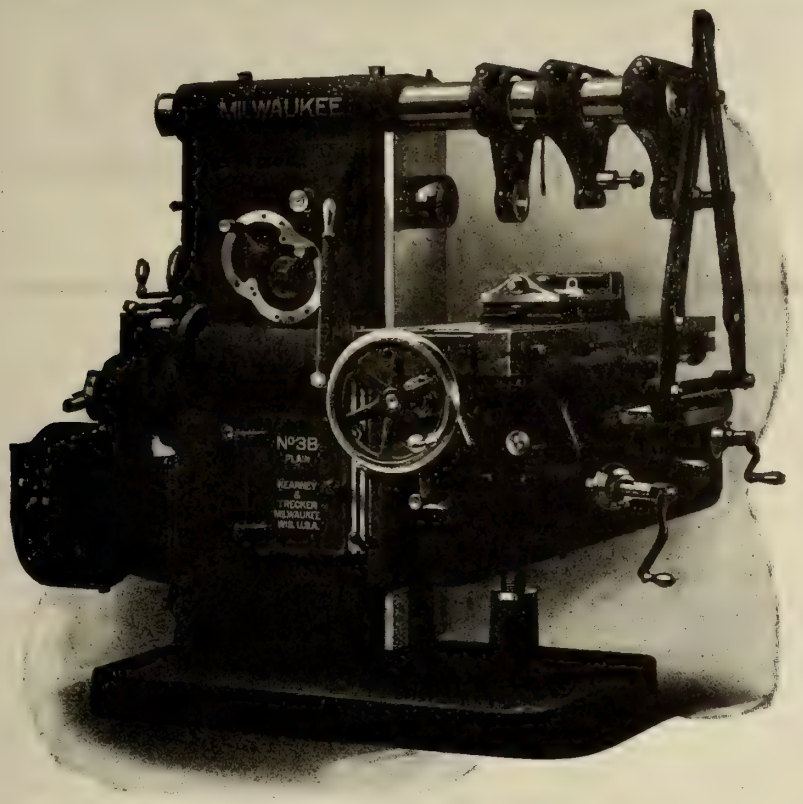
Cutting structural material and plates calls for dependable equipment—especially now when spoilage is expensive.

CANADIAN "UNIVERSAL" PUNCHES, SHEARS and BAR CUTTERS are seven and one-half times as strong and less than half as heavy as cast iron machines of equal capacity.

Let us mail you catalog No. 325-35.

Canadian Blower & Forge Co., Limited

KITCHENER, ONT.



MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

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KEARNEY & TRECKER CO.

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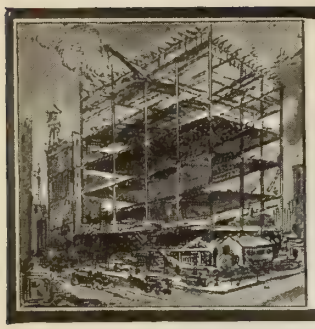
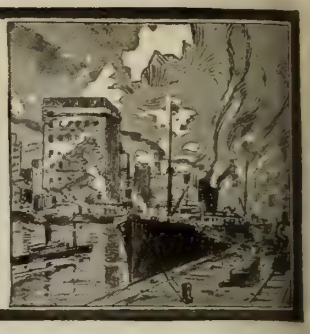


INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



TRADE GOSSIP

To Extend Restrictions. — Premier Lloyd George, in a speech recently, said it was impossible to put into effect the Government's trade policy. He therefore urged that the trade restrictions expiring in September, be extended to a future date.

Newmarket Lets Contract.—The Town Council, at a regular meeting, awarded the contract for a new bridge at Prospect Street to Mr. Lewis of Toronto. The cost of the bridge will be $3,000. A cement bridge to replace the wooden one on Queen Street was discussed, but no decision was reached.

To Relieve Congestion.—The British authorities, in an endeavor to relieve the congestion at the leading shipping ports, are introducing a new rule. All heavy cargoes consigned through ports where congestion is being experienced to destinations that can be more easily served through other ports will be transferred to coastwise steamers at once.

High Prices for Timber Limits.—Some of the Ontario timber land sold recently brought the highest prices ever received, according to the Hon. G. Howard Ferguson, Minister of Lands, Forests and Mines. These lands were situated along the northern shores of the Great Lakes. The highest price obtained was $22.50 per 1,000 feet on the stump, while a number of lots brought $20 per 1,000 feet on the stump.

Take No Ads.—The British Board of Trade desires to state that announcements which have been made in various quarters in the press that advertisements are to be accepted for the "Board of Trade Journal" are entirely without foundation. It was announced in September, 1917, that no advertisements would be accepted after the current contracts had expired, and no change has since been made in the policy of excluding advertisements.

New Cyanide Plant for Canada.—The Cassel Cyanide Company, Ltd., of Glasgow, Scotland, are about to incorporate a Canadian branch of their company. This is on the recommendation of their manager, Mr. Neill, after making one of his periodical tours of Canada and Mexico. He was very favorably impressed with the mineral resources of Northern Ontario and the industrial possibilities of the country generally. The board of the Canadian company will have three members from the Glasgow board, and Mr. Neill will divide his time between the Canadian firm and the parent company.

Foreign Trade Committee.—The Western provinces are anxious to have a foreign trade commission to represent them exclusively, as they believe that to build up western industry a proper investigation of foreign markets is necessary. The idea originated with Mayor Brown, of Medicine Hat, who is president of the Alberta Industrial Association. Mayor Brown sees the possibilities of trade development across the Pacific, and points out that one-seventh of the population of the globe lives along the banks of one river in China.

Double Tracking Railway.—The Canadian Government Railways have let contracts for the double tracking of the track between Halifax and Moncton, and for a section in New Brunswick and one in Quebec. In Nova Scotia the track will be doubled from Truro to Belmont and for long stretches from Maccan and Springhill Junction. A section is to doubled from Moncton towards St. John and at Ste. Rosalie in Quebec. The contractors are the Cook Co., Bate McMahon & Co., and M. J. O'Brien.

International Patent Bureau. — The patents section of the International Research Bureau now sitting at Brussels, have agreed on the establishment of an International Patent Bureau. This would not interfere with the working of any country's patent law, but would work out in this manner: An inventor would take out patents protecting his invention in his own country and then apply to the International Bureau for protection in every other country. This would greatly lower the cost of the desired protection and be an immense advantage to inventors the world over.

Machinery Coming Back.—German industrial firms who had set up stolen Belgian machinery in their own factories are now being compelled to disgorge their ill-gotten plant. About 3,000 tons weekly of this machinery is being shipped back to Belgium, the total tonnage returned on July 1 being 18,000. Regulations for trading with Germany will be issued in Belgium shortly, every transaction being required to be under license. Importation of raw material from Germany will be encouraged, and finished products that do not compete with Belgian manufactures will be allowed.

Useful research.—The research department of Sir W. C. Armstrong-Whitworth & Co., Ltd., have succeeded in producing bronze and aluminum powders, which are so largely used in finishing work on liners and other ships. Before the war the production of these powders was practically a German monopoly. It was only after prolonged experiment and research that the powders were evolved. The powders form bronze and aluminum paints, which are heat resisting, non-corrosive, and giving a beautiful finished appearance. The aluminum powder is also used in steel making. Almost any desired color can be obtained.

Heavy Demand on Lumber Stocks.—Stocks of lumber in Ontario are at a very low ebb, and it is confidently predicted that all stocks will be exhausted by the end of the year. In order to counteract this the cut will be started so much earlier this year. Though the British Columbia mills are again working full swing the demand is greater than the suppiy. Ontario can use all the lumber she can cut without exporting any, and it is a fact that United States buyers looking for lumber in Ontario have found that Ontario was looking for lumber in the States.

Getting After German Business.—British and French business men have been passing through the Rhine bridgeheads for the past three months, intent upon establishing commercial relations which can be taken advantage of when normal conditions are in force again. The British and French military authorities have given free permit to their business men in passing through, while the American authorities have refused all access to Germany through the bridgeheads controlled by them. This has given the other nations a long pull in getting the German trade.

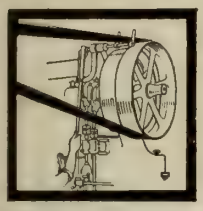
Enjoying a Boom.—Furniture factories in Canada and the United States are booked up for months to come and with a purely domestic demand. Now the demand for export trade is opening up and manufacturers foresee a still further elevation of prices. Furniture now costs about 50 per cent. more than it did in 1918, and about 100 per cent. more than in 1914. Dealers state that cheap furniture is practically unsaleable, the cheaper kinds of wood not being wanted. Suites that could not have been sold in 1914 are now readily got rid of, and the great trouble is to buy fresh stock to replace them. The only failures that have occurred in the furniture business during the last few months have been in houses handling the cheaper grades.

BELTING

SCANDINAVIA BELTING

Scandinavia
and
Lanco Balata Belting

LANCO BALATA BELTING


GOOD ON BELT SHIFTERS

GOOD MOTOR DRIVE BELT

Illustrations show the drives for which they are well adapted.

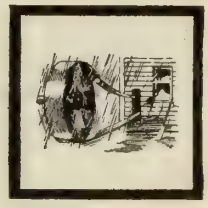
GOOD IN OILY PLACES

GOOD IN COLD PLACES

Our other lines include:

GRINDER BELTS
SAND BELTS
SHOE MACHINERY BELTING

GOOD IN DUSTY PLACES


GOOD IN WET PLACES

GOOD IN HOT PLACES

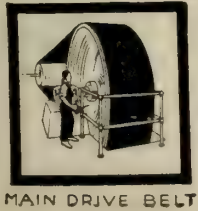
Belts for Small Pulleys:

Our experience has shown us that our Federal Solid Woven undressed belting will give better satisfaction over small pulleys than other kinds of material.

If you require belts for any special purpose, write us.

We cater to all kinds and conditions of belt drives.

SCANDINAVIA CONVEYOR


MAIN DRIVE BELT

If you are in doubt about what belt to use ask us for one of our forms. We guarantee the successful performance of the belt we furnish, when we have the necessary information.

FEDERAL ENGINEERING CO., LIMITED
172 John St., Toronto

Opportunities for Export.—Mr. A. C. Mambert, the Ontario Timber Commissioner in London, says there is a good opportunity to export wooden pails, rakes, brooms, washing machines, trays, paint brush handles, etc., from Ontario to France and England. There has been some trade along these lines done, but in a desultory fashion. Before the war Germany had the command of this trade, with Sweden and the United States following. At present importations into England are prohibited from any country outside the Empire, or else are subject to license, which is difficult to secure. There is a great chance right now to get into this trade on a sound basis.

Going to Preston.—Purchase of the Preston Chair Company by the Canada Last Company of Toronto was effected recently. The chair company has been in liquidation, and the town of Preston was obliged to take over its liabilities. The sale of the plant to the Toronto firm will enable the municipality to recover its loss. The Canada Last Company has made its product from blocks, but when the newly-acquired plant is in operation a sawmill will be included in the equipment, and the blocks will be cut from the log. The Council of Preston is congratulating itself on securing a new industry to replace the Preston Chair Company.

The Cost of Coal.—The wild rumors that coal will jump in price as much as $5 to $6 a ton, and a famine develop during the winter, are discounted by Canadian coal dealers, who have been looking into the situation in the States. There will be a shortage, it is thought, and probably a small rise in prices, but nothing like the rise that has been freely prophesied. If people get panicky and all rush to buy coal at the one time there will be a fictitious situation created which will tend to elevate prices. Many of the Italian laborers are returning to Italy, which is creating a shortage of labor, naturally affecting the output. There will be enough coal available to face a normal winter is the consensus of opinion.

Better Wages at Beginning.—Manufacturers who are alarmed at the way young men are taking to the lower or unskilled classes of work because of the better pay to be obtained by a beginner, are considering a way to combat this tendency. Their idea is to pay a beginner at a skilled trade more than he is actually worth in order to encourage him to stick with it and eventually become a skilled mechanic. They believe in this way that they will get permanent men and save the large amount of loss entailed when a skilled man leaves and a new one takes his place. Every man who runs a shop knows that, no matter how good a new man may be, he is a source of expense for the first day or two, or possibly longer, till he becomes habituated to the practice of the new shop.

High Price of Hides.—The prices of hides and leather are now practically sky high, and the supply in the United States and Canada is so low that further advances seem inevitable. Tanners are delivering leather at present at lower prices than they can restock at, and shoes are selling at prices which cannot be repeated on fresh stocks. The only thing that can check this advance would be increased imports. There are large accumulations of hides in Russia, and also in South America, India and China. What is wanted is increased transportation facilities. The stories that all raw material had been cleared out of Russia is evidently false, for a shipment of hides arrived at a Pacific port recently from Russia in excellent condition, nothwithstanding the fact that the hides were over four years old.

The Alien Getting Even.—The many aliens of supposedly Austrian nationality, but really Slavs and Croats, who have been working in the anthracite mines, are getting out of the country as fast as they can. Forty-two thousand have already gone, and as fast as steamer space becomes available, more are going. These men, who were far from being in sympathy with Austria during the war, resented the attitude displayed by many Canadians to them, and as a result of their being so anxious to get back to their own countries, there is a grave danger of many of the people who vilified them being cold this winter. The production from the mines, where central Canada gets her anthracite coal was, up till the end of June, only 38,000,000 tons, ten millions less than for the corresponding period of 1918.

The Coal Situation in B. C.—Sir Robert Borden sent a telegram to the mayor of Sydney Mines, which was read at a labor meeting recently. The Premier stated that the Canadian National Railways were taking more coal from Nova Scotia this year that last, and had divided their orders between sixteen different mines. He pointed out the handicap that Nova Scotia was under owing to the shortage of ship tonnage. He stated that the Canadian National now had a stock of coal on hand good for seventeen weeks and were adding to their stock daily. Mr. R. H. Butts denounced the leaders of the United Mine Workers locally as demagogues and agitators. Mr. McLachlan, addressing the meeting, was not disposed to accept the Premier's explanation and thought that much of the present unrest was due to the Government's attitude towards labor. He thought that United States coal should be shut out of Canada altogether.

Strike Ends.—About sixty shops in Toronto have resumed operations when the machinists, on strike for twelve weeks, returned. Following a conference between the employers and representatives of the men, the latter at a meeting accepted the terms offered with little comment, and were instructed to report for work at once. About 1,200 men started the following day. While it may be several days before all of these men are placed owing to the disorganized state of the shops following the strike, they will all be looked after. While the strike is generally admitted to be a failure in so far as the strikers did not receive the 44-hour week and 50-hour pay demanded, it is pointed out by union officials that these conditions, as well as the extra wages, have been conceded by twenty-three shops in the city at which the men have been working for some time past. The question of wages with the 56 shops will be settled at another conference between the union officials, the Strike Committee, and the manufacturers. One of the union officials stated that the loss in wages to the men might be figured as something well over a million, while the International paid out $560,000 in strike pay.

Increase in Express Rates.—The application of the Express Companies for an increase in rates has been dealt with in an exhaustive report from the Board of Railway Commissioners, occuping 93 pages of printed matter. The judgment admits that the companies are carrying on business at a loss, and in order to increase receipts, increases are allowed in the general merchandise list. There is no increase allowed in essential commodities, the Board considering that such an increase, however small, would afford a reason for a further increase of price in these commodities to the consumer. The Board feels that such a change is undesirable in the interests of the consumers and the express companies themselves. The increases allowed in the general merchandise scale amount as a whole to 45.94% on Eastern Canada, 23.75% on the prairies, and 1148% in British Columbia. The effect on the three different sections of the country will be as follows. The prairie rates 39.55% higher than Eastern Canada, will be under the new schedule only 17.88 per cent. higher, and British Columbia now 29.29% higher than the prairie rate, will be now only 15.01% more. The wagon service is materially increased in the cities, thus giving relief to those districts that have not formerly had an adequate service.

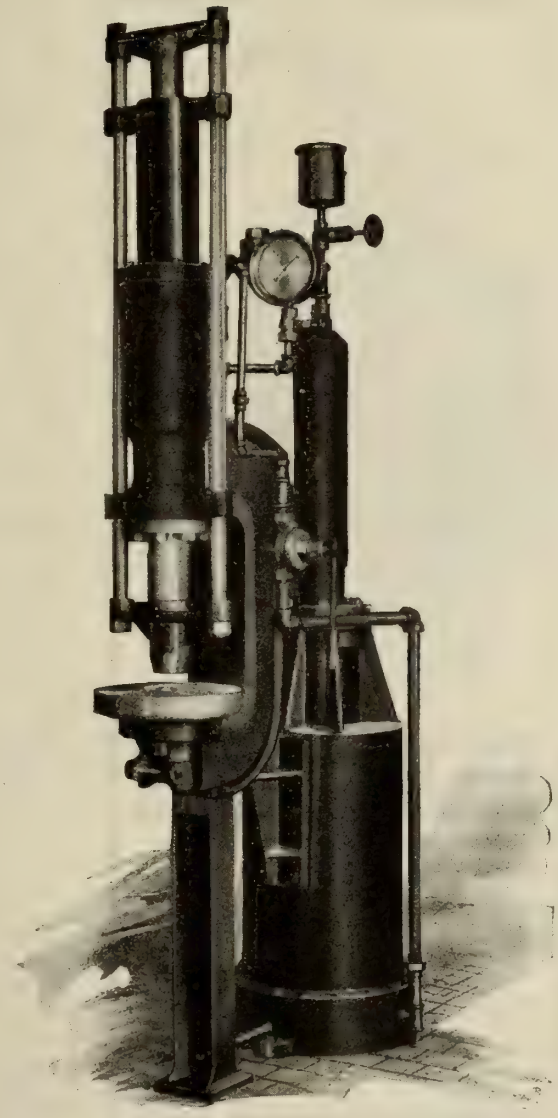
Cost of Pavement.—"That it is costing the city forty per cent. more to pave streets by giving the work to contractors than by the city undertaking the work," was the statement made by a member of the Chatham council. The alderman stated that in reply to an enquiry as to the cost of grading, paving and curbing at Gray and Lorne Avenue, made at the council, is proof of his statement. "It was shown by the figures that the cost of the work of putting down Gray Street pavement, not including material, is 16½c per square yard, and the cost of curbing was 15c per lineal foot," said the Alderman. "Adding overhead charges, which would not exceed more than 10c per square yard, it will readily be seen by these figures that the cost of laying pavements by city workmen, and under the city engineer, is about forty per cent. less than by contract, when we consider that on certain streets contracts have been awarded at one dol-

ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

EXCLUSIVE SALES REPRESENTATIVES:

Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Pa.

Special Machinery
MADE TO ORDER

Mill Machinery, Engine Work
Grey Iron and Brass Castings

TRY US FOR GENERAL REPAIRS

ALEXANDER FLECK, LIMITED
(Vulcan Iron Works) OTTAWA, ONT.

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"HAWK" BRAND STEEL

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lar per square yard, with an additional cost of keeping an inspector on the work.

Building at Kitchener. — Construction of a plant for the assembling of motor truck parts and for the manufacture of truck bodies will be proceeded with almost immediately in Kitchener, according to an announcement by an official of the F. W. D. Auto Company, which will operate as the Canadian end of the parent organization in the United States. The decision to erect a plant in Kitchener was arrived at some time ago, and a site was purchased in the eastern section of that municipality. Difficulties arose in connection with the new location of the Grand Valley Railway, and it was found advisable to postpone the work of construction until the railway plans were completed. These details have been worked out finally, and there are no further obstacles to the immediate erection of the plant. Trucks have been shipped in from the United States plant meanwhile to fill Canadian orders. One of the considerations that governed the truck company in seeking to establish a plant in the Dominion was that the British preference on motor cars will make it advantageous to ship Canadian rather than American trucks. The markets of the Empire look attractive to this firm The United Kingdom is regarded as a promising field. Australia, New Zealand, India and South Africa, and all other sections of the British Empire where railway transportation is not highly developed, are looked upon as potential markets for large numbers of trucks. Production will be commenced at the Ontario plant before the end of the present season.

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INCORPORATIONS

The Galt Brass Company, Limited, has been incorporated with an authorized capital of $500,000 to take over the liabilities and carry on the business of the Galt Brass Company Limited, Galt. They expect to develop and expand the business considerably. The old company was incorporated under a provincial charter, while the new concern has obtained a Dominion charter.

MARINE

Cleveland.—The death is announced of Capt. Charles A. Benham, master of the steamer John Stanton, of the Hutchinson fleet. He was only 51 years of age, and was in active service up to a week from his death. He is survived by his father, Captain C. E. Benham, and four brothers, besides a widow and two sons.

Paris.—The French Minister of Public Works, M. Albert Claveille, announced in the Senate that he would shortly submit a plan whereby France's mercantile tonnage would be increased to more than double the pre-war tonnage in the next three years. The aim of the Government would be to build 5,000,000 tons in French yards.

Hamilton.—A big appropriation having been made by the Dominion Government early in the year for work on the harbor, the Board of Harbor Commissioners are anxious to get it started. To this end Mr. T. J. Stewart, M.P., at-

ended the meeting and promised to use his good offices to get the work started as early as possible.

Rotterdam.—The N. Y. Wiltons machine factory, Scheepvart, has acquired a plot of land between Vlaardingen and Schiedam, for the purpose of building a huge dockyard. The dockyard will be used for building ships, which will be built in the dock instead of on slips. To begin with only one dock will be built, in which two ships about 650 feet long, and eight small ships, about 328 feet long, can be constructed at once. If the venture proves successful a similar dock for the construction of vessels as big as the Vaterland will be built, as well as a floating dock to take vessels of 40,000 tons. The dockyard, when completed, will be the largest in Europe.

NEW BOOK ON ABRASIVES

Abrasives and Abrasive Wheels

By Fred B. Jacobs

Three hundred and thirty eight 5 in. by 8½ in. pages, bound in dark red cloth boards. Published by the Norman W. Henley Publishing Co., 2 West 45th Street, New York, U.S. Price $3. This book is a complete treatise on the manufacture and practical use of abrasives, abrasive wheels, and grinding operations.

The natural and artificial abrasives are discussed fully, also the production and preparation of the same. Grits, grades and bonds, sharpening and grinding stones and wheels, testing wheels for efficiency, trueing, rebushing and installing wheels, safety devices, and dust-collecting systems, complete exposition on surface, external and internal grinding, and comprehensive data covering the physical and chemical nature of abrasives in general are fully explained and illustrated.

A condensed list of contents follows: Natural abrasive substances, artificial abrasives, the manufacture of grinding wheels, artificial sharpening stones, grits and grades, testing wheels for efficiency, laboratory tests, grinding wheel vs. grindstones, the economic advantage of using large wheels, trueing devices for grinding wheels, suggestions to follow in ordering grinding wheels, design of dust-collecting systems, safeguarding grinding wheels, abrasive papers and cloth, surface grinding, cylindrical grinding, internal grinding, special grinding operations, cutter sharpening and saw sharpening. This book is profusely illustrated throughout.

From this it will be noticed that the field is well covered, and a book such as this makes an ideal handbook for engineers, factory superintendents, foundrymen, shop foremen, and mechanics in general.

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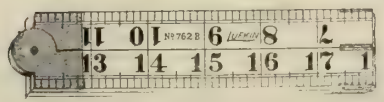
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Tenders will be received by the undersigned Commissioners up till 2 o'clock p.m. Saturday, the 26th day of July, 1919, for the repair to the 3-4 Sideroad and 8-9 Concession drain, in the Township of Brooke, County of Lambton. Estimate cost of excavation, $9,600. Contractors must furnish security for the completion of the work. Plans and specifications may be seen at the office of the Clerk, Lot 16, Con. 9, Brooke Township. Lowest or any tender not necessarily accepted.

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125	240	200	12 x 21″
150	220	225	10 x 20 x 18″
150	2300	225	14 x 22 x 16″
200	2300	200	
300	480	150	14 x 28 x 30″
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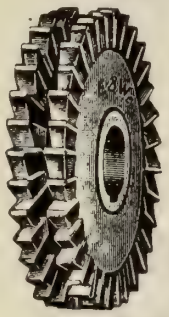

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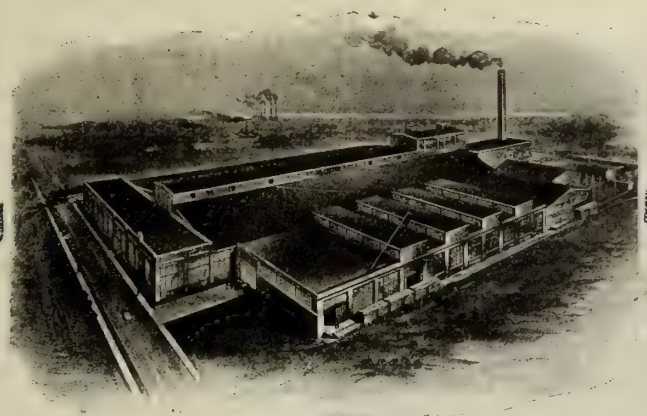

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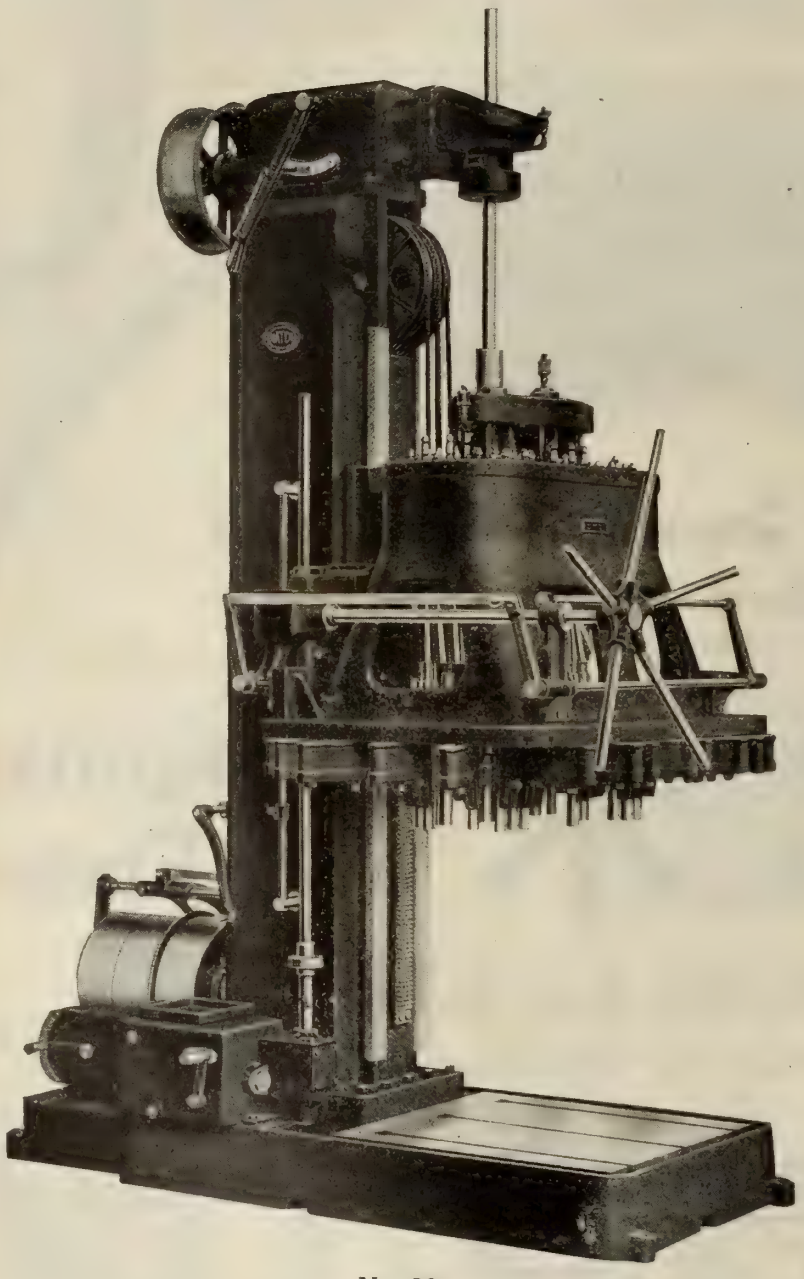

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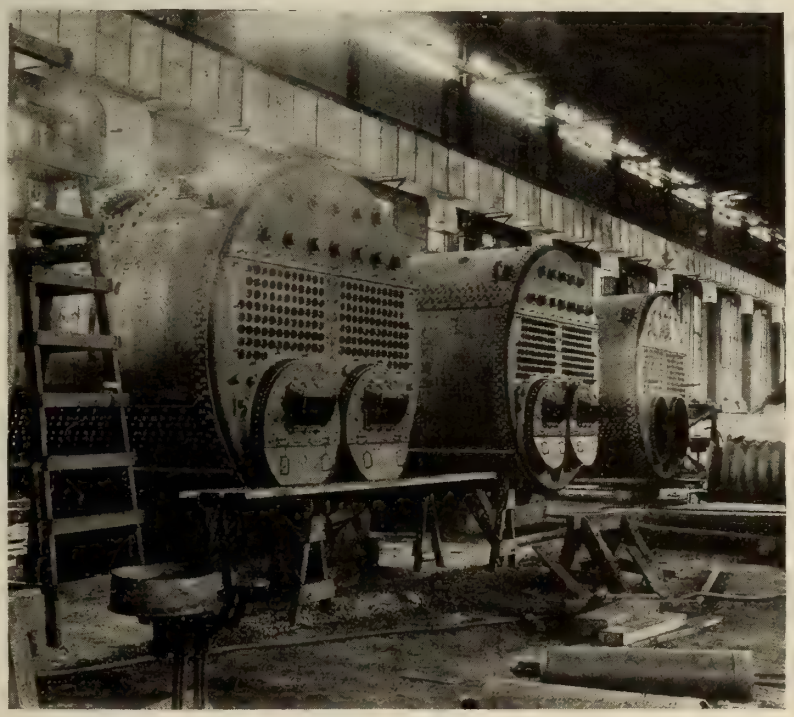

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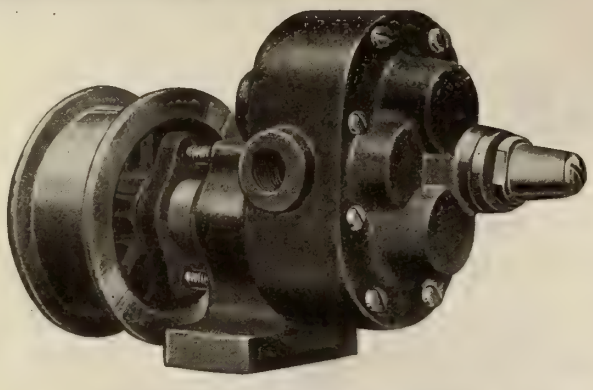

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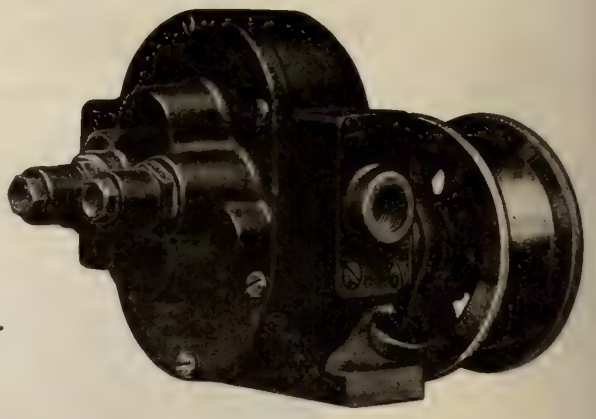

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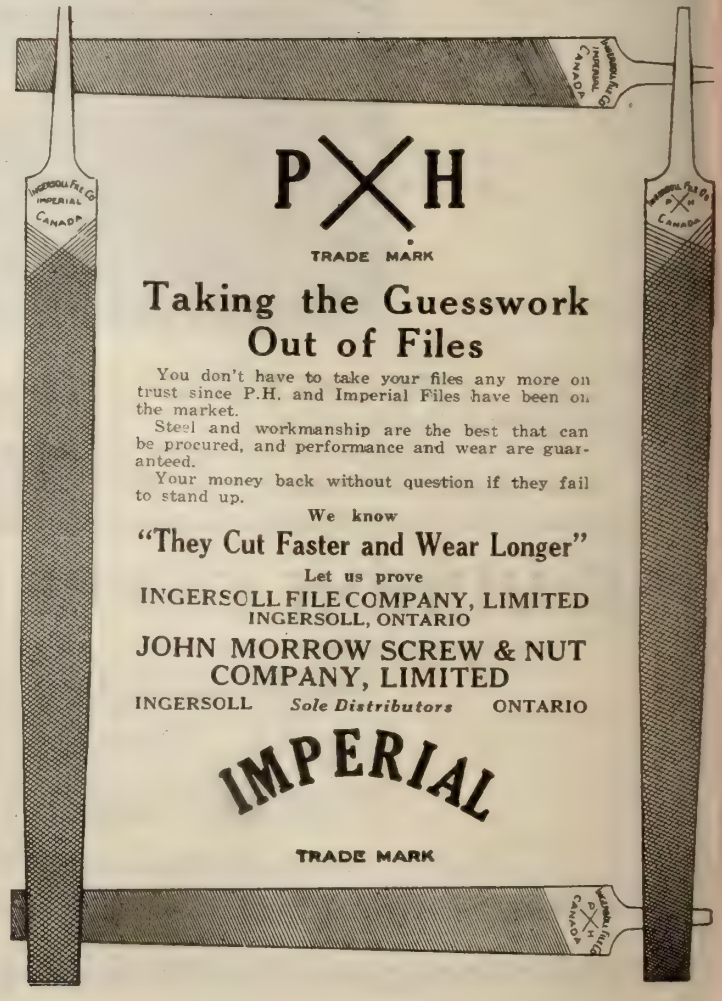

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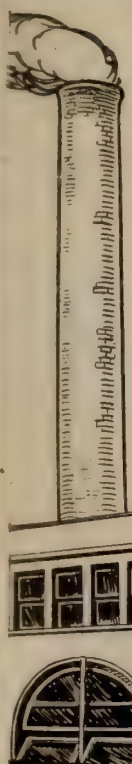

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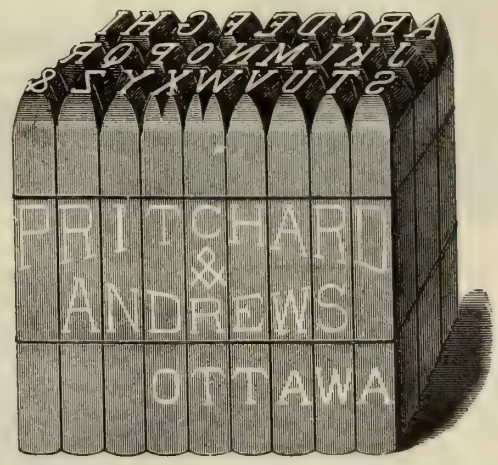

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We will Give You Satisfaction on all Work of this Kind.

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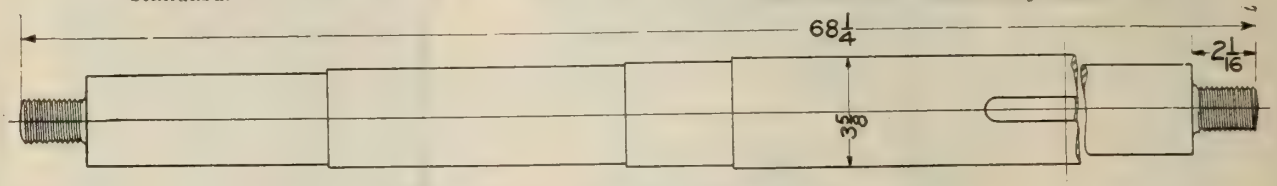
Smalley-General

THREAD MILLING MACHINES

Will give you a short cut to lower-cost thread milling.
Study the blue print and time study as given below.

MACHINE—Smalley-General Thread Miller No. 2.
THREAD—1½ in. diameter, 2 1-16 length, 6 pitch U.S. standard.
PIECE MILLED—Axle for tractor.
MILLING FEED—4.35 per minute.
MATERIAL—Machinery steel.



Tractor Axle Operation
TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the center and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

Consult us on every phase of Thread Milling. We will show you how to cut the costs.

Smalley - General Co., Inc., Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

The ideal lathe for small tool-room work, such as taps, reamers, etc.

Provides 45 changes of feeds or threads from 3 to 92 per inch, including 11½.

"STAR"
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Quick Change
Engine Lathe

Replace your larger and more expensive machines with "Star" lathes and you'll automatically reduce your manufacturing cost.

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EXCELITE for general grinding, tools and tool room work.

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Our large stock assures prompt delivery.

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Let us help you with your grinding problems.

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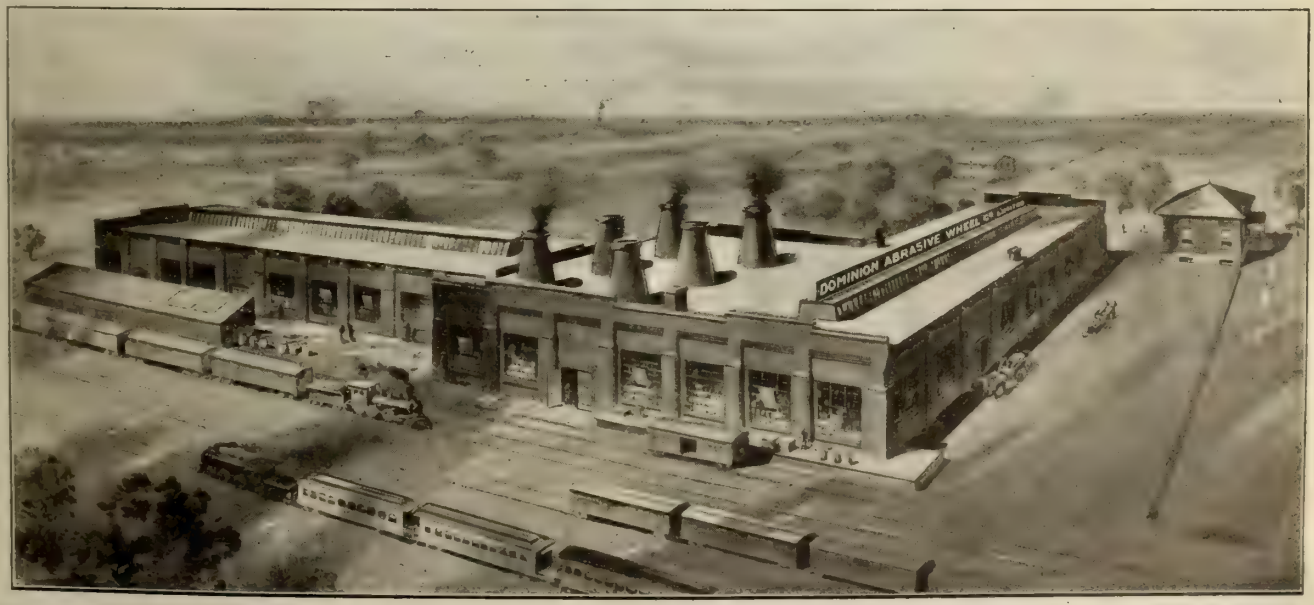

The Secret of the Strikes

Most Canadians are asking "What is the cause of the 'Great Unrest' "? Is it the fault of labor—or of capital?—or is it the result of German propaganda? Do you know of the real reason for the labor disturbances in Canada, and elsewhere? Are YOU thoroughly familiar with the ins-and-outs of the plans which threaten a world-wide "tie-up?" This is something that should be understood by every Canadian. And every Canadian should read "The Secret of the Strikes," by Lieut.-Colonel J. B. Maclean in the August issue of MacLean's Magazine. It is brimful of startling and authoritative information regarding this great problem. Read it carefully. It starts on page 33, August MacLean's.

"The Lecturer At Large"

Stephen Leacock is one of the continent's greatest humorists. "The Lecturer at Large" is one of the best humorous sketches that he has written. It is made up of what he terms "a few painful reminiscences of the platform" in the course of his lecturing up and down Canada. Get your family around you and read the sketch aloud—it's a rare treat.

Other Big Features

"A Party in the Making." By J. K. Munro. Illustrated by William Casey. An article on the political situation, giving a great deal of inside information with reference to recent developments at Ottawa.

"Solving the Problem of the Arctic." By Vilhjalmur Stefansson. The fifth instalment of his story of the five years' explorations that he conducted for the Dominion of Canada.

"The Unspoiled Country." By Harold C. Lowrey. A descriptive article of a part of Canada which is little known to Canadians generally, Temagami.

"Petite Simunde." By Arthur Beverley Baxter. Illustrated by E. J. Dinsmore. A charming romance of the war. The author will be remembered favorably for his "Mr. Craighouse of New York, Satirist."

"The Seven Blue Doves." By W. A. Fraser. Illustrated by Charles L. Wrenn. The fifth of the Bulldog Carney series and in some respects the best. It is a mystery story.

"His Majesty's Well-Beloved." By Baroness Orczy. Illustrated by C. F. Peters. The second instalment of this splendid romantic novel of the colorful era of Charles II.

The Month's Vital Question

Turn to page 34, August MACLEAN'S, and you will find timely and interesting information regarding the High Cost of Living—a problem of large proportions.

The Review of Reviews

Here are a few of the articles chosen as the best published during the past month in all magazines:—Britain Winning Supremacy of the Air; Has Japan Two Governments?; Kaiser Employed Famous Beauties; The New Triple Alliance; Mammoth Animals in Alberta.

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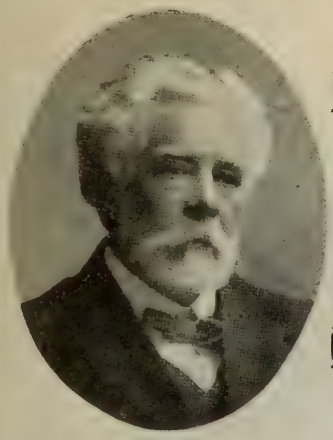

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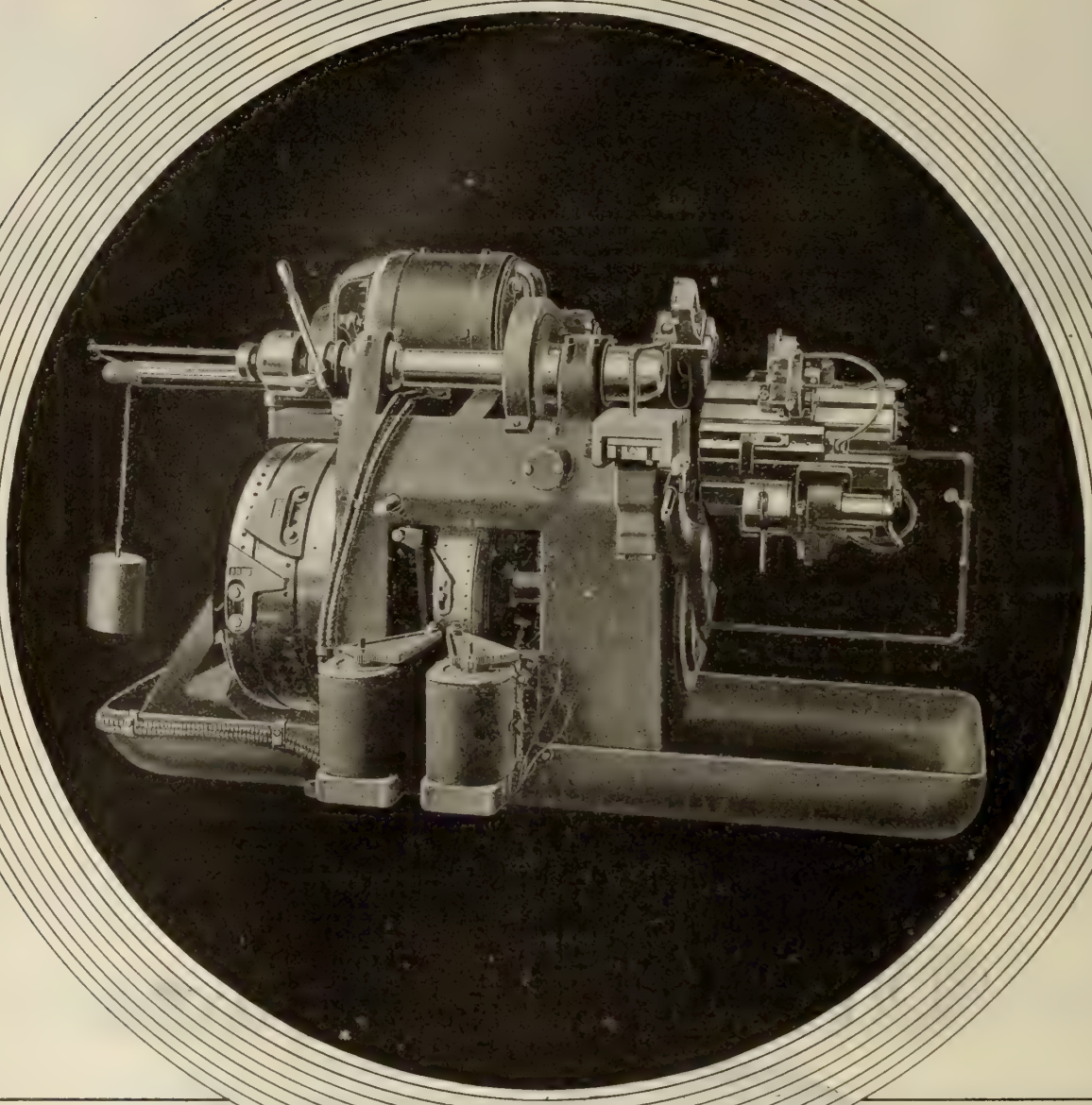

Let's be specific:

A comparison of two different Turret Lathe jobs for accuracy or for output, merely on heresay or opinion has often resulted in a new attitude when the real figures were known.

Gridley Automatic Turret Lathes stand or fall by their specific performance on *your* work in your shop. May we quote you *specifically?*

Capacities 2¼-5".

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AUTOMATIC SCREW MACHINERY AND ITS PRODUCT

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WILLIAM HAMILTON COMPANY,
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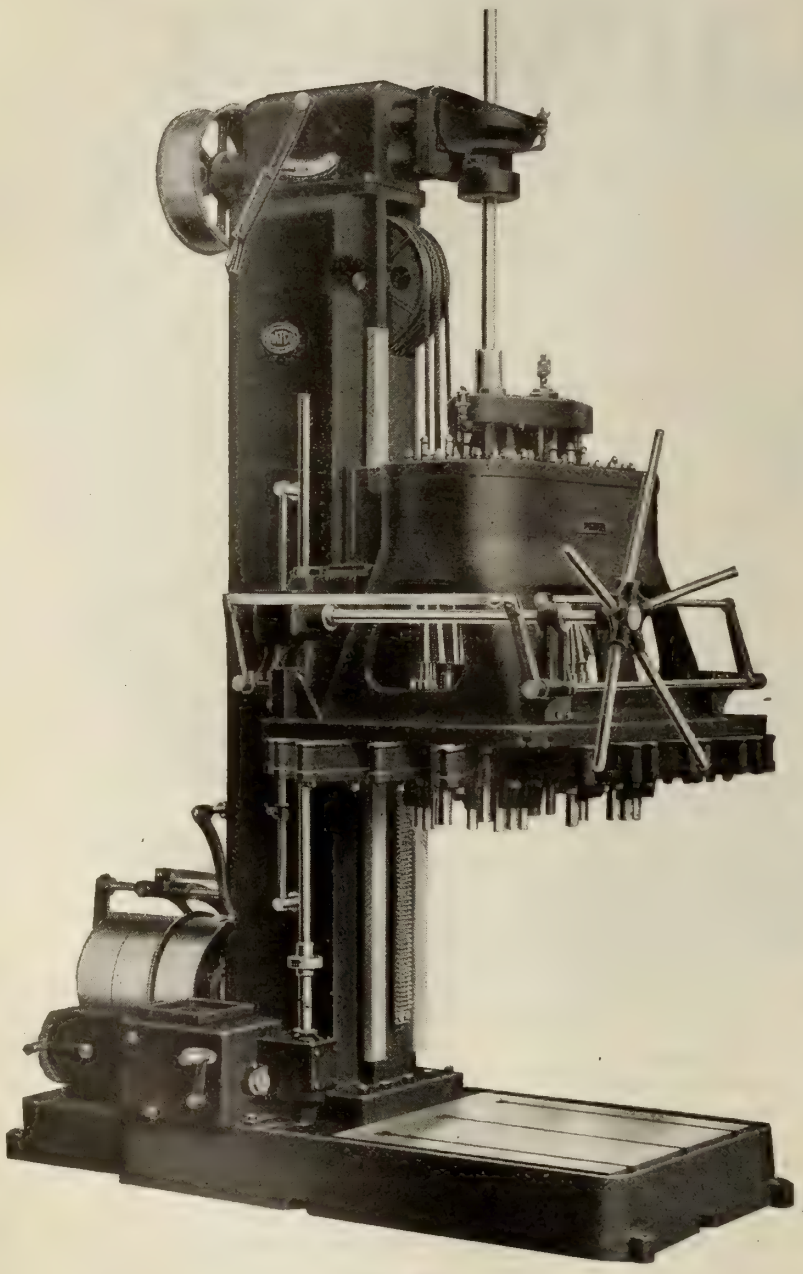

No. 30

No. 30 NATCO with Patented Independent Change of Speed to each individual drill.

NATCOS are made in 11 sizes, ranging from 2 to 72 spindles.

We have told you what the NATCO is doing for others in the way of drilling, tapping, spotfacing and counterboring.

Now let us tell you what it will do for you.

We also decipe and build Jigs and Fixtures for use in conection with NATCO Multi-Drillers.

THE NATIONAL AUTOMATIC TOOL COMPANY
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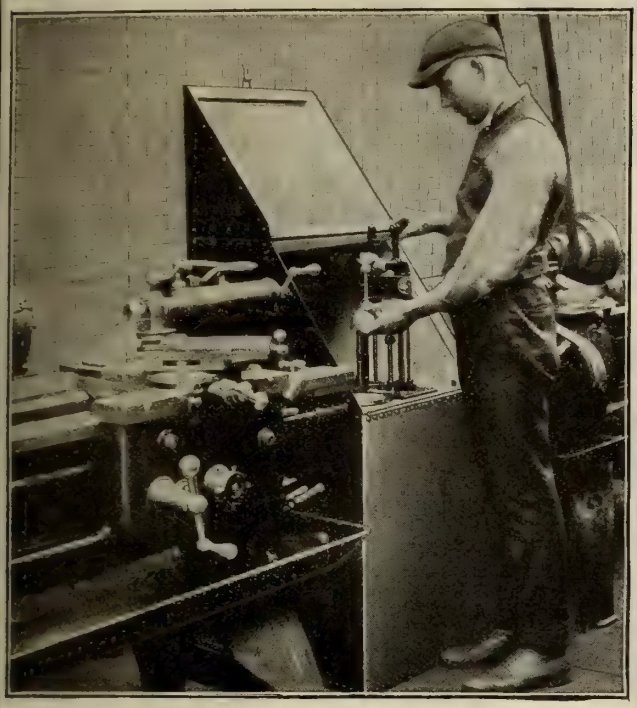
Prevent Idle Time
of Men and Machines



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There is no going back and forth to the oil room, no spilling, no wasted oil, no fire risk from the oil storage.

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The oil supply can be stored and handled as systematically as raw materials or finished parts—income checked, distribution measured, charged and recorded.

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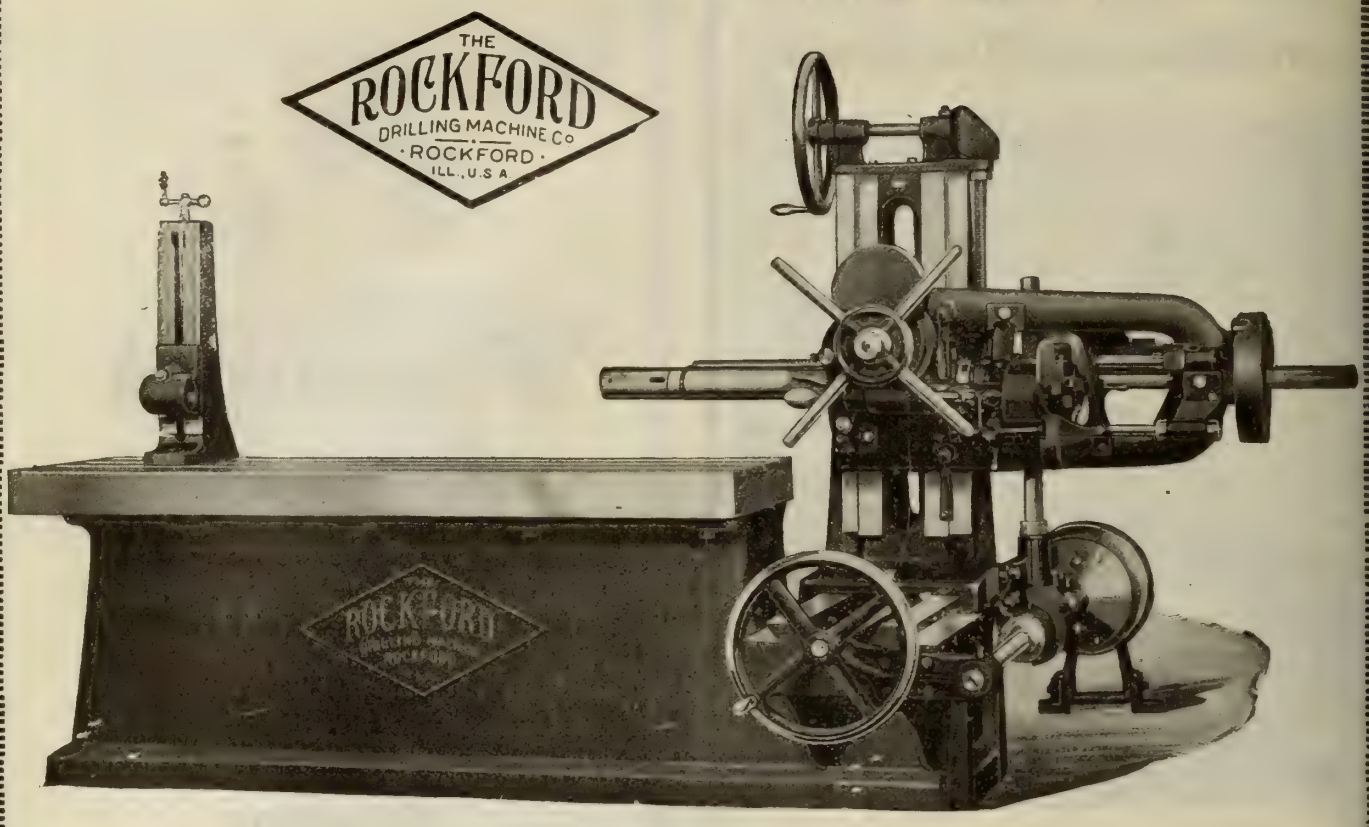

A Horizontal Boring Machine

For Heavy Duty or Fine Jig Work

This wide range machine has the strength and rigidity to drive 2-inch high-speed drills to capacity and boring tools up to 8 inches and over, but is so carefully balanced and nicely adjusted as to adapt it equally well to the finest jig work.

Lateral and vertical adjustment of the head to permit the spindle to operate anywhere over a surface 18 by 36 inches; spindle of special forged steel, ground to size, has long nose with 5/8 x 5/8 slot in the end and is provided with ball thrust bearings. Steel gears provide nine different speeds without stopping the machine and the automatic trip guards against the spindle being advanced beyond its intended range of movement.

Six styles of drive: 2, 3 and 4-step cone with back gears, and 5, 4 and 3-inch belt respectively; gear box with tight and loose pulley; variable speed motor, directly connected, and constant speed motor with gear box (as illustrated). Complete description in Circular R-1.

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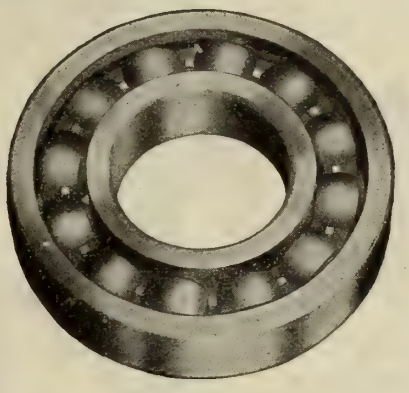
All standard sizes, annular and thrust bearings. Shipped from stock. Quotations on special bearings given promptly.



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Pressed steel ball bearing wheels and sheaves.

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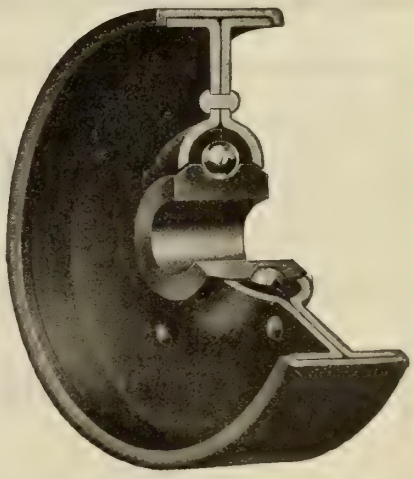

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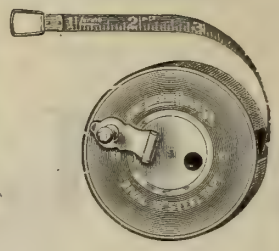

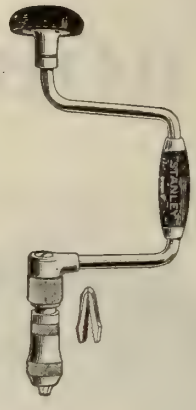

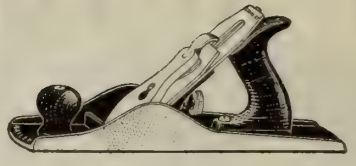

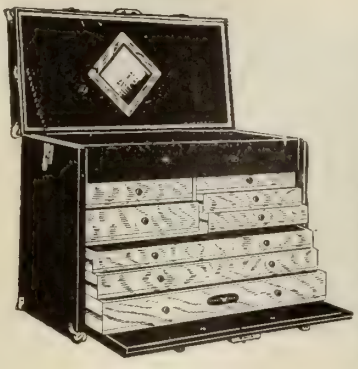

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This cabinet is strongly made and handsomely finished to suit the individual buyer, drawers slide easily and noiselessly, locks securely.

Style 5, shown here, made in two sizes. Send for prices.

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We manufacture *Mild Steel, High Carbon Steel, Manganese Steel* and *Chrome Steel Castings* from ¼# to 5000# each, annealed if necessary. Special attention given to *Rush Orders*. Prices are exceptionally moderate. Try us with your next order.

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The personal satisfaction they get out of working with sharp, well balanced tools makes for contentment.

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"Famous Five" Files give maximum returns because the steel in them is accurately cut and properly hardened.

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The Hammer With The Human Stroke

HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
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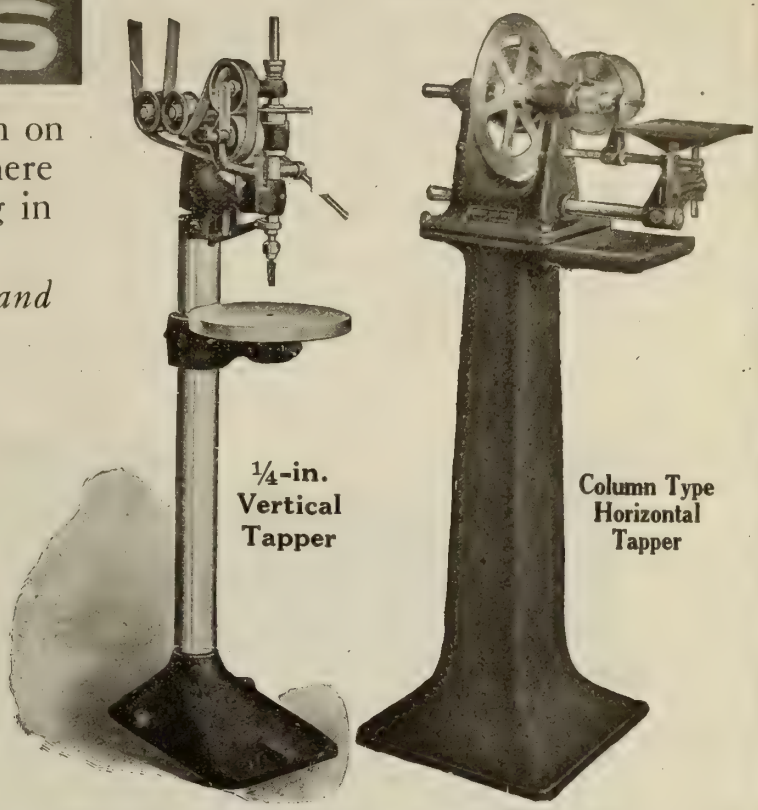
Save Tap Breakage

The *smooth drive* reduces the strain on the taps—they wear longer—and there are fewer delays from taps breaking in the work.

R-S Tappers ensure faster tapping and quicker assembling.

Friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on 5/8-in. work—50 per cent. faster than the usual tapping speed for that size. Uses but 1 h.p.



¼-in. Vertical Tapper

Column Type Horizontal Tapper

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The "Boehm" Positive Opening Threading Die

Hardened and Ground Guides for the Chasers

This Is One Distinct Feature of the

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The "Boehm" Positive Opening Threading Die has a positive opening and closing cam action.

Chasers have the necessary radial movement to enable the die to open after the threading operation has been completed. They are supported by a cam ring throughout their entire length and width. Incidentally—

The chasers slide between hardened and ground guides, and are supported by carriers which have a groove in the outer end for the positive opening cam.

This cam, the locking pins, and the "float" have features that add to the distinctiveness of the "Boehm."

We will be glad to send you complete description.

The Rickert-Shafer Co.

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For Efficient, Dependable Service On Big Work

The Landis 12" x 96" and 12" x 120", Plain

There are many just claims we could make regarding the superiority of Landis Plain Grinding Machines.

We prefer, however, to let you form your own opinion by watching the Landis in operation.

We'll tell where you can see the Landis right in your neighborhood turning out highly efficient, dependable work. The grinding is done by the wheel traveling and the work remaining stationary.

Write us if interested in getting a first-hand impression.

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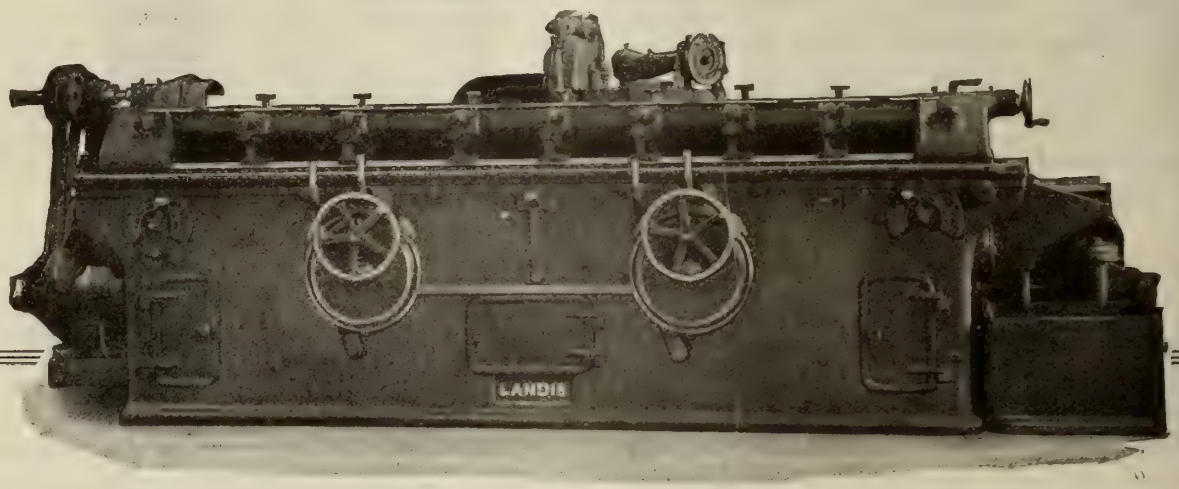

FOR CONNECTING ROD BEARINGS

A further demonstration of the Excellence of

MAGNOLIA METAL

PERKINS MACHINE & FOUNDRY CO. INC.
FOUNDERS AND MACHINISTS
Amsterdam, N.Y.

May 13, 1919.

Magnolia Metal Co.,
New York City.

Gentlemen:-

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Have used MAGNOLIA on Dynamo and Engine Bearings (Connecting Rods more particularly) and claim it to be the most excellent metal for hardest service obtainable. Am glad, indeed, to be able to recommend it.

Beg to advise that I am a mechanical man of many years experience, having handled all kinds of Babbitts, and MAGNOLIA METAL is my preference.

Yours truly,

PERKINS MACHINE & FOUNDRY CO.,
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Engineer and Manager.

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Quality
Plus
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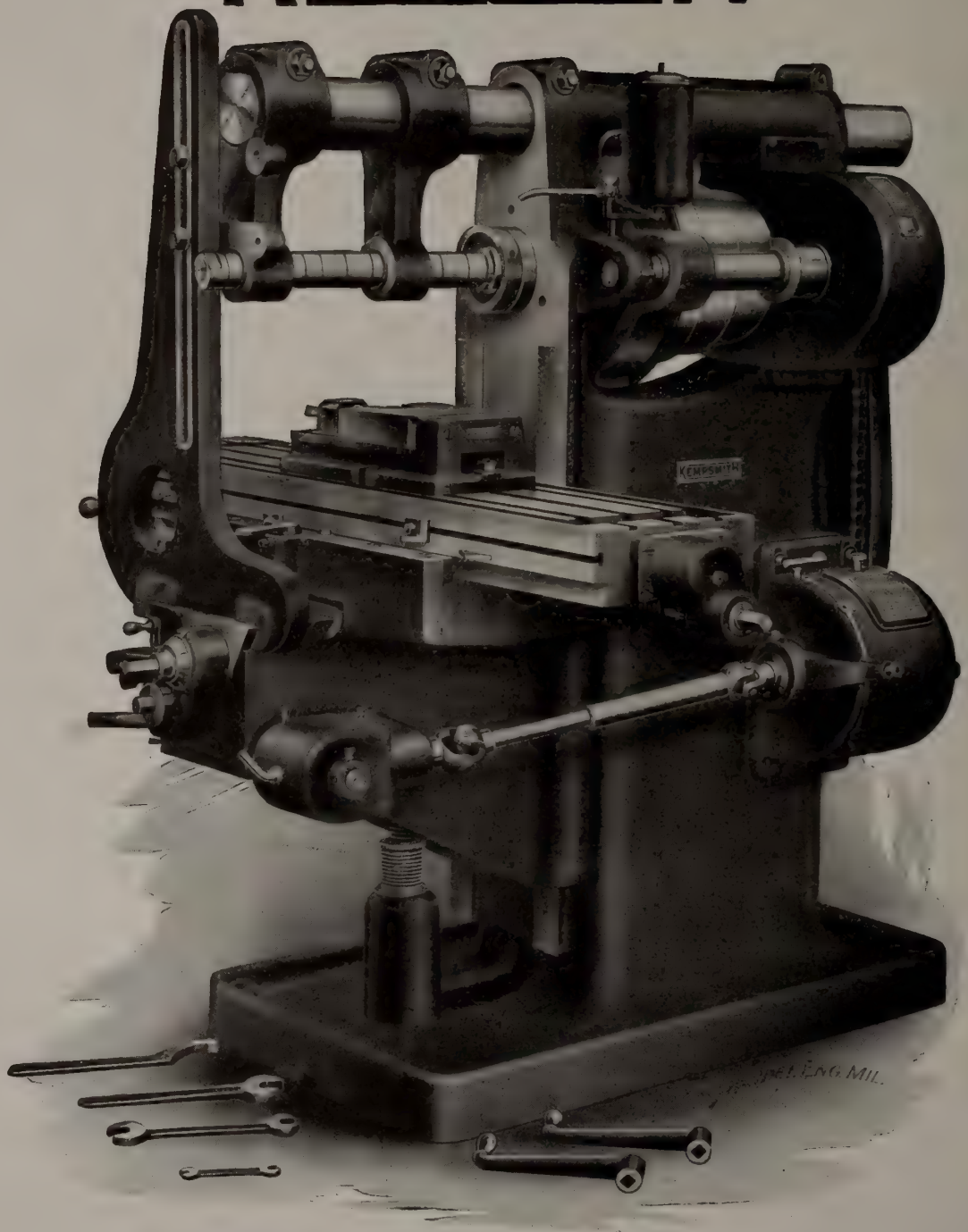
KEMPSMITH



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Double Back Geared.

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The merit of a world's record in accuracy and economy stamps this machine as distinctive among metal-cutting machines.

The value of the Racine machine has been demonstrated so thoroughly that we will send you any machine you may select upon approval.

Send for our catalogue and make your choice to suit your requirements.

Stock up to 12" x 12". Motor or belt driven.

We guarantee the accuracy of the Racine.

On the reverse the Racine lifts the blade so that wearing on the cutting edge of the blade is eliminated.

We guarantee to keep every machine we sell supplied with Racine H.S. Tungsten Blades.

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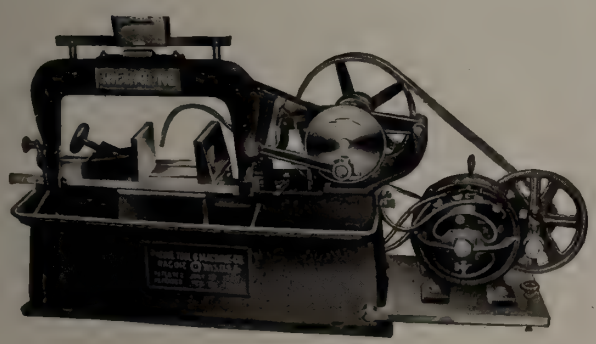
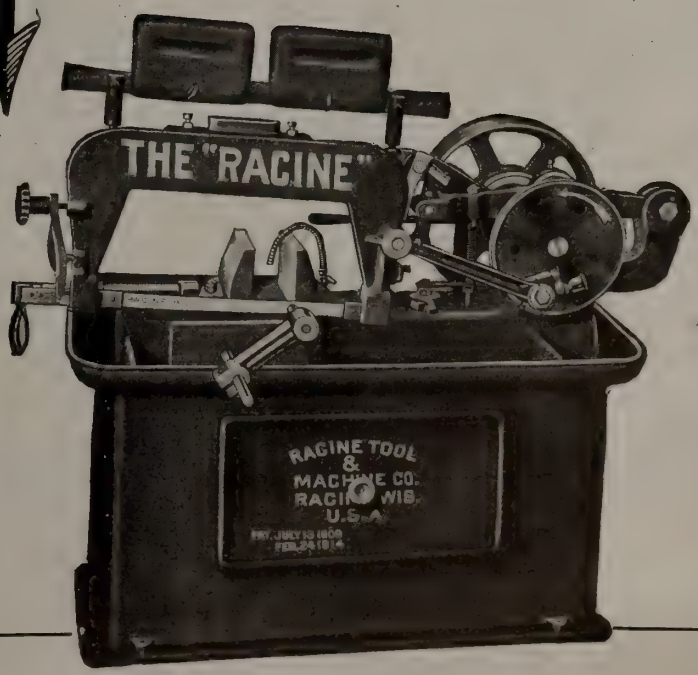




The GEO. F. FOSS MACHINERY & SUPPLY Co
LIMITED
305 St. James Street - Montreal, Quebec

One Great Advantage

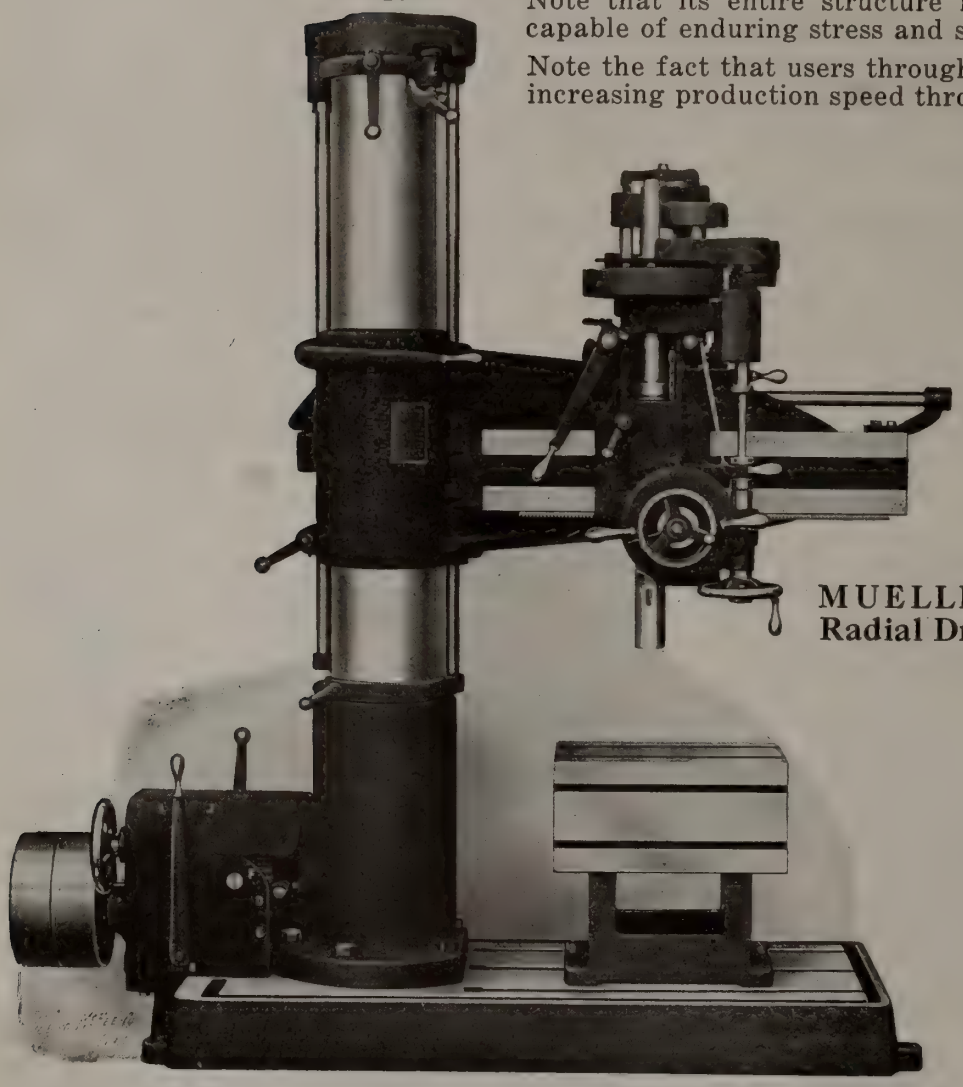
which the Mueller Radial Drill has over other radials is its Patented Stationary Column.

Note its strength—one-piece and stiffened by four internal webs.

Note the fact that every control lever is within easy reach of the operator.

Note that its entire structure is firm, rugged and capable of enduring stress and strain.

Note the fact that users throughout the country are increasing production speed through its use.



MUELLER
Radial Drill

Note the bearing surface of the arm on the column.

The Mueller Machine Tool Co.

Radial Drills and Lathes
Cincinnati, Ohio

The GEO. F. FOSS MACHINERY & SUPPLY Co.
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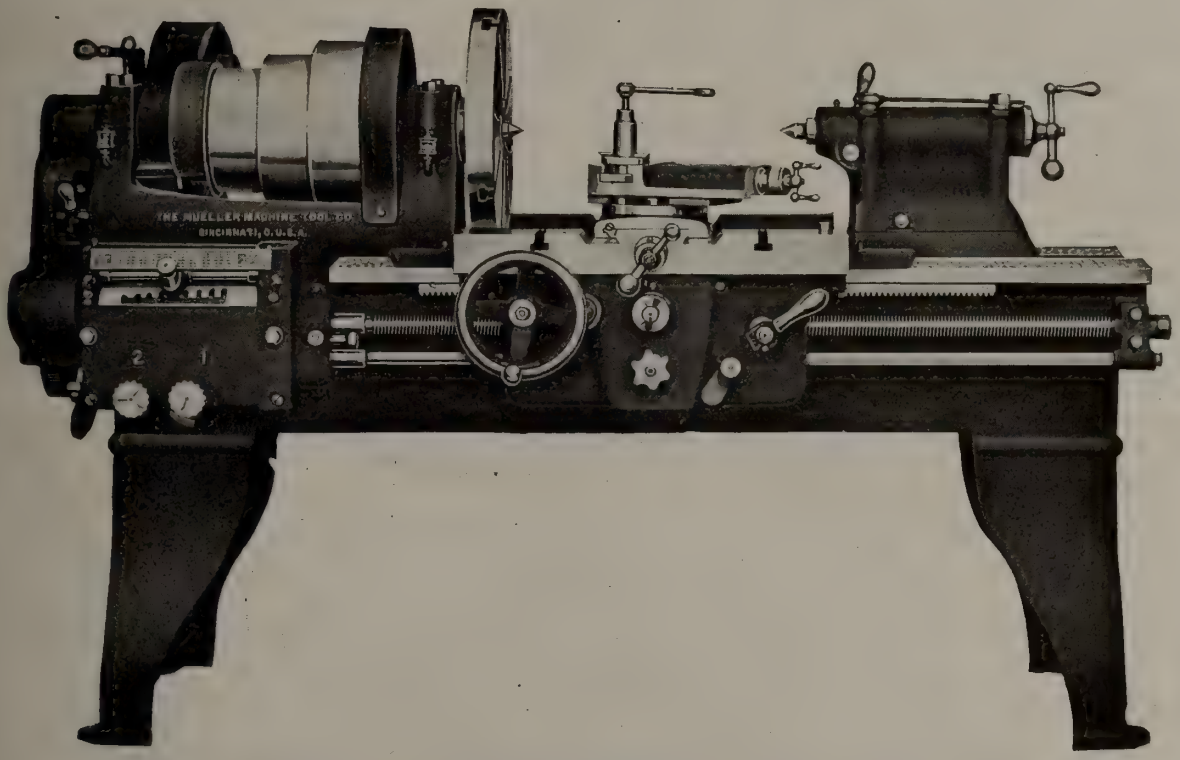
MUELLER HEAVY DUTY ENGINE LATHE



THE headstock is of heavy construction, ribbed and cross-ribbed. The tailstock is very massive in its proportion, with two 7/8-inch bolts for clamping it to the head. It is arranged for two plug clamps, to lock the tailstock without throwing it out of line. The double back gears are of the slip gear type. The spindle is made of high carbon crucible steel, ground to size. Spindle boxes are of phosphor bronze, bored and hand scraped, to fit spindle. The spindle is provided with means for any necessary adjustment. There are eighteen spindle speeds on the machine. Forty-five changes of thread can be cut, ranging from two to sixty, including 11½ pipe thread. All changes are obtained within the quick-change gear box itself. All threads can be cut without the removal or addition of a single gear. The bed is unusually deep and braced its entire length. The carriage is very rigid and capable of withstanding the heaviest strains. Double plate apron is furnished. Steel gears throughout. Sight feed oilers. Automatic stop for carriage.

Write for interesting circular describing machine in detail.

THE MUELLER MACHINE TOOL CO.

Radial Drills and Lathes CINCINNATI, OHIO, U.S.A.

The GEO. F. FOSS MACHINERY & SUPPLY Co.
LIMITED
305 St. James Street - Montreal, Quebec

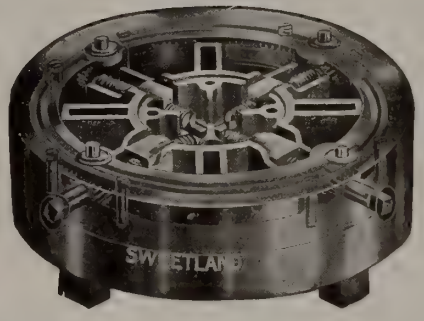
Chucking for Profit

Means the Use of

Sweetland Chucks

as they increase production remarkably by conserving the time and energy of men who operate them.

Note particularly the Sweetland Combination Chuck on the left, for all practical mechanics consider it the best Geared Screw Chuck made. Of simplest possible construction, still complete in its interchangeability from independent to universal operation of the jaws, **or vice versa.**

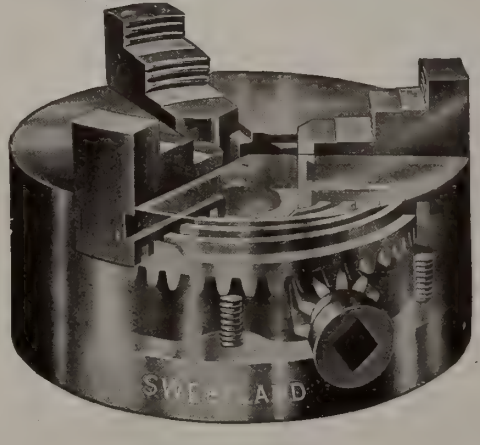


Independent Lathe Chuck

The gripping and gearing surfaces, both of hardened steel, are ground perfectly true. The large screws of special grade steel are flush with the body of this Sweetland Independent Lathe Chuck. The strong jaws are high-grade steel, properly hardened.

Universal Chuck

This Sweetland Chuck has been on the market for over 40 years. Many that long in use are good as ever for accurate chucking work.



Geared Scroll Chuck

Opposite is another Sweetland Chuck, with hardened jaws ground perfectly true on face and bite. Sizes 2½" to 18" dia, both with three and four jaws.

When so ordered this Sweetland Scroll Chuck is supplied with Solid Reversible Jaws—two sets in one; or with Non-Reversible Inside or Outside Jaws, or with both sets.

Hoggson & Pettis Manufacturing Company

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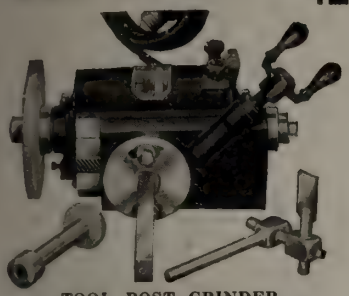

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BENCH GRINDER OR BUFFER
Five sizes, ¼ to 3 H.P. Also Pedestal Floor Grinder, 1 to 3 H.P. Fully enclosed. Dirt and dust-proof. Ball bearings.

SPECIAL FEATURES

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¼", ⅜", ½", ¾" capacities. Weight from 7 pounds up. Ball and thrust bearings. Gears run in grease. Single and two speeds.

HAND AERIAL GRINDER
For cleaning castings or surface work of any kind. Made in four sizes, ¼ to 2 H.P. Weight from 18 pounds up. Guaranteed for hard usage.

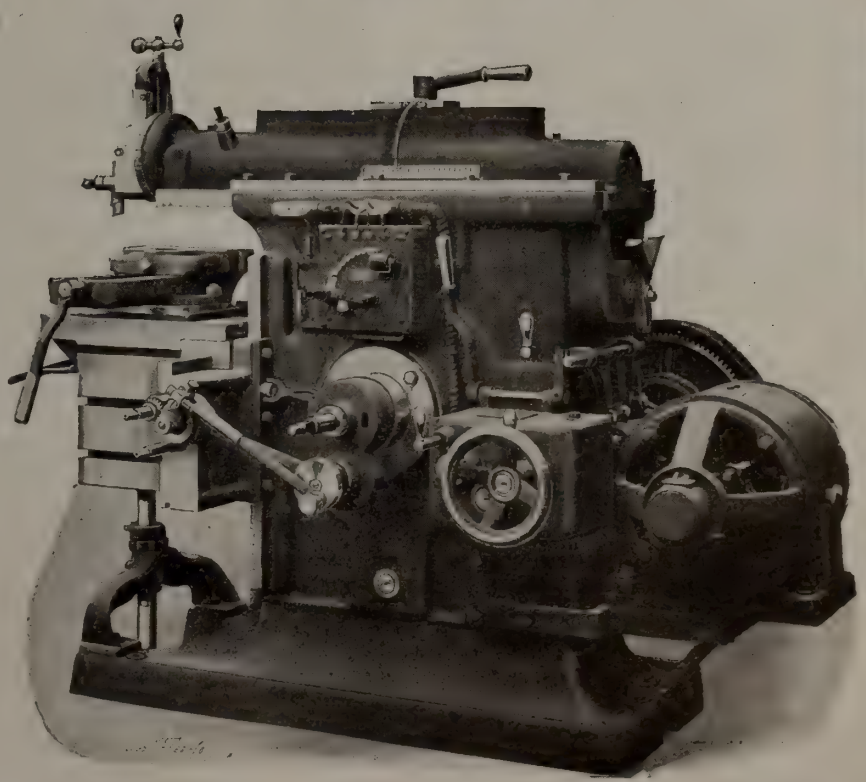
SMITH & MILLS SHAPERS

Permit Changing the Stroke Without Stopping the Machine

No stopping the flow of production with the Smith and Mills. You can change the length of the stroke, whether to shorten or lengthen it, without stopping the machine. You need only loosen locking screw and stop the shaft revolving and the adjustment is made very quickly.

The helical gear on bull wheel eliminates shock. A wrist-pin gear, fitted to the bull gear in an eccentric form, replaces the conventional bevel gear arrangement in the bull wheel. It's an ideal shaper for speed and accuracy. Send for details.

The Smith & Mills Co.
Cincinnati, Ohio, U.S.A.



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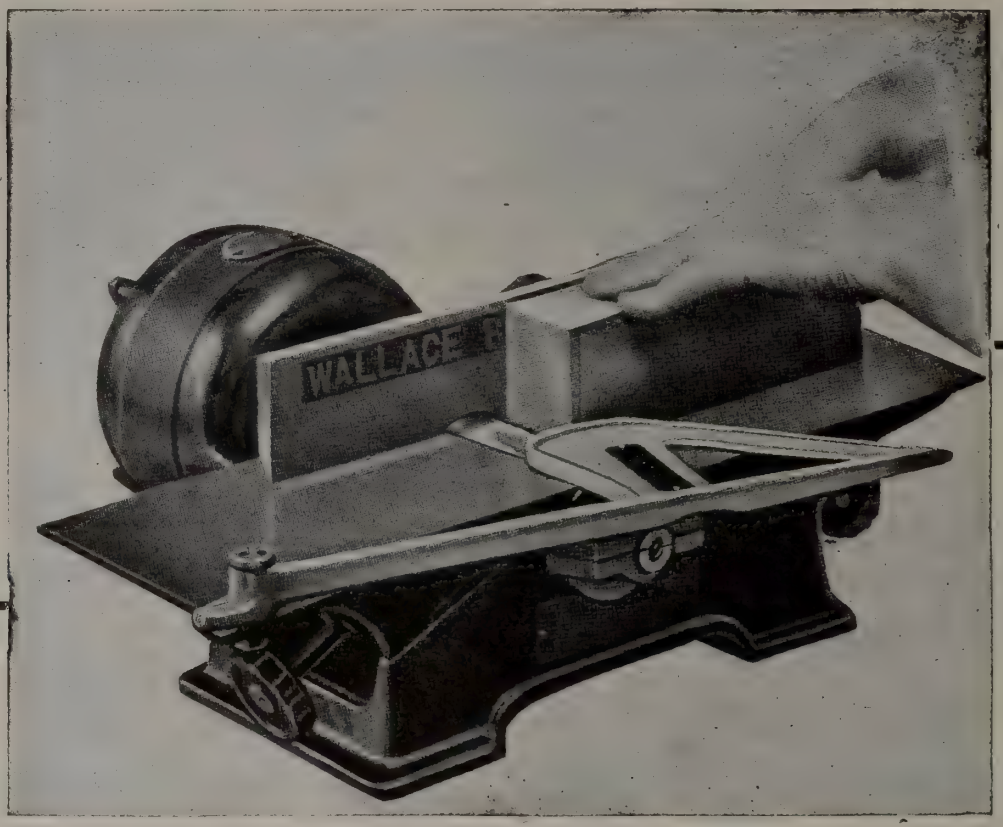

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"Speeds Up" Production Cuts Cost

THE bulk—or about 70 per cent.—of your fitting, trimming, jointing or surfacing is on work less than 4 feet long and 4 inches wide. For lack of better facilities you have had to **do** all this work by hand—at an enormous cost. If every operation were as costly you'd close up shop. You can't afford to run to the big stationary jointer with each piece of work —yet that cost must be cut.

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It is portable—works right on the bench—handy at the elbow of your men.

Try this remarkable, simple, cost-saving machine. Stop those daily losses!

The Geo. F. Foss Machinery & Supply Co., Limited
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"THE MACHINE THAT GIVES THE SMOOTH FINISH"

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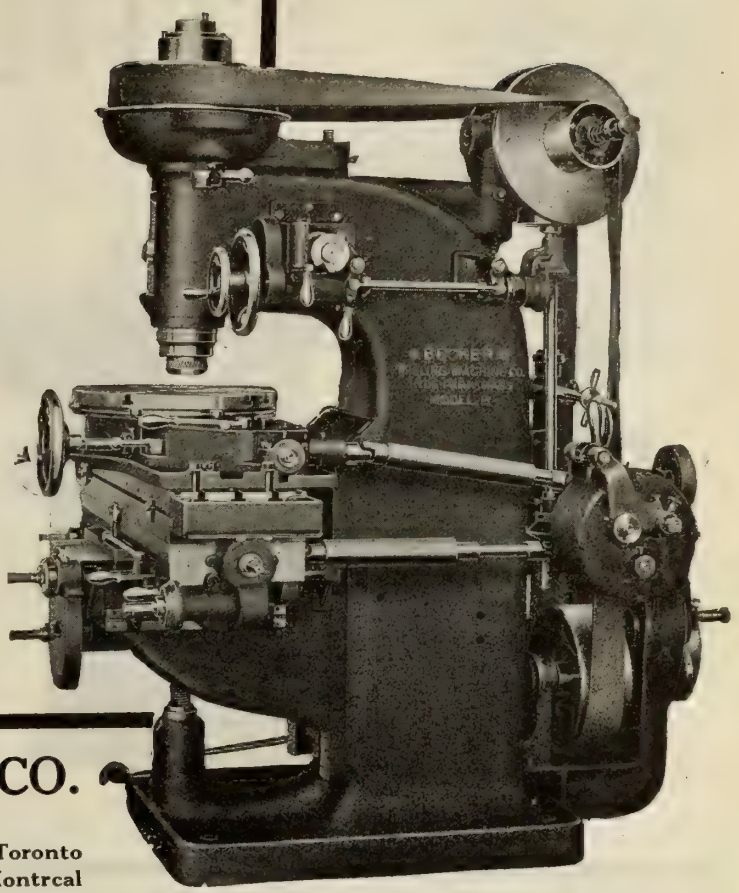
All working parts of the Becker are easily accessible and all changes are made while the cutter is working.

The elastic belt drive of the Becker gives a smooth finish that cannot be obtained with any gear driven machine.

Write for circular 0-705 to-day.



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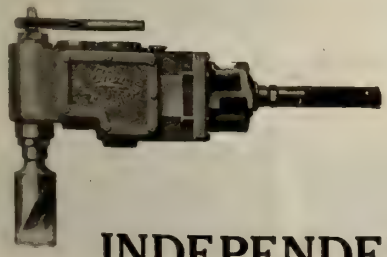
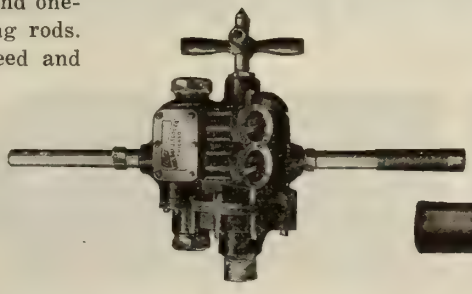
Thor are the only air drills made in America having Corliss valves, roller bearings, and one-piece pressed Vanadium steel connecting rods. Also equipped with telescopic screw-feed and removable crank chamber plate.





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There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

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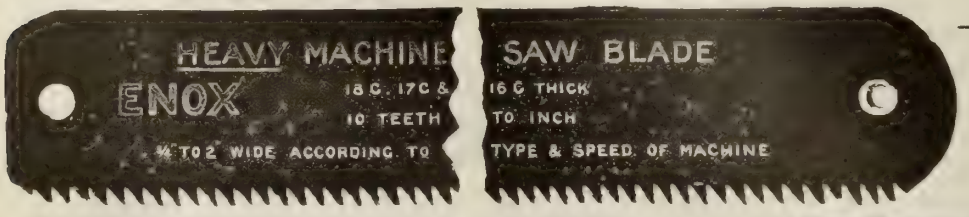

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Hacksaw Blades
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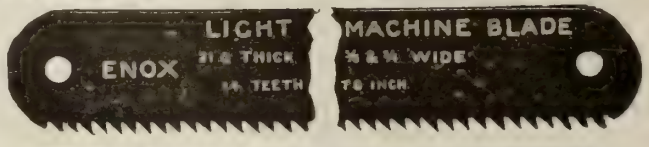

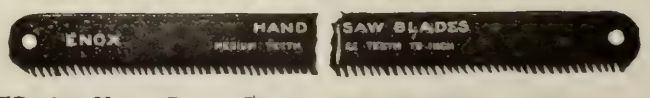

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These tool forges are particularly adapted for the requirements of the small machine shop for annealing and tempering dies, cutters, reamers, etc.

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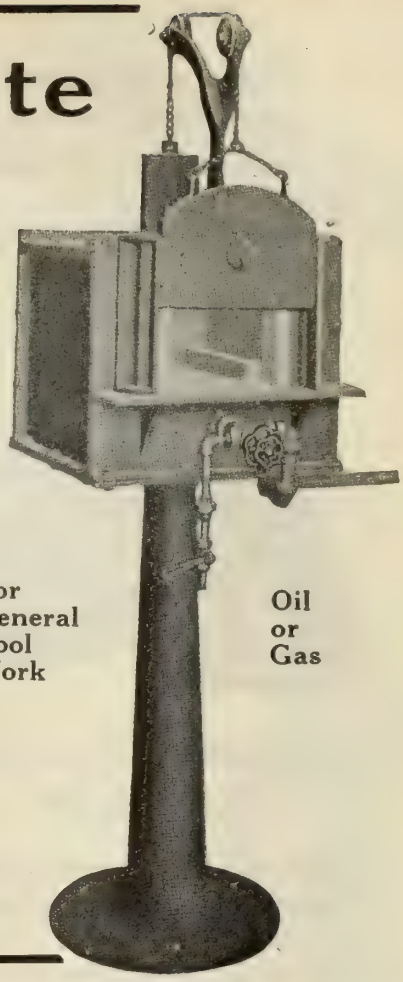

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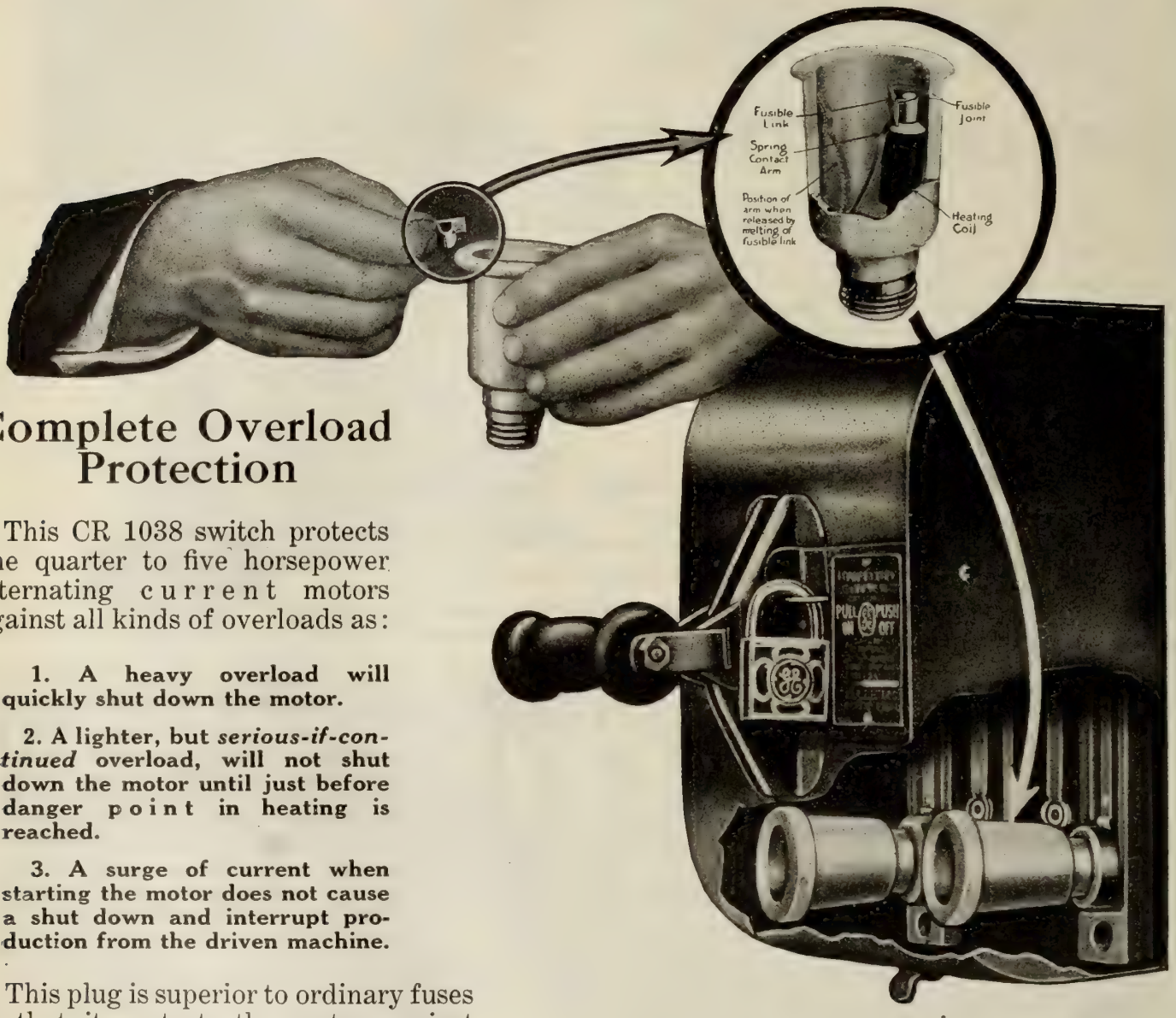

Complete Overload Protection

This CR 1038 switch protects one quarter to five horsepower alternating current motors against all kinds of overloads as:

1. A heavy overload will quickly shut down the motor.

2. A lighter, but *serious-if-continued* overload, will not shut down the motor until just before danger point in heating is reached.

3. A surge of current when starting the motor does not cause a shut down and interrupt production from the driven machine.

This plug is superior to ordinary fuses in that it protects the motor against overloads, which are serious because continued, while the former protected only against peak overloads.

Ask our nearest office for descriptive sheet No. 68327A.

A small spring switch in the porcelain protective plug shown is held shut by slipping a little link over its end. If a current large enough to injure the motor flows through the plug the fusible joint of the link is melted by the heating coil. For the cost of a postage stamp the link can be renewed and plug made operative again.

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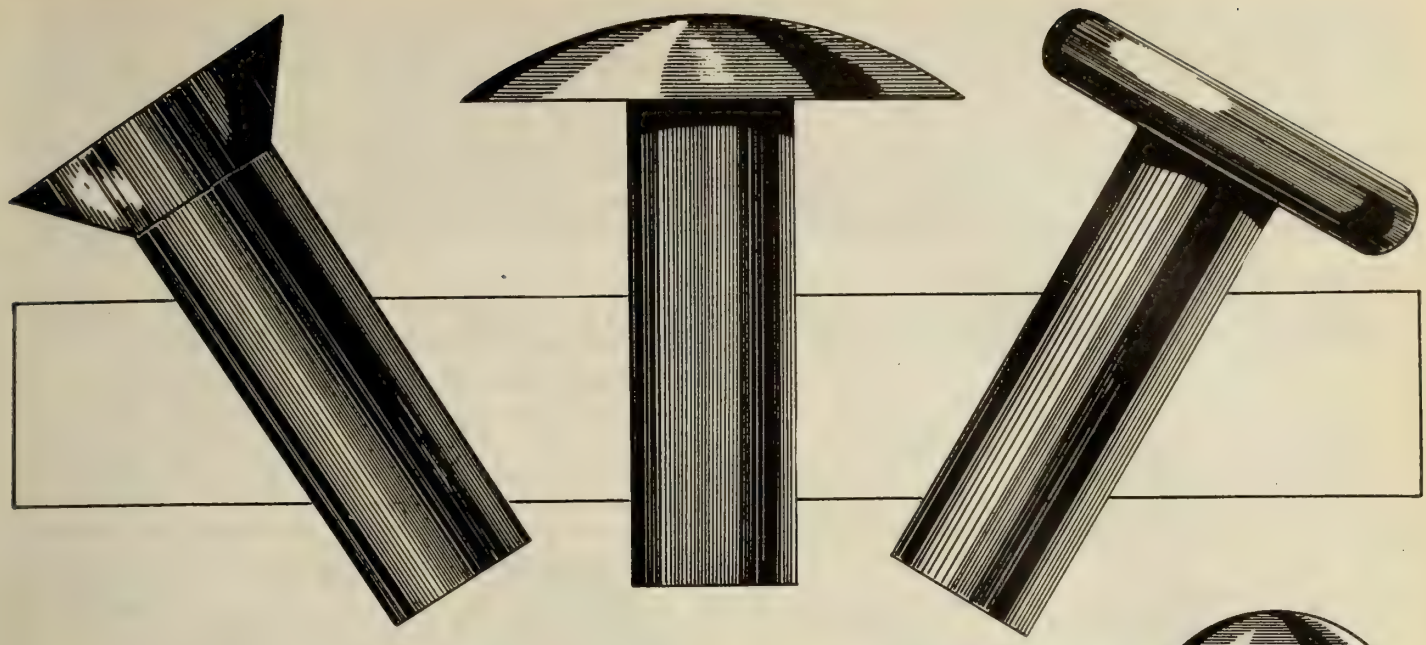

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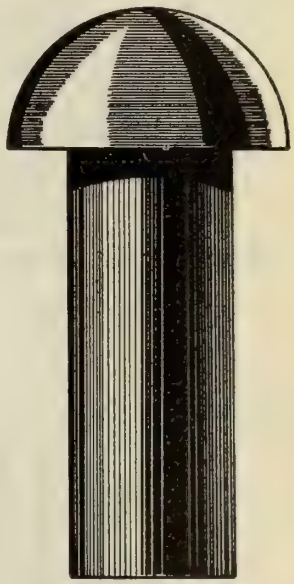

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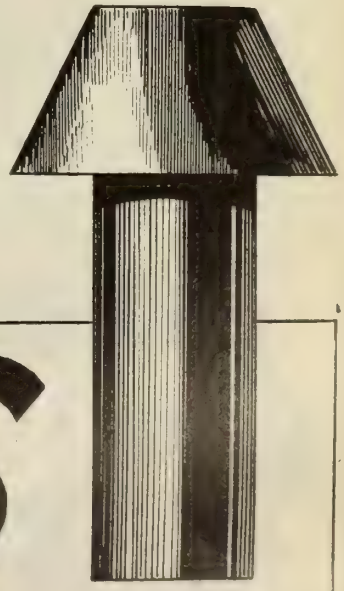

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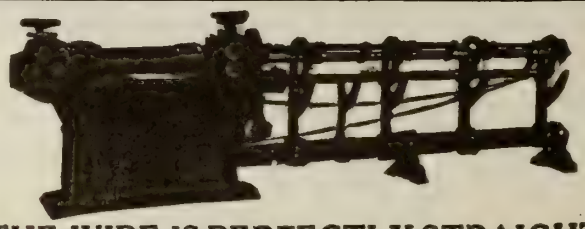

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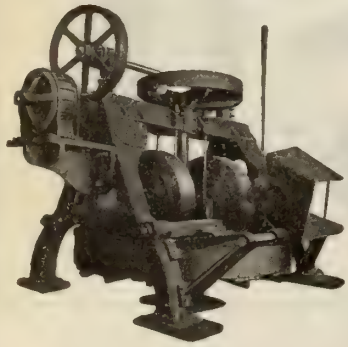

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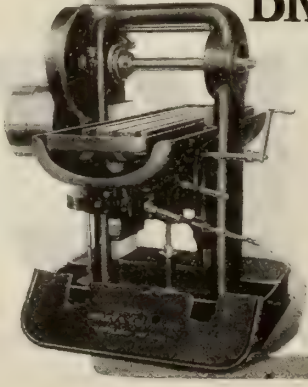

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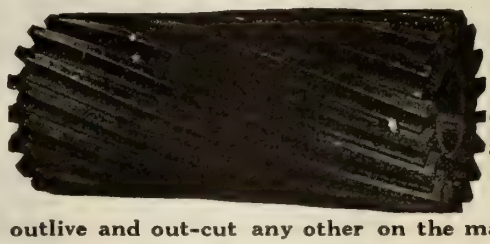

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Catalog No. 6.

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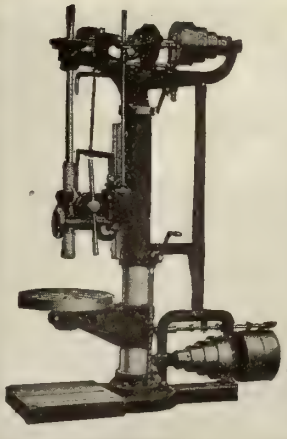

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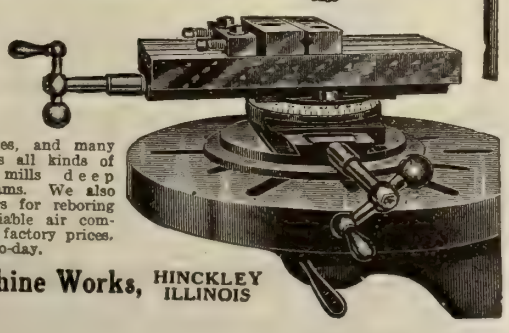

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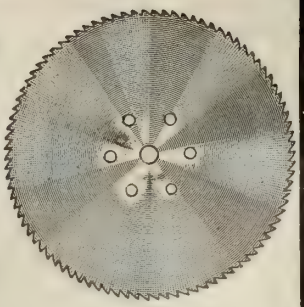

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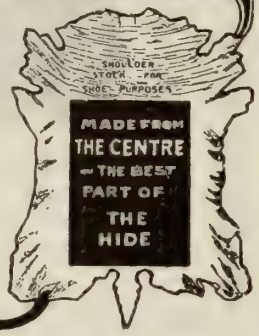

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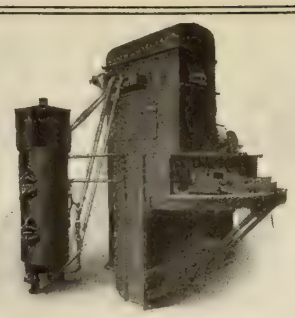

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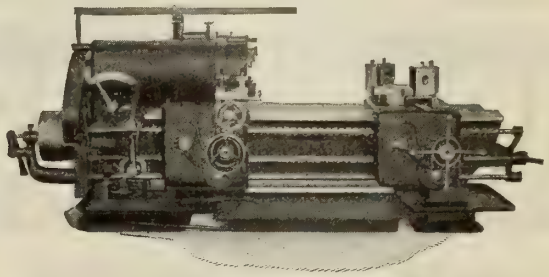

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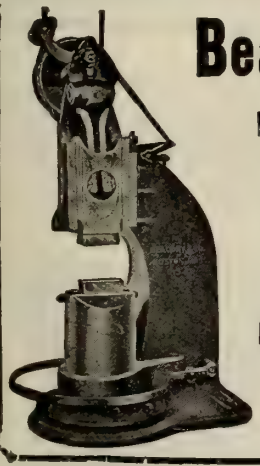

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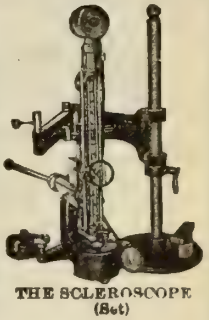

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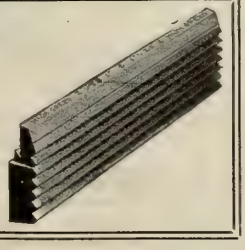

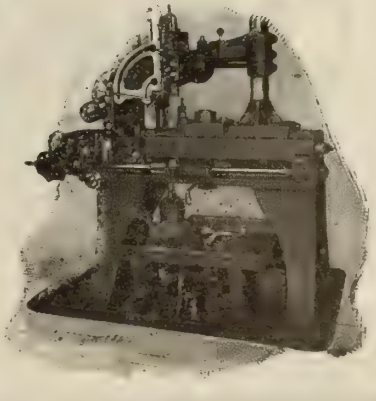

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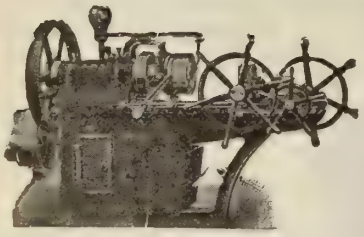

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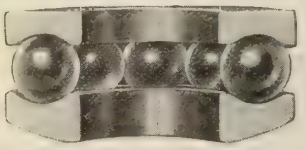

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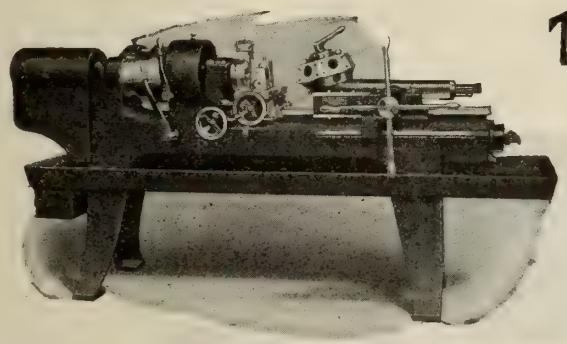

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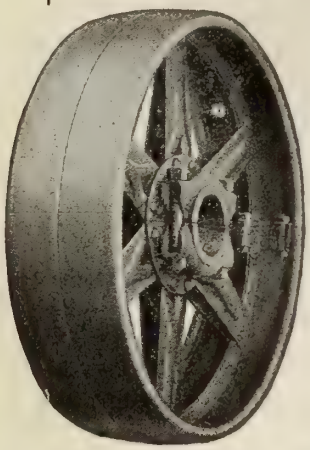

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Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Graton & Knight Mfg., Worcester, Mass.
Jones & Glassco, Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
John Tullis & Son, Glasgow, Scotland.
Bond Engineering Works, Toronto, Ont.
D. K. McLaren, Ltd., Montreal, Que.

BELTING, STITCHED COTTON DUCK
Dominion Belting Co., Hamilton, Ont.
D. K. McLaren, Ltd., Montreal, Que.

BELTING, WOVEN
Baxter & Co., Ltd., J. R., Montreal.
Federal Engineering Co., Ltd., Toronto
D. K. McLaren, Ltd., Montreal, Que.

BENDING ROLLS, PLUTE & AUGH
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Garlock-Walker Mach. Co., Toronto.
Williams & Wilson, Ltd., Montreal.

BENCH JOINTERS
Am. Woodworking Mach. Co., Rochester

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto.
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal.

BILLET MARKERS
Matthews & Co, Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

BLACKSMITH WORK
James Ballantyne, Montreal.
The Thos. Pink Co., Ltd., Pembroke.

BLANKING
Hy. Hope & Sons of Can., Ltd., Peterboro

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

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Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

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Fellows Bros., Ltd., Chadley Heath, Eng.

BLOCKS, CARGO
Fellows Bros., Ltd., Chadley Heath, Eng.

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Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

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Commercial Camera Co., Providence, R.I.
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Lufkin Rule Co., of Can., Windsor, Ont.

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BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield. Mass

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield. Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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MacLean Publishing Co., Toronto.

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Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

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Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd. Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

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Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

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Morrow Screw & Nut Co., John, Ingersoll.

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Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
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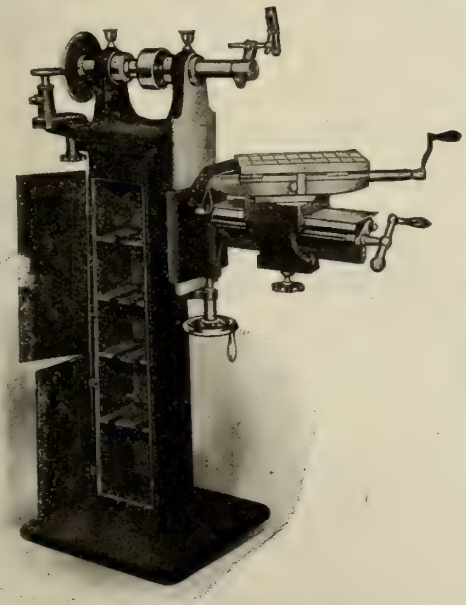

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL
Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
H. Hope & Sons of Can., Ltd., Peterboro.

FOUNTAINS, DRINKING
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield.
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL,
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING
Standard Fuel Engr. Co., Detroit, Mich.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE TANKS
Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING
Bowser & Co., S. F., Inc., Fort Wayne.

GAUGES
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochester.

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Coventry Chain Co., Coventry, Eng.

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Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal.
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Hamilton Gear & Machine Co., Toronto.
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Illinois Tool Works, Chicago, Ill.
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Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

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Garlock-Walker Machinery Co., Toronto.
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Garlock-Walker Machinery Co., Toronto.
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Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
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Garlock-Walker Machinery Co., Toronto.
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Norton Co., Worcester, Mass.

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Dennis Wire & Iron Works, London, Ont.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland.

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Wilkinson & Kompass, Hamilton, Ont.
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Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
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Can. S K F Co., Toronto, Ont.
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Jones & Glassco, Montreal.
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See Steel.

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Independent Pneumatic Tool Co., Chicago.
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Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal.

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Electric Steels & Metals Ltd., Welland.
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Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

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Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal.

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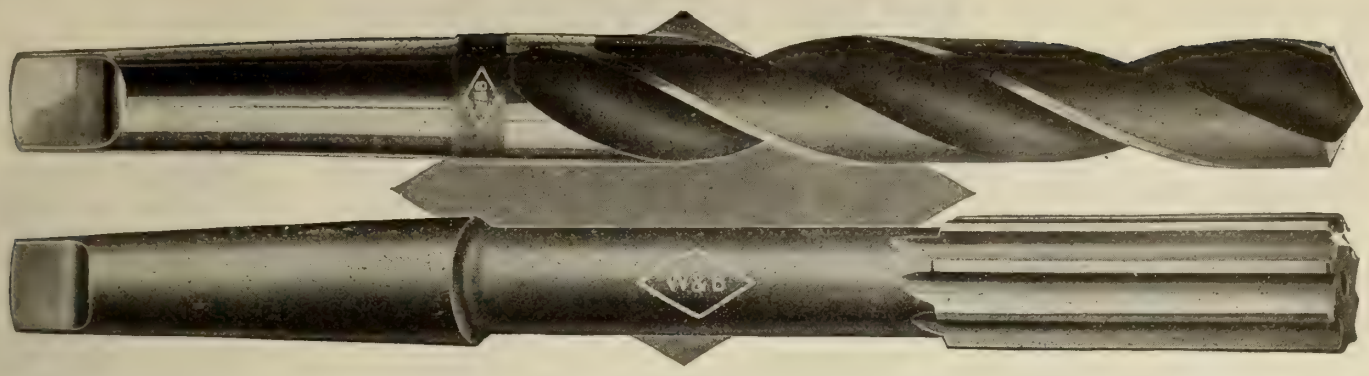

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Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
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Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Wks., Rochester.
Canada Mach'y Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, Ohio.
Wickes Bros., Saginaw, Mich.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
Kennedy & Sons, Wm., Owen Sound, Ont.
Lodge & Shipley, Cincinnati, O.
R. Mc'Dougall Co., Galt.
Miles-Bement-Pond Co., New York.
Reed-Prentice Co., Worcester, Mass.
Smalley-General Co., Inc., Bay City, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Standard Machy. & Supplies, Montreal.
Sidney Tool Co., Sidney, Ohio.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Worcester Lathe Co., Worcester, Mass.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Lodge & Shipley, Cincinnati, O.
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester.

LATHES, PATTERNMAKERS'
Am. Woodworking Mach. Co., Rochester.
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, POLISHING
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SCREW CUTTING
Bertram & Sons Co., John, Dundas, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & S'ply Co., G. F., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Wickes Bros., Saginaw, Mich.
Hepburn Ltd., John T., Toronto, Ont.
Lodge & Shipley, Cincinnati, O.
Niles-Bement-Pond Co., New York.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, TOOL ROOM
Cisco Machine & Tool Co., Cincinnati, O.
Lodge & Shipley, Cincinnati, O.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

LEAD BURNING
St. Lawrence Welding Co., Montreal.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting Chain.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton.
Dennis Wire & Iron Works, London, Ont.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne.

LUBRICATORS
Trahern Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINERY, CORNER AND BENDING
Peck, Stow & Wilcox Southington, Conn.

MACHINERY, SPECIAL
Joseph T. Ryerson & Son, Chicago, Ill.

MACHINERY, FLUE SHOP
Joseph T. Ryerson & Son, Chicago, Ill.

MACHINERY SPRING SHOP
Joseph T. Ryerson & Son, Chicago, Ill.

MILLING ARBORS
Kearney & Trecker Co., Milwaukee Wis.

MACHINERY DEALERS
Archibald & Co., Chas. P., Montreal.
Baxter & Co., Ltd., J. R., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Standard Machy. & Supplies, Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY GUARDS (See Guards)

MACHINES, AUTOMATIC SCREW
Rudel-Belnap Mach. Co., Ltd., Montreal.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Pritchard-Andrews Co. of Can., Ottawa.
Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Perrin, Wm. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MASKS, WELDING, SMOKE, FUME, GAS, ETC.
Strong, Kennard & Nutt Co., Cleveland.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser & Co., S. F., Inc., Fort Wayne.

MEASURING TAPES AND RULES
Chesterman & Co., Jas., Sheffield, Eng.

METALLURGISTS
See Chemists.

METAL SAWS
See Saws.

METAL SAWS, POWER
Hoefer Mfg. Co., Freeport, Ill.

METALS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser & Co., Inc., S. F., Toronto, Ont.

MICROMETERS
Almond Mfg. Co., Ashburnham, Mass.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Rudel-Belnap Mach. Co., Ltd., Montreal.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass
Blomquish-Eck Mach. Co., Cleveland.
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Can. General Electric Co., Toronto.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co., Toronto.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY.
Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL
Brown's Copper & Brass Roller Mills, New Toronto, Ont.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Boker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
Comstedt, J. F. A., New York City, N.Y.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich.

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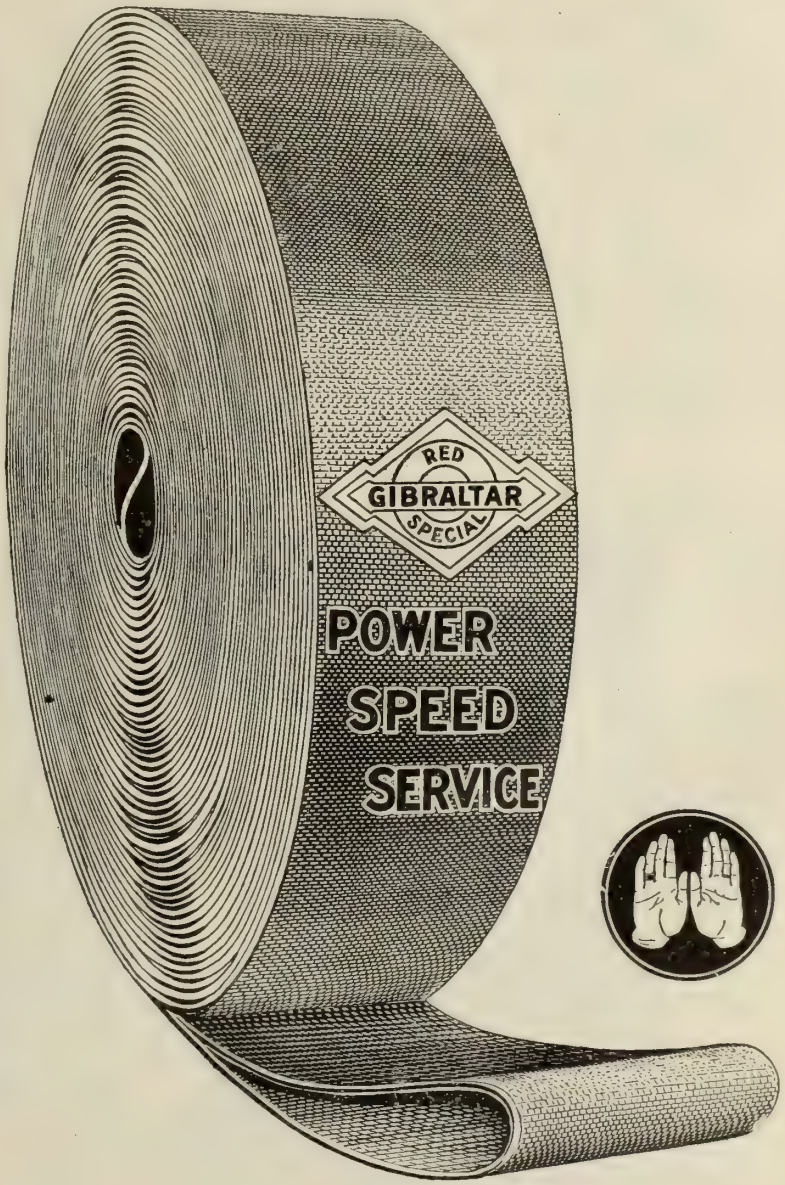
"THE ORIGINAL RED FRICTIONED-SURFACE RUBBER BELTING"



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Bowser & Co., Inc., S. F., Toronto, Ont.

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Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Paxter & Co., Ltd., J. R., Montreal.
Graton & Knight Mfg. Co., Worcester, M.
Perrin, Ltd., William, Toronto.

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland.
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES
See Lathes.

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Dominion Pattern Works, Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.
Greenleafs, Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PILLOW BLOCKS
Bond Engineering Works, Toronto, Ont.

PINS, TAPER
Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

PHYSICIAN'S SUPPLIES
J. F. Hartz Co., Ltd., Toronto.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS AND DIES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON RODS, ROUGH TURNED
General Steel Co., Milwaukee, Wis.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Rudel-Belnap Mach. Co., Montreal, Que.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PLANER-SHAPER COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Williams & Wilson, Ltd., Montreal, Que.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Sheldons, Ltd., Galt, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Bond Engineering Works, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PRESSED STEEL PARTS
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlass Press Co., Kalamazoo, Mich.
Diss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, FILTER
Perrin, Ltd., William R,, Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Banfield & Son, W. H., Toronto.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Standard Machy. & Supplies, Montreal.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

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Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Bond Engineering Works, Toronto, Ont.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
D. K. McLaren, Ltd., Montreal, Que.
Positive Clutch & Pulley Works Ltd., Toronto.
Standard Mach. & Supplies, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

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MacKinnon Steel Co., Sherbrooke, Que.

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Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
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Metalwood Mfg. Co., Detroit, Mich.
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Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

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Graton & Knight Mfg. Co., Worcester.

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W. H. Banfield & Sons, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H, Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes & Co. Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Wickes & Co., Saginaw, Mich.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

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Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

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Niles-Bement-Pond Co., New York.

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Mueller Machine Tool Co., Cincinnati.

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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
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Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Standard Mach. & Supplies, Montreal.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Co., St. Catharines.

Tractor Gears and the Gear Shaper

Refinements in tractor transmissions have been brought about as a necessary development of the tractor as a whole. Alloy steel forged gears have taken the place of steel castings and other inferior materials for high-duty work.

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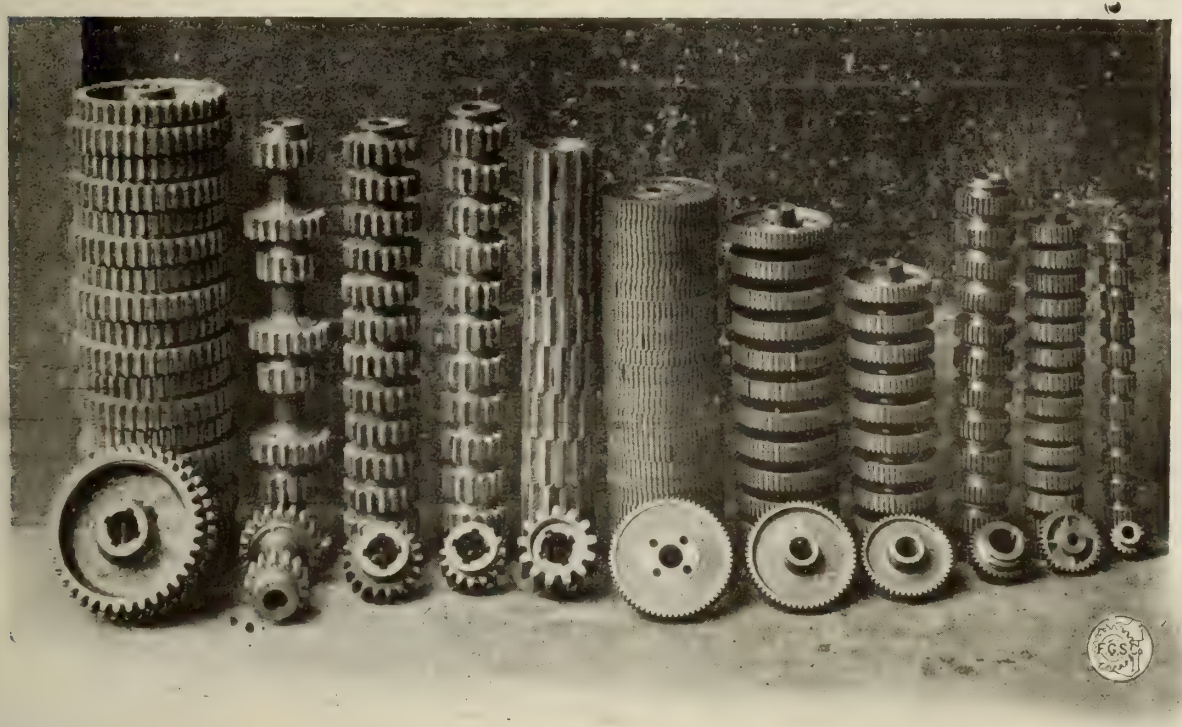
It is for this reason that tractor manufacturers and makers of tractor transmissions are using the Gear Shaper for finishing all of the spur and helical gears entering into the power transmission units of their tractors.

Another reason, which from the cost end is a highly important one, is that tractor gears can be more economically produced on the Gear Shaper than by any other process. Hence, the Gear Shaper combines both accuracy and production.

Among the manufacturers of tractors that are using the Gear Shaper is the Emerson-Brantingham Co., Minneapolis, Minn. We show herewith a collection of gears used in Emerson-Brantingham tractors that are finished on the Gear Shaper.

The Gear Shaper has played no small part in the production of efficient transmissions for automobile and truck use, and is now filling the same position in the tractor field.

Tractor manufacturers desiring assistance in connection with their gear problems are cordially invited to take up such problems with our Engineering Department. This service is given gratis. We will also send a copy of our book "The Internal Gear" to those interested in internal gear design.



Collection of Emerson - Brantingham Tractor Gears Generated on the Fellows Gear Shaper.

The Fellows Gear Shaper Company

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Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
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Marshall, Son & Bunney, Toronto.
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Wells Bros. of Canada, Galt, Ont.

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Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN
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Garlock-Walker Machinery Co., Toronto.
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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

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Electric Steels & Metals, Ltd., Welland.

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Rice, Lewis & Son, Toronto.
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Williams & Wilson, Ltd., Montreal, Que.

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SAFETY APPLIANCE GOGGLES
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Pittsburgh Crushed Steel Co., Pittsburgh.

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Canada Machinery Corp., Galt.
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Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

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Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

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J. A. M. Taylor, Stair Bldg., Toronto.

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Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

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Foster Machine Co., Elkhart, Ind.
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Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Rudel-Belnap Mach. Co., Montreal, Que.
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Warner & Swasey Co., Cleveland, O.
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Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

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Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
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Garlock-Walker Machy. Co., Ltd., Toronto
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Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Rice, Lewis & Son, Toronto.

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Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

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Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes & Co., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
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Toledo Machine & Tool Co., Toledo, O.
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SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
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SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

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Wilkinson & Kompass, Hamilton, Ont.

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SLINGS, CHAINS
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Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
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Rhodes Mfg. Co., Hartford, Conn.

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MacKinnon Steel Co., Sherbrooke, Que.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

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Katie Foundry, Galt, Ont.

SOLDERING IRONS
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Rice Lewis & Son, Toronto, Ont.

SOLDER
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Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Marten Machine Co., Hamilton, Ont.
Reed-Prentice C., Worcester, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Wilson & Co., J. C. Belleville, Ont.
William R. Perrin, Ltd., Toronto.
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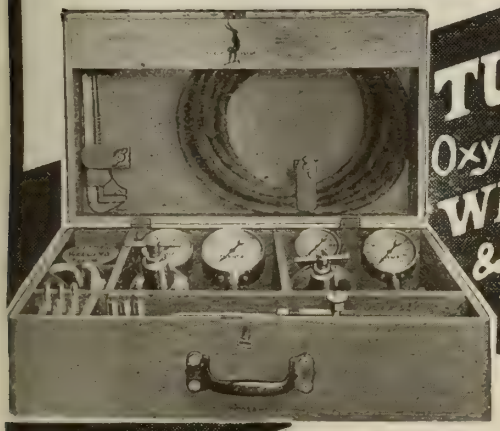

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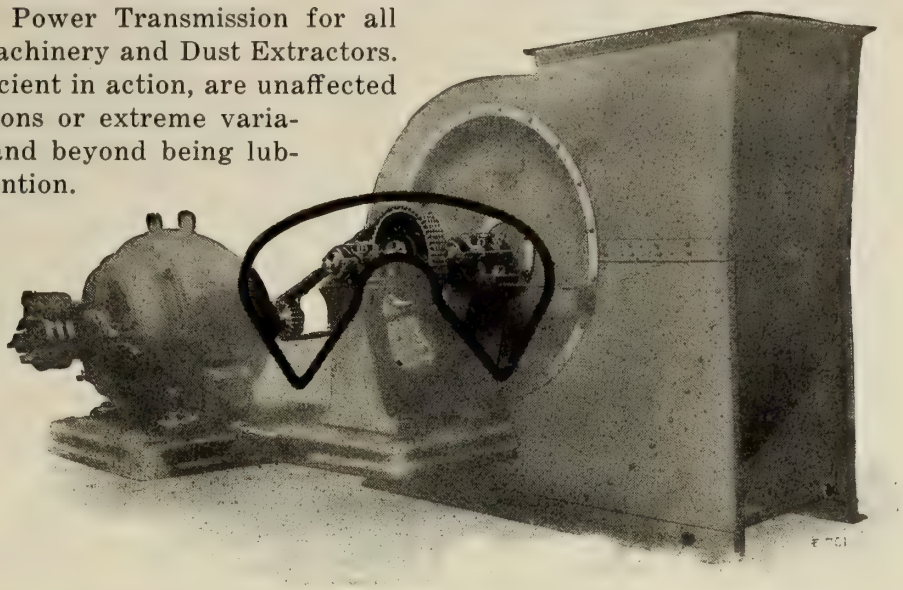

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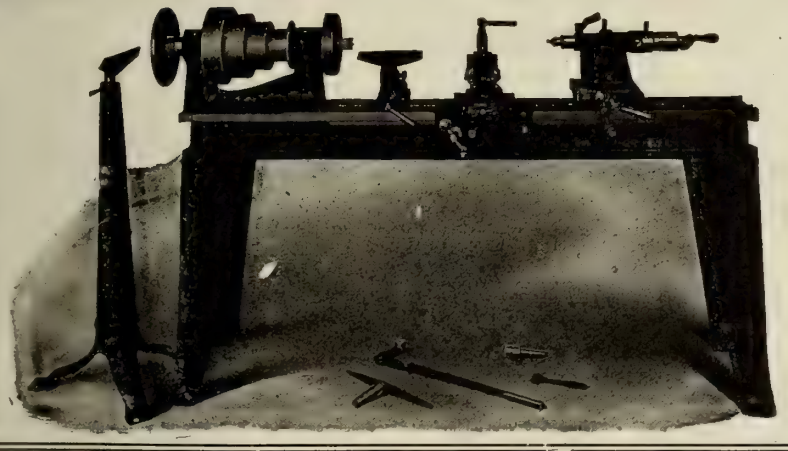

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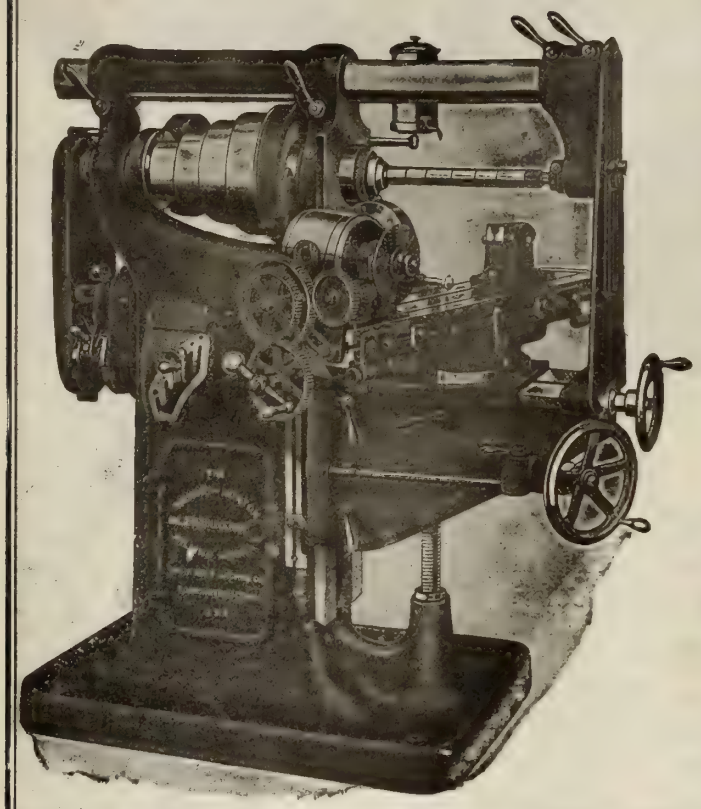

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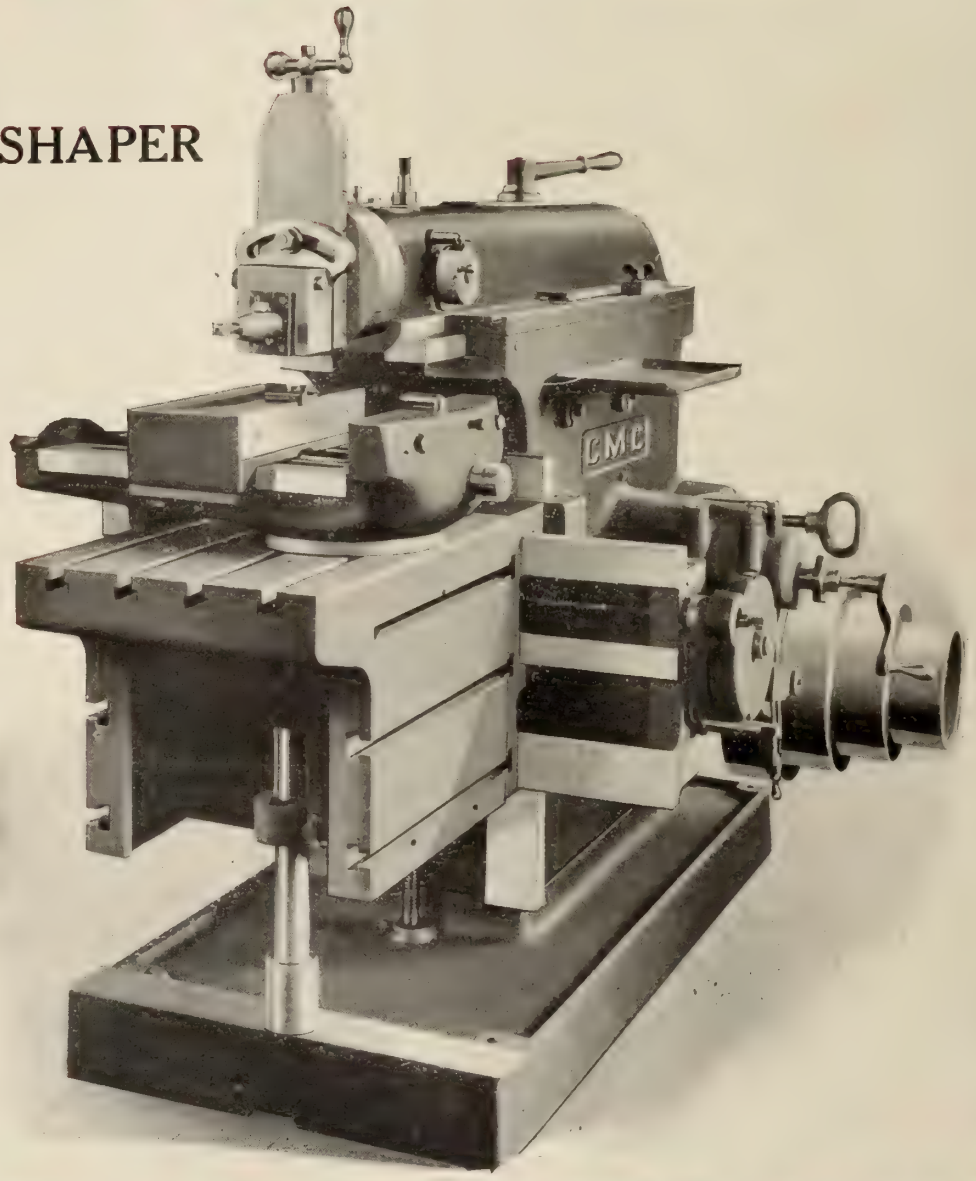

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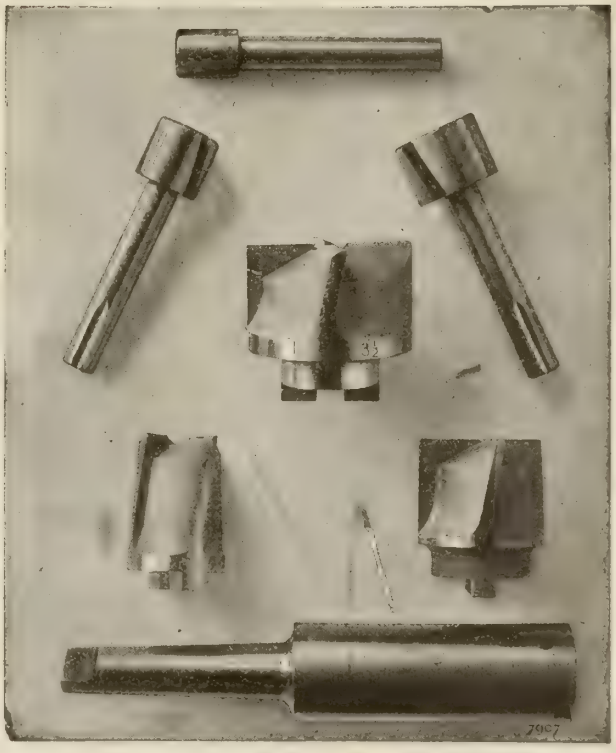

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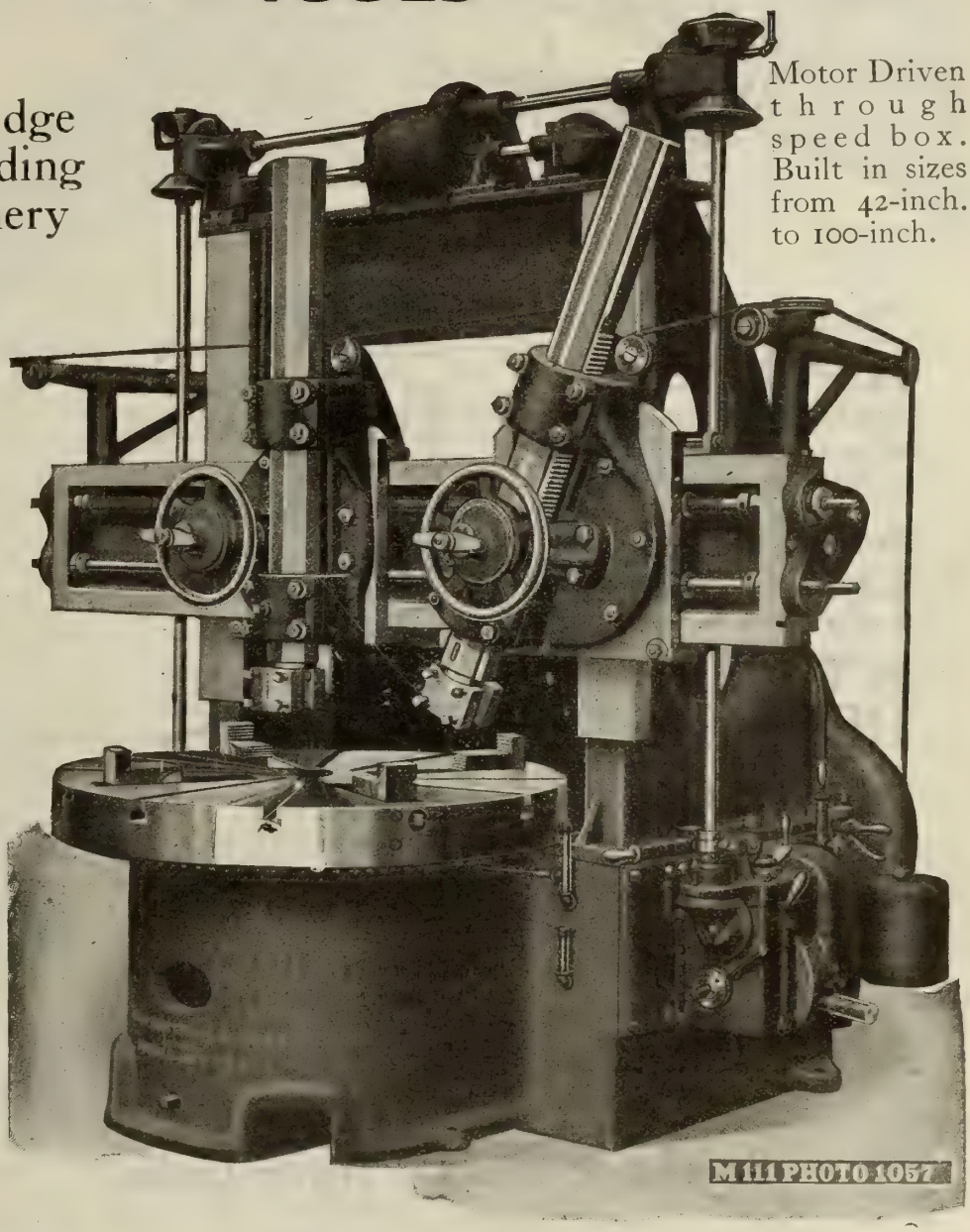

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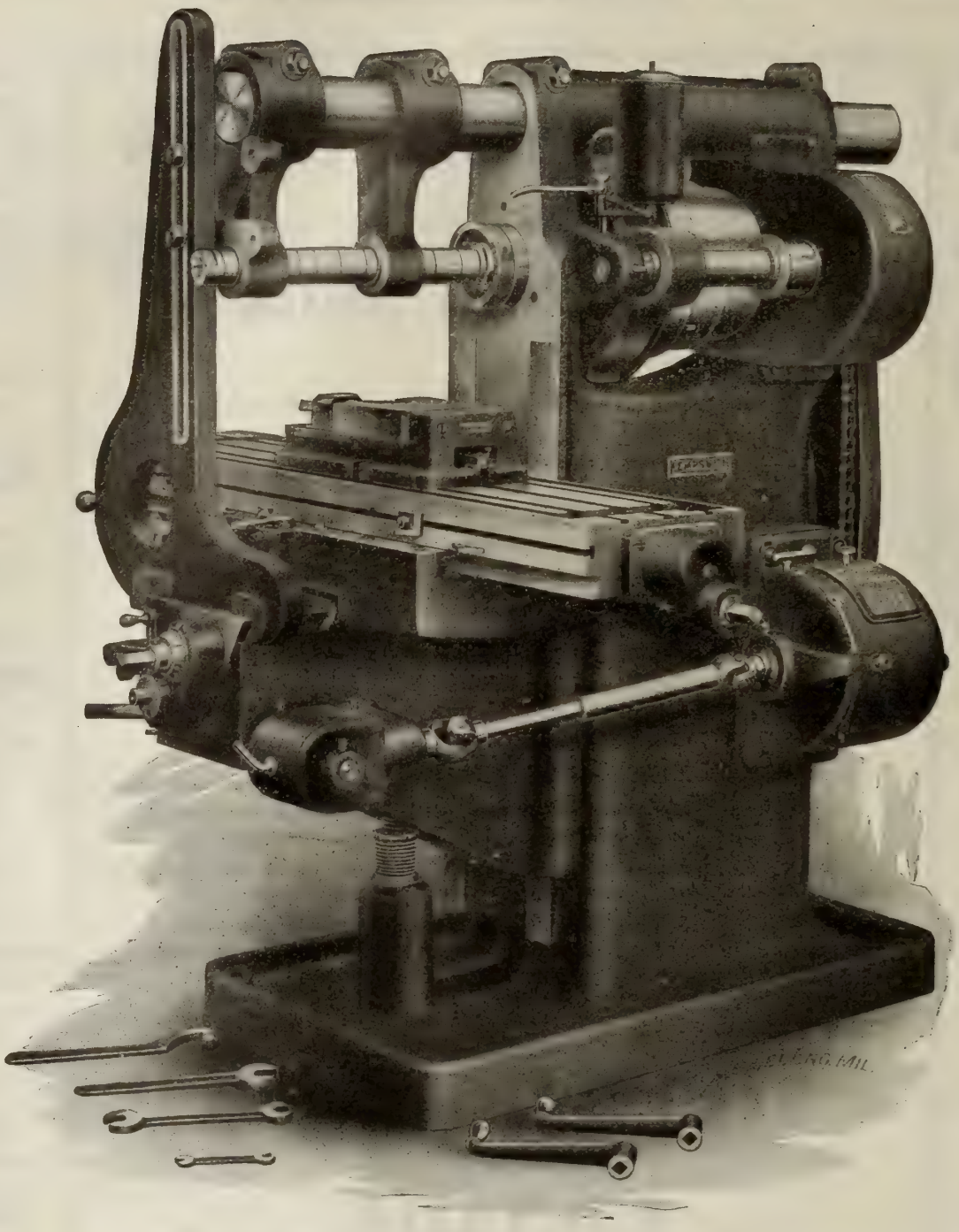

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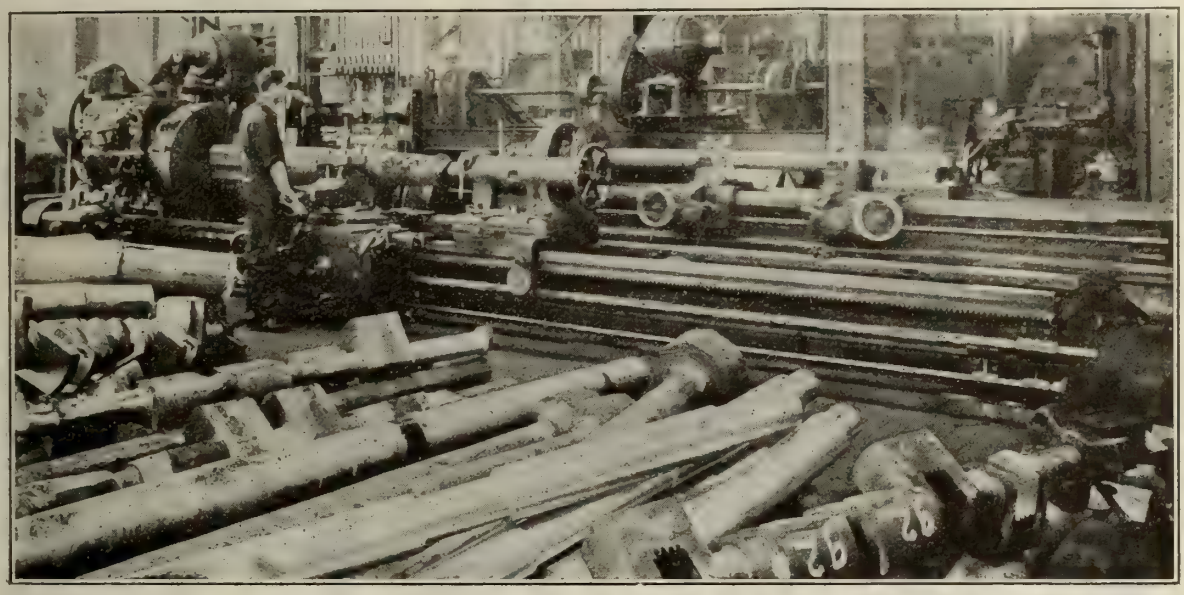
FOREIGN REPRESENTATIVES:—The Geo. F. Foss Machinery & Supply Co., Limited, 305 St. James St., Montreal, Canada. Barandiaran & Co., 3 Alameda, San Sebastian, Spain. Bevan & Edwards, Pty., Ltd., 117-29 King St., Melbourne, Australia. Edgar Bloxham, 12 Due du Delta, Paris, France. D. Drury & Co., 1-2 Central House, Main St., Johannesburg, South Africa. Roku-Roku-Shoten, 3 Shinsakanacho, Kyobashiko, Tokyo, Japan. Nielsen & Winthers, Blegdamsveg, 60, Copenhagen, Denmark. Parke & Lacy Co., Ltd., 60 Clarence St., Sydney, N.S.W., Australia. Selson Engr. So., 19 Via Botero, Turin, Italy, and 85 Queen Victoria St., London, E.C., England. Spliethoff, Beeuwkes & Co., Leuvehaven, W.Z., 159, Rotterdam, Holland.

BRIDGEFORD

Heavy Duty Lathes



The above photograph shows a Bridgeford 27″ Manufacturing Lathe finish boring a cast-iron transmission housing for the new Fordson Tractor.

The diameter of housing is 19⅛″ and the limits of accuracy are .002″.

Maximum production is a requirement in the Ford plant and that is why a Bridgeford was selected to do the work. The Bridgeford turns out 80 pieces per day of 8 hours, which is excellent production.

There's a Bridgeford for every heavy duty lathe requirement. Bridgefords are in operation in all parts of the world on all kinds of duty. The line includes Heavy Geared Head Engine Lathes from 24″ to 72″ swing, Cone Driven Engine Lathes, Axle and Journal Truing Lathes and Manufacturing Lathes of 27″ and 30″ Swing.

Send for interesting data on Bridgeford Lathes.
We are in a position to make prompt deliveries.

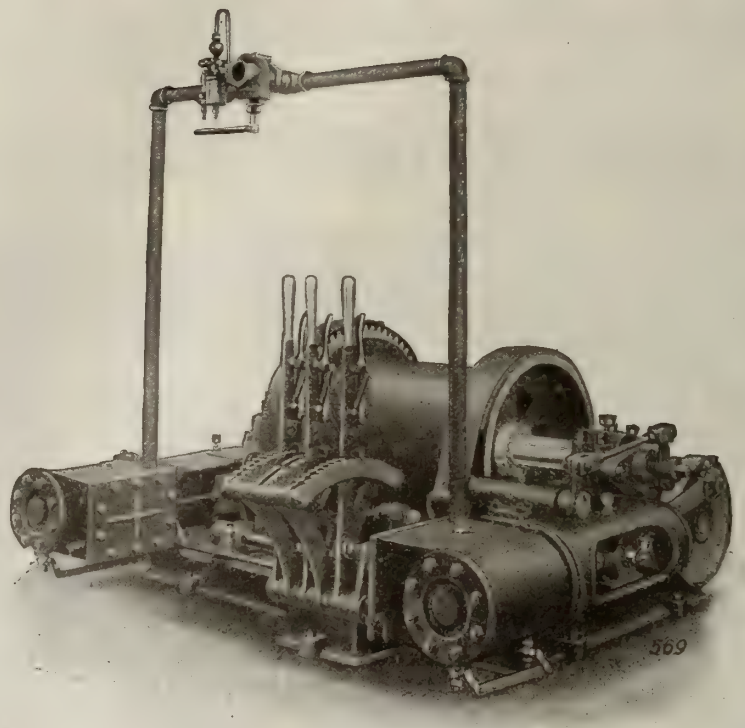
BRIDGEFORD MACHINE TOOL WORKS

161 Winton Road, Rochester, N.Y.

Manufacturers of Heavy Duty Lathes for more than 20 years.

BRIDGEFORD

THE "CIRCO" MINE HOIST



"CIRCO" Mine Hoists have many excellent features of design which are not usually found in machines of this class. The cylinders are cast separately from the frames, and are interchangeable, thus permitting one spare cylinder to be used on either side, and doing away with the necessity of buying a new frame, should one of the cylinders be accidentally damaged. The crosshead guides are bored and the end of the frame faced at the same setting, insuring accuracy and permanency in alignment. A raised ledge around the crosshead guides prevents oil from dripping, which is a common fault in the ordinary mine hoist.

The exhaust may be connected to either the top or bottom of the valve chest as may be most convenient. The drum shaft bearings are bolted to the frame instead of being cast in one piece as heretofore, and are easily replaced if necessary. The eccentrics are of the locomotive type, and the drum gear and pinion are made of Semi-Steel.

Prompt delivery can be made of "CIRCO" Mine Hoists in sizes of from 6 x 8″ to 10 x 12″, with lifting capacities of from 4,000 to 10,000 pounds, and larger sizes will be supplied on special order.

Our nearest branch will be glad to submit complete specifications of these high grade Made-In-Canada Hoists on application.

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There's the Way"

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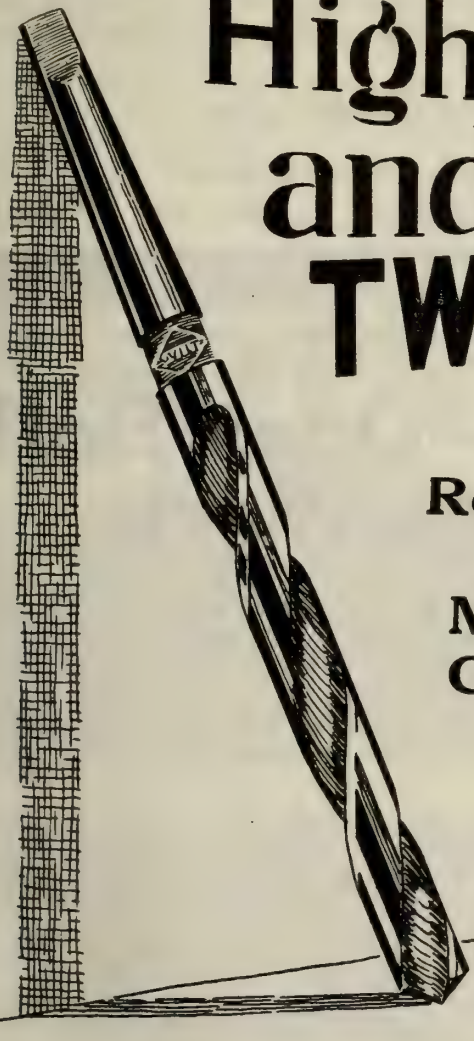
High Speed and Carbon TWIST DRILLS



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WILT Products are manufactured with the sole purpose of meeting the demand for an absolutely dependable tool of high quality.

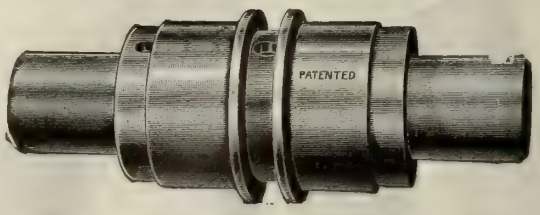
WILT HIGH SPEED and CARBON TWIST DRILLS are the kind of tools you can depend upon to give the highest form of service. If you are not getting the satisfaction you would like, adopt the WILT line. They have the quality that gives long and satisfactory service. **Give them a trial.**

Wilt Twist Drill Co. of Canada, Limited, Walkerville, Ontario

London Office : **Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England**

THE JOHNSON FRICTION CLUTCH

BUILT FOR LONG SERVICE



It takes time to do anything well, but the results usually justify the effort. Johnson clutches represent years of practice on one particular line. Our long experience in studying the demands of the trade, in refining our methods, in recording performances, and in selecting materials—all this is reflected in the present quality of our product.

Our engineers are at your disposal to help you with your clutch problems. Just send them your blue prints and they will do the rest. The Johnson clutch which they install will be correctly designed, properly rated, and honestly built. It will give that long and continuous service for which it is famous, and in which alone lies satisfaction.

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Williams & Wilson, Ltd., 84 Inspector St., Montreal

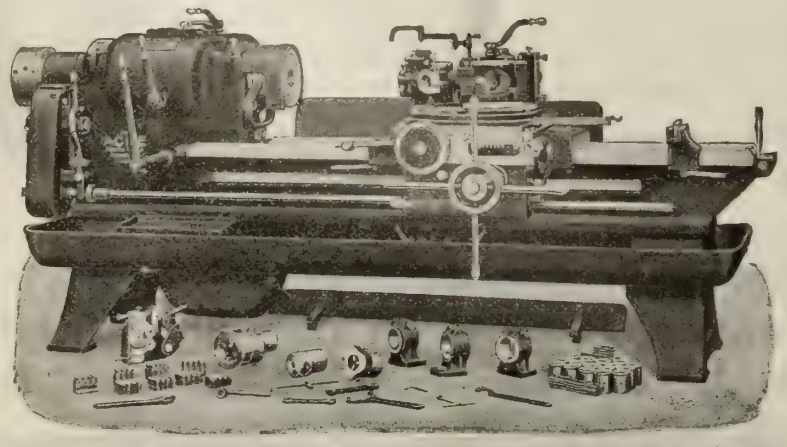
Canadian Fairbanks-Morse Co., Ltd. - Montreal, Toronto and Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Doubly Efficient—Does Both Bar and Chuck Work

This Cincinnati Acme Flat Turret Lathe is a double-production, geared head machine of the sliding gear type. It operates on minimum power because the only gears running are those doing the actual work.

This machine saves remarkable time and labor machining either bar work or chuck work up to 16 in. diameter.



3¼ in. x 36 in. Flat Turret Lathe, Equipped for Bar Work.

Head is cast solid with the bed. You know what that means: accuracy, rigidity, constant and perfect alignment of spindle with vees, upon which the turret carriage travels.

We also make a full line of Screw Machines and Turret Lathes.

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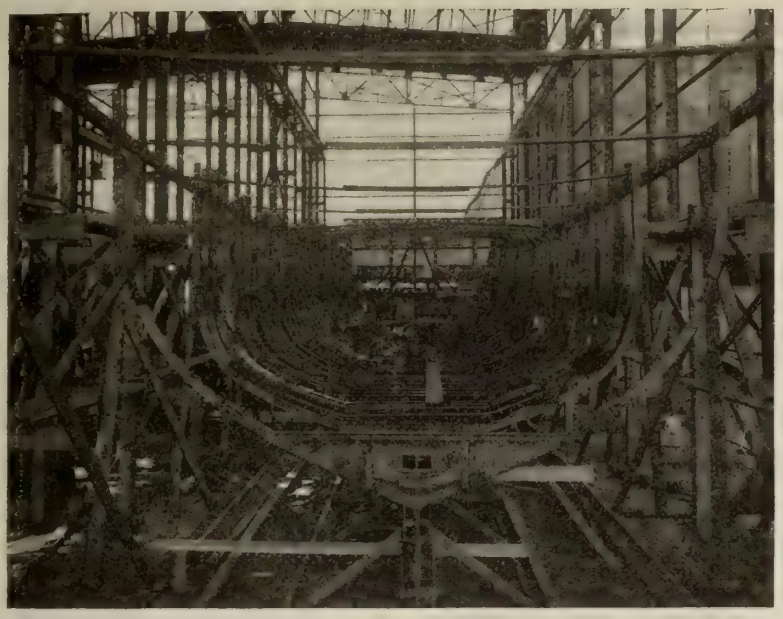
The Acme Machine Tool Co.

Cincinnati, Ohio

Canadian Agents: Rudel-Belnap Machinery Co., of Montreal and Toronto



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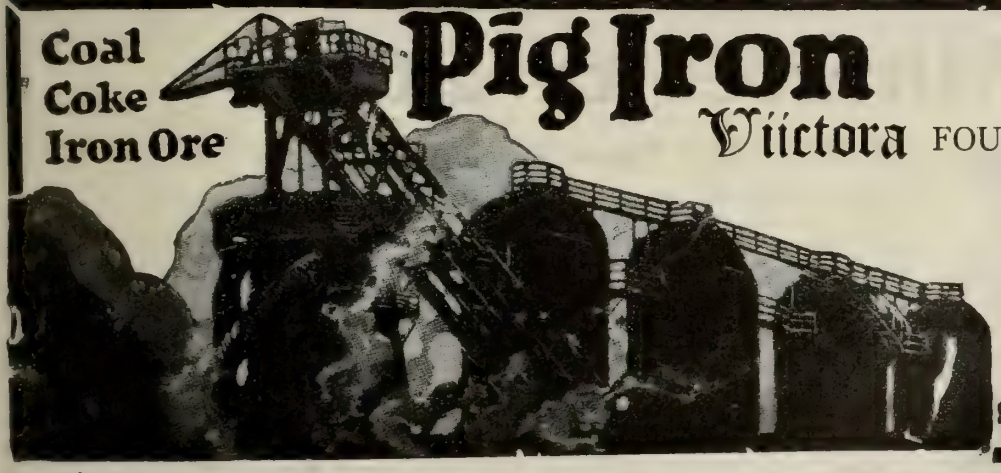

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Special Machinery

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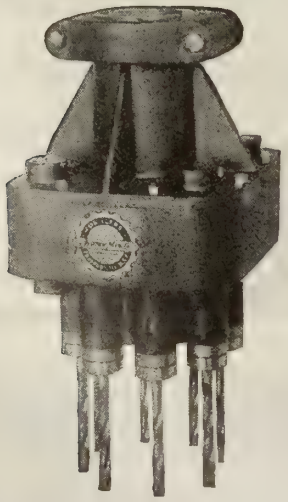
2 Minutes or 20?



This Is The Vital Question

Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time cost.

THE HOEFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Building, Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

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"Canada's Departmental House For Mechanical Goods"

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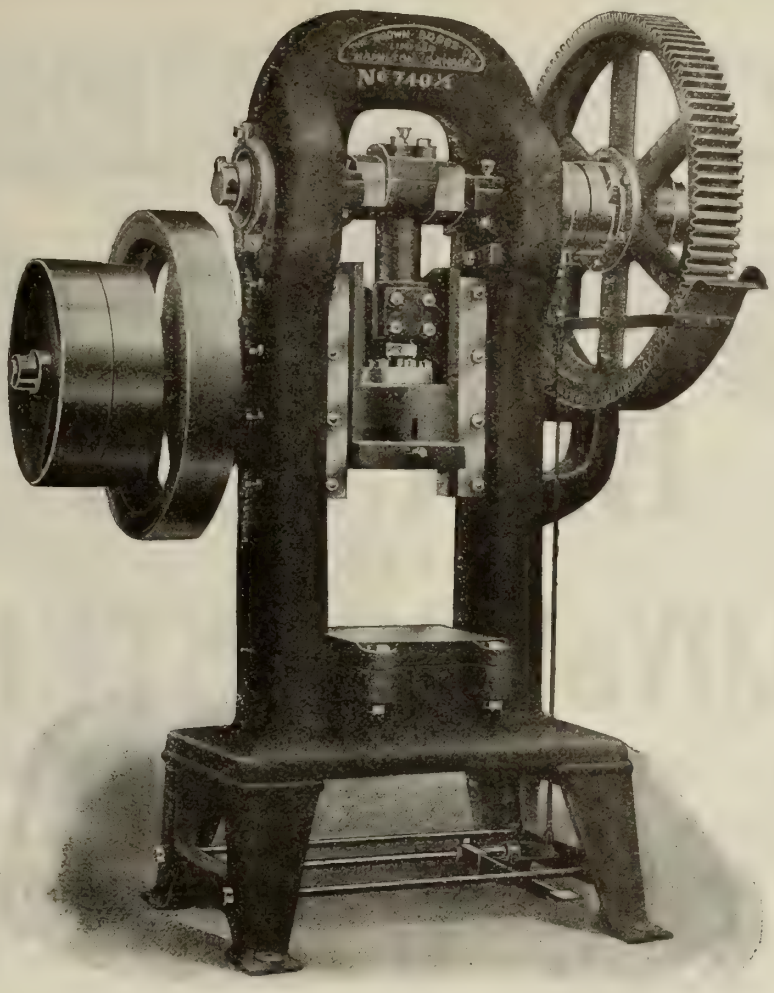
Winnipeg Saskatoon Calgary Vancouver Victoria



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Something you do not get with second-hand equipment, yet in many cases it will offset the difference in price between the second-hand and new machine.

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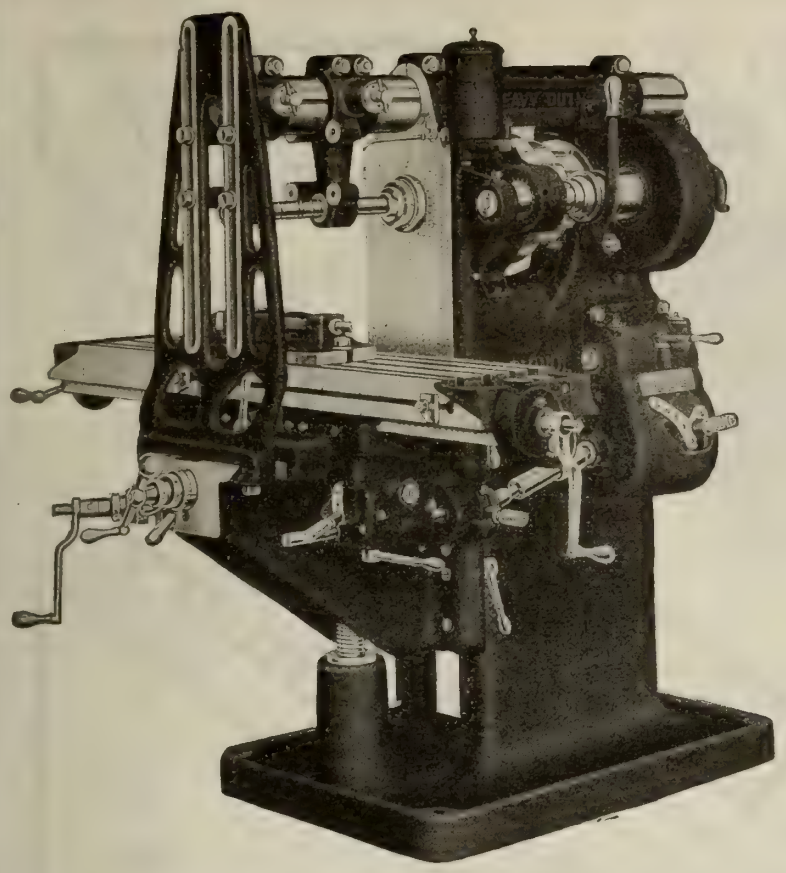

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Heavy Duty Milling Machines

Plain or Universal Types—Cone or Gear Drive. All commercial sizes No. 0 to No. 5.

Adapted for the Heaviest Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

Patent Self-Aligning Arbor Supports—

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1856

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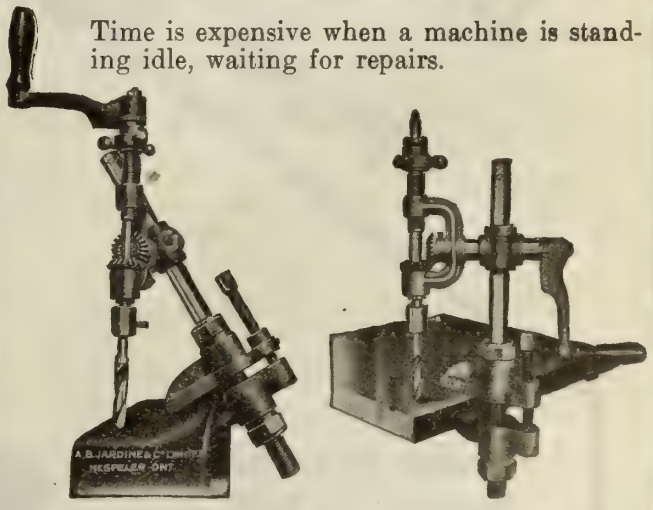
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net

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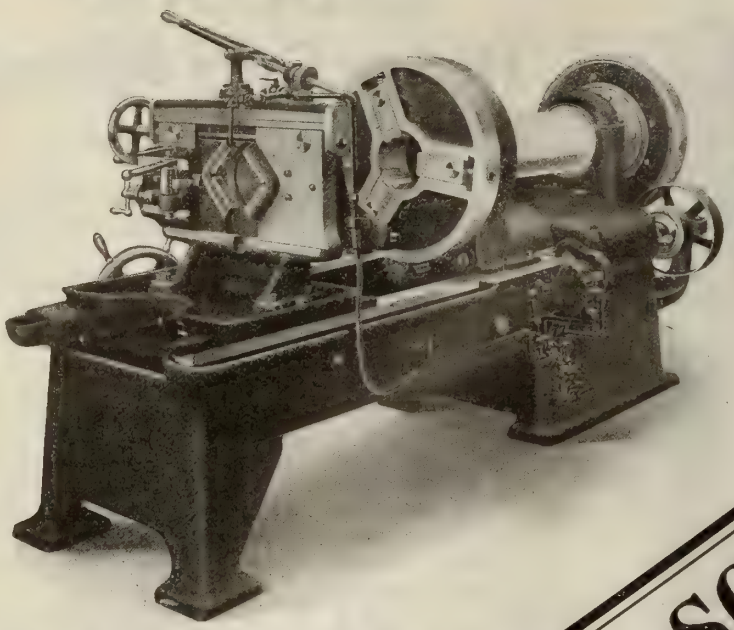

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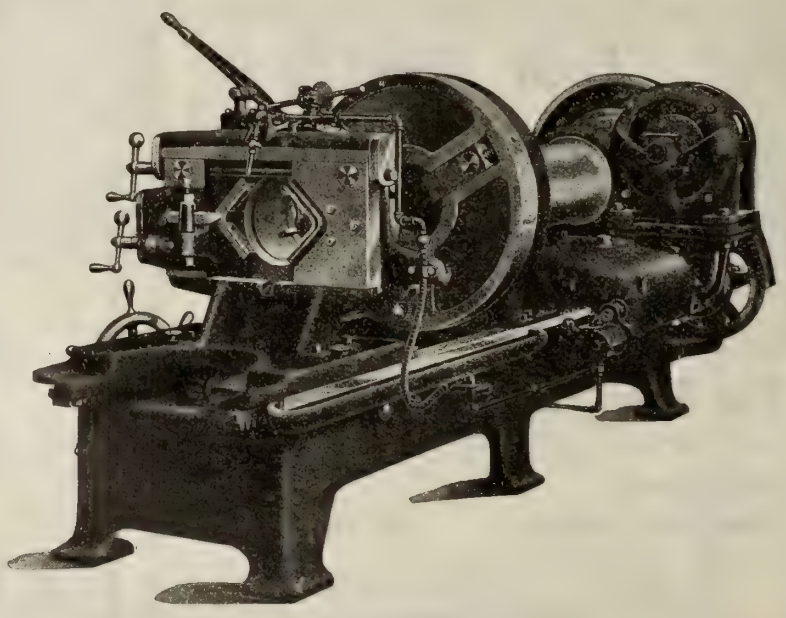

No. 8 Motor Drive
Capacity 2½ to 8"

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"DOUBLE WACO" 18% Tungsten, for Railway and Tramway Tires and Hard Metals
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Diamond Special Extra Best Quality Best Warranted
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Each quality supplied in different tempers to suit tool required

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In three qualities
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Round or Octagon
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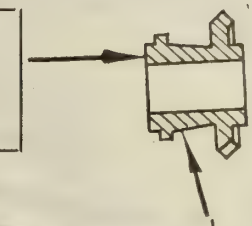

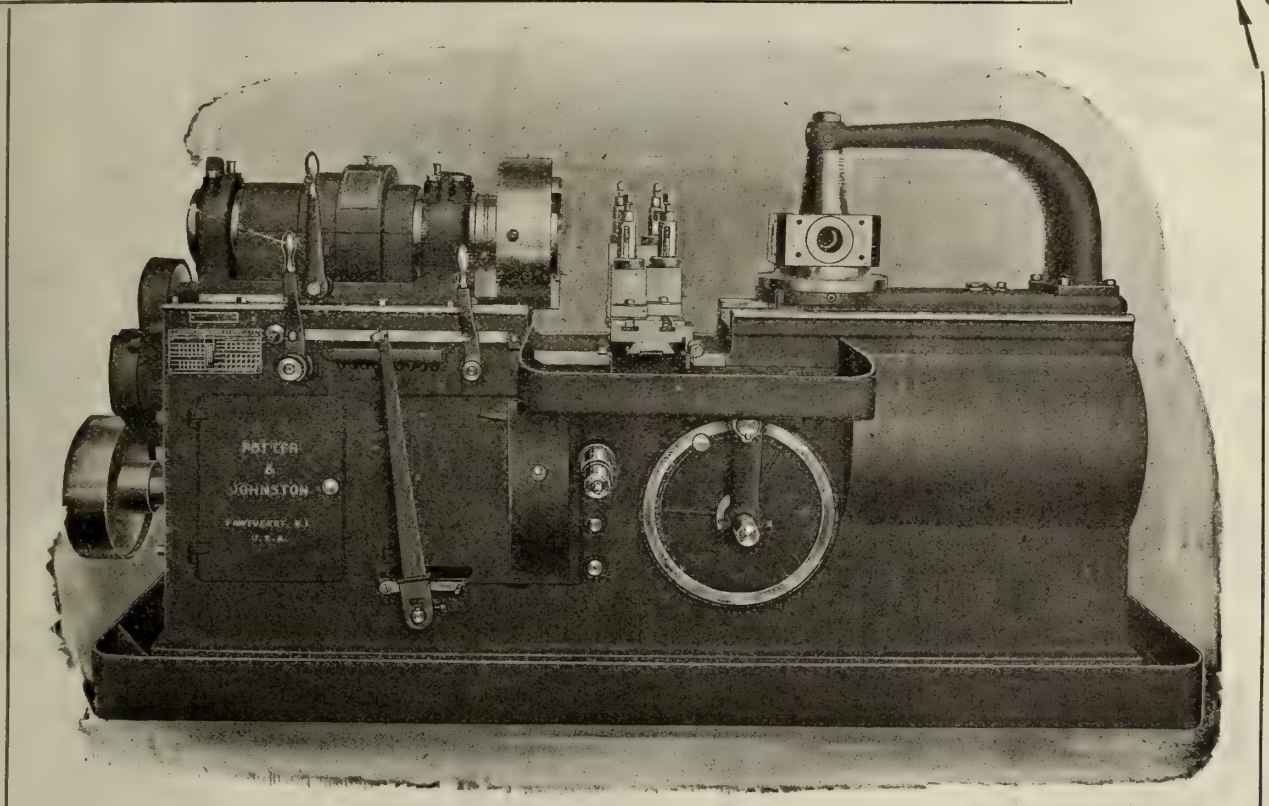

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BULLETIN 39

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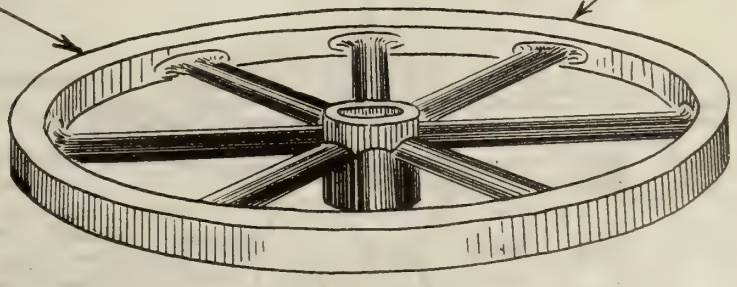
If you have, you come within the range of Potter & Johnston Manufacturing Automatics.

One operator runs from 2 to 6 P & J's



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HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA
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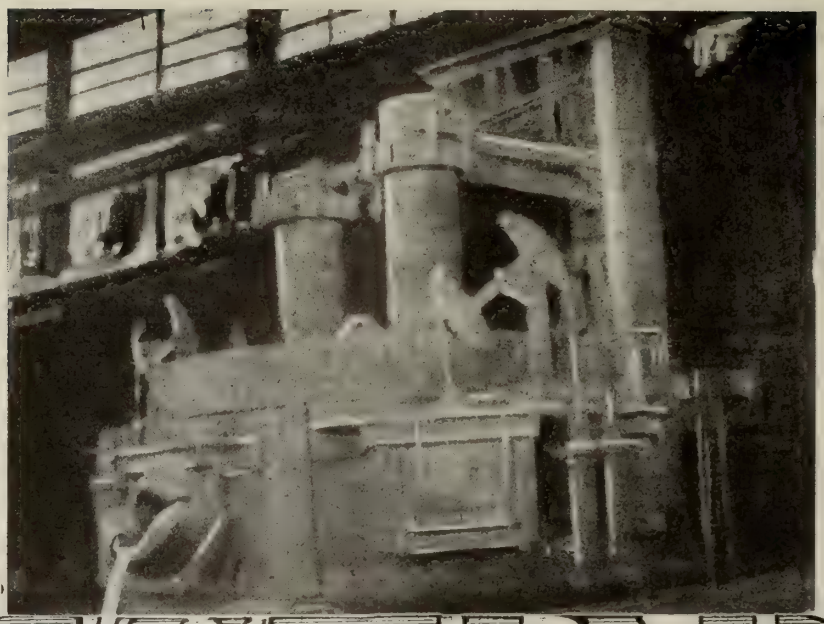

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High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces — entirely infallible, automatically regulated, delivering the same result time after time.

Uranium — This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
LATROBE, PENN.

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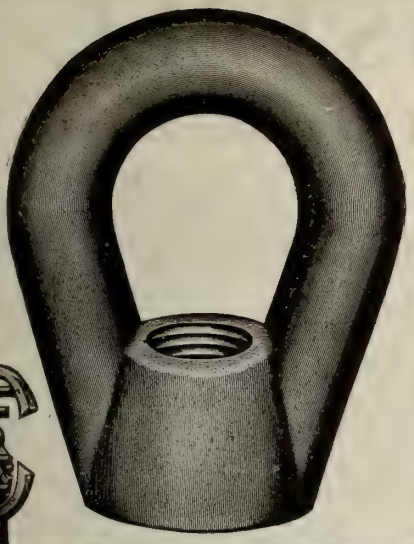
LIMITED

Eye Nuts



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all sizes

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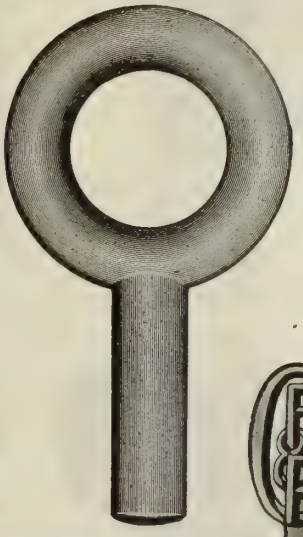
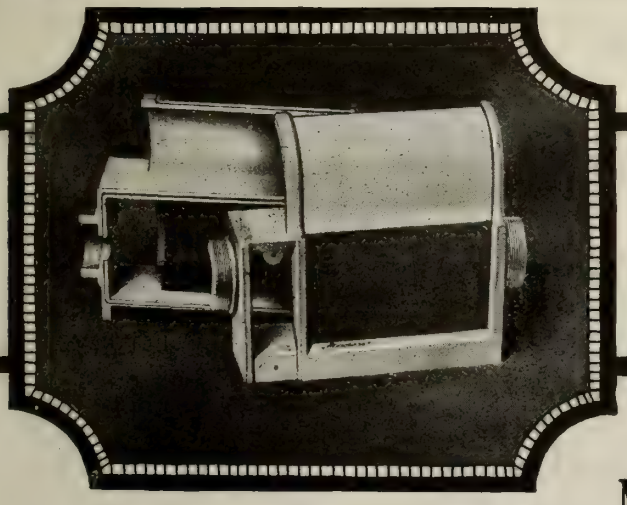
Canadian Billings & Spencer Plant
Welland Canada



Eye Bolts



FRANKLIN DIE-CASTINGS

The Possible Manufacturing Economies

GO over your product again. There may be some simple little part, or a complicated one, which would serve its purpose as well, or better, if produced by our die-casting process. If so, you will economize in manufacturing costs. And if we undertake the job the efficiency of your product will not suffer because it is not only our business to produce die-castings but to see that they are not wrongly applied.

Let us put our 27 years' die-casting experience on your *possible manufacturing economies.* Special attention given to Canadian manufacturing requirements for fuller development.

We are equipped to cast in aluminum, lead, tin and zinc base alloys.

Send sample or blueprint for recommendation and estimate. Ask for Booklet "C."

Franklin Manufacturing Co., 746 Gifford St., Syracuse, New York, U.S.A.

VULCAN

NON-SHRINKABLE OIL HARDENING

DIE STEEL

was used to make these Government Gauges

Gauge No. 1		Gauge No. 2
2.506	Outside Diameter	2.016
2.433	Pitch Diameter	1.951
8	Threads per inch R. H.	12
1 in.	Length of Gauge	1⅛

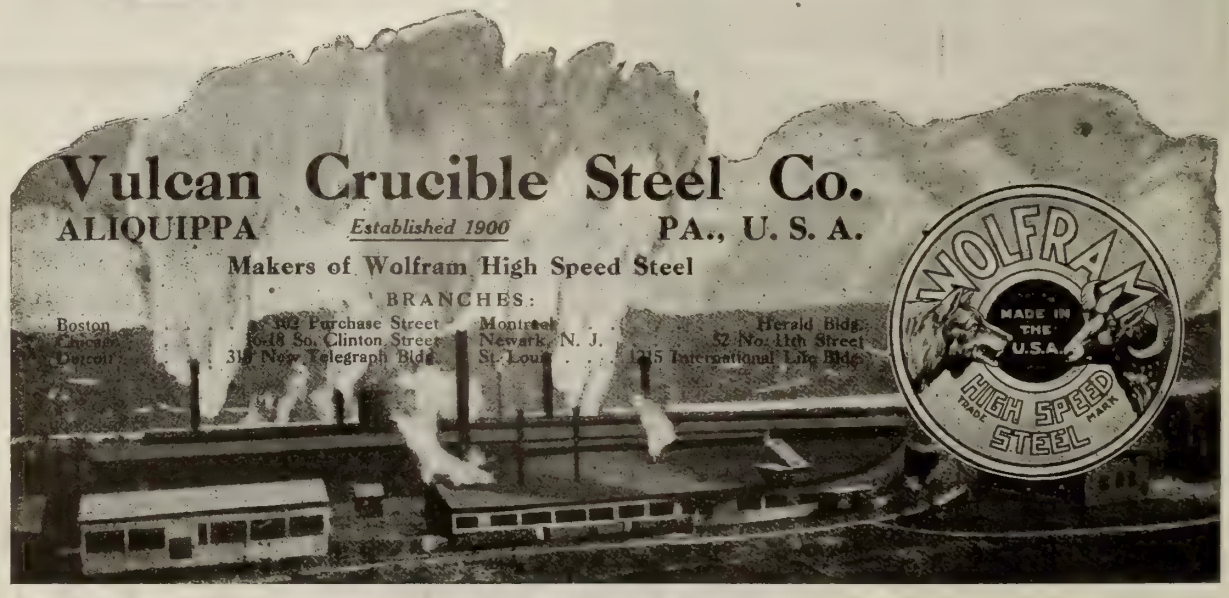
TOLERANCES

Pitch Diameter—Plus or minus .0002
Lead—Plus or minus .00025 per inch of length
Angle—Plus or minus 5 minutes

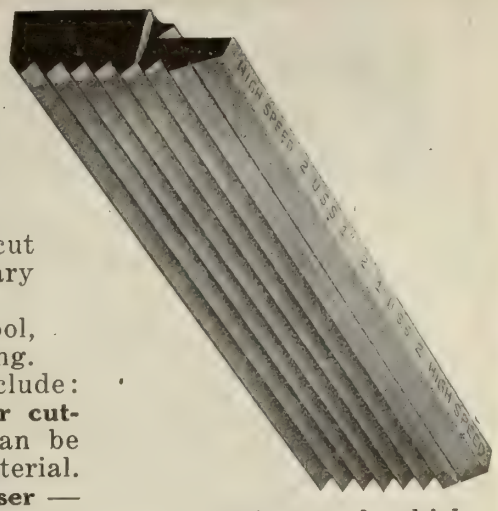
Allowance on pitch diameter for grinding .003 to .005, depending on diameter of gauge.

Change in Hardening { Lead not over plus or minus .001 per inch of length. Diameter not over plus or minus .001 per inch of diameter.

Name of manufacturer of gauges furnished on request.



The Chaser is the Factor in Threading



Any die will cut a thread—that is its purpose; but to cut threads profitably and threads that are better than ordinary requires a **different chaser.**

The Landis Die, embodying the characteristics of a lathe tool, gives you those features necessary for successful threading. These features include:

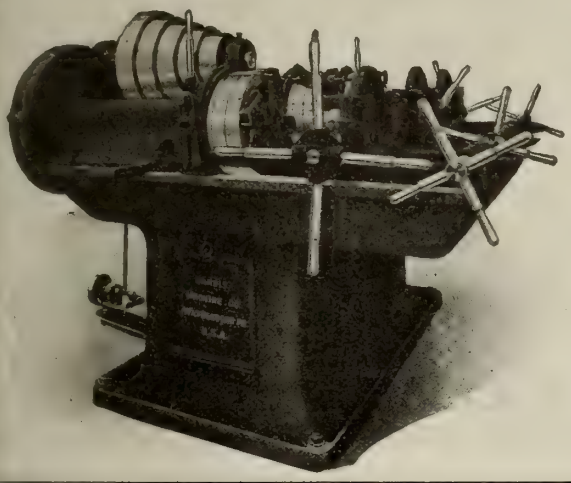
Variable rake or cutting angle which can be ground to suit material.

Long life of chaser — you have three inches of available cutting stock which gives a life twenty times that of other dies.

No annealing, hobbing and retempering—just grind the chaser on the end and you have a new die.

Interchangeability—any one of a set of chasers can be replaced without renewing the entire die.

Tangential disposition—chaser has a line contact with the stock, reducing the friction to a minimum and doubling cutting speeds.



Why not investigate this die and learn just what it can do to your threading requirements? Catalogue No. 24 will give you details.

LANDIS MACHINE COMPANY

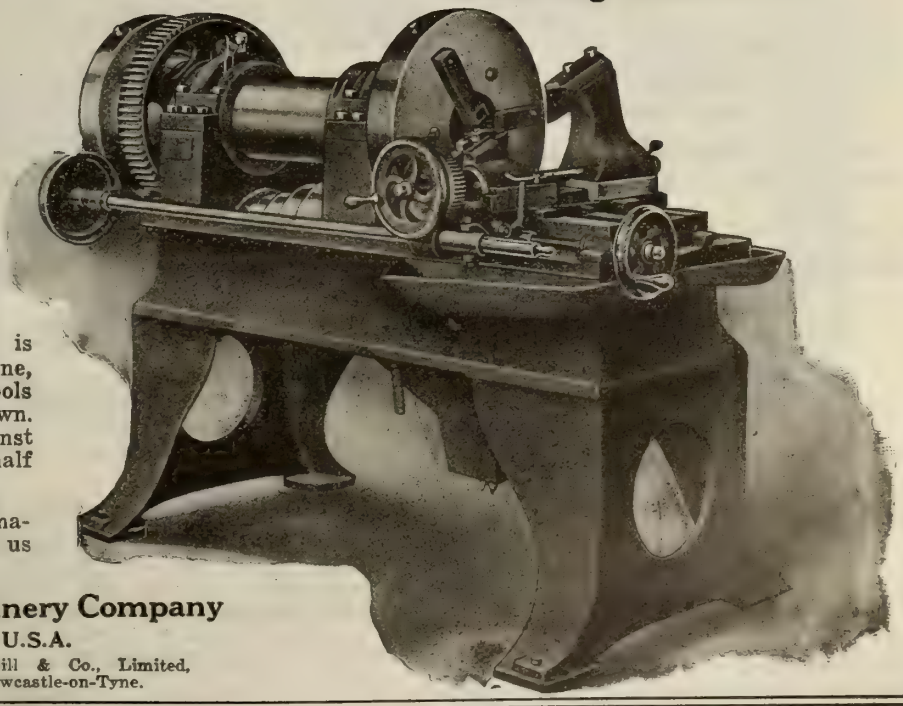
WAYNESBORO, PA.

Cut Your Cutting-off Costs in HALF

HURLBUT'S

Patent Cutting-off and Centering Machines

TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.



Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

The Hurlbut, Rogers Machinery Company

South Sudbury, Mass., U.S.A.

Foreign Agents—England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.

A WALL RADIAL DRILL

That Puts Dollars in Your Pockets

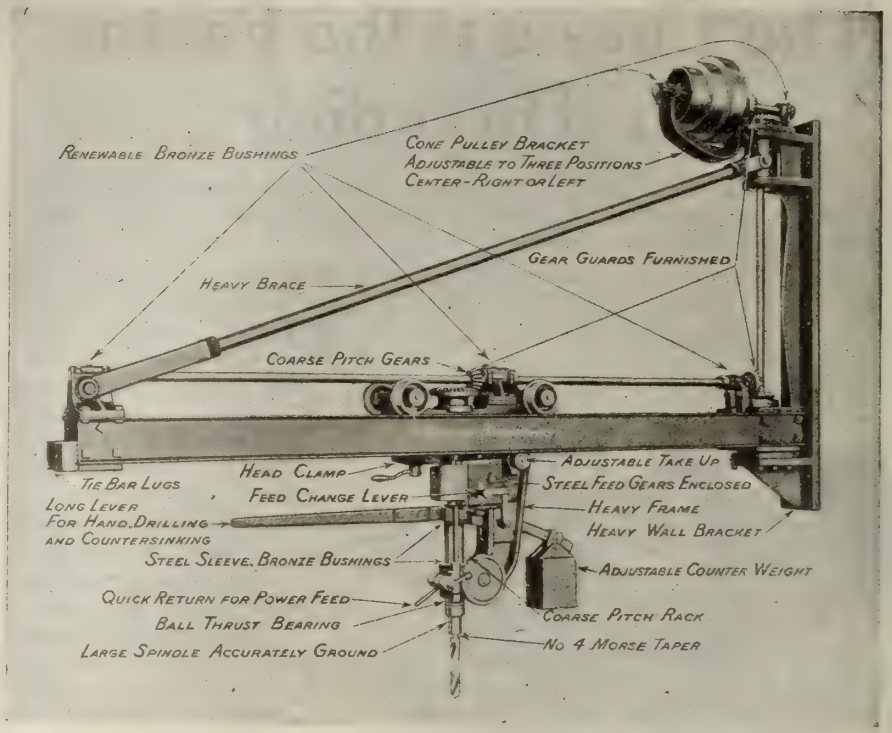
Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions, in your pocket by the installation of this machine.

Send for Detailed Bulletin

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue **BOSTON, MASS.**

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.

Annual sales over $5,000,000.

Hoyt Metal Co., Toronto

New York, N.Y. London, Eng. St. Louis, Mo.

THE

TRADE K–T MARK

FOUNDRY

GALT - ONT.

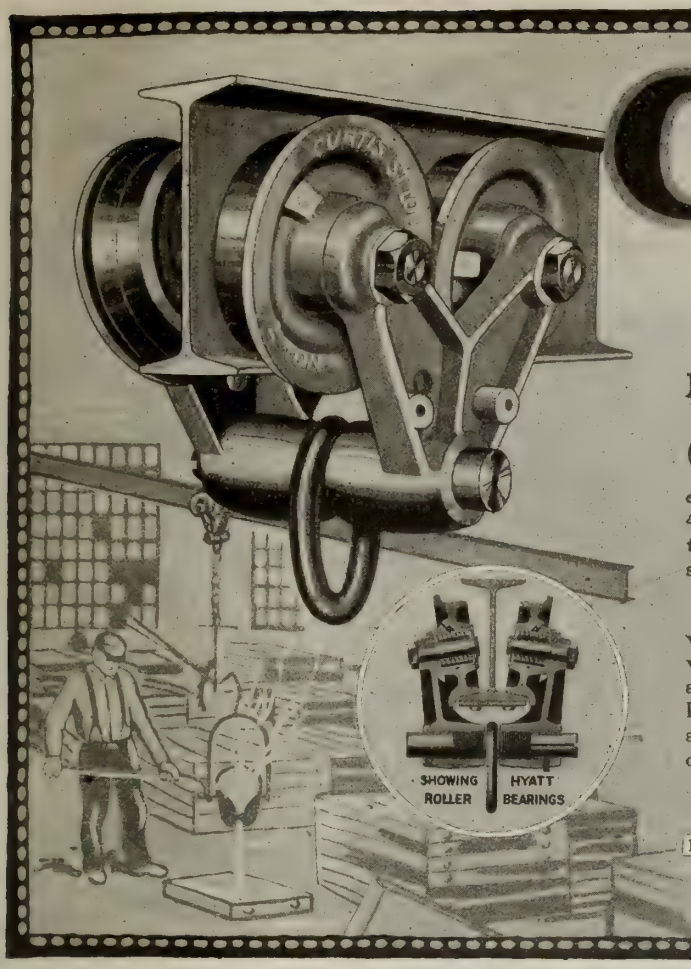
Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US



CURTIS TROLLEYS

Increase Production—Save Man-Power

CURTIS Single I-Beam Trolleys are being used by progressive firms demanding the highest operative efficiency. A Curtis Hyatt Roller-Bearing Trolley with a 4000-lb. load can be moved by a 50-lb. pull, while ordinary trolleys require nearly twice as much power to move the same weight.

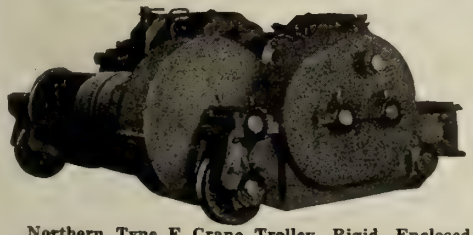
Curtis Trolleys are constructed with large inclined wheels and self-equalizing steel side-frames—so that each wheel always bears its rightful proportion of the load. They are equipped with shock-absorbing Hyatt flexible Roller Bearings—which make the trolleys easy-starting, easy-rolling and long-lasting. Full information and descriptive literature on request.

CURTIS PNEUMATIC MACHINERY CO.
1585 Kienlen Avenue St. Louis, U. S. A.
Branch Office:
532-A Hudson Terminal, New York City

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.

Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists —½ to 10 Tons.

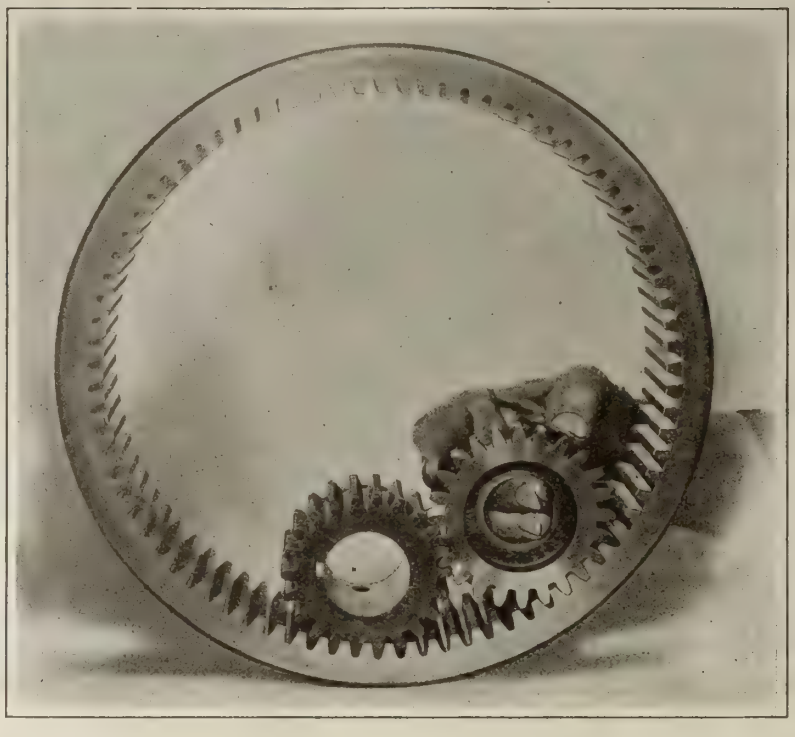
Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada

The Universal Cutter



Illustrating Universal Application of the Gear Shaper Cutter. Note—Cutter meshes accurately with internal gear and also with pinion, and will generate accurate interchangeable involute gear teeth on each.

The Gear Shaper cutter is acknowledged as being designed on the correct principle for generating involute gear teeth, but the Gear Shaper cutter is more than this. It is a universal cutter; it will cut any form of gear from a 12-tooth pinion to a rack—and either external or internal.

The illustration shows the Gear Shaper cutter in mesh with a pinion and an internal gear. This same Gear Shaper cutter will produce the teeth on both with theoretically correct accuracy.

The Gear Shaper cutter is not limited to the cutting of gear teeth. It is adapted to the generating of other shapes, such as cams, ratchets and other irregular shapes.

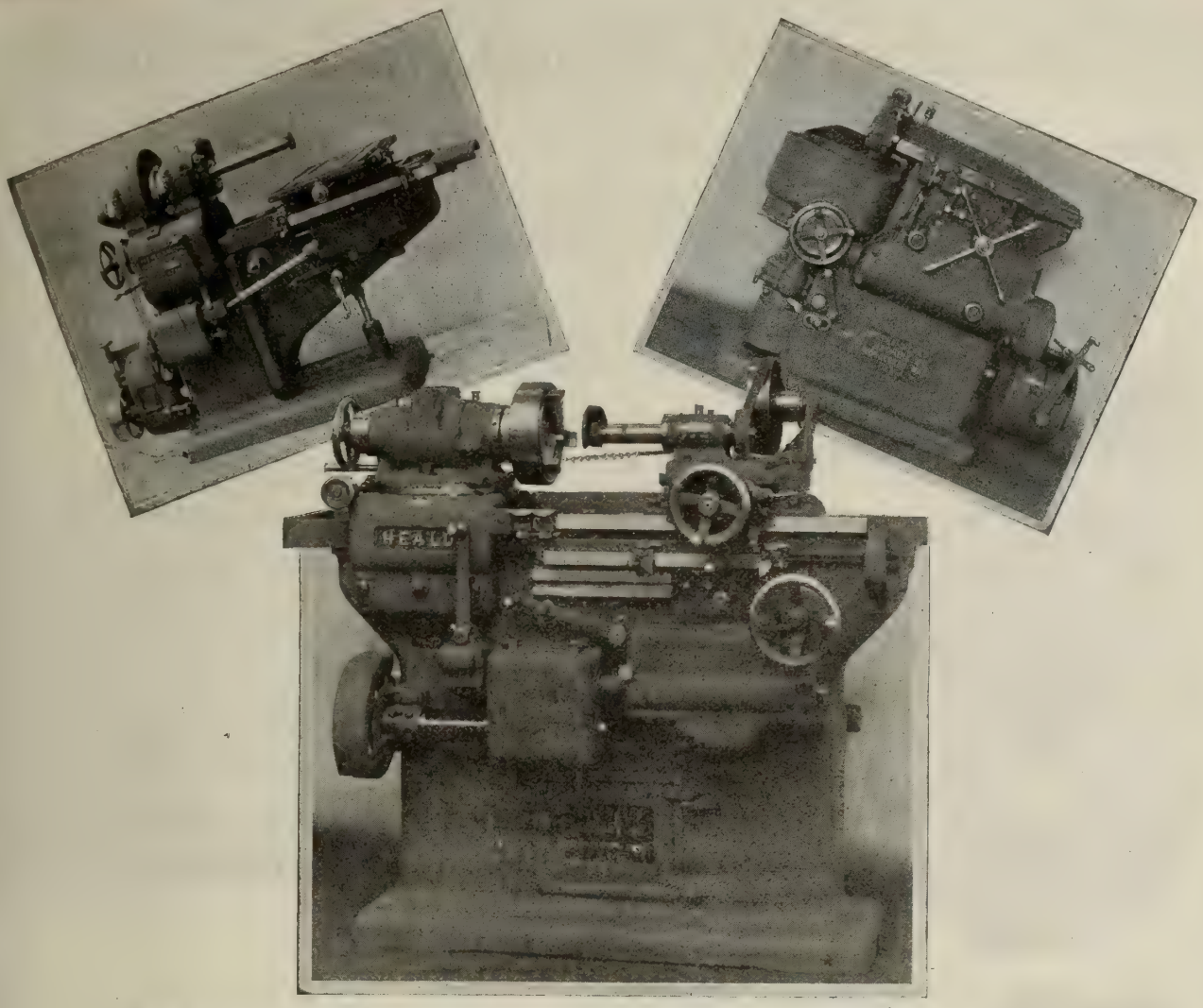
No other gear cutting tool possesses the possibilities of the Gear Shaper cutter from the standpoint of either accuracy of reproduction or low cost of production. Coupled with its many features is a service which has no equal in the gear cutting field. You will need this service more than ever now, because of the great competition that will inevitably come with peace.

Our Engineering Department stands ready to help you with your problems. Their assistance is given gratis. Submit your blueprints for suggestion to

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

Foreign Agents: **Alfred Herbert, Ltd., Coventry, England; Yokohoma, Japan; Calcutta, India; Societe Anonyme Alfred Herbert, Paris, France and Spain; Societa Anonima Italiana Alfred Herbert, Milan, Italy; A. B. Galco, Stockholm, Sweden.**



INTERNAL AND SURFACE GRINDING

If you do surface or internal grinding, one of these three will handle your work to best advantage.

The CYLINDER GRINDER will take care of all work that cannot be rotated to advantage, such as two, four or six cylinders en bloc, and awkward large size castings of any material.

The INTERNAL GRINDER produces absolutely accurate holes, either straight or taper, in hardened steel, iron or bronze. It is ideal on bushings, gears, collars, ball bearing races and a thousand other parts, where accuracy and production are essential.

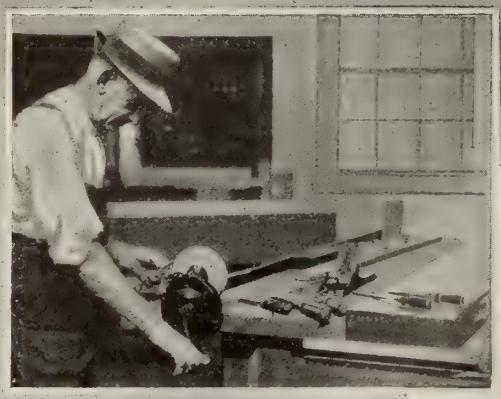
The SURFACE GRINDER delivers at a commercial rate a mirror finish on keys, rings, cutters, dies, discs, collars; in fact any shaped part whose size is within the capacity of the chuck.

Send for a Complete Folder Catalog

THE HEALD MACHINE COMPANY
Worcester Massachusetts

CARBORUNDUM NIAGARA GRINDERS

JUST TO REMIND YOU THAT YOU CAN SELL THEM



To the Carpenter

For grinding his chisels, plane, bits, gouges, etc. The No. 3 Niagara just suits him. It's big enough for bench work, small enough to pack in his tool kit.

To the Garage Man

For grinding parts, tools and fittings—for a dozen and one jobs about the shop. He will want the big No. 4, or, if he has power, the No. 28 Grinder Head.

To the Farmer

For grinding his scythes, grass hooks, mower sections, feed chopping knives—for edging spades and general farm tools, for grinding household knives, etc., the Niagara No. 14 is the machine for him.

To the Householder

For grinding household knives and tools —a little No. 1 machine.

The business is waiting for you—go after it with Carborundum Niagara Grinders. Carborundum displays and advertising will help you.

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

"One man does the work of eight".....

"We formerly cleaned off the mineral oil from these pumps with gasoline.

"We had to clean them both before and after assembling and it took *eight* men to do it.

"Now we clean them *once* with Oakite and *one* man does as much work as eight men used to do.

"We have eliminated gasoline with its dangers by cleaning with Oakite.

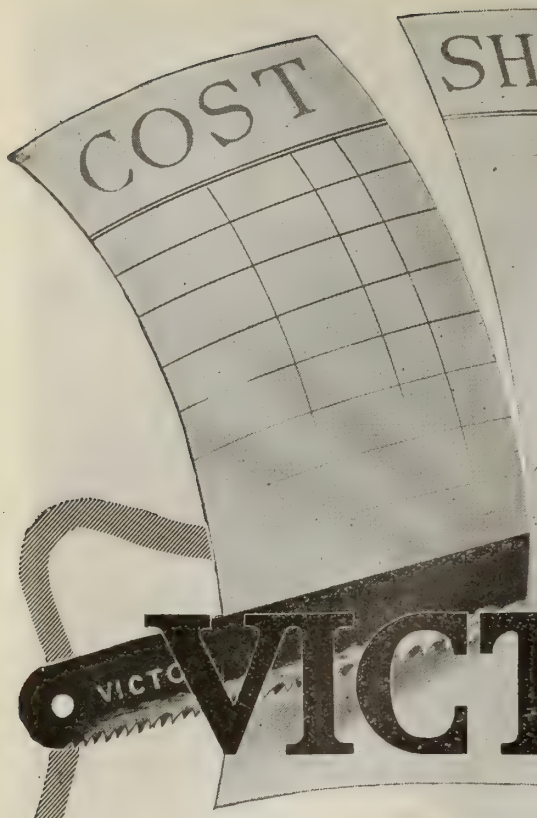
"We have also eliminated the handling of our total product once.

"We save seven men's time and get cleaner work than we ever did before."

This Advertisement is one of a series based on actual occurrences.

Correspondence Invited.

OAKITE MANUFACTURED BY
OAKLEY CHEMICAL CO.
44 THAMES STREET · NEW YORK



CUT YOUR CUTTING COST WITH VICTOR Flexibles

The high cost of tools should emphasize more than ever the importance of quality.

The high cost of hack saw blades ought to drive every hand blade user over to the saw that does not break in ordinary hand work.

VICTOR FLEXIBLE HACK SAW BLADES have exactly the same cutting power as the finest All-Hard on the market, and that they cannot be broken in use except by intentional abuse is an undisputable fact—which will represent a saving from twenty-five percent to thirty-three and one-third percent in breakage alone.

Seventy-five percent of the All-Hard blades used in hand frames break before they are worn out. Watch the All-Hard blades in your own shop and see the enormous amount of breakage—then use VICTOR FLEXIBLES and note the economy.

VICTOR SAW WORKS LTD - HAMILTON, CANADA

Standard the World Over

"THE RACINE"

HIGH SPEED METAL CUTTING MACHINE

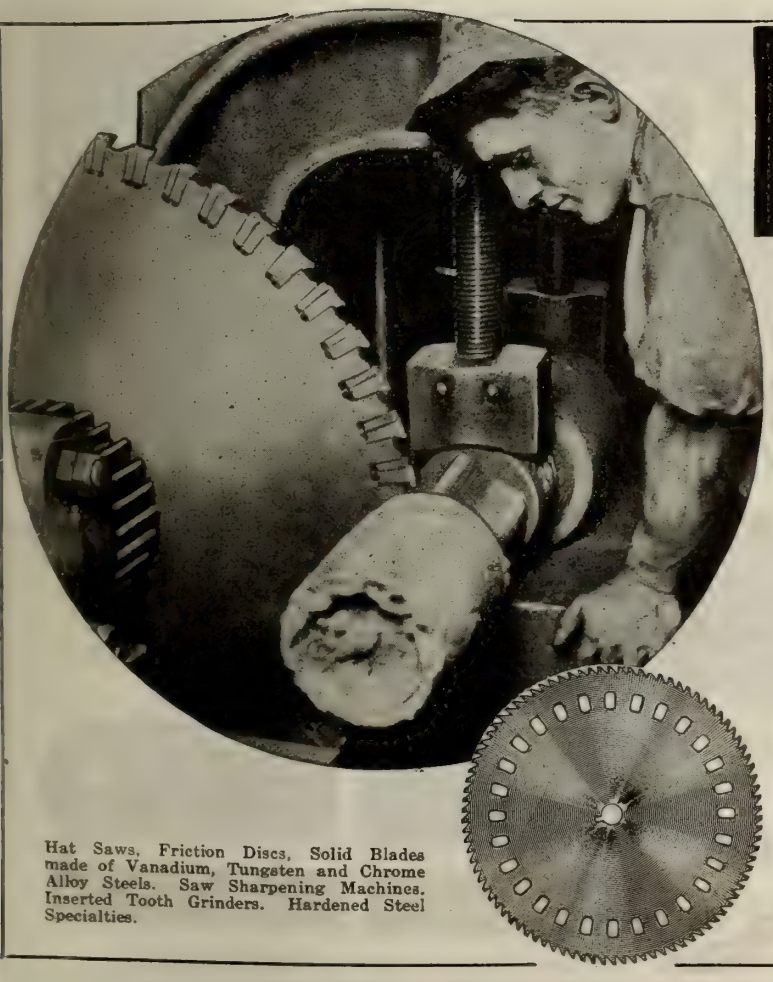
Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue - RACINE, WIS., U.S.A.



HUNTER Duplex Saws

The selection of many of the best and largest companies in the country for cutting ingots, bars, forgings, castings, rails and structural shapes.

Their fast cutting qualities mean a saving of time and power, plus increased production.

Teeth are accurately formed, ground and set for highest speed and greatest endurance. Made in sizes up to 90 in. in diameter.

Write for price list and full particulars

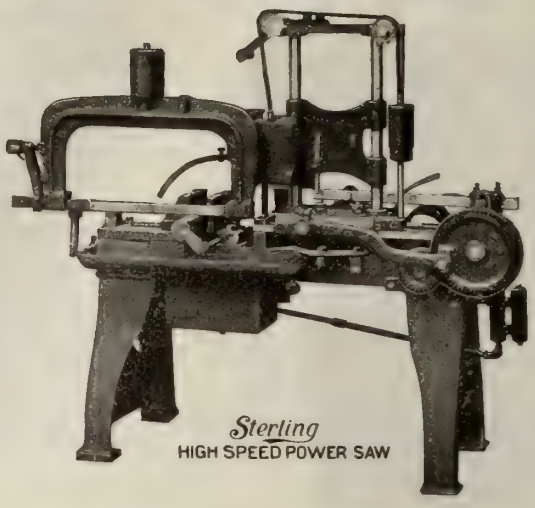
HUNTER SAW & MACHINE CO.
Pittsburgh, Pa.

Hat Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel Specialties.

HACK "STERLING" SAWS

"STERLING" Blades are worth a trial. Tell us or your dealers of your needs.

We can save you money.



To get the best results from power blades, a good machine is necessary. Try the "STERLING." The combination is excellent.

Manufactured by

DIAMOND SAW & STAMPING WORKS, 357 Seventh St., Buffalo, N.Y.

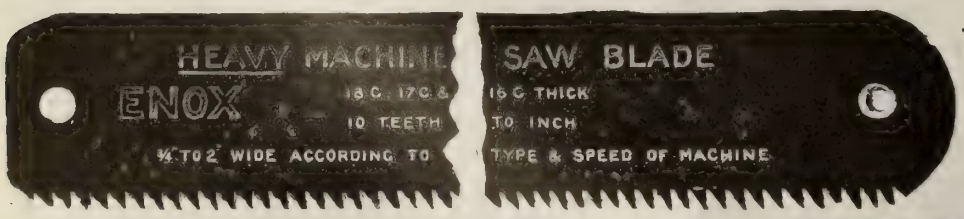
SIMONDS

HACK SAW BLADES

UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited

ST. JOHN MONTREAL VANCOUVER



ENOX
Hacksaw Blades

ARE THE BEST

AGENTS IN CANADIAN TOWNS WANTED

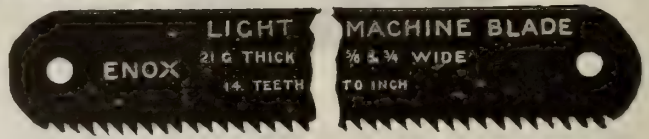
Liberal Terms offered to firms willing to carry stocks and act as sole agents for the district.

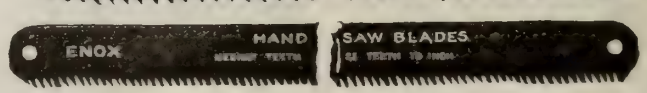
Makers:

FRY'S (LONDON) LIMITED

AN ENTIRELY BRITISH COMPANY

46 Upper Thames St., London, E.C. 4, England. Works Greenwich, S.E. 10



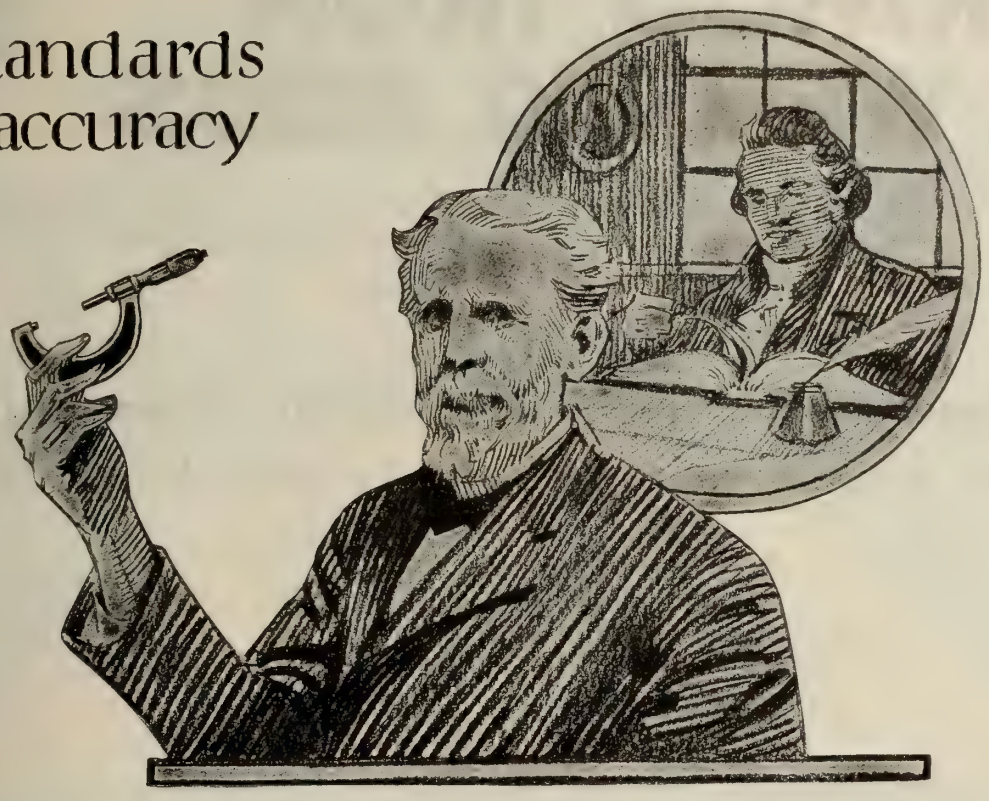


Agents for Canada, East of Fort William

THE STANDARD MACHINERY & SUPPLIES, LIMITED, 261 Notre Dame St. West, MONTREAL, QUE.

Agents for British Columbia—The A. R. Williams Machinery Co., Limited, 495 Railway St., Vancouver, B.C.

Standards of accuracy



Starrett Tools

are made according to the standard set by Noah Webster in 1828, when he defined accuracy—

"In exact or careful conformation to a standard of requirements, the result of care or pains; free from error, failure or defect."

Two generations of machinists have applied that definition to tools that bear the Starrett name—and found it fitted.

Every Starrett Tool is warranted free from error, failure or defect.

Catalog No. 21"3" gives details of the 2100 tools that comprise the Starrett line.

The L. S. Starrett Company

The World's Greatest Toolmakers.
Manufacturers of Hack Saws Unexcelled.

Athol, Mass.

STARRETT HACK SAWS CUT QUICKER LAST LONGER

42-956

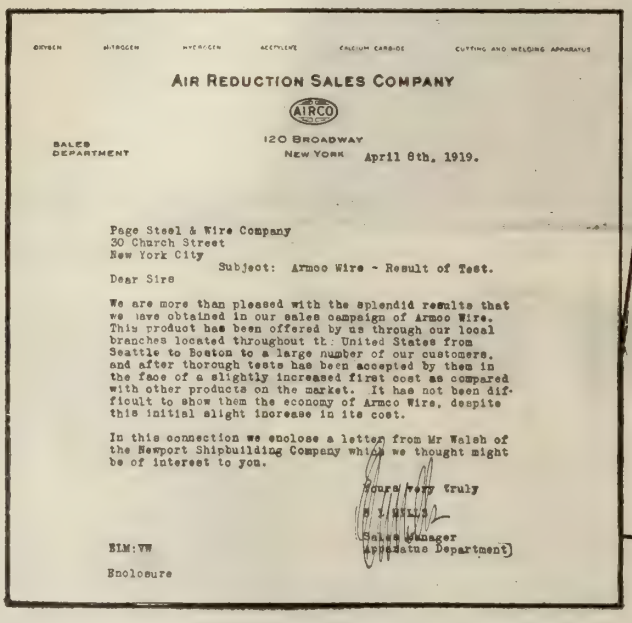
ARMCO IRON WELDING RODS

AMERICAN ARMCO INGOT IRON

The trade mark ARMCO carries the assurance that iron bearing that mark is manufactured by the American Rolling Mill Company with the skill, intelligence and fidelity associated with its products, and hence can be depended upon to possess in the highest degree the merit claimed for it.

cost somewhat more than ordinary filling material, but compared with the total cost of the weld, the difference is insignificant. The difference in strength and safety of the weld, on the other hand, is of vital importance.

"It has not been difficult to show them the economy of Armco Iron Wire—"



OXYGEN NITROGEN HYDROGEN ACETYLENE CALCIUM CARBIDE CUTTING AND WELDING APPARATUS

AIR REDUCTION SALES COMPANY

AIRCO

SALES DEPARTMENT 120 BROADWAY NEW YORK April 8th, 1919.

Page Steel & Wire Company
30 Church Street
New York City

Subject: Armco Wire - Result of Test.

Dear Sirs

We are more than pleased with the splendid results that we have obtained in our sales campaign of Armco Wire. This product has been offered by us through our local branches located throughout the United States from Seattle to Boston to a large number of our customers, and after thorough tests has been accepted by them in the face of a slightly increased first cost as compared with other products on the market. It has not been difficult to show them the economy of Armco Wire, despite this initial slight increase in its cost.

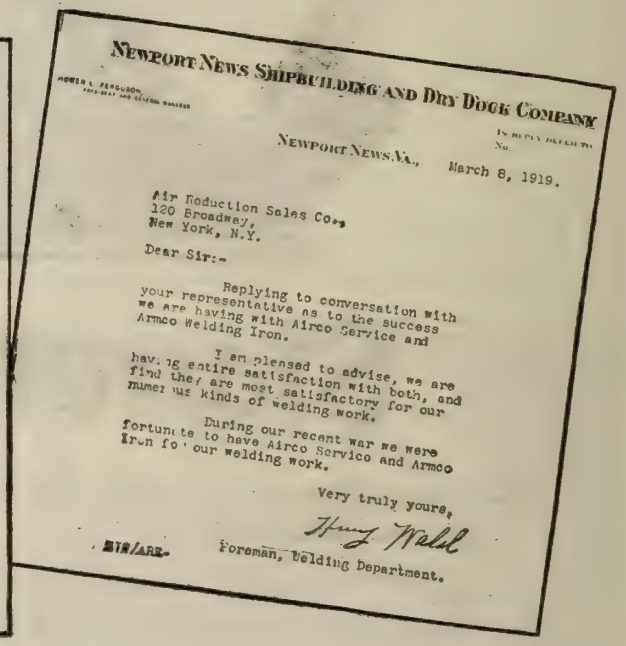
In this connection we enclose a letter from Mr Walsh of the Newport Shipbuilding Company which we thought might be of interest to you.

Yours very truly

W. L. Walsh
Sales Manager
Apparatus Department

WLM:VW

Enclosure



NEWPORT NEWS SHIPBUILDING AND DRY DOCK COMPANY

NEWPORT NEWS, VA., March 8, 1919.

Air Reduction Sales Co.,
120 Broadway,
New York, N.Y.

Dear Sir:-

Replying to conversation with your representative as to the success we are having with Airco Service and Armco Welding Iron.

I am pleased to advise, we are having entire satisfaction with both, and find they are most satisfactory for our numerous kinds of welding work.

During our recent war we were fortunate to have Airco Service and Armco Iron for our welding work.

Very truly yours,

Henry Walsh
Foreman, Welding Department.

HW/ARE.

The above typical letter to one of our distributors shows that the superiority and real economy of ARMCO welding material are readily appreciated. Welders who use ARMCO IRON exclusively have a big advantage over competitors who buy inferior filler and their customers soon learn the difference.

Another ARMCO advantage from the welder's standpoint is the fact that one kind of rod of guaranteed Armco analysis is specially treated for oxy-acetylene welding and will do all the work (with better results) that heretofore has required a choice of one from many compositions. This means that with a much smaller investment for stock of filling material a shop is fully prepared to handle the usual run of steel and iron welding work.

Because of their exceptional purity and even density Armco Iron Welding Rods flow freely, weld evenly ,and give a joint that lends itself perfectly to hammering, forging, and, where necessary, to annealing and quenching.

Our booklet on "Armco Iron Rods and Wire" is full of interesting and useful welding data. Send for it.

PAGE STEEL & WIRE CO.

STEEL AND WIRE PAGE QUALITY PRODUCTS

Established 1883 as Page Woven Wire Fence Co.

Makers of "Copperweld" Copper Clad Steel Wire; ARMCO Iron Welding Rods and Electrical Wire; Wire Mill Products, Plain and Galvanized; Wire of Special Analysis; Wire Fencing for all Purposes; Factory Gates; Ornamental Iron Fence; Machine Guards; Tool and Stockroom Partitions; Architectural Iron.

Plants: Monessen, Pa., and Adrian, Mich.

STEEL AND WIRE PAGE QUALITY PRODUCTS

Sales Offices: 30 Church Street, New York

CHICAGO: 29 South La Salle Street
DETROIT: 35-57 Washington Boulevard
SAN FRANCISCO: American Rolling Mill Company, of California
CANADIAN DISTRIBUTORS: Taylor & Arnold, Ltd., Montreal, Toronto, Winnipeg.

BROWN'S

Beaver Brand Metals

Copper, Brass, Bronze, Canada Silver, and Gilding Metal in sheets, rolls, plates and rods. Naval Bronze, Yellow Metal and Muntz Metal in sheets and rods for shipbuilding requirements. Specify Beaver Brass Rod for drilling and free cutting.

Link up with Beaver Brand Products—you'll like the quality, price and service.

Brown's Copper & Brass Rolling Mills, Limited

New Toronto, Ont., Can.

COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

MALLEABLE AND CAST IRON PIPE FITTINGS

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

When ordering from your jobber be sure you buy---"the brand that has the quality." They are different. A trial order will convince.

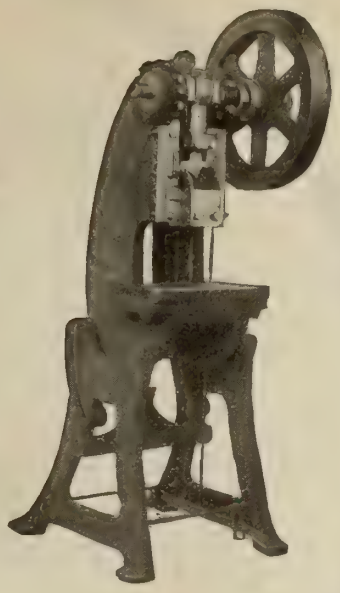
International
Malleable Iron Company, Limited
Guelph, Ontario, Canada

CONSOLIDATED

All the energy of America's most modern machine shop and foundry is concentrated upon one product.

—

CONSOLIDATED POWER PRESSES



CONSOLIDATED PRESS CO.

HASTINGS - MICHIGAN
U. S. A.

CONSOLIDATED

For trimming, stamping forging, punching, embossing.

Special presses are designed where the customer's requirements are unusual.

—

CONSOLIDATED POWER PRESSES

Fellow Manufacturers

We Make in Canada

Lead Pipe—Sheet Lead
Wire Solder, Bar Solder, Ribbon Solder.

Babbitt Metal
For All Requirements

INGOT METALS
Copper—Tin—Lead
Aluminum and Brass

Everything in Metals

Wherever you are we can serve you.

THE CANADA METAL, CO., LIMITED
Toronto, Montreal, Winnipeg, Vancouver

Swedish Steel & Importing Co., Limited

Montreal
New York
Toronto
Denver

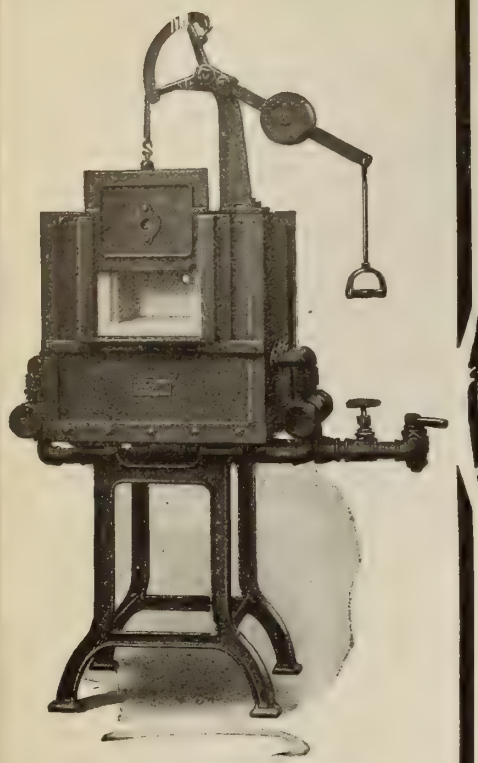
Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK
SS
DOUBLE ESS

PROMPT SHIPMENTS from large stock



TYPE K HIGH SPEED STEEL FURNACE

The Right Furnace for High Speed Steel

Too much—too little or an uneven heat treatment of High Speed Steel renders it practically worthless for the purpose intended.

This Gilbert & Barker furnace has been designed especially for the correct heat treatment of High Speed Steel. A temperature of 2400°F. is quickly obtained and **easily maintained.** The heat is uniform on all sides of the work and loss by radiation is reduced to the minimum by special insulation.

More than 50 years' experience in designing and building furnaces, especially for the accurate and economical heat treatment of metals is your guarantee of satisfaction.

PROMPT DELIVERY ON G. & B. FURNACES

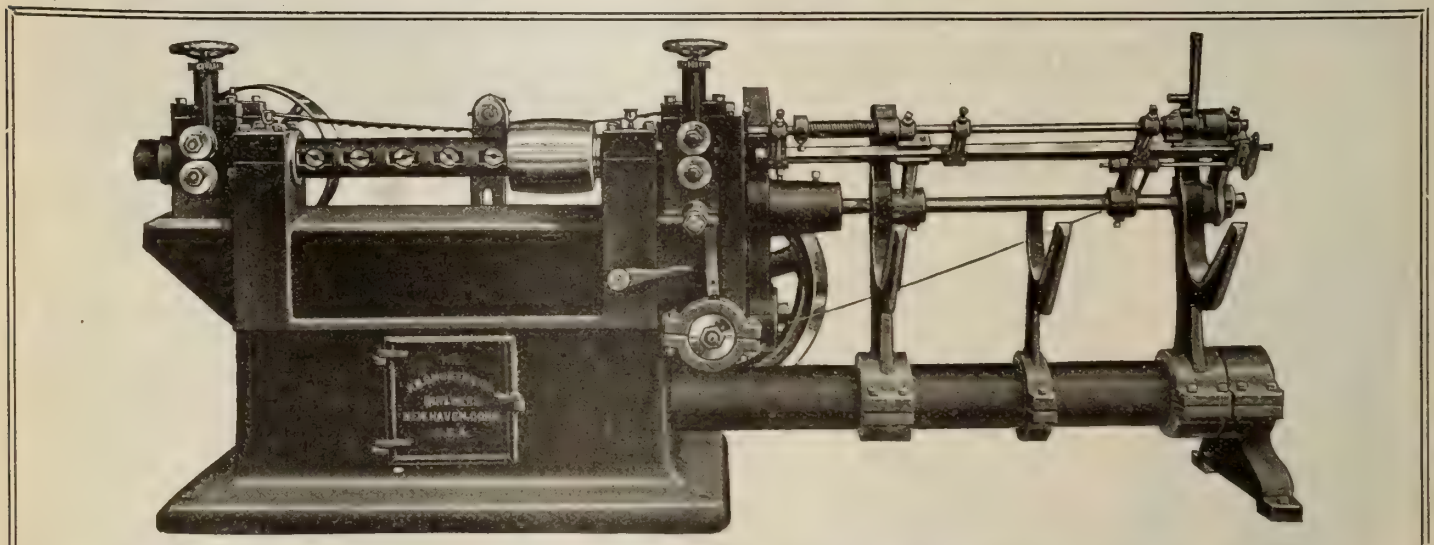
Recent additions to our plant, already one of the largest in this field, makes it possible to offer immediate shipment of your order.

Tell us your problem and we will tell you the type of furnace you require, but first send for Bulletin 24. To-day is a better day than to-morrow--write.

Gilbert & Barker Mfg. Co.

West Springfield, Mass., U.S.A.

Canadian Agents: Williams & Wilson, Montreal, Que. New York Office, 26 Broadway.



Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

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FORMERLY JOHN ADT & SON ESTABLISHED 1886

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

Williams' Drop-Forged Clamps

CAST Clamps may cost less, but they are not cheaper—first cost is not the only factor to be considered. No cast clamp can, or does, stand the constant strain of severe usage.

Williams' Clamps are all drop-forged and are then subjected to a refining heat-process which greatly increases their stiffness and strength. They are thoroughly dependable and render superior service under the hardest and most exacting conditions.

Williams' lines of "C" Machinists' and Strap Clamps provide a wide range of sizes for all clamping service—"There's a Williams' Clamp for every purpose." They are carried by leading dealers and are all fully guaranteed.

A copy of our Machinists' Tools Booklet will be sent on request.

J. H. Williams & Co.

"The Drop-Forging People

45 Richards Street : BROOKLYN, NEW YORK

THE A. G. LOW CO., LTD., 45 Pacific Ave., Saskatoon, Sask. Agents for Manitoba, Saskatchewan, Alberta and British Columbia.

The "Boehm" Positive Opening Threading Die

Hardened and Ground Guides for the Chasers

This Is One Distinct Feature of the

"Boehm"

The "Boehm" Positive Opening Threading Die has a positive opening and closing cam action.

Chasers have the necessary radial movement to enable the die to open after the threading operation has been completed. They are supported by a cam ring throughout their entire length and width. Incidentally—

The chasers slide between hardened and ground guides, and are supported by carriers which have a groove in the outer end for the positive opening cam.

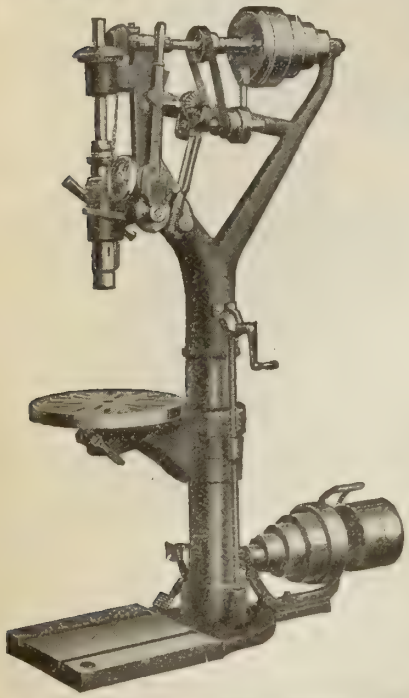
This cam, the locking pins, and the "float" have features that add to the distinctiveness of the "Boehm."

We will be glad to send you complete description.

The Rickert-Shafer Co.

ERIE, PENN.

Silver Drills

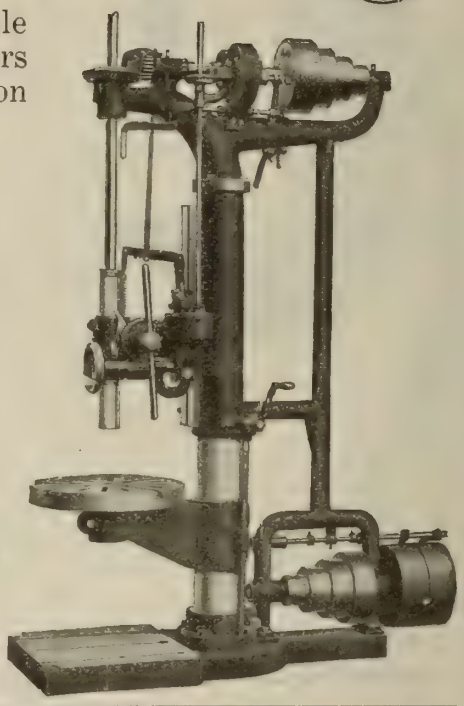


Fast, Strong, Accurate and Dependable drills with an experience of 40 years behind them—they can be depended on to finish the work and do it right.

The 20″ is made in four distinct styles with round or square base and can be furnished singly or in gangs of 2, 3 or 4 spindles.

The 25″ has eight spindle speeds and six positive geared feeds.

Send for full description and quotations



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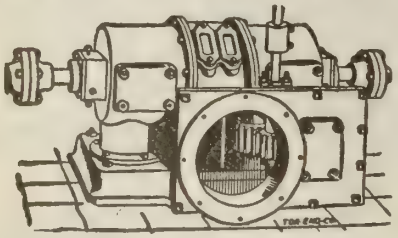

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Will remain cool under exceptionally high speed.

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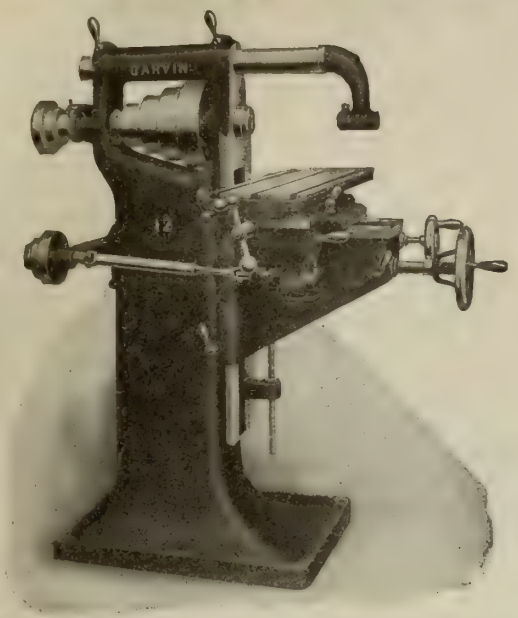

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NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

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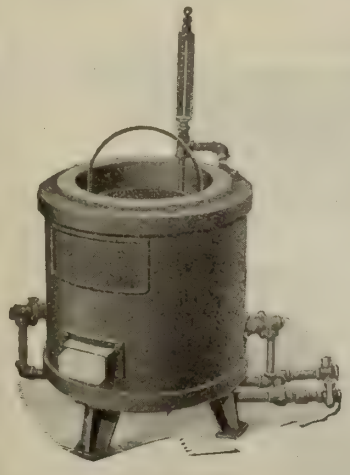

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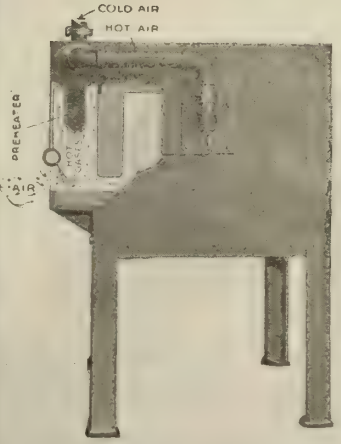

Showing deflection of hot gases, with induced air toward the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into forge shop.

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When Germany signed the Armistice, Walcott Lathe Company accepted cancellations of orders for Lathes amounting to hundreds of thousands of dollars. Not one cent of damage from the United States Government or anyone else was claimed on account of the cancellation.

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Because Walcott Lathes are standard equipment throughout. They are built and designed for manufacturing purposes in sizes to meet every requirement of your shop. Thus, we have had a constant increasing demand for Walcott Lathes for the past thirty-eight years, not from one section of the country, but from all over the world. Our business is good, and our plant is running full time, not a man idle.

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Engine Lathes

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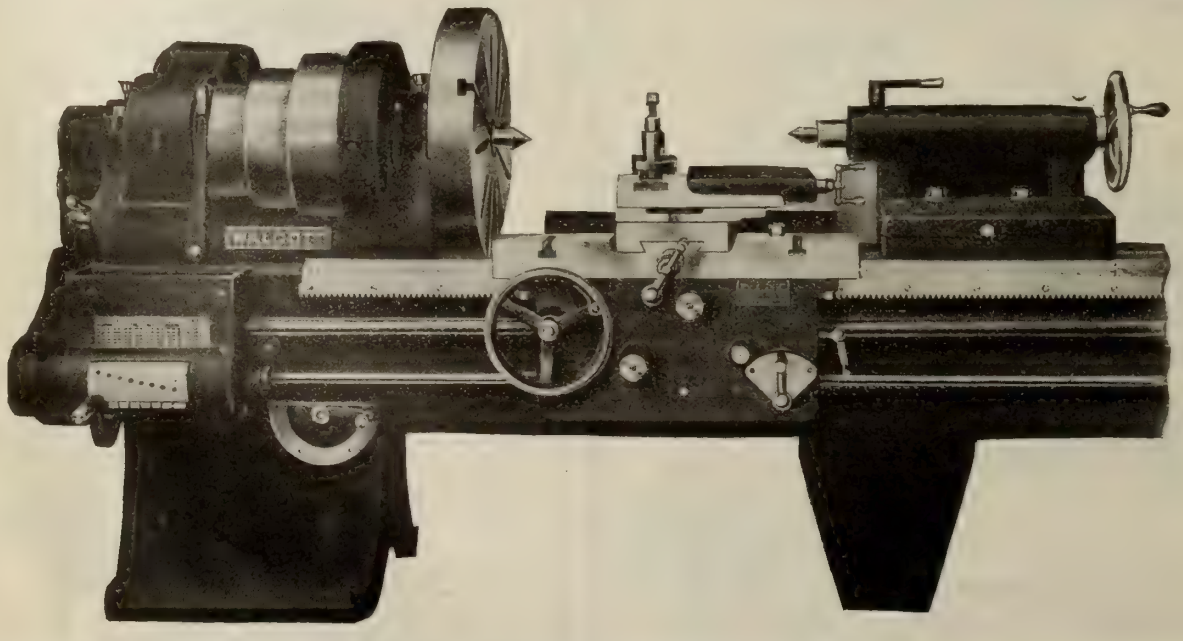
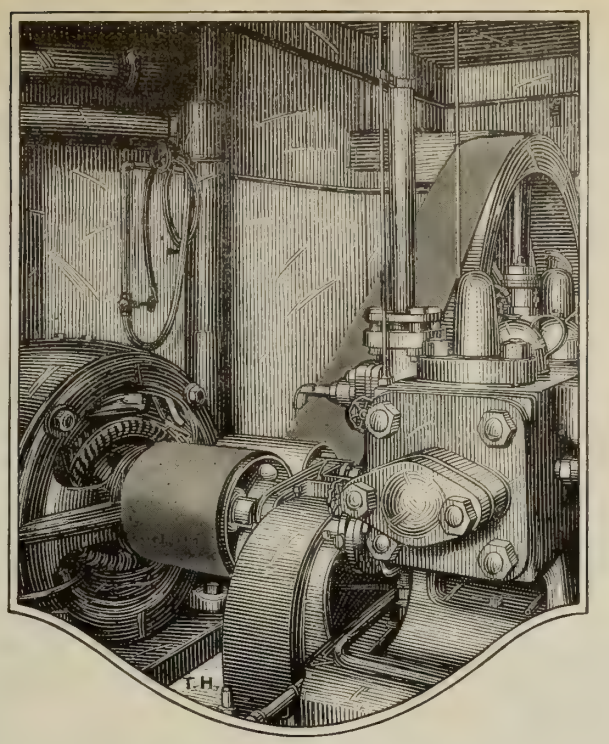


Do you know that the centrifugal force in belts at high speed reduces their driving power until at about 9600 R. P. M. a belt is incapable of transmitting power? All such factors are taken into account by our Engineering Department when they design standardized belt drives. Consult them about your problem.



This is a 12-inch Spartan Double Belt, operating a 50 horse-power Gas Compressor. Its cost to date is ½c per horse-power per week. When this belt had been in use 18 months, the engineer wrote us that it had given double the length of service of belts previously used. This has now been in use over four years and is still going strong.

TOP NOTCH

There is another case where top-notch efficiency and economy have been obtained by simply installing the right belt for the work to be done.

For many years Spartan Belting has been dominating the hard drives that destroy other belts. That experience ranks it as top notch in leather, in tannage and in workmanship. It is unusually pliable, wonderfully elastic, it is the greatest of pulley grippers and without an equal for high speed, overload drives or where unfavorable conditions exist.

Spartan well exemplifies the three principles back of Graton & Knight Standardized Series Leather Belt: First, they are made of the right material—leather. Second, they are tanned in our own tannery specifically for belting use, thus assuring the right kind of leather. Third, they are graded into a Standardized Series—a belt for each class of power transmission requirements—standardized in manufacture and standardized for the work to be done.

Certain articles can be tested in a short time—not so belting. It takes years to test out the correctness of principles applied in power transmission. The result of 60 years test of experience is that Graton & Knight Standardized Series Belting, the highest in grade, is also the most widely sold. That is a significant combination: highest quality—largest sale.

Many of the best belted plants ask us to specify the belting for every drive. Try the plan yourself. Then, when buying, call for "Graton & Knight—— Brand or equal." This won't commit you to buying our belts. It will put your buying on the one basic consideration—the work to be done.

Write for book on Standardization as applied to Belting

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Leather Belting

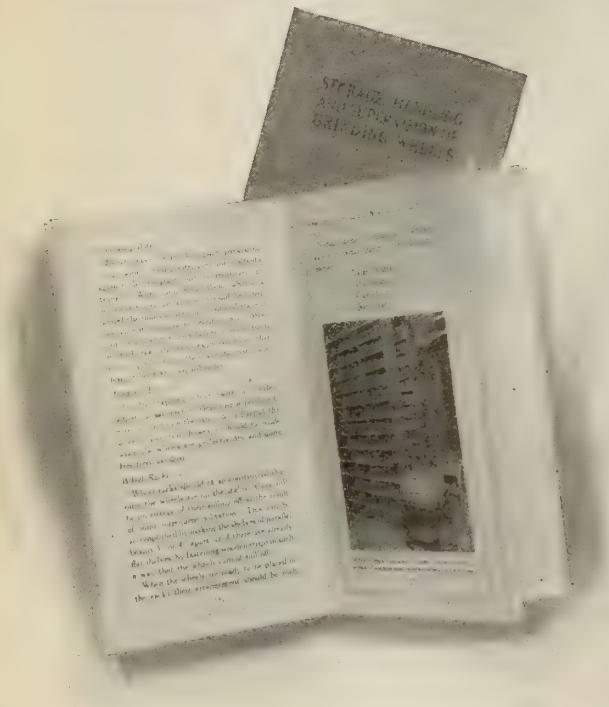
Tanned by us for belting use

Notes On Grinding

NORTON COMPANY, WORCESTER, MASS.

No. 57A

A Book For The Man Who Handles Grinding Wheels



This booklet should be in the hands of every man who handles large quantities of grinding wheels in any manufacturing plant. Sixteen pages of solid reading matter will give him the information he is looking for on

Unpacking Wheels
Tapping Test
Wheel Racks
Storing Wheels
Trucking Large Wheels
Stacking Shape Wheels
Mounting Wheels on Machines
Supervision of Wheel Stock
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In addition to the treatment of the above subjects the booklet contains three pages of diagrams designed to aid the builder of a common-sense wheel rack.

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The U.S. MILLER stands alone in its class for capacity, accuracy and speed.

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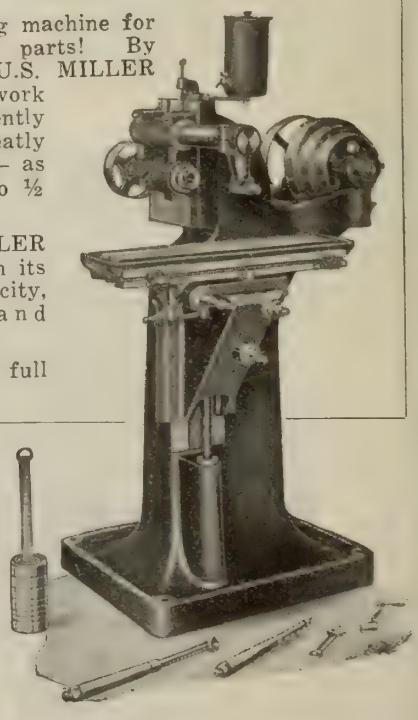

United States Machine Tool Co.
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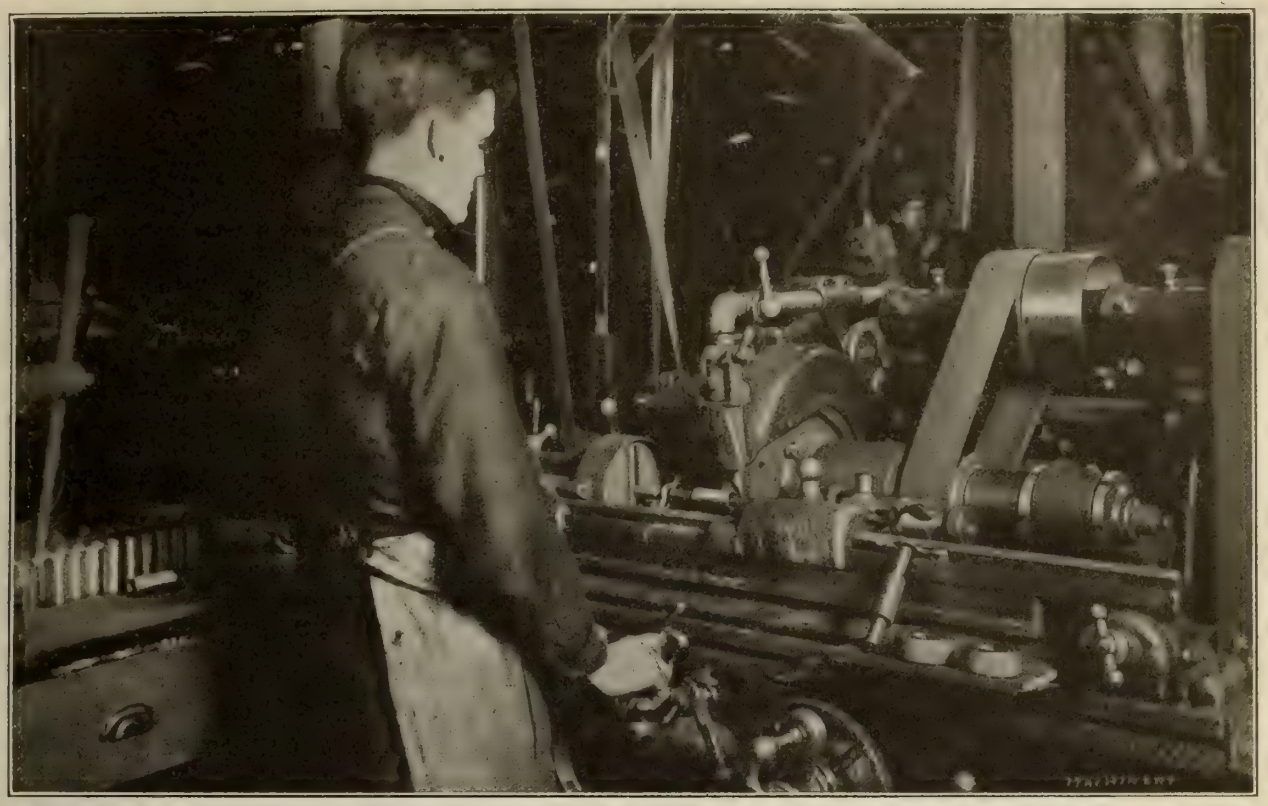

Every Hour He Grinds 50 Tapered Bushings

Compare this output with the best performance possible on a lathe. The limit is half-a-thousandth and the operator turns out 450 cast iron bushings in a 9-hour day.

NORTON

This machine is only one of 13 Norton Grinding Machines in the King Sewing Machine Company's plant at Buffalo. The material is cast iron, size 1/22 in. long and 1½ in. dia., tapered 0.00005 in.

From .008 in. to .010 in. of stock must be removed so you will realize that modern Norton Grinding is not the old style polishing operation. The operator uses two arbors and two dogs so that the machine stops only long enough to take out the work and start up again.

The work comes from the lathe immediately after the roughest kind of a roughing-out job so that the Norton saves the time necessary for a finishing lathe cut.

We'll be glad to tell you more about the elimination of the finishing lathe cut. Write us to-day.

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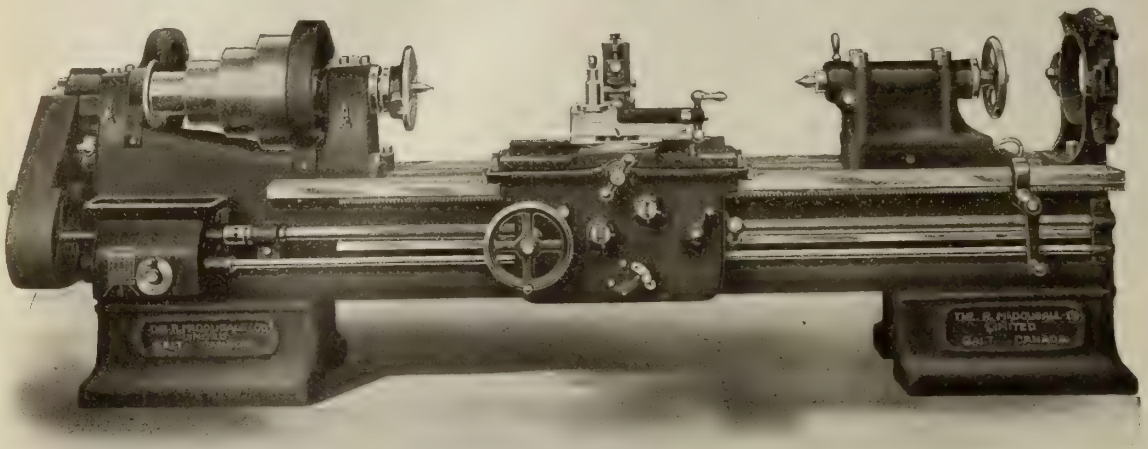
And every feature is proof of our aim to produce a machine of unusual merit.



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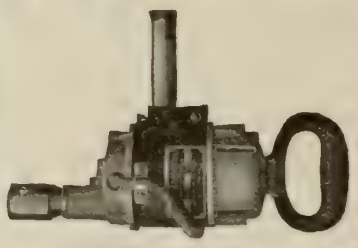

They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
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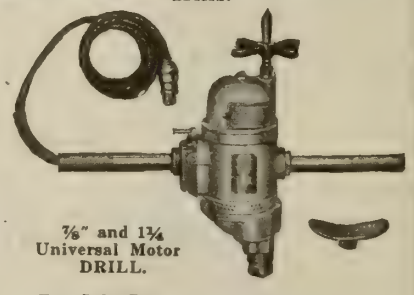
All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜" and 1¼ Universal Motor DRILL.

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Out of this Plant has grown a National Service

Gisholt products line up behind National industries. They bring to every business using machine tools an influence that steadies production and promotes economies.

No matter where you are located, the arm of Gisholt Service can reach you and help direct the activities of your plant into healthy channels. Having once seen what this Service is capable of doing you will follow the example of others and call upon it again and again.

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For Chucking Work

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Machinery Stock List

LATHES

Quan. Sizes and Description.

1—16" x 8' Reed Prentice Geared Head Lathe, with quick change gears, compound rest and full standard equipment.
1—18" x 8' Cincinnati Engine Lathe, with quick change gears, double back gears, three step cone pulley, compound rest and full standard equipment.
1—18" x 8' Perfect Engine Lathe, with quick change gears and double back gears, compound rest and full standard equipment.
1—18" x 8' Stevens Engine Lathe, with single back gears, plain change gears, compound rest and full standard equipment.
1—(Used) 48" x 26' New Haven Type Lathe, taking 20 feet between centres, having 48" face plate, supplied with adjustable face plate jaws, single back gears, compound rest and full equipment.
1—9" x 4' Seneca Falls Tool Room Lathe, with oil pan bed, plain change gears, compound rest and full standard equipment.
1—16" x 8' Reed Prentice Geared Head Lathe, with quick change gears, compound rest and full standard equipment.
1—16" x 6' South Bend Engine Lathe, with taper attachment, single back gears, plain change gears, compound rest and full standard equipment.
1—16" x 8' McDougall Engine Lathe, with quick change gears, 4 step cone, single back gears, compound rest and full standard equipment.
1—18" x 10' McDougal Engine Lathe, ditto, with same equipment as above machine.
1—20" x 10' McDougall Engine Lathe, with double back gears, quick change gears, compound rest, steady rest and full standard equipment.
1—20" x 10' McDougall Gap, with double back gears, quick change gears, compound rest and full standard equipment.
1—26" x 12' McDougall DBG and QCG Engine Lathe.
1—18" x 8' Greaves Klushman DBG and Semi-QC Engine Lathe.
1—18" x 8' Rae DBG and QCG Engine Lathe.
4—17" x 6' Leblond ditto (used).
1—Greenfield No. 107 Speed Lathe, 4' bed.
1—Greenfield No. 140 Hand Screw Machine.
1—Dalton 6" x 30' 3-Step Cone Bench Lathe, with C/S.
1—Perfect 12" x 8' Gap Lathe.
1—14" Mulliner Taper Attachment.

SHAPERS

2—16" "Walcott" Back Geared Shapers, with vise, countershaft, etc.
2—20" "Walcott" Back Geared Shapers, with vise, countershaft, etc.
3—20" McDougall Back Geared Shapers, with vise, countershaft, etc.
2—24" McDougall Back Geared Shapers, with vise, countershaft, etc.
2—Smith and Mills 28" Back Geared Shapers, single pulley drive.
1—McDougall 24" Back Geared Shaper (power down feed).
1—McDougall 20" ditto, plain.
1—McDougal 16" ditto, plain.
1—Walcott 16" ditto.

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2—No. 6 Perfect Grinders, complete, Cap 12 x 2" wheels.
2—No. 8 Perfect Grinders complete, Cap. 18 x 3" wheels.
1—No. 2 Blount Grinder complete 10" x 1½" wheels.
2—No. 1 Norton Universal Tool and Cutter Grinders.
1—No. 3 Brown and Sharpe Cutter and Reamer Grinder.
1—No. 2 Brown and Sharpe Surface Ginder.
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1—No. 1A Wells Drill Grinder, complete.
3—Gisholt Universal Tool Grinders complete.
2—No. 4 Perfect Grinder Heads.
2—No. 10 Perfect Grinder Heads.
1—No. 10 Perfect Comb Grinder and Buffer.
1—No. 1 Blount Grinder complete, 8" x 1½" wheels.
1—No. 2 Blount Grinder and Buffing Machine.
1—Type O.A. Worcester Drill Grinder complete.
2—Gisholt Universal Tool and Cutter Grinders, regular equipment.
2—Stevens Universal Tool and Cutters.
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1—Gardner No. 4 Disc Grinder.
1—Perfect Disc Grinder.
1—Greenfield No. 1A Drill Grinder.
2—Perfect No. 4 Grinder Heads with C/S.
1—Perfect No. 5 Head and C/S, with adj. guards.
3—Perfect No. 6 Grinders, with adj. guards.
1—Perfect No. 8 Grinder, 18 x 3 wheels, with adjustable guards.
1—Perfect No. 6 Grinder Head.
1—Perfect No. 8 ditto.
4—Burtch Bench Grinders, with groove pulley and 2 4 x ½ wheels.

ELECTRIC GRINDERS

3—Dumore Electric Grinders., 110 V., Type 2A.C., 1/6 H.P.
1—Dumore Universal Grinder, 110 V., No. 1, ⅛ H.P.
1—Type J., 110 V., D.C., U.S. ½ H.P., Parallel Grinder (used).
1—Type J.H.A., 110 V., A.C., U.S. ½ H.P., Parallel Grinder (used).
6—Dumore Electric Grinders, 110 V., Type 2 A.C., 1/6 H.P.

DRILL PRESSES

1—5/16" McKenzie Column Drill.
1—5/16" McKenzie Sensitive Bench Drill.
2—14 Perfect Column Drills, No. 1 M.T.
2—15 Perfect Bench Drills, No. 1 M.T.
1—16 Perfect Column Drill, No. 1 M.T.
2—17 Perfect Bench Drills, No. 1 M.T.
2—18 Perfect Bench Drills, No. 1 M.T.
1—Model L-1, Cap ⅜", H.S. Detroit Sensitive Ball Bearing Drill.
3—20" McDougall Back Geared Drills, No. 3 M.T.
1—16 Hoefer Column No. 2 M.T.
1—Model L., Cap ⅜", H.S. Detroit Sensitive Ball Bearing.
1—21" Hoefer Vertical Drill, No. 2 M.T.
1—No. 65 6-ft. Moline Multiple Spindle Drill.

ELECTRIC DRILLS

2—Type A.U., Cap. 3-16", 110 V., "Universal" U. S. Elec. Drills.
3—Type B.U., Cap ¼", 110 V., "Universal" U. S. Elec. Drills.
2—Type C.U., Cap ⅜", 110 V., "Universal" U. S. Elec. Drills.
2—Type D.U., Cap. ½", 110 V., "Universal" U. S. Elec. Drills.
1—Type E.U., Cap ⅞", 110 V., "Universal" U. S. Elec. Drills.
2—Type 2.U., Cap. ¼", 110 V., "Universal" Standard Elec. Drills.
2—Type 6.U., Cap ¾", 110 V., "Uiversal" Standard Elec. Drills.
1—Type 8.U., Cap 1", 110 V., "Universal" Standard Elec. Drills.
1—Type C.B., Cap ⅜", 110 V., D.C. (used) U. S. Drill.
1—Type C.B., Cap ⅜", 220 V., D.C. (used) U. S. Drill.
4—Type 6-U., ¾", 110 V., Universal Standard Drills.
3—Type 10-U., 1¼", 110 V., Universal Standard Drills.

DRILLS

3—No. 3 McDougall 20" Back Geared Drills.
1—Natco 20 Spindle No. 37 Drill (used).
1—Henry and Wright Class "K" 12" Overhand Drill.
2—Perfect No. 16 Drills.
1—Avey No. ½ H.S. Bench Drill.
1—Reed 4 Spindle Drill 7" Overhang Slide Table, 32" x 12" (used).
1—Prentice 3 Spindle 6½ Overhand Slide Table, 26" x 12" (used).

POWER HACK SAWS

1—6" x 6" West Haven Acme Power Hack Saw.
6—No. 0 6" x 6" Perfect Power Hack Saws.
2—No. 3 6" x 6" Perfect Power Hack Saws.
1—No. 2 5" x 5" Perfect Power Hack Saw.
2—No. 0 6" x 6" Perfect Power Hack Saws.
2—No. 3 6" x 6" Perfect Power Hack Saws.

HACK SAWS

1—Acme 7 x 7" High Speed Hack Saw.
1—Peerless 6" x 8" High Speed Hack Saw.
1—Perfect No. 3 6" x 6" High Speed Hack Saw.
6—Racine No. 1 6" x 6" High Speed Hack Saws.

MILLING MACHINES

1—No. 0 Brown and Sharpe Plain Milling Machine with pump.
4—Kempsmith No. 3 Universal Millers.
1—13½" Kempsmith Universal Divinding Head.
1—10½" Kempsmith Universal Dividing Head.
1—Garvin No. 21 Plain Miller (used).
2—Burke No. 1 Bench Millers.

BORING MILLS

1—Fosdick No. 0 Horizontal Boring, Drilling and Milling Machines.

PIPE CUTTING MACHINES

1—No. 1 McDougall Pipe Machine, cuts pipe ¼" to 2" inclusive, with quick opening, adjustable dies, and standard equipment.
1—No. 2 McDougall ditto, Cap. 1" to 4".
1—No. 3 McDougall ditto, Cap. 1½" to 6".

CUTTING OFF AND FACING MACHINE

1—6" Facer Victoria.
1—Hall 6" Cutting Off Machine.
1—Hall 4.5" ditto (used).

CUTTING OFF MACHINE

1—No. 6 Nutter and Barnes Automatic Metal Cutting-off Machine, capacity round stock 5¾"; square stock 5¼"; I Beams 8"; 1" Rods, 13 pieces; 1½" Rods, 13 pieces; with regular equipment.

PRESSES

1—Brown Boggs No. 200 Plain Press, inclinable.
1—Brown Boggs No. 2½ O.A. Press (used).
1—Brown Boggs No. 150 Plain Press, inclinable.
1—Perrin 120-ton Hydraulic Press, 12" (used).
1—Ditto 75-ton, 10" (used).

FURNACES

1—Mecol 45" Nosing Furnace.
1—Hoskins G, 32" Furnace.

WOODWORKING MACHINERY

1—78 Cowan Foot Lathe Mitre Machine.
1—212 Jackson Cochrane Chair Seat Fitter.
1—Jackson Cochrane Two Drum Sander.
1—38" Crescent Band Saw, with guards.
1—No. 8 Morgan Nailing Machine (used).
1—No. 3 American Mortiser, Belt Driven.

SCREW MACHINES

1—No. 140 "Wells" Hand Screw Machine, turns 5" length, swing over ways 11", diameter of hole in spindle 1⅛", maximum capacity of push-out collet ⅞", diameter of Turret holes 1", with regular equipment.

ELECTRIC SCREW DRIVER

1—Type V.S.U., 110 V., Electric Screw Driver (used).

ELECTRIC TOOLS

5—Dumore Grinders, style "A" attach., 110 volt.
1—Do., Do., "B" attachment.
1—U.S. Elec. Tool Co.'s Type G.U. 1¼" Drill.
1—U.S. Elec. Tool Co.'s Type E.U. ⅞" Drill.
1—U.S. Elec. Tool Co.'s Type D.U. ⅛" Drill.
1—U.S. Elec. Tool Co.'s C.U. ⅛" Drill.
1—U.S. Elec. Tool Co.'s Type B.U. ¼" Drill.
1—Black & Decker Type "C" 110 volt, ⅜" Drill
1—Black & Decker Type "D", 110 volt, ½" Drill.
1—Dumore Type 1, A.D. 3/16" Drill.

BOLT CUTTERS.

1—Landis 1½" Single Head Bolt Cutter Style "F" with holders, pump, countershaft and wrench equipment.
1—2" Landis Bolt Cutter Head.

PUNCHES AND SHEARS.

8—No. 150 Brown and Boggs Inclinable Open Back Presses, Cap 1½" hole x 16 gauge steel with fly wheel.

BALERS.

1—Camoo 18" x 18" x 14" Paper Baler.
1— " 30" x 15" x 28" Paper Baler.

MISCELLANEOUS.

1—Rickert Shafer Tapper, ¼" Vertical Type.
1—Dinge No. X Separator, 110 volt, D.C., Elec. Magnet (used).
1—Berkshire Manufg. Co.'s Moulding Machine (used).
1—Horizontal Tapping Machine, small (used).
1—St. Louis Tapping Chuck.
2—Four Sides Tool Posts for 20" Cincinnati Lathe.
4—Compound Rests for 20" Cincinnati Lathe.
1—High Speed No. 4A Hamer 4.5 Shells.

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Building 5-inch Gun Mounts at Brantford

In Our July 24th Issue We Published the First Portion of This Article—Further Operations Are Now Described, Until the Mount is Finally Completed and Inspected.

By J. H. MOORE, Associate Editor Canadian Machinery

Before going into the details of the second portion of this article, let us summarize just what parts we have touched on. As will be remembered, we touched on the operations on the stand, training ring, carriage, and slide, finishing up at this portion. So now, since we have reviewed up to this point, let us go still further into the remaining portions of this mount. To allow readers to familiarize themselves with the technical names of some of the important parts, let us refer to Fig. 1, and note what the various letters shown on this photo illustrate.

A is a large steel casting technically termed "The Yoke." B is termed the telescope holder. C the elevating and depression hand-wheels. D is what is termed the sight bar head, while E is where the support bolt of recoil cylinder comes through. F and G are the support bolt holes for the recoil spring cylinder bolts. H illustrates one of the two recoil spring cylinders. I represents the elevating bracket casting. We will now leave this photo for the present, but will refer to it later in the article.

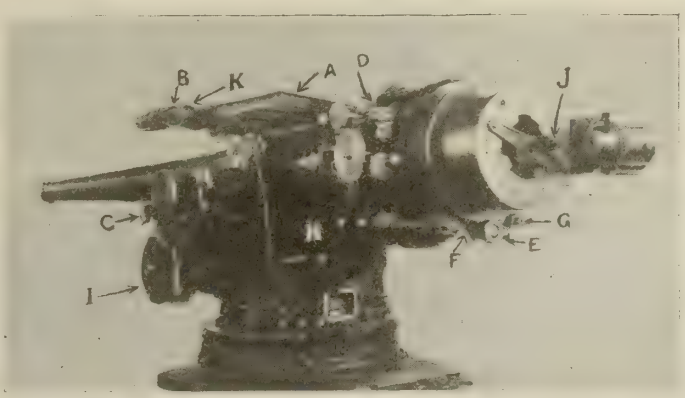


FIG. 1.—GENERAL VIEW OF THE GUN AND MOUNT.

The Yoke

The yoke is a very long and slender steel casting. The natural result is a casting very springy, and usually warped, so that the first operation on these parts is that of a straightening process.

To do this they are placed on a large frame of the shape that the yoke should be, when the parts which are warped are played on by an oil burner, when after being heated at these portions they are pulled down to the form by means of clamps, and allowed to cool. The work is then taken to the layout table, and marked off correctly. They are now roughed off on the shaper and planer, then drilled, but these operations are of the usual style. They are later taken to a converted planer, which has been turned into a vertical milling machine, and there various milling operations are performed. Another milling operation worthy of note is shown at Fig. 2. In this operation, the portion where the azimuth rack (as it is technically termed) is is milled, and this milled groove is on a very large radius, so that readers can readily understand what the pin A on the jig shown at Fig. 2 is for, namely, that the work pivots around this centre point. We have so far, in this view, not called the reader's attention to anything except the jig and the operation, but now let us speak of the machine itself. On first sight this looks like a vertical miller, but is it? On a second glance we see it is nothing more than a converted Le Blond Lathe, and a very clever conversion at that. Again proving that for special purposes, there is always a way out, providing, of course, you try hard enough to find it.

There are many other operations of special note that we cannot touch for lack of space, but will just mention a few before passing on to another part of the mount. The worm which fastens in the portion milled, (just spoken of in Fig. 2) is cut on a special machine for the purpose. The rocker is also scraped in, and friction strip fitted, when the yoke and its various detail parts are assembled.

The sight bar head will next be discussed, and in order to give the readers some idea of its general appearance, the photo at Fig. 3 was taken.

As can be readily understood by readers, this is a most important portion of the mount, and entails considerable accurate work before its completion. It will be noticed that this head is all finely graduated, and when it is mentioned that the scale on the dial A must tally up with the scale at slide B, or graduation strip as it is sometimes called, it will be realized just what this means, namely, that every operation throughout must be most carefully checked and followed up.

It will be noticed that there is a rack cut at C on this piece. This is accomplished on the miller by a special fixture for the purpose, which travels the work at the correct radius. A special indexing attachment is also part of this fixture. Another very interesting milling fixture on this portion is shown at Fig. 4. This fixture, by means of the handle A, travels in the correct radius to allow the portion B to be machined. The method of holding the work is self-apparent. This operation is done on a Le Blond Miller with splendid success.

At Fig. 5 we show still another milling fixture on this piece, completed on a Cincinnati Miller. This jig is constructed on the radius principle, all the work pivoting from the pin A, and swinging at the correct radius for the work. Numerous operations are performed on this principle, until the sight bar heads' completion. It might be interesting to mention that this portion is a drop forging of nickel steel, and originally weighs 150 pounds in its rough state. Before completion, however, it keeps reducing its weight operation by operation, until when completed it only weighs 40 lbs., a difference of 110 pounds, which, to say the least, is some difference. All these operations are from the solid, as this

piece must be without flaw of any kind. The groove seen on Fig. 5 at B is approximately 3½ in. wide, 1½ in. deep, milled out of the solid.

Recoil Cylinder

First, this cylinder is made from a steel forging, which comes to the factory in a rough-turned state. The various finish-turning and boring operations are then completed. A bronze bush is now pressed in place, after which a special shaped keyway is machined. This is not in a true measure a keyway, but rather a passageway for the glycerine, which goes inside of this cylinder for recoil purposes. Let us explain the action of this glycerine before going further.

When the gun is fired, naturally there is a sharp recoil. This would ruin the gun in short order if no provision were made to take up this jar, therefore, the reason for both the recoil cylinder, and the recoil spring cylinders, but let us, for the present stick to the recoil cylinder alone.

When the recoil cylinder is finally completed it is filled with a certain amount of glycerine. This acts in the following manner. Immediately at the start of the recoil, the piston inside this chamber has a tendency to rush back with great force. It does this in fact, for a portion of its length of travel, which brings up to the discussion of the possageway already spoken of. This groove is about 1½ in. wide at one end, but tapers down to ¼ in. wide at the other, the object being as follows: As the piston comes back, its speed is narrowing down, therefore, not allowing as much glycerine to go through as at the start, or the wide end of the groove. Naturally the more resistance offered to the piston the slower its travel, and the greater the cushion effect. The narrower the groove the less glycerine going through, and therefore, the greater the cushioning effect.

Before going on to the recoil spring cylinders and their functions, let us study Fig. 6, and see how these recoil cylinders are tested. They are placed on a wooden stand as shown, after all machining operations have been completed, and connected up to an oil pump to the left. It is now tested to a pressure of 3,300 lbs. for leaks. The idea of having glycerine in the tubes on the gun, is in order that they will not freeze up in cold temperatures. Perhaps it would be best to state that it is not pure glycerine that is contained in these cylinders, but a mixture of glycerine and water. The pistons for these cylinders are also forgings, and made from a special alloy steel.

Inspection

Before going on to the two remaining photographs let us see what methods of inspection are adopted.

From the very outset the system of inspection is most rigid, for one flaw might mean the loss of a ship. This may seem a rather wild statement, but when one considers that perhaps while a gun was training on its target it refused to act, that target, which, ten chances to one, is another ship, has an equal chance to fire on the ship with the jammed gun. For this reason the authorities are most strict in their tests.

To go over all these tests would occupy an article in itself, enough to say that special test stands and tables form a part of the inspection department, together with a regular host of gauges of all descriptions, pin, snap, and the other numerous varieties, feelers of very fine quality being frequently used. Even zig-zag cigarette paper is used in conjunction with the square, and this paper must absolutely refuse to draw at any point on the square.

Should any large size discussion arise as to the accuracy of any gauge throughout the plant, they have a Pratt & Whitney Precision measuring machine, all enclosed in its own particular compartment, which settles beyond a doubt the question of accuracy.

Scraping

The amount of scraping to be done on this product is surprising, the biggest part of this scraping being on the sight head and its component parts. This firm has trained men who knew nothing whatever of scraping into expert scrapers, turning out work that is a treat to look at, and accurate in all particulars.

Final Inspection of Gun

The gun mount is finally assembled on a special assembling stand, and the barrel, breech, telescopes and all attachments placed on the same. Fig. 1 illustrates this view clearly. The chief naval inspector now tests the gun for accuracy in the following manner. He first lines up the telescope H with the centre of the barrel. He then lines up this telescope with the cross marks, or targets shown in Fig. 6. After the gun is tested on these marks the barrel is elevated to run up the lines A and B, see Fig. 6. At top of these lines is a parallel line joining these two vertical lines, and the gun must now to be swung around on its base. with the sight on

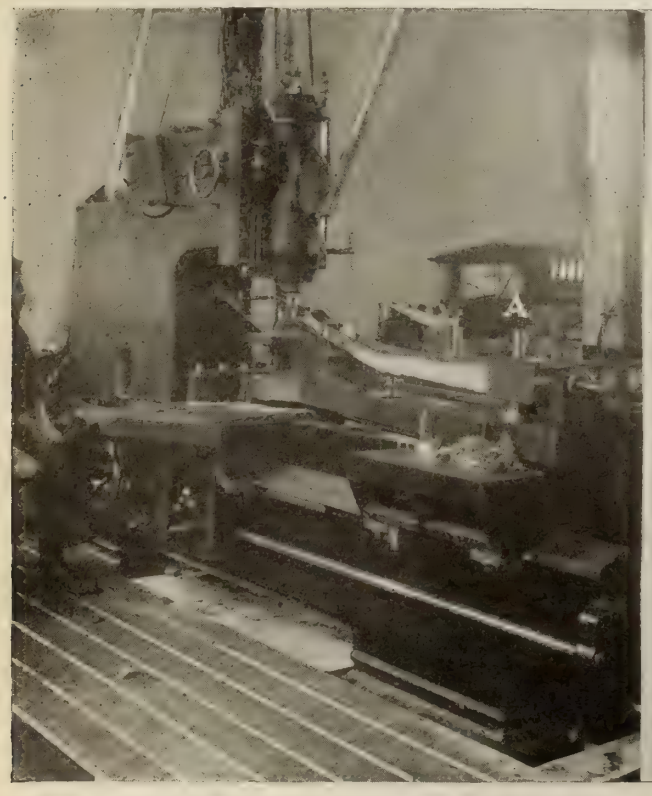


FIG. 2.—MILLING THE YOKE ON CONVERTED LATHE.

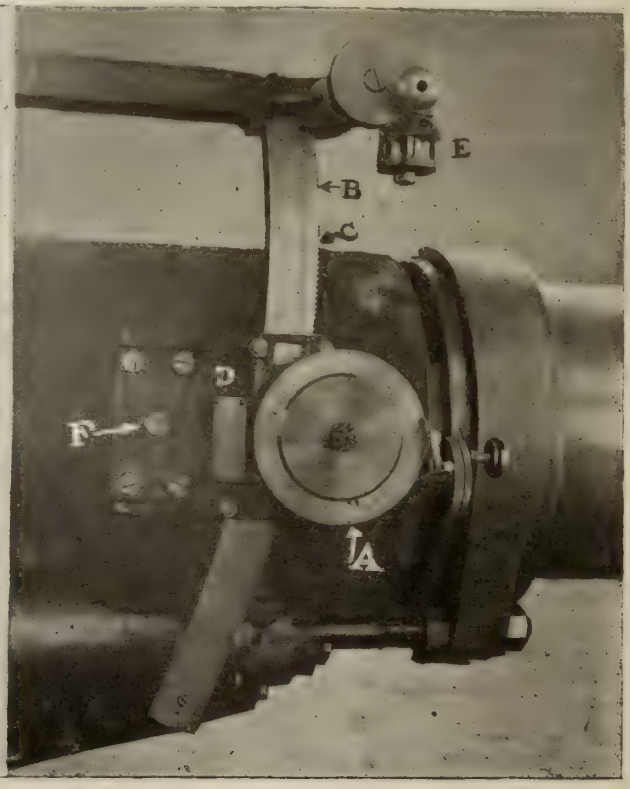


FIG. 3.—A CLOSE-UP VIEW OF THE SIGHT BAR HEAD.

the barrel never deviating from the mark, even by a hair's-breadth. Should the alignment not be perfect, the gun is disassembled if necessary, and the change made to ensure absolute accuracy.

As the readers will note, accuracy and interchangeability of all parts must be had, and is essential on all component parts entering the completed mount, as any damage which might be attributed to gun-fire from the enemy can be instantly repaired by removing the damaged parts and replacing same with similar spares in stock. In order to attain the foregoing, two important factors must be contributed:?

(1.) The manufacturers at Dominion Steel Products Corporation have contributed their ingenuity through the use of excellent standard fixtures, which parts so assembled in same and completed, must be interchangeable, through the system of coast inspection after each operation.

(2.) The Government or final inspection insures that all the drawing dimensions are kept within the prescribed tolerances allowed, and this inspection is attained through a United States Government office.

The Naval Inspector at Munhall has charge of the inspection throughout the several middle Atlantic States and that part of Canada extending from Detroit to Montreal, Brantford, Toronto and Hamilton, coming under the cognizance of the Munhall Office, and commanded by Commander R. R. Adams, U. S. Navy.

The Munhall district is divided into four sub-divisions, of which the northeastern sub-division is located with headquarters at Erie, Penn., under Lt.-Commander C. H. Fischer, U.S.N. Rt., with a corps of assistants and sub-offices scattered throughout this district. The officer in charge at the Brantford plant is Ensign F. J. Chatel, and the inspectors are largely enlisted personnel trained at Great Lakes Naval Station, and civilian sub-inspectors.

Before leaving this article, the writer believes that some particular mention should be made of this inspection staff, so, to give readers an idea of the staff and its leader, we illustrate at Fig. 7 the inspection department as far as the sailors are concerned. The gentleman marked with a cross is the ensign himself, and a brief sketch of his experience would not be amiss.

His name, of course, comes first. Ensign F. J. Chatel, U.S.N.R.F., comes originally from Detroit, Mich. He is a graduate of Michigan University of Mechanical Engineering. Started as an ordinary sailor, but by energetic work obtained his commission at sea. Has been 1½ years at sea. He received his commission on April 7th, 1917 on board the U.S.S. Huntington. On this ship he had charge of a division of engineers. Such an experience, as readers will agree, well fits a man to handle important work such as he is now concerned with.

To put it briefly, we can say without any attempt at flattery, that first, the Dominion Steel Products Co. are turning out a great product in a great way, and Ensign Chatel and his staff are helping in a like manner to ensure the accuracy and usefulness of this product.

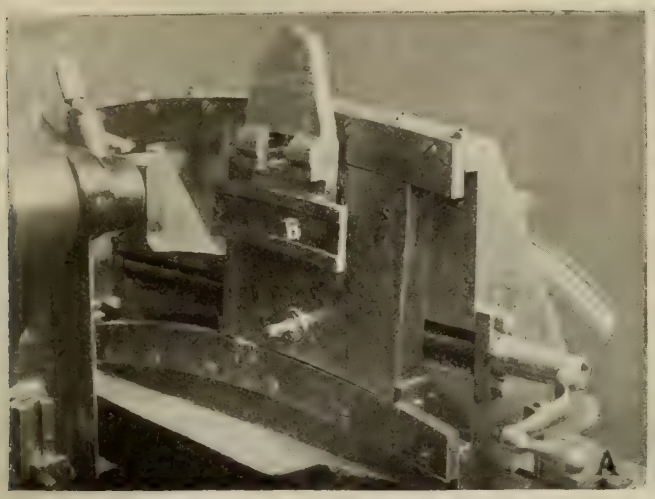


FIG. 4.—JIG FOR MILLING SIGHT BAR HEAD.

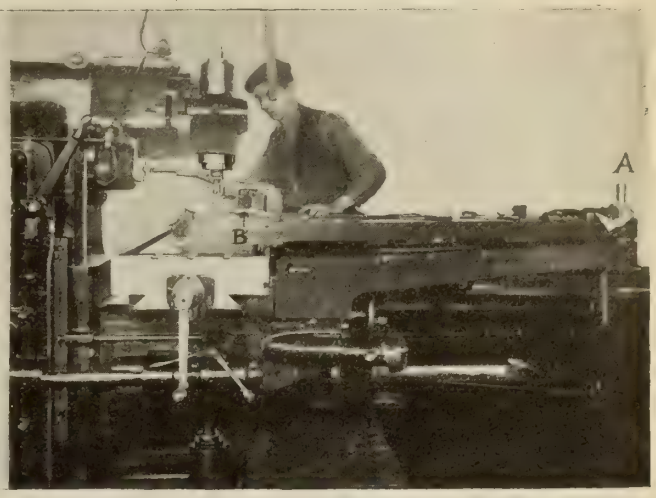


FIG. 5.—ANOTHER MILLING OPERATION OF SIGHT BAR HEAD.

It is stated that the Japanese are exploiting on a large scale the ores discovered in Korea, and are making extensions in their industries to handle this new source of supply. Ore concessions in China will further increase the Japanese raw material. A British correspondent predicts not only that Japan will soon be independent of outside sources of supply, but that in another ten years she will be exporting cheap steel to the Pacific markets, and even breaking into more distant markets like Great Britain.

FIG. 6.—A VIEW SHOWING THE SIGHTING END OF THE SHOP.

FIG. 7.—A GROUP OF U. S. INSPECTORS, TOGETHER WITH THE ENSIGN, MARKED WITH A CROSS.

Some Factory Sites Not Cheap, Even as a Gift

There Are Many Factors, All of Which Should Be Considered, if the "Free Site" is Not Going to Turn Into a White Elephant on Your Hands

ON the intelligent selection of a suitable habitat, much of the future of a new industry may depend. The factors governing this selection are so many and so diverse in their aspects, that it is quite easy to go wrong, even when the choice would appear to be quite obvious.

The erecting of a new manufacturing plant may be for the purpose of carrying on a new industry, or to provide needed space for a going concern. Again it may be to provide a branch factory for a firm whose main factory is in another country. Many examples of this latter case are found in the American firms with branches in Canadian territory.

While the choice of a suitable location is important to any industry, it is most so in the case of the business just entering the industrial world. This has all its connections yet to make, both on the buying and selling end, whereas the factory which is a branch of an already well established firm has a great deal of this question already solved for it.

Some of the Factors

What are the most important requirements for a factory plant? If these are known, then in the search for a location, some definite standard can be aimed at, and a process of elimination gone through.

The first of these requirements is geographic position in relation to supply of raw material, and the market for the finished product.

Transportation facilities would naturally be the next feature to be considered.

Labor supply, health statistics, educational facilities, general aspect of the immediate locality and its environments, and lastly, the cost of land and taxation assessments. These are put last because they are really the most easily surmounted difficulties. This is true, although sometimes they are considered first, and allowed to loom in importance over more vital points. There are hundreds of small towns vieing with each other to secure new industries and these towns are willing to offer very tempting inducements as far as land costs go. These offers are often so tempting that the seeker after new fields is inclined to look at the disadvantages through the wrong end of the telescope. Some of these offers approach the grotesque in their liberality. For instance a certain town offered recently to give an industry ten acres of land on a railway siding, build a one-storey fireproof factory containing 30,000 square feet on this land, and turn it over to the company free of water rates and taxes for ten years. In addition they are offered power at the rate of ½ cent per k.w.h.

Now an offer like this is really brilliant enough to dazzle anyone. On the other hand should it not make the thoughtful investigator pause and see why the municipality should offer to give away its ratepayers' property so freely? Sometimes it does, sometimes not.

While cheap land and exemption from taxation for a period of years is a consideration, it can be easily outweighed. For instance to take an extreme case, free land and taxes would not be much help to a lumber mill, if it was situated on a prairie. In a case like that the mill would be in a bad position, both in respect to its raw material and its finished product.

It is more important to be close to the source of raw material than to the market for the finished product. This fact really determines the case for certain kinds of industries. Lumber and pulp mills will always be found in situations such that the wood can be delivered from the limits by water. Steel mills will be in a position ensuring easy delivery from the ore deposits, preferably by water, ensuring cheap freight rates.

The advantage of close proximity to raw material sources rather than selling fields are obvious. Sales are made usually over a widely diffused area, whereas raw material is concentrated. In the case of transportation troubles arising, as often happens in this country in Winter, accessibility to raw materials is a boon.

Inability to ship finished products will lead to congestion in stock and shipping rooms, which is inconvenient, but if the raw material supply is cut off nothing else but shut-down can be looked for. Distance from supply means carrying of large stocks, which is again unfavorable, as it prevents advantage being taken of favorable changes in the market.

We have thus determined on some general qualifications, that the site selected must be easily accessible to the field of supply.

How About Transportation?

Transportation facilities are next to be considered. The municipality angling for the factory is almost sure to be able to offer a siding or spur into the factory grounds. This is very desirable but needs careful examination. If the town is on a branch line, with a poor freight service, the fact of having a siding is not such a help. It would be better to have a location in a town on a main line, even if some trucking has to be done between factory and freight shed. If freight service in the locality under consideration is good, and a siding can be secured, connecting with a main line of railway, then local conditions affecting transportation must be considered.

The climate of Canada in Winter is such that it must be considered very carefully in making selections. It is not always so considered, and neglect of this precaution has involved many manufacturers in much expense.

The factory may be reasonably close to the railroad, and be connected thereto by a siding, and that siding and its approaches may be a source of trouble for six months of the year. There are districts in Canada where snow is to be looked for in quantities from November until April. Local topography may be favorable to drifts, or otherwise, and for the former, one can readily see where the siding will be. Instances where the whole yard force of a factory are kept busy two thirds of their time during the Winter in keeping the tracks clear of snow are not hard to find. One case occurs to the writer where two factories were near neighbors. One had a siding and extensive trackage in the yard. The other had no siding. During the Winter the factory without the siding sent its product out on sleighs to the freight shed without a hitch. The other factory had its yard gang employed day after day opening up the track to get the freight cars in to the shipping room.

This point may not occur to one looking the ground over in Summer, but it is a real live question in many districts of Eastern Canada.

Power for the Plant

After the question of transportation comes that of power for the factory, and this is another question which requires careful consideration. If the product is such that a large amount of steam is required for process work all the year round, and heating in the winter, then it is likely that the installation of a steam plant would be advisable. If cheap electric power is available locally then careful consideration of the nature of the load will have to be made before the type of power is decided on. Here again the nature of the local climatic conditions should be carefully considered, and statistics over a number of years should be consulted.

Power may be cheap and plentiful, but the cost of

heating may be such as to overshadow the cost of power altogether. In such a case it is cheaper and better to generate the power on the permises, having the use of the exhaust steam for heating all Winter. The cheap power may be available in the Summer months, affording an opportunity for a thorough overhaul of the steam generating plant.

If Winter conditions are consistently bad, then the other advantages offered must be very great to outweigh this factor. If conditions in Winter are such that only a medium amount of heating is necessary, then the possibility of cheap electric power will be a great inducement. If a steam plant is to be installed, the question of obtaining the necessary coal must be studied.

Sizing Up the Labor Market

The amount and the type of labor in the locality is of course an important item. The general standard of living and education in the neighborhood will give an idea of the possibilities of getting intelligent help. Are the characteristics of the town such that a good class of labor can be attracted to it? Are the municipal authorities up to date, and capable of improving the standing of the place? Is the water supply good and is the hygienic standard of the town what it should be?

A town that already has some manufacturing plants in it is liable to furnish a better class of labor than one in which an industrial plant is a new feature.

The population of the latter is likely to be chiefly engaged in rural or semi-rural pursuits. This type takes but slowly to the work in the factory, and furthermore, there is but little reserve to draw on. A centre that has been the home of manufacturing plants for a good period is likely to have a floating population to draw on. Nearness to a large centre of population is undoubtedly a great help in the labor question, as far as ensuring a supply goes. The wage scale, of course, may be affected by the prevalent scale in the larger centre, but this is balanced by the better class of labor available. The cheap labor of the small rural town is often very dear. The men have to be trained and taught, and those who have the ability to learn quickly usually drift away as soon as they become useful. They go to the larger centres and exploit the skill they have obtained at the expense of the manufacturer in the small town. The prospect of future growth is also to be considered. Cases in which large plants have been erected in small towns with the idea that the presence of a large factory would stimulate growth, thus insuring a good labor supply, are fairly frequent. Sometimes it has turned out that way and again it has not. There is a case where after ten years the population of the town has decreased and the labor question is serious.

The trouble with a semi-rural population is that a large number subsist partially on the product of their own land. Their requirements are few and their ambition lacking in proportion. This class of labor have but little inducement to steady work. They are inclined to put in part time at the factory to help their income and refrain from working about an equal part. They are inclined to resent the introduction of strangers and make things uncomfortable for them. This attitude makes it difficult for the management to keep its forces up to strength.

Local conditions have a great influence on the filling of the higher positions in the factory. If housing accommodation is poor, sanitary arrangements not of the best, and educational facilities lacking, it is difficult to get the right kind of man to settle in the town. Even an enhanced salary will not attract, as the absence of the comforts to be obtained in better managed centres is weighed against the extra money. Out of date sanitary arrangements react on the general health of the workers, and causes a great deal of lost time through illness. Further it predisposes the population to epidemics, which may result in anywhere from 25 to 50 per cent. of the help being laid off for weeks at a time.

It can readily be seen that cheap land and exemption from taxation cannot begin to overbalance such drawbacks. Generally speaking a town that possesses real tangible advantages does not need to go to extremes in offering inducements to new industries, but there is no question that where there is competition between nearby localities for manufacturing plants, the manufacturer stands to get real concessions.

Opinions of Manufacturers

In view of the foregoing these following opinions from men in a position to speak with authority should be of interest:

"What is the best location for a factory? If you were beginning all over with the knowledge you now have, where would you locate?" Those were the questions which CANADIAN MACHINERY put to a half dozen leading manufacturers of Western Ontario, and to the Industrial Commission of the leading purely industrial cities in Canada.

It is the business of Mr. C. W. Kirkpatrick, Industrial Commissioner, of Hamilton, to be posted in such subjects; tnough, naturally, he is inclined to think that the questions can be answered with one word, "Hamilton!" Mr. Kirkpatrick would put labor supply first in the list of requirements, and, as a matter of fact, everyone interviewed held that view. "Some places seem to be better than others in this respect" said he. "'Hamilton is now a centre for the steel and iron industry, which requires male help exclusively. This leaves a surplus of female labor and provides for textile industries.

"If it is a large industry I should place a good supply of cheap power as next in importance. This has been a big factor in building up Hamilton. You know we had a hydro-electric of our own before Sir Adam Beck entered the field, and even to-day its rates are more favorable.

"Third place I should give to shipping facilities. We are served by lake and rail. Possibly the big manufacturer would rather be located close to his raw material rather than to his markets, though he is fortunate indeed if he can secure a location giving him both.

"A fourth advantage is to locate where there are other industries established, in a well known industrial centre. Finally need I say that the man seeking a factory location will realize that an industrial commissioner is necessary in any live centre. He not only brings in new industries, but acts as a buffer between the industries established and the municipality. There are always things coming up in every industrial community which have to be smoothed down, a work which is easier for our industrial commissioners than an alderman to do."

Col. Harry Cockshutt, of the Cockshutt Plow Co., Brantford, would put labor supply and freight rates as of nearly equal importance in choosing a location. "Western Ontario is the ideal location. Rates are better in the Western peninsula than in any other part of Canada, and the labor supply is exceedingly good."

"Location means nearly everything to a manufacturer, particularly on starting business in a small way," said Mr. John Muir, of Goold, Shapley & Muir, Brantford. "The average manufacturer, when starting business, needs all his capital to make a beginning and keep his business running until it is on its feet. He does not want to lock up a lot of money in building and real estate, which he should have liquid. Take our own case. About sixteen years ago we were almost wiped out by fire and the people of Hamilton tried to get us to go over there and take the old Singer Sewing Machine plant. Brampton also had an idle factory, equipped, and offered it to us free of rent and taxes. In that case the building was the big attraction to us, and we should have moved had not Brantford made attractive offers for us to stay. Freight rates were then better there than here, though at present there is no city in Canada better served by rail than Brantford.

"You can not induce manufacturers to come to a place unless you can show them that there is favorable accommodation. Recently there was a by-law passed here to guarantee the bonds of the Realty Co. This company proposes to build factories to order and offer them to American manufacturers looking for a Canadian location

at a rental to cover interest and sinking fund. The dividend of the Realty Co. is limited to 6 per cent.

"No manufacturer can afford to neglect the Ontario trade. Ontario has been the life of the Ontario manufacturer for years past."

Mr. Pock, of the Westinghouse Co., Hamilton, emphasized the necessity of amusements in a district to make it attractive to labor. Shipping facilities and cheap power were great essentials. In the Westinghouse business the line of raw materials used is varied, and it is hard for them to get near the source of supply. They can get their pig iron in Hamilton, but their copper comes from New England and their wire and cable from Montreal; so that in their case shipping facilities and labor supply are probably the most important considerations.

Mr. Hobson, of the Steel Co. of Canada, would put labor conditions as the prime requisite. Next, he considers nearness to consuming market, and third nearness to raw material. He looks on the location of his company as so favorable in all respects that it is hard to rank the conditions. "We can assemble our ores cheaper in Hamilton than they can in Pittsburgh," he said. "There is a great deal in being close to your market, however. Ordinarily, 75 or 80 per cent. of our products are consumed within a radius of 75 miles of Hamilton. We are in the hub of the manufacturing centre of Canada. When you are close to your consumers you can get the goods to them overnight, and in this we have the advantage over other steel producing centres. It seems to me that the great future of the steel industries in Nova Scotia is in the export trade. We could have made a great deal of money during the war by going deeper into the export business than we did, but we were anxious to look after our Canadian customers."

A toolmaker was confronted with the job of removing a bushing which was fitted very tightly in a blind drilled hole. There was not space enough at the bottom of the hole to get in a hook of sufficient strength to pull out the bushing. After several different methods had failed, the tool maker fitted a steel rod quite accurately into the bushing, filled the hole with heavy oil, inserted the rod and drove it in with a hammer against the oil. The fluid pressure of the oil was transferred to the inner end of the bushing, and forced it out with very little difficulty.

Centrifugal pumps for boiler-feed work, steam turbine driven by direct connection, are now to be had in small sizes. The pump, turbine, and supports are combined in a single unit. The solid shaft is hung in two ball bearings, and only one stuffing box is used. The packing between bearings and steam end is a floating carbon ring, the bearings being kept uniformly lubricated by a constant-level oiling device. An excess-pressure governor and a minimum-pressure safety stop make the operation practically automatic.

LOADING A 15-INCH SHELL INTO THE BREECH OF A HOWITZER AT THE FRONT BY MEANS OF A MORRIS SPUR GEAR CHAIN BLOCK

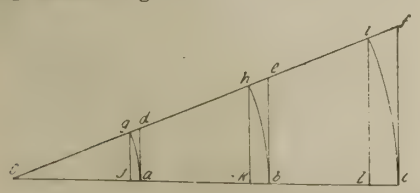
Shop Arithmetic, Geometry and Trigonometry

Ninth of a Series in Practical Mathematics For the Mechanic and Those Learning the Machinist Trade—The Present Article Takes Up the Subject in the Title.

By J. H. RODGERS

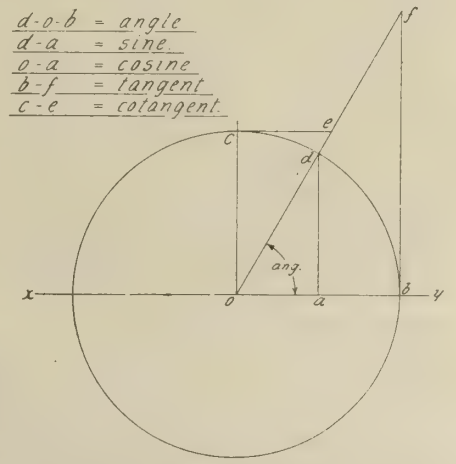
WHILE the mensuration of regular plain figures, as explained in our last lesson, is a comparatively easy process, there are occasions when other means must be adopted before a solution can be obtained. This is particularly true where angles are given in specified dimensions and a practical solution necessitates certain conversions so that the corresponding lengths can be determined from the other known factors. In the construction of jigs and fixtures it is frequently required to check the accuracy of certain calculations, and it is often necessary to figure out the distances between holes, or holes and surfaces, and to perform this work satisfactorily a knowledge of geometry and trigonometry is of vital importance. Do not let the mention of trigonometry discourage any reader who is not familiar with its application, as many shop problems can be made much easier if recourse to this branch of mathematics is resorted to. It is not intended that a complete treatise of this subject will be given here, but sufficient elementary principles will be dealt with to prove to the student the advisability of acquiring some knowledge of trigonometry, so that many shop problems may be tackled with greater confidence, and permit the workman with such learning to undertake many jobs that formerly were considered quite difficult.

Before giving any concrete examples we will endeavor to put the reader at his ease regarding certain fundamental details pertaining to the subject "trig." As the name implies, trigonometry is a treatise on the solution of triangles, and as every triangle has three sides and three angles, the purpose of "trig" is to find the dimensions of some of these angles and sides when those of the others are known. In a previous lesson on proportion it was shown that the corresponding lengths of lines of similar figures vary in direct relation to their position. This principle is the basis of trigonometry and all the constants used in this section of mathematics are determined with a circle of one inch radius. To illustrate the principle of "trig" the following sketch is given.



Suppose that the angle C-O-F is 20 degrees, and the lengths O-A-O-B and O-C to be 1, 2 and 3 inches respectively, it is clearly seen that all other similar lines are in the same relative proportion. In order that this subject should meet the every day requirements of the engineer and mechanic, tables have been prepared, and these can be found in any good technical text book, their degree of accuracy depending on whether the constants are given for degrees, degrees and minutes, or degrees, minutes and seconds, the last-mentioned being calculated for every 1/1296000 part of a quadrant of a circle. In general, the tables are invariably made out for degrees and minutes, the value of the seconds being calculated from the differences between the nearest minutes.

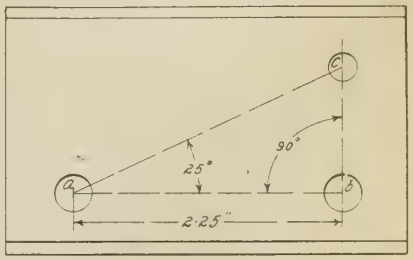
In the study of trigonometry there are several functions that determine the value of the respective angles and the lines by which the angles are formed. The most important functions are the sine—cosine—tangent—and cotangent. These are shown in the accompanying figure:



In the study of "trig." and in all tables of functions, it must be understood that the values given are based on angles calculated in a circle of one inch radius. To give a graphical illustration of the four functions given above, therefore, first draw the horizontal line X-Y, and with O as a centre draw a circle of one inch radius. Now suppose we desire to show the position and lengths of the functions for a 60 degree angle. Through the centre O draw the line O-F at an angle of 60 degrees. From the point D, where this line cuts the circumference of the circle, drop a line D-A perpendicular to X-Y. The line D-A will be the sine of the angle, and will be found by measurement to be .86603 of an inch in length. The length O-A will be the cosine of the angle and will be .5 of an inch in length. From the extremity of the one inch radius, or from the point B, erect a perpendicular and extend it until it cuts the inclined line O-F. The length B-F will be the tangent of the angle and will measure 1.73205 inches. From the opposite end of the 90 degree arc draw the horizontal line C-E parallel to the base line. The length C-E will represent the cotangent of the angle and will equal .57735 of an inch in length. These values are constant for a one inch radius and 60 degree angle. Other functions than the four above-mentioned may be used in trigonometry, but for all practical purposes these four are ample for all shop calculations.

For the students' convenience we have reproduced a table with the constants of the various functions from 1 to 90 degrees, by variation of half degrees, but for greater accuracy we would recommend the use of a table where the values of every minute are given.

Using letters shown in the functional sketch, the following rules may be used for the solution of right triangles, examples here given being for a radius (hypotenuse) of one inch, and 60 degree angle. Suppose we have three holes to locate in a die block and the dimensions given are shown in the sketch; what is the exact centre distance between the other holes?



It will be seen that the centre lines of the holes form a right triangle A-B-C, and from the rules given the solution for the distance B-C would be the tangent for a 25 degree angle, this being .46631.

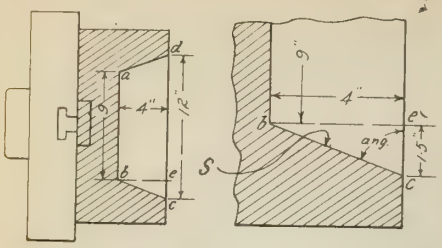
$$\text{Side Opp} = \text{Side Adj.} \times \text{tangent.}$$
$$\text{B-C} = 2.25 \times .46631 = 1.049 \text{ in}$$

For the length A-C the solution would be:

$$\text{Hypot} = \frac{\text{Side adj.}}{\text{Cosine}} = \frac{2.25}{.90631} = 2.4826 \text{ in}$$

In the construction of a forming die as shown in the sketch below, it is desired to know the angle at which to set the compound rest to turn the surface

S, and also the length of the tapered portion.



The tapered length may be found by extracting the square root of the sum of the squares of the two sides, or

$$\sqrt{4^2 + 1.5^2} = \sqrt{16 + 2.25} = \sqrt{18.25} = 4.272 \text{ in}$$

To find the inclination of the compound rest, or the angle B-C-E, we can use the rule:

$$\text{Tan} = \frac{\text{Side Opp.}}{\text{Side Adj}} = \frac{4}{1.5} = 2.6666$$

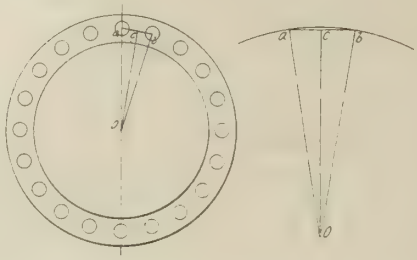
This value lies between the constants given for the tangent of 69 degrees and 26 minutes, and the tangent of 69 degrees and 27 minutes, so for close enough work a setting can be made of either one of these angles.

In a previous lesson on proportion it was shown how the height of a chimney or other elevation could be calculated, but greater accuracy could be obtained by the use of "trig." The sketch below shows the method of procedure:

Suppose by the use of the surveyor's sextant that a sight is obtained to the top of the stack at an angle of 28 degrees, when at a distance of 100 feet from the base of the chimney, the diameters of the top and bottom being as shown. The height is calculated by the rule:

$$\text{Side Opp} = \text{Side Adj} \times \tan = 102 \times .53171 = 54.23'$$

Twenty equally spaced holes are required to be located on a circle 18 inches in diameter; what must be the spread of the trammel points to step off the hole centres?

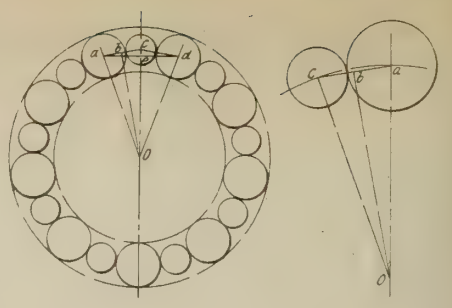


As there are 20 holes on the circle it is seen that the angle formed by two adjoining radii will be $360 \div 20 = 18$ degrees, and the angle C-O-B will be one-half of this, or 9 degrees. The chord A-B is the length required, and this is found by solving the right triangle O-C-B. With the centre angle and the hypotenuse known the short side C-B may be calculated by the rule:

$$\text{Side Opp.} = \text{Hypot} \times \text{sine} =$$
$$9 \times .15643 = 1.40787$$

This, then, is the length of half the chord, so that the trammel distance will be double this, or 2.81574.

Suppose we are making a ball race in which a series of nine ⅜ inch and nine ¼ inch balls are to be used, all the balls to touch those adjoining, what will be the mean diameter of the race?

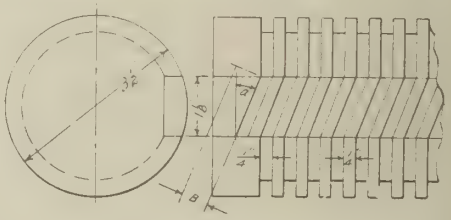


The above sketch illustrates a general layout of the race and the factors necessary for determining the desired diameters. The angle formed by the central radii of any two adjoining balls will be $360 \div 18 = 20$ degrees, and the centre angle of the right triangle O-B-C- will be 10 degrees. The mean radius of the ball race will be equal to the hypotenuse of the right triangle. The rule to apply would be:

$$\text{Hypot} = \frac{\text{Side Opp}}{\text{Sine}} = \frac{3.125}{.17365} = 1.8 \text{ in}$$

Therefore, the mean diameter of the ball race would be $1.8 \times 2 = 3.6$ inches.

In a certain sheet metal-working machine a head is advanced by the action of a special cam shaft that revolves through the centre of the head. Each revolution of the shaft advanced the head ½ inch, and this movement takes place in about 1-10 of a revolution; the head being stationary through the remaining 9-10. A sectional view of the arrangement is shown below.



°	′	Sine	Cosine	Tan	Cotan	°	′
1		.01745	.99985	.01746	57.2900	89	
	30	.02618	.99966	.02619	38.1885		30
2		.03490	.99939	.03492	28.6363	88	
	30	.04362	.99905	.04366	22.9038		30
3		.05234	.99863	.05241	19.0811	87	
	30	.06105	.99813	.06116	16.3499		30
4		.06976	.99756	.06993	14.3007	86	
	30	.07846	.99692	.07870	12.7062		30
5		.08716	.99619	.08749	11.4301	85	
	30	.09585	.99540	.09629	10.3854		30
6		.10453	.99452	.10510	9.51436	84	
	30	.11320	.99357	.11394	8.77689		30
7		.12187	.99255	.12278	8.14435	83	
	30	.13053	.99144	.13165	7.59575		30
8		.13917	.99027	.14054	7.11537	82	
	30	.14781	.98902	.14945	6.69116		30
9		.15643	.98769	.15838	6.31375	81	
	30	.16505	.98629	.16734	5.97576		30
10		.17365	.98481	.17633	5.67128	80	
	30	.18224	.98325	.18534	5.39552		30
11		.19081	.98163	.19438	5.14455	79	
	30	.19937	.97992	.20345	4.91516		30
12		.20791	.97815	.21256	4.70463	78	
	30	.21644	.97630	.22169	4.51071		30
13		.22495	.97437	.23087	4.33148	77	
	30	.23345	.97237	.24008	4.16530		30
14		.24192	.97030	.24933	4.01078	76	
	30	.25038	.96815	.25862	3.86671		30
15		.25882	.96593	.26795	3.73205	75	
	30	.26724	.96363	.27732	3.60588		
°	′	Cosine	Sine	Cotan	Tan	°	′

°	′	Sine	Cosine	Tan	Cotan	°	′
16		.27564	.96126	.28675	3.48741	74	
	30	.28402	.95882	.29621	3.37594		30
17		.29237	.95630	.30573	3.27085	73	
	30	.30071	.95372	.31530	3.17159		30
18		.30902	.95106	.32492	3.07768	72	
	30	.31730	.94832	.33460	2.98868		30
19		.32557	.94552	.34433	2.90421	71	
	30	.33381	.94264	.35412	2.82391		30
20		.34202	.93969	.36397	2.74748	70	
	30	.35021	.93667	.37388	2.67462		30
21		.35837	.93358	.38386	2.60509	69	
	30	.36650	.93042	.39391	2.53865		30
22		.37461	.92718	.40403	2.47509	68	
	30	.38268	.92388	.41421	2.41421		30
23		.39073	.92050	.42447	2.35585	67	
	30	.39875	.91706	.43481	2.29984		30
24		.40674	.91355	.44523	2.24604	66	
	30	.41469	.90996	.45573	2.19430		30
25		.42262	.90631	.46631	2.14451	65	
	30	.43051	.90259	.47698	2.09654		30
26		.43837	.89879	.48773	2.05030	64	
	30	.44620	.89493	.49858	2.00569		30
27		.45399	.89101	.50953	1.96261	63	
	30	.46175	.88701	.52057	1.92098		30
28		.46947	.88295	.53171	1.88073	62	
	30	.47716	.87882	.54296	1.84177		30
29		.48481	.87462	.55431	1.80405	61	
	30	.49242	.87036	.56577	1.76749		30
30		.50000	.86603	.57735	1.73205	60	
	30	.50754	.86163	.58904	1.69766		
°	′	Cosine	Sine	Cotan	Tan	°	′

°	′	Sine	Cosine	Tan	Cotan	°	′
31		.51504	.85717	.60086	1.66428	59	
	30	.52250	.85264	.61280	1.63185		30
32		.52992	.84805	.62487	1.60033	58	
	30	.53730	.84339	.63707	1.56969		30
33		.54464	.83867	.64941	1.53986	57	
	30	.55194	.83389	.66189	1.51084		30
34		.55919	.82904	.67451	1.48256	56	
	30	.56641	.82413	.68728	1.45501		30
35		.57358	.81915	.70021	1.42815	55	
	30	.58070	.81412	.71329	1.40195		30
36		.58779	.80902	.72654	1.37638	54	
	30	.59482	.80386	.73996	1.35142		30
37		.60182	.79864	.75355	1.32704	53	
	30	.60876	.79335	.76733	1.30323		30
38		.61566	.78801	.78129	1.27994	52	
	30	.62251	.78261	.79544	1.25717		30
39		.62932	.77715	.80978	1.23490	51	
	30	.63608	.77162	.82434	1.21310		30
40		.64279	.76604	.83910	1.19175	50	
	30	.64945	.76041	.85408	1.17085		30
41		.65606	.75471	.86929	1.15037	49	
	30	.66262	.74896	.88473	1.13029		30
42		.66913	.74314	.90040	1.11061	48	
	30	.67559	.73728	.91633	1.09131		30
43		.68200	.73135	.93252	1.07237	47	
	30	.68835	.72537	.94896	1.05378		30
44		.69466	.71934	.96569	1.03553	46	
	30	.70091	.71325	.98270	1.01761		30
45		.70711	.70711	1.	1.	45	
	30						
°	′	Cosine	Sine	Cotan	Tan	°	′

The cam strip is fitted into the shaft and has a width of 1⅛ inch. The axial distance between the cam slots must equal that of the parallel grooves in the shaft, but in shaping or milling these the cross movement of the table will necessarily be less. It is required to find the table movement of the machine when cutting the slots in the strip, and likewise the angle at which the work must rest in relation to the run of the strip. The rule to apply and the solution will be:

$$\text{Tan} = \frac{\text{Side Opp}}{\text{Side Adj}} = \frac{.5}{1.125} = .44444$$

This value corresponds to an angle of 23 degrees and 58 minutes, or slightly less than 24 degrees, and this will be the inclination of the table. The cross movement of the table for each operation will be found by the rule:

$$\text{Side Adj} = \text{Hypot} \times \text{cosine} = .5 \times .91378 = .456$$

To secure greater accuracy from the table here shown proceed as follows: Suppose the sine of the angle, after the usual calculations, comes to .57840. It will be seen that this value falls between that shown for 35 degrees and that for 35 degrees 30 minutes. Find the difference between the sines of the two known angles (to the left below) and also the difference between the smaller angle and the required sine (shown to the right).

.58070	.57940
.57358	.57358
.00712	.00482

The number of minutes can now be found by proportion, the value .00712 equalling 30 minutes, the difference in the table values. Thus:

$$.00482 : .00712 = x : 30$$

$$x = \frac{.00482 \times 30}{.00712} = 20.3$$

The angle corresponding to the sine .57840 will then be 35 degrees 20 minutes and 18 seconds.

History of the Principles of Centrifugal Pumps

The Rees-Ro-Turbo Type of Pump is Herein Described, and Various Illustrations Are Given of Interesting Portions of This Class of Pump—A Reading Will Prove Worth While.

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE going into the construction of this type of pump, let us go back quite a few years, and see where first the idea of centrifugal pumps appeared.

Something over two hundred years ago the centrifugal pump was invented by Demesne Papin in Hess, Germany. Little seems to have been done with it in a practical way for a long period. It first appeared in this country in 1818, and was known as the Massachusetts Pump. Gradual improvements were made in its design by Andrews in 1839, Bessemer in 1845, Appolod in 1848, and Gwyne in 1851. The development was slow and until within the last ten years was not considered seriously by many engineers, except for large capacities and for extremely low heads.

No doubt the delayed development was largely due to the fact that to get the best results from a centrifugal pump, impellers should be of small diameter running at high speed, but until the advent of the electric motor and steam turbine there was no means of driving centrifugal pumps at the necessary speed except through belting of gearing with their inseparable difficulties and losses in transmission, which neutralized the advantages aimed at in the pumps. With the introduction of electric motors and steam turbines high efficiencies became possible, and for high lifts the old arrangement of impellers in series was revised and the centrifugal pump became a strong competitor of the plunger pump for conditions which used to be looked upon as only suitable for reciprocating pumps.

Perhaps the defect which has been the most difficult to overcome and which has decided the buyer in many cases against this type of pump, has been the fact that it would work at its best only at the exact head for which it was designed, the reason for this being that the blades of the impeller were shaped so as to pass a certain amount of water with the minimum frictional loss, due to cavitation; but if the head against which the centrifugal pump is working reduces, a greatly increased volume of water passes and the impeller then becomes unsuitable for the increased speed of the water through it and begins to act as a water brake, thus creating an overload on the driving machine.

These conditions were well-known and until the introduction of RoTURBo by Rees of Wolverhampton, England, in 1907, it was attempted to overcome them by designing the impeller with blades bent rearwards so as to reduce the break effect. This necessitated increase in the speed of the impeller to compensate for the slip of the water, and beyond a certain amount of recurvature the capacity of the pump is very greatly reduced and the internal friction of the impeller increased with consequent loss of head at anything but a restricted range of service.

True, turbine pumps are of such comparatively recent development that the general public and, in fact, many engineers have not been sufficiently well informed upon the subject to distinguish between a high grade turbine pump and an ordinary commercial centrifugal pump. The Rees RoTURBo pump represents the most advanced in true turbine pumps.

Venturi Pipe

What is know as the Venturi principle is embodied in a specially shaped contraction in a water pipe having an abrupt nozzle where the water enters the construction, and a gradually expanding taper piece after the water has passed the contraction. The result of this is that the water under pressure in the pipe is forced through the neck at a high speed, and in doing so it loses its pressure, in the inverse ratio to which it gains velocity, so much so that the whole pressure can be annulled in the neck if the contraction is sufficient and an actual vacuum can be created. When the water enters the expanding pipe the speed of the same is slowed down again, due to the increasing diameter, and as the speed is lost the water regains its pressure. The Venturi pipe, therefore, is a hydraulic transformer, with a double transformation, converting from pressure into velocity and the velocity back again into pressure, and without much loss.

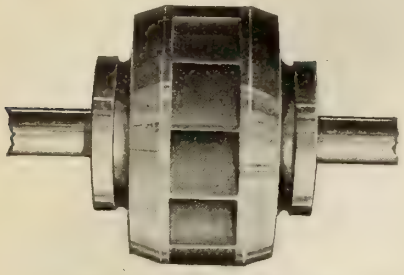
The special shape of the Venturi pipe is because a very abrupt contraction will convert pressure into velocity, but a carefully designed expanding piece of about 10 or 12 degrees expansion is necessary to attain the second conversion, because if the expansion is abrupt the water leaves the sides and the head (instead of being regained) is lost in friction and eddies.

In the ordinary centrifugal pump with an open rim impeller, the object is to pick up the water in the eye of the pump and get up a high peripheral velocity as of the water as it leaves the impeller and convert this velocity into pressure in the expanding channels of the pump casing; a very difficult and inefficient conversion.

These expanding channels are the exact counterpart of the expanding part of a Venturi transformer, but the contracting part of the Venturi transformer was not previously used in centrifugal pumps until what is known as the Rees RoTURBo Pressure Drum replaced the ordinary impeller. The pressure drum is a water chamber of large capacity, in which, by centrifugal force, a pressure is accumulated; the water being flung against the

rim by the revolution of the drum and generating a hydraulic pressure inside of the drum. The water is allowed to escape through abruptly contracted openings in the rim, precisely in the same manner as the contracting part of the Venturi pipe.

These openings, or nozzles, are pointed backward, and as the water escapes from them the jets of water have a turbine effect and give self regulation or a



SINGLE-STAGE IMPELLER.

reduction of power when the head is reduced and a larger volume than the normal passes through the pump. The contraction of the openings is such that only 25% of the initial pressure is converted into velocity. That is to say, the water going through the nozzles at normal duty has a pressure of 75 per cent. and a velocity equivalent to 25 per cent. only. This velocity is picked up again in the expanding channels of the pump casing, so as to make the total pressure of the water being delivered from the pump equal to the 100% originally intended, but by this arrangement only 25% of the head is picked up in the expanding part, instead of the 100% as in the ordinary pump. As the expanding part of the Venturi transformer is the most difficult to design, and the efficiency of the same depends entirely upon the accurateness with which this part is designed, it will readily be seen why a pump of this type leads in the matter of efficiency.

General Principles

The design of the pump is exceedingly simple, comprising a single or a series of pressure drums (the number depending on the nature of its work), rotating inside a cast-iron casing at a moderately high speed. These revolving pressure drums are mounted on a central shaft supported in bearings. There are no moving parts in contact, except at the bearings, and the whole of the internal arrangements are such that the pump is in hydraulic balance and free from any lateral end pressure on the shaft. The main bearings are external and oil ring lubricated, and packing arrangements are exceedingly simple.

When running the water gravitates or is drawn into the eye of a revolving pressure drum where its speed is slow relative thereto, the water being carried round by the revolving partitions. A pressure is created in the revolving drum by centrifugal action of rotation, and the capacity of the chamber being large the water slowly moves towards the periphery, where there are a number of short nozzles curved in a direction opposite to the direction of rotation. These nozzles convert a portion of the pressure into velocity, and the water passing through them behaves as in a turbine, assisting the rotation of the revolving drum, thereby giving a self-regulating effect. The escaped water still having velocity in the direction of rotation, is passed between stationary diffusion channels which convert the remaining velocity into pressure. A considerable space is left between the revolving nozzles and the stationary channels, greatly minimizing the effect of any wear and tear.

The Rees RoTURBo Pump is a fully developed and well tried piece of apparatus, thousands having been installed in the last few years in all parts of the world. Experience has shown that in many cases where RoTURBo Pumps have been running uninterruptedly for several years with unusually dirty and gritty water, there has been no scouring or wearing action visible when they were opened up for inspection; hence a permanent efficiency is maintained.

Impeller

The special feature of the pump, which (instead of being built as a flat disc runner with the main object of securing velocity of water in the expanding channels of the fixed casing), is designed in the form of a barrel or pressure chamber, the object aimed at being to secure a constant pressure inside the revolving drum or impeller, equivalent to the height of the lift. The impeller having this large capacity, the water inside as it approaches the rim becomes practically stationary relatively to the impeller, thus eliminating frictional losses and generating a pressure by centrifugal force.

Another interesting feature to note is that the highest efficiency point of the Rees RoTURBo Pump is when the speed of the water issuing from the impeller in a rearward direction is 50% of the peripheral speed of the impeller and this for the same reason that the Pelton wheel gives the highest efficiency when the speed of the buckets is half the speed of the water jet. In fact, the Rees RoTURBo Pump may be looked upon broadly as a reversed Pelton wheel in which the buckets are stationary and a series of nozzles on the rim of the impeller revolve, whilst the ordinary turbine pump with the narrow disc impeller is, of course the reversed vortex turbine.

The Effect of Self-Regulation

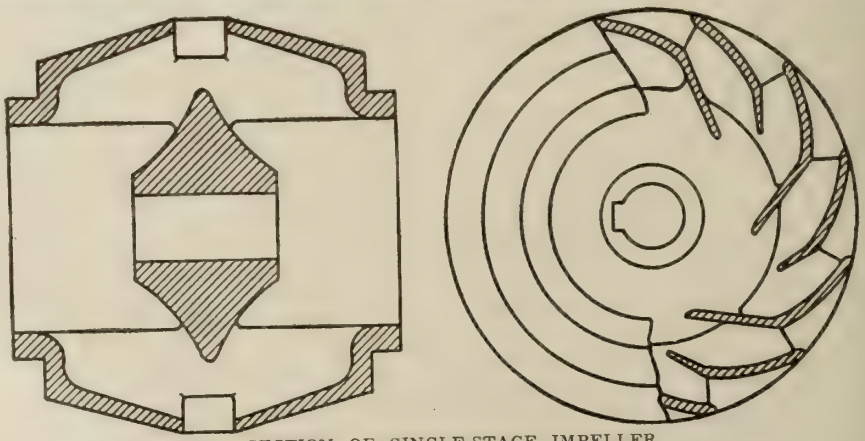
The self-regulating pressure chamber is the equivalent to a pump and a turbine in series, the result being that if the head varies or is reduced below the head for which the pump is designed, there is no overload possible, the turbine rim blades extracting the energy of the increased speed of the water through the impeller, which otherwise would be thrown to waste. It follows, therefore, that the margin of horse power usually allowed on the motor in the ordinary turbine pump for this emergency is unnecessary, it being absolutely impossible for the pump to overload materially the motive power so long as the speed is kept constant, regardless of the head against which the pump is working, or as in the extreme case of a pipe bursting, taking the head off the pump entirely. The value of this feature of the pump in keeping down power costs to the lowest point without the necessity of complicated arrangements for speed variation or cutting out impellers, will at once appeal to the manager or engineer.

With further reference to self-regulation and the turbine effect, it should be noted that the impeller becomes a pump and a turbine in series, with a pressure chamber between the two portions. The pump portion is, therefore, always discharging into a constant pressure, which is the ideal condition for a centrifugal pump, and the turbine is always discharging from a constant pressure, which is the ideal condition for a turbine.

The result of the combination just described is perfect self-regulation with the highest efficiency and, at any head lower than the normal duty, the power taken by the motor is prevented from rising.

Rees RoTURBo Characteristics

When running under a constant speed the Rees RoTURBo Pumps are designed to deliver a certain capacity against a specified head at this speed, and will give a guaranteed efficiency at that point. If required to deliver water at a higher head (and all the following calculations are based on a constant speed),



SECTION OF SINGLE-STAGE IMPELLER.

the pump will deliver against this higher head up to 115% of the designed head. The amount of water delivered will decrease as the head increases above the designed head. and the efficiency will also decrease likewise.

SINGLE-STAGE DIFFUSER.

For instance: At 106% of the designed head the pump will deliver 83% of its capacity, and the efficiency will be 95% of its guaranteed efficiency. In a similar manner: At 108% head, delivery is 73%, efficiency 90%. At 111% head, delivery is 60%, efficiency 80%. At heads above, the capacity and efficiency are not dependable, and the characteristic curves for the pump in question will have to be referred to.

For heads lower than the designed duty, the pump is more stable. For instance: for heads from 100% of the designed head down to 82% designed head, the pump will give an efficiency of 100% of that guaranteed, and the capacity at 82% is 126% of the designed.

At 69% head, the capacity is 140% and the efficiency 93%.

At 65% head, the capacity is 145% and efficiency 90%.

At 52% head, the capacity is 155% and efficiency 80%, etc., down to open valve or no head, at which point the pump will deliver in the neighborhood of 192% of the designed duty.

Due to this flat head and volume curve the efficiency of the pump is flat and varies over a wide range.

From the figures given you will note that it is best that the pump operate at heads lower than that for which it is designed. In fact, never, under any circumstances, would it be advisable for pump to operate under conditions where the head will be higher than that for which it was designed.

It will be noticed that the efficiency of the pump remains at the highest point until the head is reduced as low as 82% of the designed head and the capacity has increased to 125%. The pump can operate very satisfactorily down to heads as low as 40% of the designed head, and at this point the efficiency will be 60% of that guarantee, and the capacity will be approximately 160% of that for which it was designed.

A fact which should be remembered is that the volume increases directly as the speed; i.e., if the speed is doubled the volume will be doubled, and at the same time the head will vary directly as the square of the speed, and the head will be quadrupled, and likewise the power will be increased in direct proportion as the curve of the speed, or as the speed doubles the power will increase as the cube of 2 or 8.

Prof. Zowski's Report on Rees RoTURBo Pumps

The following technical report of Prof. Zowski, of the University of Michigan, sets forth clearly the principles involved in the RoTURBo Pump, and will be found of interest. The accompanying curves and test cards should be of assistance in discussing the subject with consulting engineers and others.

The new hydraulic principle embodied in the Rees RoTURBo Pump is that the impeller is used to create pressure head directly, whereas in all other centrifugal pumps the impeller imparts to the water practically speed energy only, leaving it to the diffusor to turn this speed energy into pressure head, which is always a very inefficient transformation.

A chamber of relatively large volume makes up the major part of this casing. A great volume of water is dragging along, and being exposed to the centrifugal force created by rotation is converted into a sort of accumulator which feeds the discharge nozzles and is itself fed by the suction pipe.

The speed of flow in the chamber is very small and its effect upon the pressure head which is caused by rotation is, therefore, very slight. Consequently, we may vary the discharge considerably without changing the pressure conditions in the impeller to any material extent. The variations in the discharge will only change the pressure at the entrance into the diffusor, and this produces the varying pressure differences which are, of course, necessary, if different quantities of water are to pass through the same passage area.

The fact that the speed of flow in the impeller is very small, means also that the theoretical power of the pump is practically dependent only on the pressure head created in the chamber, and therefore, equally independent of the discharge as the same.

If we now succeed in designing a pump in which also the efficiency will be independent of the discharge, then it is self-evident that the variations in the discharge will not affect much the actual power which is required to drive the pump. In the Rees Pump this condition is fulfilled for the following reasons:

1st. Because the speed of flow is very small, the hydraulic loss of the impeller will be very slight as compared with the other hydraulic losses of the whole pump, and changes of speed flow caused by varying the discharge can, therefore, not affect much the total efficiency.

2nd. The impeller nozzles act as turbine buckets, doing useful mechanical work by deviating the discharging water streams, and thus creating the S.C. force of reaction pressing against the buckets in the direction of rotation. This mechanical work increases with increasing discharge, and therefore, neutralizes to some extent the increase of hydraulic losses which takes place when the quantity discharged is increasing.

On the basis of what has been stated

MUTI-STAGE DIFFUSER.

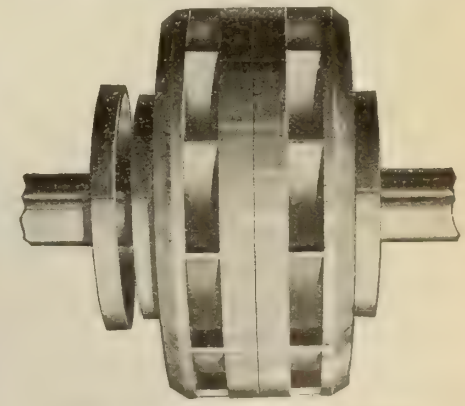
above, the following characteristics may, theoretically, be expected from the Rees Pump:

1st. A flat power curve with varying discharge.

2nd. A flat efficiency curve with varying discharge.

3rd. A total efficiency which must be at least as good as that of any other centrifugal pump, and which, on account of the relatively small velocities which flow through the impeller chamber, may be expected to be even better, if both are designed and built with the same amount of care and precision.

It cannot be the purpose of this report to enumerate the various instances in which this pump may be used to a greater advantage than the other centrifugal pumps, but this seems to be quite certain that the pump is ideally fitted to all services where the operation conditions are variable. Further, the peculiar construction of the impeller makes it relatively easy to use the pump as a wet compressor or as a vacuum pump, as it is a simple matter to admit the air



MULTI-STAGE B TYPE IMPELLER.

or exhaust steam into the wide impeller chamber, and then to compress or mix it with the water in the impeller.

S. J. ZOWSKI.

On all pumps the casing is split horizontally so that the pump can be opened

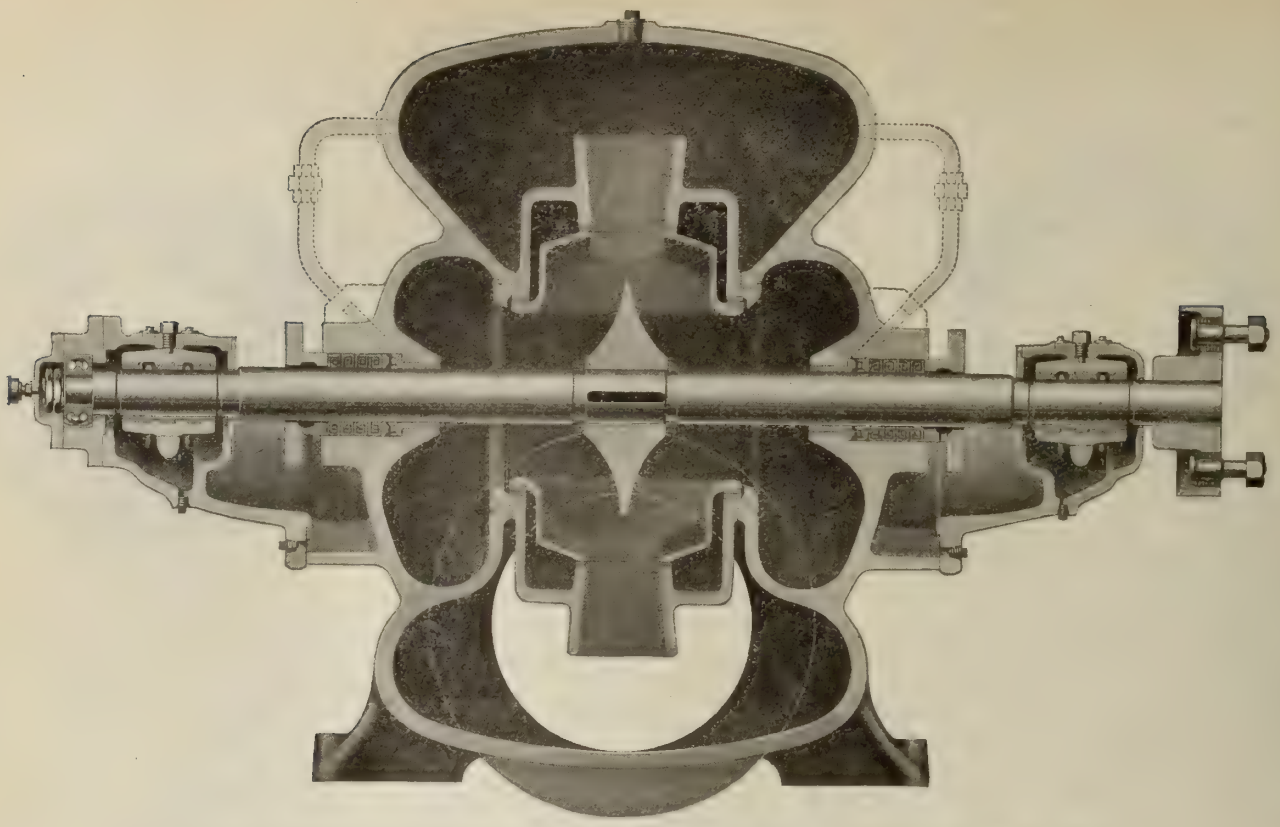


FIG. 1.—C. W. TYPE SINGLE-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

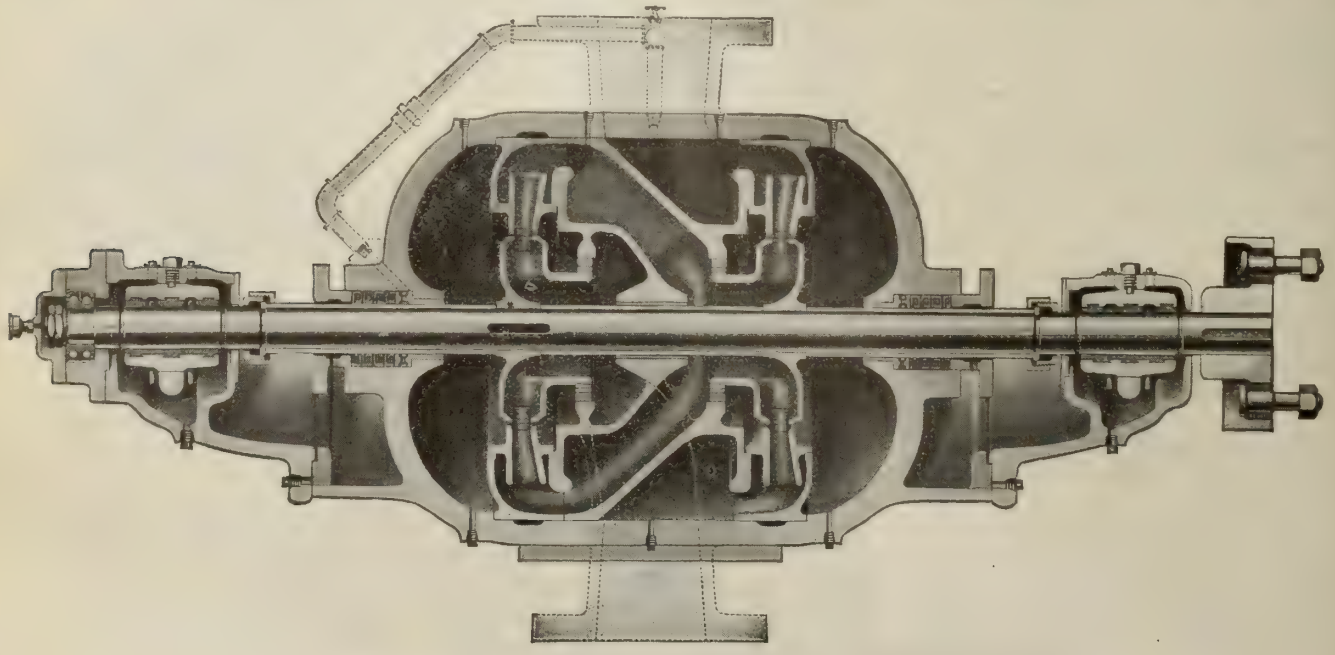
out and the internal parts examined by simply removing the top half of the casing.

It is very advisable to have both the branches, that is to say, the suction and discharge openings, in the bottom half of the casing, so that the top half can be removed without disturbing the branch connections. The standard arrangement is with both the suction and discharge branches horizontal and below the centre line of the pump. The suction branch can be made vertical if specially required. The horizontal suction branch is, however, preferred. The standard arrangement is with the discharge branch on the right hand side looking on the thrust end of the pump, but it is equally satisfactory to have it on the left hand side.

This pump may be made with either one or two main bearings. When the prime mover is supplied by another firm our practice is to fit two main bearings in all cases, but when the prime mover is supplied by ourselves, one main bearing is sufficient in the case of reciprocating engine drive and on small units with turbine drives up to moderate speeds; but in the case of high speed turbine drives (above 2200 R.P.M.) or units absorbing more than 50 H.P., two bearings should be supplied. With two main bearings a flexible coupling is used, but with only one main bearing a solid coupling is required. A brief description of the various types is given below:

C. W. Type

These pumps may be used for heads up to 120 feet, when the impeller is made of cast iron; double that head when it is made of bronze. It is not usually good

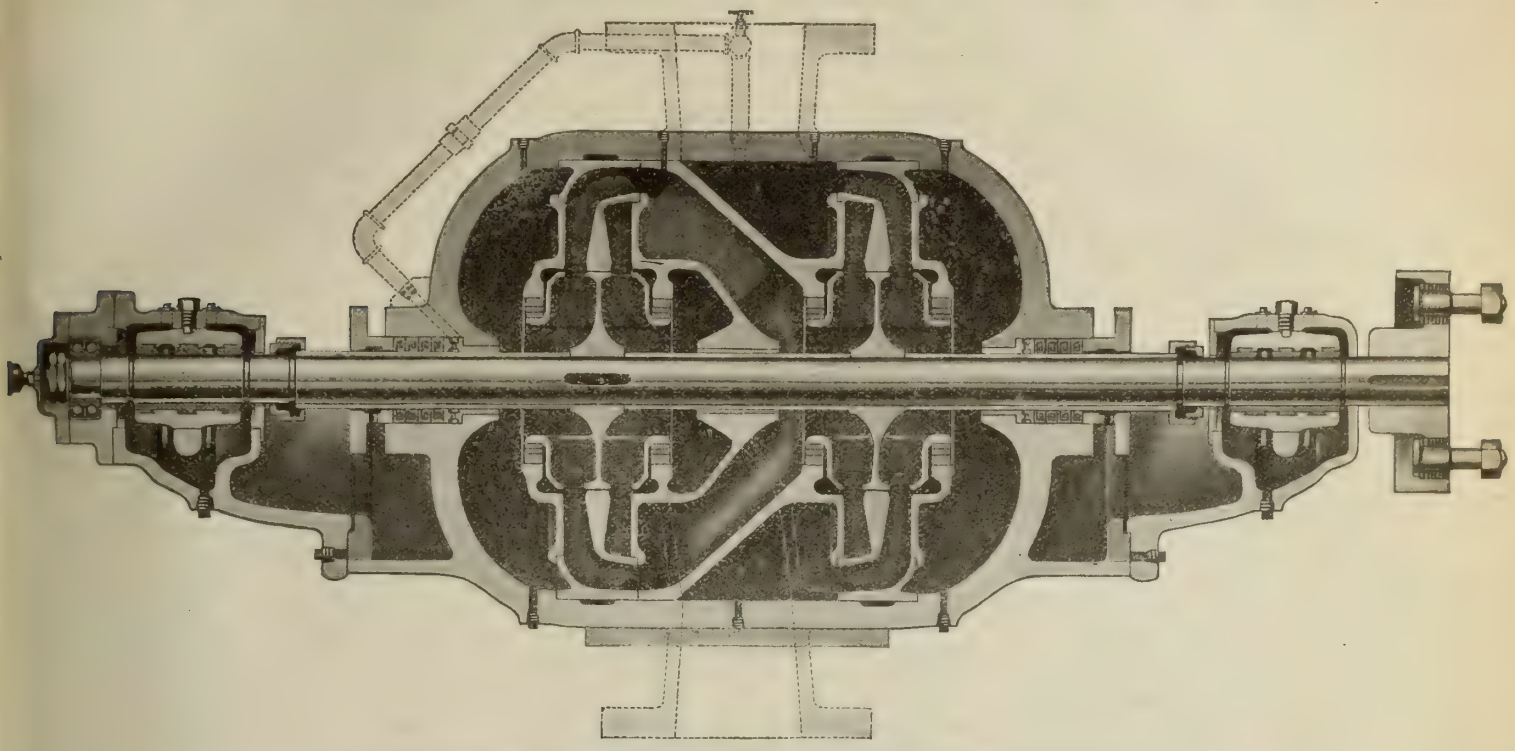


S2.—TWO-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

practice to exceed 180 feet on a single-stage C. W. pump, unless it is of considerable capacity. Lubrication is by one or two oil rings, running over the shaft and dipping into a large reservoir beneath. This bracket also contains a

furnished, thus providing a bearing on each side of the pulley. Lubrication is by ring oiling. The efficiency of this pump will range from approximately 40% on a very small pump to 80% on a large one, depending entirely on the

fore the capacity of an equivalent size S-2 impeller is only one-half that of a C.W. type of pump of the same diameter, the capacity limit of the impeller being based on the velocity of water through the eye. The impellers in these pumps,



B2.—MULTI-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

two way ball thrust bearing, which acts as a centreing block for the impeller, keeping the nozzles in line with the diverging channel. In special cases the branches may be located at almost any position on the periphery of the casing to suit the convenience of the customer; but this should be avoided whenever possible, as it means special attention in designing and will probably entail delays in shipment.

The base plate is of cast iron, usually in one piece of the heavy boxed ribbed type, extended to receive the driver. For belt drive, two pedestal bearings are

fitness of the pump in question to the service demanded of it. Efficiencies obtainable are found for any given conditions from the efficiency charts. In practice the best efficiencies are obtained with heads varying from 40 to 140 feet.

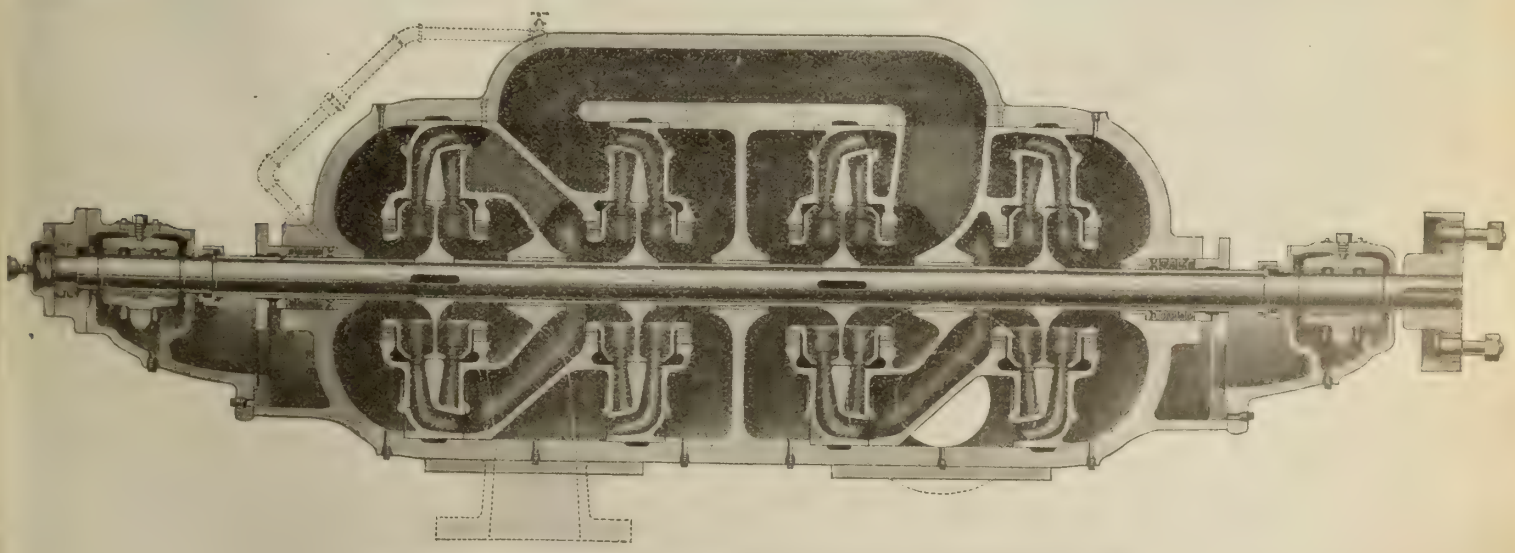
S-2 Pump

This consists of two single stage, single impeller, single suction pumps, mounted on one shaft, and placed in one casing; in reality, this is two single stage pumps in one casing. The impeller differs from that employed in the C.W. Pump in that the water enters on one side or through one eye only, and there-

when mounted on the shaft face to face, are so arranged that water under pressure flows to the back of them, thus hydraulically balancing them with regard to end pressure. The diffusors of these pumps are two in number, and are of the straight way type similar internally to those used on the C.W Pump. What has already been said about number and type of bearings for previous pump, is also applicable to the S-2 Pump.

B Type Pump

This type of pump is one which is particularly well adapted for exacting service. It has many advantages over



B4.—EIGHT-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

the ordinary centrifugal pump besides the special feature of the capacity chambers. It is multi-stage built in multiples of four, and not otherwise. The impeller is of the two stage type, each impeller having two stages back to back with an eye on both sides. This is a mechanical advantage in that it shortens the length of the pump, and consequently the distance between bearings. The arrangement of the stages in multiples of four only, is clearly explained by reference to the method of obtaining hydraulic balance. This hydraulic balance is not only theoretically perfect but is actually so. This can easily be proven by the fact that on pumps up to 16 stages and more, a standard type of ball thrust bearing is used for the centreing block instead of the usual type of collar, water cooled marine thrust bearing, used by other pump manufacturers to take up end thrust. The end thrust experienced in RoTURBo Pumps is practically negligible. The purpose of the ball thrust used is to keep the impeller in line with the diffusors. The compactness of the pumps is further facilitated by the use of cross over diffusors. These diffusors are two combined in one, and cross the water from one stage of the pump to the next, and in this way (the water being crossed in a correct manner from one stage to the next) the pump is balanced with reference to end pressure. B types of pumps usually contain two bearings, both external to the casing, supported in brackets from each end of the pump. These are the same as those used in the other pumps, and are lubricated by means of two rings to each bearing dipping into a large reservoir of oil beneath, which has an overflow and drain. Above each stage of a B type pump is a relief or pet cock, its purpose being to relieve the entrapped air. B & S types of pumps have bronze covered shaft; the other type of pumps have steel shaft unless bronze is specified, which will be special and for which an extra charge will be made. B type pumps are used for heads from 100 to 1,600 feet. Their efficiencies are found from the efficiency charts. Given the volume and head per stage on the pump the best efficiencies are obtained with heads of from 40 to 140 feet per stage.

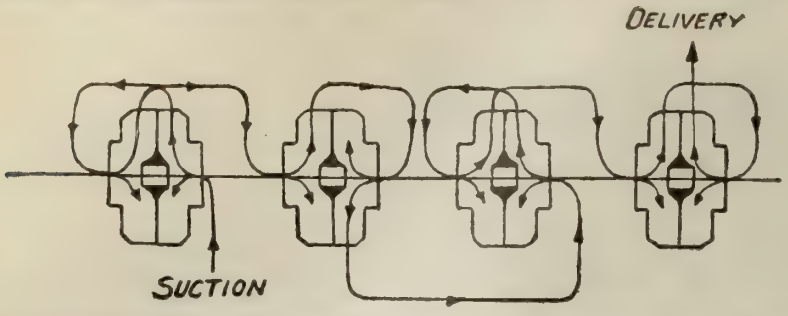


DIAGRAM SHOWING FLOW AND HYDRAULIC BALANCE OF A B4 EIGHT-STAGE PUMP.

The makers of these pumps claim the following features and advantages derived from their pumps, namely that:

1. A drooping power curve, i.e., a power curve which rises not more than 10% as the volume is increased beyond the designed duty point and falls away as the volume is still further increased, thus making it impossible to impose an overload on the motor or turbine which may be used for drive.

2. High and permanent efficiency maintained over a very wide range of heads and volumes, i.e., a flat efficiency curve.

3. A head and volume curve which goes out to approximately 200% of the volume at the designed duty point when delivering against no head, in other words, maximum increase in volume at reduced heads. This is a great advantage for many purposes.

4. Owing to the low water velocity through the impeller and stationary passages, there is almost complete freedom from wear, even when pumping gritty water. This forms a marked contrast to the ordinary centrifugal pump, where facilities have to be provided for the renewal of blade tips and other parts, due to the excessive erosion. With much wear, of course, in pumps of such construction, the efficiency falls rapidly.

5. An outstanding feature of the Rees RoTURBo Pump is that both single and multi-stage pumps are in perfect hydraulic balance, thus eliminating the expensive marine thrust bearings and balancing pistons which are always liable to wear and give trouble as soon as the clearances of same become worn through pumping gritty water. A small two-way ball thrust is usually fitted, the function of which is merely that of a centreing block to maintain alignment between the impeller and the diffusors.

6. The strong and rugged design of the impeller, diffusors and casing insures complete freedom from noise and vibration.

7. The pump is especially suitable for use with liquid of a gritty or viscous nature, owing to the low velocity through the impeller and casing, and has been largely used for pumping thick oil, sugar, liquids, etc.

8. From a mechanical point of view the pump is fully standardized and all wearing parts are easily replaceable, being made to gauge and kept in stock, thus permitting quick shipments on receipts of orders for repairs. The design of the pump is specially adapted for a wide range of duties with a given pattern by small alterations, thus reducing the number of patterns carried to a minimum and enabling us to completely standardize all parts.

From the foregoing history, and detailed description of these pumps, it will be noted that efficiency is a very strong feature. To class them as a centrifugal pump only is a huge mistake, for they combine, as the trade-mark RoTURBo infers, a rotary, turbine effect, and not simply a centrifugal pump effect. Perhaps the most interesting portion of this article follows, namely, that these pumps are now being built in Canada, by the Goldie McCulloch Co., Limited, of Galt, Ont., who have secured the sole rights for these pumps in the Dominion of Canada. For the past seventy years this firm has specialized in the production of high grade power equipment, so it is hardly necessary to mention that they are in splendid shape to manufacture work of this kind. The various photographs accompanying this article can be easily understood from the descriptive matter in the body of the article, and to aid readers to pick out the various types, titles are placed under each photograph. This firm when speaking with the representative of CANADIAN MACHINERY mentioned that they were only too pleased to answer enquiries relative to these pumps, and that such information in catalogue form was to be had for the asking.

A. R. Roberts, formerly if Burns & Roberts, Ltd., Toronto has discontinued his connection with the firm, and has opened an office at 201 Bank of Hamilton Building, Toronto. He will deal in new and used machinery, contractors' railway and power plant equipment.

ACKNOWLEDGMENT

The following firms were good enough to supply us with the photographs, etc., illustrating article on shop transportation in our last issue:—

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Jeffery Mfg. Co., Columbus, Ohio.

Northern Crane Works, Walkerville, Ont.

General Electric Co., Schenectady, N.Y.

Curtis Pneumatic Machinery Co., St. Louis, Mo.

The Electric Storage Battery Co., Philadelphia, Pa.

The Cowan Truck Co., Holyoke, Mass.

The Lamson Co., Boston, Mass., (Jones & Glassco are their advertising representatives, Montreal, Canada.)

Cheese Factory Boiler Explodes at Joyceville

Little Village Near Kingston is Scene of Disastrous Explosion—Boiler Ruptures Along Longitudinal Seam, Which Was Badly Corroded—No Inspection Had Been Made on This Boiler Since Installation

T. H. FENNER, Associate Editor Canadian Machinery

THE question of the adequate and regular inspection of steam boilers is once more brought to the public mind in a way that defies evasion. Once again a boiler in an industrial plant has exploded without a minute's warning, leaving in its trail a wrecked building, and worse still, destroying two human lives. Both the victims were young men, with many years of life in front of them under ordinary circumstances.

The boiler in question was in use at the cheese factory of Thomas Anglin, of Joyceville, and was of the horizontal return tubular type, about 38 inches diameter. It was similar to most of the cheese factory boilers, of which there are no less than one thousand and forty, known and listed in the Factory Inspection Department. There are probably many more than this in use, for it is a difficult matter to keep track of these boilers. Under the Factory Act, steam boilers in use on farms, or for general agricultural purposes, are exempt from inspection. Cheese factory boilers were at one time also exempted, but for some years past they have been brought within the law.

The original thickness of the plate was ¼ inch, and the boiler was made up of two sheets, the longitudinal seam being single riveted. We have no particulars of the pitch, but with a joint of this kind the percentage of strength to the solid is approximately 50 to 54. On this assumption the resistance of the shell to internal bursting force would be, with a factor safety of 5, about 70 lbs. if made of steel. This, if the boiler was in good condition, which it was not.

Some interesting statements were made at the coroners' inquest relative to the operation of the boiler. It had been installed in 1915, having previously been in operation for some time. The owner was supposed to have notified the Steam Boiler Department at that time, but presumably was not aware of this. It was not until two years after that he received a circular from the Factory Inspection Department, notifying him that an inspection was necessary. He then called in a local firm, who made a repair by patching the boiler. The repair people undertook to notify the Inspection Department, and apparently did so. The inspection was not made for reasons given later in this article. The owner thereupon let things slide, evidently believing it was no affair of his. He continued using the boiler, and finding that the safety valve opened at about 40 lbs. pressure, hung some more weights on the lever, to bring the pressure up to 80 lbs. It was stated that the boiler actually blew off at 100 lbs. per square inch. At the time of the explosion, the pressure was stated by Edward Gallery, the cheesemaker, to be between 80 and 100 lbs.

This man was presumably the operator of the boiler. He had received some instruction in boiler operation while taking his course for cheesemaking. He was not aware that any inspection was necessary, and stated that he never heard of inspections being made in other cheese factories.

Here we have the two men most interested in the boiler, one the owner and one the operator. The owner knew that the boiler should be inspected, but, when the inspection did not materialize, took no steps to find out why. The other man had no idea that the boiler needed inspection, and cheerfully went on operating without the slightest conception of the danger he was running. When the catastrophe took place, it was two men who were not even employed at the factory who were killed. There is an instance of fate's irony.

The provincial inspector, who made an examination of the remains of the boiler after the accident, found evidence of deep corrosion on the seam where the rupture took place. The plate was grooved until a bare one-sixteenth of an inch thick. He stated that the boiler was poorly built, and when new would have been good for only 54 lbs. per square inch. If it had been inspected by him he would have condemned it, or allowed only 15 lbs. per square inch.

Two weights were found which had been on the safety valve lever. Had they been at the end of the lever it would have required a steam pressure of 200 lbs. per square inch to raise the valve. The steam gauge, never having been tested, may have been considerably out, and probably was.

Here is a case where, had the inspection been made, the accident would have been prevented. The reason given for not making the inspection is a shortage of inspectors, there being only six for the whole province of Ontario. In the case of cheese factory boilers, the difficulty of inspection is enhanced by the out-of-the-way localities they are usually placed in. This makes the inspection a matter of a whole day in some cases, and when the number of boilers are considered, it is quite to be understood that some of them are missed. There are many owners of boilers who take no interest in the safety of their property, either through ignorance, or a desire to save the fees. There is a great need of a means to enforce the laws already in existence. In this connection a good plan has been suggested. It is that instead of having the inspectors all atttached o the central office, the province should be divided into districts, with a resident inspector in each. This inspector would know the district and everybody in it, and the possibility of a boiler being operated without inspection would be reduced to a minimum.

It would also prevent a thing that frequently happens now. A man has a boiler on his farm which comes under the agricultural classification and is, therefore, exempt from taxation. He takes up cheese manufacturing, or starts a sawmill, and the boiler is then, of course, in commercial use, and liable to inspection. If the owner himself does not notify the Factory Department of the change, it is quite probable that under the existing conditions he may operate it for one or two years before anything is known about it. Resident inspectors would know of a case of this sort immediately.

The Case of the Farmer's Boiler

This brings us to another consideration. Why should any steam boiler be exempt from inspection merely because it is not used for commercial purposes? A farmer who uses a threshing engine, or steam tractor, is not compelled to have it inspected.

The viewpoint of the Legislature is presumably that a man using a boiler on his own land for what may be reckoned as purely domestic purposes, should not be bothered with inconvenience of Government supervision.

Speaking generally, the less the Government interferes with private enterprise, the better; but here is a case where it is in the interest of the man himself to interfere. The law puts effective checks in the way of the purchaser of poison, even if only to kill vermin, or a dog who has had his day. It should do the same with such a highly dangerous instrument as a steam boiler.

There is a very wide spread fallacy among small steam users that because a boiler is comparatively small and operating at low pressure it can't do much damage anyway. They are partly right. A 30 inch diameter boiler operating at 100 lbs. pressure is not so dangerous as a 60 inch boiler operating at 50 lbs. pressure, but it is dangerous enough. The explosive force of a boiler lies not in the pressure it carries, but in the heat energy contained in the water. The greater the weight of water, the greater the damage that will be done. This

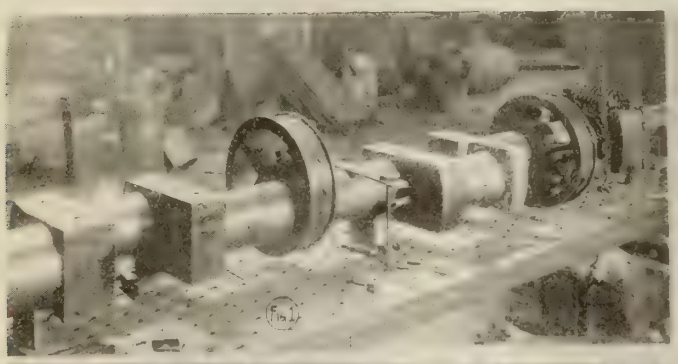
Continued on page 61

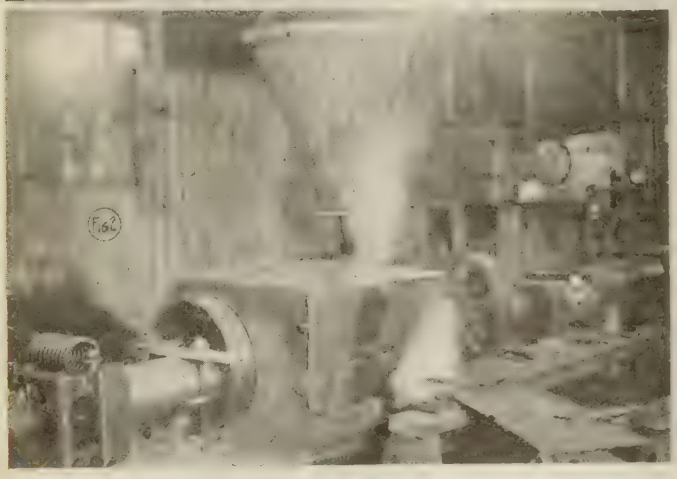
Interesting Thermit Weld to Crank Shaft

By J. R. RODGERS

THERMIT welding is now recognized as a most effective and economic means of repairs to equipment and broken parts of machinery, particularly of the heavier variety where great difficulty would be experienced with the other methods of repair. The illustrations on this page show the various stages in a repair to a two throw crankshaft taken from a high speed paper machine in one of the large pulp and paper mills. The estimated loss to the plant by the break of this shaft was approximately $200 per hour, so it was essential that operations be delayed as brief a period as possible. The shaft was removed from the machine and expressed to Montreal, where the St. Lawrence Welding Co. effected the repair by thermit welding. The time required to make the weld, after the shaft was received in the shop, was about 30 hours. This included the alignment of the shaft and clamping in position on the floor plate, the construction of the mold, the pre-heating period of 7 hours, and the actual weld, the latter only occupying a few seconds.

In setting up work of this character it is always necessary to allow for the shrinkage of the metal as the weld cools off. The two parts being completely separated by the break and the portion cut away, there is no lengthening of the shaft during the pre-heating period, so that the contraction after welding must be carefully calculated when setting up the work. After the repair it was found that the error of alignment and concentricity was less than 1/200 of an inch. The machining was completed by the Hydraulic Machinery Company in about 20 hours, and the shaft returned to the mill in less than four days from the time of the break, so that the operations were resumed at the mill with the minimum degree of shutdown. The shaft was over 14 feet in length with diameters ranging from 6 to 8 inches, cranks being 5¼ inches in diameter. The break took place close to the web of one of the cranks, as seen in the cuts herewith.





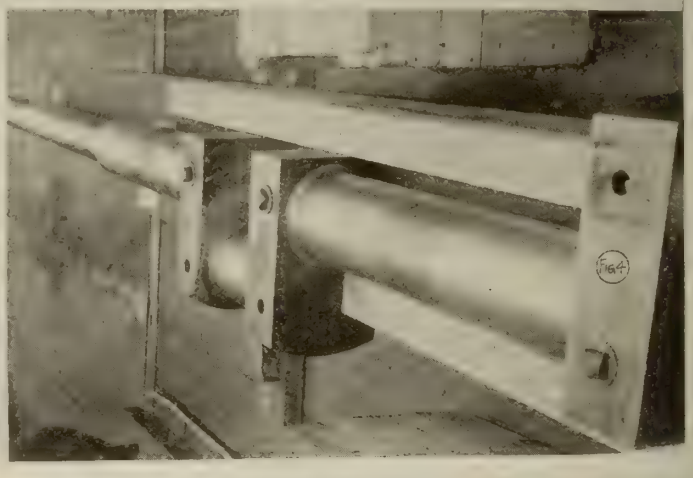


FIG. 1—ALIGNMENT OF SHAFT BEFORE SETTING THE MOLD.

FIG. 2—PREHEATING WITH MOLD IN POSITION.

FIG. 3—WELDED SHAFT AFTER MOLD IS REMOVED, SHOWING RISER AND GATE IN POSITION.

FIG. 4—COMPLETE REPAIR AFTER MACHINING.

TICKLISH TUNNELING UNDER THE EAST RIVER

A very interesting bit of tunneling was recently done on the 14th Street tube under the East River, New York. The heading was being run in rock, and at one point test holes showed a thickness of only eight inches of sound dry rock above the line along which the top of the tunnel was to run. As the tunnel was being driven without the use of compressed air it was decided to drop the upper heading four feet until this thin cover of rock was passed. The cast iron lining was set in place at each side of this section and then the rock was removed very carefully by using a great many holes, each loaded with about one-eighth of a stick of dynamite. As each bit of rock was removed to the arch the tunnel lining was set in place. By this means the dangerous section was tunneled without breaking through the thin shell.

Commercial developments by air are rapidly taking a tangible form. This is shown in the active interest taken by the aviation department of Vickers Limited, of England, and the request that has been forwarded to this company by the Chamber of Commerce and the Aero Club of Atlantic City, N.J., to seriously consider the city as the Atlantic terminal for any commercial route that may be established. It is believed that the American agents of Vickers are even now studying the advisability of making this port the western terminus of a proposed transatlantic route for air tourists.

THE ZEUS ARC WELDER

ELECTRIC arc welding of the past has been thought of in the light of large cumbersome installation of considerable cost. It has further been understood that since it consists of a motor generator set entailing moving parts, there might be some difficulty in connection with its operation from time to time. It has always been understood to be inefficient on cast iron and in connection with overhead welding.

This new arc welder, manufactured by the Gibb Instrument Company, of Detroit, Michigan, is built of an entirely different type. The motor generator set with its disadvantages of bulk and moving parts, has been supplanted by a simple transformer with no moving parts, and like all transformers with nothing to get out of order. It has been found that the current consumption is from twenty to forty per cent. less than the motor generator type. One big feature is its adaptability to overhead welding, which class of welding has given considerable trouble in the past with the arc welding equipment. It has further been found to be particularly efficient in the welding of cast iron, which has been another difficulty in the way of the unqualified success of the types of the past.

This welder is comparatively small, making it unnecessary to set aside expensive space for its accommodation. Further, because of its convenient size, it is portable.

The "Z E U S" is built on a unit system, whereby a concern may install a 150 ampere machine, and when the work becomes heavier, a duplicate may be connected in parallel with the original machine.

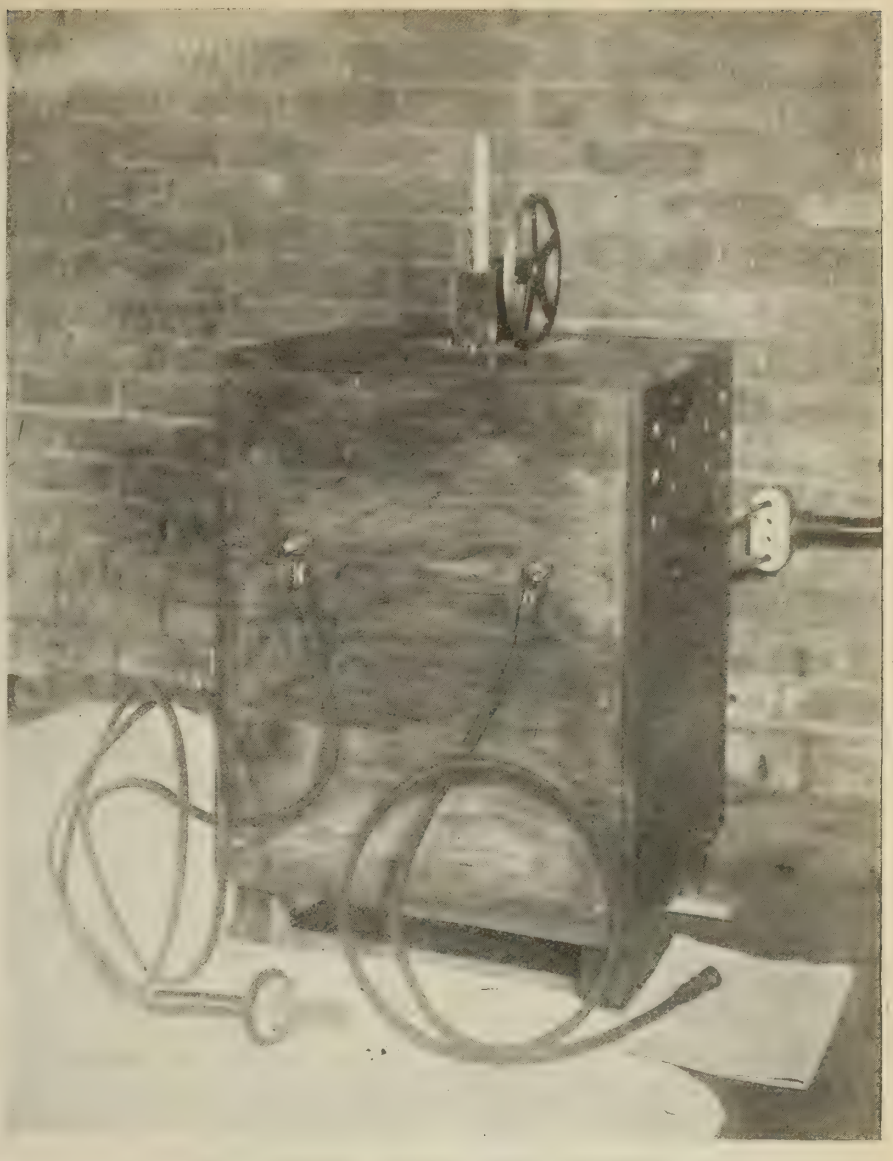


FIG. 1.—GENERAL VIEW OF THE APPARATUS.

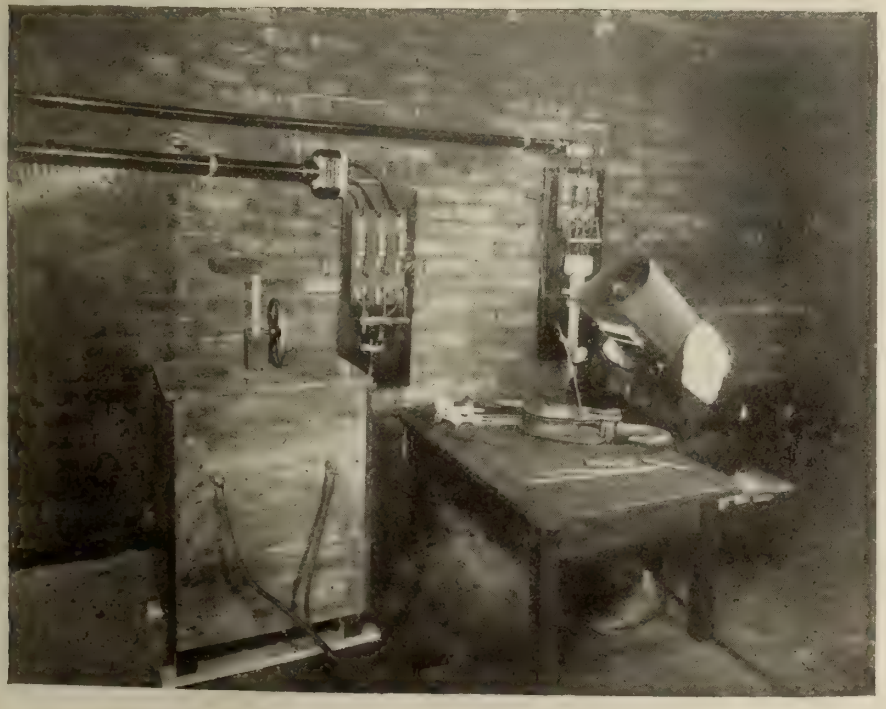


FIG. 2.—THE OPERATOR AT WORK.

One of the outstanding features of this welder is its arrangement for regulation. It is not necessary to in any way, change the connections in the regulation of the arc. A wheel connected with the secondary and extending through the top of the case, raises and lowers the secondary and provides for the regulation of the current necessary for different sizes of electrodes.

The inherent reactance of the "Z E U S" welder automatically stabilizes the arc for different arc lengths.

In addition to all its advantages, its cost is considerably lower than the cost of the types of the past.

Different methods are in use for keeping the supply of electricity steady in spite of the varying demands made on it. In some systems of distribution, instead of the two main conductors being one positive and the other negative, each is positive and negative alternately, the reversals taking place some hundreds of times a second. The current is then said to be alternating. When such reversals do not take place the currents are said to be direct.

Are Accidents Merely an Unnecessary Evil

Industrial Accidents Cost America 35,000 Human Lives and More Than $500,000,000 Annually—Is Such a Condition Necessary, or is a Large Percentage Due to Utter Carelessness?

By Master Mechanic

THE prevention of industrial accidents is a subject that at last is receiving the attention it so richly deserves. Although safety methods have been installed in various shops and factories throughout the country, still it is only in the last few years that any real systematic attempt has been made to reduce the accident bugbear.

There has been unfortunately a general fallacy existing that all work accidents were necessarily incident to industry, and that casualties were inevitable. How completely incorrect this assumption is, has been proved beyond the shadow of a doubt, by the splendid success in reducing accidents achieved by various safety engineers, and large industrial companies who have systematically attacked this accident problem.

Can We Prevent Accidents?

Not only has it been shown that accidents are preventable, but also that this prevention is not only profitable, but humane.

In 1916, there appeared an estimate of killed and wounded, which quoted the fact that the annual loss that year alone was greater than the combined losses of the Union and Confederate armies during the Civil War.

These figures cannot help but prompt the question: "Why so many accidents—were they all unavoidable?" which brings us up to a point where discussion is possible.

Accidents **can often** be avoided by exercising a little care and forethought.

An outstanding example is the Power Press. This machine was responsible, year after year, for the maiming of thousands of unfortunates, and the position of press operators was a hazardous one.

The same conditions exist in many "Safety First" campaign in motion.

At the present time in any up-to-date press room, it is the operator's own fault, and due to rank carelessness, should he lose a finger, for preventative guards of all descriptions have been installed for his benefit.

The same conditions exist in many other plants engaged in other lines of business, but for the purpose of this article, and to prove how carelessness is ofttimes the cause of accidents, let me mention a number of cases which have been cussed and discussed by the various parties concerned.

Some Examples

Let us start out with a very common form of carelessness, and the cause of many an accident—usually slight.

Did you ever see the tang of a file sticking out of the bench drawer(?). Of course you have, for unfortunately it's a common sight in the average machine shop. Usually a man opens the drawer hurriedly, slams in the file, and there you are. The handle sometimes stays on, sometimes not, then again often there was no handle on it at first. Someone comes along and without thought attempts to push it in the remainder of the distance, result—one more accident, usually slight, but in one case which came to the writer's attention, the outcome was blood-poisoning of very bad nature. Here is one case where a little care would make such an accident a thing of the past.

Then there is the chap up on the scaffold or platform, who will persist in leaving his hammer, chisel, wrench or some such article, just balancing on the edge. A slight vibration and down it comes, usually on somebody's head, sometimes luckily in such a way as to merely leave a bump, but often the victim receives a mark he never gets rid of. Here again, rank carelessness is the reason, and yet preach, preach, preach as you like, the same old condition continues to exist.

Oh, I Never Thought

Have you ever run across the type of workman who never bothers looking to see if there is any reason why he should not do the particular work he intended(?) The incident I have in mind was in connection with a boiler.

There was an inspector in the boiler, and on the job, watching him carefully from the outside, was the engineer. Naturally the engineer was very much interested to know what report the inspector would make, and on hearing a muffled remark from inside to the effect that his valve on top was leaking slightly he went up and without thinking(?) turned it the wrong way. Luckily he had presence of mind enough to realize what he had done and shut it off at once. Out came a badly scared and badly burned inspector. Here was a case where a locked valve would have been a real blessing. There is such an article on the market, which not only locks the valve, but has a tag which says, "Danger—man in boiler," yet here we have a case where no doubt the fact that such a thing existed was unknown. Was this accident unnecessary? We should say yes!

Don't Take the Short Cut

In a certain plant where safety first was believed in there was a sign as follows: "Never crawl through, over or under a belt." This sign was rather necessary, for there was one belt in particular, a 12 in. wide belt, which ran a pulp mill, and which ran over a space about three feet wide, a real nice short cut if you liked to take the chance. The belt was held together by a series of fasteners which protruded considerably on the side of the belt.

One chap in particular couldn't see the sense of this sign and kept on taking the short cut. He was warned, in fact threatened, but to no avail. He happened to be assistant superintendent or otherwise he would have been fired. Nobody seemed to think of blocking the path up with a real suitable guard. "You'll not bend enough some day," this fellow was told, and one day he didn't. When they picked him up he was dead, with his head practically torn in two.

And then, strange to state, a guard went up. What is the answer?

It's a strange fact that in spite of these different accidents, you will find the fellow who feels sure he's all right. He will usually tell you he has done this for the last five years and never got hurt, so why change his method now?

A case of this nature is well worth repeating.

This fellow was employed to attend to the oiling of all shafting in the plant under discussion. He was, to give him justice, an adept at handling a ladder, and so on safety feet for his ladder being suggested he pooh-poohed the idea. "What, me put those non-slips on the foot of my ladder, well I should say not."

However, time will tell, and on this particular day his ladder slipped. With great presence of mind he grabbed the shafting and hung on as best he could. Right below him was a paint mixer with its gears noisily letting him know they were very much there. It was not long before someone shut off the power and helped the victim of the accident down to terra firma once more.

His hands were badly lacerated and his nerve was badly shaken, and, what is more, he came down a convert to safety methods. His ladder received feet of the best non-slip variety, furthermore he exercised more care than ever before in the carrying out of his duty.

It may seem to the reader at this point that here we are croaking of all these accidents and mentioning only the gruesome cases, never touching on the lighter (?) side of trouble, but to illustrate that it is not the intention to show only the horrors of the situation let me quote a real funny incident that occurred some time ago in a machine shop in which the writer happened to be at the time.

Owing to bad judgment in the placing

of machines there were, strange to state, two planers in such a position that their tables ran in similar direction. It had never been considered possible that these tables could nearly meet if out at full extreme of stroke, but as luck would have it, one chap found this fact out, for in passing between these machines in an offhand manner he was pinned between the two tables. It looked mightily like a serious accident for a moment, but luckily the tables had reached the very maximum point of their strokes. Of course the yells of the victim could be heard for blocks, but he was more scared than hurt. All he really got was a steady squeeze, but he never takes short cuts any more, and these machines are now arranged in a different manner.

To show how similar cases have different results, let us quote another planer incident with an entirely different ending. The machines concerned in this case were a lathe and a planer, these being so arranged that often the space between the end of the lathe bed and planer table was very small. One day a workman was jammed in this space, and unfortunately so hard that he died inside an hour. Of course as per usual the stable was locked after the horse had left, for immediately after this accident the position of these machines was changed.

The Use of the Crowbar

A crowbar, like any other tool, has its own particular use, and this use is certainly not to pry around the flywheel of an engine under steam. Yet how often we see workmen using a bar under these conditions.

One incident that comes to the writer's mind is that of the attempt to start a huge hydraulic pump by means of a crowbar. "Did you close that throttle valve?" was the first question asked of the engineer before commencing operations. "Sure," came the answer back, and so the crowbar was inserted. But not for long, for suddenly wtihout warning, crowbar and men went off at a tangent to the flywheel at what a youngster would describe as some speed. Of course the reason is apparent, for although it was thought that the throttle valve was closed, still results proved it was only partially closed. Luckily nobody was hurt, merely badly shaken up, still, crowbars are not used for such purpose in this engine room at least.

Emergency Elevator

It is sometimes the most foolish idea that workmen will follow out, as for example the following incident.

It was desired to hoist a heavy casting, too large for the elevator, up to the fourth floor. The only solution was to knock out a small section of the outside wall and hoist up to this point. One fellow thought out the brilliant plan of using the shafting on the fourth floor as an elevator, so he wound the rope round the shaft and gave orders to start the motor. He omitted, however, to notice a loose loop of rope which caught his foot when the motor started, with the result that it carried him up to the shaft, and before they could stop the motor he was dead.

But these stories of lack of thought could go on indefinitely, for case after case has no doubt cropped up in readers' minds while they have been perusing this article, so, with a closing example, the writer will close.

This incident happened in quite a large manufacturing concern where there were men who were paid high salaries to know better, and they did no doubt realize that the scheme adopted was a risky one—but to go on with the story.

They were moving a large motor down an incline of about 25 degrees. This motor was of such width that all the weight would rest on two boards of the portion on which the same had to slide, so for safety's sake it was deemed wise to place crosswise on this boarded incline two large doors on which to slide the motor, this of course distributing the weight evenly.

All went fine, and the motor was coming down in splendid shape. Only 4 feet more was necessary to bring it to the level, and it seemed a shame and a waste of good time to move and place a door under the motor for such a small distance. It was suggested that they take a chance (I use the term advisedly) and skid her down without the aid of the door.

They tried to do so, and as soon as she came off the door one of the feet plunked through the board, the motor swayed with the impact and toppled over sideways on to the cement below and smashed some parts of it, which took over two weeks to replace.

Of course there were some men lost their jobs over this incident, but that didn't help the motor any. Here we have a plain case of foolishly taking a chance in order to save a few moments' time.

It is this fact of rush, rush, rush, that causes so many accidents. As readers have no doubt read elsewhere, the A B C of safety first is, "Always be careful," so when tempted to rush matters, think of these three words and be careful rather than sorry.

The final question is this: "Are accidents absolutely necessary, or are a great percentage due to carelessness and lack of thought as described in the previous examples?" at which point the writer leaves readers to their own thoughts on the subject.

GUNPOWDER SAVES

A somewhat novel idea is in successful operation in the machine shops of the D. & H. R. R. Co., at Watervliet, N.Y. They are using ordinary black sporting powder to save the time of mechanics as described below:

Used for blowing nuts and bolts (sweated on) of which there are many in the construction of locomotives and other railroad equipment.

Breaking up iron and steel to be scrapped.

Forcing off a piston (locomotive) when rust or corrosion binds it.

Breaking metal which has become cold in a furnace (this has been done at this plant without breaking a firebrick).

Methods of Use

The charge of powder in all cases is loaded in steel guns of various sizes and held by a steel plunger, which is forced out when the charge is set off. No wad is used. The plunger is milled to a size to fit (easily) the bore of the gun.

They have these guns in sizes, from end to end, of 5 to 12 inches, with other dimensions in proportion; also dimensions for plunger to sink. Some of the gunbarrels are milled in the shape of an octagonal prism instead of being cylindrical; the bore in all cases is round.

The gun, after loading, is jacked up with the mouth within about one inch of the object to be struck by the plunger, and fired. They use approximately 1 oz. of powder per nut or bolt (sizes in common use on locomotive construction) which is to be broken off or loosened. The load, of course, is varied with the work to be done. I mention the amount for bolts and nuts because this is the commonest practice with the gun.

By the use of these guns, they claim, much time and labor has been saved; also, a sharp, quick blow can be directed at an object which is barely reachable otherwise.

BOILER EXPLODES AT JOYCEVILLE

Continued from page 157

Joyceville boiler was of the kind usually reckoned by the farmer class to be without possibilities of danger. The accident clearly shows what a small boiler can do if it explodes.

The Remedy

The remedy is so obvious that it hardly needs suggesting. It is the plain duty of the Government to put its inspection departments on a basis that will enable them to keep track of every steam boiler in the province. Where there is danger to life, petty economies should not be considered. Five or six inspectors for a province the size of Ontario are hopelessly inadequate, and it is to be earnestly hoped that steps will be taken before any more fatalities occur.

Accidents in the iron and steel industry have decreased by more than two-thirds during the past 10 years as a result of the movement to enforce safety regulations, according to a report recently made by the Bureau of Labor Statistics. In 1907, the report shows, 245 men were killed or injured out of every 1,000 employed, while in 1917 the accident rate was reduced to 81 per 1,000. A further reduction would have been recorded in 1917 but for the dislocation of industrial processes to meet war needs, the report adds. The majority of accidents are declared to have resulted from defective machinery and the employment of inexperienced men.

WHAT OUR READERS THINK AND DO

RADIAL BORING FIXTURE

By J. J. McIntyre

MACHINING operations out of the ordinary are not plentiful, but the method described here for boring "round a corner" is away from the "beaten path."

The Lamson Conveyor Co., of Lowell, Mass., makes conveyor systems for carrying mail through underground tubes at Washington, D.C.

These tubes are 8 in. in diameter in the bore. All right angle turns are made on an 8-foot radius. It is the boring of these sections that the turn makes necessary that the attached sketches explain.

Fig. 1 gives the requirements that have to be met. Each section, of which there are four, comprises an arc of a little over 3 feet in length. Each section must be bored smooth on an 8-foot radius so that the mail carrier will not get stuck when it shoots around the corner.

After the four sections are bored they are drilled for bolt holes on the flanges and are later secured by bolts when assembled.

The ingenious set up represented by sketch Fig. 2 and attached photograph will help to make the method understandable.

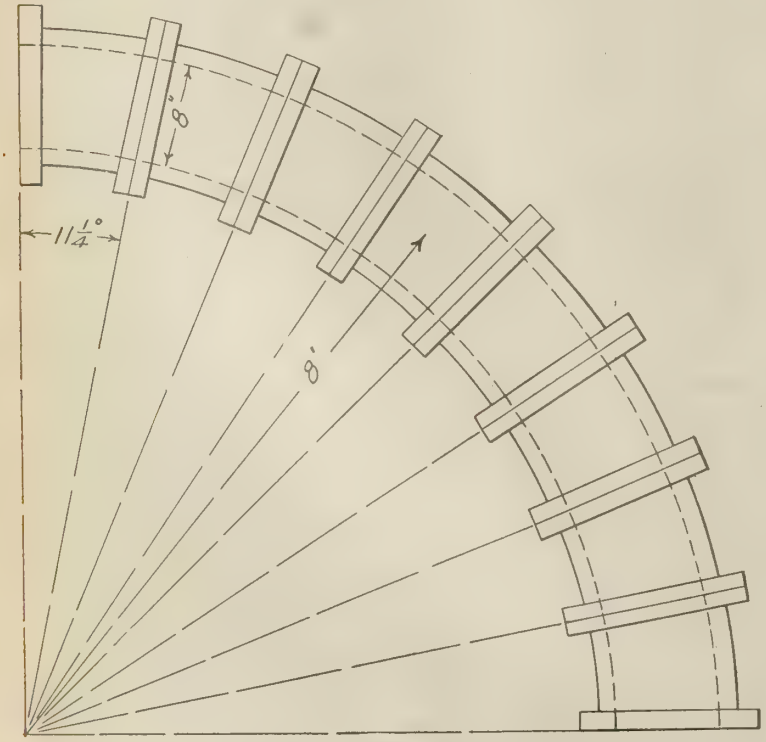
The method involved is that of machining Stephenson locomotive links applied to a horizontal boring mill.

The work-holding cradle is made to pass by the revolving cutter head on an 8 ft. radius by the aid of the longitudinal feed of work table which is free to move at right angles to spindle of machine—the crossfeed nut is removed to permit this.

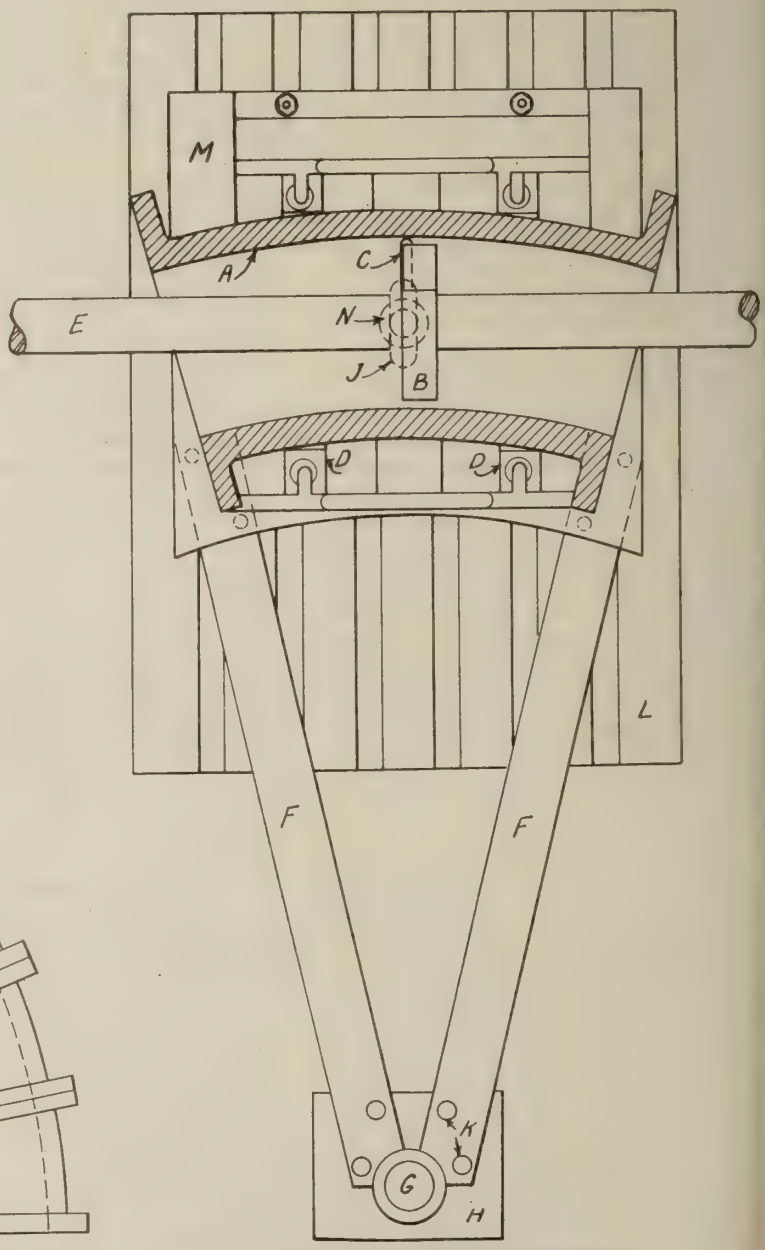
The two stops D hold the work A in the cradle. The cutter holder can be pinned or held by screws on shaft E.

Boring around a corner becomes a reality when the procedure described here is followed out.

When this operation was first proposed it was declared to be impossible of execution; however, the design proved workable and the above concern has accomplished the machining of a great variety of radii and different sized bores.



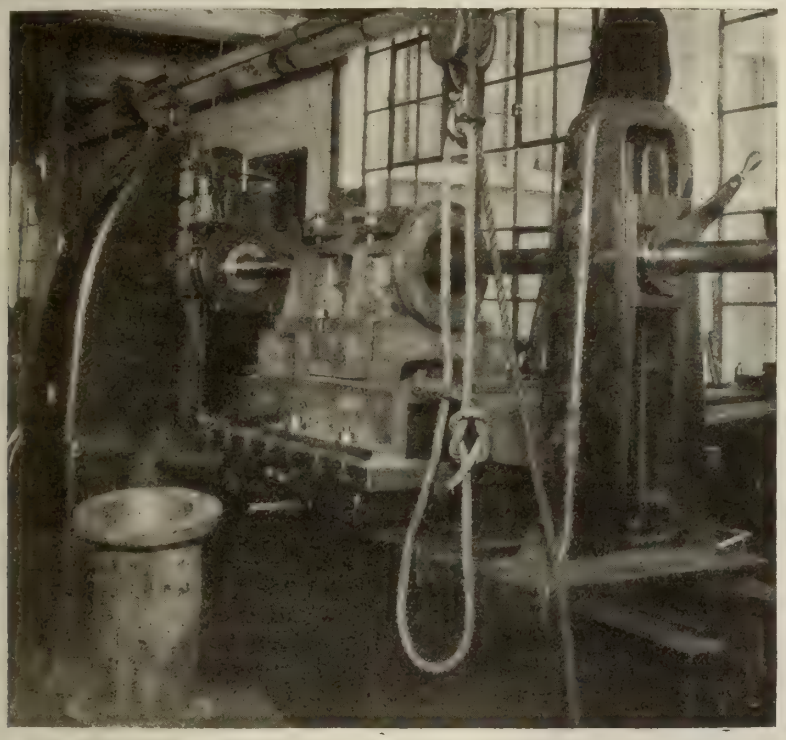
A VIEW OF EIGHT SECTIONS OF PIPE.



SECTIONAL VIEW OF ARRANGEMENT.

There is of course a certain relation between the size of hole and diameter of spindle that holds cutter holder. The smaller the diameter of spindle the shorter the radius that can be machined.

The centre of the 8 ft. radius is a bushing G that fits over a stud set in a concrete pedestal and securely held by melted sulphur. The plate H which holds bushing G has also attached to it the two arms F, which serve to move the



GENERAL VIEW OF THE FIXTURE.

work-holding cradle in unison with the longitudinal motion of table. The elongated slot J, in which works the shoulder stud N, serves to hold the cradle to the table, also by the aid of two bolts in back, the stud and two bolts are just loose enough to permit the cradle to slide without shaking.

The cutter C on spindle E revolves in the same plane—the work passing it on an 8 ft. radius. The proper distance of cutter from spindle head gives a perfectly round hole—this must be found by experiment—if the cutter is not set the correct distance from head an elongated hole will be bored.

DOUBLE SPINDLE ATTACHMENT FOR LATHE

By G. BARRET

The fixture, as illustrated, was made to fit a standard lathe, and equipped to turn two drums at the same time.

These drums are used on a textile spinning frame for variation of spindle speed.

This fixture is attached to lathe in the manner shown, and is worked by the gear A (see Fig. 1), which is made to screw on to the lathe spindle. This gear meshes with pinions B and C. These pinions are keyed to shafts D, which receive their bearings in a special bracket, E (shown at Fig. 2).

These shafts are made of cast iron and the driving plate is cast solid and machined all over, then bored to suit lathe centres.

The casting F on the tail stock is made pretty heavy and bored to suit tailstock spindle; also for two steel centre holders, G and H, which are shrunk into casting after being bored.

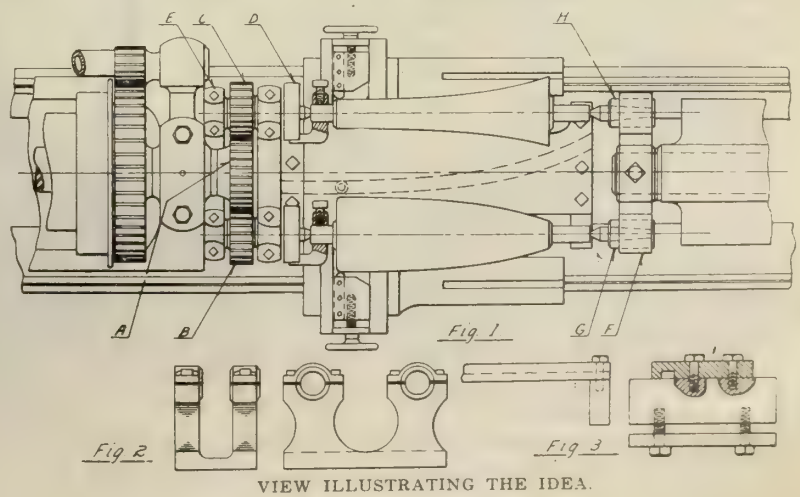
The cam plate is made to straddle the cross slide, so that the roller is free from castings while in operation. The method of fastening this plate to lathe is shown in section at Fig. 3.

The regular cross slide is removed and replaced by a special slide made to suit width of lathe and gears used for driving purposes.

As the adjustment for cuts is but small, the tool blocks are made to move by a small screw and handwheel, shown in drawing.

The front block is made high enough to allow the cutting tool to operate above centre, as the front drum is caused to revolve the reverse way by the gear and pinion, A and B.

This attachment not only produces two articles at once, but they are bound to conform one to the other.



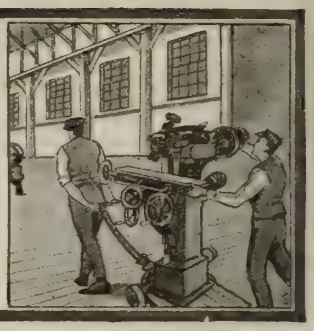
VIEW ILLUSTRATING THE IDEA.

Until lately a handsaw was one thing and a circular saw was another. But now an enterprising manufacturer has brought out a portable tool in the shape of a hand circular saw with electric drive, that should make sawing wood a pleasure. A ¼ h.p. universal motor is mounted directly on the tool, which has a handle like a regular handsaw and weighs only 12 lb. Two 3-in. saws are supplied, a rip and a crosscut, an eccentric mounting allowing adjustment for depth. The base, of aluminum, is grooved to slide on a track when a guide is necessary, such a track being part of the equipment. For ripping, the gauge slides along with the work. The saw blade is well guarded, so the tool is particularly adapted to manual-training school use. It operates from any lamp socket, direct or alternating current.

It is safe to predict that destructive forest fires will soon go out of fashion as a result of the many preventive measures being taken. Quite the latest is the forest balloon service. Experiments at an army balloon school have shown that the innovation is entirely practicable, and most efficient when in the hands of trained observers who can spot a blue wisp of smoke miles away. The observer's telephone will be an essential part of the system that will spread the fire alarm through the great forests.

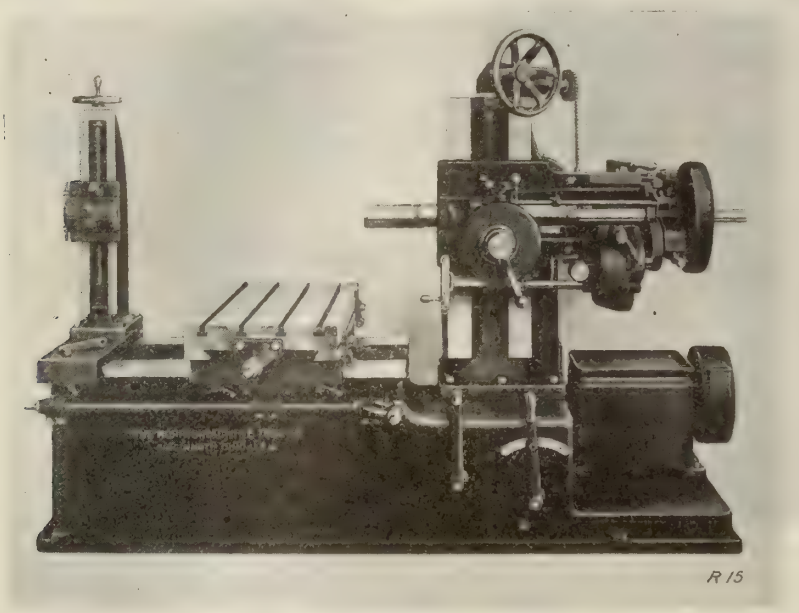
By hinging the ordinary carpenters' steel square, and providing a third strip, calibrated in inches and degrees, to connect the two arms, a folding square has been obtained that may be put to many uses. It may be clamped to lay off anything from a straight line to a right angle; it will divide any angle as desired, or it may even be extended, clamped and used as a yardstick. Besides making several instruments superfluous, the tool will fold into the carpenter's tool box, unlike the cumbersome rigid square.

DEVELOPMENTS IN SHOP EQUIPMENT



MORRIS HORIZONTAL DRILLING AND BORING MACHINE

THE horizontal drilling and boring machine shown in the illustration has just been placed on the market by the Morris Machine and Tool Co., Cincinnati, Ohio, in answer to a demand for a machine for drilling, boring, facing and tapping operations. The bed is of one-piece box section, ribbed internally, and runs down to the floor. The column is also a box section and is bolted to the base. The bed moves on ways arranged with taper gibs, adjustable for wear, and is counterbalanced, the handwheel at the top of the column serving to raise or lower the head. A steel scale graduated in sixteenths of an inch is set into the column, and this in connection with the micrometer column on the head elevating screw enables readings in thousandths to be obtained for the full travel of the head.



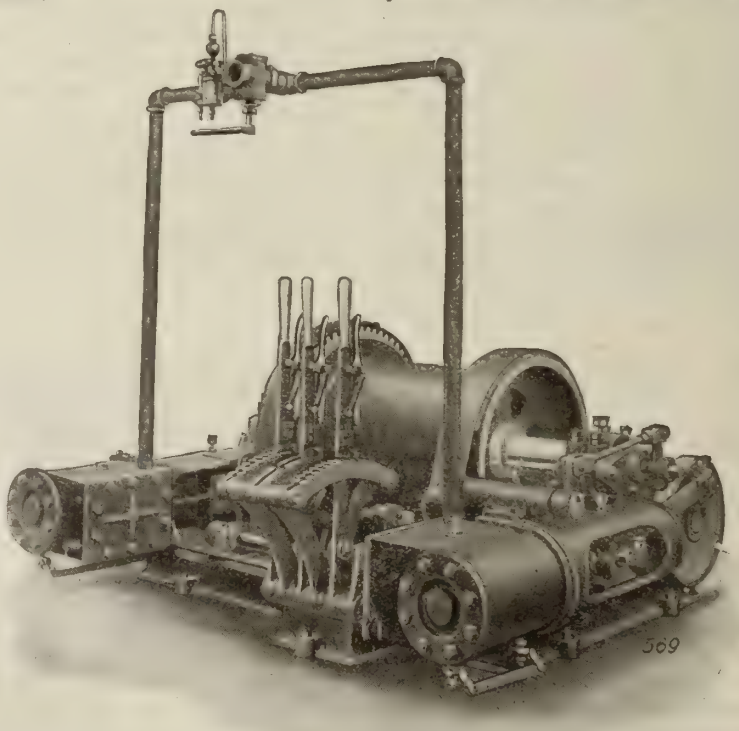
GENERAL VIEW OF THE MACHINE.

The spindle is of forged high-carbon steel ground to size, the thrust being carried on ball bearings. The sleeve is graduated and provided with a direct-reading depth gauge. The spindle drive gears are helical, this construction giving smoothness of action and the elimination of chatter. The back gears are of 3½ per cent. nickel steel, heat-treated and hardened, and are fully enclosed and mounted as a unit on the back of the head. The speed box is mounted on the bed with the gears fully enclosed and running in light grease. Six speeds are provided, controlled by two vertical levers on the front of the bed below the column. The lever at the left controls the double friction clutch and pulley shaft, and the other lever the three sliding gears. The feed box is also a unit mounted on the head, the gears being enclosed and running in oil. Six speeds are provided that can be automatically tripped at any depth within the traverse of the spindle.

The bearings throughout are of bronze arranged with oil chambers, the oil being drawn into the bearings by felt wipers. The machine shown is for belt drive, but motor drive can be furnished if desired. In this case a three-to-one variable-speed motor is connected to the lower shaft by one pair of gears or a constant-speed motor used in connection with the speed box.

A NEW LINE OF MEDIUM AND SMALL STEAM HOISTS

REALIZING the demand for medium and small-sized high grade hoists for mining and industrial purposes, the Canadian Ingersoll-Rand Co., Ltd., has placed on the market a line of such hoisting engines, embodying many new features of design which will commend themselves to those who are familiar with the usual construction of machines of this class. These improvements have been adopted as a result of their long experience in the manufacture of mining

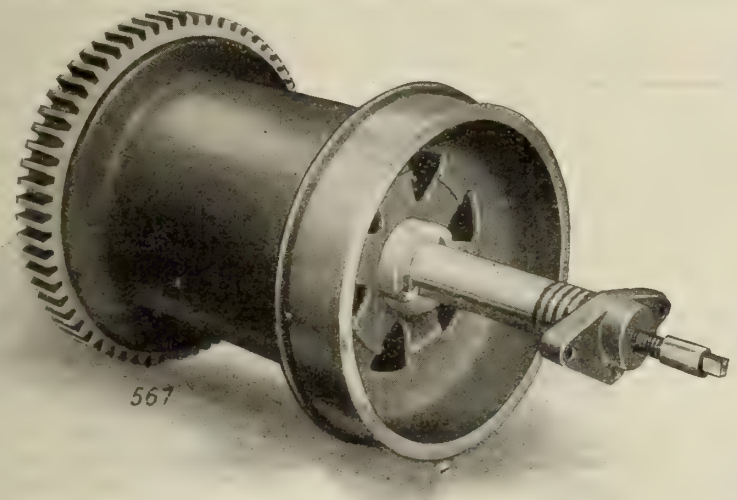


GENERAL VIEW OF 7 x 10 INCH. SIZE NEW "CIRCO" STEAM HOIST.

machinery and contact with users in all parts of the Dominion.

During the war this firm, which was one of the largest producers of shells and shell machine equipment in Canada, also built several hundred ship winches for the United States Emergency Fleet Corporation, the Federal Construction Co., the Foundation Co., etc. In starting to manufacture this new line of hoists they decided to design jigs and fixtures, and produce the engines in quantities, on the interchangeable part system which had proved indispensable in the rapid production of ship winches, and which has been one of the most important factors in the development of the modern automobile and machine tool industries.

While the company is ready at all times to make these hoists in larger sizes on special order, they are at present concentrating on the production of five sizes, ranging from 6x8 to 10x12 inches, with lifting capacities which are conservatively rated at from 4,000 to 10,000 pounds.



DRUM, DRUMSHAFT AND FRICTION OPERATING DEVICE OF NEW "CIRCO" STEAM HOIST

Some of the interesting points in the construction of the new Circo hoists are as follows:

The cylinders are cast separately from the side frames and are interchangeable, thus permitting one spare cylinder to be used on either the right or left hand side of the hoist, and doing away with the scrapping of the side frame of the hoist should one of the cylinders become accidentally damaged in some way.

The exhaust may be connected to either the top or bottom of the valve chest when the hoist is operated on steam as may be most convenient, the opening not in use being plugged. In case it should be desirable to operate the hoist by compressed air for any reason, this extra opening will be found valuable as it will enable the air to exhaust more freely than is possible with the old style valve chest. The cylinders are bolted to the side frames by strong turned studs and faced nuts, and the walls are amply heavy to permit operation at maximum pressure after reboring.

The interchangability of the cylinders is typical of the construction of the entire machine, every part being made to close limits, of the best materials and thoroughly inspected throughout the various steps of manufacture. As the hoists are so easily dismantled they should prove of special value in the case of isolated mines where the machinery has to be transported long distances by horses or mules.

The valves are of the plain slide type and are provided with an adjusting device which automatically compensates for wear without changing the original alignment of the valve rods. The valve rods are guided by carefully fitted babbitted cast iron guides attached to the side frames.

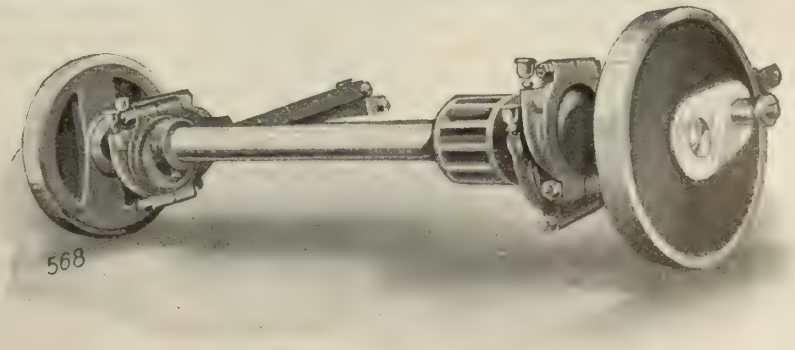
Locomotive type eccentrics are used, which are characterized by deep, flat rods bolted to the straps by turned bolts in holes which are reamed after the valves have been set, preserving the accuracy of the original setting. The eccentric straps are provided with large bearing surfaces and are adjustable for wear.

Connecting rods are of steel of the solid end type, having bronze boxes in both the crank and cross head ends, provided with wedges and screws for taking up wear. The screws are made adjustable in opposite directions, so as to insure approximately the same length in each rod. The crank pins and shaft are made of the best grade of open hearth hammered steel fitted to the cranks (which are of the counterbalanced disc type and finished all over) by hydraulic pressure. To insure accuracy the discs are turned and the crankpin holes bored after the disc has been pressed on the shaft.

The drum shaft bearings are bolted to the side frames instead of being cast integral as has been the usual practice for many years. A high grade of babbitt is used in these bearings and they are adjustable for wear. The drum is made of close-grained cast iron, turned, bored, and tested for a good running fit on the drum shaft. The bearings being bolted to the side frames ensures accurate alignment of the shafts and easy running gears. A heavy brake ring is cast on one end of the drum, and on the other a friction of the heavy V type which has proved its efficiency for this class of service. The brakes are so proportioned as to have a holding capacity considerably in excess of the maximum lifting capacity of the hoist, which is of value in case of emergencies, or should the hoist be overloaded. The drum driving gear and the pinions are made from semi-steel, a material which has been found well adapted for this purpose. The pinion is keyed to the crank shaft so as to permit its ready removal when necessary.

When reversing engines are ordered the hoists are fitted with a Stephenson type reverse gear, operated by a hand lever with quadrant and locking latch, which for ease in operation, is placed with the clutch and brake levers in a stand near one of the cylinders, thus grouping all of the control levers near the throttle, and within convenient reach of the operator.

This firm also builds two styles of hoist of smaller capacity than their new Circo hoists, which are known as the "Special" and the "Little Tugger" types. The former is of the diagonal reciprocating type, with trunk pistons, and the latter of the square piston or Dake type, both of which may be adapted to operate on either compressed air or steam. Being of rugged construction and requiring no special foundation they are readily moved from place to place, and have a wide range of usefulness where the requirements are within range of their capacity, which is 1,400 pounds in the "Special," and 1,000 pounds in the "Little Tugger."



CRANKS, CRANKSHAFT, ECCENTRICS AND PINION OF NEW "CIRCO" STEAM HOISTS.

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A Dangerous Thing To Do

MAKERS of boots and shoes are seeing to it that advance notices are being well circulated to the effect that prices of boots and shoes are going to "increase enormously."

The same is said of clothing. It is not at all necessary to stop at these two lines, but they are taken because reference to them has been made very recently in all sections of the press.

Just how long the public temper will stand for this sort of business is problematical. It is a safe guess, however, that every price boost has its effect on the public mind. How long can this sort of business continue without the strain becoming greater than the temper to stand it?

Manufacturers of all sorts, no matter if they are turning out the finished product, or semi-finished, or raw material, know as well as any other class of people that labor troubles are greater now than they have ever been. They know, unless they are too blind to admit it, that the failure of a strike to win does not mean that labor unrest has been cured. It means that it has been aggravated, and unless conditions change it will break out anew.

Ask many of the men who are strikers, or who have been, what is their complaint. Make allowance for the agitators and all the rest of that ilk, but see to it that you listen seriously and honestly to the man who would much rather work than strike.

What is his complaint?

Simply this: His expenses are increasing to such an extent that his wages cannot keep up. He is going behind. He has not the power to force all those with whom he does business to see that his dollar buys more than 52 cents' worth. All he can do is reach out and try and increase his earning power.

If boots and shoes "increase enormously," and if clothing is "much higher" the wages of men who have to buy these things will either have to "increase enormously" or go "much higher."

Now this is a very real and a very dangerous situation. Right now, when this whole continent needs production, needs a co-operative feeling between shop and office, needs fewer strikes and fewer lockouts—right now, we claim, it is nothing short of crime to upset and disturb the public mind with notices of further increases in the prices of those things that people must buy if they are going to live decently.

The man who will bluntly stand, in the face of all the labor unrest, and tell that his company's profits were 70 per cent., and that the business was not run for the glory of God, but for the shareholders, is lacking in his sense of appreciation of what citizenship really means.

The men who, as individuals or corporations, are responsible for sending out intimations of large increases in the necessities of life, are likewise barren of any indication that they realize the seriousness of their movement.

If men are going to continue to make the grabbing off of dollars the greatest job in the world, then we are going to have a tremendous heap of trouble, and it is very doubtful if it will be possible to shove in the peg at the stopping point we may think desirable.

To those in authority to-day, both in Canada and United States, we would say: "Gentleman, do not wait until the crowds parade the streets with bricks, or until they start to shoot; don't imagine these things are impossible. They are not. They are dangerously probable."

The man who is seeking, even after what we have passed through, to mulct the public, and to make it harder for men to live decently, is a menace to the peace of the country. The jail is the only place for him, and the sooner he is securely locked there the sooner can we go ahead and attend to our right and legitimate business.

Tinkerin' John

HE was just a sort of a handy man as he canted around the shop, and everything got done the same with a kind of a skip and a hop. He did odd jobs and just filled in whenever a chap was off, with the gout or rheumatiz or such, or nursin' a graveyard cough.

But they'd never give him a steady job, this tinkerin' chap named John, for fear that somethin' he turn or do would have a chance to be wrong. So he puttered around at this and that, and he worked from bell to bell, but Tinkerin' John could never do a particular job real well.

Oh, Ive seen a heap of tinkerin' Johns; you meet them East and West, and they couldn't, to save their bloomin' hides, name the job they could do the best.

They can tinker at this and tinker at that, and they're handy to have around, and they always stay on the ladder quite near where it hits the ground. And when there's a chance to go higher a bit, where pay is both thick and long, they never turn to give a chance to this here tinkerin' John.

Oh, I've seen a heap of tinkerin' Johns; you meet them up brown, and do it better than any chap what's campin' in the town. It's great to see the hand of skill linked up with a mind that's keen; that can take any job that comes along, the fat as well as the lean—and can do the thing bang up each time with never a flaw to spoil—it's chaps like them that help to bring real honor to honest toil.

But tinkerin' John, he's always here, just fiddlin' his years away; a sort of a handy chap to have and never one hard to pay.

There's a bit of a sermon here for you—don't dodge nor pass it along—if you want to get to the top of the heap don't be just a tinkerin' John.—ARK.

The Case from the Draftsman's Point of View

By One of Them

IT is quite refreshing in these modern days of camouflage to read an article such as written by one who signs himself "Engineer," on page 79 of your July 24th issue of CANADIAN MACHINERY.

Evidently this engineer is also a draughtsman, otherwise he could not discuss so freely and intelligently the ins and outs of the situation. There is a saying that, United we stand, divided we fall; so if I may be allowed a short space I will try to confirm and establish some of the points brought out by the original article, at the same time slipping in a few ideas of my own.

First and foremost, the writer remarks, "Yea, verily," to the suggestion of making a dividing line when speaking of draughtsmen, designers, detailers, and tracers. Why should the chap who has industriously stuck to his guns, studied evenings at home, or at school, and read up up-to-date technical literature, get a paltry two to five dollars more a week than the other fellow, who merely puts in his seven or eight hours a day, as the case may be? Do you blame the chap who has the ambition and initiative grouching at the unfair value placed on his ability?

Such a condition will remain in vogue just so long as employers continue to view their drafting staff as an organization, which, unfortunately, has to be put up with.

Some readers might not be inclined to agree with this remark, so, in order to prove at least one case in point, the following tale is told.

In a certain munition plant (never mind the name or locality), machinists were making on an average of 70c to 80c an hour; toolmakers were drawing as high as $1.00 to $1.25 an hour; hunkies, or to be more kind, general handy men, who had learned one particular operation on shell work, were drawing as high as $100.00 for the week's work of 10 hours in the day. Draughtsmen, all kinds, designers, detailers, etc., etc., were drawing from $90 to $125 per month, not per week. Why?

To heap coals of fire on their humble heads, as it were, this firm paid bonuses to all help mentioned, with the exception of the drafting staff. This, naturally, peeved the pencil pushers, who timidly requested enlightenment as to why such a state of affairs existed. "You fellows are 'non-productive'," was the laconic answer.

Do you blame the average draughtsman for having very thin hair on top and none in front if he must listen to such a tale. No wonder he pulls his hair out. Who designed the tools for this plant spoken of (?) Could the toolmakers, all respect given them, have designed, as well as assembled the dies, etc., required? Without the dies and tools could the handymen have turned out the shells? Yet the poor draughtsman was non-productive.

And now we will talk of the average apprentice, who is on his last stage of apprenticeship and about to become a full-fledged designer (?) all in his four years' experience.

Personally, when the writer had completed his four years he was only beginning to sit up and take notice, yet he had never slouched on the job, but tried to stick to his guns, studied evenings, read all possible literature, especially on tool and jig design, which was the particular field he was interested in. This brings us up to the point where we ask the question: "Is four years sufficient to make a draughtsman?" The writer's answer would be: "In four years you can make a draughtsman, but not a first-class designer, especially with the average system now in vogue."

The writer agrees strongly with "Engineer" that actual shop experience is absolutely essential to an apprentice if he desires to become an intelligent designer. The machine shop, tool room, patttern shop, and foundry, should all form a part of his training. He should now, at least, be a real designer if he has paid attention to all these branches. Of course, the old point crops up once more, that after he has mastered all these little trifles (?) he receives the usual average salary meted out to the slaves of the drawing board.

Readers might well say, "Why should an apprentice require such wide training?" To answer such a supposed question let us first suppose we are in the machine shop watching a planer hand at work on a large bed of a machine, one surface of which is being planed, not all the way through, but which must be stopped at a certain point. To those acquainted with the machine-tool trade it is not necessary to state that certain allowances must be made for tool clearance purposes, where the stroke of planer trips and reverses the direction of the table.

We, in imagination, see this planer hand stop his machine to chip out a clearance space for his tool, at the same time cussing draughtsmen in general for their lack of brains.

We now, still in imagination, go to the drafting room, where the chief has heard of the trouble spoken of. "Say, why didn't you leave clearance for the tool on piece so-and-so?" he asks the draughtsman responsible for the blunder. "I did," comes back the answer, "I allowed over ½ in. long and 1-16 in. deep. Wasn't it enough?"

If this chap, who we have been imagining about, had spent even one day on a planer, he would not have made such an apparent blunder. Of course, all are not like this, but the extreme example is mentioned to bring out the point that actual working conditions must be known before a designer can design to the highest point of efficiency.

Then again, by a good understanding of pattern making many a dollar can be saved in the drafting room. The same holds good for the foundry in regards to castings, which, I believe, will convince the doubtful reader, if any, that shop experience is essential in the making of a real honest-to-goodness machine-tool designer.

All these knocks and grumblings may sound as if the writer has a personal grouch at the business. To those who have read this far let it be said that the writer wishes he could work up a real sized grouch at the trade, sufficient to disgust him enough to leave it, but no—the fascination of the game is too much for him in spite of its disadvantages. Sometimes it seems as if the employers have secretly found this weakness out in the average designer, and play on it for all it is worth.

There is many a designer to-day who realizes only too well he is underpaid, and yet loves his job of creating things in general too well to leave it for something more lucrative.

Is there any remedy for this situation, or is it something which simply must exist?

To the writer's opinion there is a remedy, but one not likely to occur. The remedy that has been employed with so much success by the branches of the engineering trades outside of the drawing office, can be applied to those in it. That is, if they can get together and compose their own differences and adopt a real standard of efficiency with a minimum reward.

Coal for Bridgeburg.—Bridgeburg received its first coal for the season this week. Consumers are now being supplied, but coincident with this comes a warning from D. A. Coates, of the Provincial Natural Gas Co., that gas will be increased forty to fifty cents per thousand in September next. He also warns consumers to use gas for cooking and water heating only, as if they use it for house heating there will be a gas famine.

Worth-While Information From Many Points

In Chicago there is a bureau devoted to finding employment for men 45 years and over. It is estimated that over 20,000 men have thus found employment. In practically every case the concerns who hired the men came back for more, which proves you are not by any means a dead one at 45 and over.

* * *

Mixing dry colors in ready mixed paint with the ordinary paddle to get the desired shade is a decidedly tedious job and unless thoroughly mixed will be streaked and spotted when applied with a brush. A much quicker method of accomplishing the mixing is to use an egg beater, which also eliminates the skin and other foreign matter from the liquid.

* * *

The British Government has decided to offer a prize of $10,000 for a process of making a mixture of dehydrated coal tar with mineral petroleum oils suitable for Admiralty use as fuel oil. This will be awarded to the first competitor submitting a successful process which must be capable of ready and economical application without undue absorption of material and labor.

* * *

If two parts of copper and one of tin are mixed, it makes a white alloy which has a brilliant lustre, and will take a high polish. This alloy is known as speculum metal, the technical name for telescope mirrors or reflectors. The addition of 1 or 2 per cent. metallic arsenic makes the metal more compact and gives it a greater lustre and hardness, but renders it liable to be tarnished. It is nearly as hard as steel and as brittle as sealing wax.

* * *

Tracings may be very readily cleaned and pencil marks removed by the use of benzine, applied with a cotton swab. It may be rubbed freely over the surface without fear of injury to the lines drawn in ink, or even water colors, but pencil marks and dirt will quickly disappear. The benzine evaporates almost immediately, leaving the tracing unharmed. The surface, however, will be somewhat softened, and should be rubbed down with a little powdered talc or chalk before drawing more ink lines.

* * *

The metal layers of an engine that come in contact with one another rub off small articles of matter that combine with the lubricant used and form a dirty and sticky mess. The olein contained in the lubricant will in course of time form an acid, known as oleic acid, which has a deleterious effect on the metal parts that it touches, causing progressive corrosion. But luckily, it is only when its oleic-acid content exceeds one-quarter of one per cent. that an oil becomes unfit for lubricating purposes.

Celluloid articles can rarely be restored to their original whiteness if they have been thoroughly discolored throughout, but if merely superficially discolored, wipe them with a woollen rag wet with absolute alcohol and ether mixed in equal proportions. This dissolves and removes a minute layer of the surface being cleansed and lays bare a new surface. To restore the polish rub briskly with a woollen cloth and finish with silk or chamois. A bit of jeweler's rouge will greatly facilitate matters.

* * *

Electric current is available to most people, but it is not always apparent whether it is direct or alternating, 110 or 220 volts. A new pocket instrument, 4 inches long, 2 inches high, and 1½ inches wide, has a dial at each end in which the letters "A. C." or "D. C." appear, as the case may be, when the flexible cords are connected to the circuit. The voltage is indicated in the same manner. Provision is made for connecting to any kind of terminal, a plug being provided into which the posts on the wire-ends fit, for lamp-socket testing.

* * *

Lead poisoning is being investigated these days, because of its widespread existence in various industries. The Working Conditions Service, Department of Labor, has prepared, as a guide to industrial physicians, a schedule for the physical examination of lead workers, in which provision has been made for covering not only the typical manifestations of lead poisoning but also for bringing out the previous history of the worker, to determine whether hazards in other industries may have had an adverse effect upon the health. This schedule has been forwarded to districts in which lead poisoning in the pottery industry has appeared.

* * *

Regulations have now been laid before the British Columbia Legislature in which there is to be the provision that every winding rope shall be given a bath in hot oil before being installed; that every winding rope shall be recapped at intervals of not more than six months; and that no winding rope which has been in use for more than two years, or which has been spliced, shall be used for raising or lowering persons. No cable is to be used for more than two years for raising or lowering persons. In this country the Royal Commission on Mines in 1909 recommended that winding ropes should be allowed to be used for three years and six months. To prevent crystallization of chains it will be provided in the new B. C. regulations that all cage chains in general use shall be annealed once at least in every six months, and detaching hooks shall be cleansed and refitted once in every three months.

* * *

Word comes from the north-east coast of England of a vessel that has been designed to meet the need of an unsinkable ship. To accomplish this end the bridge of the ship is made watertight, and is made large enough to accommodate all the people and valuables on board. It is not made integral with the ship, but is attached thereto with easily-detached fastenings, and in the event of the hull being mined or torpedoed, the bridge will have enough buoyancy to float and sustain the weight of the immersed hull. The crew and passengers can remain in the bridge until taken off or towed into safety. If the hull through very bad weather becomes a danger to the bridge it can be released and allowed to sink, leaving the bridge afloat.

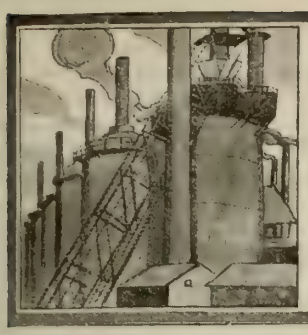
* * *

Stamping, drawing, and general press work on cupro-nickel can be accomplished as easily as with brass, according to the "Metal Industry." The metal can be more drastically treated, and stands greater reduction than brass, although more power is required than for working most alloys. Annealing cupro-nickel articles between operations is not advisable, chiefly on account of the great tendency toward fire-cracking and the production of excessive scale, which is very difficult to remove, and which, unless entirely eliminated, will ruin punches and dies.

* * *

Zinc water pipes which come in contact with mortar containing gypsum become in a relatively short time corroded and eaten through. Where the surface is wetted and quickly dried a protective coating of zinc oxide is formed, but where the contact with running rainwater is prolonged, such as in the case of roofing plates and gutters, energetic action must be reckoned with. According to "Building News," the most active agent of destruction is sulphate of lime. Zinc is energetically attacked by mortar containing gypsum sand, but only feebly by mortar containing limestone sand alone, or with an addition of gypsum. Lead, on the other hand, is energetically attacked by limestone alone and with an addition of gypsum, but only feebly by gypsum sand mortar. Both metals are strongly attacked by pure cement, but the destructive action is lessened by the addition of sand. Hence zinc should be put in contact only with limestone—carbonate—mortar, and lead only with gypsum—sulphate.

The Oil Works of Canada, Limited, have opened an office and factory at 29 Prince Street, Montreal, to manufacture the Hvid type of oil engine. M. L. G. Vincent is the managing director.



MARKET DEVELOPMENTS

Buying is on a More Generous Basis Now

Many Lines Represented in Inquiries and Business Now Being Booked—Prices Show a Decided Tendency Toward Higher Levels

THERE is a steady improvement in machine tools and supplies, and there is more general buying of steel and kindred lines. All through the summer season business has been showing a betterment, and there are indications that it is going to continue.

One thing seems to be quite certain, and that is that the lines represented that are buying now are well distributed, indicating a much more general activity than has been noted for some time. Several very good inquiries are in from the mines this week, while the railroads, automobile and agricultural industries are also buying.

Price lists for the most part remain the same. There can be no dodging the fact that the tendency is upward, and that a new list for certain kinds of steel products will likely be out before long. Warehouse interests in several instances have been advised to protect themselves against any outstanding quotations they have on present figures, and to close the business or cancel, as new lists are on the way.

It is become more evident daily that those who have stayed out of the market, hoping for better prices on machinery, or on raw material if such material came from the steel market—are in for a disappointment. The lower price has not arrived, nor is there any indication that it can for a long time to come. The fact that prices are stronger and likely to increase is a sign in itself that buying will be brisk for some time to come, fearing that further advances may be coming.

The scrap market shows even greater strength than it did a week ago. The scarcity of heavy melting is becoming more marked, and it may be that better prices will have to be offered to bring out any of this material. This same condition is developing to a marked degree in United States, where it is recorded that heavy melting is selling for more than pig iron, certainly an unusual situation, due, no doubt, to local conditions.

SELLING BECOMES MORE GENERAL IN MONTREAL MARKET LATELY

Special to CANADIAN MACHINERY.

MONTREAL, Aug 7.—While the outward signs of business do not appear to show any marked degree of activity, the reports that can be gathered from different sources would indicate that industrial life is gradually assuming a more staple character. A feeling of confidence seems to be taking hold more rapidly, but there is still much room for improvement. However, it cannot be expected that sudden developments should take place and while business is gradually increasing there are many who claim that existing circumstances prevent the carrying out of enterprises that would be possible if industrial conditions were more favorable. The steel trade here continues steady, but does not show the increase that has taken place in other directions. Machine-tool dealers are reporting comparatively good sales, and it is interesting to note the gradual increase in the enquiry for new equipment. Many users of machine tools have been waiting for an easier market, but are beginning to realize that there is a probability that quotations will go above the advances that have been made recently. Metals are still moving freely, and the situation in this respect would indicate that further activity might develop. Old material dealers that have been laying in stocks may reap the result of their foresight in the coming weeks, as the continued strength and good demand has stimulated buying to some extent.

Steady Growth in Metals

"The better demand that has developed for all metals during the past few weeks would seem to prove that business, generally, is returning to a more normal condition. Consumers that have apparently been waiting an easier market in which to purchase metal have been disappointed, and are now realizing that a marked decline in prices is very unlikely. In fact, our impression is that the present is a good time to buy, and many consumers are seeing the advisability of covering their requirements, not only for the present, but future buying is in larger volume. The present market is quite strong. We are not making advances this week on anything but tin; this market has become stronger and we are asking 59 cents per lb. Copper is going better, and also spelter. Brass mills are taking considerable metal." This statement by a dealer here, reflects the better tone of the market and the steady character of the business now being done. The dealer remarked that the German interests have not yet traded heavily in American copper, but believed that feelers were now out for considerable tonnage.

Better Machine-Tool Demand

That general business conditions are nearing a more progressive stage is shown by the optimistic reports of machine-tool dealers. The enquiries that are coming in are not for large single orders, but the sales are more numerous, due to the fact that a greater number of buyers are coming into the market. In the larger number of cases the purchasers are for one or two machines, but it is in the quantity of such orders that gives to the market the feeling of better times. As one dealer remarked: "We are looking forward to a good fall in respect to the sale of machine-tools. The fact that we are now selling more new tools would indicate that many are giving up the idea that prices on tools will come down. Second-hand equipment is still going good, but the sale of new machines is steadily growing. Grinding machines and millers are the best sellers." There is no doubt that many industrial strikes have affected the activity in machine-tools, but with settle-

ments being made or adjusted, the probability is that an increased demand for tools will follow.

Scrap Sales Still Good

Scrap sales for the week have been on a par with that of the previous week, but the inquiry is good and the consumers are buying freely, but sales for future needs are seldom made. The better business at present is being done in the non-ferrous scraps, steel purchases being on a comparatively light basis. "Our sales for the week have been good," said one dealer, "and the outlook appears satisfactory, but many consumers hold up their hands when future buying is suggested. We have had a few fluctuations in prices during the week, but those listed are nominally correct."

BUYING BECOMES MORE GENERAL NOW

TORONTO.—A large number of industries are represented in the purchases that are being made this week. There has been a gradual improvement in this respect, and each week sees lines coming into the buying list that have been absent for some time. This may be due to business that is pressing, or to the fact that the market all around for machinery, supplies, or steel is stronger, and increases are being made.

The scrap metal market continues strong, and is still marked by a real and acute scarcity in some lines, particularly heavy melting steel. There does not seem to be much of this material to dispose of, and there is also a scarcity of machinery scrap, the demand for this latter being brisk, with the offerings correspondingly poor. There is some speculation as to whether much of these "wanted" metals are being held back for still greater increases. It would appear that there should be more of this material in the country. It may be that labor is not available to bring it out, or that the price is not tempting enough, but the fact is that it is not making its appearance.

The Steel Market

Seamless steel tubes are about due for an increase, although the new prices were not announced yet, but the warehouses are calling in quotations that were made some days ago, and which have not been closed with. The increase will probably be about 2½ per cent., and the only good reason that CANADIAN MACHINERY can find for it is that there is a great demand for tubes just at this time, and many of the mills are booked well into the future.

Sheets have gone up at the mills in some places, although there has been no increase at the warehouses. Advice received by CANADIAN MACHINERY on the sheet situation this week states: "We believe that all of the mills are entirely sold up for third quarter delivery, and we know of no manufacturer as yet quoting jobbers for shipment throughout the fourth quarter." The same advice goes on to state that "Further advances in prices both upon sheets and tin plates may be expected within the next few days."

There seems to be a difference of opinion in the market regarding the plate situation. Advices from very reliable sources continue to refer to plate as the weak spot in the steel situation, while others point to the fact that operations are gradually approaching some 70 per cent. capacity at many of the mills. There was one order for some three hundred tons that went to a Cleveland mill a few weeks ago, and the impression seemed to be abroad then that the selling agency in this country had broken the 3.65 price. However, it turns out now that such was not the case, and the business was secured because the mill in question had a more advantageous lake and rail rate than the Pittsburgh mills. The price was 2.65 f.o.b. mill. One dealer this morning was willing to stake his reputation on the fact that a higher schedule for plate would be announced inside of a month. This hardly seems likely, as there is a very large plate capacity in the steel centres now, and it can take on a lot more business before coming to the point where capacity will be in sight.

Drills Are Cheaper

A ten per cent. reduction was announced in Canadian drills this week, high speed and carbon. Buying of supplies is improving. Dealers in this district are already beginning to get some of the daily breakage in the way of business, and this has been entirely absent for several months in most shops, as there has been little work.

POINTS IN WEEK'S MARKETING NOTES

Instead of dropping off, as is usual in the hot weather, buying at the steel mills is actually showing an increase.

A ten per cent. reduction is announced by makers of Canadian drills.

Steel tubes, seamless, advance slightly, about 2½ per cent.

Machine shop supply trade is improving as more shops are coming into active operation following settlement of the strike.

The Steel Corporation is not favorable to price advances this year, although the steel market all through is much stronger.

Several independent mills have advanced prices $2 a ton on black sheets and $4 a ton on galvanized.

Dealers who bought shell steel scrap some weeks ago above the market figures at that time can now turn around and sell at a profit. Most of them are "sitting tight" and little heavy melting is coming into the market.

SCRAP BROUGHT MORE THAN PIG

THE scrap market shows great activity, with higher prices all round. No. 1 cast scrap has sold higher than pig iron in one district. Following are reports from U. S. points:

PHILADELPHIA.—Steel scrap has been quiet in the domestic market, but a very large sale of heavy melting steel for export has been made. 2,000 tons stove plate was sold to a New Jersey interest at $21, delivered.

BOSTON.—Dealers are buying any lots that come on the market, and prices are high. The slight falling off in buying by consumers had no effect in lowering prices. Machine shop turnings have brought $10.50 delivered, and $21 has been offered for malleable scrap.

NEW YORK.—Fairly good demand in all grades, with prices steady and tending upwards, is the market condition here. $21 delivered has been reported for heavy melting steel for Pittsburgh, but the local price is around $15.50 to $16 f.o.b. New York.

PITTSBURGH.—Dealers are holding stocks for higher prices, it is pretty well believed, and heavy melting steel may see $25 before long. Some small orders have been closed at $22 for this grade. Machine shop turnings are quoted at $14.50 to $15.

BUFFALO.—Heavy melting steel is in active demand, and dealers are holding their stocks. Outside districts are offering higher prices than local consumers will meet. $22.50 delivered has been offered for heavy melting by valley mills.

CLEVELAND:—Trading is better, and both scrap iron and steel are showing strength. Heavy melting steel has advanced $1, and is quoted at $21 to $22. Demand for all grades of scrap is strong, steel rails and car wheels going up about 50 cents.

CHICAGO.—No. 1 cast scrap has sold here at higher prices than pig. $28 per ton has been secured for this grade for fair sized quantities. Re-rolling rails and stove plate are almost unobtainable. Railroad offerings are light.

CINCINNATI.—Most grades are firm, greater activity having been noticed in the cast iron and steel scrap market lately. There is some talk of a scarcity of scrap should the melt increase. The ordnance department is expected to offer some scrap shortly.

ST. LOUIS.—Dealers are piling up material in their yards, and are not keen about selling at present prices. Re-rolling rails have gone to $28.50 and $29 per ton. Stove manufacturers are operating at a good capacity, and prospects for fall and winter are good.

USED TOOLS WERE NOT MUCH BELOW PRICES THAT WOULD SECURE NEW ONES

Special to CANADIAN MACHINERY.

NEW YORK, August 7.—For the first time since the financial position of the railroads became so critical, one of the roads, the Cumberland Valley, a subsidiary of the Pennsylvania, has come into the market with an expenditure of about $100,000. Orders were placed with the Philadelphia dealers for about 25 tools. The list was issued several months ago, and the trade has begun to think, that, like many other recent railroad inquiries it would come to naught. The purchase is encouraging in that it shows the need of the railroads for new and modern equipment, and further shows that funds are forthcoming when the Railroad Administration is definitely persuaded that the need is an urgent one.

In the absence of large lists in the East, business in machine tools during the past month has been confined largely to small lots, but it appears from the reports of some sellers as to July business that the aggregate of these is better than has been supposed. In fact quite a fair proportion of machine-tool buidlders are now in a fairly comfortable position as to orders, while a few are downright busy. Compared with pre-war records a very satisfactory machine-tool business is being done; the fact is, however, that many machine-tool plants so greatly increased their capacity during the war that they are figuring on total capacity rather than on the business they did prior to war times.

Auto Business Buying

Some of the largest orders continue to come from the automobile industry, as, for example, a $500,000 contract for automatic machines received by a New England builder from a Detroit automobile company, but thereis an increasing amount of business from other industries. A Chelsea, Mass., shipyard has bought a list of plate-working machines; a New York concern has expended $50,000 or more for plate-working machines and tools for a ship repair plant, and new equipment has also been purchased by the Bethlehem Shipbuilding Corporation for its Sparrows Point, Md., yard. The Bethlehem Steel Co. has been an active purchaser of various kinds of equipment for its steel plants. Sentiment in the steel trade clearly indicates that, barring labor troubles, this fall and winter will be unusually active.

The Export Business

Export business is in fair volume. Chinese and Japanese inquiries have appeared in the market, chiefly for large tools for railroad and shipyard work. The Standard Oil Co., of New Jersey, had revived an old inquiry for about 75 tools for Rumania. The list was issued months ago, but no action has been taken. It is expected, however, that purchases will now be made very shortly.

August starts out under good auspices. The trade has just had a good month, and if customs of former year prevail there should be increasing activity as the autumn months approach. Certainly sellers are on a firmer foundation for there appears to be no prospects of further weakening of prices, but on the contrary the indications point the other way. Some prices have been advanced and others are likely to follow. Lathe manufacturers have advanced prices from 10 to 15 per cent.; a manufacturer of plate-working machines has advanced about 20 per cent. and a turret lathe maker has put an increase of about 17 per cent. into immediate effect. Some of the prices paid for used tools at an auction sale held recently at the plant of the Standard Aircraft Corporation, Elizabeth, N.J., pointed to a strong condition in the market as they were within close range of the prices now quoted on new tools of the same types.

Some of the second-hand machinery dealers who attended the sale were quite content to look on as the prices being bid by manufacturers who wanted the tools for their own use were above what any dealer could pay and resell at a profit.

BIG PRODUCERS ARE OPPOSED TO HIGHER STEEL PRICES FOR THIS YEAR

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., August 7.—Despite the fact that now is the middle of the midsummer period, almost invariably a very dull one in the steel market, trade conditions are visibly improving. The volume of buying keeps up, if indeed it does not increase, and prices show a stiffening tendency. In this they reflect the heavy bookings all the mills have done. Shipping orders in July, including new orders and specifications against contracts, made a total tonnage fully double the shipments in the month. The only undesirable feature of the market situation is that the buying is poorly distributed among the products. There is too much buying of some products, more than the mills can take are of, and too little in others. Thus the lap weld departments of the pipe mills are sold up to the end of the year and are making five-month delivery promises, while the plate mills are operating at less than half capacity and the rail mills are doing practically nothing except by way of producing rails for export.

Steel mill operations are now estimated at fully 75 per cent. of capacity, based on ingots produced, or perhaps a trifle more. The output for July as a whole will probably show somewhat over 70 per cent., against 67 per cent. in June, and 54 per cent. in May, the month of lowest production.

Steel Price Advances

While members of the steel trade do not disagree with each other as radically, and certainly not as vociferously, as members of the United States Senate, there are very marked divergencies of opinion as to price policies. Some producers are committed to making every price advance that seems feasible, in other words, doing everything "they can get away with," while others regard it as much wiser, and likely to prove much more advantageous in the long run, to hold prices precisely where they are. More than a month ago the United States Steel Corporation, without making any formal or official statement, allowed it to become distinctly known that it was opposed to any steel price advances, this year at least, and that is still very positively the Steel Corporation attitude. It is not alone in this position, there being at least one or two large independent producers that share the view. Just why some independents are so anxious to advance prices is not made altogether clear. They can hardly believe that the steel market is capable of advancing indefinitely from the present level, and present prices are certainly highly profitable to any mill that has full operation. Prices cannot be advanced in any line where there is not full operation. Those who believe in holding to present prices contend that the period of market activity will be prolonged thereby, that price advances will bring the end sooner, and they also contend that an advancing steel market is almost certain to result eventually in higher wages. Mills might have to pay higher wages before they had completed orders taken at the old prices. Rather satirically they suggest that if mills know this, as they should, they had better advance wages at once and then they would have a good talking point—which they have not now—for advancing prices.

The advance in wire products noted a week ago, as made by several producers, is now practically general, in this way, that the majority of independents have advanced their prices while the other independents as well as the American Steel & Wire Company (Steel Corporation) are practically out of the market since they are booking business only from regular customers, and then in quite restricted fashion. This makes the market quotable at spreads, 3.00c to 3.10c on plain wire and $3.25 to $3.50 on nails.

Pipe mills have not advanced prices generally, following the example of the Wheeling Steel and Iron Company, which advanced butt weld 2½ points and lap weld 5 points on July 10, but it is reported that a number of mills are taking business at premium prices, i.e., their regular quotation is the open market but for the delivery that the buyer wants there is a higher price.

Several of the independent sheet mills

have advanced prices $2 a ton on black sheets and $4 a ton on galvanized, and in some quarters it is predicted that eventually all the independent mills will be on the advanced basis. The leading interest has made no advances and shows no sign of doing so, but when importuned by automobile interests to cover them for the first half of 1920 it has made some sales at $5 a ton advance. Apparently it proposed this advance in the first place in order to discourage the automobile trade from buying for so late a delivery.

For all the important steel products there is as much demand as 30 days ago except in some cases where mills are filled with contracts already, and then they are getting good specifications, while in some lines there is heavier demand. Lettings of fabricated steel contracts are making a heavier tonnage almost every week, and are now running at approximately the capacity of the fabricating shops. There is increased demand for merchant steel bars from nearly all customers, and the cold drawing shops are particularly good buyers. They are running full on sizes of 3-in. and less, but at low rates on the large sizes. Forging billets are now moving in a moderate way, mills having sold several hundred tons in the past fortnight, and they state they are obtaining the full March 21 price, which is $51, Pittsburgh, or $12.50 over the regular price of rolling billets.

The pig iron market is strong in foundry grades, but Bessemer and basic are a trifle unsteady. The condition is natural as foundries are running fairly well and want their particular demands, while for Bessemer and basic there is never so much demand in the open market unless the mills are operating very nearly at capacity. There are many large steel interests that make enough iron themselves for ordinary requirements but when they are particularly rushed they have to buy some merchant iron to fill in.

Scrap

The advance in scrap prices, particularly heavy melting steel, has brought the market to a very interesting stage. Sales of United States and Canadian Government scrap were made to dealers in the past few months at prices above the current market, the dealers putting the material into stock, knowing that they could make a profit some time. Now, with ordinary melting steel advanced to $21 to $22, and with special grades like shell steel commanding considerably more, up to $25, those dealers can sell at a fair profit. If they did not sell the market would advance somewhat more as little scrap is being produced, but if any selling movement should start the dealers would probably all fall in line and weaken the market in short order. One dealer in Pittsburgh has sold 25,000 tons in the past few days, but this has not precipitated any general movement, at least thus far. The largest holder is a Cleveland dealer, who has been "sitting tight" up to date.

MONTREAL NOTES OF THE WEEK

Commissioner Ross of the Montreal Administrative Commission has notified that body that he will propose the adoption of a by-law amendment to increase tax on water consumption in breweries, hotels, manufacturing establishments, and other large business houses. The present tax is at the rate of 4 per cent. per year, and the increase, if adopted, will bring this up to 6 per cent. per year, an advance of ½ per cent. per quarter.

There will be no exhibit of the Canadian manufacturers at the Athens fair on September 15. It has been decided the notice was too short for anything but a Government exhibit, but arrangements are being made between the Government and the Canadian Manufacturers' Association for future exhibits to be made at short notice in connection with the Dominion's bid for European trade.

An interesting sight is to be seen in the Montreal harbor just now, in the steamer War Dream, a development of the shipyard of Harland and Wolff. The design was intended to deceive the German U-boats, but unfortunately were not put into commission until the war had ceased. The sides of this vessel, instead of being rounded, are straight slopes, which permits of a plate being easily inserted in case of damage. It gives the stern the shape of a V. She is taking on freight for England.

The Federal housing scheme has again been revived in this district. A further and definite step has been taken in the appointment of a technical commission of three members, who will be associated with Dr. Emile Nadeau, provincial director of housing. The three members that have been mentioned for this work are: F. G. Todd, Montreal, architect; Wilfrid Lacroix, Quebec, architect; and Theo J. Lafreniere, Montreal, sanitary engineer. This commission will act under the direct supervision of the provincial director, and their task will be to draw all the plans for all the municipalities for the various classes of houses that will be built from the $7,000,000 allotted to the Province of Quebec of the $25,000,000 that the Federal Government is loaning for the purpose.

W. J. Sutcliffe has been appointed assistant auditor of freight and telegraph receipts of the Canadian Pacific Railway. He will succeed J. Bonner, who has been retired on a pension. Mr. Sutcliffe has been in the services of the C.P.R. for the past 19 years, starting in the same department in which he is now assistant chief.

Regular passenger service between the ports of Montreal and Havre commenced on the first of this month, when the steamer "California" of the Compagnie Canadienne Transatlantique docked here with 280 passengers. The "California" is a vessel of 9,000 tons, and will leave on her return trip on the 7th inst.

There is every likelihood that a fuel commissioner may be appointed to negotiate with the Americans for the protection of Canadians in respect to the supply of coal for the coming fall and winter. An informal gathering of manufacturers in the Montreal district has taken place to discuss this matter, with the result that a resolution was passed for the petitioning of Ottawa for the re-establishment of a fuel controllership.

After forty years of continuous service with the Grand Trunk Railway, W. D. Hannah, chief fuel inspector of the company, has been retired on a pension. On the occasion of his retirement, Mr. Hannah was presented with a purse of gold by his fellow employees in the stores and purchasing departments.

Heavy rains during the early part of last week was the cause of serious floods in the vicinity of St. George and Beauceville, Quebec, and caused the River Chaudiere to rise considerably, and fears are entertained that floods similar to those of last year will occur should further storms follow.

HAVE PURCHASED THE BIG TRENTON PLANT

Briggs & Turivas, Chicago and New York, dealers in iron and steel scrap and salvage, have purchased from the Imperial Munitions Board of Canada the entire plant and property of the British Chemical Co., Ltd., located at Trenton, Ont. A Canadian corporation under the name of Briggs & Turivas of Canada, Ltd., and capitalized at $1,200,000, has been formed, with main offices in the Canadian Pacific R. R. Building at Toronto, Ont., and a branch office at Trenton, Ont. The property consists of 255 acres and fronts the Trenton River, a navigable stream. Three trunk line railroads enter the plant. The British Chemical Co. was formed and built during the war at an outlay of approximately $8,000,000. The equipment consists principally of two separate and complete sulphuric acid chamber plants, sulphuric acid concentrators, a nitric acid plant, an alcohol rectifying plant, two refrigerating plants, a smokeless powder plant, a complete high pressure fire system, two miles of narrow gauge trackage with electric locomotives and trucks, two boiler houses, electrical equipment, warehouses, storage tanks, administration building, etc. The new owners are as yet undecided as to the extent of the operations of the plant for the future, but it is expected that the powder manufacturing apparatus and equipment, and possibly the nitric acid plant, will be dismantled and disposed of, allowing the sulphuric acid plants to stand.

The Pressure Proof Rings, Ltd., has been incorporated with a capital stock of $100,000, divided into 1,000 shares of $100 each, the head office to be in Sherbrooke, Que. The company will manufacture piston rings, packing, etc.

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May we explain to you their many advantages and the convenience of their control.

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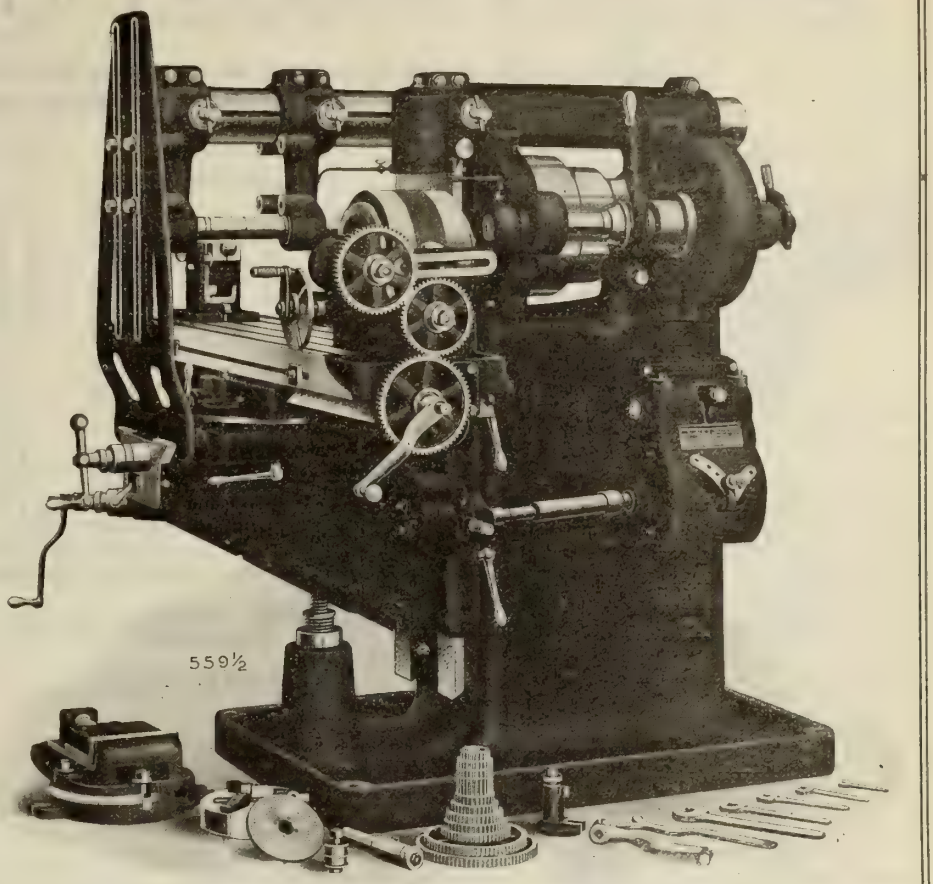

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SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	.....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$27 00	$27 00
Electro copper	26 00	27 00
Castings, copper	26 00	25 00
Tin	57 00	58 00
Spelter	10 00	10 00
Lead	7 25	7 00
Antimony	10 50	10 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$17 00	$13 75
Copper, crucible	21 50	18 00
Copper, heavy	21 50	18 00
Copper wire	21 50	18 00
No. 1 machine composition	18 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	16 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	9 00	7 00
Medium brass	10 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	5 00	5 25
Tea lead	4 00	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	14 00	13 50
Shell turnings	7 00	6 00
Boiler plate	14 00	11 00
Axles (wrought iron)	20 00	20 00
Rails	20 00	13 50
Malleable scrap	16 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe wrought	11 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd. brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

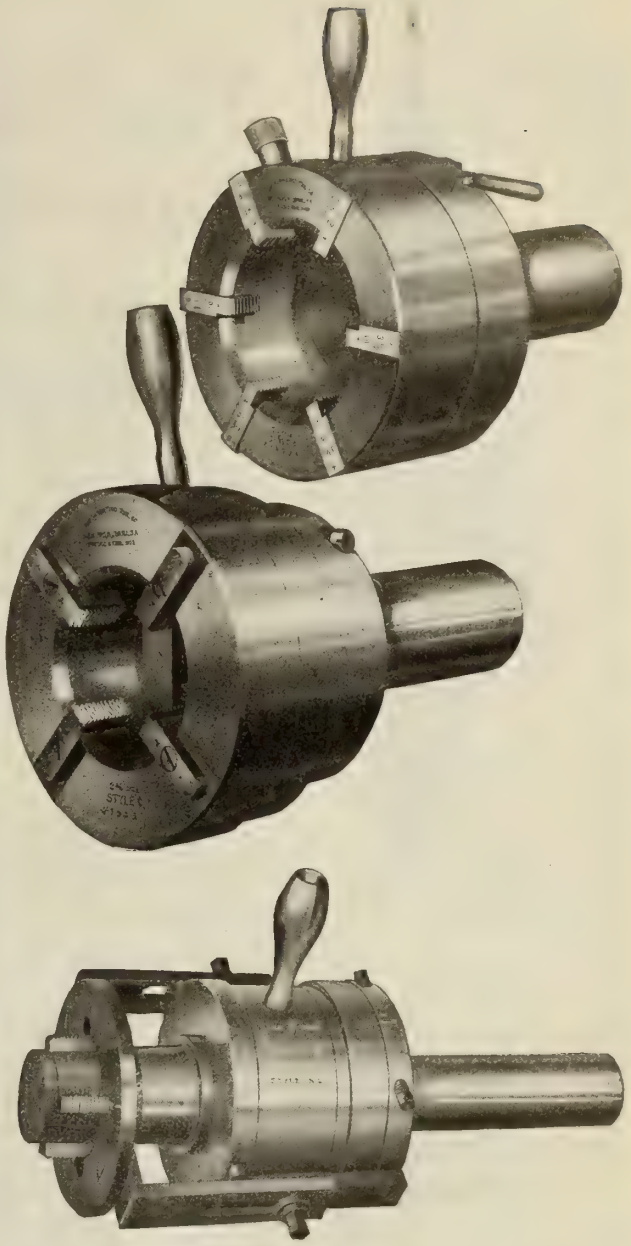
POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

A Good Boon

"Geometric Tools are a boon in our business. Always reliable and sure of turning out a class job; in fact, I don't know how we could secure a decent output without them."

This is what the Works Inspector of a London (England) shop says. He adds that they are making screw and small parts for air craft, and have quite a lot of Geometric Dies in constant use.



Because of the fact that Geometric threading tools are "a good boon" in the thread cutting business, the majority of screw machines and turret lathes are equipped with Geometrics.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN, CONN.

Canadian Agents:

Williams & Wilson, Ltd., Montreal.
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

For any thread, any size, any pitch—there's a Geometric Collapsing Tap or Self-Opening Die Head. Be assured there is one to meet your particular threading need—whatever it may be. Ask us.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sies up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40 plus 10
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus 10 to	40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head, 28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S.	.....	7 50
Premier, 10¾ oz.	.....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	.....
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium carbonate	...
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

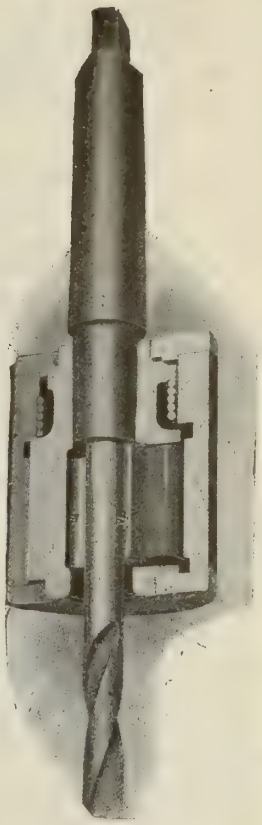
Prices per lb. unless otherwise stated

Use Wahlstrom Chucks

POSITIVE DRIVE
AUTOMATICALLY
SELF-CENTERING
NO SLIPPAGE

Aikenhead's

Wahlstrom Attachment



Speed Up Production in Your Machine Shop

Consider the merits of an automatic chuck that keeps the spindle of every drill press running without a second's stop.

Calculate the money value of the minutes saved by the Wahlstrom chuck each time a tool is changed.

The Wahlstrom chuck—not the operator—centres the tool perfectly. It enables the operator to make tool changes in less than two seconds. Spindle of machine never stops. And there is absolutely no delay because of tool slippage. For no tool gripped by the jaws of a Wahlstrom chuck can slip. If the resistance on the tool is great, the holding power of the jaws increases.

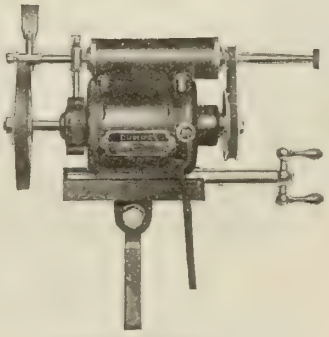
Send for Bulletin

Aikenhead Hardware Co., Limited

17, 19, 21 TEMPERANCE STREET - TORONTO, CANADA

Aikenhead's

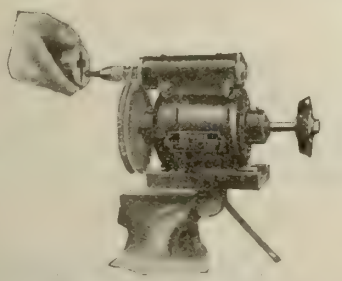
DUMORE ELECTRIC GRINDERS



Invaluable for Accurate Grinding of Tools

These grinders are designed to meet the requirements of the manufacturer who desires a light grinder which will do accurate work, and at the same time does not wish to invest in a large and more expensive tool. The Dumore grinder can be quickly attached to lathes or other machine shop equipment. Their scientific construction entirely eliminates vibration and work done is accurate and free from chatter marks.

Write to-day for descriptive literature.



EQUIPMENT C

Button Die Grinder. Speed, 50,000 R.P.M.

EQUIPMENT A

General Tool Room use. Includes high-speed internal spindle. Reach, 2 inches; speed 30,000 R.P.M.; motor spindle speed, 10,000 R.P.M.

EQUIPMENT B

Deep Internal Work, 10-inch extension arm. Speed, 10,000 R.P.M.

AIKENHEAD HARDWARE, LIMITED

17 TEMPERANCE ST., TORONTO

LOOKS LIKE A HIGHER 1920 PRICE

THE market for pig iron keeps active and prices firm. Buying for 1920 delivery has taken place, at much higher than present levels. Following are reports from various United States points.

CHICAGO.--Repeat orders have been a feature of the market here, one customer purchasing 1,500 tons after making a purchase of 1,000 tons to carry him over the year. An order for 15,000 tons for first half of 1920 has been booked by a leading seller, at $2 per ton over present prices. Most of this was malleable.

BOSTON.—Boston agents report sales amounting to 7,000 tons, not including a 5,000-on order booked direct at furnace for the Crane Co. Some business has been placed for last quarter and first quarter of next year combined, but there is little enquiry for 1920 business. 1.75 to 3.25 silicon iron has been sold for $32 furnace last quarter.

NEW YORK.—The market is strong, with enquiry very active, and sales good. The export market is being canvassed, but high freight rates and unfavorable exchange are against business. A large interest closed an order for 10,000 tons, and is said to be in the market for another 10.000.

PITTSBURGH.—Steel making and foundry grades are being enquired for, and No. 2 foundry has been sold at an advance of $2 per ton, for last quarter. Only one booking for next year is reported, for 8.000 tons railroad malleable distributed between three or four furnaces. Low phosphorus is quoted at $39 to $40 valley furnace for copper-free iron.

PHILADELPHIA. — Business continues brisk, and prices tend to stiffen. The Worthington Pump Co. is enquiring for 7,000 tons for last half and first half. The Roebling Co. bought 10,000 tons among different makers, the price being from $26.75 to $27.75 delivereed.

BUFFALO.--The furnace capacity still available is rapidly being booked up. Next year's business is not being looked for. Enquiries during the week have been brisk, and actual bookings amounted to about 25,000 tons.

CLEVELAND.—Selling has been quite lively, in some cases the business for July having exceeded June, which was a very heavy month. One interest reports sales amounting to 20,000 tons, some for first half next year delivery. Makers generally are not inclined to book business for next year.

CINCINNATI.—Business seems to have been enlivened by the firm stand taken by makers in regard to price. Southern iron has been sold for $28, Birmingham, but $26.75 for prompt shipment on 1.75 to 2.25 silicon can still be obtained.

ST. LOUIS.—Foundries are consuming a large amount of iron, but are mostly covered up to the end of the year, and producers are not offering iron for next year delivery. The signs are for an advance in prices.

BIRMINGHAM.—Furnaces here are being blown in, and production will be increased as fast as possible. Inquiries are good, and makers believe that the output can be sold with little difficulty, and prices will increase.

THE FERRO-ALLOYS

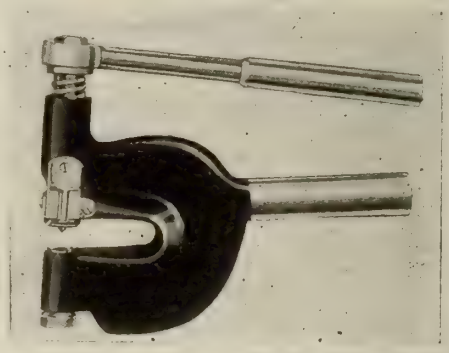
A large industry has grown up within the last fifty years, most of it within the last twenty-two years, which furnishes steelmakers alloys of iron with some of the rarer metals. It is quite commonly known that the addition of these metals to steel greatly improves its qualities for special purposes. These ferro-alloys were originally made in crucible, cupolas, or blast-furnaces, but are now made principally in electric furnaces, and their manufacture is now one of the principal electric-furnace industries. They are of great importance to the steel industry. The steelmaker uses them for one of two purposes: (1) As reagents to take oxygen out of melted steel, and thus ensure sound, solid casting. For this purpose ferromanganese, ferrosilicon, and ferroaluminium are employed. (2) To add to the steel a small or large percentage of the rare metals, ferromanganese, ferrochromium, ferrotungsten, ferromolybdenum, ferrovanadium, ferrotitanium, ferrouranium, ferroboron.

Melted steel, just before it is taken from the furnace, always contains some dissolved oxygen (like the dissolved gas in charged soda water). The addition of a small amount of metal with a high affinity for oxygen removes this element, and makes the casting sound. Manganese (1 per cent. or less) is the cheapest and most generally used reagent; silicon (½ per cent. or less) is more powerful, but also more expensive, and is often used to supplement the action of the manganese; aluminium (0.1 per cent. or less) is still more powerful and expensive, and is used in very small quantities as a final addition to complete the action of the manganese and silicon. All steelmakers use one, two, or all three of these reagents—manganese and silicon in the form of ferro-alloys; aluminium more often as the pure metal, though ferroaluminium is sometimes used.

When a sufficient quantity of the rare metal is added to the steel, it acquires properties different from plain carbon steels, deoxidized by manganeses, silicon, or aluminium. Thus, a very tough, hard steel, such as is used in mining and grinding, burglar-proof vaults, etc., may be made by the addition of 12 to 14 per cent. of manganese. Chromium (2 to 4 per cent.) makes a very hard tool steel; tungsten (15 to 25 per cent.) makes a high-speed tool steel, which, while red hot, cuts iron. Vanadium (0.1 to 0.5 per cent.) makes a very strong steel, which resists shock extremely well, as when used for automobile axles; titanium, uranium, and boron also impart valuable properties. Every one of these materials produces some specific result; sometimes two, three, or four are used for producing a specific combination of special properties. Some of these materials cost 20s. per pound, and special steels produced up to 10s. per pound.—"General Electric Review."

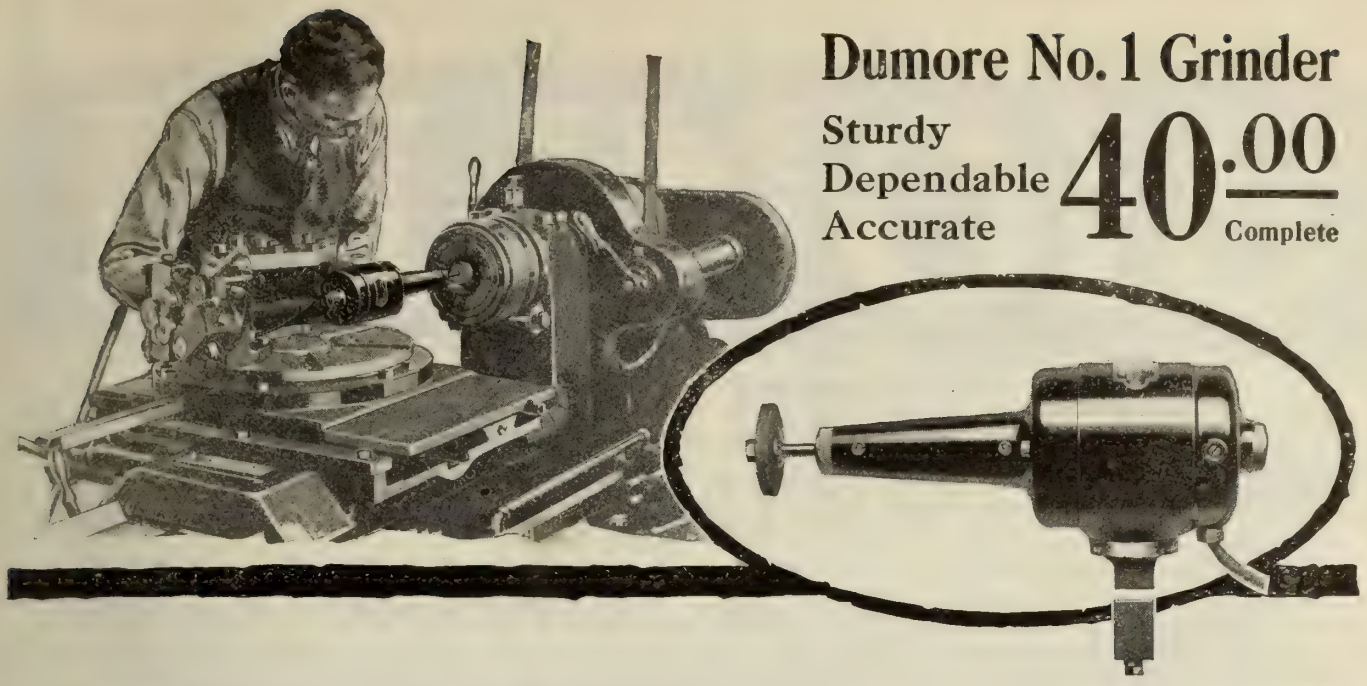
KOCH HAND PUNCH

THE tool which forms the subject of the following description is known as the "Jiffy" hand punch, and it is a recent product of Paul W. Koch & Co., 19 S. Wells St., Chicago, Ill This tool is adapted for use in pla ces where space is limited, and its capacity is for punching holes 5-32, 3-16, 7-32, and 1-4 inch in diameter, in metal up to 10 gage. It will be apparent from the illustration that the punch is provided with a deep throat, and it is equipped with an automatic stripper which is so designed that it does not prevent the operator from gaining a clear view of the punch and work. Several sheets can be punched at one time with this tool. A crowned punch of the floating type is used, which directs power to the center and is so arranged that it will not twist and turn in operation, so that there is little danger of breaking the punch. Also, it is stated that the hole is clean-cut and that there is no tendeny to leave a burr on the metal, half turn of the lever being required to drive it through the metal. This tool is 9-12 inches in length and weighs five pounds.



GENERAL APPEARANCE OF THE PUNCH.

In the power house of the Interborough Rapid Transit Co., New York, is what is claimed to be the world's greatest prime mover. This is a cross compound turbine, consisting of a high pressure and two low pressure elements, the capacity of the whole unit being 60,000 kw. continuously, and 70,000 kw. for one hour. The floor space occupied is 52 x 50 feet, and the height about 19 feet. The high pressure turbine receives steam at 205 lbs. gauge and 150 degrees superheat, and the exhaust is divided equally between the two low pressure turbines. Each element operates at 1,500 r.p.m., driving a direct connected generator of 20,000 kw. capacity, three phase, 25 cycle, 11,000 volt.



Dumore No. 1 Grinder

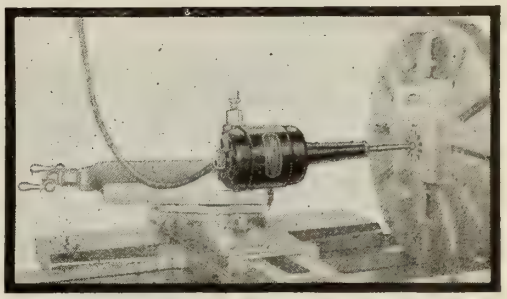
Sturdy
Dependable
Accurate

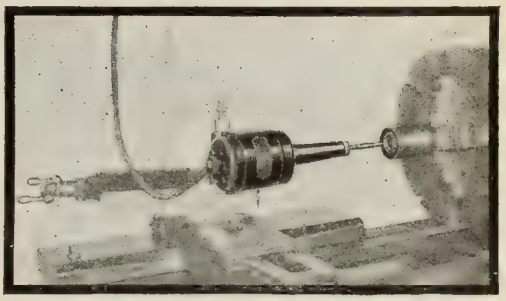
40.00 Complete

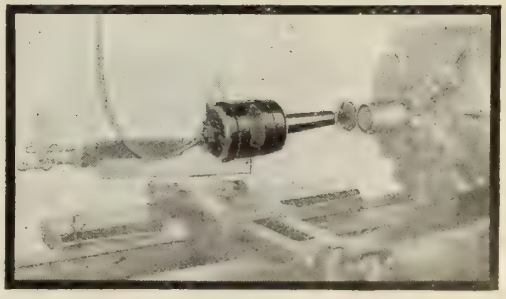
THERE is no doubt of the value of the **Dumore No. 1 Grinder.** No other tool, at or anywhere near its price, can give a greater amount of actual, accurate daily service.

Because jigs, dies, gages, bushings, etc., will always warp during tempering, thousands of mechanics use the **Dumore** grinder to bring these tools to as close limits as .0001″. Such a degree of accuracy is possible solely because the **Dumore** is perfectly balanced throughout and operates at the correct cutting speed.

We have some very interesting literature for men facing grinding problems —write for it.







WISCONSIN ELECTRIC COMPANY
2914 SIXTEENTH STREET
RACINE, WIS.

DUMORE HIGH SPEED GRINDERS

Brief Bits of News From Many Sources

A considerable vein of pitchblende, from which radium is extracted, has been discovered near Buckfastleigh, in southern Devonshire, England. The ore yields over 26 per cent. of uranium oxide, and the lode will be developed immediately.

* * *

A very effective dust catcher for surface grinders consists of an iron bracket, to which is bolted a broad piece of sheet metal, with a water pan or trough built on at the bottom. A piece of heavy cloth, or burlap, is hung over the sheet-metal surface, long enough to reach down into the water trough. The burlap soaks up the water like a wick, and is always kept wet. Emery dust and small metal particles thrown against it are caught and kept from flying around the shop.

* * *

When the race of an automobile ball or roller bearing works loose, the surrounding metal may become so badly worn that even a new race fits loosely. In such a case the worn surface can be built up with solder until it makes a tight fit, and the bearing can then be forced into position with a hardwood punch. Loose dust caps can be fixed in the same manner.

* * *

Wealthy tourists to St. Moritz, the world-famous Swiss winter and summer resort, may soon be able to make the trip from Zurich in one hour, instead of the seven or eight now required by the railroad. Capitalized at about $100,000, a company has been formed to back the 90-mile airplane line, and has already announced that service will be inaugurated during the year with tickets selling at about $100. Many will doubtless be willing to pay this price, if for nothing but the matchless view of mountains, lakes, and glaciers.

* * *

Liquids and solids do not ordinarily mix, and the idea of combining coal and petroleum to make a new fuel sounds rather chimerical at first. Yet that very thing has been done, and successfully, by pulverizing the coal so finely that it forms a colloidal, or suspended, mixture with the oil. This compound passes freely through all regular oil pipes and burners, so that it can be used for power and heat without equipment change; and it generates a greater heat value than oil alone. Coal dust, passed through a 200-mesh screen, mixed with a little tar in the oil, leaves no deposit even after months. Use of the new fuel in place of fuel oil on sea and land would save millions of barrels of oil a year.

* * *

A newly developed steel that seems particularly desirable for dies, taps, and other cutting tools, changes its form so little during the hardening process that castings have the appearance of smooth forgings, and need almost no machining. The texture is uniform and close-grained, and castings may be subjected to high temperatures without scaling. Because of this heat-resisting property it is claimed that the walls of annealing boxes may be made much thinner with this material, and that the original shape and weight is retained through many more firings than when malleable or cast iron is used.

* * *

Pottery ware which is to be subjected to kiln fire is placed in rough clay boxes, called "seggars." Ordinarily made by hand, these articles can now be turned out by an electrically-driven press, which increases the capacity of a man and helper about tenfold. The operator places a piece of plastic clay in the mold, pushes it under the press, and moves the lever forward. The screw brings the top plunger down, and presses the seggar; after which the machine reverses itself and comes to a stop at the proper height. Pulling the mold back, the operator pushes out the seggar by means of the geared ejector. The helper carries the finished product to the drying room, from which it is delivered ready for use.

Two men could make by hand about 60 or 70 seggars, but it is claimed that with this machine the output may go as high as 1,000 a day. Much coarser materials may be used than with the hand presses.

* * *

A novel kind of lock nut, which cannot be accidentally loosened on the bolt, but is readily removed with a wrench, has been designed by a woman inventor. A recess in the top of the nut is shaped at the bottom like a shallow spiral stairway. The nut is turned onto the bolt, and a short cotter pin is inserted through a slot in the bolt. Tightening the nut engages the pin with the notches or "stairs" of the recess, which position it holds until forcibly disengaged. With the cotter pin removed it acts as an ordinary nut.

* * *

THIS is the season of the year when the $10-a-week chap makes a sensational splash at the $40-a-week summer hotel.

* * *

IN CHICAGO blacks are bowling over the whites, and the whites are asking the blacks to leave the premises feet first with a bunch of flowers on top of the heap. Sort of putting things down in black and white.

* * *

MANY people spend a great deal of time wondering why the Government, or some other organization, does not go ahead and deal with the cold storage. We heard of one man who spent three days going around getting signatures to protest against storing eggs. The same amount of effort, together with a crock and some water-glass, would have given this well-purposed chap a cold storage plant of his own, and would have made the doings of the cold storage people a matter of indifference to him.

* * *

UNITED Mine Workers of America have revoked the charter of District 18, taking in Alberta and British Columbia, because officials have joined in with the One Big Union. Officials of District 18 have for years been eager to grasp onto and embrace anything and everything in the line of radical action. They have succeeded now in getting themselves alienated from one of the most powerful and sanest labor organizations in the continent.

HAVE YOU LOTS OF FRIENDS?

By H. J.

If you have, then all is Jake, as the saying goes.

If you have not—then something is out of kilter.

Is this your trouble?

Are you inquisitive, and keep sticking your nose into other people's business?

Do you repeat all the gossip tales you hear of?

Did you ever haw! haw! at some religious belief you've heard suggested?

Do you carry a grouch around with you?

Have you ever knocked someone, simply because they possessed some quality you haven't got yourself?

Do you tell your troubles, and speak of your aches to every Tom, Dick and Harry that you meet?

Do you try to convince everybody that this old world is all built wrong, and that you've been lost in the shuffle?

If you have spilled any of the above remarks from time to time—no wonder your friends are few.

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REAMERS

None better can be made.

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Woodward and Warren Aves.

A. C. Towne, Inc.
17 W. Swan St., Buffalo.

S. J. Pfaff
Pioneer Bldg., St. Paul.

Rose Tool and Supply Co.
111 Market St., Pittsburgh

Louis G. Henes
75 Fremont St., San Francisco.

Title Insurance Building,
Los Angeles.

Indianapolis Office
616 Fletcher Sav. & Trust Bldg.

New York Office
141-145 West 36th St.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

OBITUARY

The death of Capt. Murphy, at the age of sixty years, is reported from Kingston. Capt. Murphy was a son of the late James Murphy of Kingston. He was for many years a pilot on the St. Lawrence.

Mr. Robert M. Cox, of Liverpool, England, and Ottawa, died at his Ottawa residence, 381 Stewart street, in his 83rd year. He had been interested in the lumber trade in the Ottawa district for the past 45 years, and was an esteemed member of a large circle of friends. He visited England for part of each year since he started in business, forty years ago.

PERSONAL

A change in the management of the Union Carbide Company, Welland, is announced. Mr. John White, who has been manager of the Welland plant since its inception five years ago, goes to the company's plant at Sault Ste. Marie as manager. He will be succeeded by P. F. Gormally, at present assistant manager at the Soo.

The Senior Trade Commissioner for Canada and Newfoundland, Mr. G. T. Milne, is being transferred to Havana, Cuba, as commercial secretary to the British Legation in that city. No announcement has yet been made as to his successor.

TRADE GOSSIP

New Waterworks for Chatham.—The present water system of Chatham being unsatisfactory, it has been decided to build a new plant at a cost of $250,000.

Newfoundland Imports Free. — The last restrictions on imports into Newfoundland have now been removed, by flour being restored to pre-war conditions.

Algoma Steel to Extend—The Algoma Steel Co. will spend several hundred thousand dollars in making extensions to their mills, to enable them to manufacture structural steel up to 32 inches.

English Firm For Hamilton.—The firm of Perrits & Spencer, Bury, England, will build a factory in Hamilton at an approximate cost of $600,000. W. J. Westaway has been appointed engineer for the building.

Purchase Coal Handling Plant.—The coal handling plant on the Canadian National Railway terminals at Halifax, has been purchased by the Nova Scotia Steel & Coal Co. from the British Ministry of Shipping.

Chatham Buys Asphalt Plant.—The city council of Chatham has bought an asphalt plant at a cost of $18,000. The plant will be delivered in about five weeks, and work will be immediately started repairing the streets.

Military Hospital Expands.—The Ontario Military Psychiatric Hospital is to have five additional buildings. Two will be for recreation, one for isolation, one for tuberculosis and one for the vocational re-education branch.

New Smelting Plant.—The forthcoming industrial congress at Calgary will consider the establishment of a smelting plant near that city, the new process of smelting by electricity to be employed. Considerable interest is being displayed already.

Strike at Lauzon.—About 900 men at the Davey Shipbuilding Co.'s plant at Lauzon, near Quebec, walked out on strike. The men belong to the International Union, and the strike is for recognition of the Union. The yards employing National Union men are still operating.

To Inaugurate Sunday Service.—The Grand River Railway Co. will commence a Sunday service covering all points on the line. This will give a two hour service connecting Kitchener and Hespeler, and the C.P.R. at Galt will give connection with the Lake Erie and Northern Railway to Port Dover.

Electrifying Montreal Harbor.—The Montreal Harbor Commissioners have awarded contracts for material required in the electrification of the railways on the wharves. Work will be started as soon as material is available. A generator set will have to be installed, the rails bonded and poles and wires erected.

Collingwood Strike Over—The Collingwood Shipbuilding Co.'s men, who have been on strike for the last two weeks, have returned to work. The men went out owing to the dismissal of some of their number who failed to turn to on July 12, in defiance of a notice that any man absenting himself on that day would be dismissed.

Openings in South Africa.—There are good opportunities for Canadian manufacturers to get markets in South Africa, according to Mr. S. P. Morgan, of Cape Town, who is now in the country. South Africa imports nearly every line of goods that Canada produces.

Credit Company Appoint Agents.—Messrs Weber Bros., McLeod block, Edmonton, have been appointed agents of the Commercial Credit Co. The company, which is an old established organization, is engaged in financing sales of tractors, trucks and autos on a time basis.

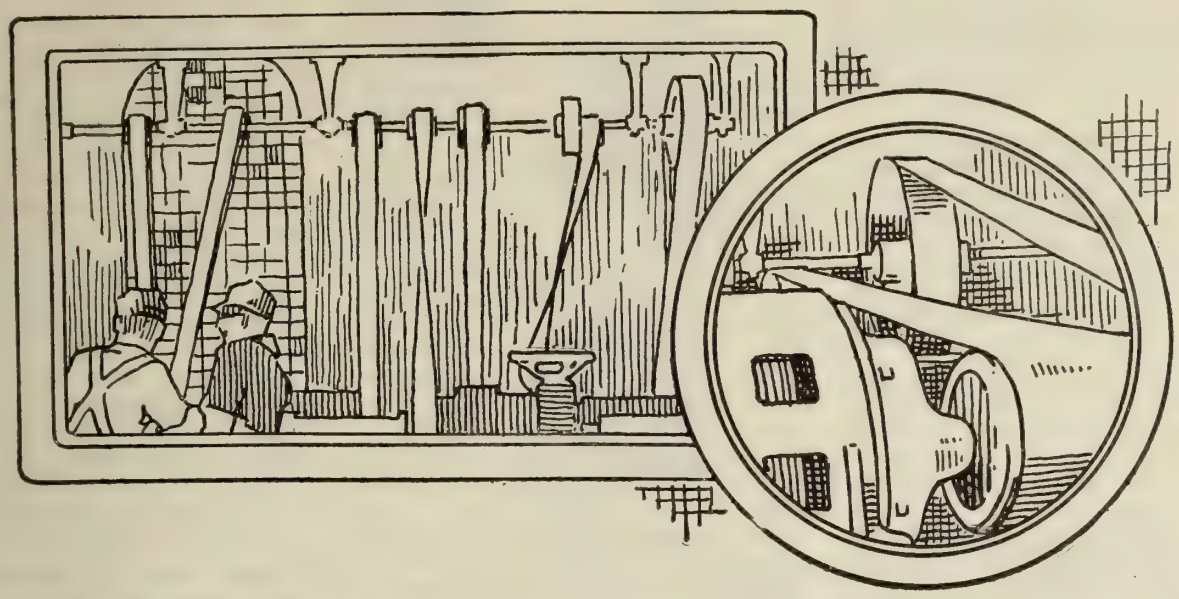
Manufacturers Want Controller.—At a meeting of manufacturers from the Montreal district, the appointment of a fuel controller to negotiate with American authorities for the procuring of coal for Canada at reasonable prices was discussed. The feeling was that the coal situation was very serious, and if factories were not to be shut down next winter, every effort should be made to get coal now.

New Industry for Hamilton. — The Carr Fastener Company of Boston, Mass., are to open a factory in Hamilton. This firm are said to be the largest manufacturers of fasteners in the world. The Hamilton branch will be known as the Canadian Carr Fastener Company, and will be probably capitalized at $250,000. Two and one-half acres of land on Gage avenue have been purchased.

U. S. Firms Looking to Canada.—A large number of American firms have been communicating with the Alberta Industrial Congress, Calgary, on the subject of locations for Canadian branches. Among these are the National Cycle Manufacturing Co. of Bay City, Mich.; the Marchant Calculating Machine Co. of Oakland, Cal.; Edgar M. Moore Co. of Pittsburgh; Cardwell Machine Co. of Richmond, Va., and many others.

Heavy Shot at Chippewa.—A dynamite charge that cost between $4.000 and $5,000 took place at Chippewa recently. The amount of dynamite used in the blast was in the neighborhood of ten tons. It was used in opening up a large section of rock in the forebay of the new development canal above Queenston.

Increase in Receipts.—The customs receipts on imports from the United States show a large increase in the last month, according to the figures issued from the Customs Office. The actual amount for the month is $3,083,243, against $2,698,513 for July 1918. Mr. J. H. Berram, collector for the port of Toronto, stated that it was the biggest month ever known at this season of the year.



Low Up-Keep Cost of Dominion Friction Surface Belting

Cost of maintaining equipment in the average plant is seemingly so small when compared with other costs that it is seldom considered seriously, but when totalled at the end of five years, represents a far greater expense than actual necessity demands.

Maintenance of belting is in itself an important item, because each repair means idle employees, idle machines and less production, the total cost of which is often greater than you would pay for better belting.

Dominion Friction Surface Belting is built for "service first" that its long, continuous performance may eliminate the necessity for repairs and replacements.

But it gives an added service in conserving power—the rubber that goes into it is a special friction compound that prevents practically all slipping on the pulleys even under quick load changes.

Our belting experts are ready to help lower your maintenance costs on belting and can suggest changes that will lower your production costs.

A phone, wire or letter to our nearest service branch, places at your disposal, without obligation or charge, not only their services but the entire facilities of the oldest and largest rubber organization in Canada.

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DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

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Service Branches

Halifax	Fort William	St. John
Winnipeg	Quebec	Brandon
Montreal	Regina	Ottawa
Saskatoon	Toronto	Edmonton
Hamilton	Calgary	London
Lethbridge	Kitchener	Vancouver
North Bay	Victoria	

To Use Dominion Lumber.—The heavy stocks of lumber purchased by the British Government during the war are to be shipped over to England as fast as space can be provided for them. The material will be used for house building, the lack of houses being one of the principal causes of industrial unrest.

A Fortune in Oil.—Mr. Kenneth Johnston, a former Sarnian, but now of Buffalo, is the inventor of a lubricating grease, which has been taken up by one of the largest oil companies in the United States. The sum paid to Mr. Johnson for his invention is said to be $600,000. He is a veteran of the South African war.

Strike is Settled. — The Polson Iron Works have affected a settlement with the various unions employed by them, an dthe me nhave returned to work. The men withdrew their demand that the company should recognize the Marine Trades Federation and the Marine Council. A 47 hour week has been conceded and wages raised.

Better Output for Sydney.—The output of coal for the month of July, as shown by the records, has increased at Sydney, C.B. The highest output was obtained by the Florence Colliery with a figure of 16,000 tons, the Princess Colliery coming next, with 13,000 tons. Scotia had a decrease but this was

Newmarket Boiler Explosion.—At the inuest into the boiler explosion which caused the death of five persons recently in Newmarket, evidence was given to the effect that the water used in supplying the boiler was high in sodium carbonate. The analysis of the water coincided with that of the water in other districts where the embrittlement of plates by the action of sodium hydroxid has occurred. The water is from an artesian well on the premises. The ton supply and ahe Office Specialty Supply Co. suply were found to be free from sodium carbonate.

Locating in Hamilton.—The Carr Fastener Company of Boston, Mass., the largest manufacturers of metal fasteners in the world, have completed arrangements for the immediate establishment of a large Canadian branch of their industry in Hamilton, Ont. A two and a half acre site in the heart of Hamilton's manufacturing district has been purchased, and building operations are to be commenced at once. The Carr Fastener Company is capitalized at a quarter of a million dollars, and the buildings to be erected will cost in the neighborhood of $100,000. The Canadian plant will give employment to upward of 200 hands almost immediately, and it is expected that this number will ultimately be increased to 400 or 500. The Carr Company are the manufacturers of the "Lift the Dot," "Durable Dot," "Voltex Dot" automobile fasteners, as well as the "Common Sense" and other lines. In addition to supplying the Canadian automobile and other trades from Hamilton it is the company's intention to have its Canadian plant supply the export trade. Building operations are to be rushed, and the company expects to be manufacturing in its Hamilton plant before December 1.

Municipal Power for Port. Colborne.—Port Colborne decided by a vote of 141 majority to purchase the distribution system of the Ontario Power Company in Port Colborne.

Record Ship Deal.—What is probably the largest sale of ships ever recorded took place when the U. S. Shipping Board sold one hundred steamers built on the Great Lakes during the war for $8,000,000. The purchasers were the Anderson Overseas Corporation of New York. Delivery of the ships will be commenced early in August and proceed at the rate of six or more per week till completed.

Longest Bridge in the World.—A bridge is under consideration between Windsor and Detroit, which will be the longest in the world if erected. The length would be 2,500 feet, 1,000 feet longer than the span of the Brooklyn Bridge. Mr. W. H. Adams, the engineer for Detroit, informed Mayor Winter that the cost of such a suspension bridge would exceed the cost of a tunnel.

Parrsboro.—The schooner, Jennie V. Merriam, was launched from the Port Greville yard of George Wagstaff. She is a fine tern schooner of 454 tons register and is classed for thirteen years in Bureau Veritas. She is fitted with power for hoisting sails and anchor, and is lighted throughout with electric light. Greville for England. Mr. Wagstaff has another schooner under way for other owners.

C. M. A. Meeting.—The Canadian Manufacturers' Association, Maritime branch, held a meeting at Bathurst with President Angus McLean in the chair. A delegate in the person of H. R. Thompson, the secretary, was appointed to attend the trades congress at Calgary next month. It was decided to approach the Provincial Government with a view to having a similar congress for the Maritime Provinces next year. The Trade and Commerce Department will be requested to arrange for visiting British journalists and other British delegates visiting Canada to call at the commercial centres of the Maritime Provinces. through having three or four idle days due to an electrical breakdown.

INCORPORATIONS

The Merchants Realty Corporation has been incorporated with a capital stock of $2,000,000 in 20,000 shares of $100 each, with head offices in Montreal, to carry on a general real estate business.

The Canada Stoker Co., Ltd., has been incorporated with a capital stock of $40,000, divided into 400 shares of $100 each, the head office to be in Galt, Ont. The company will carry on a general business.

The Phoenix Construction Co. has been incorporated with a capital stock $100,000 in 1,000 shares of $100 each, and head office sin Montreal. The company will carry on business as manufacturers of metal products, etc.

The London Clay Products Ltd. has been incorporated with a capital stock of of $50,000 in 500 shares of $100 each, the head offices to be in London. The company will manufacture all kinds of sewage pipe, tile, etc.

The charter of the Ames Holden Mc Cready Co. has bee nextended to include the promoting and holding of shares in any subsidiary or allied company with similar objects, and to finance and generally assist or guarantee the performance of contracts by any such company.

A hardening solution for concrete floors that prevents dusting, says "Concrete" is made from sulphate of alumina and acidulated water. To 10 gallons of cold water add 1 fluid ounce of sulphuric acid. Heat the liquid to boiling point and stir in 25 lb. of sulphate of alumina, then let the solution cool and strain. The concrete surface to be treated must first be swept and thoroughly washed. After drying, the hardener is put on in four applications of varying strength, ranging from 30 per cent solution and 70 per cent. water, up to 100 per cent. solution. The above quantity suffices for the complete treatment of an area of from 50 square yards to 100 square yards. depending upon the porosity of the surface treated.

The Navy Department has adopted an audio frequency signal for aviators which will enable them to land with safety in a dense fog or in the dark. This system of audio transmission which has been perfected has played a conspicuous part in the war and is now being applied to the uses of peace. It will be of advantage to navigators finding their way through fog into port, as well as to navigators in the air. The difficulties encountered because of fog in the recent transatlantic flights of the NC-4's and the Vickers-Vimy airplane demonstrates the need of just such a device.

RECLAIMING TOOL STEEL

All the tool steel over the entire Atchison, Topeka & Sante Fe Railroad is reclaimed, all such steel being returned to the Topeka shop for general inspection, the portion considered serviceable being held in reserve to be made up into small tools. The practice with regard to short lengths of high speed steel is to make tips for lathe and planer tools, although a certain part can be used with patented tool holders. The tools on which the high speed steel tips are applied are of ordinary tire steel. The tips are faced with Norway iron, and welded to the recessed tool ends by the oxy-accetylene process. These tools are said to have proved very satisfactory in service, and made possible the continuous operation of many of the tools which would have had to close down for want of the tool steel which was difficult to secure under war conditions.

TENDERS

The Ontario Department of Public Highways is calling for tenders, which must be delivered not later than Friday, August 8, for the construction of substructure of Odessa bridge. The work consists of concrete abutments, roadway and sidewalk floors, and other necessary work in the building of a bridge over Mill Creek in the village of Odessa.

The Board of Control, Toronto, is calling for tenders for the erection of partitions, etc., in the Rendering House at Toronto Municipal Abattoir, to be addressed to the chairman, Board of Control, not later than August 5. Plans and specifications can be obtained from the city architect, City Hall.

The township clerk, London, will receive sealed tenders up to noon, August 4, for the excavating of Oxbow Creek drains, estimated cost about $10,000. Plans and specifications can be obtained from the Township Clerk, London.

The Board of Control, Toronto, require tenders for all trades in connection with the building of an implement shed at the Men's Municipal Farm near Thornhill, Ont. Tenders addressed to the Chairman, Board of Control, will be received up till Tuesday, August 12. Plans and specifications can be obtained from the City Architect, City Hall, Toronto.

The Department of Public Highways will receive tenders up till August 19, for the following: Construction of concrete structures on the Provincial Highway from Cobourg to Port Hope. The construction of substructure of Pickering bridge, including abutments, roadway and sidewalk floors. Plans and specifications ca nbe obtained from the office of the resident engineer, Port Hope, of the office of the Department, Toronto.

The Department of Public Works will receive tenders till August 5, 1919, for the eastern wharf at Grosse Isle quarantine station, county of Montmagny, Que. Blue prints can be obtained from the Department of Public Works, Ottawa.

Tenders for the construction of the Walkerville sewerage pumping station will be received by the Essex Border Utilities Commission up till August 12. Plans and specificatons can be obtained at the offce of the commission, 14 Victoria block, Windsor, Ont.

Canadian National Railways will receive tenders till August 9, for the erection of a station building at Chicoutimi. Plans and specifications can be seen at the office of the divisional engineer Montreal, Que., or the district engineer, Champlain Market, Quebec.

MARINE

Kingston.—The steamer Phelan went aground at Fraser's Shoal, below Cardinal, and the Donelly Wrecking Co. were requested to send a tug to her assistance.

Victoria.—The third ship of the Foundation Company's building, known as Hull 209, has undergone her steam and endurance trials successfully. The contract speed for these ships is 11 knots. Hull 216, which completed her trials recently, has been handed over to the French crew which were sent out for her.

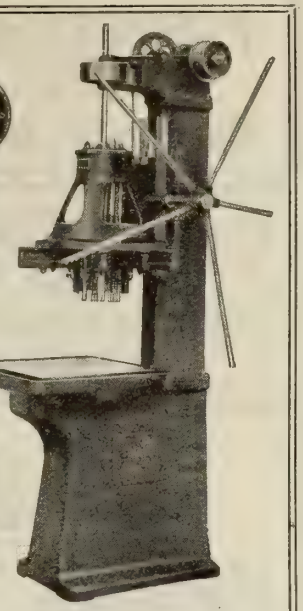
Montreal.—Canada now has seven ships in commission, and thirteen more will be ready this year. Those already in commission are engaged in the North Atlantic and West Indies trades. These ships up to the present have been employed at profitable rates, and there is no fear that for some time to come they will have difficulty in obtaining remunerative charters.

Collingwood.—After four years' war work the Government steamer "Bayfield" has returned to Owen Sound. She has been employed during the war in Halifax on patrol work. The steamer is in charge of Capt. Nat Barret, of Owen Sound, while Mr. John Nesbitt, of the same town, is chief engineer. After overhauling and repainting she will go on survey work on the Great Lakes.

Port Arthur.—The "Canadian Trader," the first of the new Government freighters built at the Port Arthur Shipbuilding Company, sailed for Montreal in command of Capt. J. H. Foote. She will load in Montreal for Cuba, which she will take to Liverpool. After this voyage she will be placed on the Jamaica to Liverpool sugar trade. Mr. Thompson will sail as a guarantee chief for six months.

London.—There will be no attempt on the part of British shipowners to rival the proposed 1,000 feet liners of the American Shipping Board. The tendency is to build vessel of moderate size and speed, and more of them, in an endeavor

No. 12



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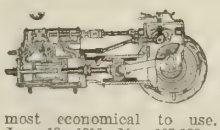

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"HAWK" BRAND STEEL

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TOOL STEEL

Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

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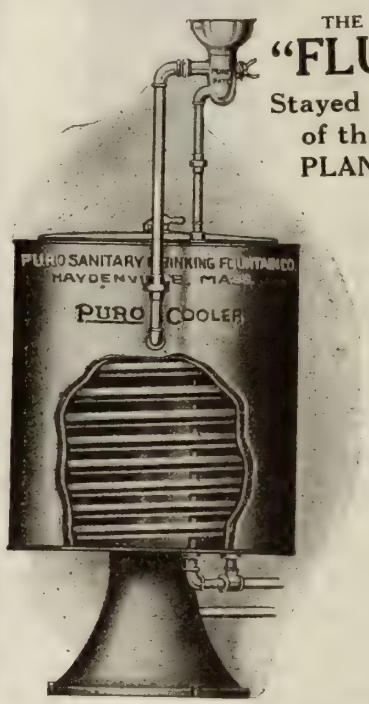

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to catch up with the shortage. To build another "Aquitania" would cost more than double the amount that vessel cost.

Cleveland.—Freighters are now experiencing less difficulty in getting cargo for the down trip. Very few are coming down light, although there is plenty of tonnage offering. The coal trade shows no change from the conditions prevailing over the last three weeks, and there is more tonnage offering than actually required. Some mines are not working on account of a shortage of cars.

Bridgeburg.—The second vessel built for the Imperial Munitions Board at the Canadian Allis-Chalmers shipyard at Bridgeburg, was successfully launched in the presence of a large and distinguished company. Mrs. Wallace Nichols acted as sponsor. The vessel was named "War Vixen." Her sister ship, "War Magic," was launched a short time ago. They are built to the classification of 100A1 at Lloyds.

Toronto.—The Bishop Navigation Co. is making a bond issue of $1,000,000, the money being required for the steamer "Iver Heath," which is to be engaged in ocean shipping. The ship is valued at $2,109,000, and the promoters estimate that the net earnings for the next six months will be $360,000. The vessel is now at Halifax, where she is being rebuilt to the highest classification of Lloyd's register. She was built in 1901. A. E. Ames are handling the bond issue.

Port Dalhousie.—The port received a visit recently from the Canadian Government steamer "Concretia," the only reinforced concrete vessel built in Canada. She is employed by the Government in supplying the lighthouses with oil for their lamps. She is of 320 feet in length, 22 feet beam, and depth 12 feet. Her speed is about 9 miles per hour. An interesting feature is the lighting arrangement, gas being the medium employed. This is stored in a tank in the

Toronto.—The "War Algoma" was launched from the yard of the Polson Iron Works with appropriate ceremony, the christening being performed by Mrs. Dingman, wife of Major Dingman, of this city. The "War Algoma" was the 149th vessel to be launched from the yard, and the 150th is on the stocks and will be launched shortly. The "War Algoma" is a full canal-sized vessel, being 261 feet overall by 43 feet 6 inches by depth moulded 23 feet. She is equipped with triple-expansion engines and Scotch boilers, the working pressure being 180 lbs. per square inch.

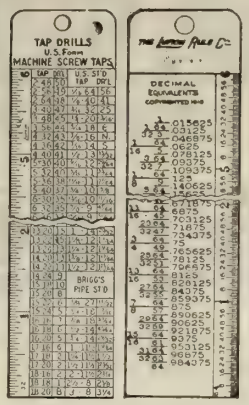
Vancouver.—The Pacific Steamship Co.'s wooden steamer, "Admiral Knight" was burned to the water's edge, and left a charred derelict off the mouth of the Fraser River. Her crew were rescued by the Princess Victoria, bound from Victoria to Vancouver, and landed at Vancouver. The crew consisted of 23 men, and all were gotten off safely. The cause of the fire is unknown, but the blaze started in the engine room. The wooden construction and the oil fuel

made fighting the flames an impossibility. The crew lost all of their belongings, and the pilot even had his license burned.

Victoria.—Victoria is looking forward with great pleasure to the renewed activities of the dockyard at Esquimalt, with the advent of the North Pacific squadron. There is no doubt that now the menace is past the fleet will be spread over the surface of the globe, and the naval stations that were reduced to skeleton propositions during the war will once again be put on a full working basis. Bermuda and Halifax on the North Atlantic and Esquimalt on the North Pacific are probably the best examples of this. The United States navy will also maintain a fleet on both oceans, and the result will be a large measure of prosperity and fuller social life for the cities within their purlieu.

Port Stanley.—The inauguration of the steamer service between Cleveland and Port Stanley was attended with several undesired features. The "Theodore Roosevelt," a 22-knot steamer, arrived from Cleveland with 1,500 passengers, and reached the Government wharf in safety. It was when she tried to get away again that the trouble started. She tried to turn at the dock, but her stern grounded on the undredged channel and she had to give up the attempt. In trying to get out stern first the vessel was blown by the stiff breeze up against the old pier. Trying to clear this her forward end stuck in the mud. Finally she was towed out into clear water by a tug, not before breaking a few piles from the old pier by trying to make fast a rope to them. The American passengers asked earnestly from the Canadians on the quayside if this was really the finest harbor on the Canadian side, as advertised.

London.—The Board of Trade announce the awarding of the silver medal for gallantry in saving life at sea to the following: Capt. E. C. Perry, Temporary Skipper Martin Dalton, and Seamen Harold Clouter, Charles W. Penney, Adolphus Morey, Daniel Ralph and Michael Whelan, and the bronze medal to Chief Engineer Robert Pierson and Seamen Mathew Shanahan, Patrick Gallagher, George Westcott and Joseph Budden. The occasion when the services were rendered by these men was when the steamer Florizel of Liverpool stranded on the Newfoundland coast about 15 miles N.E. of Cape Race. A heavy sea was running, and in response to wireless calls for assistance, several vessels arrived from St. Johns but were unable to approach the wreck till the following day. They started at daylight and had all the survivors taken off the wreck by 8 a.m. The rescue had to be effected by means of dories, and it was in performing these rescues that the men mentioned above displayed great bravery and saved many lives.



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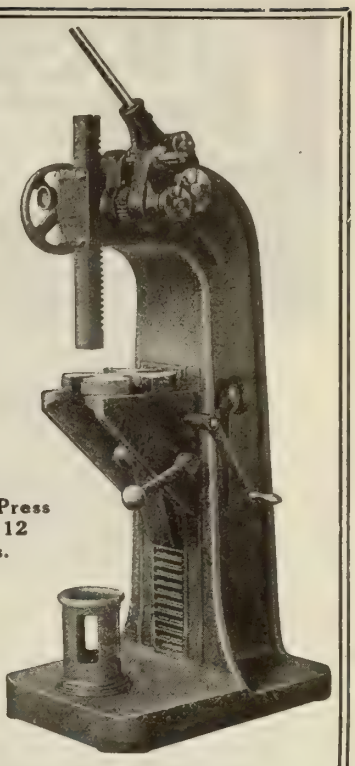

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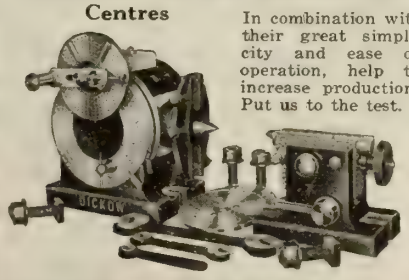

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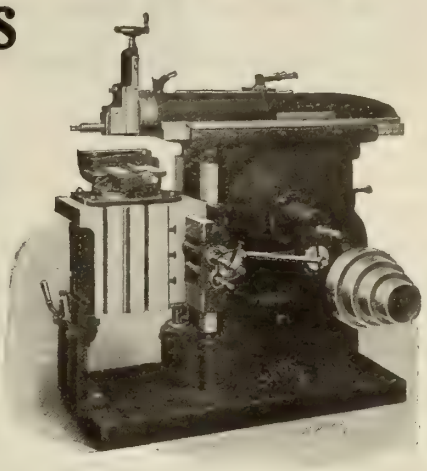

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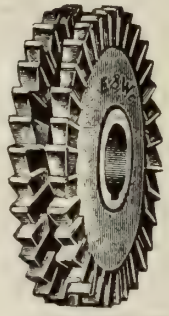

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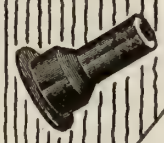

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In the past, Sarnia has been built substantially with none of the semblance of a boom. In the future, Sarnia will be built as substantially with the boom which is only possible by its citizens' investment of faith in its bright future. These are days of reconstruction; we stand at the portals of a new day and see just ahead of us important strides in progress.

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Sarnia is located at the gateway of the West. It is the terminus of the Grand Trunk Railway, with the world-famous St. Clair Tunnel, and the headquarters of the Northern Navigation Co. and P.M. Rly. Best shipping facilities and abundance of electric power at reasonable rates.

The City Beautiful

Living conditions are ideal; no strikes or labor disturbances of any kind.

It has a delightful residential section; miles of paved streets, beautifully shaded; fine homes; clean streets; summer homes on Lake Huron; free bathing beaches. Two boats daily to Detroit. Main line double track Chicago to Montreal.

Investigate Sarnia Now. For full particulars re manufacturing sites, write

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ALD. THOMPSON,
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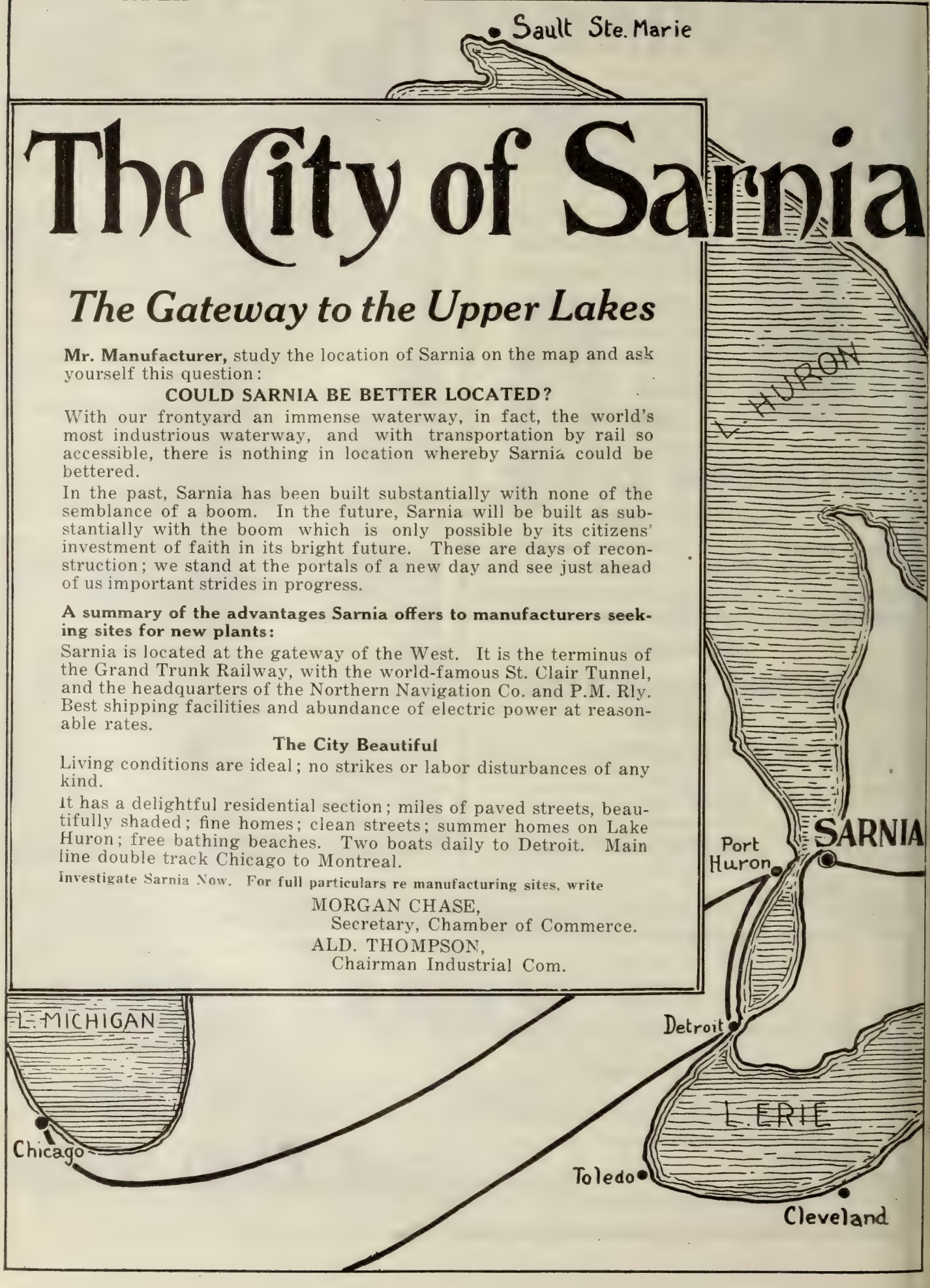

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10 welds, 5 years old, still running. Bevel gear 85" diameter after being repaired in ten places by our process.

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We can weld anything anywhere.

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8

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Automatic Machinery
for all purposes
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Consult us on your machine problems

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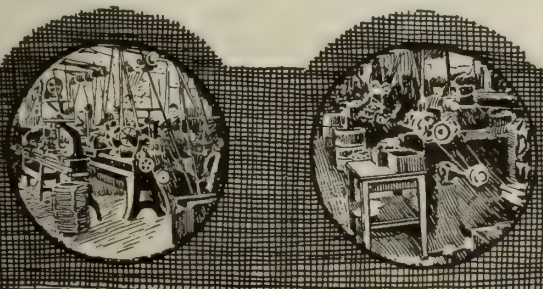

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Open Hearth, Basic and Acid, Electric and Alloy Steels

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For Ships, Railways, Rolling Mills, Gears, Machinery and Ingots to 35 tons

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Plates and Heavy Sheets to 30 inches wide, Soft and High Carbon
Automobile Plates and Sheets

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Soft Center and Solid Plow Steel, Harrow Discs, Shovel Steel, Cultivator Blades

Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.

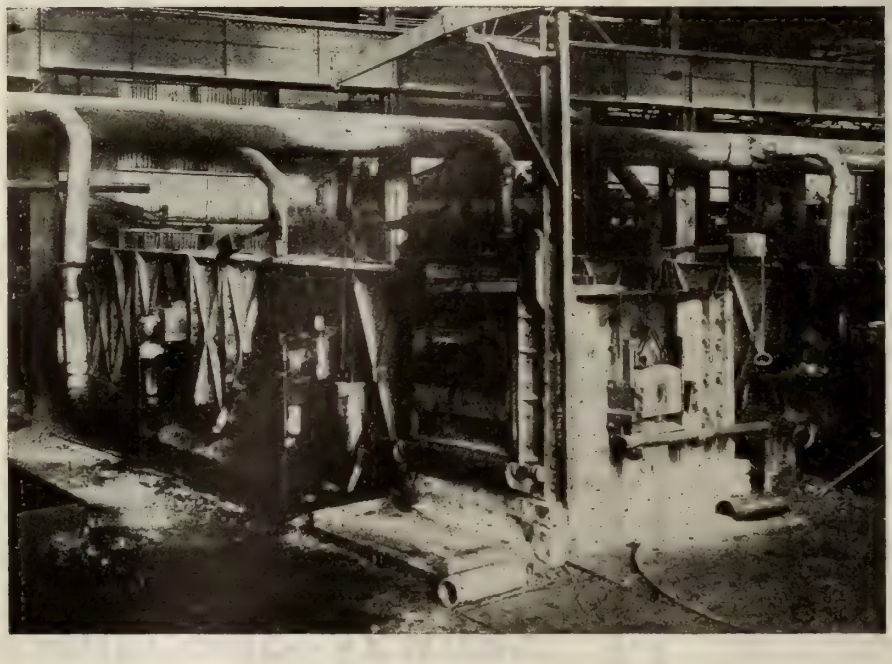

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Illustration shows an "Oliver" 16" Engine Lathe turning a spindle for an "Oliver" 28" Lathe.

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The accuracy, convenience and rigidity of "Oliver" Lathes, the cost and quantity of their output make them a logical choice for modern tool room or production work.

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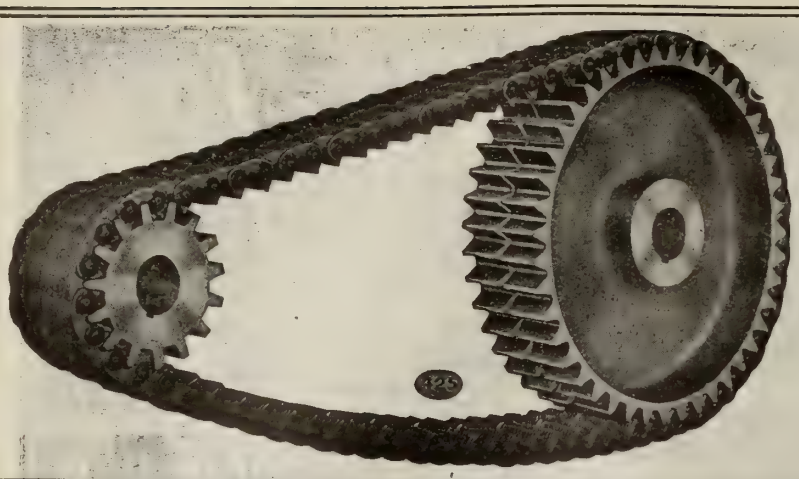

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Smoothly running machines, with balanced mechanical motions and no rotating cams. Built in 5 sizes, handling wire from No. 17 to ⅜" diam.

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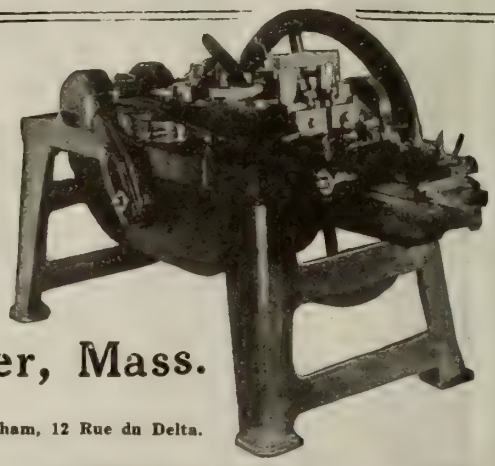

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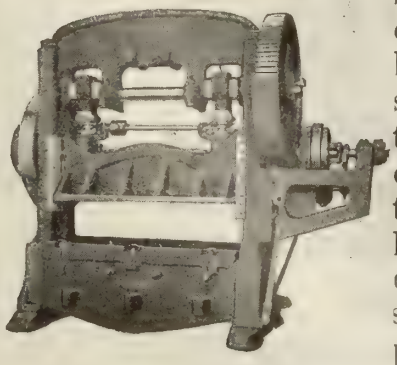

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The Hammer With The Human Stroke

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Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the **High Speed Riveting Hammer** does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

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Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

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ROCHESTER, N.Y.

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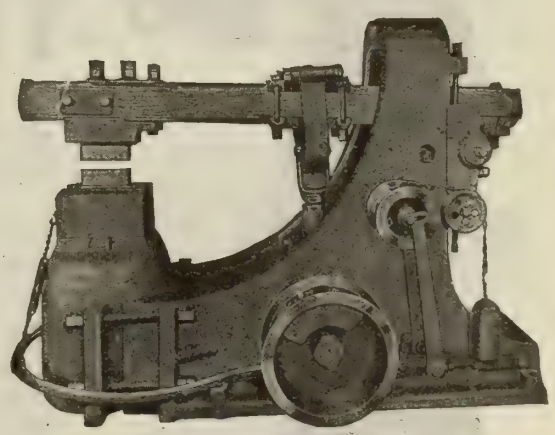

The Rochester Helve Hammer

The Mechanic who works comfortably does the best work in quick time. He gives you WORTH-WHILE results. You can't pry him loose from a superior tool. He brags about it. Give the chap a chance who uses the Helve Hammer. In 9 cases out of 10 he'll say, "The Rochester Helve" for mine. He is the man who knows the 100% Satisfaction Helve. We can't tell you all its distinctive features in this brief advertisement, so we ask you to write for our Helve Hammer Book.

THE WEST TIRE SETTER CO.
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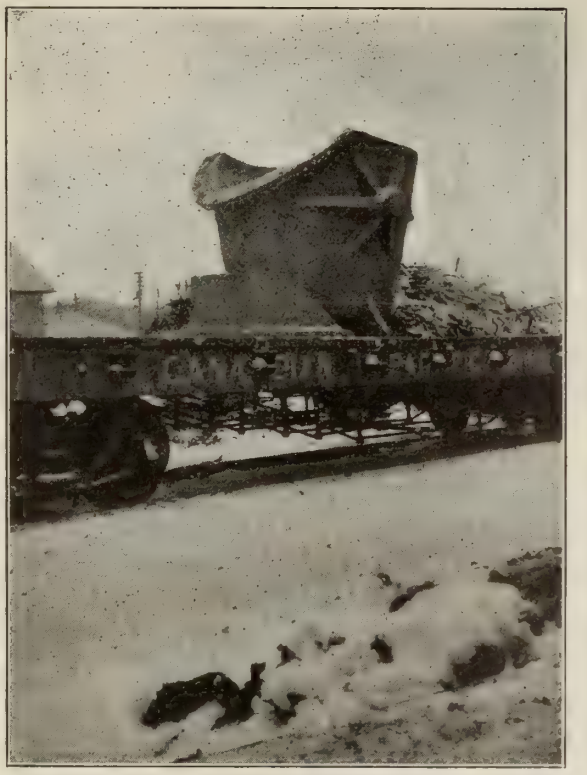

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Every process that enters into the production of a steel casting must count upon the final factor of responsibility.

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Hisco plant is equipped to produce any definite grade of steel casting in any alloy or process from one pound to 20 tons.

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in sizes up to 18 feet, without patterns.

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guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

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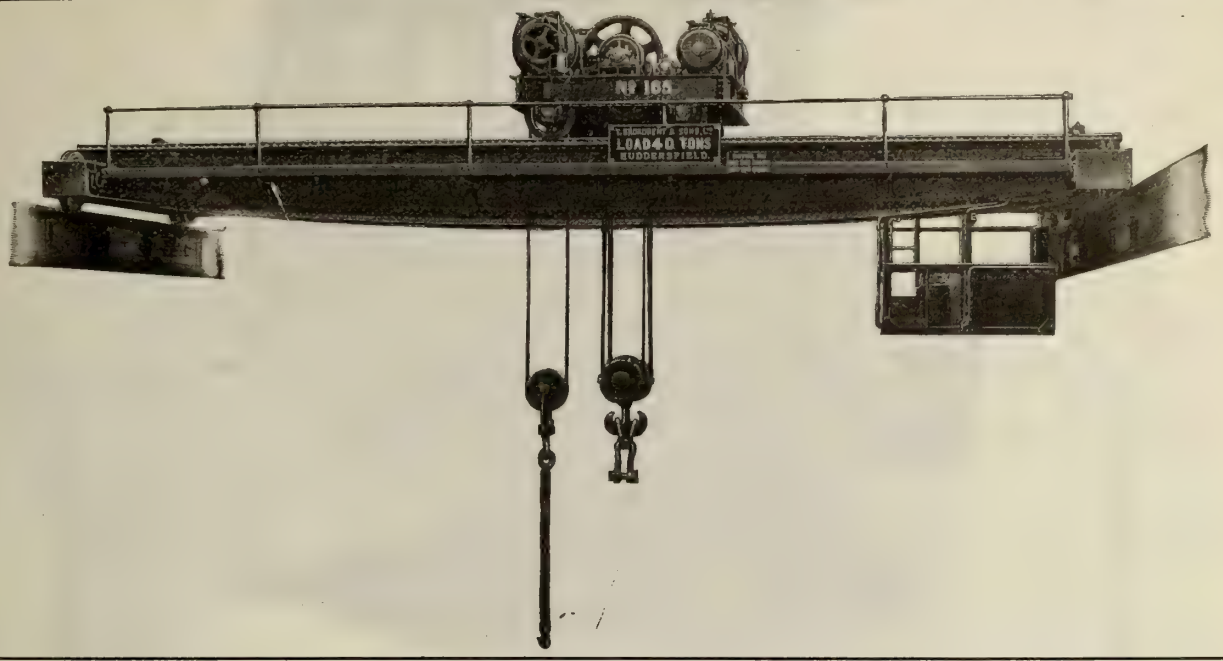

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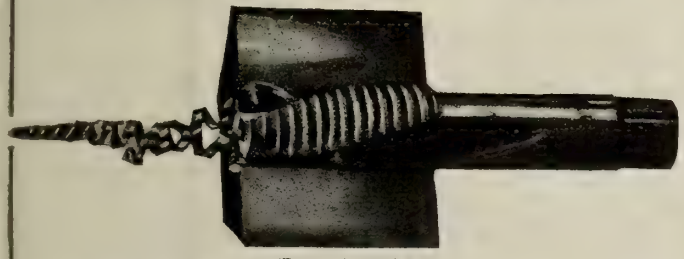

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makes tapping a pleasure

The Most MODERN,
The Most EFFICIENT,
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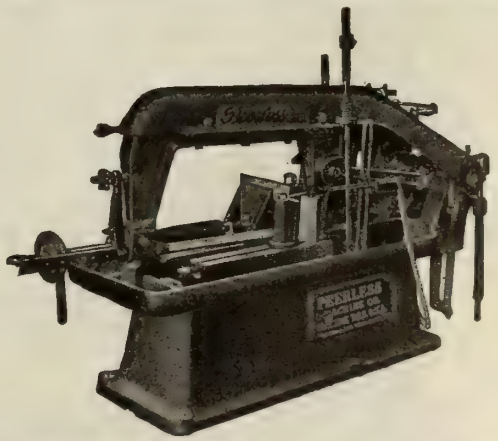
Has Proven Its Efficiency Where Others Have Failed



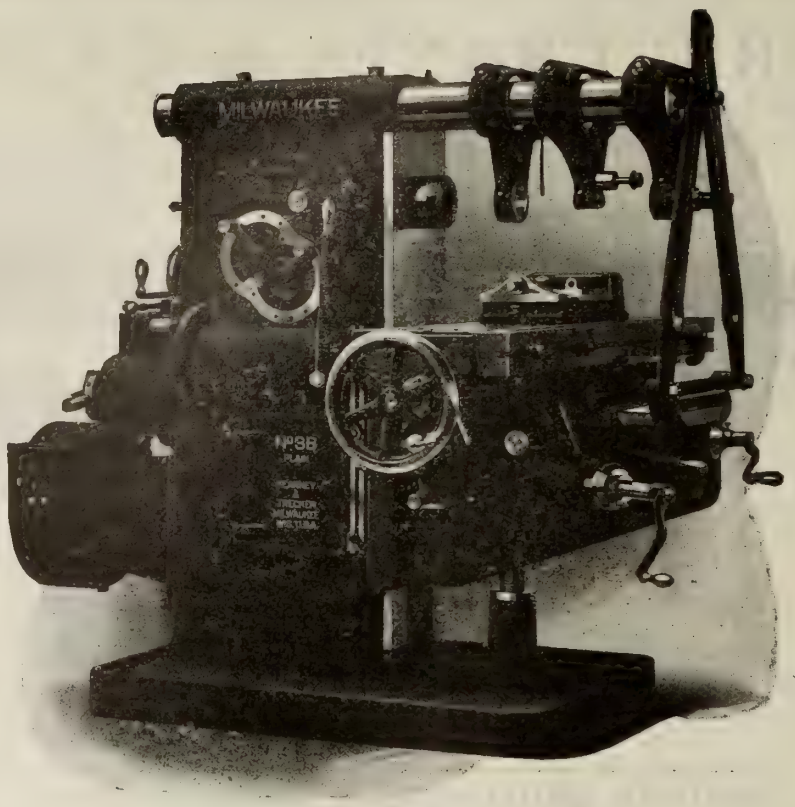
DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN



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Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication—one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

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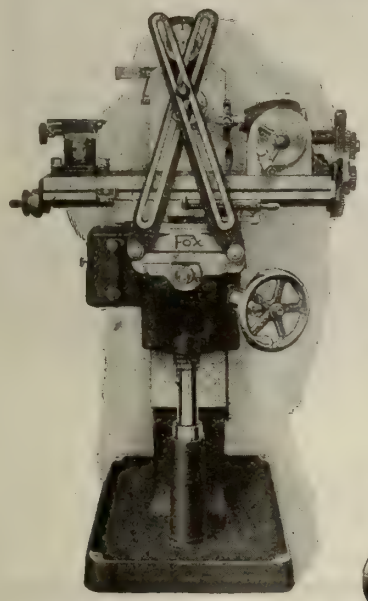
TRADE FOX MARK
REGISTERED

MILLING MACHINES

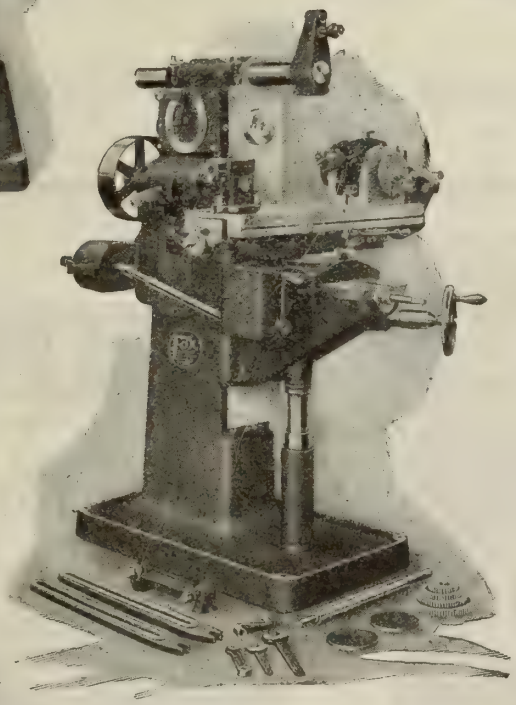
FOR

Rapid Production of Motor Parts



The **demand** for increased production **requires tools** of **great strength** and **durability;** the Fox 2-A Universal Milling Machine illustrated has met this demand, and is being used wherever extreme accuracy and quantity production are required.

The machine has a universal table, spiral cutting attachment, 10″ Dividing Head with 6″ Universal Chuck, making it a machine **especially adapted for Tool Room Work.**



The **United States Government** used this machine in its various **repair shops** for **Aeroplane Motors.**

You should be using this tool to help the production of parts necessary for reconstruction.

Specifications—No. 2-A Miller.

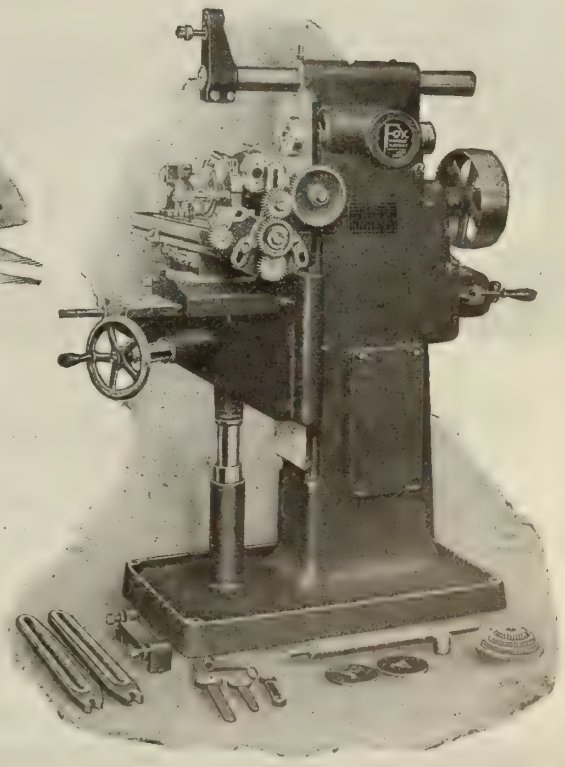
Spindle speeds 12
From 21 to 423 r.p.m.

Table feeds 6
From .317″ to 2.79″ per min.

Table .....8½ x 27″
Long. feed (power) 26″.
Vertical feed (hand) 13″.
Trans. feed (hand) 8½″.

Drive...Single pulley 10 x 3″ running 250 r.p.m.

Gears — Hardened steel.
Weight .....1,500 lbs.



We build this same machine with a plain table, omitting the spiral cutting attachment and Dividing Head.

Our No. 1 type machine has a four-step cone drive, and while being a lighter machine is a "bear" for work. This was proven by **the hundreds** of **them in the largest munitions plants.**

We also build the Fox Multiple Spindle Drilling Machines.

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Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

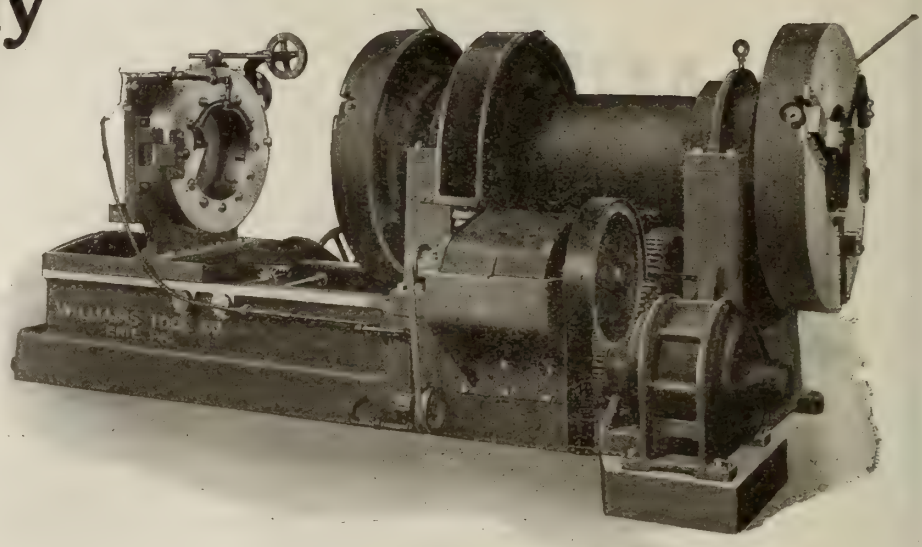
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½″ to 12″. Also nine other sizes to meet your requirements.



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We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and our experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for **accuracy** and **quality**. Send us specifications, for estimates.

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Did It!

Castings by the hundreds—yes, by thousands—all easily, rapidly and efficiently transferable with the Transveyor.

Not on the floor, but on wooden platforms, or on skids made instantly mobile by elevating the Transveyor under the loaded skid—that is Transveyor transfer.

Despatching and storing material the Transveyor Way, promotes system, saves time and labor through the elimination of rehandling; reduces "overhead" cost.

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HAVE WORLD WIDE REPUTATION FOR
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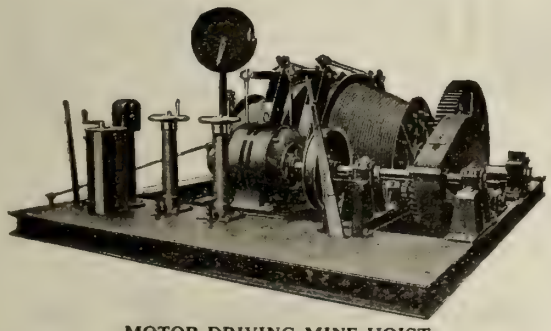

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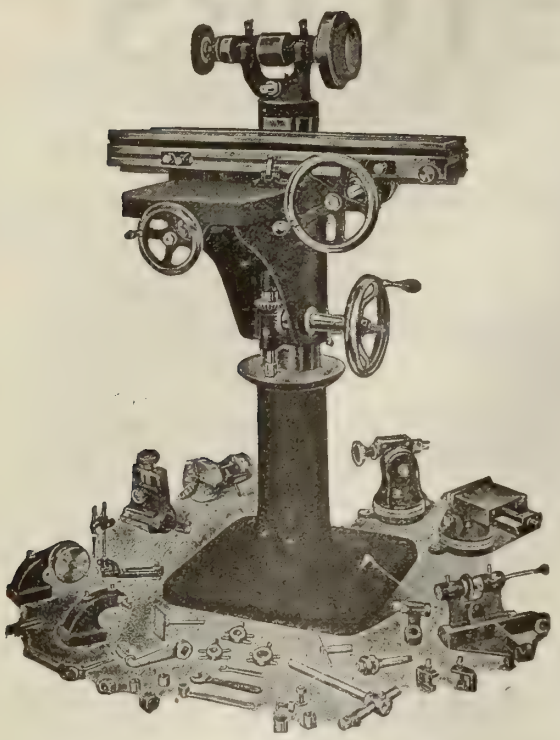


The Greenfield Universal Grinder

For General Tool Room Work

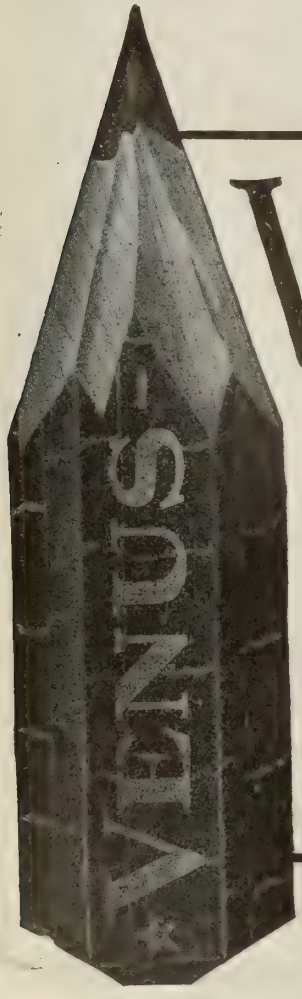
This grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,
GREENFIELD, MASS., U.S.A.



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Engineers use VENUS Pencils in their offices and drafting rooms because of the *exact* uniformity of each of their 17 degrees reduces errors to a minimum. Quicker, easier, better work is done with them, by executives and working staff alike.

Special 14c Offer

Send 14 cents for 3 trial samples, mentioning degrees. After you find how perfect VENUS Pencils are, buy them at any dealer.

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We wanted something original— this is what we got

"BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

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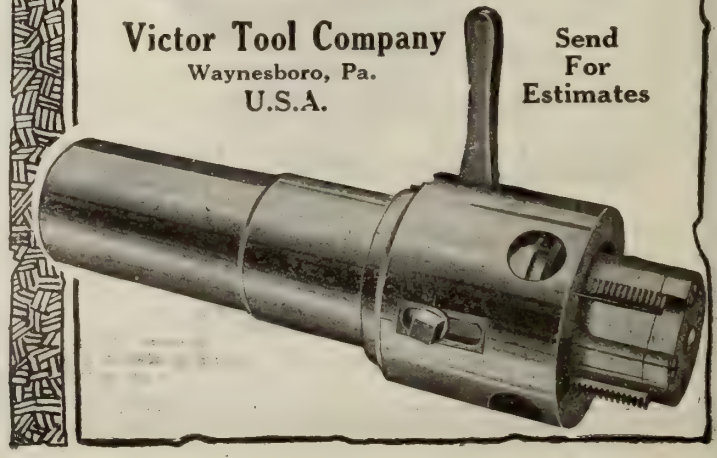
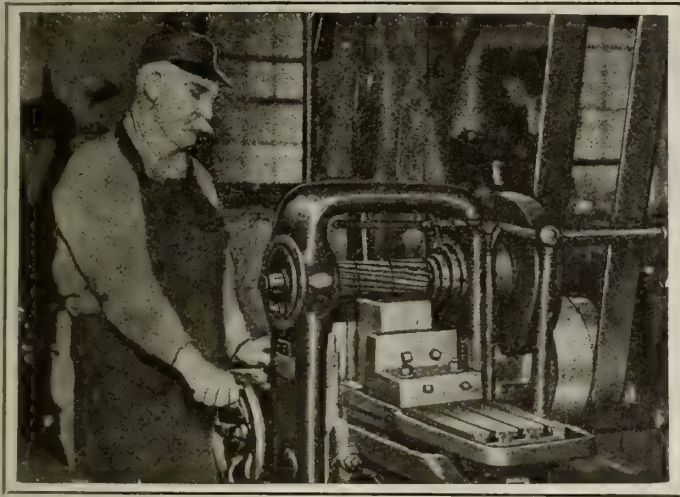
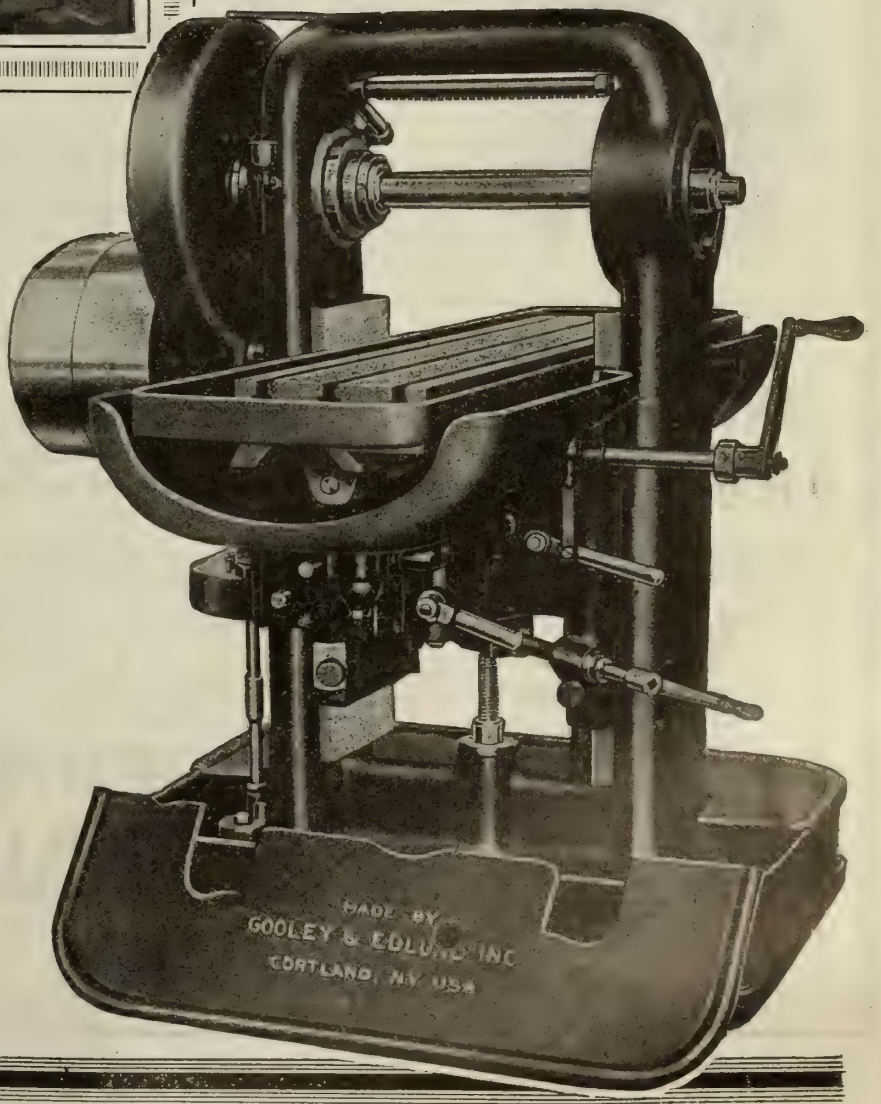


BRIGGS MILLER

Keeps Five Die Sinkers Going





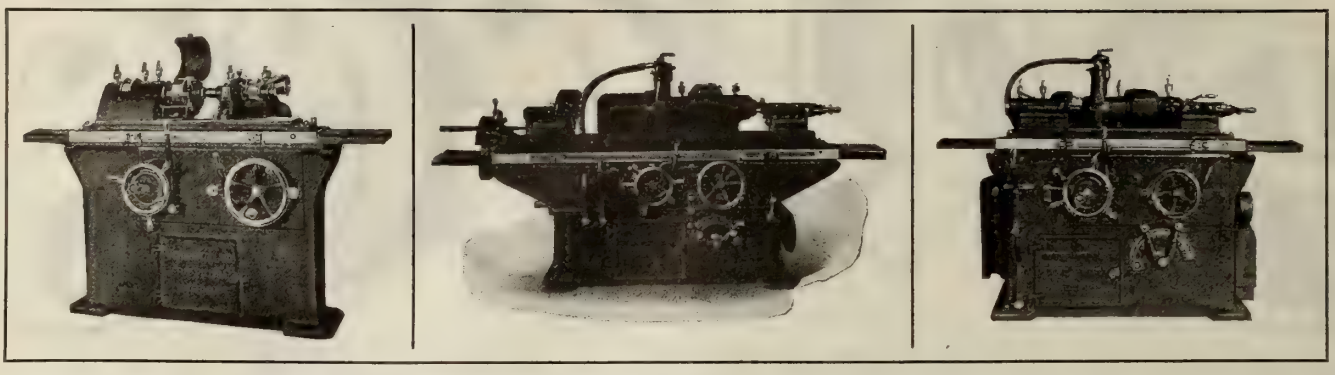
HERE you see the Briggs Miller Squaring Die Blocks, and it is working so fast it keeps five die sinkers going.

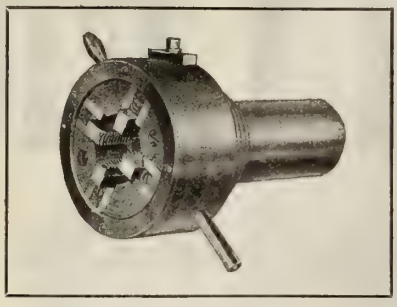
Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work. Unusual rigidity accounts for Briggs' higher efficiency.

Don't you think you could use this tool to advantage in your shop? Write for the details.

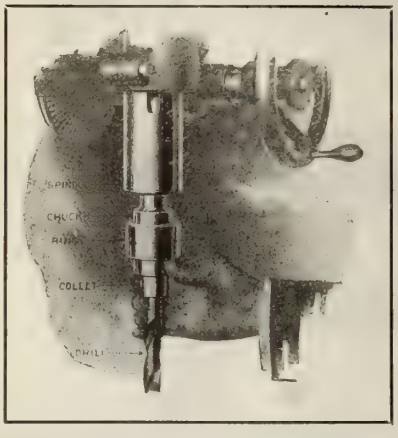
Gooley & Edlund, Inc.
Cortland, N.Y., U.S.A.

Garlock Walker Machinery Co., Ltd.
Toronto, Ont.
Williams & Wilson, Ltd., Montreal





MODERN TOOLS
MAKE BUSINESS HUM



The Modern Line supplies indispensable aid in business progress. Modern Tools are precision tools of the finest quality, noted for accuracy, dependability, volume of output and durability. We make:

—Modern Plain Grinders
10 sizes—8″ x 18″ to 16″ x 60″.

—Modern Internal Grinders
One model with fixtures in 3 sizes.

—Modern Universal Grinders
Normal range 13″ to 40″.

—Modern Chaser Grinders
For any chasers with parallel sides and general tool room work.

—Modern Self-Opening Die Heads
18 sizes—for threads up to 7 inches.

—Modern "Magic" Chucks
For quick change of tools on live spindle machine.

—Modern Collapsible Taps
3 sizes—Will tap holes ¾″ to 3″.

—Modern Tapping Attachments
For driving tools "through" or "to bottom."

All are tools of widespread use in the States—all have enviable records for reducing costs and speeding up production.

Send for technical bulletin of any which may interest you.

Send us your specifications and blue prints for data on your particular kind of work.

INDUSTRIAL REVIVAL DEPENDS ON YOU

Start your own ball a-rolling.

Remember the order you give goes to the man who buys from the chap who orders from you.

MODERN TOOL CO.

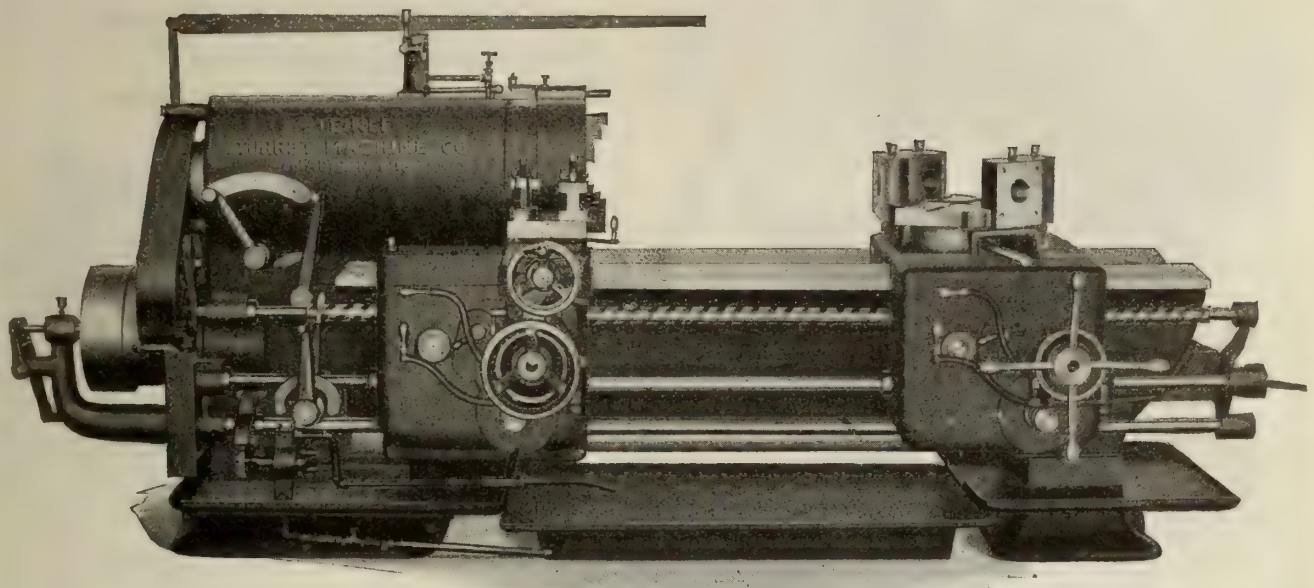
Main Office and Works: **ERIE, PA.** STATE AND PEACH STS.

Canadian Agents: Rudel-Belnap Machinery Co., Limited, Toronto and Montreal

Branch Offices:

New York, N.Y., 2 Rector St.
Chicago, Ill., 32 N. Clinton St.
Cleveland, Ohio, Guardian Bldg.
Detroit, Mich., 1223 Dime Bank Bldg.
Cincinnati, Ohio, 2 Greenwood Office Exch.
Export Department, 2 Rector St., N.Y.C.

STEINLE



Another reason why the Steinle 24″ Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

The One Piece Box Construction Design of Bed and Headstock Housing

The headstock is entirely enclosed on front, top and bottom sides, and also on the back with the exception of an opening left for assembling purposes and for which a suitable cover is provided. This design furnishes substantial support for the main spindle bearings and also for all driving shafts.

The bed is enclosed on all four sides and designed to withstand torsional strains and to properly support the side carriage and turret in alignment with spindle when carrying heavy tool loads.

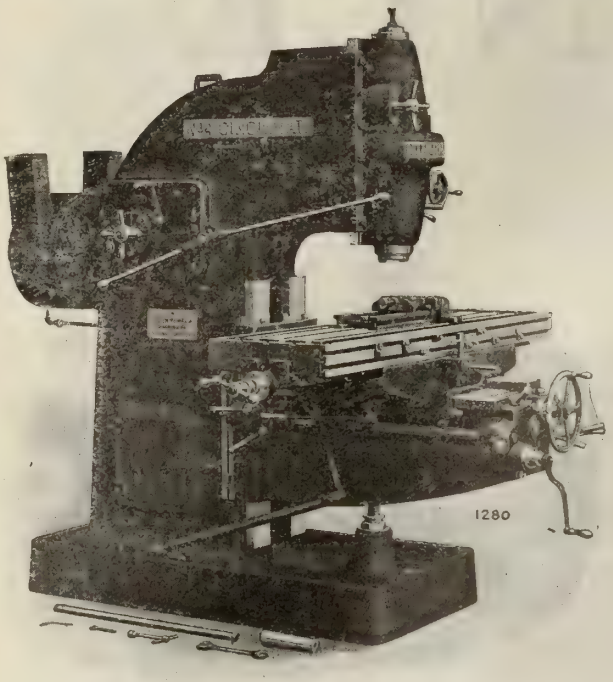
This bed and headstock housing by reason of the amount and proper distribution of metal absorbs all vibration due to heavy cuts, and shock or jar incidental to heavy intermittent or uneven cuts.

There are more good reasons why the Steinle 24-inch Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work. We will give these reasons in future advertisements in this journal. Watch for them. They will be interesting to you.

STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.

The New Cincinnati No. 4 High Power Vertical

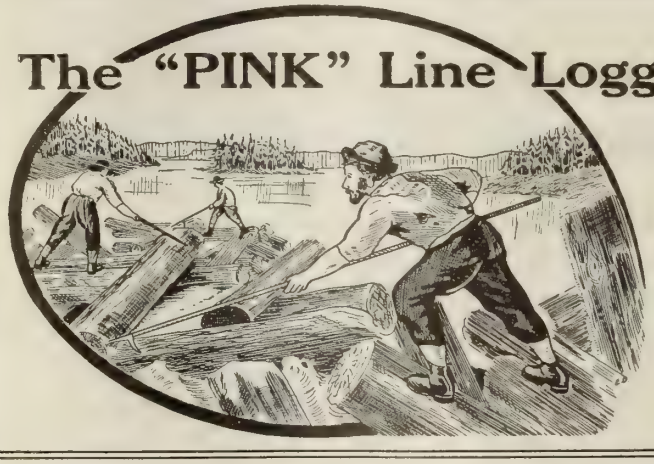


- Intermittent feed, power quick traverse
- Square gibbing with narrow guides
- Feed changes at front of knee
- Safety couplings in feed transmissions
- Individual feed control levers
- Automatic lubrication
- Centralized oiling
- Stream lubrication
- Hardened sliding gears throughout
- Starting lever at front
- Automatic brake
- Cincinnati standard flanged spindle end
- Spindle can run in either direction

Patent Rights Fully Reserved

THE CINCINNATI MILLING MACHINE COMPANY
CINCINNATI, OHIO

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

EXPORTERS TO EUROPE

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited
PEMBROKE, ONT., CANADA

Advertise It!

If you have Machinery which your plant has outgrown—advertise it. Or if you have a Factory Building which you have outgrown—advertise it. That is, advertise it in our Classified Advertising Section and SELL what you have for sale.

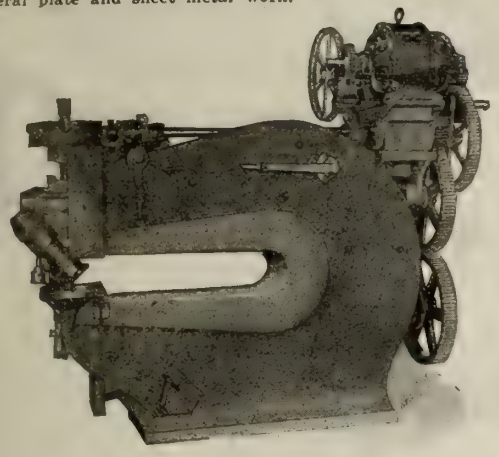
CANADIAN MACHINERY
CLASSIFIED ADVERTISING SECTION
143-153 UNIVERSITY AVENUE - - TORONTO, CANADA

H. COLLIER SMITH
"QUICKWORK"
Registered U.S. Patent Office

ROTARY SHEARS

Made in 6 Sizes

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing

Write for Catalogue

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.

War Record Not Made Public

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-7 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
Hartford, Connecticut

Your Money's Worth

Never again will the Canadian Nation and People be the same careless improvident spenders of "ante bellum" days. "EFFICIENCY" and "GET YOUR MONEY'S WORTH" will be the popular motto and the successful machine shop manager must be able to see the advantage of making one pound of High Speed Tool Steel do the same work as ten pounds in forged tools; in other words he must and will

USE ARMSTRONG TOOL HOLDERS

No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men—a good thing to consider from a production standpoint.

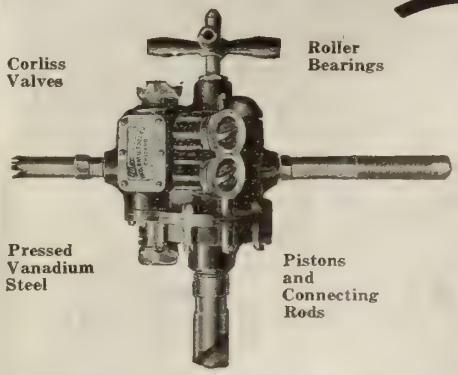
Our Catalogue is of handy pocket size and will be mailed to you upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.

Thor

Pneumatic Tools

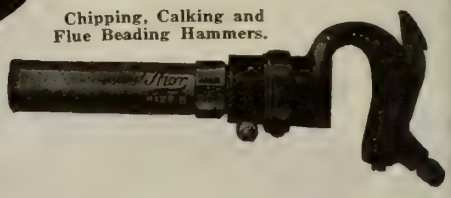
Piston Air Drills and Reamers



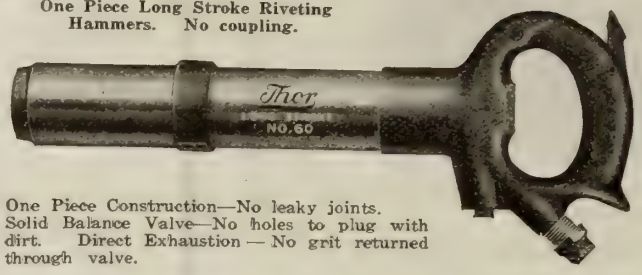
Four cylinder type, two on each side. Semi-Corliss valve close to each pair of cylinders gives greater efficiency and power, saves clearance losses and allows air to enter cylinder at full pressure of the pipe line.

SPEED UP YOUR PRODUCTION AND BE PREPARED FOR THE COMING BOOM

Chipping, Calking and Flue Beading Hammers.



One Piece Long Stroke Riveting Hammers. No coupling.



One Piece Construction—No leaky joints. Solid Balance Valve—No holes to plug with dirt. Direct Exhaustion — No grit returned through valve.

Four sizes, 1" to 4" stroke. The barrel and all wearing parts are hardened and ground, making the Thor Chipper practically free from vibration.

Independent Pneumatic Tool Company

General Office: 600 West Jackson Blvd., Chicago

CANADIAN OFFICES: 334 St. James St., MONTREAL; 32 Front St., TORONTO; 123 Bannatyne Ave. E., WINNIPEG; 1142 Homer St., VANCOUVER

INDICATING CALIPERS

This finely made tool, of the simplest construction, incorporating features of outside calipers, rule, magnifier, and indicator, is accurate, easily read and manipulated with one hand. Great saving of time is effected in the hands of an interested user. A hand attached to a pinion is actuated by a geared segment; a coiled spring draws the points together; adjustment is provided for wear of parts; locking device permits setting of tool to required measure; easy movement is effected by ball bearings.

Indicating Calipers

are used by

MACHINISTS, PATTERN, TOOL and MODEL MAKERS.

$8.75 **3"** Graduated in 64th inches, Scale enlarges two times.

2" Graduated in 100ths inches. Scale enlarges three times.

Write for folder or make inquiries thru local dealer.

MADE EXCLUSIVELY BY THE

INDICATING CALIPERS CO.

506 East 19th St., New York

Stocked by Exclusive Canadian Agents:
Williams & Wilson Limited, 84 Inspector Street, Montreal, Que.

PERRIN FOR RELIABILITY

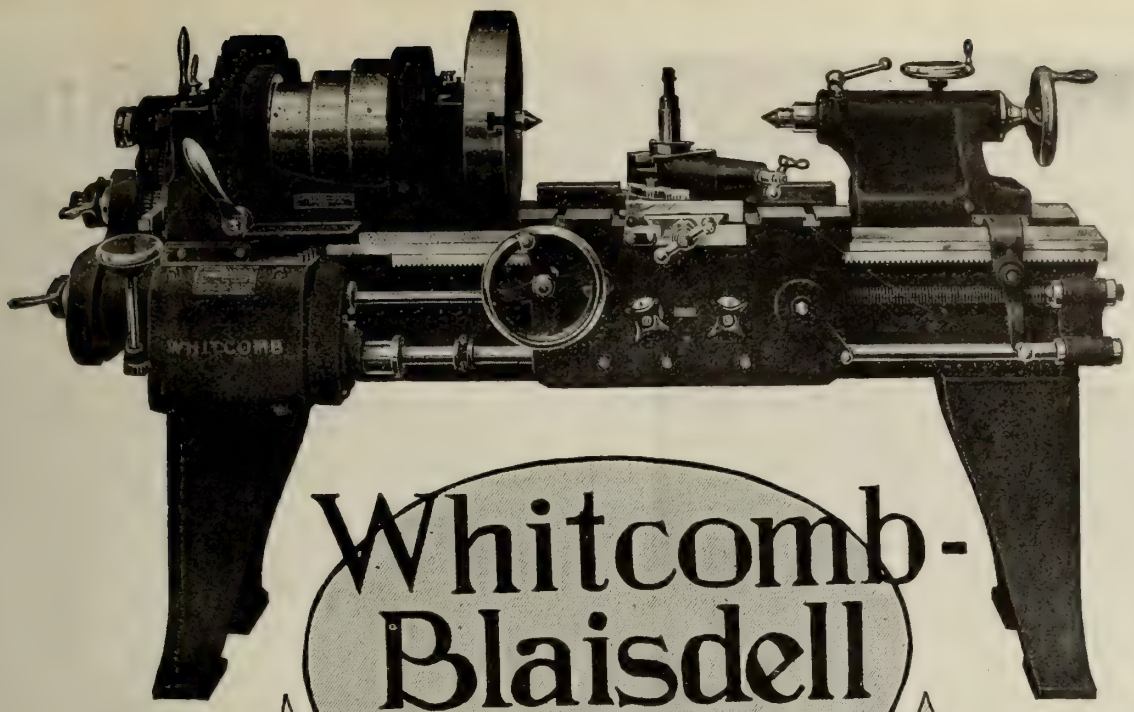
Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED

TORONTO



Whitcomb-Blaisdell Lathes

POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product.

Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes.

Lathes

WHITCOMB-BLAISDELL MACHINE TOOL CO.

WORCESTER, MASS.

Planers

Give a Tribloc severe service

—use it every day
—work it to capacity
—let anybody "run" it
—operate it indoors or out

It never falters, never fails. It's built for service and "delivers."

Gears, chains, hooks and all working parts are made of steel. The **Loop Hand Chain Guide** prevents "gagging" of the hand chain, injury to the block and overriding of the flange when working at high speed.

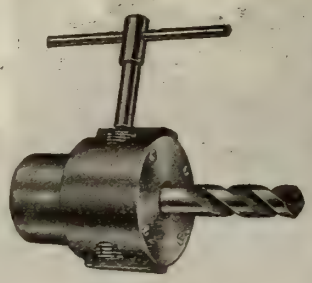
For a safe, durable, dependable hoist—a **Tribloc,** with capacities of ½ to 40 tons. Guaranteed (in writing) for five years.

Ford Chain Block & Mfg. Co.
Second and Diamond Sts., Philadelphia, Pa.

OVER-SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
120 BROADWAY, NEW YORK, U.S.A.

PARIS TURIN ZURICH BARCELONA

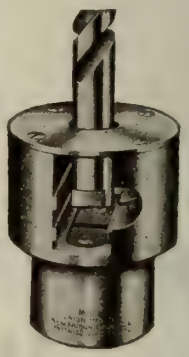
2154-D



UNION

POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



UNION
Manufacturing Co.
New Britain, Conn.

New York 26 Cortland St.

Makers of a complete line of chucks

B-T THREAD LEAD INDICATOR

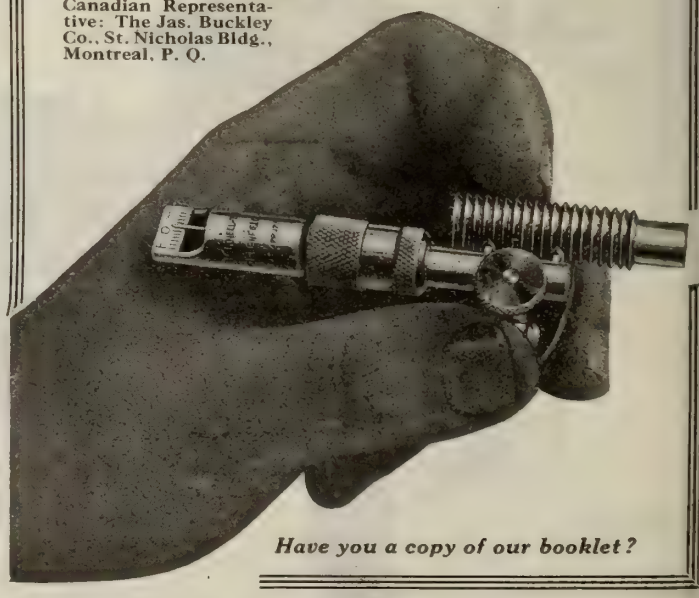
Be Sure You're *Right*—Then Go Ahead

Getting the right thread lead instantly, and maintaining a constant check upon it, minimizes the possibilities of delays in assembling and reduces the number of parts scrapped through incorrect measurements.

B-T Thread Indicators detect errors of one thousandth of an inch from correct lead. They are easily read—absolutely accurate—and can be used for testing odd pitches, as well as external and internal threads.

BICKNELL-THOMAS CO.
GREENFIELD, MASS

Canadian Representative: The Jas. Buckley Co., St. Nicholas Bldg., Montreal, P. Q.



Have you a copy of our booklet?

Boys, use these STOCO CELOGLAS SHATTER-PROOF LENS SAFETY GOGGLES

IT'S one of your most important duties to see that your workers in eye-hazardous positions are supplied with suitable eye-protectors. You cannot give them a better goggle than the Stoco safety goggle with Celoglas "Shatter-proof" lenses. It's a wonderful protection glass — staunch and durable and extremely comfortable in use. Your men will wear it willingly.

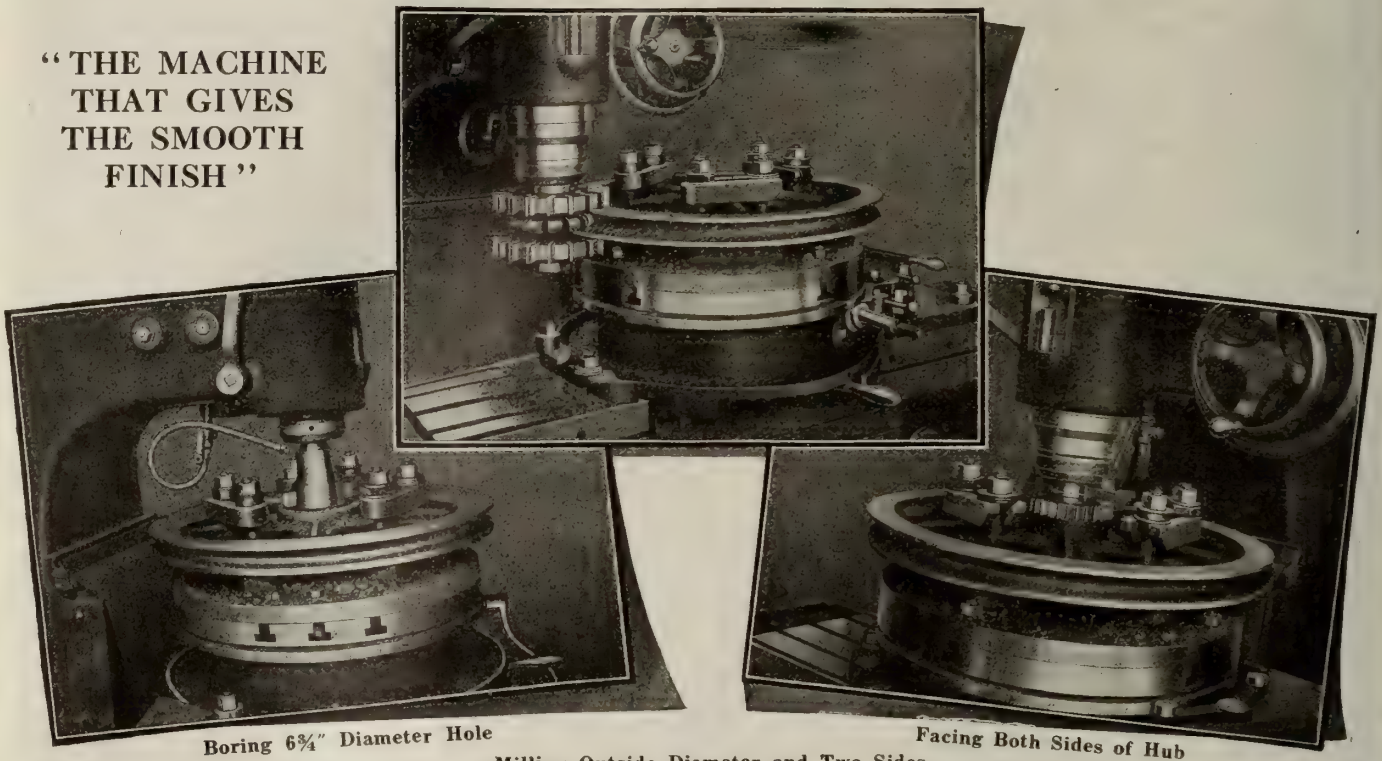
The Stoco safety goggle is made with easy cable earbows or with elastic headbands. The price with Celoglas lenses is $150.00 per hundred pairs; with heavy, clear optical glass lenses, $115.00 per hundred pairs.

STANDARD OPTICAL CO.
GENEVA, N.Y.

DOUBLE PRODUCTION

ON THE SAME JOB BY THE SAME WORKMEN

"THE MACHINE THAT GIVES THE SMOOTH FINISH"



Boring 6¾" Diameter Hole

Milling Outside Diameter and Two Sides

Facing Both Sides of Hub

A SIMPLE PROOF OF MACHINE SUPERIORITY

The photographs shown above were taken in the plant of the Mead-Morrison Company at East Boston, Mass. They show real every-day operations—not just posed for photographic purposes—and operations on which the manufacturers have doubled their production by using Becker Belt Driven Millers.

Prior to the installation of Becker Vertical Millers, the best production attained was on a boring mill, 3 hours being consumed. Becker Belt Driven Millers have cut this in half—1½ hours being the time consumed now on the same operation, and the finish is smoother, more accurate and better.

A similar saving may be possible in your plant—Investigate to-day—Now!

BECKER MILLING MACHINE CO.

HYDE PARK, BOSTON. MASS.

Canadian Agents:

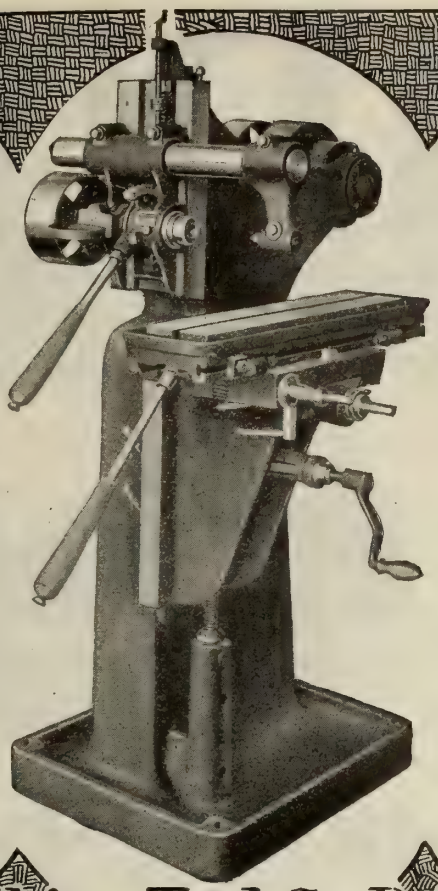
A. R. Williams Machinery Company, Limited - 64 Front St. West, Toronto
Rudel-Belnap Machinery Company, Limited - 137 McGill St., Montreal

The "BRISTOL" Hand Milling Machine

Extensively used in the manufacture of small parts where accurate duplication is essential. Illustration shows our number 1 Heavy Type Hand Miller.

Specially designed for use on work where heavier machine than standard type is necessary.

BRISTOL



Convenience Assures Big Production

The lever controls make a very convenient method of operation, though crank is furnished for table feed for use when so desired.

Users acknowledge these machines to be exceptional producers, proving in many cases more satisfactory than milling machines of the more expensive type.

Write for catalogue.

BRISTOL

The Bristol Machine Tool Co., Bristol, Connecticut

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify "Diamo-Carbo"—the perfect diamond substitute.

For large, coarse, hard wheels ask for the "Desmond-Huntingdon."

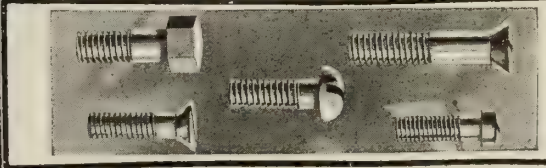
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

Wood Screw Making Machinery

SEND FOR CATALOGUE
Series B6



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

Write or Wire us.

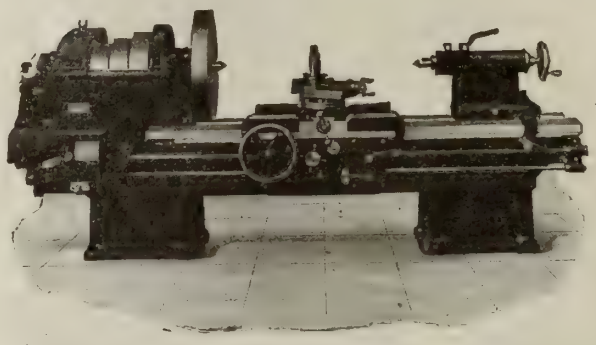
Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
Western Union

Asa S. Cook Co.
Hartford, Conn.

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



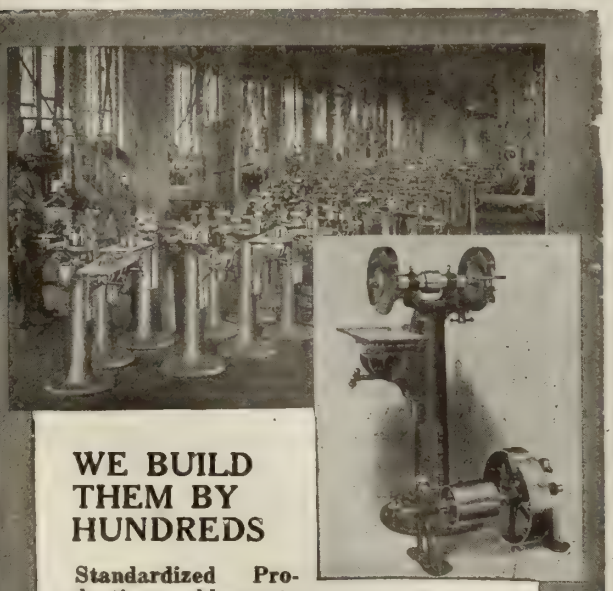
Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.



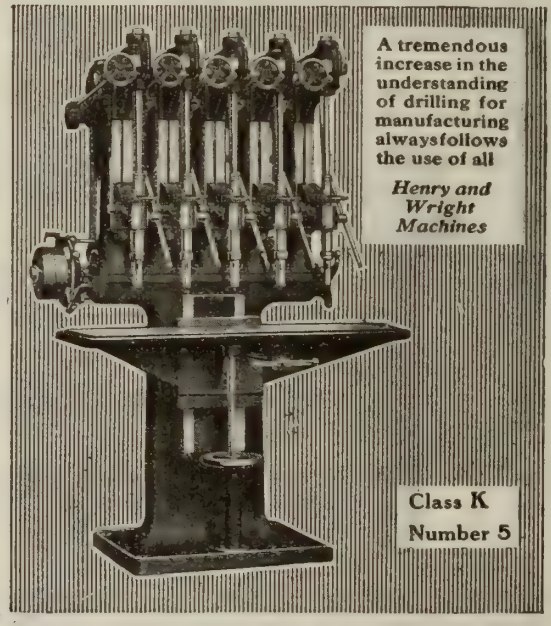
WE BUILD THEM BY HUNDREDS

Standardized Production enables us to offer this powerful **Waterbury Grinder** at such a low price. It grinds rapidly and accurately, all flat surfaces, dies, punches, planer, lathe, and other tools. Has adjustable table and tool rest with large radius of travel. Rigid, 3-point table supports giving great steadiness. A reliable, practical grinding outfit.

The Blake & Johnson Co., Waterbury, Conn.

HENRY & WRIGHT

Drilling Machines



A tremendous increase in the understanding of drilling for manufacturing always follows the use of all *Henry and Wright Machines*

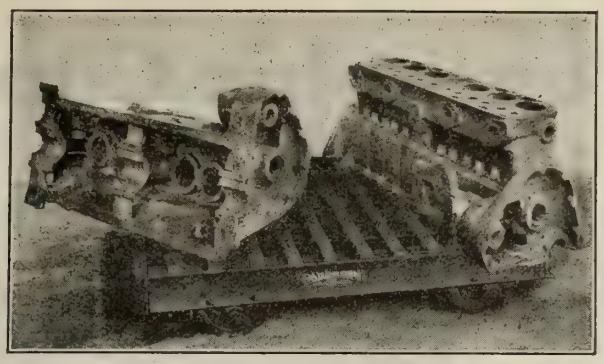
Class K
Number 5

The Henry & Wright Mfg. Co.

Hartford, Conn.

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

How long would it take to clean this Cylinder by your present methods—and what would be the labor cost alone?



How long would it take to pay for a Sand-Blast Installation from the saving in labor cost if you cleaned it in 3 minutes?

CLEANED IN THREE MINUTES BY

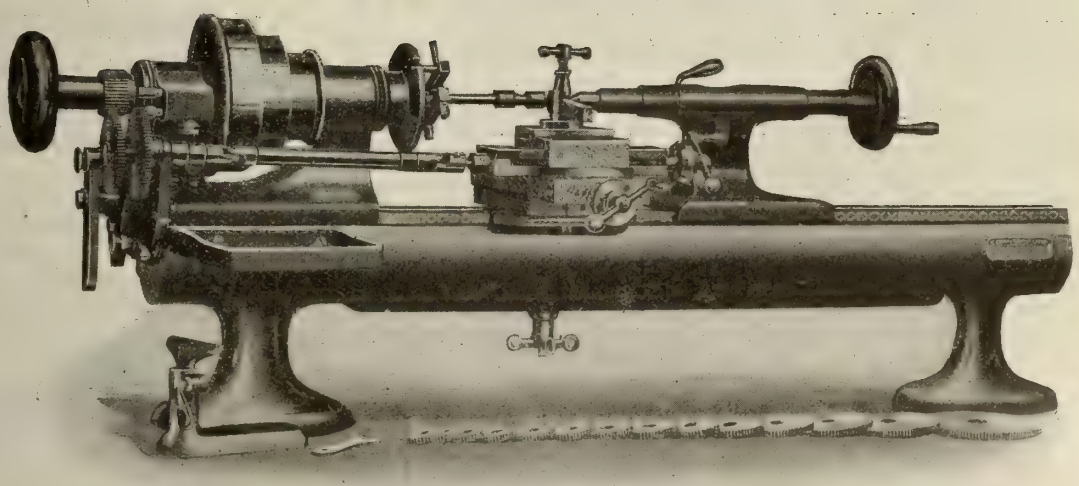
PANGBORN SAND BLASTS

and whether your requirements are the cleaning of Castings, Forgings, Stampings, Sheet, Plate or Structural, or the removal of scale from Heat Treated Parts there's a Pangborn Unit or Combination for every need, large or small, that will make a saving for you—and a more attractive product.

PANGBORN CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS
P. O. BOX 8503

CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

Photographic Copying
The PHOTOSTAT
(Trade Mark Registered)

"Orders are now delivered three or four days earlier to our customers by making photographic copies of sketches and drawings which are the same in every detail instead of having our draftsmen reproduce the original.

"Practically all orders were previously held up three or four days by our drafting department while copies of the intricate drawings of ordered tools were being made. Now with the Photostat, only 15 or 20 minutes are required to make the three copies, exact duplicates of the original, which the factory needs to turn out the order. By eliminating this needless delay we are able to provide better service for our customers, and attract new prospects because of prompt deliveries."

This cut shows a PHOTOSTAT on which a large drawing has just been copied in less than a minute.

Never Makes a Mistake

It is simple, practical, easy to handle. Requires no expert knowledge. The machine is loaded with a roll of sensitized paper especially manufactured for the purpose.

The original subject is photographed directly upon this paper producing a facsimile copy which is immediately cut off, developed and fixed right in the PHOTOSTAT itself.

The focusing, exposing and developing are all controlled by simple mechanical devices and no glass plate, film or other intermediate negative has to be made.

After fixing, the copy is removed to a tank of running water and rapidly washed free from chemicals. It is then dried and is ready for use. As many copies as desired may be run off in this manner.

By a simple adjustment of the mechanical focusing device the copy may be made at actual size, reduced, or enlarged, within the size limitations of the machine.

Error in copy is impossible because every copy is an absolute facsimile. The operations are all simple, such as a boy or girl can do.

The PHOTOSTAT Copies

Pencil Drawings, Ink Drawings,
Tracings, Reports
Shipping Lists, Data Sheets,
Contracts, Ledger Pages,
Illustrations for Salesmen, Insurance Records,
Sketches, Blue Prints,
Specifications, Maps,
Legal Documents, Graphs,
Cuts and Drawings for Advertising, etc.

Manufactured by the Eastman Kodak Company exclusively for the

COMMERCIAL CAMERA COMPANY
343 STATE STREET, ROCHESTER, N. Y.

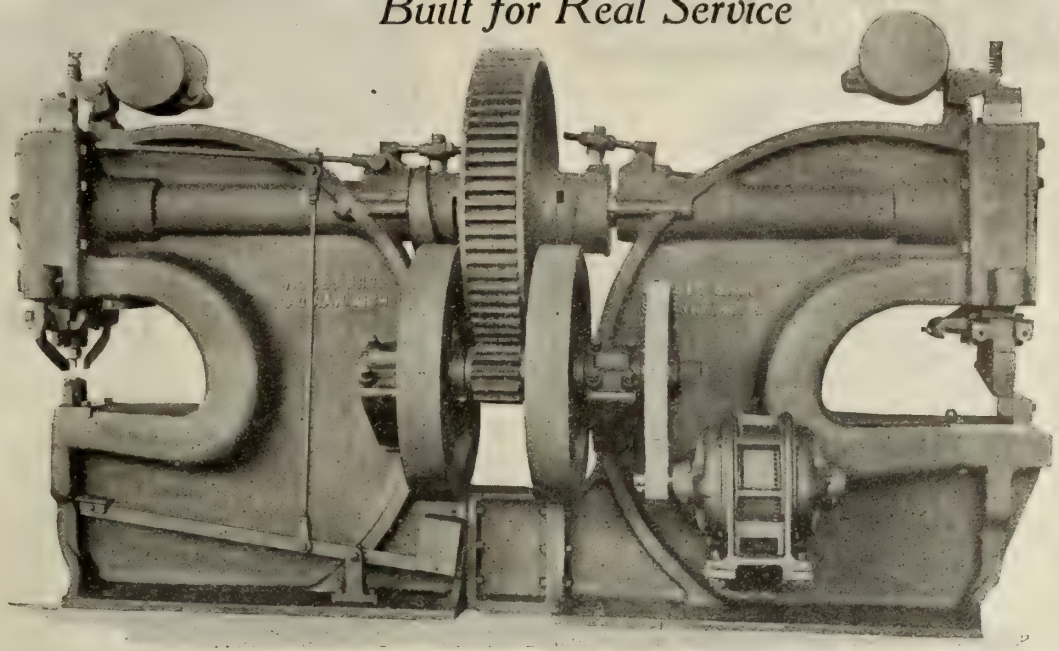
CHICAGO NEW YORK CITY PHILADELPHIA PROVIDENCE WASHINGTON

AGENCIES:

Alfred Herbert, Ltd., Coventry, England
Societe Anonyme Alfred Herbert, Paris, France
Societa Anonima Italiana Alfred Herbert, Milano, Italy
Graham Broters, Stockholm, Sweden

WICKES' Heavy Duty Double Punch

Built for Real Service



We also manufacture High Grade Horizontal and Vertical Rolls, Angle Rolls, Single Punches, Shears, Spruce Cutters Radial Wall Drills or Counter-sinking Machines, Flanging Clamps and Heavy Duty Engine Lathes. *Ask for Catalogue.*

WICKES BROS., SAGINAW, MICH., U.S.A.

Tiresome, Expensive, Dangerous, Wasteful—but Unnecessary.

With Bowser Equipment One Man Does the Work with Less Time and Effort —and Without Loss.

STOP WASTING LABOR IN HANDLING OILS

Do away with the back-breaking, disagreeable labor in storing and handling oils.

With Bowser Storage Equipment the heavy work is done mechanically—there is no wasted energy—all oils are easily and quickly put into storage by gravity.

Save With BOWSER Systems

Distribution is done by accurate, rapid self-measuring pumps—no oils are left in shipping containers to dry up, leak and seep away—none is lost through spilling or dripping faucets. Every operation in the use of oils is done in a systematic, safe and saving manner.

Write us for literature, showing why Bowser Systems are a paying investment

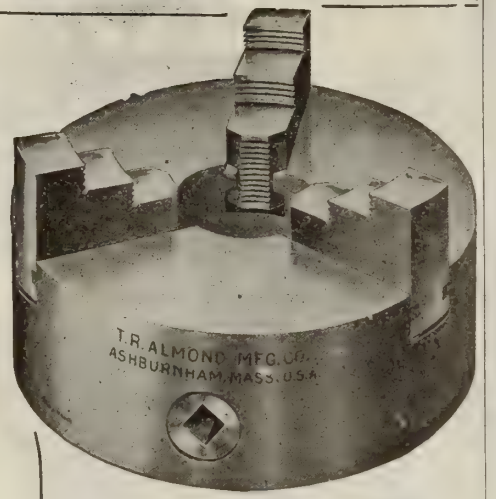
S. F. BOWSER CO., Limited

66-68 Frazer Avenue, Toronto, Ont.

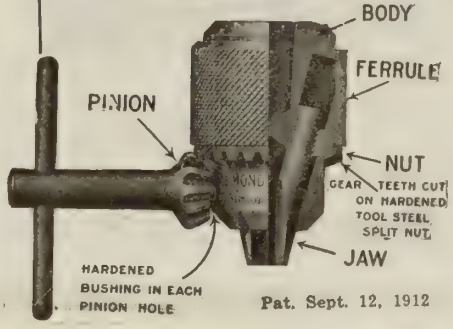
LONDON 32 Victoria St. S. W. 1 | PARIS 5 Rue Denis-Poissons | HAVANA Lonja del Comercio 427 | SYDNEY 6 Castlereagh St.

ALMOND
CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5″, 6″, 7½″, 9″ and 12″.



Geared Nut Drill Chucks, in various capacities, 0″ to 1″.

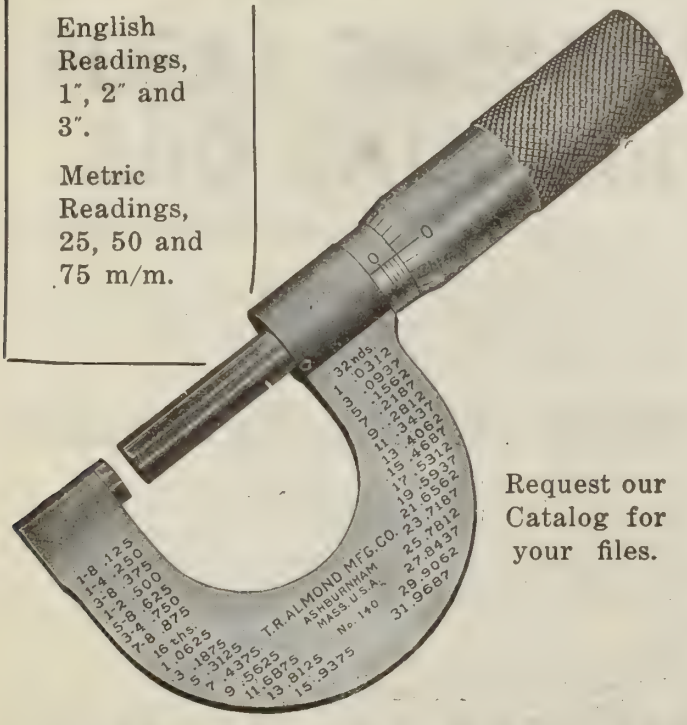


Pat. Sept. 12, 1912

Micrometer Calipers—

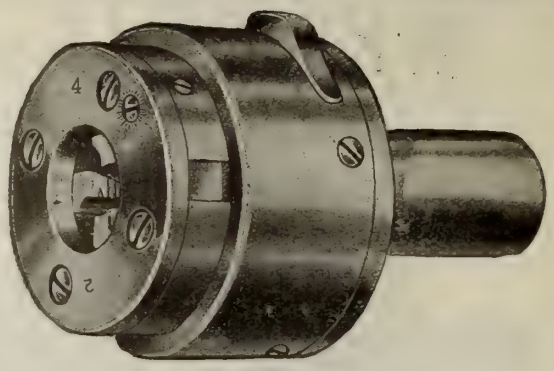
English Readings, 1″, 2″ and 3″.

Metric Readings, 25, 50 and 75 m/m.



Request our Catalog for your files.

T. R. ALMOND MFG. CO.
6 Maple Avenue, Ashburnham, Mass.



H & G Die Heads

are of small outside diameter compared with the size of work they do.

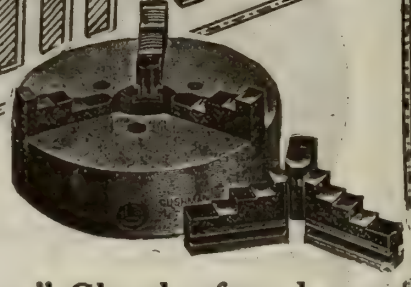
The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16″, 1″, 1¼″ and 1½″.

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

Cushman



The "Cushman" Chuck of to-day is the fruit of nearly sixty years of Chuck building

And right from the start in 1862, they have been known throughout the industry for their high quality Material and Workmanship.

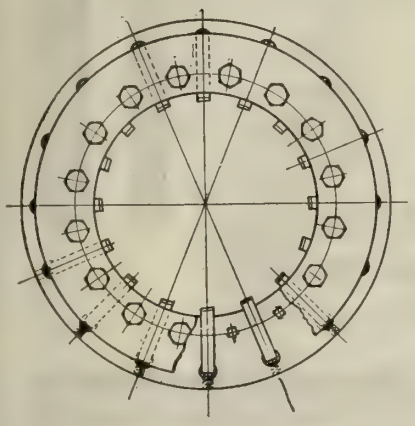
The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

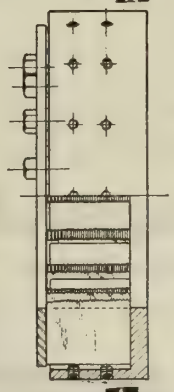
Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

Cushman Chuck, Hartford, Co. Conn

CHUCKS

SMALLEY
GENERAL THREAD MILLER





Cuts Quality Milling Costs

Smalley-General Thread Miller reduces costs, increases output and improves the accuracy of the finished product. Accompanying blue-prints and time studies show results that should interest you.

MACHINE—Smalley General Thread Miller No. 1.

PIECE MILLED—Chasers for 8″ pipe die. Two sets milled at one time.

THREAD—Diameter, 8½″; length, 3⅝″; 8 pitch, Briggs, Ltd.

TIME STUDY—	Min.	Sec.
Inserting jig in chuck		30
Champfering for leading threads	5	
Milling roughing cut	13	
Finishing cut	8	
Removing jig from chuck		30
TOTAL TIME	27 minutes	

for two sets of chasers of 13½ minutes per set.

MILLING FEED—Roughing cut, 2″ per minute. Finishing cut, 3″ per minute.

MATERIAL—Rex A Tool Steel.

NOTE—Jig was arranged so as to hold two sets of chasers. Chuck was an air collet.

Consult us on every phase of thread milling. We will show you how to cut the costs.

Smalley General Company, Inc.
Bay City, Michigan

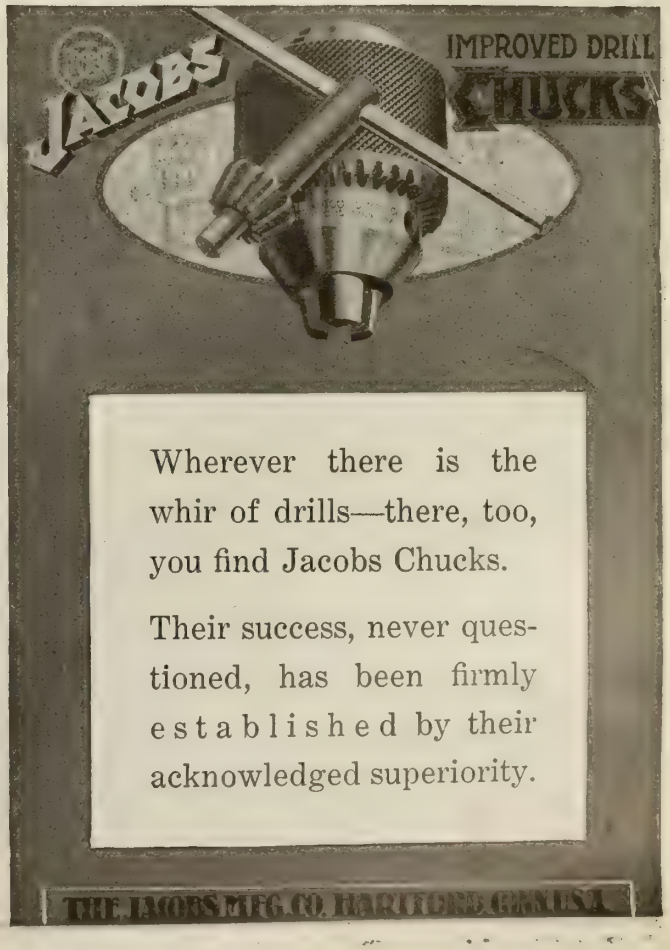
Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

Look at this again —closely

and read what we have to say below

WHEN a tap breaks off close or below the surface, you'll find the Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

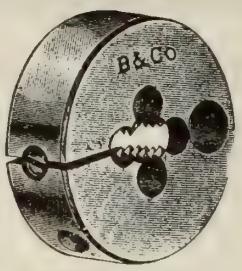
The Walton Company
Hartford, Conn.



Wherever there is the whir of drills—there, too, you find Jacobs Chucks.

Their success, never questioned, has been firmly established by their acknowledged superiority.

THE JACOBS MFG. CO. HARTFORD, CONN. U.S.A.



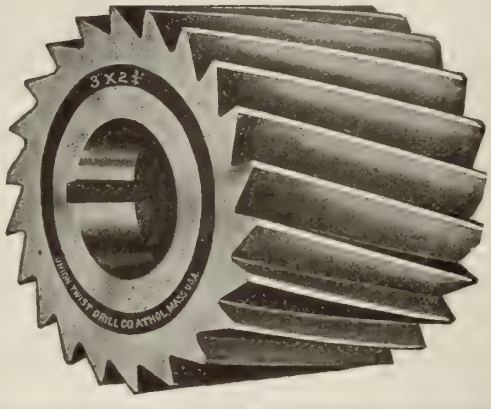
Butterfield

Taps, Dies, Reamers, Drills, Milling Cutters

Butterfield quality gives the Maximum returns on your investment.

BECAUSE

It ensures clean and accurate cuts and will duplicate the work over a long period of use.
Butterfield Quality is the result of 35 years' continuous effort to keep our product distinctly in the lead from the standpoint of efficiency and economy.



SEND FOR OUR CATALOGUES.

Catalogue Seventeen covers Taps, Dies and Reamers. Catalogue "A" covers our line of Twist Drills, Gear and Milling Cutters.

Butterfield & Co.
Inc., Rock Island, P.Q.
Toronto Office: 220 King Street West

Opportunity Knocks Here Every Week!

It may not knock for **you** this week, but read these pages regularly and grasp the opportunity when it presents itself. Every ad here is an opportunity for someone! Your time is coming. If you think the time is ripe to spring that little proposition of yours, send in your copy now for the next issue. If it is of interest to our readers, rest assured it will get attention.

CANADIAN MACHINERY
Classified Advertising Section
143 University Avenue TORONTO

The Wallace Barnes Company

"Barnes-made" for every trade

SPRINGS, WIRE & STEEL — EST. — "BARNES-MADE" PRODUCTS — 1857 — SCREW MACHINE PRODUCTS

Specialists to Solve Your Problem

The uniformity of our finished product, its absolute correctness in design, its lasting strength, is largely due to our engineering specialists.

Every man of the engineering personnel is an experienced and practical spring mechanic, yet a technically trained expert in the conception and design of springs.

This department's co-operation assures the invariable result; the production of the exact spring for the purpose — "Barnes-made" quality.

ESTABLISHED 1857

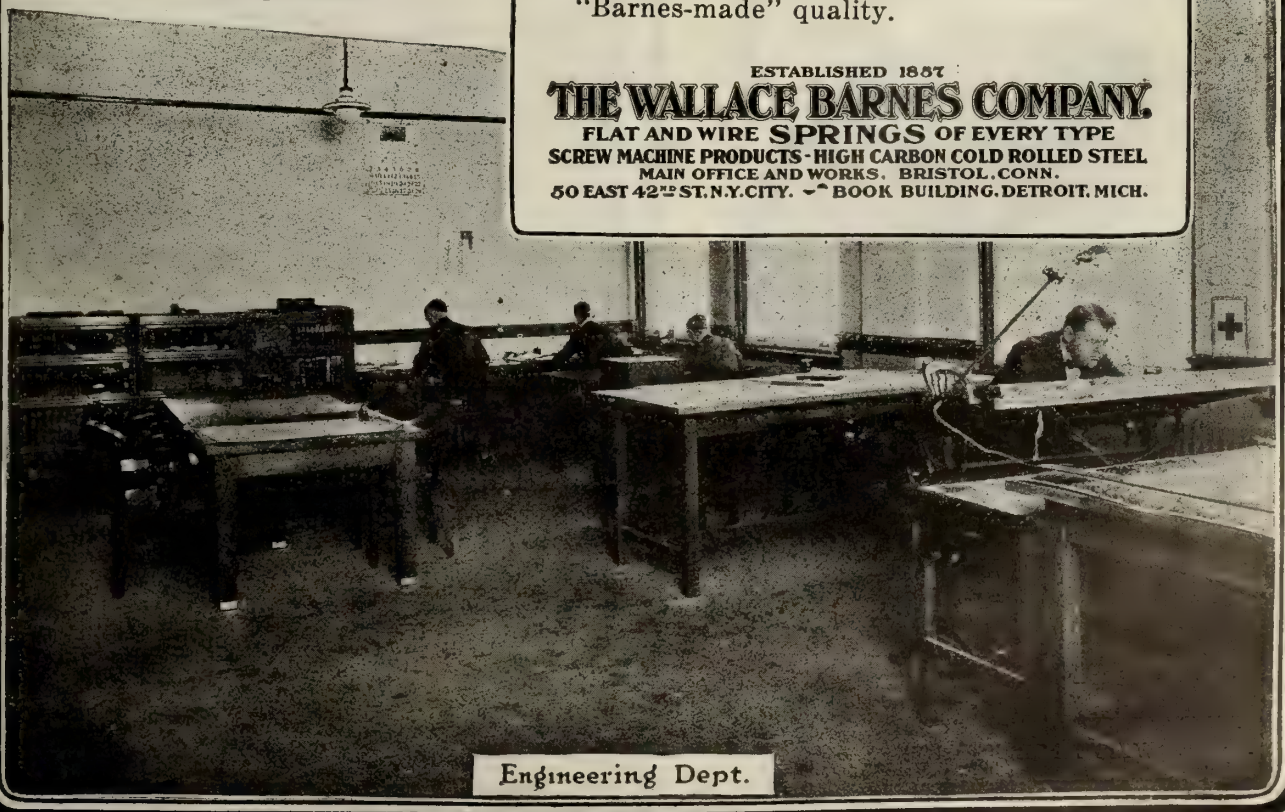
THE WALLACE BARNES COMPANY.

FLAT AND WIRE SPRINGS OF EVERY TYPE

SCREW MACHINE PRODUCTS - HIGH CARBON COLD ROLLED STEEL

MAIN OFFICE AND WORKS. BRISTOL, CONN.

50 EAST 42ND ST. N.Y. CITY. — BOOK BUILDING, DETROIT, MICH.



Engineering Dept.

From East to West
And All Over the Civilized World

CISCO LATHES WERE SHIPPED IN JULY

Seattle, Washington and Boston, Mass.; Detroit, Michigan and Cuba; Youngstown, Ohio and Lansing, Michigan; Belgium and Spain; New York and Asia.

Mechanics know CISCO LATHES. They want and insist upon

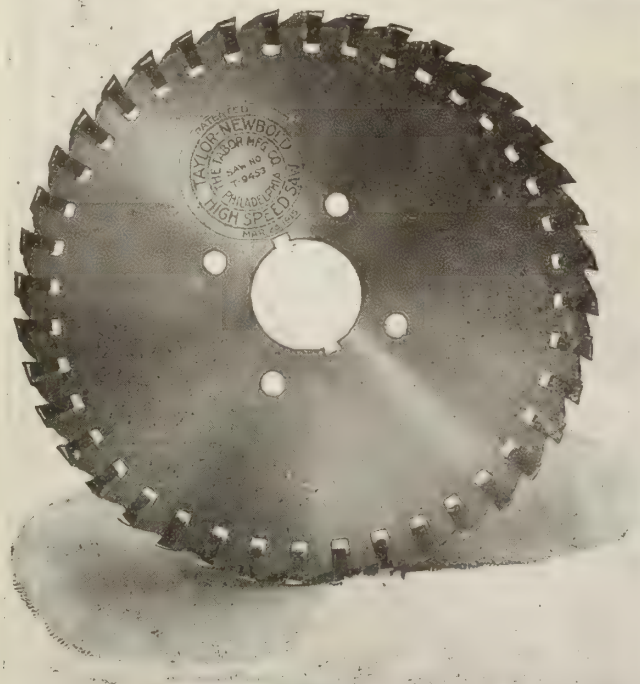
The Lathe with the Pull
The Lathe of Simplified Accuracy

No Overhang, Rigid, Proportionately Uniform, Accurate, Simplest Operated Lathes Made. Repairs few, if any.

Built in sizes 14"-16"-18"-20"-24" Engine and Tool Room, Belt or Motor Driven, Geared Head Belt or Motor Driven.

The Cisco Machine Tool Company
CINCINNATI, U.S.A.

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

Don't Keep It--Sell It

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor
or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue TORONTO, ONT.

Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me / us free, one of your tool grinding charts.

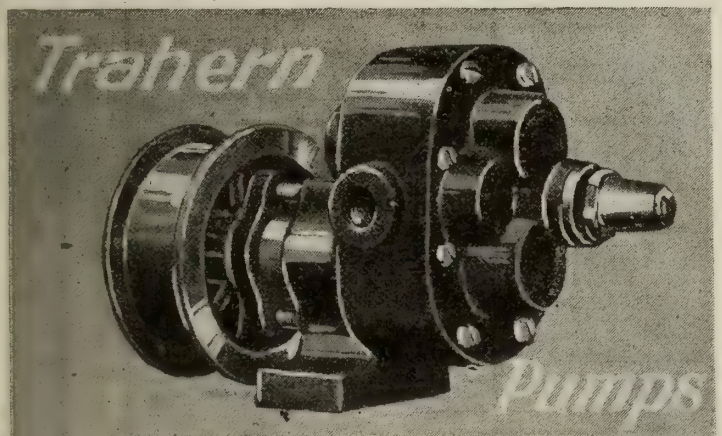
Signed.....

Firm Name.....

St. Address.....

City.....

Prov. .....



TRAHERN LUBRICATING PUMPS are for use on metal working machines of all kinds: planers, milling machines, gear hobbers, lathes, drill presses, saws, etc.

TRAHERN PUMPS are known to machine tool manufacturers the world over. Our customers are satisfied customers and install Trahern Lubricating Pumps on their machines as a regular equipment before leaving their factories.

Write for list of firms using **TRAHERN PUMPS**, then you will not have mere assertions but PROOF.

Try us and see that we have not overstated the facts.

Trahern Pump Co. Rockford, Illinois

60 Rivets in a Minute

Faster if the work can be fed faster.
But at least 60 every minute.
And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

GRANT

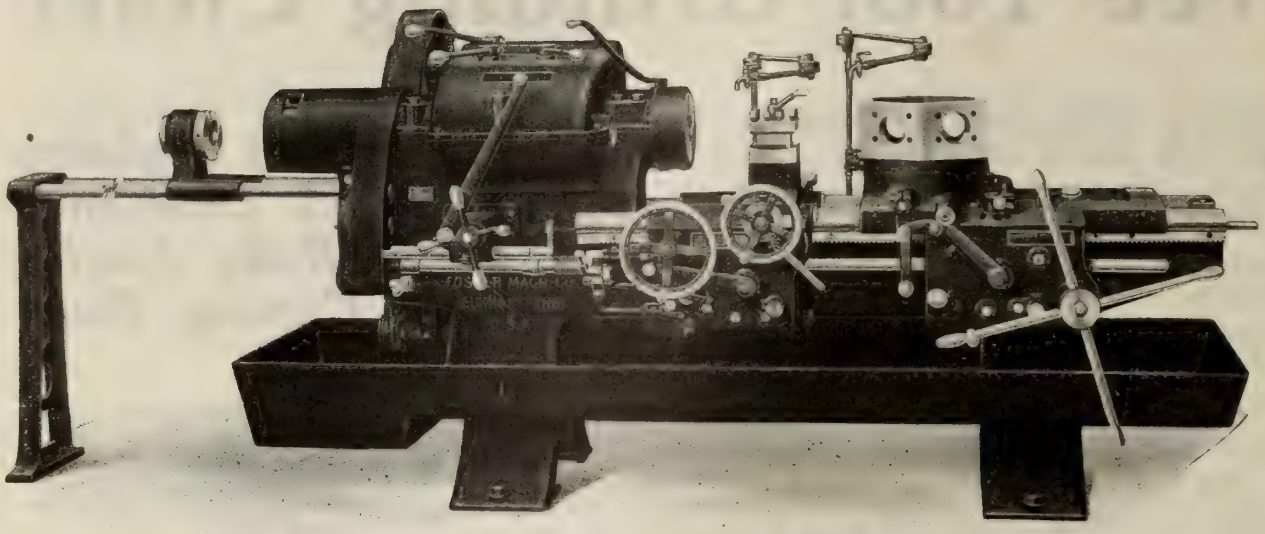
Rivet Spinning Machines

handle any rivet up to ¼-in. shank.
If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.
The Grant Book called "Perfect Riveting" tells how to give an extra appearance of quality to your product. For your copy

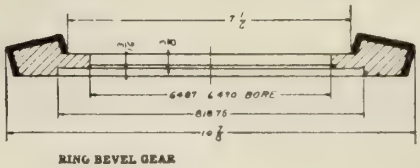
Write to-day

GRANT MFG. & MACHINE COMPANY
85 Silliman Avenue, Bridgeport, Conn.

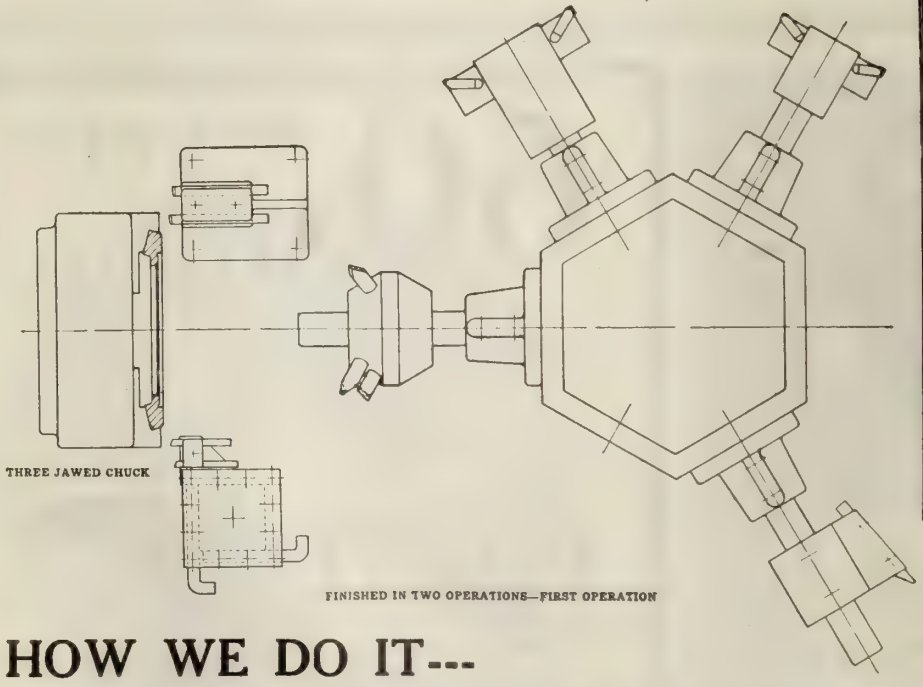
FOSTER TOOLS CUT PRODUCTION COSTS



2-B Universal Turret Lathe



RING BEVEL GEAR



THREE JAWED CHUCK

FINISHED IN TWO OPERATIONS—FIRST OPERATION

THE FOSTER LINE

No. 1-B UNIVERSAL TURRET LATHE
Bar Cap. 2" — Swing over Carriage, 14" over Cross Slide, 8"

No. 2-B UNIVERSAL TURRET LATHE
Bar Cap. 3¼" — Swing over Carriage, 20" over Cross Slide, 13½"

No. 3-B UNIVERSAL TURRET LATHE
Bar Cap. 4½" — Swing over Carriage, 26" over Cross Slide, 18¾"

No. 0 PLAIN HEAD SCREW MACHINE
Bar Cap. ⅞" — 10" Swing

No. 1 PLAIN HEAD SCREW MACHINE
Bar Cap. 1⅛" — 11" Swing

No. 2 PLAIN AND FRICTION HEAD SCREW MACHINES
Bar Cap. 1⅜" — 13" Swing

No. 3 PLAIN, FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1⅝" — 14½" Swing

No. 4 FRICTION HEAD SCREW MACHINE
Bar Cap. 1⅞" — 17¼" Swing

No. 5 FRICTION AND ALL GEARED HEAD SCREW MACHINES
Bar Cap. 1⅛" — 17¼" Swing

Nos. 6, 7, 8, 9, 10 FRICTION HEAD SCREW MACHINES
Bar Cap. 2⅛"; 2⅜"; 2⅝"; 2⅞"; 3⅛" resp. — 20" Swing

No. 2 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1⅜" — 14" Swing

No. 2 FRICTION SET-OVER TURRET LATHE
Bar Cap. 1⅜" — 14" Swing

No. 3 FRICTION HEAD UNIVERSAL TURRET LATHE
Bar Cap. 1⅝" — 16" Swing

No. 3 FRICTION HEAD SET-OVER TURRET LATHE
Bar Cap. 1⅝" — 16" Swing

THREAD MILLERS
Manufactured under the Holden & Morgan Patents

HOW WE DO IT---

The line drawing shows the Foster method of performing the first operation on a ring bevel gear. Incidentally it also illustrates the big value of the rear cross slide tool holder in reducing the production cost.

The time on this production is very short. Are you interested? Write us and we will give you actual production figures; also show you how we do the second operation.

Is our 2-B Catalogue in your files?

FOSTER MACHINE COMPANY, ELKHART, Ind., U.S.A.

Don't Read This Ad—

If You Want To Throw Away Money

on transmission troubles. As you well know, there's no easier way to spend money than on power losses, hot boxes, lubrication, etc. Thousands are spent yearly in fighting these evils. But, if you are reading this ad, you are tired of paying for these troubles. Good! Here's the panacea: **Chapman Type Ball Bearings** are durable almost to the point of permanency; save an average of 20 per cent. on power; eliminate 75 per cent. of your friction losses, and 95 per cent. of lubrication and attention. All your power is delivered to your machines. And they fit the frame you now have in your shop.

You have read this ad. Then find out about Chapman Bearings for your shafting hangers, pillow blocks, loose pulleys, friction clutches or wherever you employ bearings.

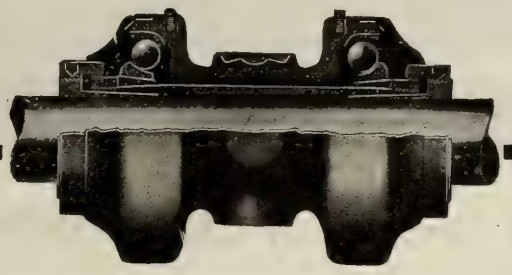
CHAPMAN DOUBLE BALL BEARING CO.

339 Sorauren Ave., Toronto, Ont.

408 Shaughnessy Bldg., Montreal — Greenville, S.C.

TRANSMISSION BALL BEARING CO., BUFFALO, N.Y.

They will fit your present hanger frames



Send for Catalog No. 3-B

The "Why" of Steel Shelving

DENNISTEEL Shelving takes proper care of stock, preventing waste and careless handling, saving time in finding the thing required. It provides 25% more storage capacity than wooden shelves, saving valuable floor space. In stock-taking, everything is simple and quick—the stock is rightly kept. **DENNISTEEL** Shelving is adjustable to requirements, will carry heavy loads, is vermin and rodent proof; will not rot, crack or split; is **FIREPROOF**, reasonable in cost and lasts a lifetime. This, we believe, will appeal to you as a money-saving proposition and economy. Write for folders, please.

THE DENNIS WIRE AND IRON WORKS CO. LIMITED
LONDON
CANADA

Halifax, Montreal, Ottawa, Toronto, Hamilton, Winnipeg, Calgary, Vancouver.

DENNISTEEL
Made in Canada

The CANADIAN Disc Sander Is 90% Dustless

Think what a godsend that is to the pattern shop! Hundreds of prominent concerns are profiting immensely by using these sanders.

Two types of Canadian sanders are built—the Disc Sander, and the Oscillating Spindle Sander. Both machines are equipped with New Departure ball bearings and General Electric motor. The table in each case can be tilted by a hand adjustment, 45 degrees down or 15 degrees up. Power is obtained by plugging into a lamp socket.

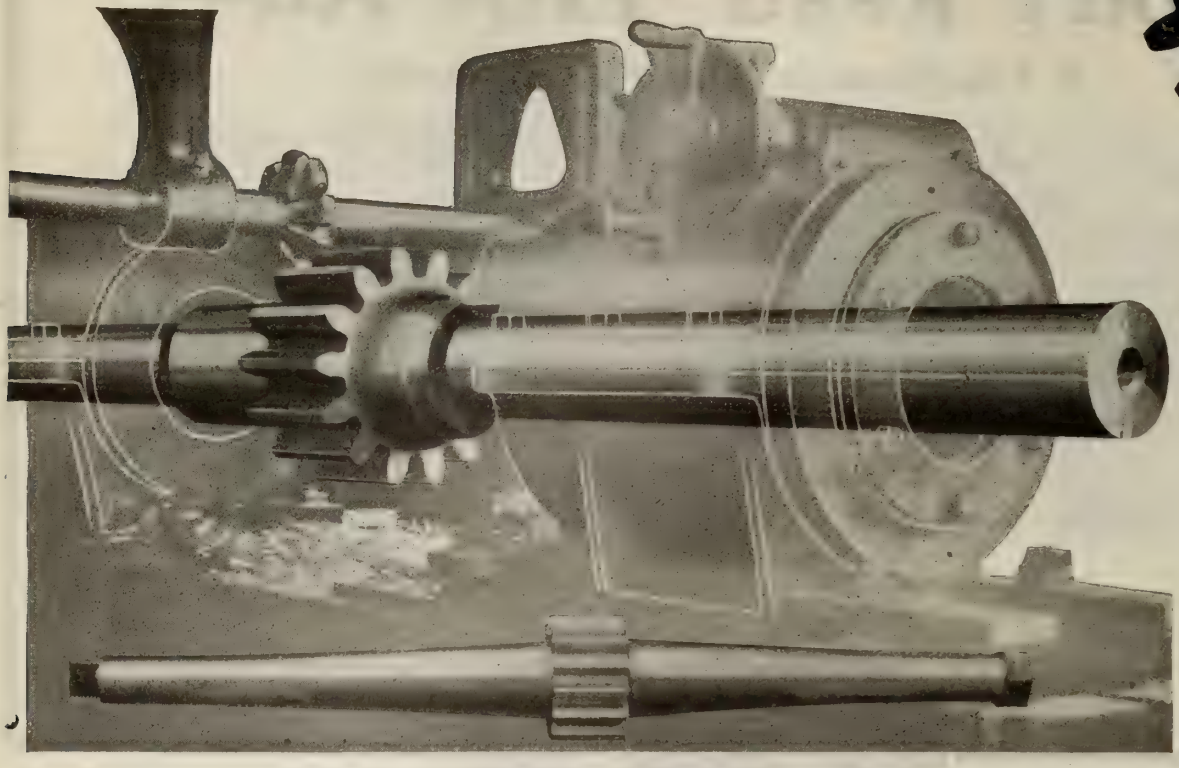
Canadian Sanders are extraordinarily well built and are guaranteed against all defects.

Ask for Bulletin and Prices

Canadian Sander Mfg. Co., Inc.
Brockville, Ont.

Cutting 2-Pitch Pinion, Forged Solid on Shaft

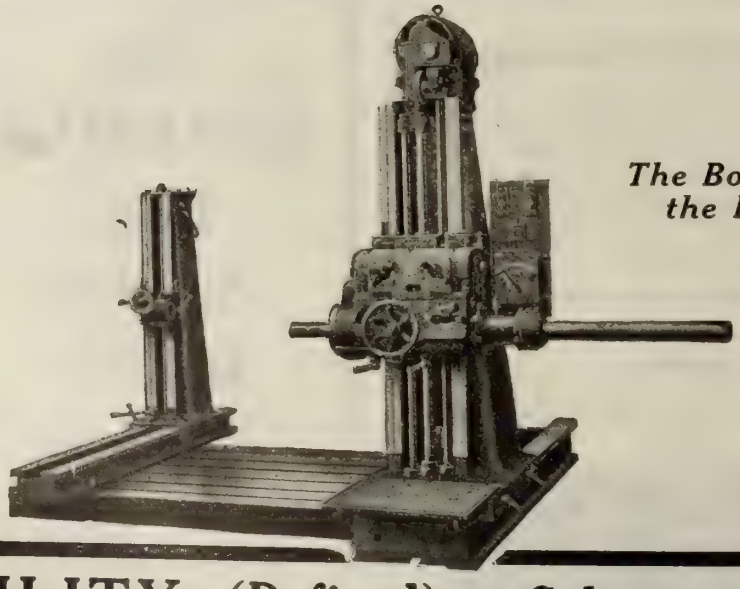
CUT GEARS



Get Our Quotation

Hamilton Gear CO. LTD. Van Horne St., Toronto

LANDIS



The Boring Machine with the Powerful Spindle

Boring, Milling and Drilling Machine

DURABILITY (Defined)—Columns sidebraced

in two directions and well proportioned for rigidity. Floor plate and runways of solid web construction and very stffly ribbed, Bearings of high grade bronze, Gears and Shafts of chrome nickel steel and specially heat-treated—these are the features which contribute to the unequalled DURABILITY of this machine.

A machine possessing such DURABILITY and capable of as many as seven different operations on large work with only one chucking is the machine for intensive production.

Our Boring Machine Catalog gives complete data.

LANDIS TOOL COMPANY, Waynesboro, Pennsylvania, U. S. A.

New York City, 50 Church Street

BERNARD

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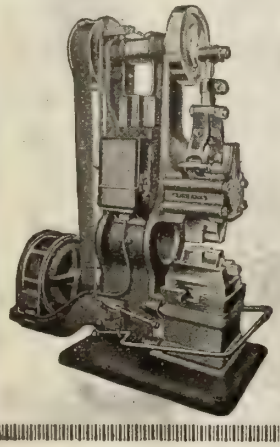

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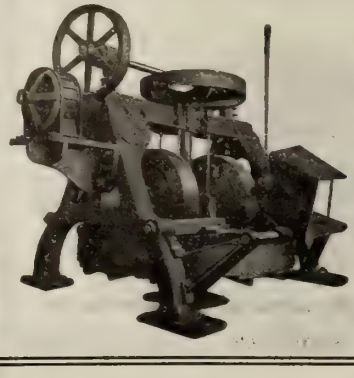

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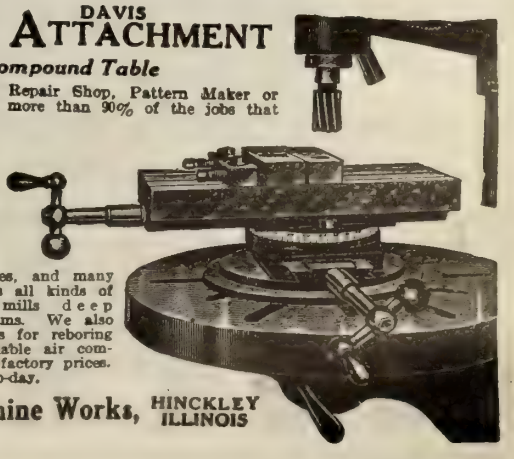

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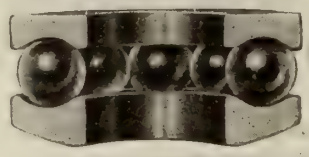

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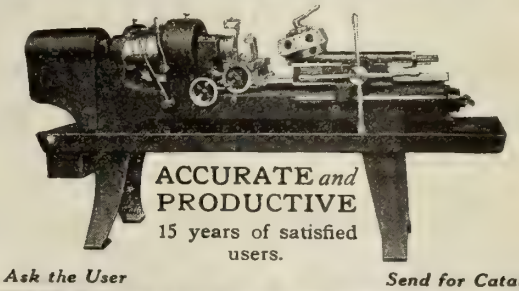
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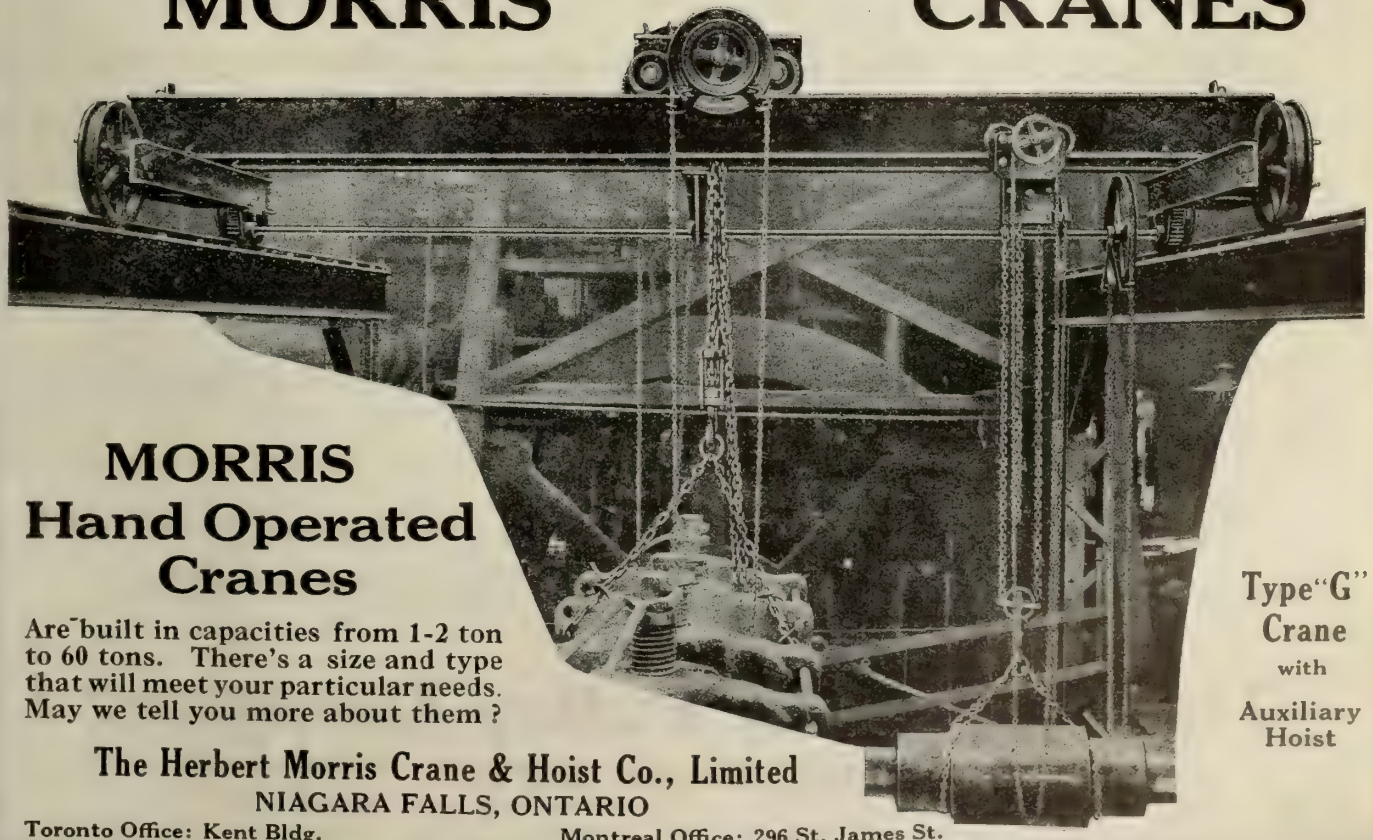
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Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRAWING
Henry Hope & Sons, Ltd., Peterboro, Ont.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
Barnes & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
Blomquist-Eck Mach. Co., Cleveland, O.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Fry's (London), Ltd., London, Eng.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

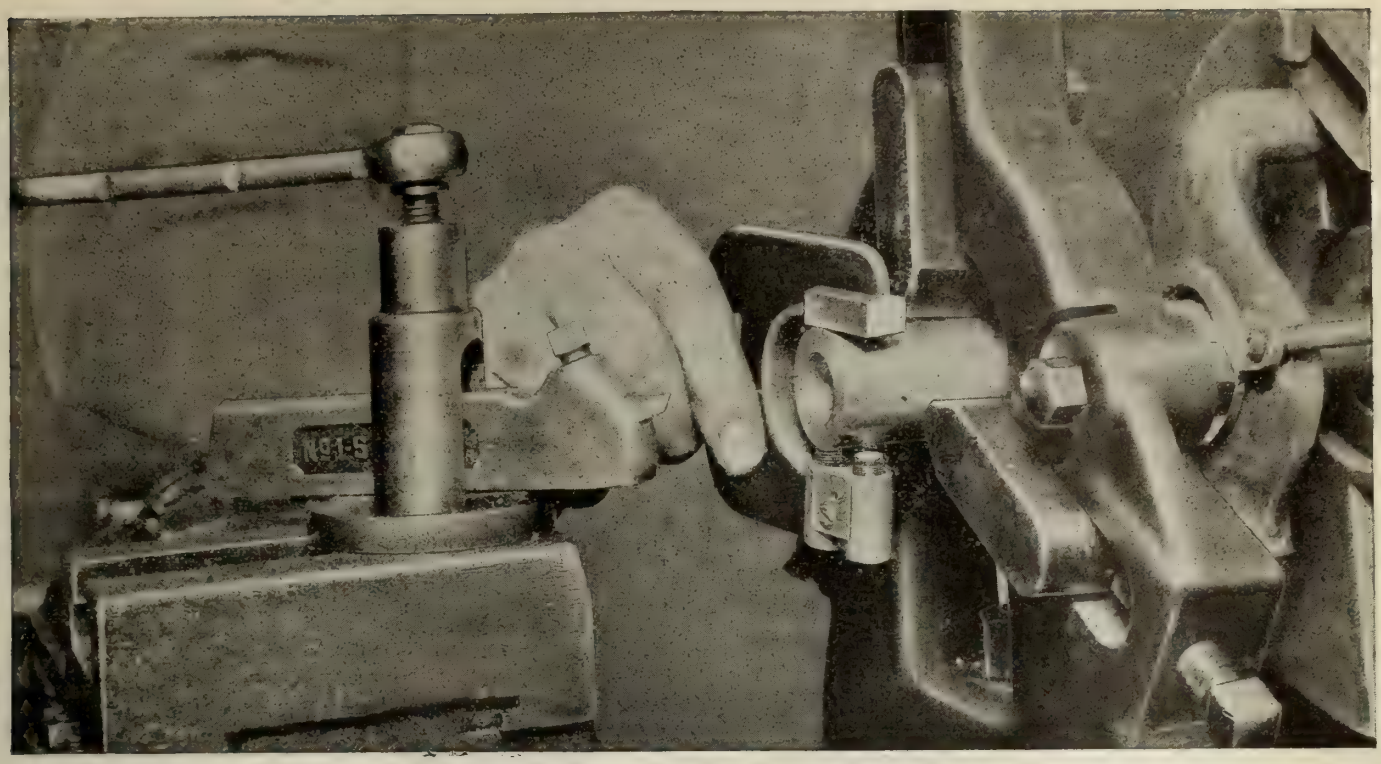
DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Co., St. Catharines.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.



Adjustable External Limit Gage in Use in Turning Work

T-P Tool Room Specialties
Limit Gages of Unlimited Utility

External Limit Gage Style 31

External Limit Gages

Taft-Peirce External Limit Gages are made from tool steel drop forgings and are so designed as to be extremely rigid and yet have large, easy measuring surfaces. They are carried in sizes that are multiples of 1/16 in. up to 3 in.—adjustable gages to 7 in.—while other sizes are finished to customers' specifications.

Limit Plug Gage

Limit Plug Gages

Taft-Peirce Limit Plug Gages can be purchased from stock in all usual sizes and limits. The gage is made up of three units, a "Go" plug Style 11, a "Not Go" plug Style 12, and a handle Style 13, all of which are carried in stock sizes in multiples of 1/16 in. These plug members are so designed that they may be reversed on the same handle by simply removing the screw and turning the plug around. Larger and special sizes are made to order. Bulletin No. 104E describes the complete line of T-P gages and other tool room accessories. Ask for it.

TAFT-PEIRCE
Woonsocket, R.I., U.S.A.

New York: Woolworth Building 2072 Detroit: Majestic Building

Williams & Wilson, Limited, Montreal and Quebec

Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK

Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK

Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN

See Belting, Chain.

DRIVING TOOLS

The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM

Bowser & Co., Inc., Fort Wayne, Ind.

DRYERS, SAND

Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES

Baird Machine Co., Bridgeport, Conn.

DRUM CONTROLS

Elec. Steel & Metals, Ltd., Welland, Ont.

DUMP CARS

Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER. ARRESTER SYSTEM

Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT

Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS

Can. Blower & Forge Co., Kitchener, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES

Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES

Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACE

Electric Steel & Metals, Ltd., Welland.
General Steel Co., Milwaukee, Wis.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

Can. Driver-Harris Co., Walkerville, Ont.

ELEVATOR, ENCLOSURES

Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS

Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS

Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES

Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS

Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS

Wheel Trueing Tool Co., Windsor, Ont.

END MILLS

John Morrow Screw & Nut Co., Ingersoll

ENGINES, STEAM, GAS, GASOLINE

Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL

Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE

Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS

Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS

Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS

Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRACTORS, TAP

Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS

Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS

Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES

Page Steel & Wire Co., Adrian, Mich.

FANS

Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE

Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY

Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES

Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Simonds Mfg. Co., Fitchburg, Mass.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL

Bowser & Co., S. F., Fort Wayne, Ind.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRST AID CABINETS

Strong, Kennard & Nutt Co., Cleveland.

FIRE BRICKS

Harbison-Walker Refractories Co., of Canada, Montreal, Que.

FIRE EXTINGUISHERS

Strong, Kennard & Nutt Co., Cleveland, O.

FIXTURES

Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS

Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON

Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING

Victoria Foundry Co., Ottawa.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL

Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING

H. Hope & Sons of Can., Ltd., Peterboro

FOUNTAINS, DRINKING

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS

Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING

Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS

Bowser & Co., S. F., Inc., Fort Wayne.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING

Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST

Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING

Gilbert & Barker Mfg. Co., Springfield.
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL,

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

Standard Fuel Engr. Co., Detroit, Mich.

FUSE BOXES, STEEL

Dom. Forge & Stamp. Co., Walkerville.

GANG PLANER TOOLS

Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.

Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

Bowser & Co., S. F., Inc., Fort Wayne.

GAUGES

Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS

Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT

Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD

Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE

Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL

C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS

Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST

Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS

Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY

Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE

Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL

Bridgeford Mach. Tool Wks, Rochester.

GEAR BOXES, REDUCTION

Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN

Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM

Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE

Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR

Fellows Gear & Shaper Co., Springfield, V.

GEARS, SPRING

Morse Chain Co., Ithaca, New York.

GEARS, SILENT CHAIN GENERATORS, STEAM TURBO

Can. General Electric Co., Toronto, Ont.

GENERATORS AND CONVERTORS

Can. General Electric Co., Toronto, Ont.

GENERATORS, MOTOR

A. R. Williams Machry. Co., Toronto.
Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

GERMAN SILVER

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.

Strong, Kennard & Nutt Co., Cleveland.

GLUE HEATERS

Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY

Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GOVERNOR, WATER WHEEL

Wilson & Co., J. C., Belleville, Ont.

GRAPHITE

Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES

Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal.

GRAVITY CARRIERS

Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS

Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE

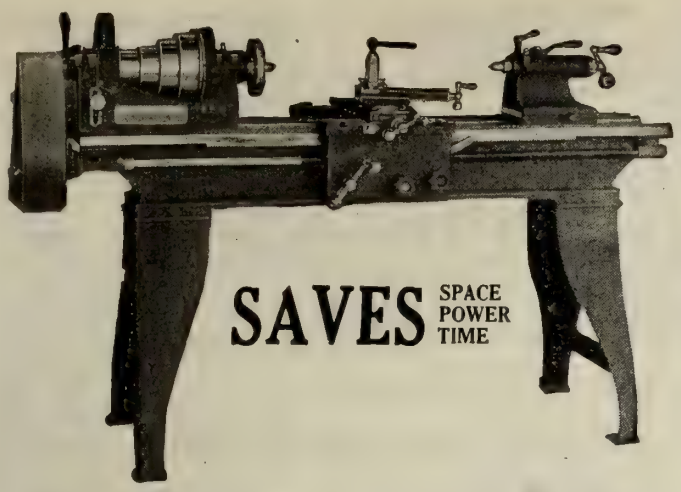
W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH

Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal.

GRINDERS, CUTTER

Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.



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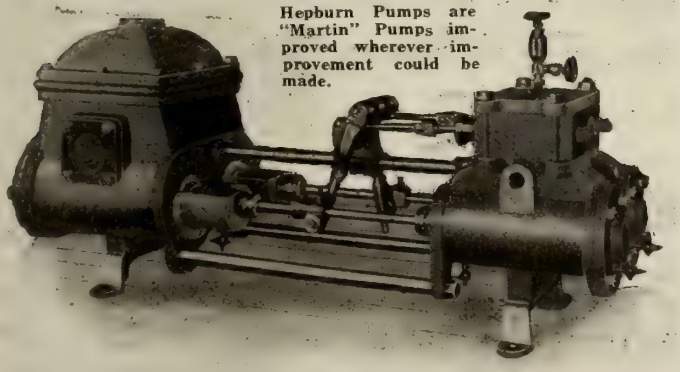

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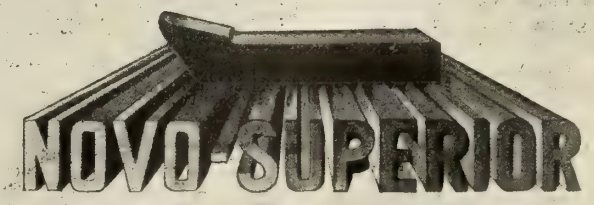

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Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS

Kearney & Trecker Co., Milwaukee, Wis.

MILLING ATTACHMENTS

Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, AUTOMATIC

Bilton Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MILLING CUTTERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL

Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL

Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PROFILE

Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING TOOLS

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

MINE CARS

Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY

Can. Fairbanks-Morse Co., Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND

Frost Mfg. Co., Chicago, Ill.

MODEL WORK

Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES

Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC

Can. Fairbanks-Morse Co., Montreal.
Can. General Electric Co., Toronto.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK

The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC

Cleveland Pneumatic Tool Co., Toronto.

MULTIPLE INDEX CENTRES

Garvin Machine Co., New York.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,

Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL

Brown's Copper & Brass Roller Mills, New Toronto, Ont.

NAIL SETS

Morrow Screw & Nut Co., J., Ingersoll, Ont

NAIL MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED

Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS

Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL

Boker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL

See Steel.

NIPPLE HOLDERS

Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES

Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN

Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED

Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED

Gait Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT BURRING AND NUT MACHINES (HOT)

National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES

Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS

Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS

Can. Fairbanks-Morse Co., Montreal.

OIL STONES

Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS

Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS

Bowser & Co., Inc., S. F., Toronto, Ont.

OPENING DIE HEADS

Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES

Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING

Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL

Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS

Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS

Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

PACKINGS, ASBESTOS

Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.

Graton & Knight Mfg. Co., Worcester, M.
Perrin, Ltd., William, Toronto.

PANS, WET AND DRY

Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES

Bertrams, Ltd., Edinburgh, Scotland.
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE

See Guards

PAPER MILL MACHINERY

Garlock-Walker Machinery Co., Toronto.

PATTERN SHOP EQUIPMENT

Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES

See Lathes.

PATENT SOLICITORS

Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Wilson & Co., J. C., Belleville, Ont.
Greenleafs, Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

PECK CARRIERS FOR POWER PLANTS

Can. Link-Belt Co., Toronto, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS

Canada Wire & Iron Goods Co., Hamilton

PIG IRON

Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER

Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING

Clipper Belt Lacer Co., Grand Rapids.

PIPE FITTINGS, MALLEABLE AND CAST IRON

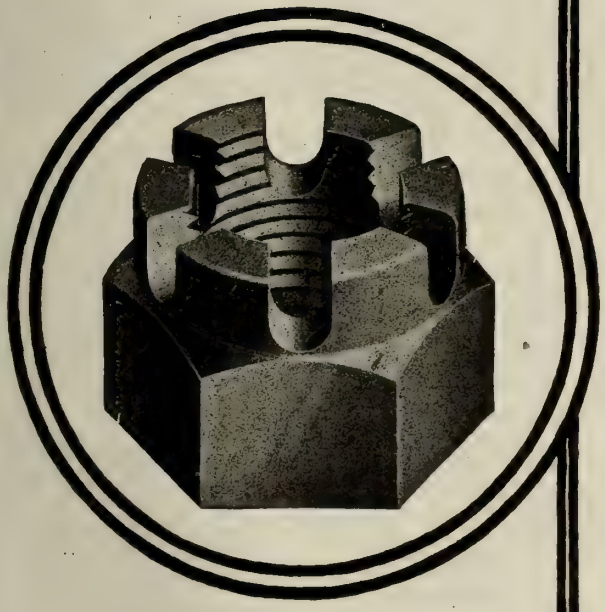
International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES

Butterfield & Co., Rock Island, Que.

SCREW MACHINE PRODUCTS

STANDARD OR SPECIAL



READY FOR DELIVERY

NUTS—Plain—S.A.E.
Castellated—S.A.E.
Semi-finished—V—U.S.S.

SCREWS—Cap V—U.S.S.—S.A.E.
Set—U.S.S.—V.

MADE TO SPECIFICATIONS

Special Screw Machine work, sizes up to 2¼" diameter, 10½" long.

NAMCO

THE NATIONAL ACME COMPANY

DE COURCELLES & G.T.R. MONTREAL P.Q.

Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS AND DIES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON RODS, ROUGH TURNED
General Steel Co., Milwaukee, Wis.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Williams & Wilson, Ltd., Montreal, Que.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGowern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Williams & Wilson, Ltd., Montreal, Que.

PRESSED STEEL PARTS
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlass Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Banfield & Son, W. H., Toronto.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Standard Machy. & Supplies, Montreal.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Standard Mach. & Supplies, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL
Bowser & Co., Inc., Toronto, Ont.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, RUBBER CEMENT
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H, Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Standard Mach. & Supplies, Montreal.
Wells Bros. of Can., Galt, Ont
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
H. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

REAMERS STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.

REAMERS, HAND
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

REAMERS, PIN
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland.

RIVETS.
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

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Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

RODS, ROPE AND SPRING
General Steel Co., Milwaukee.
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

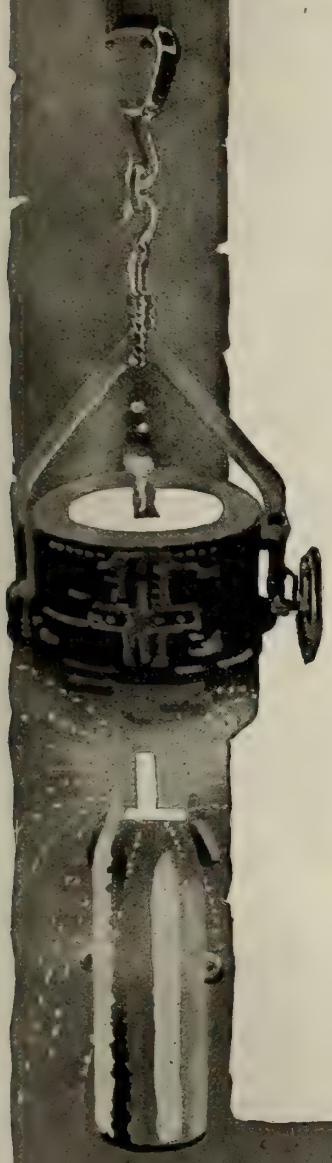
ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

Nichrome Castings for Heat Treatment



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The performance of cast iron, cast steel, structural steel and wrought iron in heat treatment has never been satisfactory. Ferrous castings contain blow holes, slag inclusions, sand and foreign material, all of which affect the time rate of heat penetration. The repeated heating and cooling of ferrous materials from room temperature to 1800° F. for several hours results even in a reducing atmosphere in the material becoming blistered, burned, cracked and covered with scale; thereby producing thin spots in the walls and ultimately holes are burnt through.

Under the influence of heat, Cast Nichrome DOES NOT CRACK, GROW, WARP or SCALE. Being heat resisting and durable, it minimizes and practically eliminates costly expenditures for repairs and maintenance. The life of carbonizing boxes and other heat treating containers is 25 to 48 times that of ferrous materials under the severest conditions.

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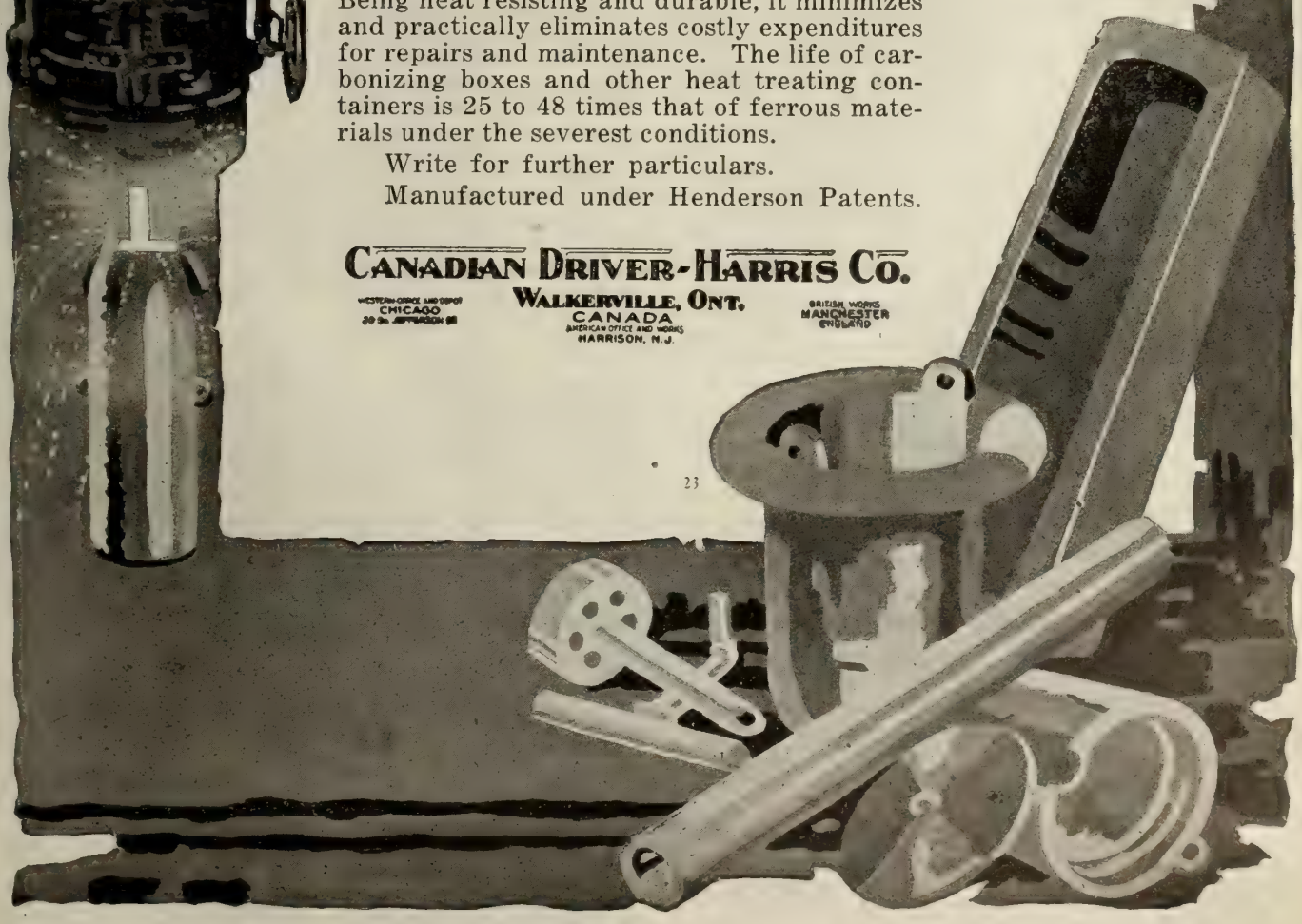

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ROOF COOLERS
Electric Steels & Metals, Ltd., Welland.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

RUBBER MILL DRIVES
Can. Link-Belt Co., Toronto.

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James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

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RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

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Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
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SAND MILLS
Frost Mfg. Co., Chicago, Ill.

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Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
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Puro Sanitary Drinking Fountain Co., Haydenville.

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Can. Sander Mfg. Co., Brockville, Ont.

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Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

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SAW SHARPENERS
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Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
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Lufkin Rule Co. of Can., Windsor.

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Shore Instrument & Mfg. Co., New York.

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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
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Greenfield Tap & Die Corp., Greenfield.
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Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

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Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

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Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

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See Dies.

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Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

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Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Williams & Wilson, Ltd., Montreal.

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Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Rice, Lewis & Son, Toronto.

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Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

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John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
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SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

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SHEETS, NICKEL. RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

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Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
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SHEARS, SERPENTINE
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SHEARS, SQUARING
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D. H. Stoll Co., Inc., Buffalo, N.Y.

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Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

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Modern Tool Co., Erie, Pa.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto. Ont.

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Katie Foundry, Galt, Ont.

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Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
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Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

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Cleveland Wire Spring Co., Cleveland.
Dumbar Bros. Co., Bristol, Conn.
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Brown Engineering Corp., Toronto, Ont.
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Garvin Machine Co., New York.
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John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Marten Machine Co., Hamilton, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Wilson & Co., J. C. Belleville, Ont.
William R. Perrin, Ltd., Toronto.
Windsor Mach. & Tool Co., Windsor, Ont.

SPRING COILING AND WINDING MACHINERY
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Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
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Sleeper & Hartley, Inc., Worcester, Mass.

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SPROCKETS, SPRING
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Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia.
Wilson & Co., J. C., Belleville, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Perrin, Wm. R., Toronto.
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Katie Foundry, Galt, Ont.

SQUARES
Peck, Stow & Wilcox Co., Southington, Conn.

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Oliver Mach. Co., Grand Rapids, Mich.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

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Wells Bros. of Can., Galt, Ont.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

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Dom. Forge & Stamping Co., Walkerville
Hope & Sons, Henry, of Canada, Peterboro, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
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Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

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Matthews, Jas. H & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STAPLE MACHINES
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STEAM SEPARATORS AND TRAPS
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STEEL BALLS
See Balls Steel.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL CHROME VANADIUM
General Steel Co., Milwaukee, Wis.
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Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Electric Steel & Metals Co., Welland.
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Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Po.

STEEL, HIGH SPEED

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Can. Fairbanks-Morse Co., Montreal
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., J., New York.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Plewes, Ltd. Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
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STEEL, CHROME, MANGANESE

Joliette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH

Illingworth Steel Co., John, New York.

STEEL, CRUSHED

Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL, ROCK DRILL

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Norton, Ralph B., Agent, Montreal.

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Atkins & Co., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
General Steel Co., Milwaukee, Wis.
Drury Co., H. A., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto, Ont.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Wells Bros. of Can., Galt, Ont.

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Wells Bros., of Can., Galt, Ont.

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Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

STRAIGHTENING MACHINERY

Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND

Page Steel & Wire Co., Adrian, Mich.

SWITCHBOARDS

Can. General Electric Co., Toronto, Ont.

SWITCHES, RAILWAY

Can. Steel Foundries, Ltd., Montreal.

TABLES, SAND-BLAST

Pangborn Corporation, Hagerstown, Md.

TACK (DOUBLE POINT) MACHINES

Sleeper & Hartley, Inc., Worcester, Mass.

TAPPING MACHINES (PNEUMATIC)

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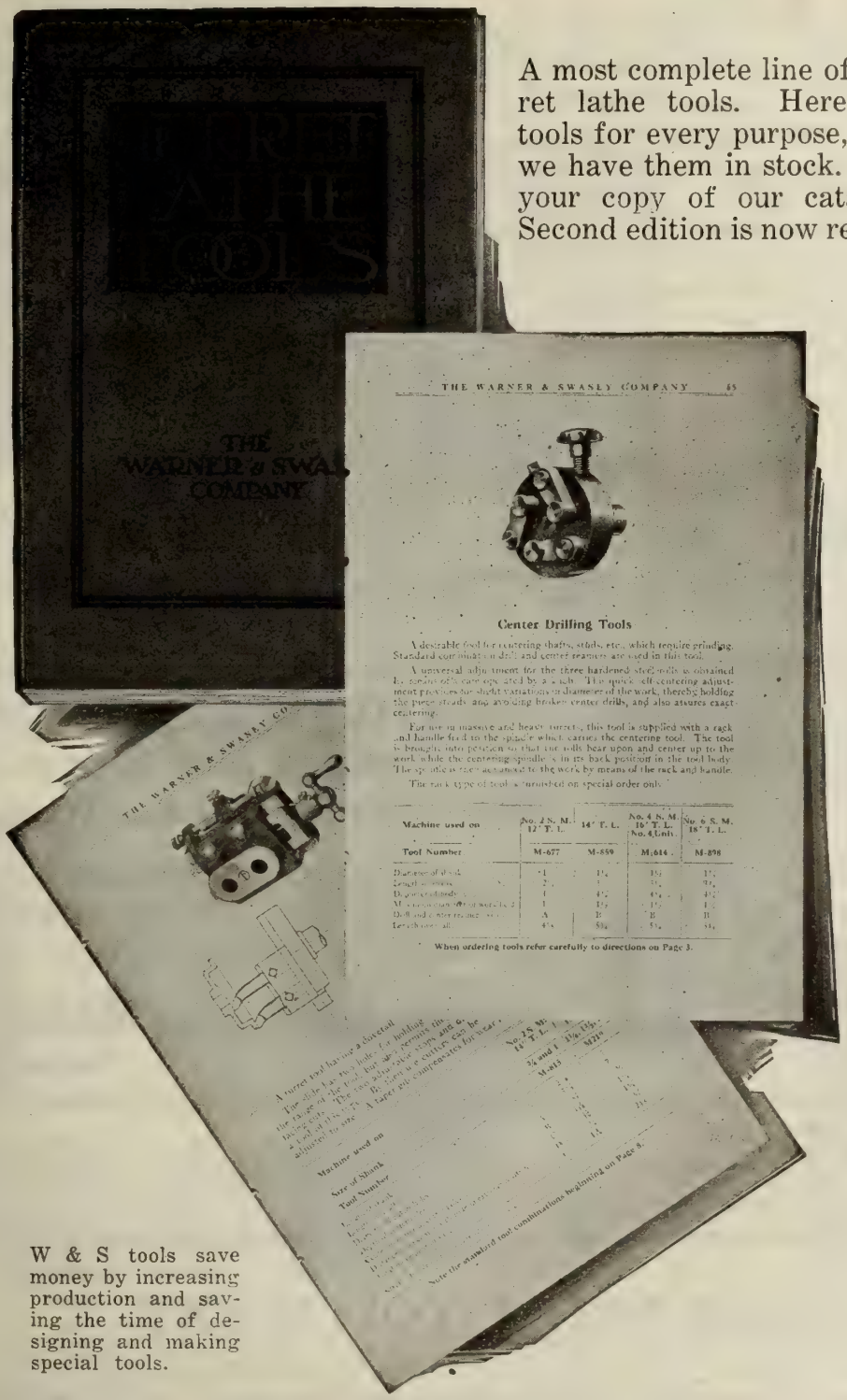

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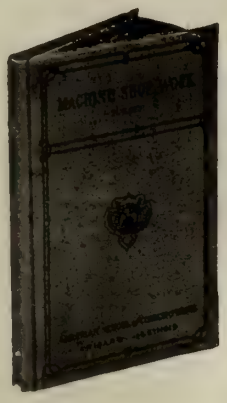

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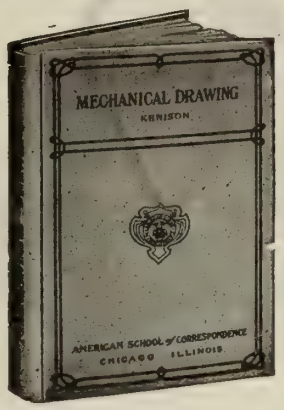

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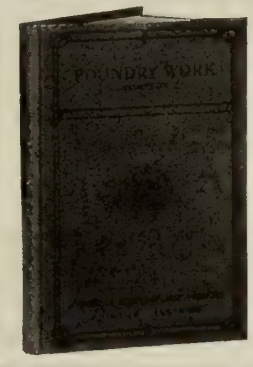

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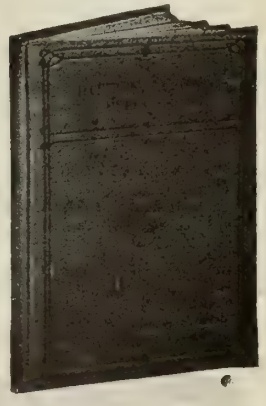

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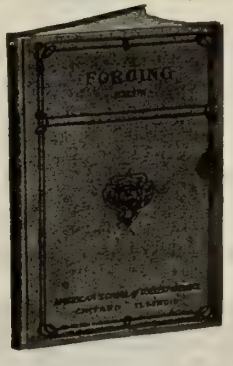

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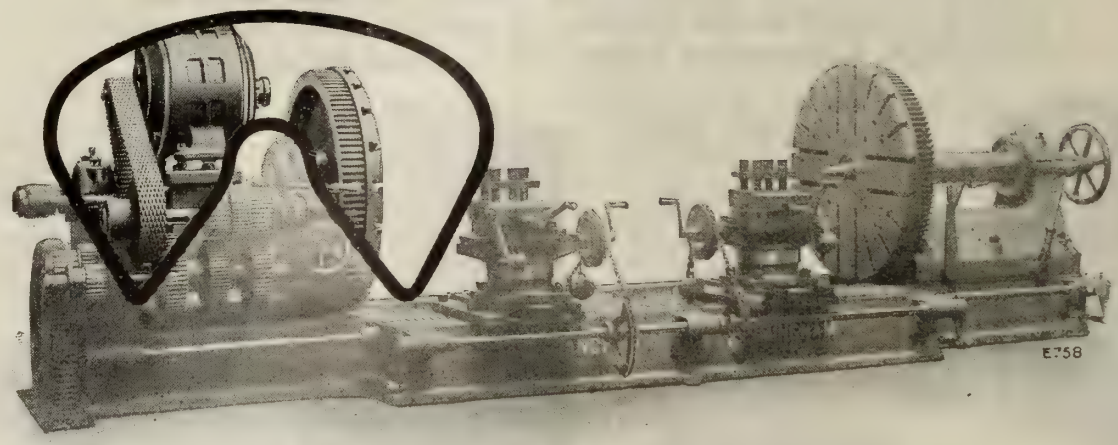

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The Secret of the Strikes

Most Canadians are asking "What is the cause of the 'Great Unrest' "? Is it the fault of labor—or of capital?—or is it the result of German propaganda? Do you know of the real reason for the labor disturbances in Canada, and elsewhere? Are YOU thoroughly familiar with the ins-and-outs of the plans which threaten a world-wide "tie-up?" This is something that should be understood by every Canadian. And every Canadian should read "The Secret of the Strikes," by Lieut.-Colonel J. B. Maclean in the August issue of MacLean's Magazine. It is brimful of startling and authoritative information regarding this great problem. Read it carefully. It starts on page 33, August MacLean's.

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Stephen Leacock is one of the continent's greatest humorists. "The Lecturer at Large" is one of the best humorous sketches that he has written. It is made up of what he terms "a few painful reminiscences of the platform" in the course of his lecturing up and down Canada. Get your family around you and read the sketch aloud—it's a rare treat.

Other Big Features

"A Party in the Making." By J. K. Munro. Illustrated by William Casey. An article on the political situation, giving a great deal of inside information with reference to recent developments at Ottawa.

"Solving the Problem of the Arctic." By Vilhjalmur Stefansson. The fifth instalment of his story of the five years' explorations that he conducted for the Dominion of Canada.

"The Unspoiled Country." By Harold C. Lowrey. A descriptive article of a part of Canada which is little known to Canadians generally, Temagami.

"Petite Simunde." By Arthur Beverley Baxter. Illustrated by E. J. Dinsmore. A charming romance of the war. The author will be remembered favorably for his "Mr. Craighouse of New York, Satirist."

"The Seven Blue Doves." By W. A. Fraser. Illustrated by Charles L. Wrenn. The fifth of the Bulldog Carney series and in some respects the best. It is a mystery story.

"His Majesty's Well-Beloved." By Baroness Orczy. Illustrated by C. F. Peters. The second instalment of this splendid romantic novel of the colorful era of Charles II.

The Month's Vital Question

Turn to page 34, August MACLEAN'S, and you will find timely and interesting information regarding the High Cost of Living—a problem of large proportions.

The Review of Reviews

Here are a few of the articles chosen as the best published during the past month in all magazines:—Britain Winning Supremacy of the Air; Has Japan Two Governments?; Kaiser Employed Famous Beauties; The New Triple Alliance; Mammoth Animals in Alberta.

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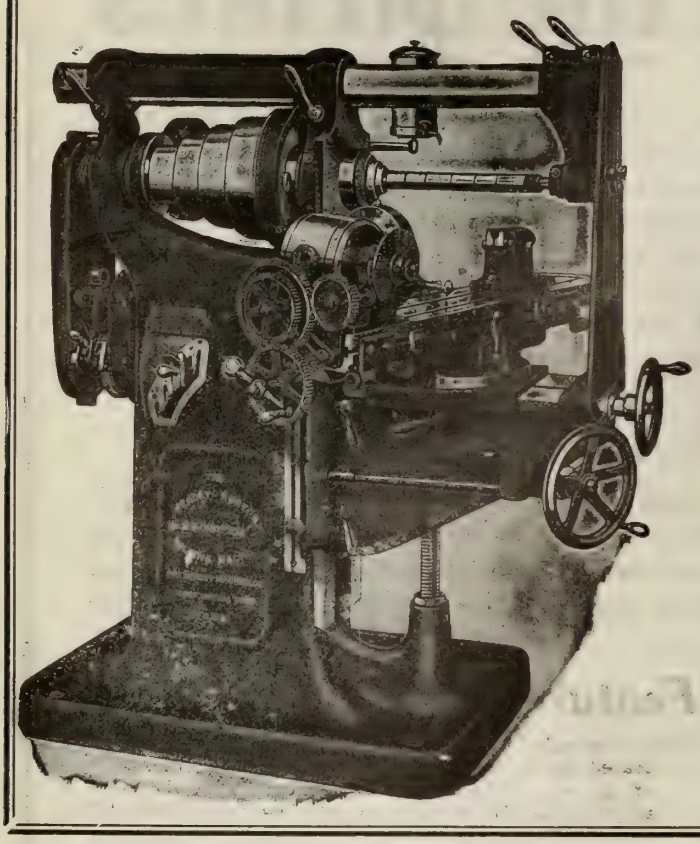

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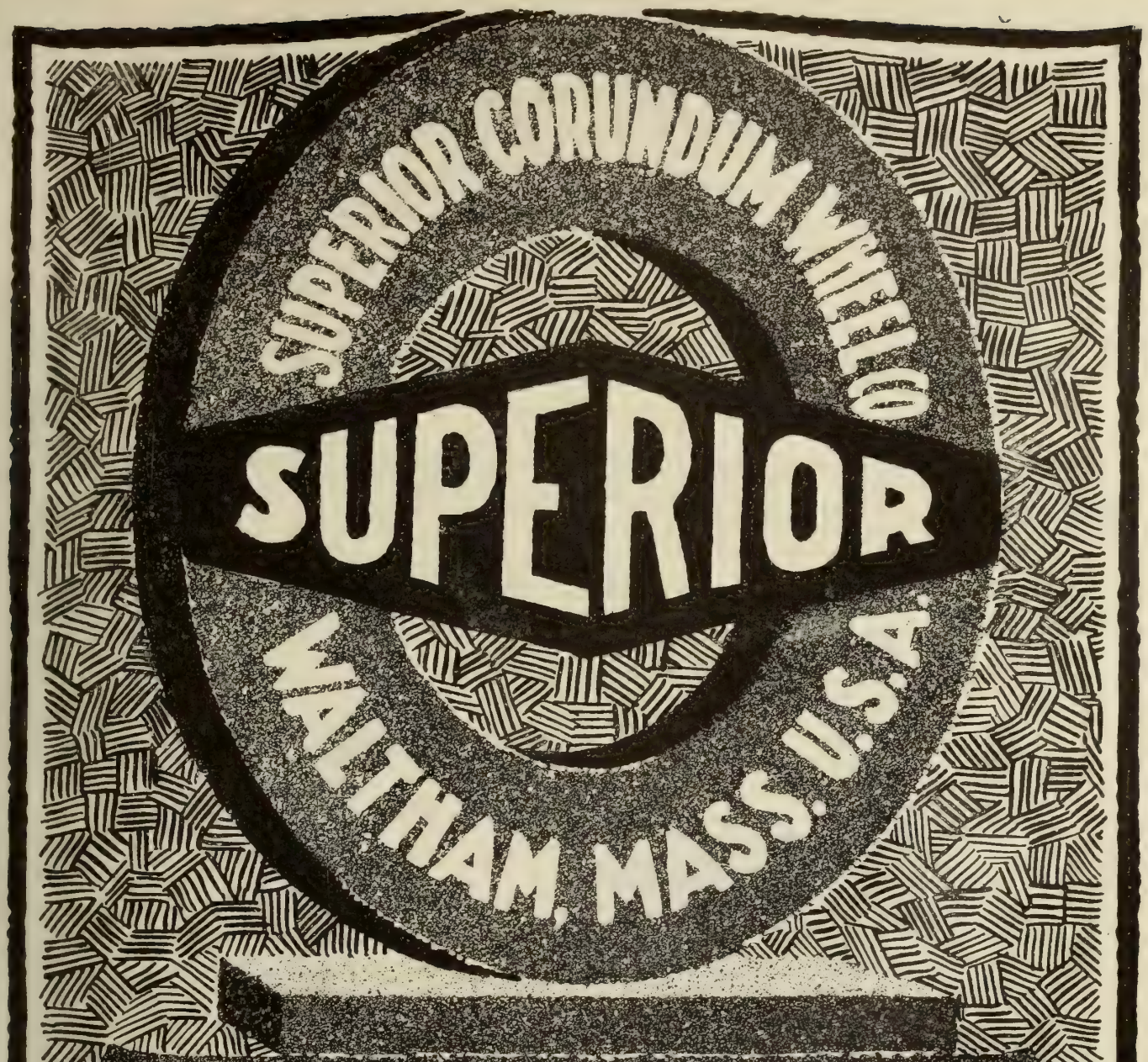

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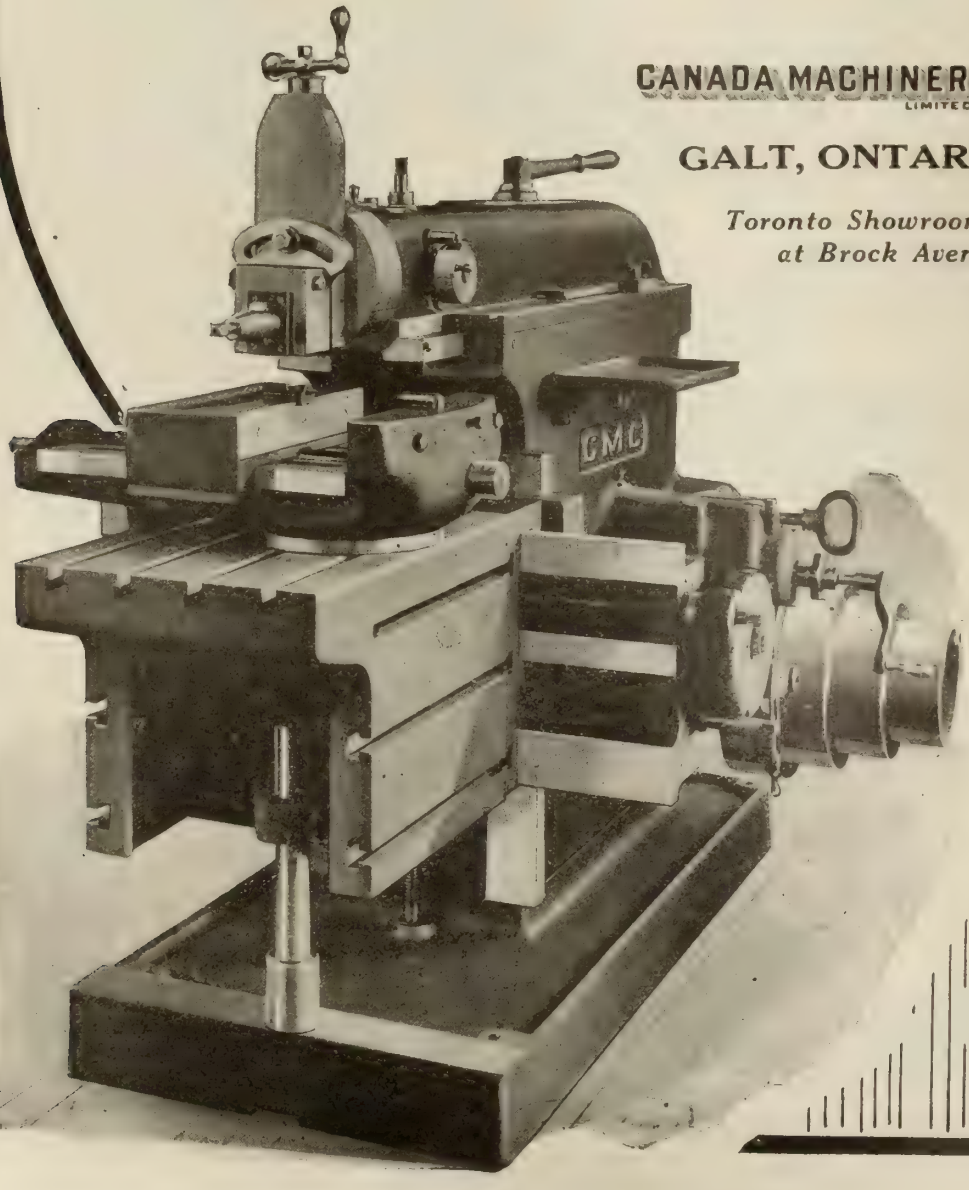

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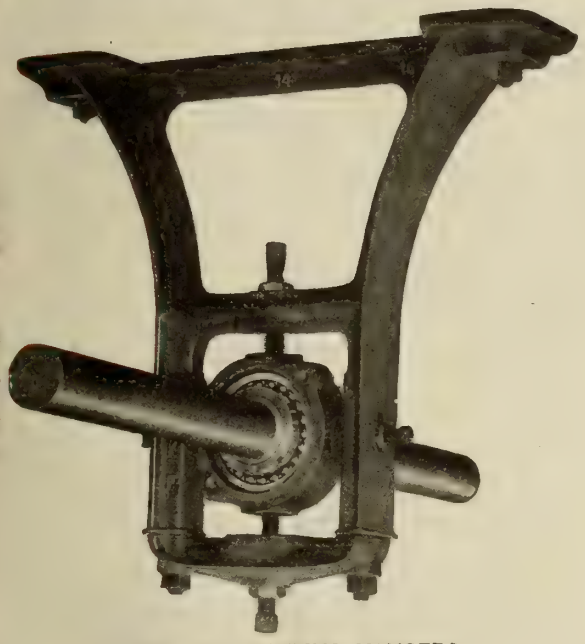

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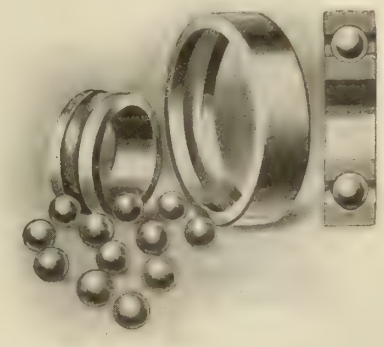

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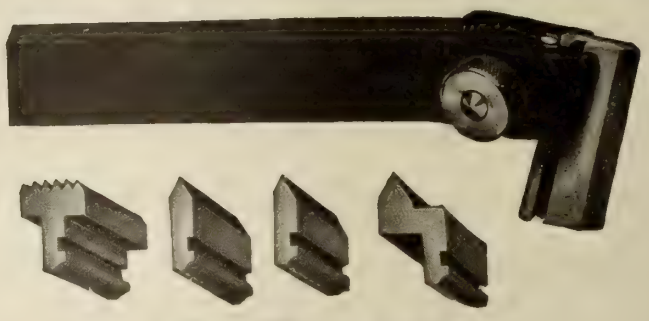

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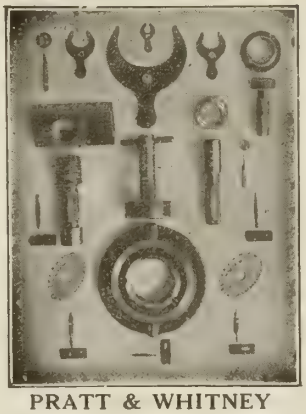

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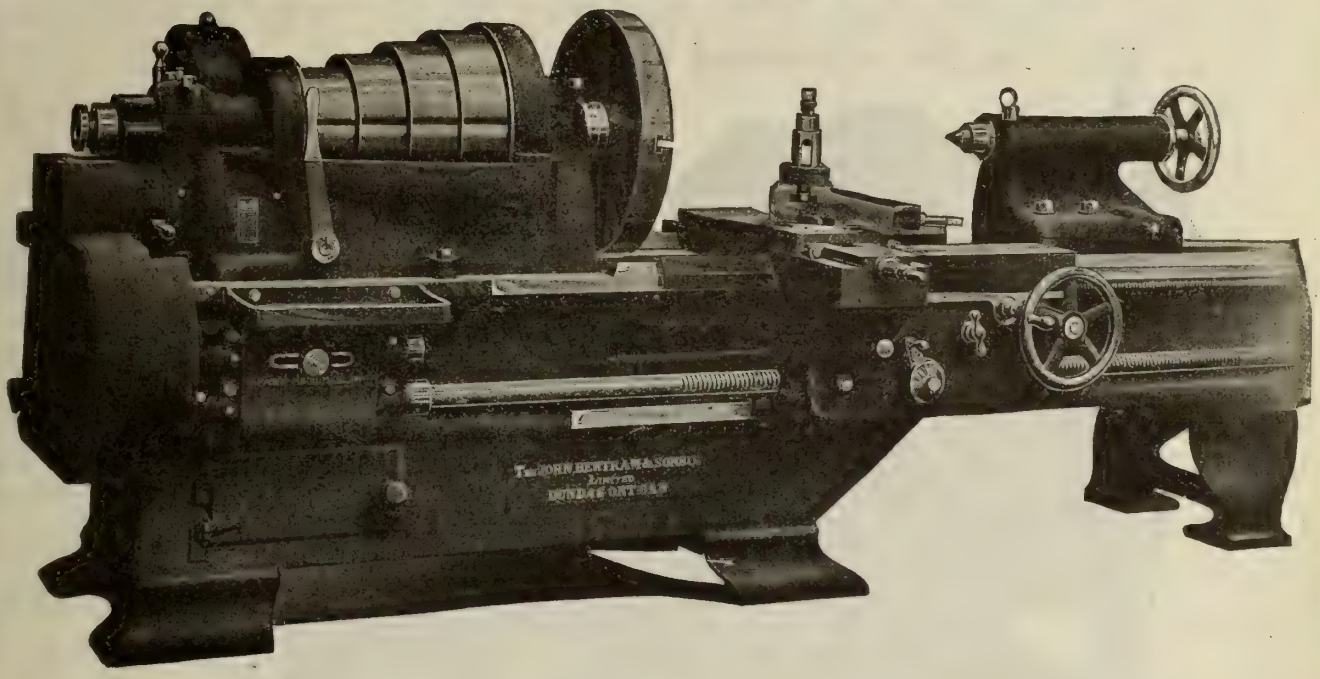

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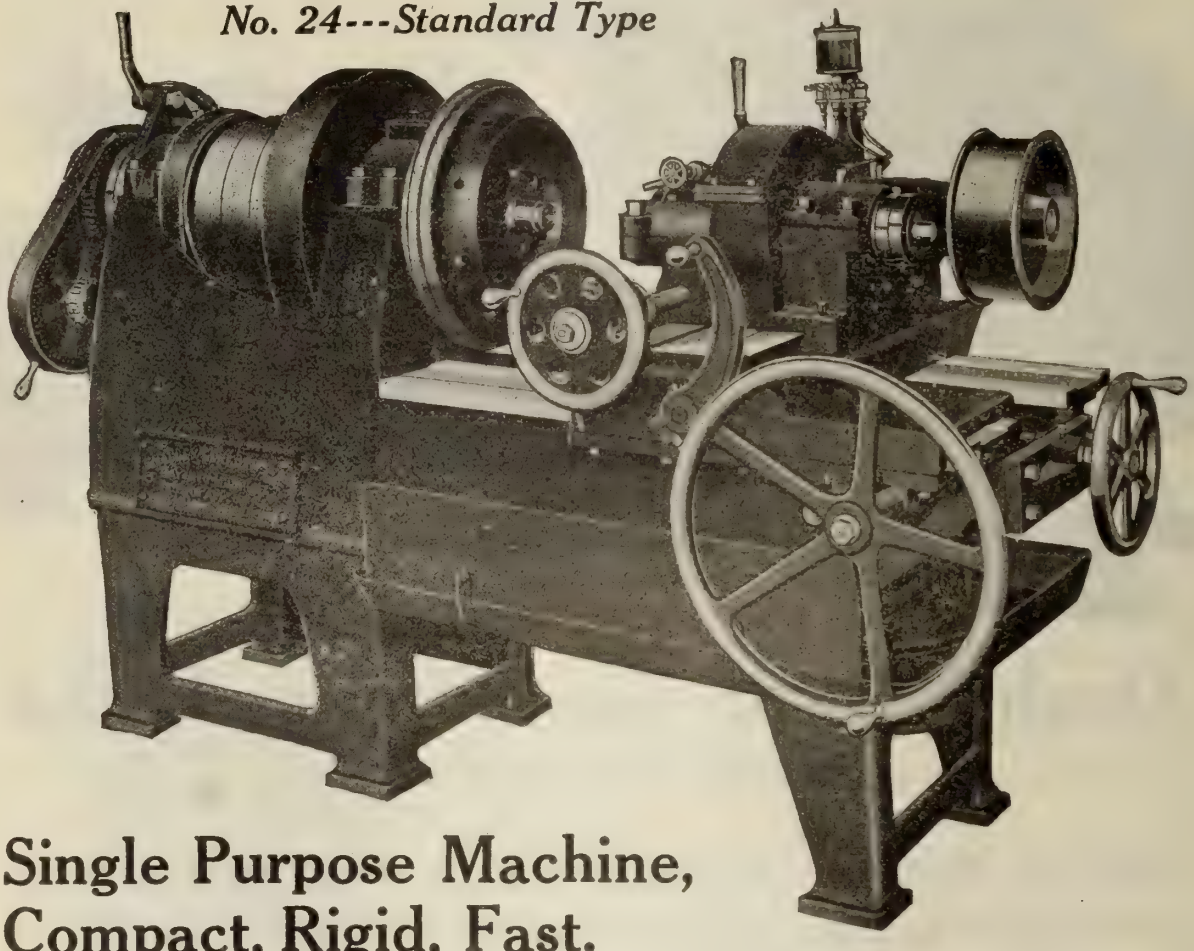
Smalley General Thread Miller

No. 24---Standard Type



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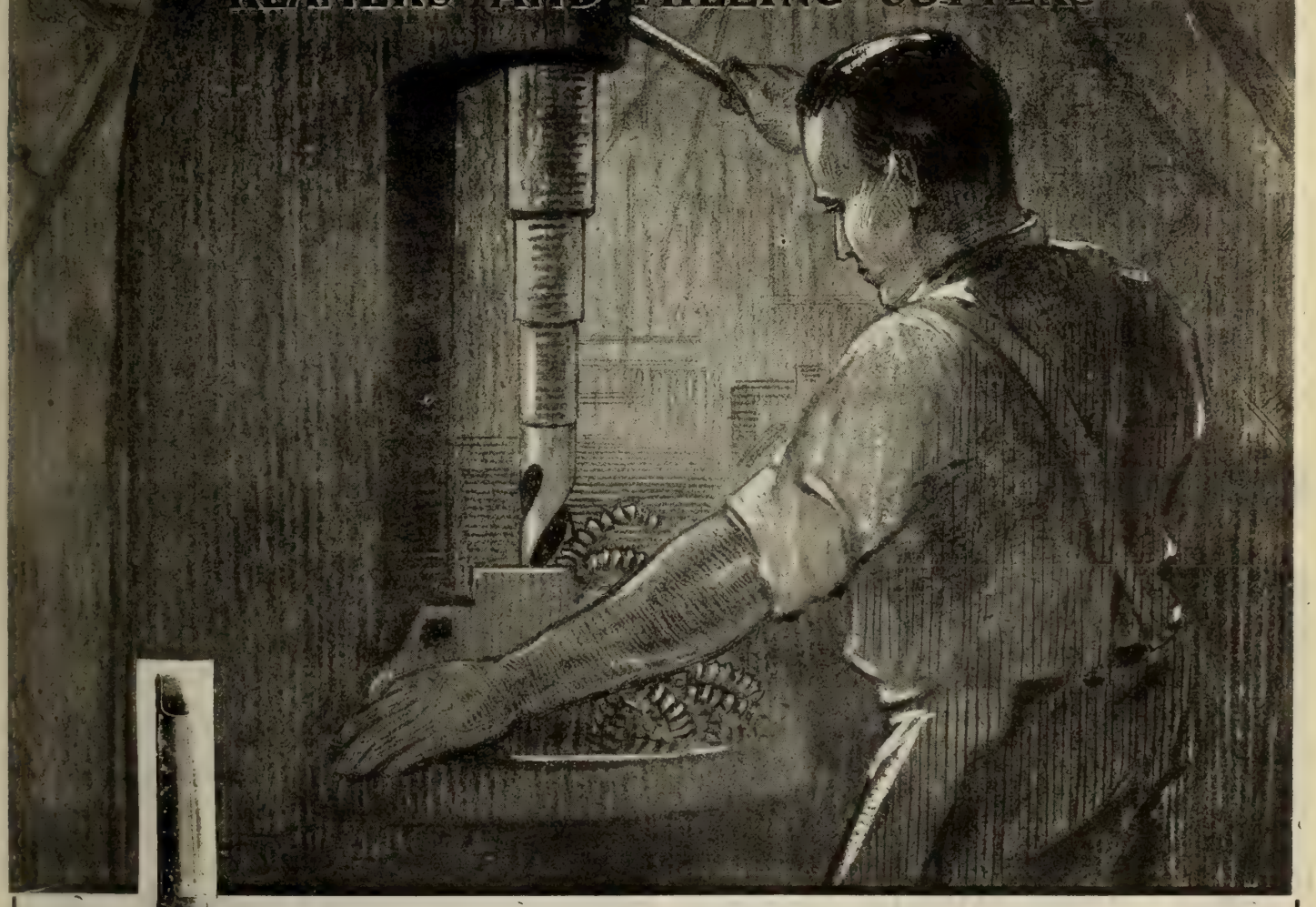

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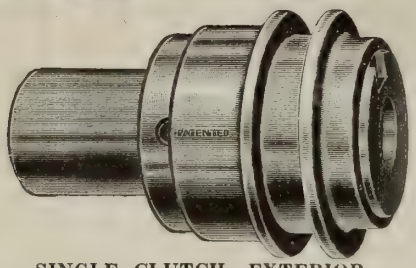

SINGLE CLUTCH—EXTERIOR

THE SIMPLEST WAY—AND THE BEST

In a clutch or any other mechanical device, unnecessary complication means trouble. Make a single part serve where two have been used before, and you have reduced by one-half the places than can break, wear or get out of adjustment. Put the cost of *extra* material into *better* material, and you have doubled the length of service.

In the Johnson clutch, this idea has been fol'owed out to its practical limits. The result is a model of simplicity in clutch construction—a few sturdy parts, each correctly built and accurately tested for the duty it must perform. This lack of complication means continuous service and low maintenance cost. Johnson Friction Clutches stay on the job.

WE CAN BUILD TO SUIT YOUR NEEDS

WRITE FOR OUR YELLOW DATA SHEETS

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WILLIAMS & WILSON, LIMITED, 84 Inspector Street, Montreal.

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Swedish Steel & Importing Co., Limited

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New York

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Direct representatives of foremost Swedish mills; makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

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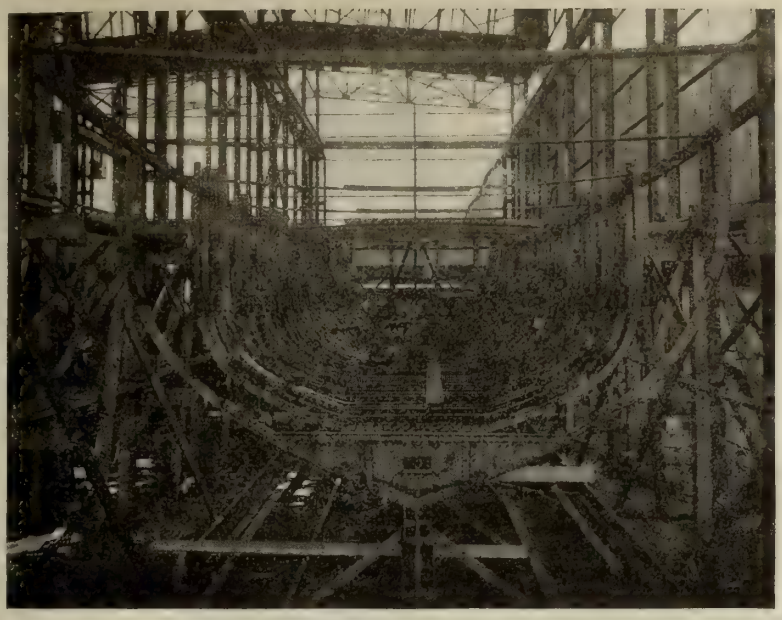
PROMPT SHIPMENTS from large stock



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IN STEEL

STERN and RUDDER FRAMES,
SHAFT BRACKETS, ANCHORS,
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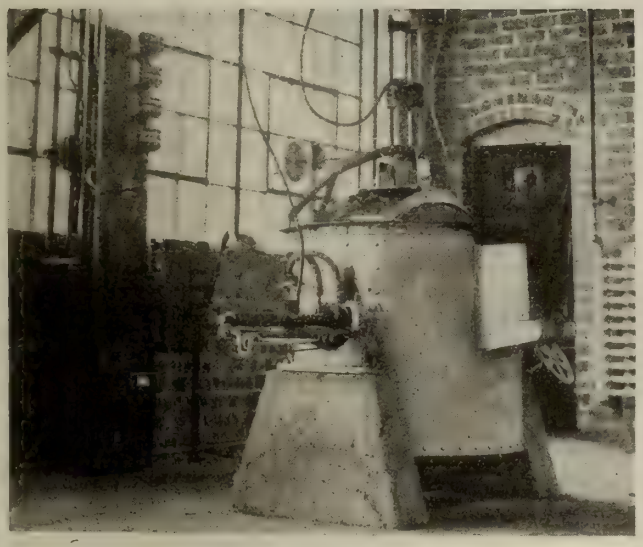
LIMITED

Transportation Building, Montreal



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Built in capacities from 100 lbs. to 6 gross tons

Melting and Refining Steel, Cast Iron, Ferro-Manganese, Copper, Nickel, Aluinum and various Non-ferrous Alloys.

Hamilton & Hansell, Inc.

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Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium — make this a steel of truly remarkable cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

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High Speed Steel

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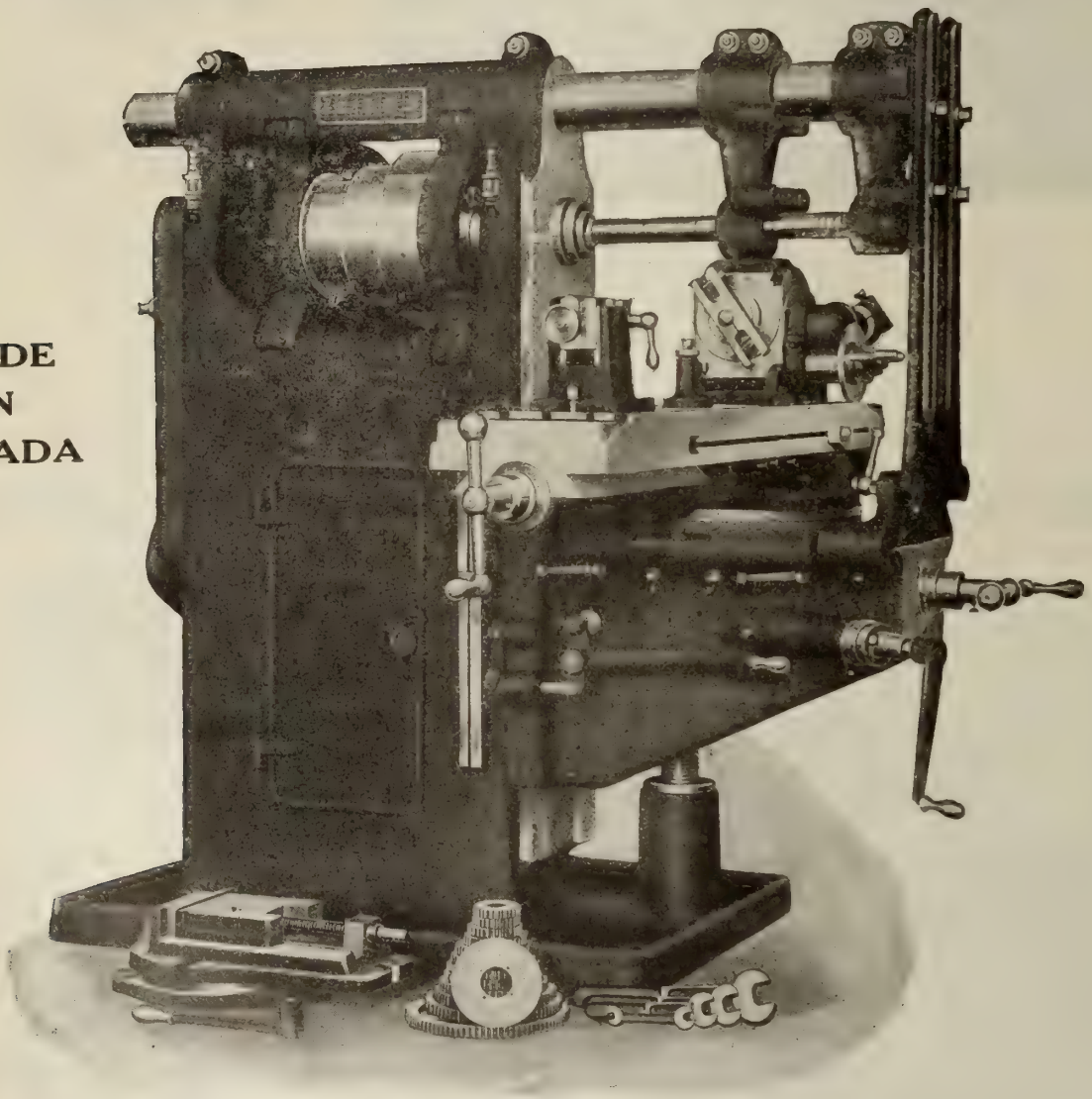
FORD-SMITH MILLING MACHINES

MADE IN CANADA



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By their continuous and accurate performance under the strenuous wartime conditions, FORD-SMITH MILLERS have added a distinctive page to their reputation.

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STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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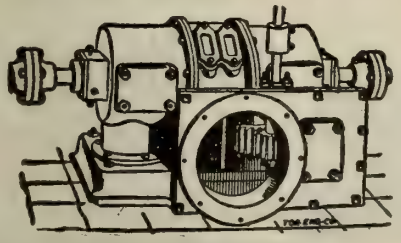
Steel Ingots
by the
HARMET
Liquid Process

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

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We Make in Canada

Lead Pipe—Sheet Lead
Wire Solder, Bar Solder, Ribbon Solder.

Babbitt Metal
For All Requirements

INGOT METALS
Copper—Tin—Lead
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Everything in Metals

Wherever you are we can serve you.

THE CANADA METAL, CO., LIMITED
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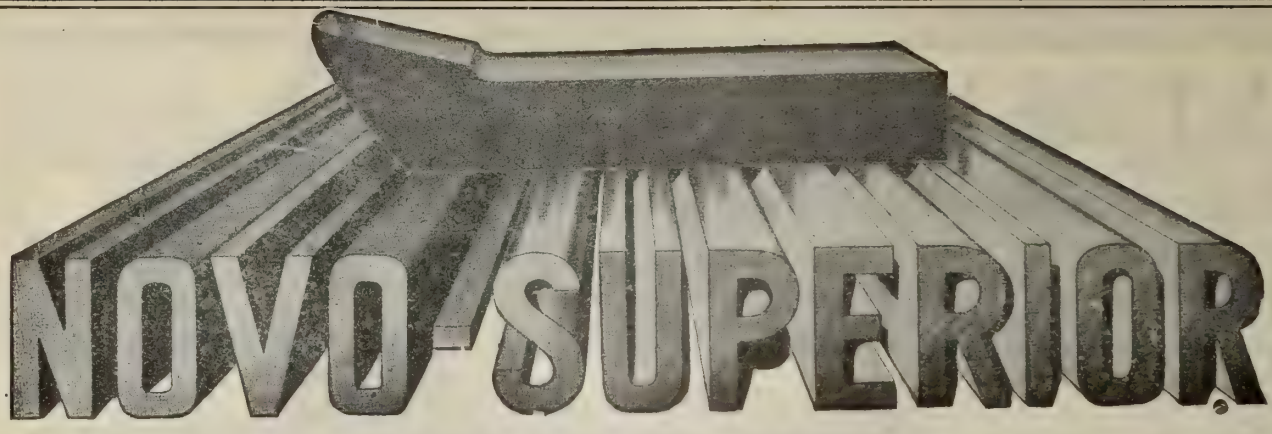

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INTRA STEEL *GIBRALTAR STEEL*

Tool Steel for Every Purpose

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.
Music Wire for Springs, Steel Balls
Cold Rolled Mild Steel for Shafting, Etc.

We call to your particular attention that we make a specialty of and solicit your inquiries for

Circular Saws—for wood and for hot or cold metal cutting
Machine Knives—for cutting wood, paper, tobacco, agricultural.

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Insures Maximum Production

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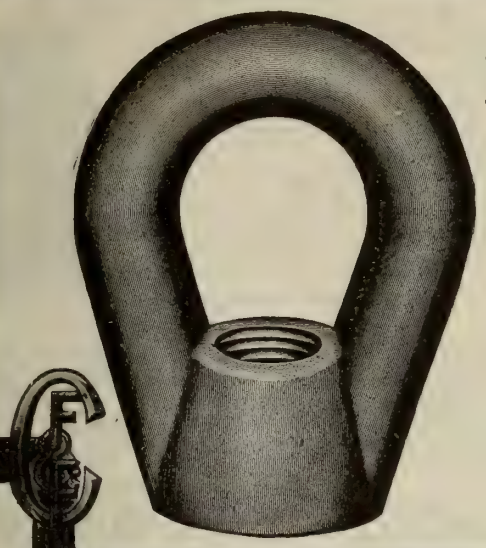

DROP FORGED STEEL

all sizes

Produced at
Canadian Billings & Spencer Plant
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Drill Steel Opportunity

25 Tons 1⅛" Cruciform Section Solid Drill Steel.

25 Tons 1¼" Cruciform Section Solid Drill Steel.

Will receive bids on lot or any portion above Steel for immediate delivery. Guaranteed quality.

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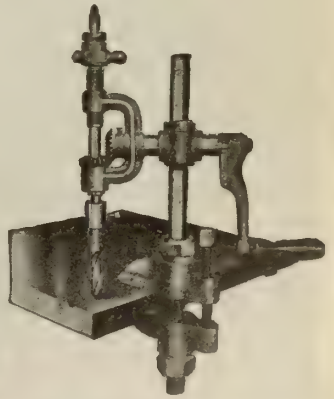
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

Individuality

A GREAT MAN wrote this: "I'm called away by particular business, but I leave my character behind me." And nobody had to guess whose character it was. Even if the familiar Red Cut label should disappear there would be no doubt as to the character of the steel that remained. More than ever would the quality shine forth in the results when it was worked. Adherence to the highest standard with an unvarying uniformity has placed a well merited reputation all its own on

RED-CUT SUPERIOR HIGH SPEED STEEL

VANADIUM ALLOYS STEEL CO. LATROBE, PA

"Red Cut Superior"

The Nationally Known--First Quality

HIGH SPEED STEEL

The Best For All Machine Work

VANADIUM-ALLOYS STEEL CO.

General Offices : Pittsburgh, Pa.

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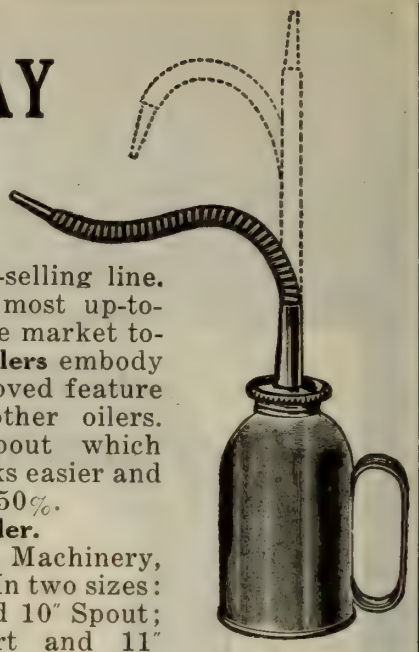


Here is a quick-selling line. The latest and most up-to-date oilers on the market today. **All-Way Oilers** embody a new and improved feature not found in other oilers. The flexible spout which makes oiling tasks easier and reduces oil bills 50%.

R.R. Oiler.

For Locomotives, Machinery, Threshers, etc. In two sizes: No. 4, 1 Pint and 10" Spout; No. 5, 1 Quart and 11" Spout.

Canadian Fairbanks-Morse Co., Ltd., Montreal; Wood, Alexander and James, Hamilton; Caverhill, Learmont Co., Montreal; Auto Supply Company, London; Great West Electric Co., Winnipeg; Wood, Vallance & Leggatt, Vancouver; Walker, Vallance, Ltd., Hamilton; Wm. Stairs, Son & Morrow, Ltd., Halifax; Summer Bros., Moncton, N.B.; Canadian Specialty Co., Moose Jaw; Rice Lewis & Co., Toronto; Whites, Limited, Collingwood; J. H. Ashdown & Co., Winnipeg; D. Ackland & Co., Winnipeg; Miller Morse Co., Winnipeg; Wilkinson-Kompass Co., Winnipeg; D. H. Howden & Co., London.

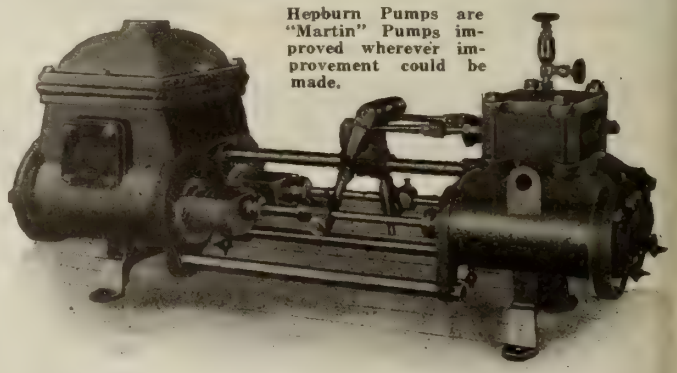
If your Jobber cannot supply you, write us

THE ALL-WAY MFG. COMPANY

196 KING ST., WEST, TORONTO, ONT.

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street **Toronto, Ontario**

"WACO"

HIGH SPEED STEEL

"WACO" TRADE MARK

"DOUBLE WACO" 18% Tungsten, for Railway and Tramway Tires and Hard Metals
"WACO" 14% Tungsten, for Turning, Planing and Slotting Tools, Milling Cutters, Taps, Rimers, Twist Drills

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CARBON TOOL STEELS
for
Engineers', Railway, Boilermakers', Shipbuilders', Miners and Blacksmiths' purposes in various qualities
Diamond Special Extra Best Quality Best Warranted
Warranted Ordinary
Each quality supplied in different tempers to suit tool required

DIE STEELS
for
Screwing Dies, Stamping Dies, Top and Bottom Nail Dies, Cartridge Dies, Mint Dies, Dies for Hot Stamping, Drawing Dies

COMBINED IRON AND STEEL
for
Beds, Dies, Machine Irons, Blades, etc.

MINERS' DRILL STEEL
In three qualities
Extra Special Special Ordinary

HOLLOW DRILL STEEL
Round or Octagon
Stainless Cutlery Steel Single or Double Shear Steel

SPECIAL MAGNET STEEL
Hammer and Wedge Steel, Scythe and Sickle Steel
"WACO" High Speed Twist Drills Carbon Twist Drills

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"Frost King"
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BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
Annual sales over $5,000,000.

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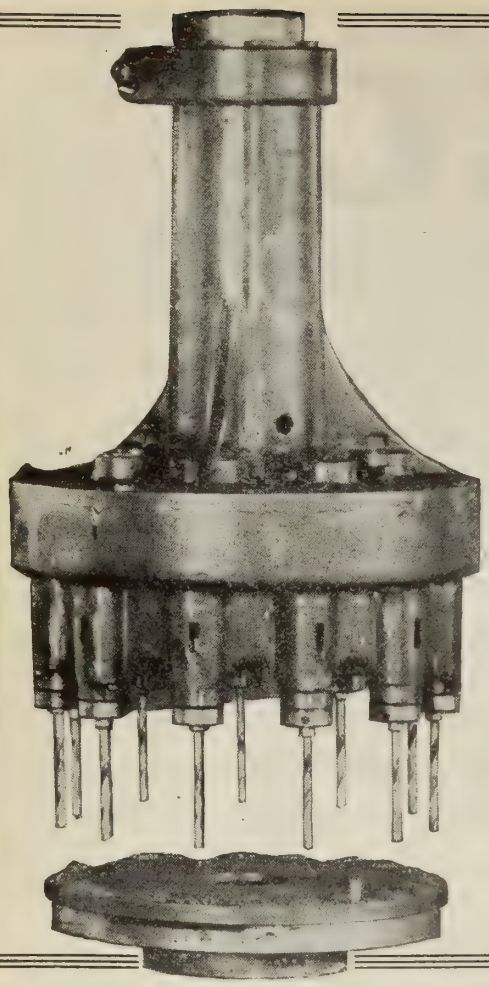
Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. **We can advise you** and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US



SPEED UP THE WORK

Rising costs are knocking the bottom out of profits these days! Materials and labor are up. No chance to reduce them. But you can speed up your work. The Hoefer Manufacturing Company has a proposition that will cut your drilling cost. Not guesswork, either, but on a basis proved by experience.

By using Hoefer Auxiliary Heads you can drill ten, twelve or more holes in the same time as one. Not only do you save the drilling time, but also the time lost shifting the jigs and raising and lowering the spindle for the extra holes.

360 manufacturers, 99 distinct lines of business—probably some of your competitors—employ Hoefer Auxiliary Heads to increase profits. They say the Hoefer Auxiliary Heads pay for themselves in 30 to 60 days.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. Made by expert toolmakers and guaranteed to handle accurately the work for which they are designed.

Investigate now. Stop the leakage of dollars due to the use of single drills. Write for catalog and send blueprint of some of your work for estimate of time and cost.

The Hoefer Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Bldg., Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Bldg., Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

The Canadian Fairbanks-Morse Company, Limited

"Canada's Departmental House for Mechanical Goods"

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

HŒFER Auxiliary Heads

"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

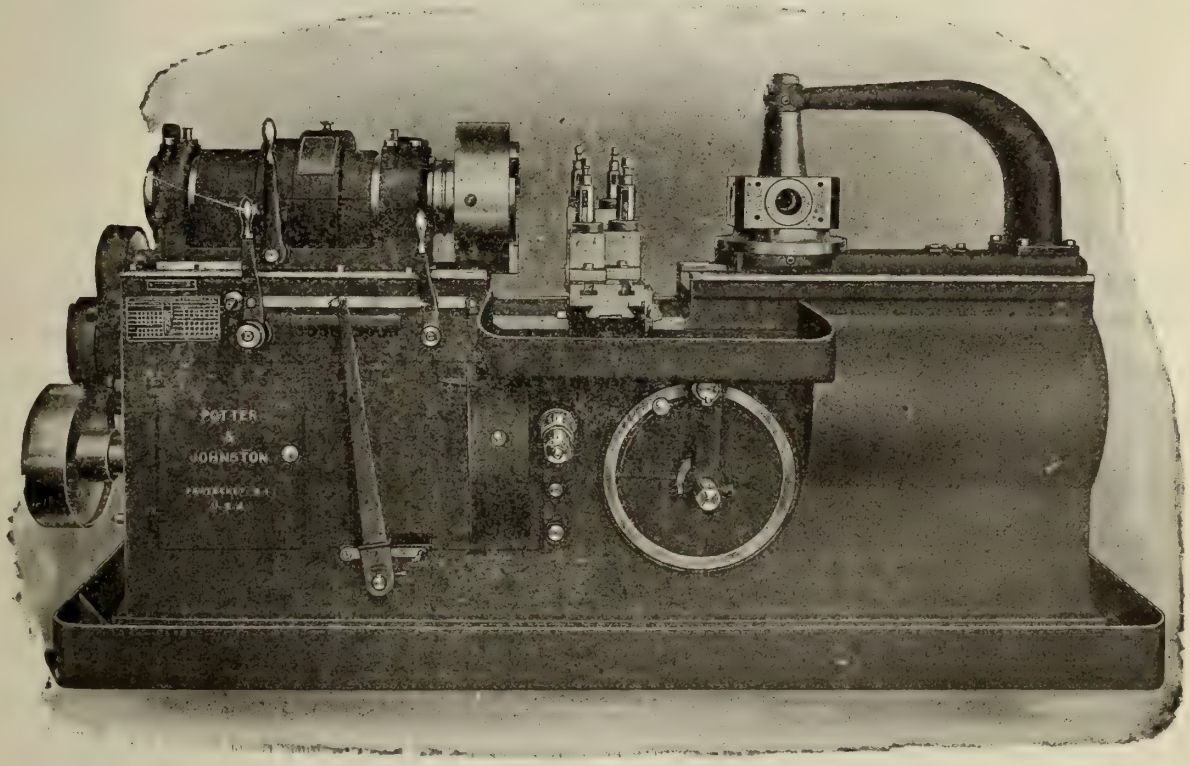
Marshalltown Mfg. Co.

Marshalltown, Iowa

U. S. A.

POTTER & JOHNSTON

MANUFACTURING AUTOMATICS FOR ECONOMICAL PRODUCTION



6A Manufacturing Automatic

When times are dull you want to get full value from your labor—you cannot afford to do otherwise and stay in the game.

When times are busy you have hard work getting help.

A serious problem from either angle.

The solution: Potter & Johnston Manufacturing Automatics for all duplicate parts from castings, forgings, cut-off stock, up to 40 inches diameter and up to 15 inches long.

From two to a dozen cutting tools always in simultaneous operation. Instead of an operator for each machine, an attendant for from two machines to half-a-dozen.

If you have any doubts as to whether these Manufacturing Automatics will apply on your work, take it up with us and we will help you investigate.

Descriptive Bulletin 39 on request.

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LTD.

HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA

WORKS AND WAREHOUSE: GALT, ONT., CANADA

A WALL RADIAL DRILL

That Puts Dollars in Your Pockets

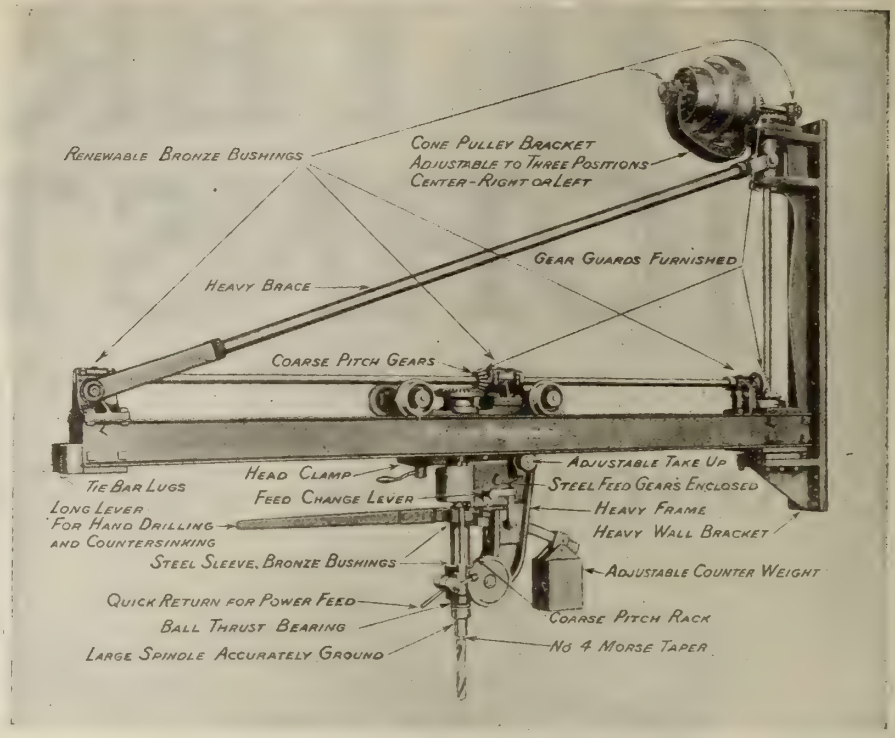
Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions, in your pocket by the installation of this machine.

Send for Detailed Bulletin

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

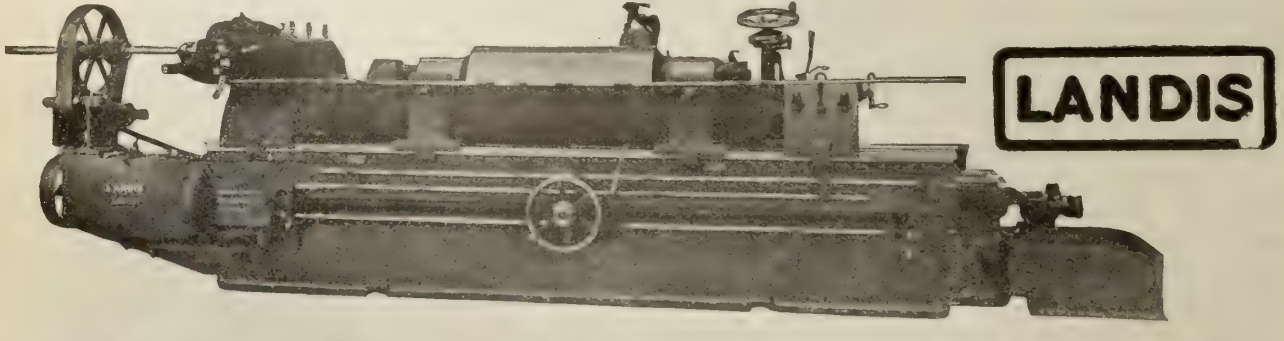
419-425 Atlantic Avenue **BOSTON, MASS.**

Grinding Rolls Rapidly

A Landis finished 180 rolls in **100 hours** as against a lathe record of **400 hours.** The material was of chilled iron and steel and metal removed was 1/32″ and 3/32″ respectively.

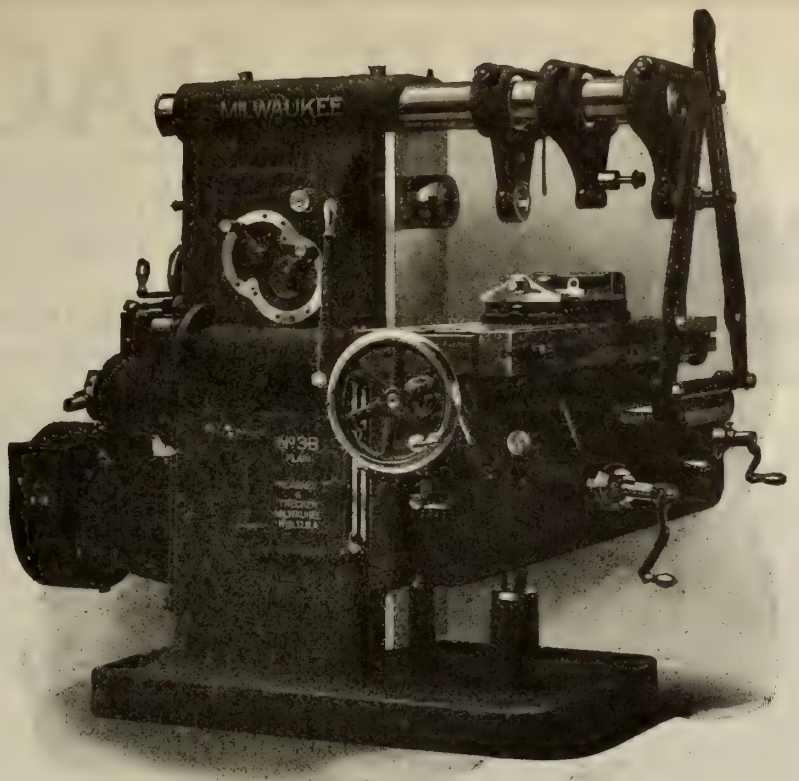
Diameters were 9″ to 12½″ and the lengths 9½″ to 33″, a grinding wheel 24″ dia. x 2″ face was reduced to 12 5/16″ during the operation.

This record is convincing; the Landis does make a profitable investment. Send for literature.



LANDIS TOOL CO. WAYNESBORO, PA.

NEW YORK: 50 CHURCH STREET



MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

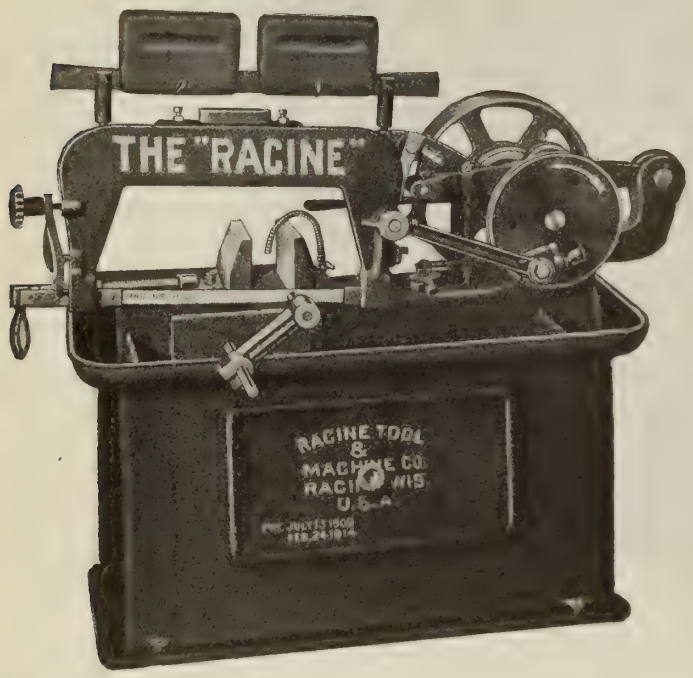
Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

KEARNEY & TRECKER CO.

MILWAUKEE, WIS. U.S.A.

Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

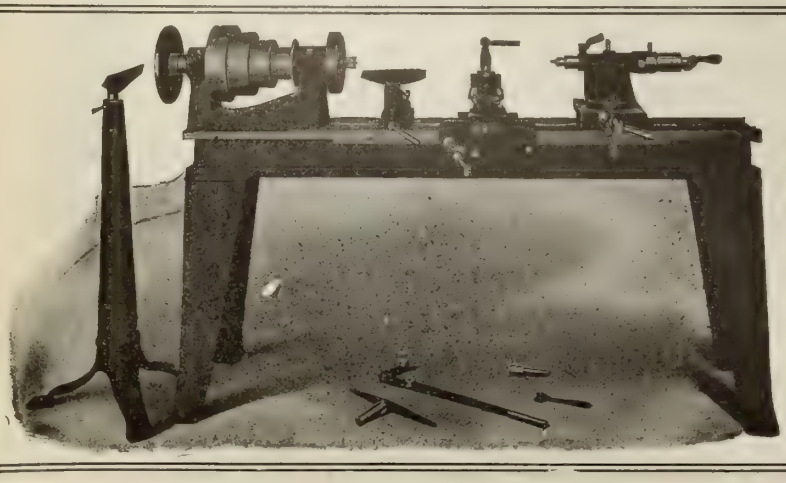
There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue - RACINE, WIS., U.S.A.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER



A Favorite—

Blount Pattern-makers' Lathe

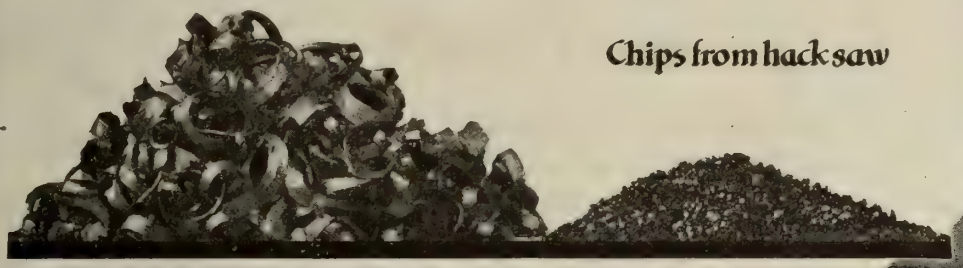
FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY
EVERETT, MASS., U.S.A.

Chips from cold cutting saw

Chips from hack saw



Starrett Hack Saws make less waste

Economy of material is almost as important as economy of time—or power.

The Starrett idea is to always use the particular blade that does the work in hand most economically—to save material, time and power.

That's why the Starrett Hack Saw Chart recommends blades of different thicknesses as well as different numbers of teeth to the inch for certain classes of work. And it's the reason why you find Starrett Hack Saw blades and charts in the tool rooms of so many shops—it pays to use them.

CHART 3 AND CATALOG NO. 213
SENT FREE UPON REQUEST

THE L. S. STARRETT CO., ATHOL, MASS.

THE WORLD'S GREATEST TOOLMAKERS
Manufacturers of Hack Saws Unexcelled

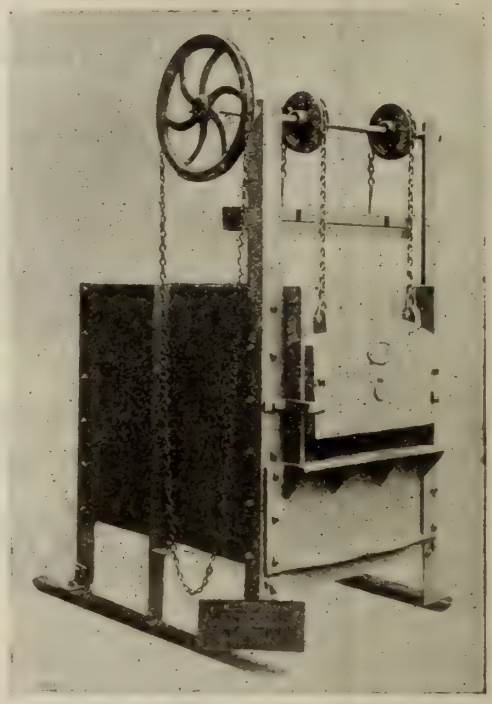
42-955

Do These Advantages Appeal

To Your Sense of Economy and Efficiency?

It's economy — requires one-half the space; costs less than half; no chimneys or flues required; instantaneous and perfect control of temperature; higher temperature obtained; no coal ash handlers required; no coal or ash piles; less waste of fuel, because it is shut off instantly; requires much less time to get the required heat. *Can you afford to lose the Advantages of this oil Furnace?*

OIL FURNACE
VERSUS
COAL FURNACE



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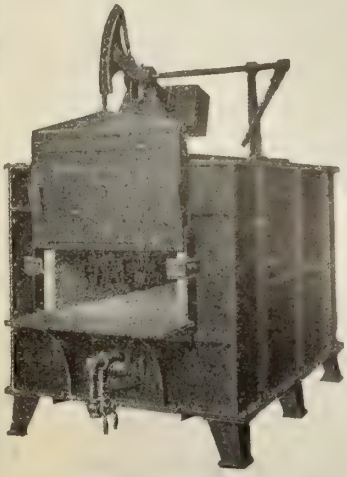

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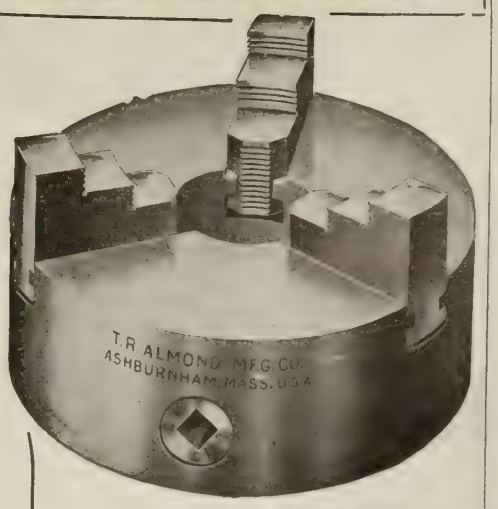

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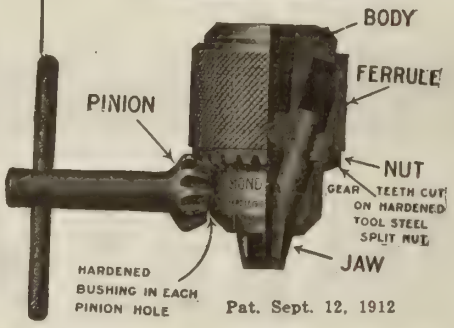

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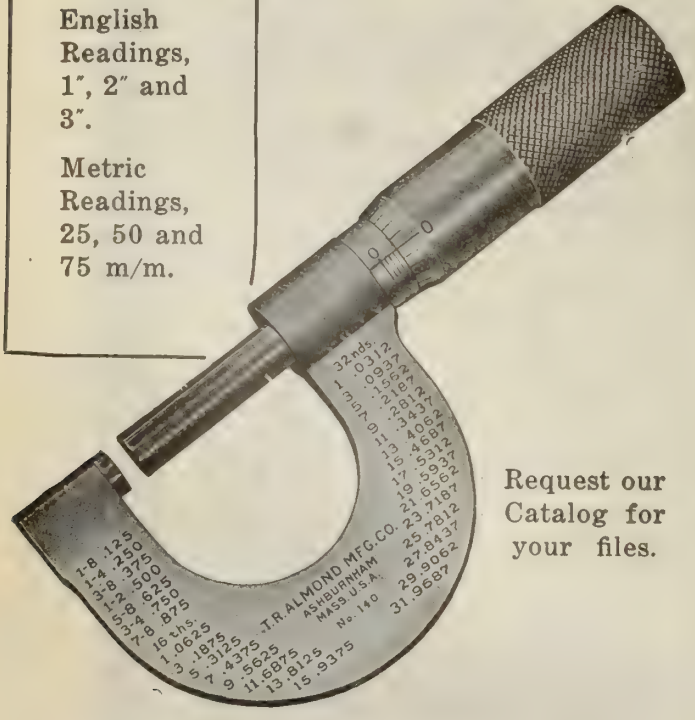

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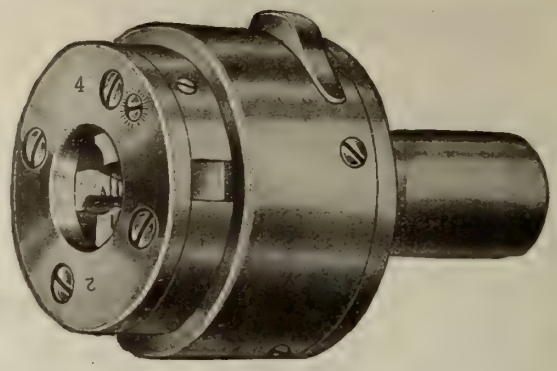

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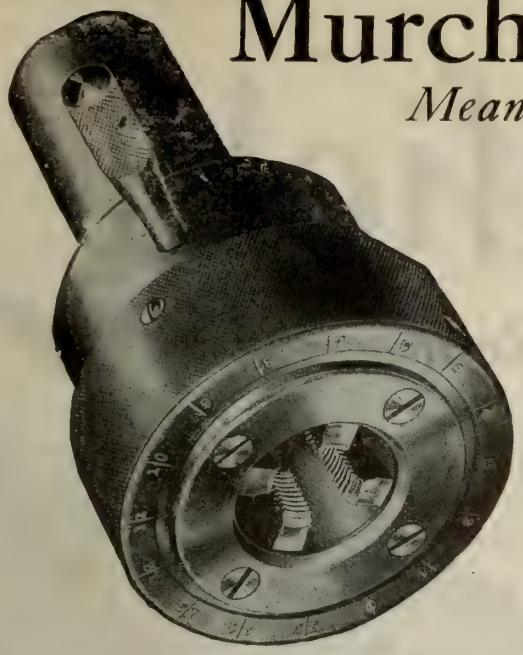

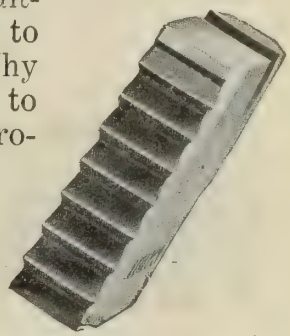

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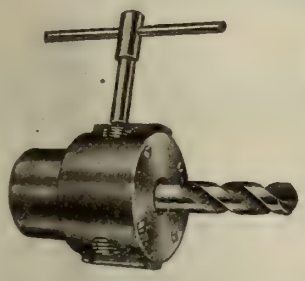

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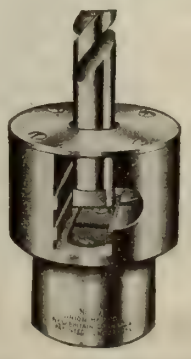

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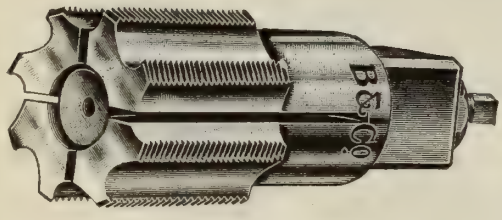

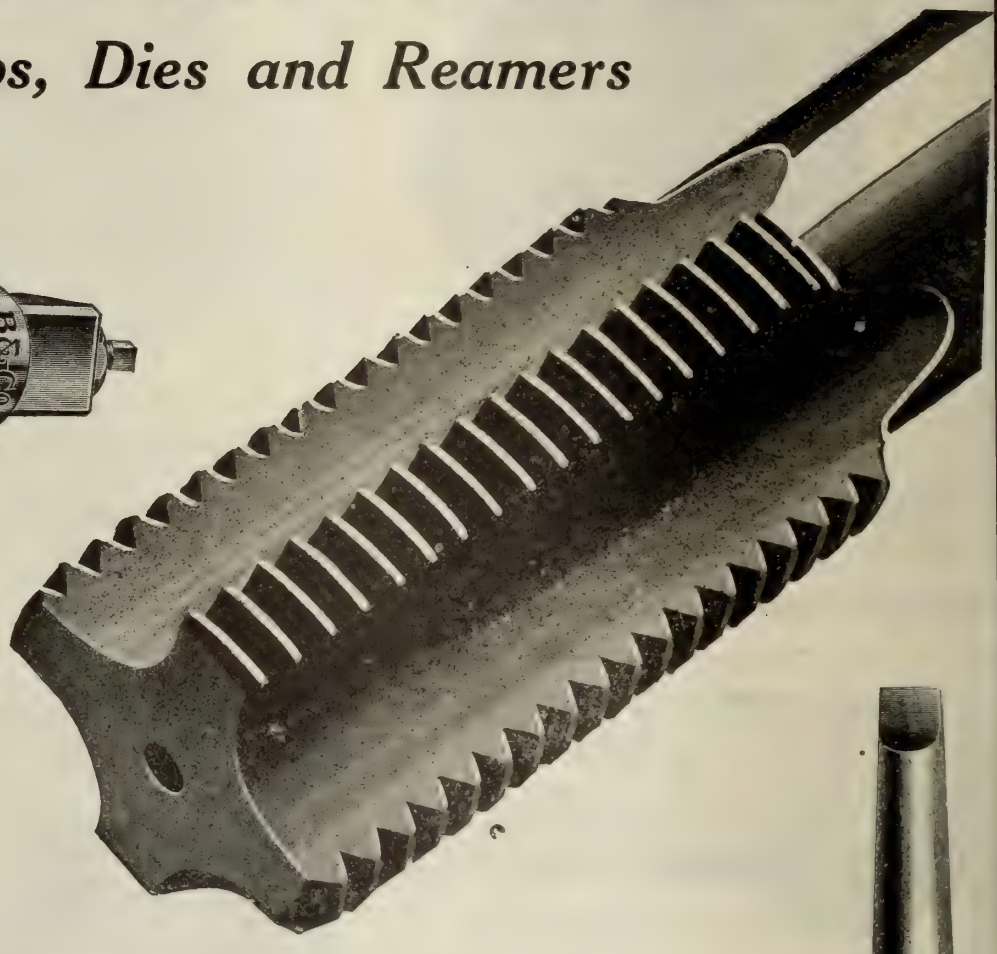

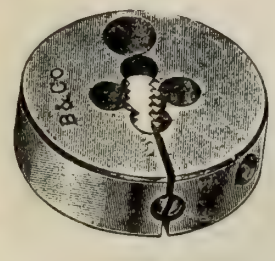

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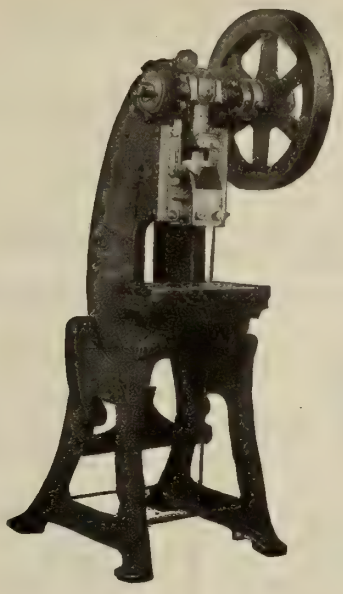

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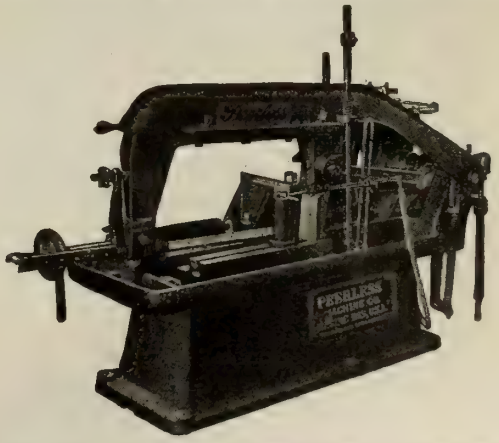

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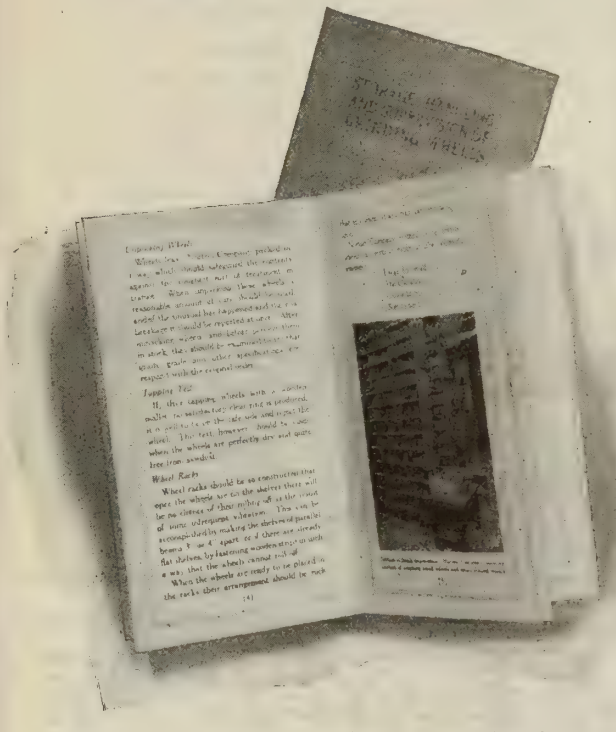

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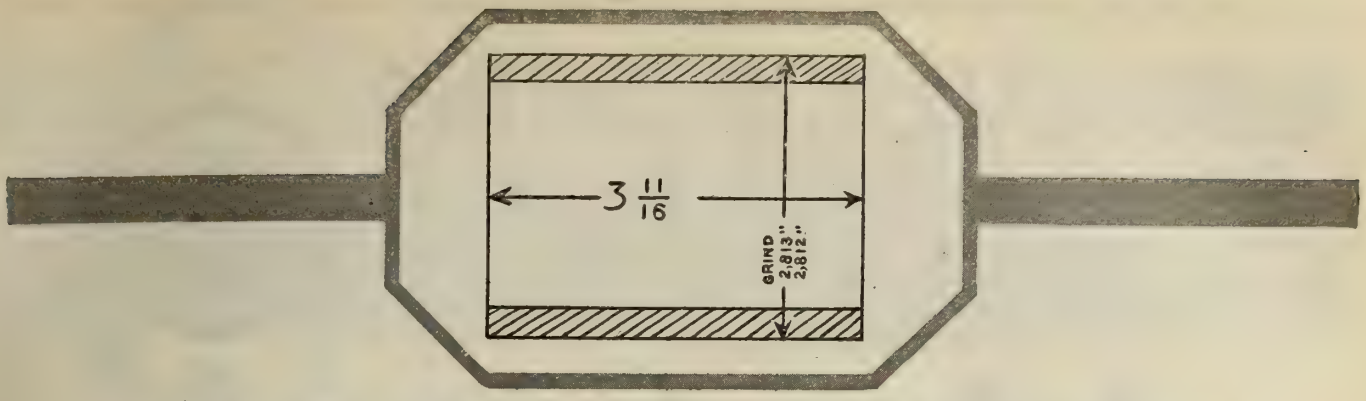

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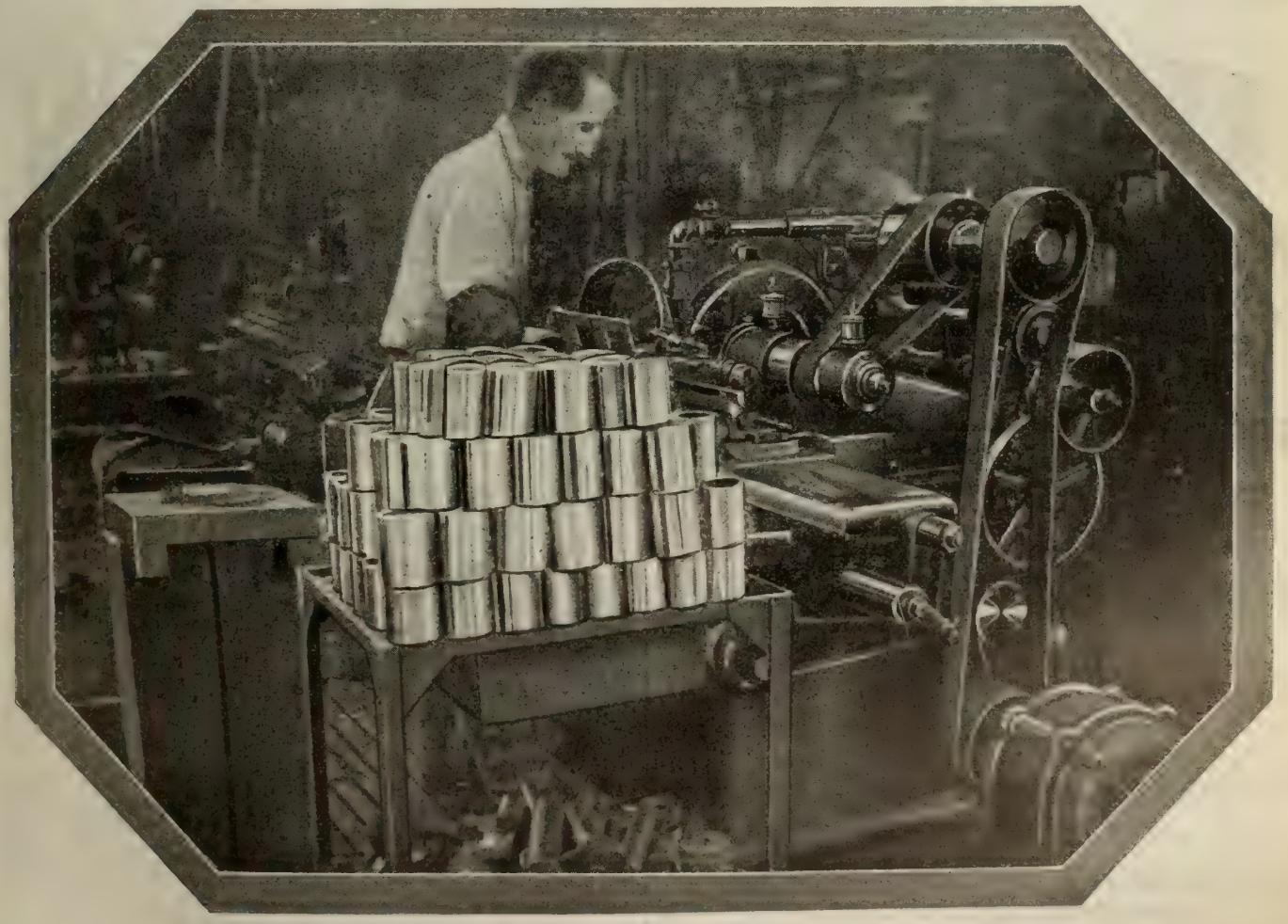

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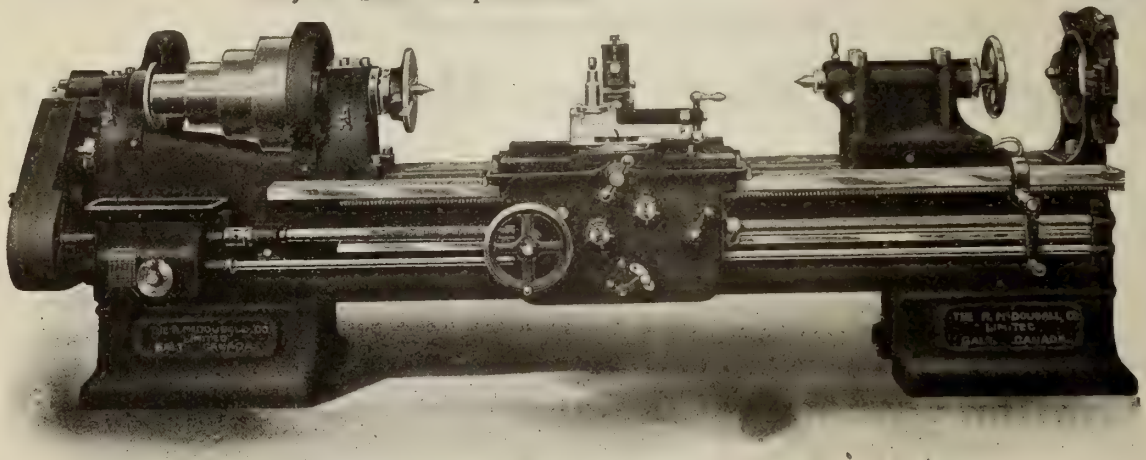

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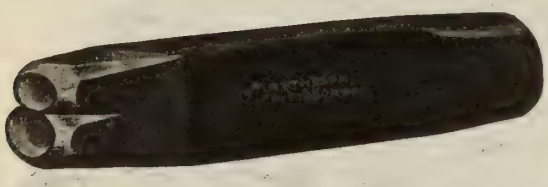

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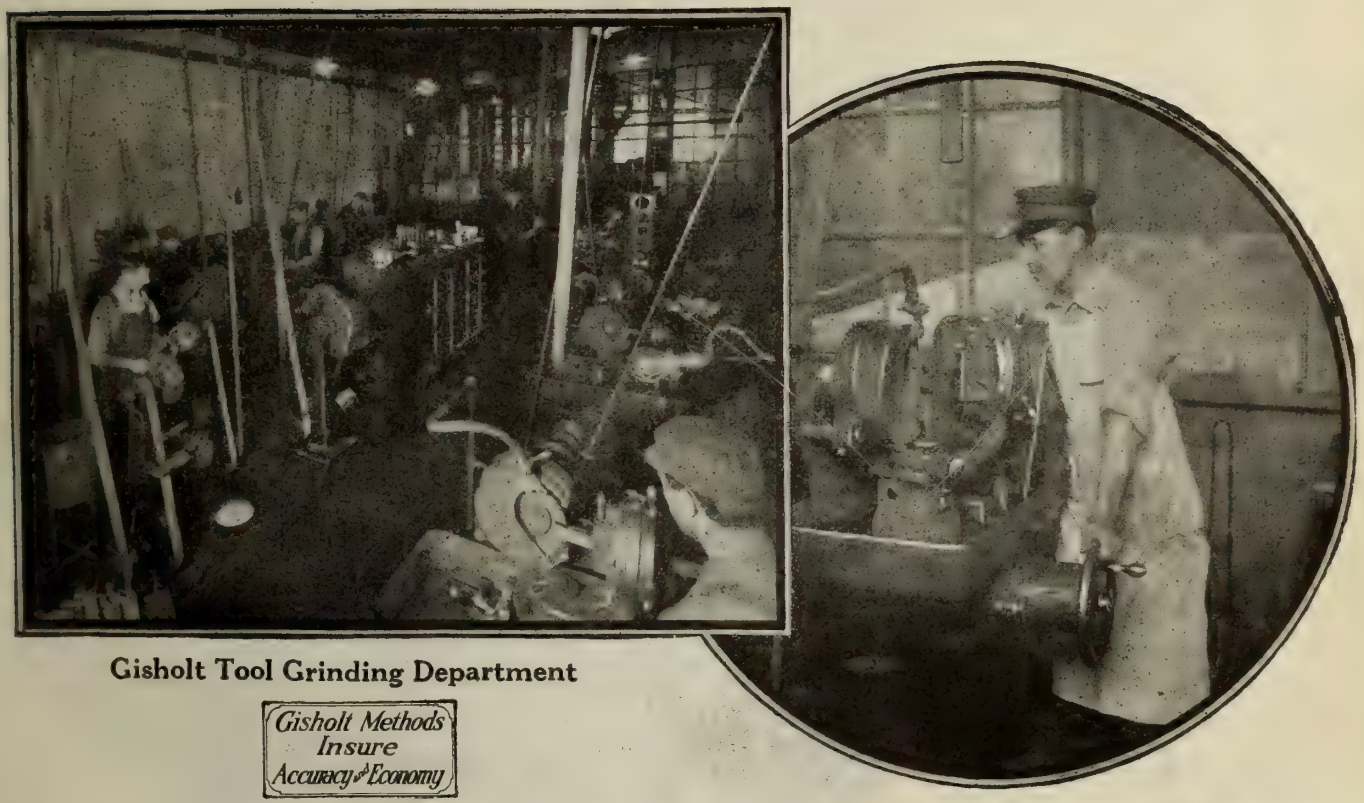

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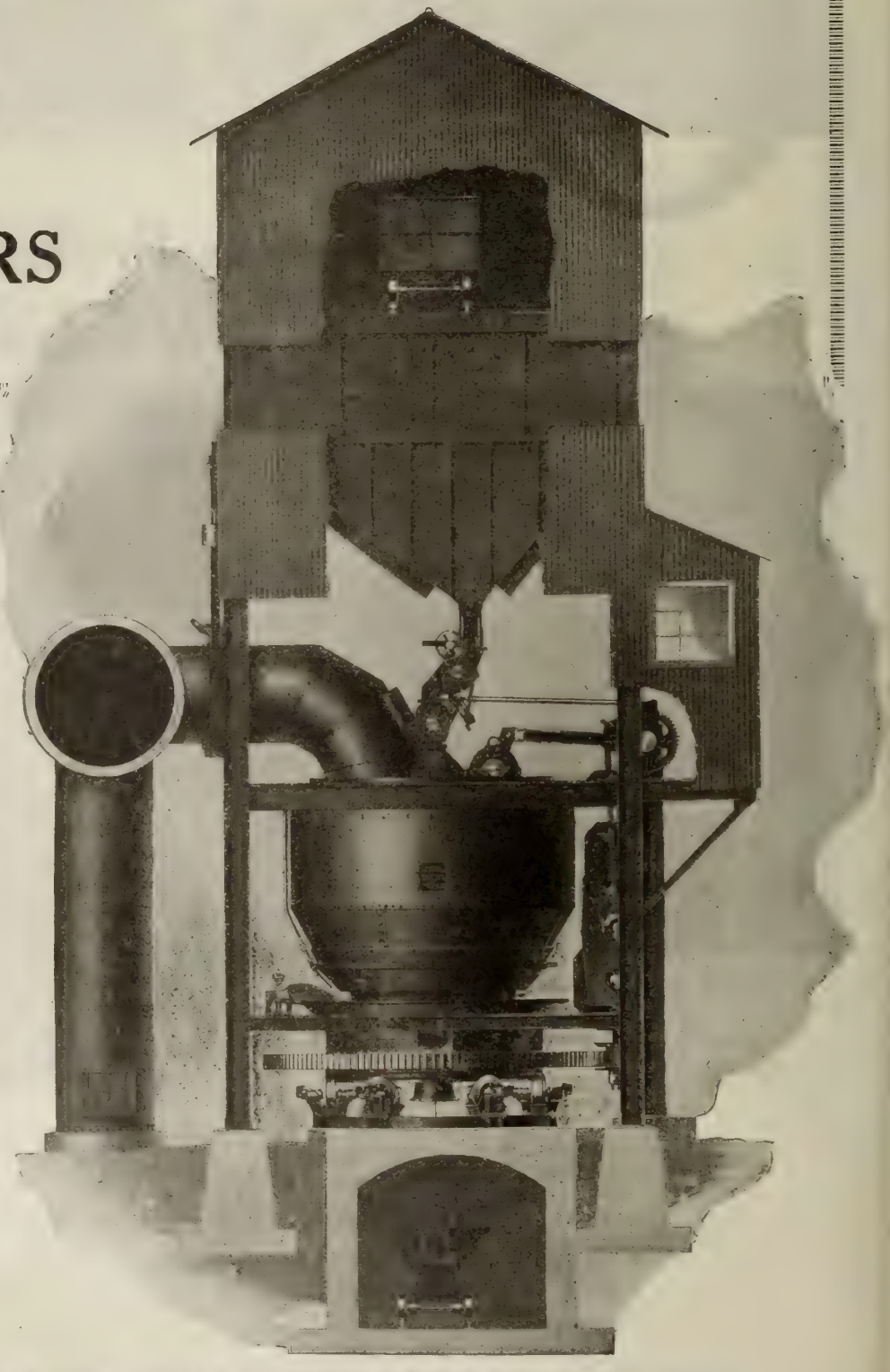

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 7 Toronto, August 14, 1919

A Railroad Service for the Automobile

Can We Successfully Use the Automobile in Place of the Steam Engine for Railroad Purposes? Read How This System is Being Operated With Splendid Success

By D. A. HAMPSON

WHEN the automobile entered its heyday of popularity it was freely predicted that it would soon usurp the place of the steam train for passenger service. The idea seemed to be that we would have motive power units of the automobile type, larger and much more powerful, and possibly drawing a number of cars behind it as does the locomotive. "But somehow or other, the scheme never got very far," to quote the summary of the average person who had expected such a change in transportation. There were, and are, a number of conditions adverse to the broad application of the gasoline engine to railroad work, the chief of which were the limited efficient speed range of the engine itself, the absence of a satisfactory means of building up a train speed from a dead stop, and the high cost of operation and maintenance.

However, a change has come about in the last five years. The motor truck, from an experimental machine, has grown to be the husky workhorse of commerce that we know to-day. Both in first cost and upkeep it is cheaper now than then; and designs have been evolved that adapt it to every kind of hard service. On the railroads, however, materials and supplies and labor have doubled in price, so the cost of running trains has far outreached the meagre increase in rates. Street railways and branch lines and short independent roads are fighting with their backs to the wall to make ends meet. As the natural sequence of such changed conditions the automobile has been again tried out on railroads and has proven to be quite satisfactory.

Everyone has seen the loads and overloads which are carried by motor busses on our streets and highways, in times of strikes and breakdowns and in the feverish struggle at the height of munitions manufacture, the loads that these machines carried were almost past belief. All such conveyances are bus bodies mounted upon regular truck chasses. It is reasonable to assume that they would perform creditably upon steel rails with their rated loads, a fact proven beyond a shadow of a doubt.

Fig. 1 shows a railroad job that has been running on a steam road for months. The body is a standard 20-passenger bus set upon a Reo chassis. A body of this seating capacity is four feet longer than the car frame, producing quite an overnang at the rear; in this case, the frame was lengthened to

FIG. 1—A GOOD VIEW OF THE CAR.

reduce the overhang and to relieve the rear axle construction.

Raliroad Service

Two of these motor cars are in service on a fifteen mile standard gauge road. Five round trips a day are made with one car, the other one being kept constantly in reserve or to run as second section for a peak load. Slightly over ten gallons of gasoline furnishes fuel for the day's run, with a pint of engine oil, besides the usual "oiling around" for running gear parts. Formerly a steam mixed train made three round trips a day, but this now makes two trips only, the motor train making the third and four other trips, thus providing the territory served with unusually good accommodation.

In common with many other short roads, the cost of operation is out of all proportion to the revenue even with the bunching of the traffic in a few trains. Two engine men, two brakemen, and a conductod constitute the crew in most cases, and these men have good reason to object to a time card that keeps them on the road from early morning until late at night, seven days a week. An extra train crew is a luxury not to be thought of for a minute, so it happens that the small road schedule usually narrows down to a 7 to 6 basis, to which the travelling public strenuously objects with an incessant "disgracefully poor service on this old P. & Q. road."

The motor train has come as a welcome relief to the conditions named. It has ample capacity for carrying the few passengers travelling at most hours of the day. The driver is the entire crew —he may be a serious-minded youth or a middle-aged man, or again the position may be acceptably filled by a disabled soldier. The saving thus effected over the expense of skilled men's wages is a big item. The saving in operation of a car weighing, loaded, two to four tons, as against a train of a hundred tons may be imagined, as also may that of stopping the two to take on or discharge the one lonely passenger so frequently witnessed. With the motor train, therefore, it is possible to give better train service, to extend that service to evening hours and give patrons a chance to attend gatherings that would be out of the question with the steam service. We find then that the automobile on the railroad has enabled us to do two things, i.e., give more frequent service and cut down the operating expenses. With the revenue practically fixed the showing made from the change is gratifying.

One railroad manager hit upon the scheme which is depicted by Fig. 2, a sort of a double ender, which probably has no parallel except on the mountain railroads of Central and South America, where locomotives are built to face and run either way to the front. Our illustration shows two Reo busses coupled

back to back, the total seating capacity is forty, with a possible crowding capacity of nearly double that. The beauty of this arrangement is that no time is lost at terminals in turning around, in fact, no provision for turning need be made.

Going south, engine No. 1 pulls the train, while going north, engine No. 2 works and No. 1 rests with the gears set in neutral. Stated another way, a trailer is pulled on every trip. There is ample power for the trailer at all times: its weight with twenty people is approximately 6,000 lbs., a weight that necessitates but a small draw bar pull mounted, as it is on anti-friction bearings and running over the smooth, comparatively level railroad line. There are, of course, but two driving wheels at any time, and so on a greasy rail the same slipping occurs that is true of steam equipment, but the addition of sand boxes has rid the management of this trouble.

This two car train makes a speed of forty miles an hour at points between stations. It is very popular with patrons of the road, who prefer to ride on it to riding on the mixed trains, because it is cleaner and does not stop to switch cars at stations. Where the road was once a thing of derision, the patrons now take considerable pride in it and its up-to-date equipment and frequent service.

THIS ONE WORKS BOTH WAYS.

Still another application of the automobile to railroad use is shown at Fig. 3, which shows a Reo with 15 passenger body running on a trolley road. Electric roads have suffered more than steam roads from rising costs, while the nickel remained the chief units of fares and the jitneys robbed them of more or less of their trade. Small roads find the cost of maintaining power plants a heavy burden—much greater in proportion to the power required than with the larger electric systems. It is not contended that gasoline cars are cheaper to operate than electric ones of the same weight and carrying the same two-man crew—they are not. Neither is the wear and tear of frequent starts and stops in city service less for the gasoline vehicle, on the contrary it is a well-known fact that the automobile engine and mechanism is most uneconomical in operating cost when frequent stops are made.

But it is true that the automobile engine operates at its greatest efficiency on long runs, within a limited engine speed range where the thermal efficiency is greatest. And then the cost of a motor truck is small when compared with a trolley car, also the ratio of the load carried to the deadload is far in favor of the gasoline machine. The big does not enter into the railroad automobile operation is that of tires and this does not enter into the railroad automobile at all, for the tires used are good for the life of the car, in fact the railroad wheels can be put on a new car at practically no expense by turning in the rubber tired wheels or tires alone in an exchange. Automobile weights have been pruned by the use of high class materials until the weight per horse power is but a fraction of that in use on all kinds of existing railroads.

A typical case of trolley work is the system of the average city of about 25,000 inhabitants, It has ten or twelve miles of street railway within its city limits, and usually one or more lines extending to neighboring villages; a good average would be double the trackage outside the city that was in it. The heavier and better cars are almost always run on the interurban lines, cars of 28 or 30 tons weight with four 30 or 40 h.p. motors under them. At present rates, these cars run at a big loss most of the time, the rush hour load from some factory, the holiday and Sunday crowds to a pleasure park, and the Saturday afternoon shopping crowds are the only paying times during the week. The rest of the time the cars are running nearly light but the expenses for current and the two men of the crew are just the same.

Hour after hour during the mornings these cars operate with six to a dozen passengers, and for a thirty ton car! Where power can be purchased cheaper than it can be made, there is a saving on the city lines but the suburban and interurban lines still are a drag. What is more natural than to use a motor outfit on such trackage, cutting off the electric current altogether? The outfit in Fig. 3 is one solution.

One man can operate this car. It carries all the morning and light afternoon loads that the thirty ton electric would run for. It gets away faster than the electric car. The way it can pull has been a revelation to many an old trolley man. What is of interest to the passenger is the smoothness of riding, these cars being entirely free from the bobbing of the single truck car and its disagreeable side lurching. Electric roads have much heavier grades than steam roads, but the motor car has no difficulty with these except where stops have to be made on steep upgrades. The single pair of driving wheels not having or getting sufficient traction under unfavorable conditions it is found necessary to rearrange the stops and to fix points where a start would not have to be made on a bad upgrade. A judicious seating of passengers has helped in other cases, so has sand, and so has a freeing of the rails of the grass and grease which did not bother the trolleys. There is no lack of engine power—there is power to slip the wheels on any start.

"How do you reverse?" is a question that might well be asked. Steam roads always have a Y or a turntable at the terminals. Special turntables have sometimes been used for motor cars. On trolley lines either a turntable or a Y has to be put in. Or the double end scheme previously discussed may be worked. Still another way is shown by the photo. The car is run off the end of the rails and turned as you would turn any automobile. As municipal authorities might object to this (although the wear and tear on the street is no more than with heavily loaded horse drawn vehicles with narrow tires) it is now proposed to pave a thirty-five foot square at the track end and turn around on this, by so doing making a good all weather area for car use without in any way detracting from its function as a highway.

It might be inferred from the foregoing that the automobile for railroad use was a perfect, fool-proof piece of rolling stock. It is not. With decent handling and a little attention to well-known vital necessaries, it will do plenty of work and do it cheaply, quickly and with cleanliness. But if neglected as the farmer did his Ford, by running it without oil or water (and then pronounced it a "lemon") the railway automobile will lay down too. However, this is a mechanical age and all men have more or less latent ability in that line, so it is a simple matter to pick out a faithful, serious-minded person to run such cars and give them service attention.

Where rough tracks are encountered the wheel and axle bearings get some pretty hard pounding and these should have weekly inspections. Overloading is an unpreventable evil on the railroad as in ordinary motor trucking service, and this hastens the renewal time for bearings. The same is true with cars in rail-

way service; but as the bearings are standardized, are comparatively inexpensive, and can often be changed between trips, this item is a minor one. These are the only parts found to suffer from the exacting requirements of railway service—quite negligible alongside of average rolling stock repairs.

All of the work with which the writer has been connected, and the experiments, have been made with the Reo model F, commonly called the "speed wagon." The

TURNING AROUND AT THE END OF THE LINE.

time-tried sturdy motor of these trucks has been found fully equal to the demands made upon it, through hauling several times its rated load and under guaranteed conditions. Without holding any brief for Reos, the writer feels under obligation to add that the performance of these trucks, the unique interchangeable system of manufacture, and the reasonable charges for parts should commend them to all prospective users of light trucks for this class of work.

Sharpening the Coventry Screwing Die*

It is Quite Possible That We Have in This Country Some of These English Die Heads in Operation, so for Readers' Benefit We Publish an Account of Method of Sharpening

THE following notes are written for operators who are new to the use of the Coventry diehead and those who have been unable to get the satisfactory results which are generally obtained.

The older forms of screwing dies could not be sharpened after wear. This is true, at least practically, of the half-die, split nut and solid nut forms. It was extremely difficult even to make them correct when new. The engineers at Alfred Herbert's works in Coventry had to face the fact some years ago that the development of the capstan and turrent lathes, on which they at first wished to concentrate their energies, was impeded by the inferior design and quality of cutting tools generally obtainable on the market. The screwing die was one of the chief deficiencies, and they were practically forced to take up the whole question of design of dies and dieheads.

The British screw manufacturers met the difficulties in their own way, and many years ago produced bolts, screws and nuts in all forms and sizes of excellent accuracy and at wonderfully low prices. Manufacture, in the proper sense of the term, is the continuous production of large quantities of identical things. It allows of highly specialized methods, management, supervision and training of labor and special machinery which are not always applicable to the production of a limited number of pieces in the engineering works.

The diehead required, in order to get the full advantages of the new lathes, was one which (1) could be quickly and accurately fixed in the turret, (2) in which the dies were as free cutting as any other lathe tool, (3) in which the dies could be sharpened quickly and accurately to the best new condition, (4) in which the dies would stand prolonged cutting work and many re-sharpenings, (5) in which the dies were positively and reliably self-opening at a set point, and (6) in which the parts were interchangeable.

These results were obtained after a great deal of work and expense, and now there is hardly any tool more accurately made and more widely used than the Coventry diehead.

Sharpening the dies is not a difficult job. Ten of thousands find it no trouble, but there are always a few who require some explanation. These few have not, perhaps, had the opportunity or do not take the trouble to master the mechanical principles involved. The sharpening is not only easy, but an almost automatic process if the right methods and appliances are used. If other methods are used it is an almost impossible job. A highly skilled man who thoroughly understood the forms of cutting tools would not think of wasting hand work time on what he would at once see to be a job for jigs and machine grinding.

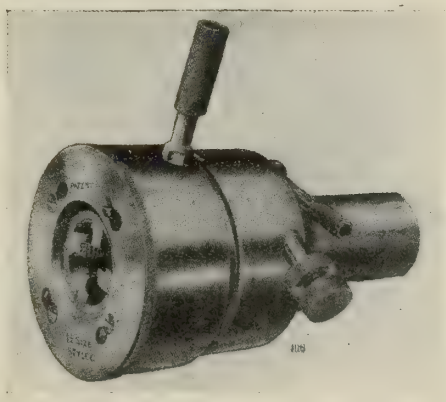


FIG. 1—GENERAL VIEW OF THE DIEHEAD.

The method is stated in a very few lines of print in standard form instructions. But we find by experience that while the terse straight style is enough for the skilled or experienced, some explanation is necessary for others.

A general photographic view of the diehead is shown in Fig. 1. The handles for changing from roughing to finishing cuts (where two are necessary), adjusting the finished size and closing the dies, are familiar to users. The dies are plainly seen in this figure in cutting position. A general photographic view of a die, removed from the head, is shown in Fig. 2, and will be useful in understanding the line drawings in the following figures. All four dies, for any size, are alike except on the thread face, where they differ so as to form four stages in the continuous coils of a screw thread.

The analysis of the form of the die can only be followed by separate views of the several surfaces, such as are roughly drawn in Figs. 3, 4 and 5. At this point, however, we may indicate where the mistakes begin when they occur at all.

A man takes out the four dies, as in Fig. 2, and finds one or some of them worn on the cutting edge. He sharpens those that are blunt, and says to himself, "It is no use sharpening things that are not blunt; that would be foolish and a waste of time." That seems to be good logic, but it overlooks the main principle, viz., that the dies are not four independent cutting tools, but one compound cutting tool in four parts. All four, when in action form one tool with four edges in strict relation to each operation, which is not always neces- equally until the bluntest one is sharp; because they must not only be all sharp but all the same size in order to divide the cutting work equally amongst them. They must be equal in size as well as equally sharp.

Another kind of mistake follows. A man takes out the four dies and sharpens them equally and properly. On putting them back he finds that they cut like new. He repeats this several times, with equal care, but finds they gradually depreciate in cutting efficiency. This arises from neglect of a second grinding operation, which is not always necessary, but becomes necessary in proportion as the repetition of the first grinding operation wears away the die and alters its shape. This will be explained in the following:

Fig. 3 shows a direct side view of the die, only face H need be ground. The rectangular, as shown by the outside line. Line F—G will coincide with the centre line of the piece to be screwed and of the lathe. The line K—L shows

*From "Machine Tool Review."

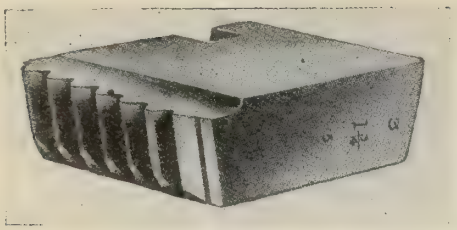


FIG. 2—GENERAL VIEW OF A DIE.

the inclination of the thread in relation to the centre or axial line, and does not concern our present purpose. The die is ground in a tapering direction, creating a face H—the vertical direction of this taper being shown in Fig. 4 and the horizontal direction in Fig. 5. When the die gets blunt face H is ground until the cutting edge is restored, therefore face H gets larger in area at every grinding. H is a clearance face and a means of forming an overhanging cutting edge, so that when the die touches the rod the sharp edge will enter the metal and cut out a space which will leave a thread. This cutting edge is created from two sides; the clearance face H and the cutting face J. Fig. 2 shows the cutting face as a recessed part tapering from the top of the dies body at the back to a lower position at the front. Fig. 3 shows the cutting face as a line J which crosses the line F—G at a point indicated by E. E is the middle point in the cutting edge.

A difference will now be noticed in Figs. 2 and 3. In Fig. 3 the clearance face H is of relatively larger area, the first partial thread is more to the back of the die and at the same time the cutting face J is lower in the body of the die. This difference may be considered as the difference between a new

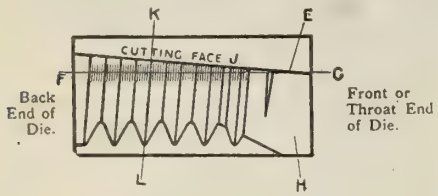


FIG. 3—DIRECT SIDE VIEW OF A DIE.

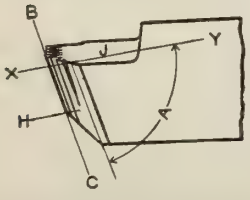


FIG. 4—DIRECT FRONT END VIEW OF A DIE.

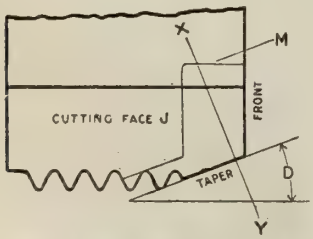


FIG. 5—TOP VIEW OF A DIE.

die (Fig. 2) and a die (Fig. 3) that has been in use for some time and has been ground properly. The difference between a new and a much-used and sharpened die is that the line J (Fig. 3) gets to a lower position in the body and the point E moves to the left.

For the sole purpose of sharpening the die, only face Hneed be ground. The roundness or bluntness of the edge is removed by taking metal off H only. A necessary consequence of this sharpening, however, is to leave the cutting edge above the line F—G. Then the edge will not cut because it is too high, just as a turning tool will not cut if placed too high in the slide rest. For this reason it becomes necessary to grind down the cutting face J.

The cutting edge extends a little to the right and left of E (Fig. 3). E is the centre of the length of the cutting edge, hence it is possible to sharpen the dies several times without seriously impairing their cutting efficiency. That will be the case especially if the sharpening is done as soon as the least bluntness appears and when very little grinding will be necessary.

It is good practice and economical in all ways, to keep the dies sharp. This is true of all cutting tools. There is an old workshop saying: "Don't sharpen your tools, keep them sharp."

The line B—C indicates the direction of the thread; D the taper of cutting edge or its angle in relation to the line F—G on a horizontal plane, and A the cutting angle. The cutting angle is formed and measured on the two faces H and J; the direction of the H line being shown on Fig. 4 and that of the J line by the line X—Y on Fig. 5.

When the die is very much worn away by repeated grindings its cutting qualities will be maintained. It will last a long time but not for ever. The disadvantage is that as the cutting edge goes back the die would not cut so close to a shoulder. This can be remedied by grinding away the die body as indicated by line M, of course only to the necessary extent.

The back threads, shown at the left of Figs. 3 and 5, do not cut, but act as a guide and smoother on the thread after it is cut. All the cutting is within the limits of the taper line on Fig. 5.

In grinding it is necessary to use the jig specially made. The four dies are ground at once, clamped in the jig in their proper order. If care is taken to use the right jig and to place the dies properly the sharpening is easy and the correct angle is obtained automatically. A special graduated gauge is made for testing the point E to indicate when grinding the face J is necessary and to grind it correctly. All the four dies must be ground on the face J equally. These jigs and gauges are not included with every diehead because one set will serve for a very large number. One set is necessary whether the dieheads in use are many or few.

An English scientist declares that insomnia may be cured by removing excess moisture from the lungs. To put his theory into practice, he has devised a small machine for supplying warm, dry, filtered air, which the patient then breathes through a nose tube secured to the head with tape. The process is said not to be uncomfortable.

Saving controller contacts from damage by arcing is the object of a European inventor. In series with the contacts he connects hot-cathode rectifier tubes, whose heating circuit is broken by the switch arm in advance of the main circuit. The momentary interruption of the current prevents any arc formation.

The number of German airplanes destroyed by the French aviators and the members of the Lafayette escadrille for the ten months ending October, 1917, was one hundred and twenty over the French lines, and three hundred and ninety-seven over the German lines—all total wrecks.

For a long time the waste steam from steam-engines has been turned to good account, but there have been difficulties in the way of using the exhaust gases from a gas-engine as they readily attack the metal of the conduits. However, the difficulty is being overcome, for a New Jersey candy factory has an installation in connection with a sixty horsepower engine which is used to heat the factory. The gases pass through an economizer made of cast-iron, with the passages to the different sections staggered so that all parts are heated for the whole length. Water circulates in jackets surrounding the gas passages.

The hoe-blades are fixed to the lower ends of arms suspended from a crankshaft. Bars extending from the hoe arms to rocker arms at the rear of the machine regulate the movement of the hoes, imitating the strokes and motions of an ordinary hoe worked by hand. The crankshaft that drives the hoe-blades is connected by a chain, sprocket-wheels, a gear-shaft and gears with the main or driving axle. The device may also be arranged to be driven by power from a small gasoline engine, but it is not very hard to run by hand.

ERRATA

In our July 31 issue, an page 126, we illustrated an electric storage battery truck, which we mentioned was handled by the Electric Storage Battery Co., of Philadelphia. This was an error, as the truck shown was made by the Baker R. & L. Co., of Cleveland, Ohio, but was equipped with a battery of 24 cells MVY-17 Ironclad-Exide, which are manufactured by the Electric Storage Battery Co., of Philadelphia.

Novel Portable Electrical Drill Heads

Both English and German Type of Portable Electric Drill Head is Herein Described. The Unprecedented Range of These Tools Make Them Exceedingly Valuable in Many Classes of Work

By FRANK C. PERKINS

THE accompanying illustration, Fig. 1, shows the operation of a novel English portable electrical drill head, developed at Bootle, near Liverpool, England, while in drawings Figs. 2 and 3 and photograph Fig. 4 may be noted the construction and use of a unique German portable tool head in cylinder boring; also German tool head with pivoted tool seat and telescope shaft, driven by an electric motor at the works of the Allgemeine Electricitats Gesellschaft at Berlin. It is claimed that this portable electric drilling machine has an unprecedented range, and can be instantly adapted, with the minimum amount of trouble, to work under almost any conceivable conditions. The motor may be operated in any position on the ground, or speedily detached from the carriage and slung up in the air, without the use of stay ropes, steadying gear, or platforms.

It is pointed out that there are no flexible or telescopic shafts, knuckle joints, or similar devices for transmitting the power from the motor to the drill. The drive is practically direct, and the important advantages of this arrangement will be fully appreciated by those who have had experience with the earlier methods. It is a sound mechanical tool with no complicated gearing likely to get out of order, and is of such a solid character that it is almost impossible, with fair wear and tear, for any part to cause trouble.

It is maintained that the whole machine may be easily managed by one man, who can start and stop instantly, without removing his hand from the drill head. The field for the employ of this drill is almost illimitable. Many steamships with electrical equipments carry them, as the engineers have at command an appliance enabling them to carry out with neatness and despatch the repairs usually necessary in the event of a breakdown.

This novel English portable electrical drilling machine consists of an electric motor, sliding shaft, and universal movement drill head. The motor is carried on two horizontal centres, by a frame which may be moved at will, in a complete circle, on the carriage proper of the motor. The carriage itself is furnished with suitable handles and wheels to permit of easy movement from place to place. The motor can be instantly removed from the carriage and suspended in a stirrup or bow provided with the outfit, when required to suit the working conditions. On the top of the motor is a bracket carrying a hollow shaft. This hollow shaft is provided at one end with a spur wheel, which is driven from pinion on armature shaft. Through the hollow shaft slides a long shaft, the extreme end of which is connected with the drill head. The long shaft is slotted for nearly its whole length, and this slot fits a key on the inside of the hollow shaft. Thus the motor drives the hollow shaft by means of the key and slot, and the motion is transmitted to the drill head.

The drill head is constructed with two pairs of bevel wheels (four wheels in all) in such a manner that the drill may be turned through a complete circle in a plane at right angles to the long shaft,

FIG. 1—ENGLISH ELECTRICALLY OPERATED PORTABLE DRILL IN OPERATION.

and through an almost complete circle in the same plane as the long shaft. The switch for stopping and starting is fixed direct on the drill head, thus giving instant control to the man who is drilling. The special universal worm-geared drill head, combined with an adjustable stand, can be coupled to the shaft of standard drill when specially required for tapping as well as drilling.

It is stated that this portable electrical drill will drill holes up to 1½ in. diameter in steel. The motor is 1½ brake horse power, which will take approximately 1,300 watts. This is 1.3 B.O.T. units per hour. The cost of electrical power per B.O.T. unit in most towns in England, from corporation supply, averages 3 cents. On this basis the drilling machine will cost 4 cents per hour. Where electrical power is taken from private firm's own plant, as would be generally the case, the cost would be less than this, and would vary according to the efficiency of the plant. The motor weighs 240 lbs. and carriage 138 lbs., while the weight of the shaft is 24 lbs. and the drill head weighs 44 lbs.

It is claimed that this machine has been very largely adopted by many of the foremost engineering firms in the United Kingdom and abroad, being used for a variety of purposes, embracing bridge-building and general constructional iron work, shipbuilding and ship repair work, locomotive and stationary engine building and tramway track work, also for colliery work and general engineering of all descriptions.

It is held by English engineers that this electric drill combines in a greater measure than any other machine of its class, the advantages of a fixed and portable drill. It is an excellent substitute for ratchet and pneumatic drills, the latter, owing to their excessive cost in up-keep, together with the heavy cost in application, are being rapidly superseded by electric drills.

As above stated, it is direct driven and all flexible shafts, knuckle joints and similar contrivances are dispensed with, and the simplicity of operation is thereby increased enormously, whilst loss of power in transmission is reduced to a minimum. It is under instantaneous control, the switch being fixed on the drill head or contiguous thereto, within reach of the operator. One man can easily handle the machine. The universal movement drill head and sliding shaft enable the apparatus to be worked in practically any position.

In the operation of this English outfit, with its carriage, sliding shaft and universal movement drill head, the motor is series wound, this being found preferable to the shunt wound type, the power absorbed being in proportion to the work done. The motor is carried on two horizontal centres by a frame which may be moved in a complete circle, the whole being mounted on a carriage furnished with handles and wheels to permit of easy movement from place to place. If necessary the motor can readily be removed from the carriage and suspended from a stirrup or bow.

On top of the motor is a bracket carrying a hollow shaft fitted at one end with a spur wheel, which is driven from pinion on armature shaft. Through the hollow shaft slides a long shaft, one end of which is connected to the drill

head. The long sliding shaft is slotted for nearly its whole length and this slot fits a key on the inside of the hollow shaft. Thus the motor drives the hol-

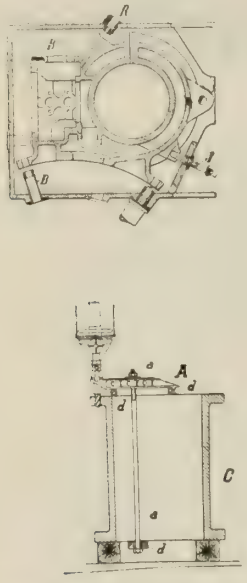


FIG. 3—GERMAN PORTALE TOOL HEAD IN CYLINDER BORING.

low shaft, and by means of the key and slot the motion is transmitted to the drill head. The gearing on the motor and drill head is entirely covered, thus protecting the workman against accident, and all terminals are protected. The machine can be made reversible for tapping. Arrangements are in progress for fitting the drills with a variable speed attachment, where required.

The special hand electric drill is one of lightest and most useful machines in service and it can be coupled up to existing lamp holder or wall plug and controlled by small switch attached to the body of the drill. Its applications are numerous, principally for direct drilling as a breast drill, or for working in a drilling pillar with ratchet feed. It is capable of working at any angle and in practically any position. One of the handles can be removed to enable the machine to be operated in confined places.

Its capacity largely depends on the nature of the work. The motor is capable of drilling holes up to ¾ in. diameter in metal, but under favorable conditions holes up to ⅞ in. diameter can be drilled. Its speed is 1,300 revs. per minute on motor and 150 revs. per minute on drill spindle, and holes ½ in. diameter can be drilled through ½ in. plate in 50 seconds, or ⅞ in. diameter in 80 seconds.

This English drill can be used for drilling, reaming, tube expanding, milling, grinding and tapping, and is specially adapted for drilling in positions where stationary machines cannot be employed. In order to obtain the maximum efficiency of the drill, it is necessary to use high speed tool steel which is self-tempering and continuous cutting when nearly red hot. It therefore requires less grinding, and the rate of drilling is much higher than can be obtained with ordinary tool steel.

AIR SCREEN FOR FURNACE WORKERS

An account was recently given in a German technical paper of the latest methods employed in Germany for screening furnaces. Workers required to examine the glowing material at frequent intervals suffered a great deal from the excessive heat radiated, and various devices have been tried to minimize the ill effects. For example, hollow water-cooled furnace doors have been tried, but obviously they afforded protection only while closed. Again, devices have been installed for drawing off the hot air in front of furnaces by centrifugal exhausters placed in front of the furnace opening. An objection to these is that workers are subjected to great variations in temperature prejudicial to health. According to the article quoted, the most effective device is to fix immediately behind the furnace door a narrow, oblong nozzle, through which cold air is blown upward, thus interposing a screen and relatively cool air between door and furnace. This arrangement is to give adequate protection to the worker, and has the incidental advantage when the doors of the furnace are opened, the escape of flame is checked.—Engineering and Industrial Management, London.

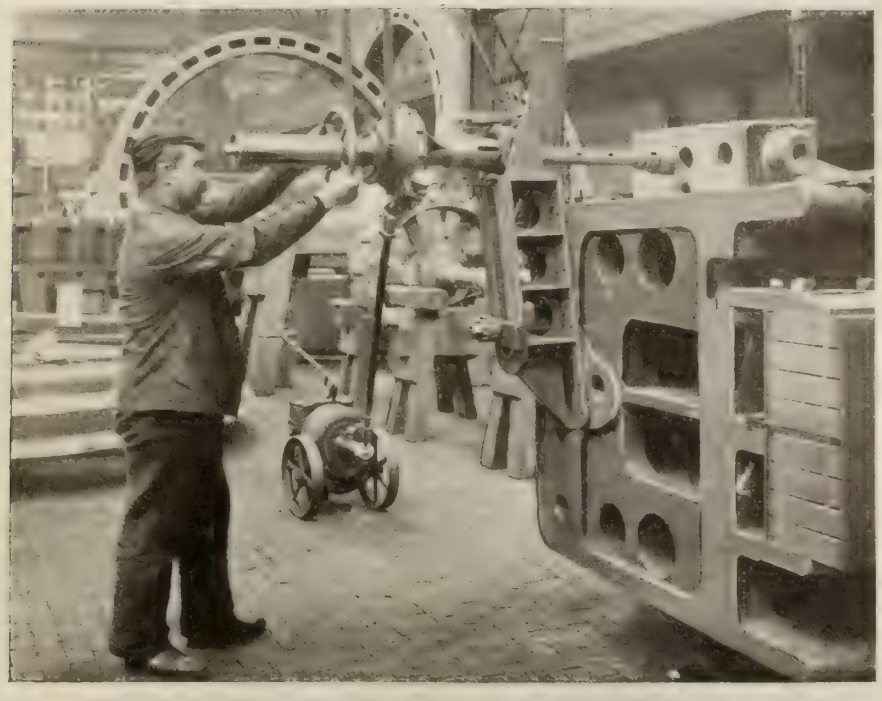


FIG. 4—GERMAN PORTABLE TOOL HEAD, WITH TELESCOPE SHAFT OPERATED BY ELECTRIC MOTOR.

AIR RESISTANCE OF TRAINS

The advance of aeronautics has, among other things, made engineers generally pay more attention to the importance of so shaping objects which have to move at high speed through the air that they shall offer as little resistance as possible. Anyone who puts his head out of the window of an express gets some idea of the pressure of a sixty-mile-an-hour wind, but he may not give a thought to the fact that the same pressure is helping to retard the progress of the train. It has been calculated that the flat front of a locomotive smoke-box offers sufficient resistance to absorb about 32 h.p. at 60 miles an hour, and 75 h.p. at 80 miles an hour. By giving the smoke box a hemispherical front the figures could be reduced to 7 h.p. and 15 h.p. respectively—a very important decrease. By reducing the width of the buffer beam, avoiding pockets in the sides of the engine, giving the tender sides and a roof of the same height of the carriages, decreasing the gaps between carriages, stream-lining accumulators and air reservoirs and making windows as nearly flush as possible, train resistsance would be greatly lessened. A tapering tail, such as is fitted to a racing car, would have good results, since the suction at the rear of a train is very considerable, but there are practical objections to its use. Experiments made in America showed that a flat-ended electrically propelled carriage could not be driven at 50 miles an hour by power which sufficed to give a similar carriage with parabolic front a speed of over 75 miles an hour. This seems to show that there is plenty of scope for reducing the power bill of our railways by applying to trains some of the care which is expended on designing the lines of a fast steamship.

One of the most efficient lock nuts for small bolts is a piece of sole leather or belt leather. Bore a hole in a small scrap of the leather, and screw it on the bolt just outside the iron nut. If the leather nut is a tight fit, the iron one will never rattle off.

The Various Mechanical Properties of Steel

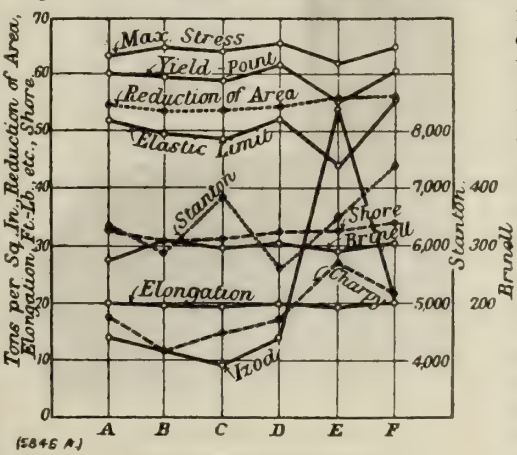
Taking Up the Consideration of the Question of Brittleness. Together With Investigation of Failures of Various Kinds. A Paper of This Nature on Steel is Especially Valuable at the Present Time

By W. H. HATFIELD, D. Met. of the Brown-Firth Research Laboratory, Sheffield, Associate Member

ULTIMATE success in ensuring the safety of parts constructed of steel is dependent upon a sympathetic collaboration of the engineer and the metallurgist. A perusal of recent publications leaves the definite impression in one's mind that at the present moment engineering design has hardly attained the position in which it can be considered as a subject for purely mathematical treatment. We have much to learn, not only concerning the distribution of stress in the different parts under working conditions, but also of the actual mechanical and physical properties of the steels when in the diverse conditions under which those various parts are called upon to perform their duties. The author hopes in this paper to extend somewhat the data at present available in this direction. In a recent paper, Dr. Rosenhain, F.R.S., and Mr. Hanson* made the following statement: "For this purpose an impact test has been used, for, although it is recognized that conditions under which failure occurs in boiler plate possess no apparent resemblance to those of an impact test, yet experience has shown that materials which give a low figure under an impact test are liable to fail under apparently static conditions." It will be seen that the authors quoted seek to determine the safety of a part under static conditions by the employment of a dynamic test.

One can, however, appreciate the question at issue in their minds, and it is hoped that this paper may throw a little light on such matters. Another recent statement, in this instance, by Dr. Arnold, F.R.S.** has a bearing upon the subject under consideration. He states: "In fact, no matter how dangerously brittle steel may be from chemical or physical causes, if such causes have coproduced a high elastic limit, the Wöhler test indicates the steel to be quite safe if stressed well short of that limit, when, as a matter of fact, it is inevitable that the steel must certainly rupture soon or later under stress theoretically quite safe." The author's reply to Dr. Arnold would be that any theoretical conclusions of the type to which he is referring must be based upon insufficient data. If a part is not stressed beyond its elastic range it must necessarily successfully withstand the stresses upon which it has to deal. It is considered that Professor Unwin, F.R.S., adequately deals§ with the subject in the following words: "All the published experiments on endurance tests have now been brought together and reduced to common measure, because the subject of safe limits of stress, especially in bridges, must, before long, be reconsidered, and because, while experiments of this kind take a long time to make, it is the number and the consistency of the results which are most impressive. A few results of bars breaking with comparatively small stress may be put aside as possibly accidental or abnormal, but here are four completely independent series of researches by different observers

Fig. 5. TESTS ON SIX STEELS 60 TO 65 TONS



ILLUSTRATIVE CHART.

(Wöhler, Sir Benjamin Baker, Bauschinger and Spangenberg) with stresses of different kinds on very different materials, and the whole of the results are singularly consistent. In all cases the number of repetitions of loading the bar will bear diminishes with increased range of variation of stress."

One might continue with advantage, to quote Professor Unwin's summing up of the data extant at the time at which he wrote, but those interested may refer to the original at their leisure. The author has always considered Professor Unwin's reply as an adequate commentary on such statements as those already quoted.

It is clear that there is a safety range of stress in which any given material may be stressed for an indefinite period. There is obviously a minimum range of stress which, over a long period, will produce rupture. However long this latter period may be, it is clear that whilst on more or less empirical calculations the stresses may have been shown not to exceed the elastic limit of the part under consideration, it is certain that some local piling up of stress must have taken place to produce rupture. If we now supplement the work to which Professor Unwin has referred with items from recent investigations, it is possible to obtain a more complete picture of what is happening. The work of Dr. Coker and others upon unequal stress distribution during recent years has done much to indicate the insufficiency of some of the empirical calculations upon which design has depended so much in the past.

The researches of Rosenhain and Ewing, and others, with regard to the development of slip-bands and the commencement of failure of crystalline metals, have done much to explain the effect of local accumulation of stress. It will be seen from these remarks that it is considered that, given reliable material, it should be possible, in the course of time, when our data are more complete, to so determine our factors of strength that the different parts of our various mechanisms may be perfectly reliable.

The engineer is familiar with the properties of steel, in the first place by actual experience with it in service, and in the second place by the results obtained from different mechanical tests to which such materials are put. The mechanical tests at present available may be recapitulated somewhat as follows. The static tests include tensile, torsion, bend, and Brinell. The dynamic tests include the Izod, Charpy and Fremont impact tests; the Stanton repeated-blow test, the Sankey, Arnold and Wöhler alternating-stress tests; the Shore scleroscope should also be included in this category. There are also the different wear tests, such as those devised by Dr. Stanton, Mr. Saniter, and others. There are other tests, but those just mentioned represent the ones which the author employs in his (different) investigatory work.

Later in this paper will be found instances of results obtained by the use of them, and in Appendix I will be found the size of test-bars employed, together with a statement of the detailed conditions, so that direct comparison may be made with similar tests performed by other investigators. The author would at this stage take the opportunity of emphasizing to engineers the danger of crediting any particular types of test with predominating importance. In his opinion, the tensile test is fundamental, but all the other tests are valuable as bringing out in each case data not other-

*Paper read before the Institution of Mechanical Engineers, on Friday, May 2, 1919.

**Journal of the Iron and Steel Institute, Vol. I., 1918.

†Inst. of Naval Architects, 1908.

§"The Testing of Materials of Construction," page 355, 1899 Ed.

wise fully disclosed concerning the properties of the steel under examination.

The Investigation of Failures

As regards failures in service, the author's experience is that there is frequently some obvious cause. Whether or not the cause is obvious, it is, of course, existent. The fugitive nature of the explanations of some failures which he and others have experienced is the real reason for the presentation of this paper. Whilst discussing failures in service, it is well to point out that the explanation of failure is frequently assisted by examinations of examples which have done excellent service. Too little examination is made of the latter, and it is frequently the case that many features of failures are considered to be bad ones, which would most likely be cancelled out by the same features being discovered in excellent examples. When cases come to the Brown-Firth Research Laboratories for investigation, the following procedure is adopted. In the first place, the design of the part and its relation to other parts in the mechanism in which it serves, are carefully studied, together with the actual conditions of service, that is, the magnitude and manner of the stresses the part is called upon to withstand. In this preliminary investigation some idea is obtained as to the possible mechanical causes of failure. The manner in which said failures would be assisted by inherent undesirable characteristics in the steel is next investigated. The chemical composition is determined to indicate the quality of the steel; the microstructure is examined to determine the thermal treatment to which it has been submitted, and the microstructure is developed with a view to determining the homogeneity of the mass. The mechanical tests, including an adequate selection of the previously enumerated ones, are performed. For purposes of comparison a companion examination of a successful part is put through wherever possible.

As a result of numerous investigations, failures seem to place themselves in different categories. Treating the matter broadly, there are two types. In the first one, failures would be included where the material has rightly been assumed by the engineer to possess strength and freedom from defects, but when the material unfortunately did not merit his confidence, that is, the material has failed to live up to reasonable expectations. In the second category, would be placed the wide range of cases where subsequent examination has shown the material reasonably to possess properties which the engineer associated with it, but where failure has obviously been due to insufficient knowledge or to too empirical treatment on the part of the engineer with regard to the stresses with which he had to deal.

In the first category one would include cases where the steel is put to work in the wrong condition; where it has received faulty heat-treatment; where it has been put to work in an unstable condition; and lastly, where the part has been placed into service containing undiscovered actual defects. In the second category one must include bad design; imperfections of the technique and production; abnormal stressing (shock, deformation leading to overstressing, etc.); an imperfect knowledge of the full properties of the steel by the engineer; and lastly, an imperfect knowledge of the distribution of stress in the parts under consideration.

Fatigue failures, so called, may come under either category, that is, the steel may be well below the requirements in strength, or the part may be too weakly designed to withstand the repetition of stresses which has to be encountered. There are two further sources of failure which it is considered should also come under the second category, namely, wear and corrosion. The author recently investigated a very serious case where the failure of a shaft through corrosion would have been prevented had the engineers responsible appreciated the more simple causes of corrosion. The question

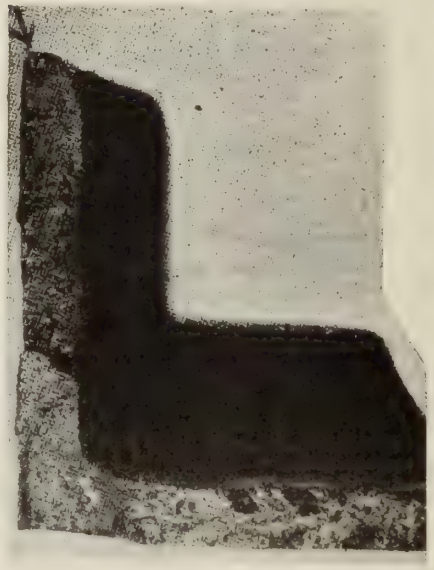


FIG. 1—A FRACTURE.

of wear is naturally a matter definitely within the field of the engineer, although the metallurgist must take some responsibility.

Different cases of past failure which have been thoroughly investigated are of considerable interest. At times also such cases are aggravating, since, as years pass along, new methods of approach and means of testing are developed, from which, could they only be applied to some of the past cases, clear explanations might possibly be provided of important cases which are even now only improperly understood. Whenever possible some of the material of such important failures should be retained so that in years to come some of it can be forthcoming to form the subject of subsidiary helpful investigations in the light of more recent knowledge. It is stated that the Greeks raised an altar "to the unknown God"; it is our practice always to retain a suitable piece of steel for submission to that new and at present unknown test, which it is hoped will some day be devised, capable of giving information which at present is absent from our tests. A few of the types of failure at present under discussion may be quoted.

Some little while ago the author read with considerable interest a paper by Mr. Sidney Houghton* on "Certain Failures of Steel Boiler Plates under Pressure." Mr. Houghton surveys and discusses a number of cases of failure, and apparently comes to the conclusion that we are yet without a satisfactory explanation of some of the most serious causes of failure in that field. The author has carefully followed many of the cases to which Mr. Houghton refers, and he is entirely of the same opinion. In the discussion of this paper Dr. Stead, F.R.S., described a very interesting case of a boiler-plate burst under pressure. It was found that there were many hundreds of fine hair lines running from the rivet holes, yet curiously there were many good features about the plate. The analysis would be considered satisfactory, but the carbon was as low as 0.09 per cent. The maximum stress was 24 tons, the elongation 30.7 per cent., whilst the reduction of area was 64 per cent. Dr. Stead stated that, in his opinion, the yield was probably about 12 tons. It is recorded that the microstructure was good, and that the non-metallic inclusions were not pronounced. One very interesting feature of Dr. Stead's investigation was the alternating-bend test to which he submitted some of this material. A value of 733 reversals before fracture was obtained, which was quite good when compared with the value he states for good English plates, namely, 760 to 970. This alternating-bend test, coupled with other considerations, would certainly point to the material being by no means in a brittle condition. Dr. Stead was not dogmatic in his conclusion as to the cause of failure in this instance, but was inclined to think that the cracks were produced by the maltreatment of the material in the vicinity of the rivet holes. It is of interest to record that he thinks that the low yield may probably have assisted failure by fatigue. This is a well authenticated case of failure carefully investigated by a recognized authority, and is certainly most instructive. It is hoped to refer to it later. The actual manner of the distribution of the stresses in the vicinity of the rivet holes is of considerable importance, and has been tackled by several investigators, notably Dr. Wolff. The design and technique of the riveting will always have a profound influence, and no doubt many of the failures in boiler plates might be rightly traced in that direction.

(To be continued)

Assuming that 10 per cent. of the total power represented by the Victoria Falls, Rhodesia, can be usefully developed, the water powers of that country are capable of generating about 220,000 electrical horse-power. Of this amount some 95,000 horse-power would come from the Victoria Falls and the following rapids at Kariba Gorge and Mapata, while the Sabi River system would supply about 91,000 horse-power.

Worth-While Information From Many Points

A bolt that has been lost may be replaced by a wood screw and a leather nut. This idea is especially useful on small-sized vehicles, ton wagons, baby cabs, and the like.

* * *

An American still holds the world's airplane altitude record with 28,900 ft., as recent rereading of the British claimant's instruments showed a revised height of only 27,000 feet.

* * *

A hoeing machine, invented by Otto F. Ullman of Severy, Kansas, operates several hoe-blades simultaneously. It does the work of three or four men armed with hand-hoes. Only one man operates the machine.

* * *

When a piece is held in position on an arbor by means of a nut and washer, it is usually necessary, in order to remove the piece, to take the nut entirely off. Where a number of pieces are to be handled, this requires considerable time. To avoid this time-wasting method a slotted collar may be used, making the nut and washer of such a size that the piece may be slipped over them without removing them from the stud.

* * *

Magnetized screwdrivers are useful for many classes of work, the carbon steel of which screwdrivers are made being capable of retaining considerable magnetism. A screwdriver which will retain a considerably stronger magnetism than an ordinary one, may be made from a round piece of tool steel, or preferably of tungsten steel, by simply grinding the end of a bar into the form of a very short screwdriver blade.

* * *

The use of a cold chisel by anyone inexperienced with it usually results in the hammer occasionally striking the hand instead of the chisel, with disastrous results. For the use of beginners, and possibly some of the older workmen who occasionally fail to hit the chisel directly on the head, it will be helpful to cut out a disk of old leather belting, making a hole of the proper size in the centre, and mount it on the end of the chisel to break the force of any misdirected blow.

* * *

Two large shipwrecking firms in England have been commissioned by the British Government to receive and distribute certain of the waste war materials imported from the Western fighting front. Scrap iron of low grade is melted into bars for the tin-plate industry. Steel bars of better quality are rolled into plates that are used in constructing trench shelters. Approximately 80 per cent. of the tin, terne, and black-plate mills of the kingdom are situated within 20 miles of the port at which the scrap is received from the continent.

* * *

"Flivver" airplanes that will carry two passengers and have a wing spread sufficiently narrow to make possible a landing on a country road are to be manufactured at the Maryland Pressed Steel Co.'s plant at Hagerstown, Md., according to reports. The first plane of this type was witnessed by the July 4th gathering at Towson and is the invention of an Italian. It was the idea of the War Department to use the planes in France, but after the signing of the armistice the inventor was induced to work on a peace plane.

* * *

A jackshaft or conveyor, if driven by a belt, may give a warning of its own stoppage by the use of an electric-bell wire with push button, and over it a piece of slat, held up by a spring. Place these so that if the belt comes off, part of its weight comes onto the slat, thus depressing the push button and closing the circuit. This may be used with either horizontal, vertical, or inclined belts, provided the surroundings permit the installation of wires and push-button support at suitable points. More than one bell may be wired up, each with its own circuit and its own push button beneath the slat, or several buttons may be connected through the signal lights to the same bell.

* * *

An electric-heating system which utilizes power that would otherwise go to waste has been installed in a school in a southern European city. The existing hot-water pipes and radiators are connected with a well-insulated water tank of 1,300-gal. capacity. In this reservoir electric resistances are built and at night are supplied with current which raises the water to well above the boiling point. The cost of the current is low because the water power used to produce it normally would go to waste. During the day the hot water is allowed to circulate through the radiators, its volume being sufficient to warm the rooms without using more current. The desired temperature is maintained by a thermostat.

* * *

At Portland, Oregon, a gas container 70 feet in diameter and 75 feet high, weighing 300 tons, was moved a distance of three miles. First, it was raised 15 feet and loaded on rollers. Then it was moved four blocks through the city streets and lowered 28 feet to a dock, whence it was moved upon a pair of barges. The barges were towed three miles to a shipbuilding plant, where the tank was unloaded and raised 26 feet, moved across newly-filled ground for a distance of 2,000 feet, crossing a railroad track and placed on its new foundation. It took 71 days to complete the work.

* * *

Shoe soles with metal coverings were made by Germans during the war—leather, cardboard, or wooden soles covered with aluminum or iron, not more than 0.01 mm. thick. The weight was the same, but they lost flexibility, became more solid and quite water-tight.

* * *

In concluding a paper to be read before the American Institute of Mining and Metallurgical Engineers, Messrs. P. D. Merica, R. G. Waltenberg, and H. Scott say that in the heat treatment of alloys of the type of duralumin the temperature of quenching should not be above that of the $CuAl_2$—aluminum eutectic, which is usually about 520 deg. Cent., but should be as near this as possible without danger of eutectic melting. The pieces should be held at this temperature from 10 to 20 min., and quenched preferably in boiling water. The hardening for most purposes may best be produced by aging for about five days at 100 deg. Cent. The hardening of duralumin during aging or tempering after quenching presents a very close analogy to that of steel, and the evidence in support of the theory is of the same nature and of approximately the same competence as that in support of the prevailing theory of the hardening of steel.

* * *

A simple device for improving the shearing strength of bolted joints in wooden structures has been brought out by Professor C. Forssell, of Stockholm. It takes the form of a corrugated washer, which is threaded on the bolt between the two pieces to be joined. The bolt is tightened against a pair of plain washers on the outside with sufficient pressure to force the corrugations into the wood. The strength of the joint is thus unaffected by the bolt hole, and depends on the friction between the two surfaces which are proportionate to the size of the washer and the depth of the corrugations. The strength of the joint is increased, according to Ingenioren, about twofold. The washers are known as "Bufo" washers, and made in various sizes, but all 1-16 in. thick, with corrugations about 9-32 in. high. In order to permit sinking into the wood, it is necessary to remove all knots at the joints to a depth of 3-16 inch. to 3-8 inch. The bolt is screwed up with spanners not less than 2 ft. to 2½ ft. long, and it is necessary to repeat the process after the first 48 hours and a further 72 hours.

WELDING AND CUTTING

Welding Jigs and How to Overcome Distortion

The Subject of Welding Jigs, and Various Methods for Overcoming Distortion as Presented by a Paper Read at a General Meeting of the British Acetylene and Welding Association

By C. S. MILNE

THE president, in opening the discussion, said:—

Mr. Milne is to be congratulated on the very thorough manner in which he has dealt with his subject.

This paper and his illustrations bear all the evidence of complete knowledge and careful preparation.

From begining to end he must have devoted a great deal of time and thought, taken a great deal of trouble and incurred a fair amount of expense in completing it. It is something out of the usual in these days to find a busy man who is prepared to do so much.

For all this we are grateful and trust he will feel sufficiently recompensed by our appreciation to-night and that which will no doubt follow from others when the paper is published.

The information he has given must surely be of great value to those concerned in the industry, and therefore I hope this paper will be widely circulated, because, as I am never tired of saying, the efficiency of the whole industry is more important that the super-efficiency of any one firm or system.

I think this idea is gradually sinking into the minds of those concerned in this industry. They should recognize it and give us all the encouragement and assistance we need.

I don't know that I can put forward from the practical point of view any useful criticism on Mr. Milne's statements. I will leave that to the experts. I dealt very faithfully with his matter in revising these proofs, and pointed out a number of small slips.

I mention this because Mr. Milne was grateful for having these trifling slips pointed out, and I am certain he will be equally grateful to anyone present who can point out any such slip on the practical side, because he is broad-minded enough to recognize that we are banded together in this association for the common object of advancing the industry and making all connected with it as efficient as may be.

Mr. Dixon said: I am sure that we are all very much indebted to Mr. Milne for his very valuable paper. It has been most interesting and we have learned a great deal from it.

There is one point, however, which I should like him to amplify, that is with reference to the statement that he considers it bad practice to weld and rivet the same joint. He does not qualify that in any way by saying whether he refers to all classes of metal whether under tension or compression. Take the case of welded seams that have been rivetted. It is well known that rivetted seams, no matter how well and carefully done, are not tight under external pressure unless the laps of the same are caulked thoroughly. Now, it has been a practice in a good many cases instead of calking, to adopt the system of welding the laps so as to effect a sealing. In the very valuable examples of modern welding which we have seen this evening the majority have been in connection with mines, and one, I think, in connection with trench mortar bombs. In these cases they we made principally, I believe, of steel plates. In the case of the mines, they are not subjected to tension or tensile pressure in actual work.

The only pressure which comes upon them is the pressure due to the depth under water in which they are placed, and the internal pressure is caused in both cases only when the fuse is started and disruption is required to give a violent explosion in order to cause destruction.

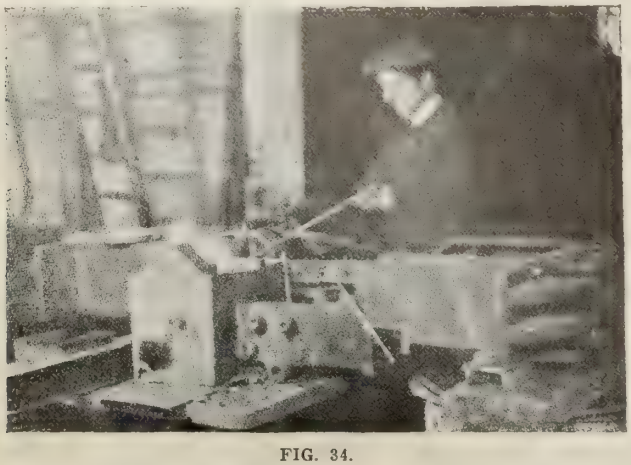


FIG. 34.

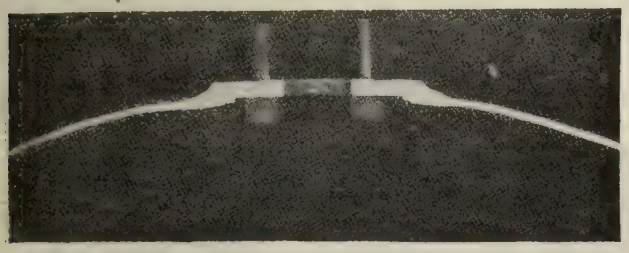
FIG. 36.

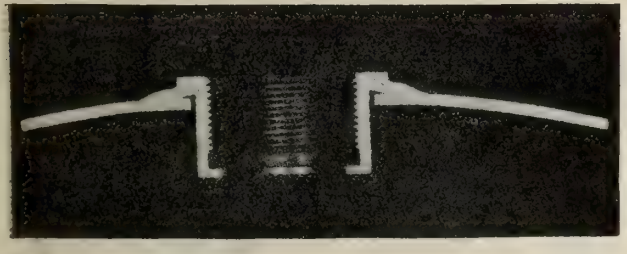
I suggest that in the case of steel vessels which are subject to internal pressure by means of steam or other ex-

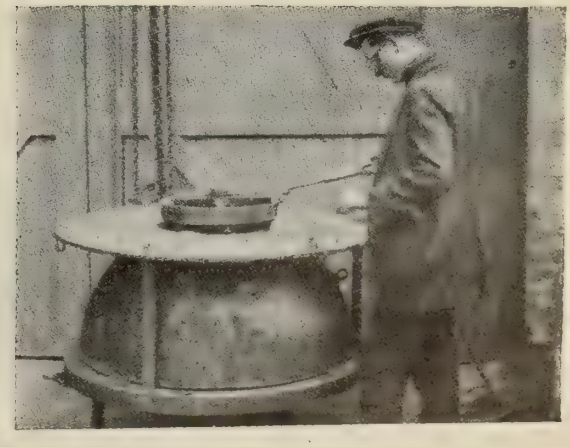
plosive gas, when we get a rupture in the plate, consequent upon sudden reduction of atmospheric pressure, a more violent disruption take place and a disastrous explosion occurs. In such a case as that a large number of engineers consider that when a steel plate is welded the weld should be covered by means of a butt strap and when such things as hemispherical ends are welded to a cylindrical vessel, that they should be reinforced by through stays.

In these circumstances I should like to ask Mr. Milne whether in his valuable experience he considers it absolutely safe and desirable practice that steel plates of ordinary commercial quality, say 26 to 30 tons per square inch, which are subjected to internal pressure by means of steam or other explosive gas, are absolutely safe without being reinforced in such a way as I have suggested?

Capt. Harley said: Although I speak with some diffidence as a member of







SOME INTERESTING EXAMPLES OF WELDING.

Mr. Milne's firm, it did occur to me, as one having had a very long experience in this class of work, that his remarks upon riveted joints might be subject to some elasticity. If you take the cover of a vessel which has to be sealed and you rivet or bolt that flange to resist the pressure of the fluid or gas against the cover, you would probably have to caulk also, but it might be preferable to seal the edges by welding.

The welding is useful on the edge for this purpose of sealing, but would not countered, but he has shown us the actual way he has solved them. I would like to ask just one question: Does he anticipate being able to go further into his machine-welding device or shall we have to wait for another war?

The president: I know Mr. Milne would like to have a few more pertinent questions. I was afraid when we started that we should have to adjourn the discussion to another meeting.

Mr. Thomson: This is the first time I have had the pleasure of meeting this interested in that particular industry and I would like Mr. Milne to let me know whether he has any experience in connection with the welding of the crowns of cylinders of internal combustion engines that have been fractured?

If a job of this description could be made successful by welding I daresay I could find him some work to do.

The president: I will now ask Mr. Milne to reply to the question which have been raised.

Mr. Milne, replying to Mr. Dixon's

FIG. 26.

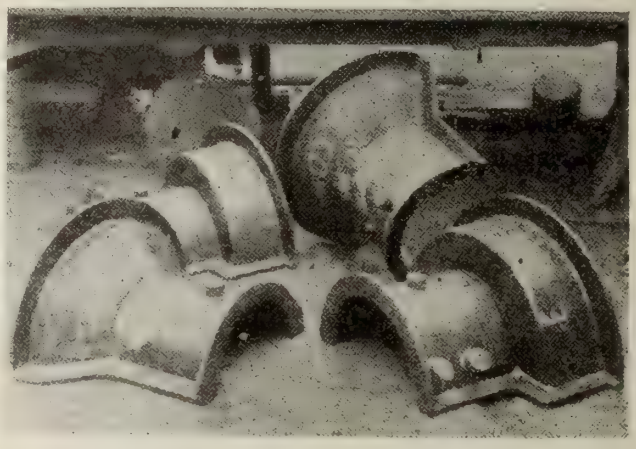


FIG. 27.

necessarily be any good against intense pressure on the area of the cover. In regard to the last speaker's remarks about mines, you must consider the question of disruption in relation to that of welding, because if your weld were to yield at the moment of destruction the mine would be absolutely useless. The hemispheres would simply come apart and would not have any retentive effect at all against the explosive charge.

You do not have longitudinal stays in mines. C. S. Milne & Co., Ltd., have made a great many mines which I do hope went off effectively, and I think we may say that the hemispherical welding, without the use of stays has been a success.

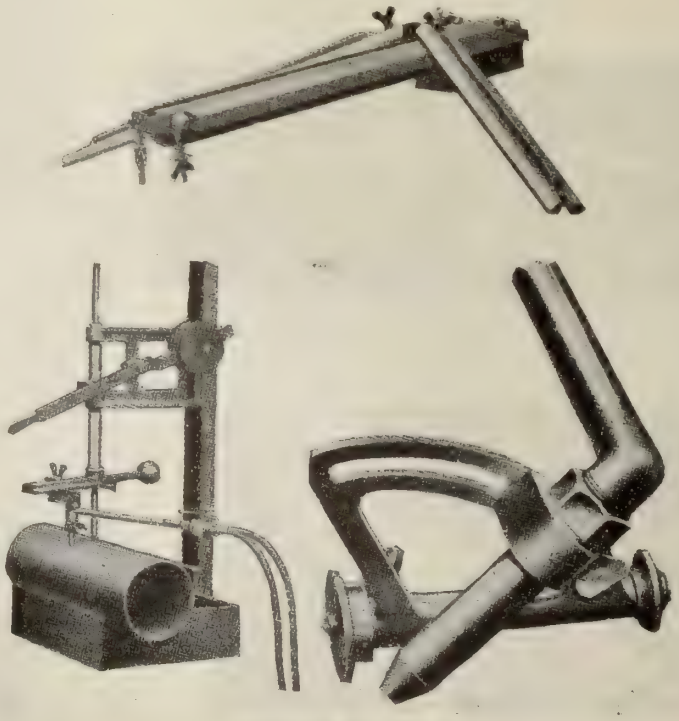
Mr. J. J. Gardner asked: In the case ipulation of the blowpipe by one of the workmen depicted by means of the lantern slides which illustrated the lecture, and asked for some particulars as to why Mr. Milne liked his welding on the work which had to stand tests which were beyond the ordinary?

Mr. Metcalfe enquired if Mr. Milne made any provision in the cutting machine, shown in Fig. 31, against the rubber tubes getting tangled?

Mr. Pickett said: Can Mr. Milne give us any information with reference to welding fractures in copper? This question particularly interests me and I should very much like to know whether Mr. Milne has any information on the subject.

Mr. Albert Hoddle said: I am sure we are all very grateful to Mr. Milne for the way in which he has dealt with the subject of his paper. He has not only described the difficulties he has en- association, and as comments have been invited, I should like to say that I failed to recognize among the many slides one that has dealt with the component parts of motors, or castings connected with internal combustion engines. We have to recognize now that motor transport is a very great power in the land and a great deal of acetylene welding has to be done with these various parts. I am query and also to Capt. Harley's remarks, said: My point was, if riveting is satisfactory, why weld? and if welding is good enough, why rivet? On the question of chambers that are in excessively high tension due to internal pressure, I think that you had much better stick to your riveting and say nothing about the welding.

To be Continued



FIGS. 28, 30, AND 32.

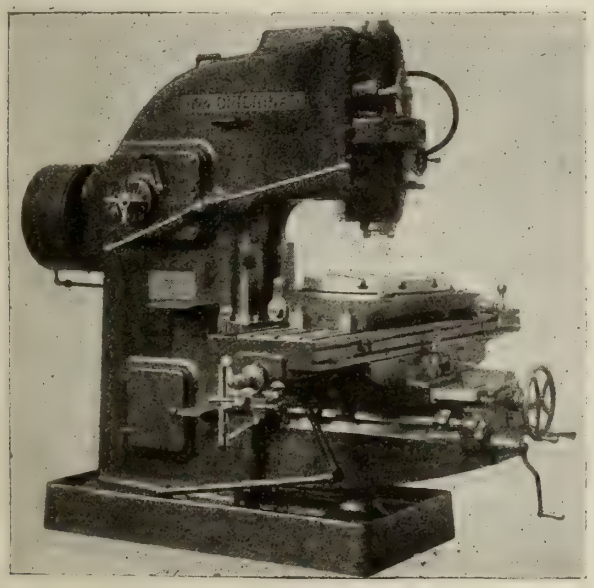
DEVELOPMENTS IN SHOP EQUIPMENT

No. 4 VERTICAL HIGH POWER MILLER

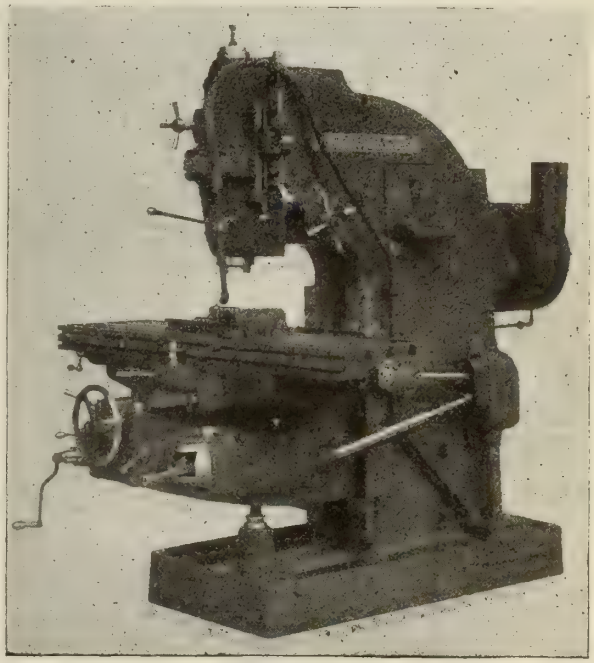
As a result of the success attained by the new No. 5 High Power Horizontal Type Cincinnati Milling Machine, the Cincinnati Milling Machine Company has placed on the market a heavy vertical machine of similar design, embodying the same features. This new machine is intended for extremely heavy work and it patterned after the No. 5 in all those elements which are common to both machines.

For die work, some classes of tool room work and many manufacturing operations, the vertical spindle milling machine has many obvious advantages over a machine of horizontal type. Chucking the work, in particular, is often simpler and the work is more accessible and very easily observed. Also, in combination with a rotary milling attachment the vertical spindle machine becomes a continuous miller.

The strains set up by the cutter in the vertical machine, particularly when using the large diameter face mills



BACK VIEW OF THE MACHINE.



GENERAL VIEW OF MACHINE FROM OPERATING SIDE.

for which this machine is designed, are just as severe as those which must be taken by the horizontal machine of the same horse power rating. However, all horizontal machines are provided with braces for tying the upper part of the machine carrying the cutter and the knee which carries the table and the work, together. There is no such provision on a vertical machine and the strains must be absorbed by the knee and column and those parts must therefore be made very strong and solid to take heavy cuts at high rates of feed. The illustrations will indicate that the column of this new machine has unusually great depth and width and the walls are thick and well ribbed.

The Knee

The knee is the other member which must absorb these same strains and also carry the entire load of the table, saddle, fixture and the work. This portion is well ribbed, and so designed as to allow ample thickness of walls. The openings are small and are placed as far as possible in the neutral sections. It is connected to the column by rectangular bearings with square gibs and narrow guides which together with the rigid construction of the knee itself provides ample strength for the maximum cuts and heaviest load this large machine is designed to carry.

The Saddle

The saddle is long and its extreme width provides an ample bearing for the table. Its bearings on the knee are again rectangular, square gibber and with a narrow guide which provides good sliding conditions even when the table is heavily loaded, and at the end of its travel. This square gibbing also enables the incorporation of a very effective clamp for securing the saddle to the knee. This clamp is, in fact, so effective that no special stops or other facilities are required for holding the saddle in position when heavy irregular cuts are being taken. The saddle details are shown on figure 2, which also illustrates the liberal proportion of the feed gearing, the connection of the power quick traverse transmission and also the connection for the drive for the circular milling attachment shown in the heading of this article. This circular attachment is also entirely new, designed of strength and general proportions to suit the machine. By using this arrangement the machine may be converted into a continuous miller, at the same time allowing the use of the table feed independent of the rotary feed, and also the use of the power quick traverse for both the machine

table movement and for rotating the attachment table, the operator being relieved of all hand adjustments.

The Table

The table of the machine is 19 in. wide, has a working surface 68 in. long, with three T-slots ¾ in. wide, providing ample clamping facilities. In order to resist as far as possible the warping effect of clamping bolts when holding the work for heavy cuts, the table has been made of unusual height, box section, and has a large number of ribs to give it added stiffness.

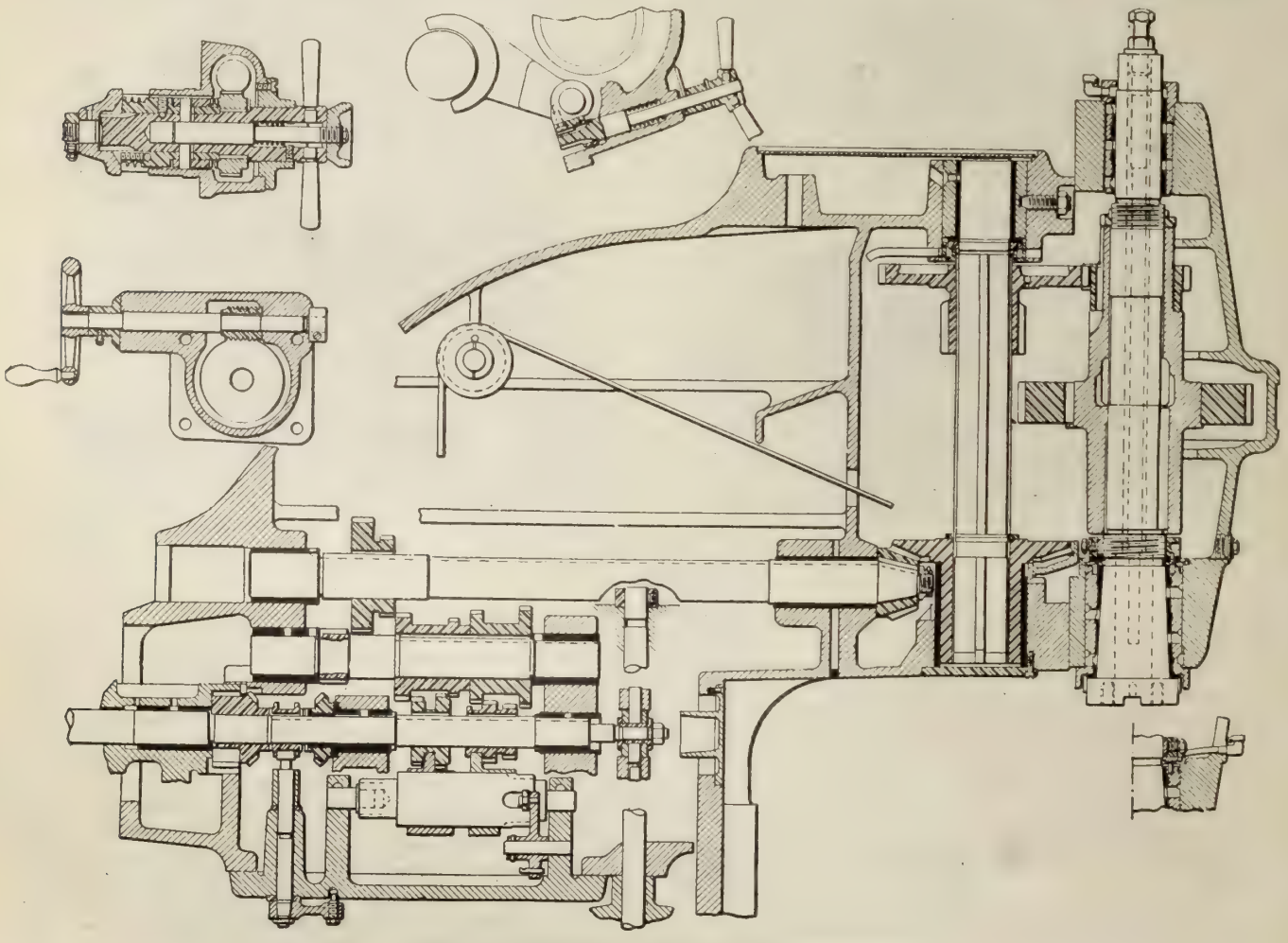
The main driving pulley runs on ball bearings and is mounted on a bracket fastened to the column which relieves the driving shaft of all belt pull. It drives the machine through a large powerful friction clutch which is operated by the main starting lever from either the front or rear of the machine. When the clutch is released to stop the machine an automatic brake is engaged and stops the spindle almost instantaneously. A belt guard conforming with the modern safety laws is also provided. The main driving pulley runs at a fast speed which allows the use of a high speed motor for either the belted or geared driving arrangements.

Speed Changing Mechanism

The speed changing mechanism is similar to that of the No. 5 machine except that the spindle and back gear shaft are turned to the vertical position. One of the novel features of this machine lies in the fact that this is accomplished by incorporating in the vertical machine the same large face gear and the same powerful mounting of the spindle as in the horizontal machine. The back gear shaft which is parellel with the spindle, and therefore, also in a vertical position, is driven through a pair of bevel gears, and back of those the entire drive is the same as on the horizontal machine. The speed changes are made through selective sliding gears. There are no tumblers in the machine. All shafts are hardened. This back gear shaft has four integral keys on which the back gears slide. This transfers the sliding feature from the spindle to the back gear shaft and eliminates the difficulty resulting from a construction that requires the spindle to slide through the gears. The gears on the back gear shaft may be selectively brought into mesh with the gears of the spindle and no matter which set of gears is engaged, when the spindle is adjusted vertically they may slide along with the head and retain their driving engagement at all positions of the head. The spindle itself has no gears on it but is surrounded by a sleeve, the lower end of which is slightly tapering and fits snugly on the spindle to which it is keyed at this point. This construction for all practical purposes makes the spindle and sleeve one piece, having the effect of merely enlarging the diameter of the spindle, and at the same time placing all strains due to driving on the sleeve to which the face gear for the slow speeds and secondary gear for the higher series of speeds are keyed. When the head is adjusted up and down these gears are carried with it and there is a connection between the head and the driving gears on the back gear shaft which moves them up and down to correspond.

The Spindle Head

The spindle head is square gibbed to the column and carries both bearings of the spindle in fixed positions in relation to each other for all positions of the head. The quick head adjustment may be made through the pilot wheel at the right side of the column, one turn of which moves the head 6 inches, the full adjustment. There is also a slow adjustment provided through a hand wheel (worm and worm wheel) which is brought into engagement



GENERAL SECTIONAL VIEW OF THE MECHANISM.

by means of a fine tooth clutch operated by a knob in front of the pilot wheel. There is a micrometer stop and also a micrometer dial provided. The details of the head are shown on figure 3.

The Feed Mechanism

The feed mechanism, similar to that of the No. 5, is placed at the side of the knee and the feed changes are made by a single lever operated from the front through a system of sliding wears. The changes may be made instantaneously from one feed to any other by merely shifting the position of this lever. Its location and the ease with which the feeds may be changed also makes the fast feed of 30 inches per minute available as a quick traverse for cross and vertical adjustments. The standard feed range is ¾ to 30 ins. A slower or faster rate may be furnished when desired.

The individual feed levers for table feed control, each of which starts, stops and reverses its corresponding feed, also at the same time indicate the direction of movement and these levers are duplicated at the rear of the machine so that the feeds can be controlled from a position behind the table when the size of the work makes this position desirable. The table feed lever has five positions controlling the starting, stopping and reversing of the table feed, and also the quick traverse of 100 ins. per minute for the longitudinal movement in both directions. The trip mechanism is arranged for intermittent feed, this feature being made available by setting the necessary dogs to suit the work and the intermittent feature may be used for feeding in either direction. This feature saves much time on work in which the cut is intermittent, the fast and slow feeds being controlled entirely by dogs, automatically bringing the quick traverse into action at all times except when the feed rate is being used. This is one of the outstanding features of this new machine and is a great time saver. One of the cycles of movement which is especially useful in the vertical machine is the continuous reciprocating cycle. The application of this cycle is as follows:—Assume 2 pieces of work on the table some distance apart and assume the cutter in the space between the 2 pieces. The operator starts the machine; immediately the table moves quick until one of the pieces has arrived at the cutter, when the dog trips to the feed rate, the work is fed under the cutter and then the table is reversed and is returned at the quick rate until the cutter arrives at the next piece, when a second dog trips to the feed rate and after this piece has been traversed the table is again reversed and a piece which the operator has in the meantime chucked in the other fixture, is again brought to the cutter and so on. This is continuous reciprocating milling, the operator chucking a piece in one fixture while the machine is milling the other, the entire operation of the machine being automatic. Another feature is that the table and cross feed can be used consecutively, being dog controlled. The design of the trip members is such that with the dog in the path of the trip plunger the power feed can be easily reversed and the table fed in the reverse direction, so that the work can be finished in a square or rectangular path in either direction.

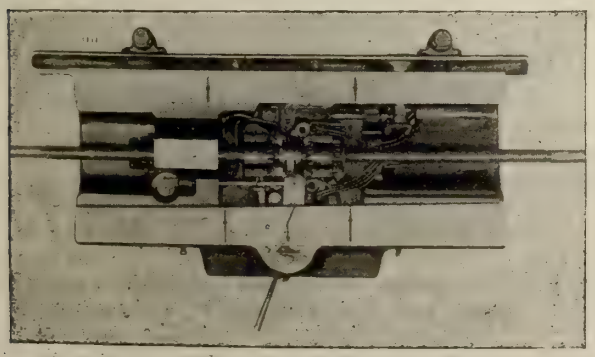


FIG. 3—PLAN VIEW OF THE SADDLE.

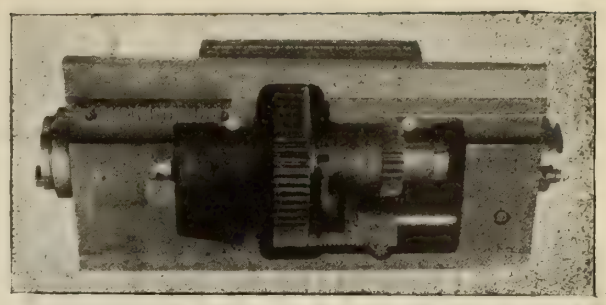


FIG. 2—DETAILED VIEW OF SPINDLE HEAD.

The Pump System

A centrifugal lubricant pump with a capacity of 11 gallons per minute is supplied as regular equipment for cooling the cutters. A geared pump placed in the pulley bracket provides automatic lubrication of all mechanism in the column, and several centralized oiling stations provide quick and convenient oiling facilities for the bearings in the knee, saddle and table. Another feature is that it is not necessary to set the table in a certain position for oiling the inside parts of the saddle and table and their bearings, as these parts may be oiled with the table in any position whatsoever.

Figs. 3 illustrates the spindle head detached and shows the two main gears and the gear shifting mechanism, as well as the method in which the gear assembly slides on the back gear shaft to allow for spindle head adjustment.

The remaining illustrations are self-explanatory.

A service of genuine worth is rendered to its patrons by one automobile manufacturing company. When it is reported to the central factory that a car has been lost or stolen, the factory history is consulted and the car's secret markings collected. In bulletin form these markings are then sent regularly to the company's dealers and garage men, who know that a thief always erases the engine mark but usually overlooks the number on some small, inconspicuous part. In this way the company has been able to recover hundreds of stolen cars in the last few years.

A claw hammer of the usual kind with a wood handle may be made very strong for heavy work, such as pulling very large nails. This can be done by sawing out an opening in the handle from the hammer head back past the centre of the handle an inch or two and inserting a strip of very narrow old steel buggy tire and securing in place by drilling small holes through both handle and buggy tire strip. The proper place for the holes is just back of the hammer head, one in the centre, and one just back of the centre an inch or two from the end of the buggy tire strip. Sometimes the drilling may be dispensed with by selecting a strip of buggy tire with bolt holes in the proper places.

The term shell shock has misled many persons to believe that it is due to the profound impression or shock produced on the nervous system by the detonations of high explosives. No doubt, there are cases of actual brain or nerve injury due to concussion of the air accompanying shell explosions, but these mechanical causes are a great deal less frequently responsible for war neuroses than the mental effects of general war strain. It is remarkable that these war neuroses, common as they are among privates and officers alike, are seldom found in men who have been actually wounded. Perhaps this seeming anomaly is due to the actual wound shock offsetting the mental impression affecting the controlling nerve-centre in such cases.

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Tearing Down Tariffs

AT the gathering of the Liberal party at Ottawa a few days ago the matter of tariffs came in for some very strong talk. The broad statement was made that tariff should be taken entirely off some lines such as agricultural machinery, tractors, etc.

The trouble is that when people come together at times such as the Ottawa gathering, they are apt to talk in glaring generalities without getting down to real facts and facing all the conditions.

Taking the tariff off of any line and throwing a Canadian shop into competition with the world would mean, if there were to be any degree of fairness in the matter, that the Government should see to it that that shop has all the advantages that the competing manufacturers have. There should be the same ability to buy raw materials at the first cost, equality of carrying charges, etc. There are a large number of things to be considered, but in the heat of a convention called for the purpose of framing a platform they are generally overlooked.

The majority of the Canadian manufacturers are not of the Haman's gallows type of tariff makers. They are reasonable. They are not clamoring for tariff as a bonus for inefficiency. They have learned that it is possible for Canadian goods to be made good enough to enter the markets of the world.

But those who propose to bring into effect a tariff in Canada that would wipe out all protection and all tariff, regardless of the amount of revenue it would destroy in these days of high taxation, must think seriously of what they are about if they do not wish to strike at the root of much of Canadian industry.

What is needed, and what seems very hard to secure, is that there should be a scientific and careful study of the whole tariff field in a scientific and thorough manner. Political conventions have vague notions on tariff matters, for the simple reason that those who attend have not studied the matter in a big enough way.

A Strong Indictment

AT a time when the household preserving industry should be in full swing, the supply of the most important ingredient, sugar, has been ruthlessly suppressed, presumably by the large interests who can control the supply. The authority for this statement is Dr. R. J. McFall, the Cost of Living Commissioner. Without any attempt at equivocation, he states that sugar is being deliberately kept from the housewife in order to prevent her competing with the canning combine.

In support of this he shows that the amount of sugar being refined in Canada is more than sufficient for the needs of the country, and the imports are in excess of the exports. An advance takes place in Canada in spite of the fact that it remains stationary in New York.

It would seem that here is a clear case for Governmental action. With the amount of discontent and unrest apparent throughout the country, conditions such as are here disclosed are nothing less than criminal. People naturally think if these things are true of one type of big business they are true of all.

Will those in power be able to take their eyes off the political situation long enough to look into a condition which affects so vitally the pockets of the voters?

THE latest horror to be perpetrated on a long suffering public is an actors' strike in New York. However, the tired business man can pluck up courage. The chorus girl is sticking to the job.

* * *

THE Cost of Living Commissioner says that the sugar trust is boosting prices to help the canners' combine. We trust the people will combine to can both the canners and the sugar trusters.

* * *

That the state may have a sufficient number of tractor drivers to cultivate the maximum amount of land, and so increase the food supply, the California State Board of Education has been conducting emergency classes in tractor operation in the rural districts. The course given lasts three weeks and costs only $2.50. The first week, the students are taught the theory and principle of gas engines; the second week, the assembling and disassembling of tractors, their operation and repair, and the third week they drive tractors in the field.

* * *

It would seem that the phenomenon of growing old has really nothing to do with the number of years that an individual has lived, but depends principally on the extent to which he has conserved his recuperative powers. The human body wears out in two ways, i.e., either by long-continued use or by long-continued disuse. In the former case it is like bending a wire back and forth in one place until it breaks, and in the second it is the atrophy of organs or functions through disuse. The only way to stave off old age is to eliminate all forms of abuse and live as Nature intended us to live.

Advice to the Draftsman; Get Out of it

By Thernaldus

THE draftsman's life must truly be a hard one if all is true that has appeared in two previous numbers of CANADIAN MACHINERY and unfortunately, it is. From the writer's point of view the unsatisfactory state of affairs existing to-day is due to several causes.

First the draftsman himself. "The attractive surroundings and cleanliness of the work itself," undoubtedly appeal to many youths and to their parents. This is responsible, perhaps, for the number of so-called draftsmen seen to-day pushing a pencil who might better be counter-hopping in a dry goods store or behind the wicket in a bank. The same remark also applies to the product turned out by engineering schools in vast numbers, with sheepskins enabling them to design everything from Quebec bridges to cast iron bath tubs. For among them too many are found who are utterly unsuited for any engineering profession. This state of affairs is due perhaps to the glamor of the engineering profession, but more likely to the idea unfortunately mistaken that the engineer's stipend is of fabulous proportions.

However, if a man is not suited mentally for mechanical pursuits he might better stay out of them and get into something more to his capabilities, leaving the field open to those of the proper talents, to their better advantage.

The draftsman himself is also at fault through his mental inertia or laziness, call it what you will. The drafting room to a man of ambition and who is willing to work is but a step to something better. Take a look around any drafting room and you will find very few men who have reached middle age still bending over the board with tee square and set square. Where they go has puzzled the writer for some time, but an explanation might be found in the fact that the earnest ones desiring self improvement usually reach the designing engineer's office or some other sphere where their capabilities have better scope for their display, while the inefficient ones drop out of sight and are found in other occupations.

Not only is the draftsman himself at fault, but his employers are not altogether blameless. "One of Us" says it takes an average of four years to make an average draftsmen. This is all too true, and when the four years are up his knowledge is usually very limited and confined to whatever he may have been working on most of the time. It should be recognized that the apprentice (we may call him that though not articled) draftsman is entitled to a reasonable amount of educational opportunity aside from that which comes to him through his particular work. "One of Us" lays stress on shop training and this point can only be emphasized in the strongest of terms, for a draftsmen without shop knowledge is as useless as a doctor without a knowledge of anatomy. There is another side of the question of education which should be dealt with equally with the practical, however, and by this I mean the theoretical side of whatever branch of engineering is applicable.

It goes without saying that a mechanical draftsmen should have a good knowledge of machine design in all its parts, should know the principles of mechanics and their application, and should have a sound knowledge of materials and their strength. The electrical draftsman is in a somewhat similar position but his need for theory is even greater. In some cases his knowledge must approach that of an engineer. The structual draftsman, too, if he does not wish to remain a detailer on that everlastingly monotonous job of structural detailing, must have a knowledge of the theory of framed structures.

Where will the apprentice draftsman gain this specialized knowledge. Through his superiors? Yes, if they are willing as they usually are, and if the boss is acquiescent. Through home study? Perhaps, but it is a lonely job. Through technical schools? Yes, by all means, and it should be the employer's part to give a bit of encouragement and incentive.

The actual production of a pretty drawing is not so important. The neatest letterer in the room is usually given the job of lettering shop signs, etc. More to point though is an understanding of the principles of projection and the construction of a neat accurate drawing. How many draftsmen know whether they are drawing in the first or third positions?

The argument is often heard in the drafting room as to whether the college graduate or the practical man from the ranks is the better man and the discussion at times becomes quite bitter. The inconclusive nature of these debates is a guide to the equal value of both and the proper training for the draftsman, or, the engineer whether from college or from the practical side of the fence will be found in a combination of both theory and practice.

For the mechanic, the drafting room offers a means of acquiring the elements of engineering practice and this supplemented by his own efforts and study should make him a REAL engineer.

The engineering graduate fresh from the halls of learning has to, or should, reverse the process and go first to the shop, then the drafting room and from thence where he lists.

For the youth ambitious to become a draftsman the shop training as proposed by "Engineer," in one of the former rhapsodies on this subject, is absolutely essential and after he has entered the realm of blue print and tracing cloth his education should not stop, but change, and should smack more of the theoretical, gained by study at home, night school or otherwise.

The three elements, practical knowledge, theory and draftsmanship, should go together much as capital, labor and brains; all three necessary to the achievement of success and all as necessary as are the three legs of a milk stool, n.b., this simile is not mine.

After all this suppose we have a finished draftsman or really a designing engineer and he comes for advice regarding the remuneration offered for his really worth-while efforts. If he asked the writer's advice he would say: "Get out of it."

MARKET DEVELOPMENTS

There is a Fair Amount of Business Moving

While Not so Active as Previous Week, Machine Tool Trade Shows Steady Business—Steel Warehousemen Report Good Business

THE general feeling among machine tool dealers and steel warehousemen is that business is satisfactory, though not quite as lively as during the previous week. There is some hesitancy still being shown by machine tool purchasers regarding the probabilities of labor troubles interfering with business later on. While there are plenty of machinists available now, the fact that in many places molders are still on strike makes it impossible for the machine shops to be fully engaged.

There have been no changes in steel prices since last week. That a change must come before long, and that when it does it will be upward, is the opinion of those interested in these lines. There is still a difference of opinion as to the probabilities of an advance in plate prices, but the fact that mills are operating at 75 per cent. capacity and will not promise delivery before last quarter would seem to preclude the idea of a drop in prices.

Pig iron still shows advances. Many furnaces are now booked up for the rest of the year and show no anxiety to book business for next year. What bookings have been made for first quarter have been at an advance of from $1 to $2 a ton over present prices.

In the scrap market the scarcity of steel scrap is still the feature, and prices for heavy melting continue to advance. Dealers are holding on to what they have for better prices, and sales at $23 per ton have been reported. Cast scrap has reached a point in some districts where furnace men are buying low grade pig as being cheaper than scrap.

BUYING OF MACHINE TOOLS KEEPS STEADY

TORONTO.—While business in the machine-tool trade is fairly active, the still unsettled conditions of the labor market is having its effect on buyers. One dealer reports having placed twelve machines last week, part new and part second-hand. The general feeling is that there is nothing to complain about in this line.

Considerable interest is being taken by dealers in the buying now going on at Walkerville, at the plant of the Canadian Products. While the proximity to Detroit is somewhat of a handicap, the Canadian dealers are getting some of the business. Some lines of course must be purchased through Canadian houses where they have the sole rights of the territory.

The steel market is at the moment practically stationary, but as this is not a natural condition, a movement in prices is expected shortly. That this movement is to be an upward one is pretty generally believed.

One feature of the situation is that plate mills now refuse to promise delivery on orders before the last quarter. A few weeks ago delivery could be obtained in two days, if required. The mills are now operating about 75 per cent. capacity, which is high. This would seem to be against the idea that plate prices would drop, although that is still being entertained by some well-informed men. There is a good quantity of plate still being brought into Canada to fill existing contracts in the shipbuilding and marine engineering lines.

Warehousemen report very good business, which is keeping their stock turning over. The railways are buying freely. August is generally looked on as a dull month so the situation may be called very satisfactory.

There is practically no change in the scrap situation since last week, the scarcity of heavy melting steel still being apparent.

AUTOMOBILE INDUSTRY IS RESPONSIBLE FOR MUCH BUYING

(Special to Canadian Machinery)

NEW YORK, Aug. 11.—The volume of machine-tool buying is steadily increasing, but a large proportion of the orders and inquiries continue to come from the Central West and particularly from the automobile industry.

The White Company, of Cleveland, manufacturers of trucks and passenger automobiles, has made inquiry for 250 to 300 tools for an addition to its plant and other large buying by auto makers is in prospect, while the day-to-day business in the Detroit territory makes up a very satisfactory aggregate for many tool builders.

The Hudson Motor Co., Detroit, will build a large plant at Detroit for the manufacture of Essex cars and perhaps $1,000,000 worth of equipment will be required, while buildings will involve about an equal expenditure.

Dodge Brothers have purchased a large tract of land near Detroit for new manufacturing capacity, and it is rumored that this concern may erect its own steel plant and sheet mills. Ground will be broken soon at Marysville, Mich. near Port Huron, for the new plant of the Wills-Lee Company. This will be one of the largest automobile plants in the country and many millions of dol

lars will be invested. The Canadian branch of the company will be located on land below Sarnia, Ont., which was formerly a part of the Indian Reservation.

One of the largest projects in the shipbuilding field announced since the end of the war is a $5,000,000 ship repair plant to be built near Havana, Cuba, by the Cuban Government. Monks & Johnson, Boston, Mass., contractors and engineers, who laid out the Alameda, Calif., plant of the Bethlehem Shipbuilding Corporation, and who have done much other important work for the Bethlehem interests, have received the construction contract. Equipment for plate shop, forge, machine shop, etc., will be purchased in the United States.

A maker of grinding machines and boring mills has advanced prices 5 per cent., but no further price advances are noted, other than those reported a week ago. Prices are firm, however, and there is practically no tendency among sellers to make concessions. The Standard Oil Company of New Jersey early in the year got quotations on about 75 machines for shipment to the Roumanian oil fields, but postponed buying, presumably on account of high prices. It is quite certain that the company now will pay much more, the list having been revived, as few sellers need business as badly now as when the list first came out, and the temptation to cut prices will not be so strong.

POINTS IN WEEK'S MARKETING NOTES

Steel plate mills are operating at 75 per cent. capacity and will not promise delivery before last quarter.

—

Machine-tool business is giving dealers satisfaction. Some big buying just now at Walkerville.

—

The steel output for the month of July was equal to 75 per cent. capacity of mills.

—

Scarcity of steel making grades still feature the scrap market. Cast scrap price in some cases up to that of pig iron.

—

Large quantity of ship and boiler plate still being imported into Canada to fill contracts.

STEEL OUTPUT FOR JULY WAS 73 PER CENT. OF CAPACITY

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., Aug. 14.—The volume of orders flowing to the steel mills keeps up very well, easily exceeding the current production, but an element of uncertainty has been injected into the situation, in that some of the buying may be prompted by fear that mills will have difficulty in making deliveries later in the year, either through their having too much business or through there being strikes. The steel producers think it highly improbable that the efforts of the American Federation of Labor, in the direction of having a general strike in the steel industry, will lead to anything, but in this matter it is not a question of what the producers think, but of what the buyers have in their minds. Strikes as affecting steel production, moreover, are not all in the future by way of probabilities or improbabilities, for the strikes of railroad shopmen have curtailed pig iron and steel production materially in the past ten days, considerable parts of the South Works and Gary Works in the Chicago district having been thrown idle through lack of transportation facilities, as well as practically the entire Newburgh works, Cleveland. The three plants mentioned are all controlled by the Steel Corporation. On the whole, steel mill labor itself appear sto be contented and to realize that it is well treated. The Steel Corporation in particular asserts that its men are well satisfied with their treatment, and the Steel Corporation takes great pains to ascertain the exact facts in this matter. Two incidents may be mentioned. The Leechburg and Vandergrift works, near Pittsburgh, of the corporation's sheet and tin plate subsidiary, employ about 2,000 men, and recently a mass meeting of these men gave an enthusiastic viva voce vote to a set of resolutions to the effect that they intended to keep at work "under present conditions" and that "we resent any interference by any union, outsiders, or paid agitators." Another incident is that at two independent tin plate plants the men asked the management to give them, not the Amalgamated Association, the union scale, but the open shop scale of the Steel Corporation's tin plate plants.

Steel Prices

The whole country has been much wrought up lately over the high cost of living and deep interest is taken in the efforts being made by all branches of the Government to bring it down by all methods available, including the punishment of profiteers. All price advances must prove very unpopular. Hitherto there have been divided counsels in the steel trade as to the propriety of advancing prices at this time, with the Steel Corporation and some of the independents positively opposed to there being any advances. In view of the state of popular feeling it is likely that the minority, which has been talking higher prices, will change its attitude.

In the pig iron market several price advances have been announced. Alabama furnaces state that they are back to the March 21 price of $26.75 on No. 2 foundry iron, which would put them in an impossible position as to sales in much of their territory when various northern furnaces, with much smaller freights, are still at $26.75, furnace. Chicago district furnaces are reported to have advanced their prices $2 a ton, and two Cleveland furnace interests report having made an advance of 50 cents. The Pittsburgh market is merely firm at the old price. The price advances are probably simply "on paper," the furnaces making them being sold up for a time. If 55 per cent. of the merchant furnace capacity of the country can advance prices without any of the idle 45 per cent. coming into blast then there is something possible that has never occurred before in the history of the industry. Usually the market is rather wobbly as idle furnaces come into blast, because they are not punctilious as to selling prices when they are accumulating a backlog of orders upon which to blow in.

Steel Production

The monthly report of the American Iron and Steel Institute shows that in July 2,508,176 gross tons of steel ingots were produced by 80 companies, which in 1918 made 84.03 per cent. of the country's total output of steel ingots. This means that in July the industry as a whole produced at the rate of about 35,700,000 tons per annum, or at 73 per cent. of capacity, taking the latter at 49,000,000 tons. This compares with rates of 67 per cent. in June, 54 per cent. in May, and 65 per cent. in April. Production has been increasing almost as rapidly as formerly it was decreasing, the low point, about 50 per cent., having been struck at the middle of May. In view of the dearth of orders for rails, plates and structural shapes it does not seem probable that the present rate of steel production can be greatly exceeded in the near future. Some departments, particularly the lap weld departments of the pipe mills, are oversold, but that does not help the departments that are short of orders.

Steel Corporation Tonnage

The Steel Corporation reports 5,578,661 tons of unfilled obligations on books at the end of July, indicating a gain of 685,806 tons during July, against 610,545 tons gain during June, and losses averaging over 600,000 tons a month in the six months preceding June. The corporation's shipments in July may be estimated at 74 per cent. of capacity, and as the increase in unfilled obligations represented about 63 per cent. of capacity the total tonnage entered in the month appears to have been about

127 per cent. of capacity, against about 117 per cent. in June and only about 20 per cent. in May. The figures, it must be remembered, include contract obligations, and thus give little suggestion as to shipping orders, which include specifications against contracts. The monthly tonnage reports indicated extremely light business during the six months preceding June, but the shipments were fairly good, being chiefly against specifications on contracts entered long before.

Exports

February marked the low point in iron and steel exports from the United States, 234,793 gross tons. Afterwards there was continuous improvement, June showing 544,580 tons, the largest amount for a month since December, 1917. Since about the end of June export demand has not shown distinct signs of increasing, and in some respects it has fallen off a trifle, though the latest reports suggest a revival. On the whole, however, it is probably not out of line to take it that the June exports are a fair guide to what may be expected in the matter of exports for some time to come, and general comparisons may therefore be indulged in. First, it should be noted that the iron and steel exports as reported by Washington include scrap, pig iron, unfinished steel, the various rolled products, and such manufactured goods as cast and wrought pipe, wire and nails, nuts and bolts, etc., as well as some castings. Accordingly, while comparisons can be made between months and years, comparison cannot be made between the total exports and the total production or the capacity. Eliminating pig iron, wrought iron and castings, the steel exports are left and can be compared with steel production and capacity. The June exports of steel represented a rate just a trifle under 6,000 000 gross tons on the basis of finished rolled steel, the productive capacity in which is about 37,000,000 tons a year, so that the exports of steel represented 16 per cent. of the capacity. Production in June was at about 67 per cent. of capacity and thus the exports represented about 24 per cent. of the production. In 1912, the best calendar year for steel exports before the war, the exports amounted to about 2,400,000 tons, and that was about 10 per cent. of the production. There are two ways of looking at most things. One may say that steel exports now are two and one-half times the best exports before the war. One may also say that while the present capacity of 37,000,000 tons is 14,000,000 tons greater than the production of 1912, the exports have increased by only 3,600,000 tons, and as there is no evidence that they are going to be much larger, it is more readily seen how idle was the talk during the war that afterwards the export demand would take care of the increase in capacity produced by the war.

MALLEABLE SELLING HIGHER

Advices from almost all centres show further advances in pig iron prices. Furnace capacity for 1919 is fully booked up. Malleable iron for first half brings higher price. Following are reports from U. S. points:

Chicago.—Foundry interests are evidently seeking to get as much iron as possible before prices advance again. 1919 production of furnaces will all be booked up before the end of this month at present rates of selling. Iron for 1920 is quoted at $2 over present prices.

Boston.—Sales through New England dealers approximate for the past week 10,000 tons. Prices have fluctuated, in some cases stiffening, concession being given in others. The general trend is towards further stiffening, with enquiry good. Some sales for 1920 have taken place, but the price has not been given out.

New York.—Enquiries are in excess of capacity in this district. A large tonnage for export could not be quoted on owing to lack of iron. For 1920 first half delivery, about 40,000 tons are asked for, but few furnace interests are willing to quote on next year delivery, feeling the labor market is too uncertain.

Pittsburgh.—The tendency of consumers is to cover themselves for their future requirements before prices get any higher. Steel making grades have been in demand, although steel makers are not busy. A quantity of low phosphorus iron was bought for $39 to $40 from a valley producer, while a sale of 3,000 tons of basic at $25.75 is reported.

Buffalo.—Furnaces are booked up in most cases for this year's delivery, and at least two are out of the market. Some 1920 tonnage has been sold, the prices reported being malleable $29; No. 2 foundry $28; No. 2X foundry $29, and gray forge $27.50.

Cleveland.—There have been good sales of round tonnages during the past week, due mostly to the talk of impending higher prices, consumers being anxious to get covered. Enquiry for 1920 is fairly brisk, but sales are few. Furnace stocks have been reduced more in the past week than in any preceding week this year.

Cincinnati.—There has been little business done here although prices are favorable, last quarter delivery being quoted at $26.75 Birmingham for 1.75 to 2.25 per cent. silicon. First half enquiry for foundry iron is coming out, but no sales are reported so far.

St. Louis.—Brisk business involving good sized tonnages has been the feature of the market here this week. Consumers who had covered on estimated business find it necessary to secure more material on extra orders. Sales are ahead of production, and it will be necessary to light up some idle stacks.

Birmingham.—Sales for third and fourth quarter are being made, and the market is strengthening. Several furnaces have been put in blast and others are expected to follow shortly. The increase of prices in other districts has had a good effect on the local market.

HEAVY MELTINGS STILL SCARCE

The scrap market shows great strength in both iron and steel scrap. Heavy melting and re-rolling were strong and in some cases cast scrap approaches the price of pig iron.

Philadelphia.—A large tonnage of heavy melting steel has been sold here for Pittsburgh shipment at $23 delivered. Sales generally are light, but prices are advancing on account of activity in other centres. All grades of scrap are scarce.

Boston.—An unusual feature was the sale of a small tonnage for fourth quarter delivery, pointing to the fact that consumers expect higher prices. This lot was sold at $28 delivered, and was of No. 1 machinery grade. Other lots of the same grade brought $26.50 delivered.

New York.—Borings and turnings have advanced slightly in response to a better demand. Sales of heavy melting at $22 are reported, but it is thought only small quantities have been bought at this figure by Pittsburgh users. Heavy melting is quoted $16 to $16.50 f.o.b. New York.

Buffalo.—Dealers are very active and prices firm. No. 1 machinery cast is quoted at $24.50 to $25.50 and No. 1 railroad wrought at $23 to $23.50. Heavy melting is quoted in the local market at $20.

Pittsburgh.—Consumers having covered their requirements for the present, the sales have quieted down somewhat, although prices remain firm. Heavy melting has sold at $22.50 and $23 is being asked. Railroad scrap is bringing higher prices for all grades, iron axles being quoted at $31. Low phosphorus has brought $25.

Cleveland.—Although consumers are not buying much the dealers are keeping the market strong. Prices have advanced in almost all grades. A round tonnage of heavy melting has been sold at $23.

Chicago.—A general advance on all grades of $1, and in some cases more, are the conditions here. Rerolling rails have shown a jump of $3 per ton, a small lot having been sold at $33. Railroad offerings are scarce. No. 1 cast, which sold above the pig iron price, is holding firm.

St. Louis.—The scarcity of scrap and the higher prices prevailing are causing consumers to look for low grade pig iron in preference to paying $28 for scrap. Scrap dealers are holding all grades and very little is offering either from railroads or country.

Birmingham.—The market is still behind, but a better spirit is apparent. Dealers have made some small sales. Quotations on heavy melting are around $15 to $16 but it is being held for $20.

Is Your Heating Plant Ready for the Winter?

While the Weather is Warm is the Time to Prepare for the Cold Time Coming—Cold Rooms in a Factory Are a Cause of Dissatisfaction to All Concerned

By T. H. FENNER, Associate Editor

IN that locality which is popularly supposed to be paved with good intentions, we are led to believe that no trouble is ever experienced with the heating arrangements. It is also an attribute af fallible human nature that once the immediate incentive of the said paving material has disappeared, action is delayed in favor of some more pressing need, till the recurring season brings along the old troubles, and a crop of vain regrets. All of which is merely a way of saying that to avoid six months of misery in the winter, a few days or weeks should be devoted in the summer to a thorough examination of the heating arrangements.

There are few things that lead to more lost time and bitter recriminations than the failure of the heating system to properly function at the required time. Workmen coming in to a cold room first thing in the morning are usually disgruntled for the remainder of the day, and are prone to stand around the shop, with their hands in their pockets, calling down anathema on the engineering department, rather than attempt to forget the temperature by an assiduous attention to the job in hand. In many cases they are not to be blamed, for a man who is engaged on monotonous repetition work, which entails but little bodily activity, is usually supersensitive to uncomfortable shop conditions. Furthermore, the plant superintendent, who has to sit in an office where the temperature is around 50 degrees, is not disposed to kindly feelings towards his chief engineer. The latter may not be entirely to blame, as oftentimes lack of sufficient or competent help has caused him to delay the necessary overhauling until an unusually early cold snap brings down trouble on his prematurely gray head.

A winter season such as we had in Canada in 1918-19 did not strain the capacity of the heating plant over-much, and the early spring, followed by the gloriously warm summer, was likely to dispel all thoughts of heating systems from the minds of the engineering staff, but there have been some chilly mornings and evenings lately which serve as a sharp reminder that our summers are short. If not already done now is the time for a sharp and systematic campaign, started at the exhaust line and carried through the factory.

The Right Time To Do It

The proper time to overhaul the heating system is the early summer, just as soon as one can feel that there is no chance of the system being required again that season. All its most obvious needs are, or should be, fresh in the mind then, and the unpleasant remarks caused by them still rankling in the breast. That main reducing valve, for instance, that requires a new diaphragm, the leaky joints in awkward corners of the basement, the vacuum valves which have ceased to justify their existence, and the countless other small things that have had to be neglected for the time being. Small things in themselves, but what a cause of misery in the aggregate.

Perhaps there has been no lack of heat in the factory, but the heat has only been maintained by the expenditure of a totally disproportionate amount of coal or else there has been both a lack of heat in certain sections, as well as a large coal bill. In the small and compactly arranged factory it may not have been very bad, but in the plant that covers a large area of ground, with the heating done from a central plant, the waste may be enormous.

Two Points to be Considered

There are two things to be taken into account. The heating system itself and the state of the buildings. There is little use in having a perfect heating system if there are ½-inch openings around window frames, door jambs, pipe entrances to buildings. The chief engineer should send his foreman bricklayer or painter or go himself if possible, and make a systematic inspection of the buildings, taking careful notes of all places where the cold winds can find entrance, and then take effectual steps to stop them. A little spring yarn caulked tightly into the spaces between window frame and brick work will work wonders in the way of comfort and saving of fuel. Where roofs are built with lanterns take a good look at the joint of roof and lantern, and see that there is no open space under the flashing, and that the flashing itself is in good repair. Count up the broken panes of glass and order the required quantity immediately so that it can be all replaced before the summer is over. There will be quite enough work to be done on building exteriors to keep a man or two busily engaged all summer, and there is no one more vitally interested in having this work done than the chief engineer. Every bit of cold air that enters a building by unauthorized inlets has to be heated up, and it all requires some of his dearly bought b.t.u.'s. Furthermore, a building that is reasonably tight will retain the heat for the better part of the night, when the main engines are stopped, and makes less demands on the live steam.

Coming to the heating plant itself, there is ample scope for useful work to be done. In a large factory there are miles of coils, thousands of feet of main feeders, risers and returns, and hundreds of steam and thermostatic valves, outside of the engine room altogether. The majority of plants using exhaust steam for heating are equipped with a vacuum return system, the returns being delivered to the feed water heater, and thence to the boiler. Where feed water has to be paid for, the more water that is reclaimed from the heating system the less has to be paid for. But it must be free from oil, and it is also necessary to have the oil extracted from the exhaust before it enters the steam heating system, otherwise it will coat the coils and form an excellent non-conductor. Therefore, the oil extractor on the main exhaust line should be thoroughly cleaned, and the trap or other drainage arrangements examined and put in good shape. The vacuum pump should next be overhauled, both steam and water ends, and rods turned up if necessary. The suction and discharge valve plates should be taken out, and if the valve seats are worn unevenly, they can be put on the shaper and faced up. Failing this, they should be faced up with a surface board and file and scraper. Overhaul the valve springs and valves, pack the plunger, and see that the pump barrel liner is not worn in the middle. If it is have it bored out. Once the pump is as perfect as possible you are in a position to start testing out your system. The usual arrangement of piping is a main carried from power house to factory basement, and individual branches carried to different sections of the building. The return branches are brought back to a return main, which is connected to the suction of the vacuum pump. The function of the vacuum pump is two-fold. It has to deliver the condensation from the returns to the feed heater, and also maintain a difference of pressure between the main exhaust and the return system, to ensure a circulation of steam through all the coils. If the pump is not doing its duty, there will be an increase of back pressure on the engine, and the heating system will be filled with water, the result being more fuel consumed, and a cold factory, while the heat that should be going into the building will be carried up the atmospheric exhaust to the open air. If there are leaks in the system anywhere the pump will be drawing air into the returns instead of maintaining a vacuum. Air leaks should be eliminated as far as practicable. Now shut off every branch valve, both steam and return, leaving only the length of the main return open

Continued on page 196

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross	
Lake copper	$27 00	$27 00
Electro copper	26 00	27 00
Castings, copper	26 00	25 00
Tin	57 00	58 00
Spelter	10 00	10 00
Lead	7 25	7 00
Antimony	10 50	10 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

	Per 100 feet	
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$17 00	$13 75
Copper, crucible	21 50	18 00
Copper, heavy	21 50	18 00
Copper wire	21 50	18 00
No. 1 machine composition	18 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	16 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	9 00	7 00
Medium brass	10 00	7 75
Scrap zinc	6 50	6 00
Heavy lead	5 00	5 25
Tea lead	4 00	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	14 00	13 50
Shell turnings	7 00	6 00
Boiler plate	14 00	11 00
Axles (wrought iron)	20 00	20 00
Rails	20 00	13 50
Malleable scrap	16 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe wrought	11 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	5 50	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd. brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	.....	.....
Queen's Head, 28 B.W.G.	.....	.....
Fleur-de-Lis, 28 B.W.G.	.....	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28 U.S.	.....	7 50
Premier, 10¾ oz.	.....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	.....
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS.

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium carbonate	...
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2 25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite, per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated.

IS YOUR HEATING PLANT READY?

(Continued from page 193)

to the pump. Better still blank off the return branches in case there may be leaky valves on the branch where it joins the main. Blank off the water connection to the small condenser on the suction pipe and start the pump. You should get a vacuum immediately, and if your pump is in good shape you will be able to drain from 20 to 24 inches on the gauge. Now stop the pump, and if the length you are testing is tight, the vacuum will be maintained for a considerable time, say 10 to 15 minutes. If it disappears in three or four minutes there is a leak, which must be stopped. Now take the blank flange from one branch and connect it to the return main. This branch may carry four or more coils. Blank these coils off at the steam end, one at a time, and take the thermostatic valve out of the return end, and get the vacuum again. If it does not hold, take a candle, keeping the pump running, and try the flame at every joint till the leak is discovered. Try every coil in this way, till you are morally certain that your return system is airtight.

Then comes the steam side. You can test this out by taking out the thermostatic valves and pulling the vacuum right through, but a more convenient way is to blank your main, one section at a time, and attach a small branch from the air compressor to it. Pump up about five pounds pressure, and see how long it remains. You will soon discover the leak and can remedy each section as you go along. There remains one very important feature, the thermostatic valves. There are various types of these, some being controlled by the expansion and contraction of a volatile liquid and others by the expansion and contraction of a carbon. Those operated by the liquid usually are non-adjustable, but the carbon ones are, and if not adjusted correctly will allow steam to blow right through the coil. Now the latent heat of steam is much more than the sensible heat, but if the steam is not held in the coil till condensed, the latent heat will be given out where it is not wanted, in the return pipe. Therefore, the thermostatic valve must be adjusted so that it will remain closed unless surrounded by water. The best way to ensure this is to disconnect the union on the return side of the valve and then put steam in the coil. If steam blows through screw the carbon body down a little by the screw provided in the top, until the steam stops. Then note if it opens to let the condensation out. It should open and shut precisely as a steam trap does.

When the system is in operation send a man around to every coil at least once a week, to see that valve spindles are tight and nothing leaking on the coil itself.

These precautions will well repay the work involved by the peace and comfort obtained. A factory uniformly warm in every department, Monday morning as well as Saturday noon, will produce more and better work than one in which these conditions are not maintained.

A NEW RUDDER

A rudder of a completely novel type, which has been used on small vessels during the war, is about to be developed commercially. It is named after its inventor, Mr. J. G. A. Kitchen of Lancaster. It enables a boat to be steered, reversed, controlled and turned by a single tiller, and with the engines running continuously in the forward direction. The rudder consists of two parts which, when closed form a cone, apex pointing aft; and, when fully open, form a sort of tunnel in the wake of the screw. Whether shut or open the rudder as a whole can be turned to port or starboard like one of the ordinary kind. When the rudder is closed the propeller stream entering the open mouth is deflected forwards by the sides of the cone, brings the vessel to rest, and then moves it astern. The partial opening of the plates allows some water to pass through, and the speed and direction of the boat can thus be controlled without slowing the engines. For ordinary steering the rudder is opened fully, and deflects the propeller stream to one side or the other. It has an extremely powerful braking effect, and is capable of arresting a vessel in its own length; while its capacity for deflecting the water driven aft by the propeller renders it very useful for manoeuvring in restricted places.

Electric Furnaces in the Iron and Steel Industry; Rodenhauser, Schoenawa and Vom Baur. John Wiley & Sons, Inc., New York.

This is the second English edition of this well-known work. In it a number of changes and additional matter have been incorporated consequent upon the rapid growth of the electric furnace industry. While a considerable number of books has been written on the subject of the electric furnace, the majority of them are of such general scope that the iron and steel industry does not receive the attention it warrants. An historical resume of the development of this branch is given and is followed by a chapter devoted to the explaining of the laws and principles of electricity which enter into electric furnace work. This chapter is somewhat elementary in its scope and has been inserted for the benefit of the general student interested in this branch of metallurgy. The effects of the electric current in the production of heat by resistance, arc or induction heating is dealt with next, together with other actions of the electric current in the furnace, such as the motor and pinch effects. Chapters IV, V and VI deal with power factor and alternating current theory in general, general conditions for the operation of electric furnaces and arc furnaces in general. The various types of arc furnace dealt with are the Stassano, now practically obsolete, the Heroult, the Girod and the Pennerfelt. Induction furnaces, now little used, are also treated of. Space is given to the electric shaft furnace for the reduction of iron ore. Part II takes up materials for furnace construction and the costs of operation, and Part III, the electro-metallurgy of iron and steel. These latter two parts of this book are of value from the economic standpoint, as an exhaustive treatment is given of everything affecting the operation and economics of the electric furnace.

Next time you "light up," think of this:

About 10,000 matches are scratched in this country every second that passes, and of these 95 per cent. are used by smokers to fire pipe, cigar, or cigarette.

The man whose head for figures turned out that information also estimates that the time lost by the smokers in lighting matches—not in smoking—is worth $513,024 each eight-hour working day.

He arrives at his estimate by figuring that it takes fifteen seconds to scratch a match and use the light, and that 213,759 men, whose time is worth thirty cents an hour, are holding matches at the same time, thus losing golden minutes at the rate of $1,068 a minute, or $64,128 an hour.

No one, so far as we can learn, has figured out how large a percentage of the match-scratchers throw away the matches while they are still burning, but it has been estimated that half of the fires which cost the United States $250,000,000 a year are caused by carelessness.

Wood, phosphorus, chlorate of potash, rosin, whiting, and powdered flint are the makings of this little device.

In some anti-aircraft shells use is made of the bow wave of compressed air which is present on projectiles travelling at a sufficient velocity. In flight the striker of the fuse rides or floats on this bow wave and absolutely nothing else keeps it off the primer. The instant an obstruction, no matter how light, is encountered, the wave disappears and the striker jambs back on the primer, exploding the shell. These fuses will explode on your silk handkerchief not to mention airplane and balloon fabrics.

The discovery of helium in natural gas, both in Canada and the United States, has brought the price of this element down from over $1,000 a cubic foot to a merely nominal figure and has rendered it possible to use it for the inflation of balloons.

Accidents in the iron and steel industry have decreased by more than two-thirds during the past ten years as a result of the movement to enforce safety regulations.

The motor cycle has found use in a Hawaiian sugar factory as a heavy hauling unit or baby tractor. Four and a half tons can be hauled distributed over four cars.

A Complete Line 8 in. to 50 in. Swing.
with or without tapping attachment.

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Upright Drills
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Gang Drills

Accuracy—Strength
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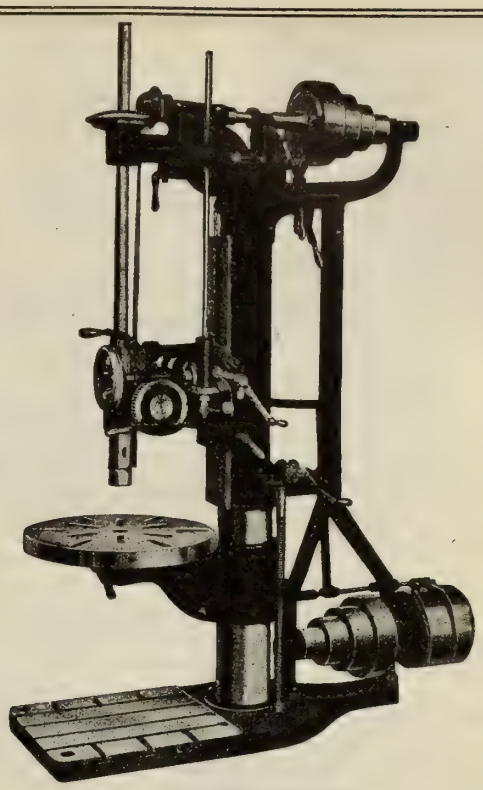

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Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

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MORROW NUTS MORROW

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Twist Drills

Made from the most expensive and highest grade Sheffield steel, **Jessops**, and our expert tempering process—*Result: Morrow Drills do more work with less re-grinding.*

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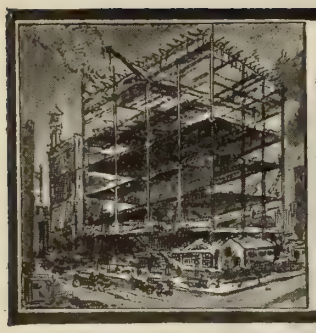


INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Building Foundry. — Burnett and Crampton, Rigaud, Que., are planning a new foundry capable of turning out 250 tons of castings a month. They will install molding machines and equipment of the most modern type for producing machinery castings, mill and mining equipment and general castings.

Sault Ste. Marie.—Freight through the Soo canals shows a decrease from that in July, 1918, of 1,446,192 tons. The amount carried this July was 11,916,152. Two-thirds of this tonnage was going eastward. Of the total tonnage only 533,377 was carried through the Canadian canals.

Lachine Canal Reports.—The gross tonnage passing through the canal for July and for the season to the end of July is less than for the corresponding period of last year. A larger tonnage of grain has been moved, but the coal shipment has decreased. For the three months ending July 31 the grain carried was 10,414,989 bushels, and for the month of July 2,017,134 bushels. The coal tonnage was 36,313 tons less this July than last.

Privy Council Lowers Award.—The case between the Seattle Construction & Dry Dock Co., and the firm of Grant, Smith & Co., arising out of the loss of a drydock has been settled finally by the Privy Council. The Drydock Co. had been previously awarded $85,000 by Justice Clement and the board of assessors in the Vancouver Court. The Privy Council reduced the award to $44,500. The claim was for $150,000. The dock was wrecked when the contractors, Grant, Smith & Co., attempted to utilize it in the placing of large concrete caissons in Victoria Harbor.

Squaring Up With the U.S.—Great Britain has liquefied her munition debt to the U. S. by a payment of $35,176,123. Of this sum $13,600,000 was for Liberty motors, $13,274,000 for airplane spruce, $2,887,000 for wood distillates, $4,690,000 for powder, and $651,000 for cotton lineters.

Do Not Favor Kitsilano. — Public opinion in Vancouver is against the use of Kitsilano as a site for the terminals of the Canadian National Railways. Burrard Inlet is regarded as being eminently more suitable, and it is believed that the Government also takes this view as they are building the approaches to Burrard Inlet. A site at Kitsilano would involve the city in a large outlay for new bridges, besides spoiling this district as a pleasure resort, which is now its most valuable feature.

Going After Trade.—The B. C. and Overseas Trading Company, which was formed recently with "Expand B. C. Industries" as a slogan, is going after trade in the Orient. Mr. J. Fred Sanders, the president, has gone to China to study the needs of the market there and will send back instructions to the firm concerning the goods required, methods of packing, weights, measurement and style to conform with the customer's wishes.

To Get Canadian Goods.—Mr. Marcus Reich, of Prague, who represents the Importers' Association of Czecho Slovakia, is in Toronto to confer with the Trades Commissioner and the Canadian Manufacturers' Association. He desires to establish banking facilities and promises the establishment of a Canadian Chamber of Commerce in Prague. His country manufactures cotton goods and porcelain extensively, but require raw material and other manufactured goods.

Lumbermen Criticized.—Sir Douglas Colin Cameron, Lieut.-Col. and Lieut. Governor of Manitoba, who is also president of the Rat Portage Lumber Co., as well as being connected with other large interests through Canada, had some words of criticism for the lumbermen of B.C., on the occasion of a visit to Vancouver recently. "There are great markets for B. C. lumber," he said, "but the lumbermen have not availed themselves of their opportunities. It creates an unfavorable impression to find that the 70,000,000 feet order of lumber placed here has not yet been moved.

Valuing Fraser River Yard.—An arbitration board has been sitting in the Vancouver Court House to determine the value of the plant of the Imperial Munitions Board in the Poplar Island yard of the New Westminster Shipbuilding Co. The public sittings have been concluded but the award has not yet been given out. During the proceedings the contract between the Imperial Munitions Board and the New Westminster Co. was produced. The agreement was that the company should be reimbursed for the actual cost of building each hull, and receive a sum of $16,000 profit on each. The board consists of Mr. Justice Morrison, Mayor Gray of New Westminster, and Arthur H. Edwards.

Victoria Yards Please New York.—The success of the Foundation Company's yards at Victoria, has attracted favorable notice at the head office of the organization in New York, according to Frank Quilter, secretary-treasurer of the company. The good performances of the Victoria built ships on their trial trips has been the subject of much favorable comment. The Foundation Company are now at the height of their activity in Victoria, and the payroll amounts to over $500,000 per month.

One Engine Per Day.—The works of the Kerr & Goodwin Machine Company at Brantford, are now turning out one of the new Hoag oil engines manufactured by this company every day. There is good prospect of these engines being made on a large scale very shortly.

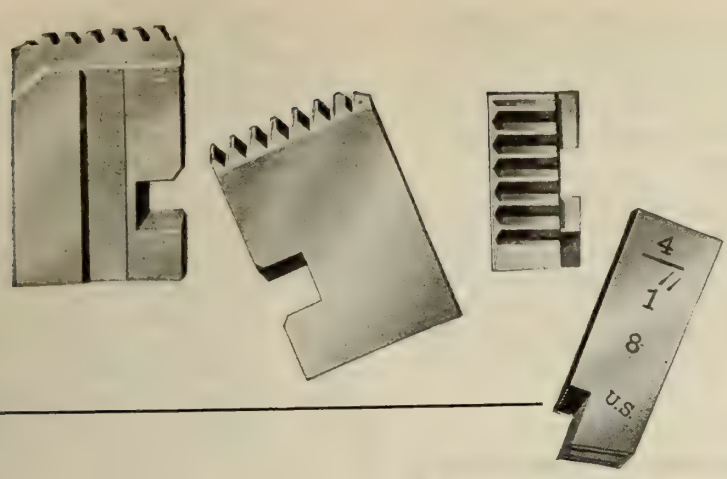
New Steel Mill.—A proposition to build a large steel plant in Belleville is now under consideration by the Tivani Steel Co., Ltd. The plant would consist of electric furnaces, rolling mills, merchant bar mills and open-hearth furnaces. A similar plant is being considered for Vancouver.

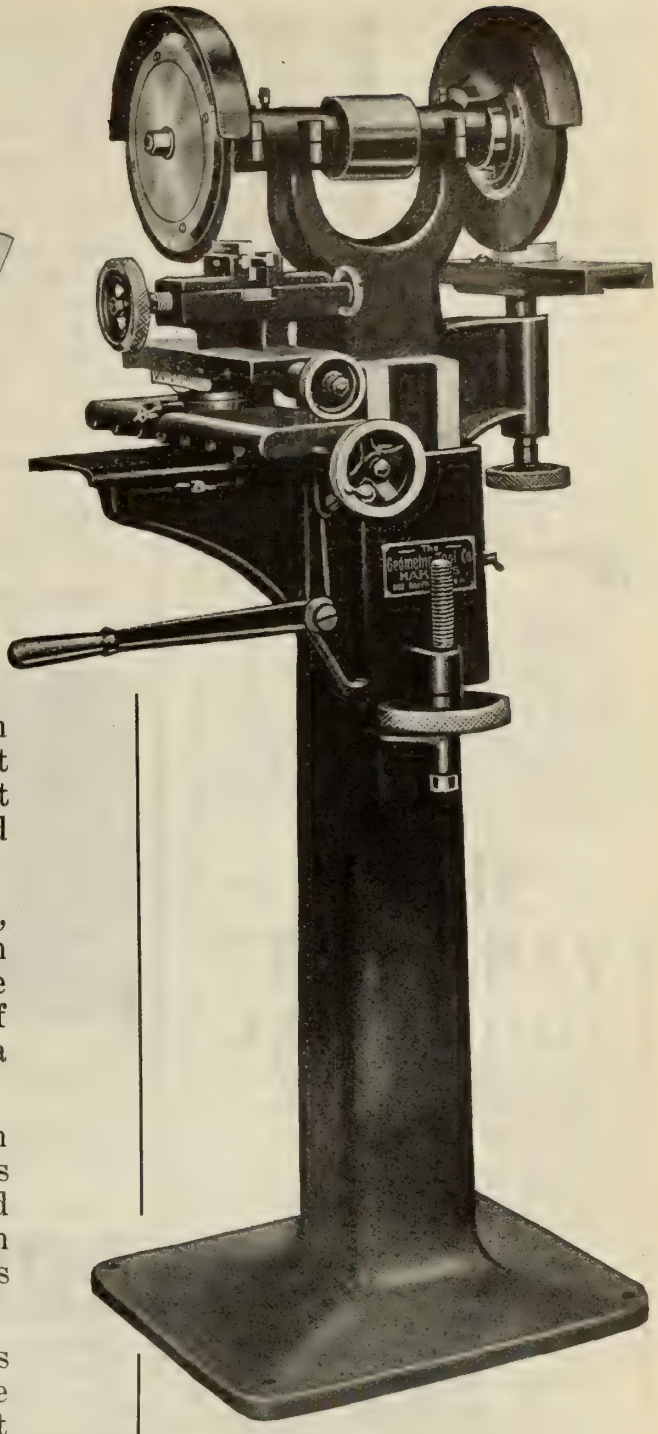
Tin Plant.—Galt is to be the site of a tin smelting plant, for which we understand a contract has been let. The idea is to build one smelter to begin with to be followed by others as the need arises.

MARINE

Halifax.—The steamer "Troja," which was recently salvaged at the entrance of the Bay of Fundy by the Maritime Wrecking Company of Halifax, has been brought to Halifax in a pretty bad condition. The repairs will be given to the firm making the most successful tender, and it is thought here that the job will go to the Halifax Shipyards Ltd., who are operating the dry dock.

Montreal.—The monthly service to be provided between Montreal and Havre, France, by the Cie Canadienne-Francaise Transatlantique was inaugurated by the arrival of the steamer "Californie" in Montreal. She brought over 280 passengers, of whom 265 landed at Quebec. The vessel left again for Havre on the 7th inst. with freight and passengers.





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalog describing this machine is a mine of information on chaser grinding. Write for it.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, Winnipeg, St. John, N. B.

The second steamer, the "Hudson," is expected shortly.

Victoria.—The Canadian Pacific Railway Co. are building two new steamers for the Pacific service of 20,000 tons each. One has already been launched in England and will be called the "Empress of Canada," while the second one, which has just been laid down, will be named the "Empress of Australia."

North Vancouver.—After the launching of the C-39, the last of the eight ships built for the French Government from the Lyall yards, a number of the men were laid off. There are now only about 300 men employed in fitting out the vessels already launched. The yards at one time employed 1,200 men.

Cleveland.—A large number of freighters are being held idle owing to the strike of ore dock workers at Superior. A number of vessels have loaded coal and are holding it until owners are sure that there will be no delays in unloading at Lake Erie ports.

Buffalo.—There are six freighters on the way to Buffalo with approximately 1,500,000 bushels of grain aboard them. By the first week in September the full movement of grain will be under way. Shipments of ore are increasing and hopes are entertained of a good season despite the slow start.

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"HAWK VANADIUM" TOOL STEEL

Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

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Large Stock. Prompt Shipment.

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SEND US YOUR ENQUIRIES.

Upon the Health of your employees depend your profit and production

Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup !

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates it—"and" pays saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

Canadian Agents

McKENZIE BROS.

18 St. Alexis St., Montreal, P.Q.

PERSONALS

Sergeant Paul Mitchell, of the Provisional Supply Depot, American Expeditionary Forces, France, has just returned to Chicago and has resumed his duties as travelling representative for the Independent Pneumatic Tool Company, 600 W. Jackson Blvd., manufacturers of Thor air and electric tools. Mr. Mitchell will travel out of the Chicago sales office as heretofore.

TENDERS

The Peterborough Board of Education are asking for tenders on a new school. Tenders received till September 1. Plans and specifications can be obtained at the office of the architect, W. & W. R. L. Blackwell, Room 17, Bank of Commerce Building, Peterborough.

The Toronto Board of Education are asking tenders for an addition to Keele Street School. Tenders open till August 27. Specifications and information can be obtained at the office of Messrs. Chapman & Oxley, Harbor Commission Building, Toronto.

The Norton Co. and Norton Grinding Co. have arranged to conduct their business through the Norton Co., starting July 1. A board of directors has been appointed and several other important appointments have been made in this new organization of the two companies.

The Electric Furnace Co., Alliance, Ohio, has just shipped to the Dayton Engineering Laboratories, Dayton, Ohio, an electric furnace for melting and refining aluminum in the Delco plant. This furnace has a hearth capacity of 500 pounds, and a melting rate of 200 pounds of aluminum per hour. It is equipped with a double charging door in the front and rear, and otherwise is similar to the standard Baily electric furnace of 105 k.w. electrical capacity, and 1,500 pounds hearth capacity, that is used for melting brass.

The growth of trades unionism in Canada is shown by the following table: 1911, 133,132; 1912, 160,120; 1913, 175,799; 1914, 166,163; 1915, 143,343; 1916, 160,407; 1917, 204,630; 1918, 248,887.

Heating Buildings With Electricity. There has been considerable experimenting in certain parts of the Pacific-Northwest states, where there is ample hydro electric development, with heating dwellings and office buildings with electricity, both as an adjunct to steam heat, and with electricity alone. One investigator, after considerable research, found that to compete with steam heat it would be necessary to deliver electricity to the premises to be heated at from $1.95 to $3.73 per hp.-year. With electricity at one-half cent per kw.-hr., electricity for heating is from 25 to 50 per cent. more expensive than for coal at $6.00 per ton. At one cent per kw.-hr. electricity is two and one-half to three times as costly.

ELECTRIC BRASS FURNACES DISPLACE OTHER TYPES

One Company Uses 2,500 Kw. for Melting in Three-Phase Furnaces, Another Requires 800 Kw. for One-Phase Induction Furnaces

Brass manufacturers who recently met in the convention of iron and steel electrical engineers at Pittsburgh said that they knew from experience that there are now electric brass furnaces whose metallurgical efficiency justifies their use in preference to fuel-fired furnaces. W. R. Clark, works manager of the Bridgeport (Conn.) Brass Company, spoke on the experience of his company, which has in operation a total of 800 kw. in the Ajax Metal Company's "Wyatt" single-phase, 60-cycle induction furnaces melting brass. He said that the largest furnace has a demand of 75 kw. at 75 per cent. power factor, and its pouring capacity is from 500 lb. to 600 lb. (340 kg. to 290 kg.) per hour. These furnaces have melted and poured from 6 lb. to 9 lb. (2.7 kg. to 4.1 kg.) of brass per kilowatt hour, and the linings are being used for as many as 2,000 heats each. A 75-kw. rating is not the largest for which this type of furnace can be built, but when designed for 60-cycle operation the power factor drops rapidly with increased size. The induction furnace is found to have the advantage of heating the bath from within, automatically stirs the molten metal and has very little tendency to give off spelter. However, the furnace is limited in size and has the disadvantage that it must be started with molten metal from another furnace. This latter characteristic is more of a drawback in a foundry than in a brass mill.

This Bridgeport (Conn.) Brass Company is increasing its electric melting capacity by the addition of a 1-ton (900 kg.) "Detroit" rocking type brass furnace which has opposed arcs from electrodes entering through the centre of an oscillating drum. The voltage across the arc is 65 and the maximum demand is from 250 kw. to 300 kw. per ton. This furnace is expected to melt a ton of brass with from 225 kw. hr. to 300 kw. hr. of energy. The higher consumption is for mixtures high in copper, which require a greater temperature.

It was stated in an informal discussion after the close of the meeting that whereas oil-fired furnaces are limited to a capacity of about 1,000 lb. (450 kg.) of brass each, there are now in operation "Bennett" three-phase brass furnaces with capacities up to 5 tons (4,500 kg.) of brass each. These furnaces have not yet been placed on the market, but there was said to be an installation in actual operation aggregating some 2,500 kw.

The time of flight for the shell of the long range gun which bombarded Paris was three minutes, and during the 76-miles flight the rotation of the earth added nearly half a mile to the distance. A very interesting point is that the average flight of the projectile is in a 28½-in. vacuum.

VICTORY CELEBRATION

EXHIBITION

Aug. 23 TORONTO Sept. 6

Formal opening by H.R.H. the Prince of Wales, Mon. Aug. 25th

An incomparable programme of absorbing human, historic and patriotic interest.

Grenadier Guards Band—Canadian War Trophies — War Memorial Paintings.

Aerial exhibition in enemy machines by Cols. Barker, Bishop and other famous aces.

Gorgeous spectacle—Festival of Triumph—1,500 performers.

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Machine Tool Makers.
Specialties: Patent Puncher Slotting Machines, Milling Machines, Boring Machines.
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SPECIAL DRAW CUT R.R. SHAPERS
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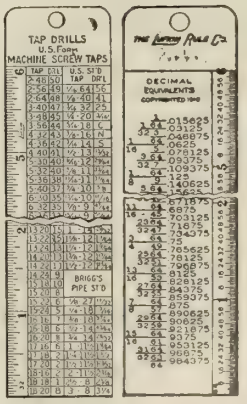

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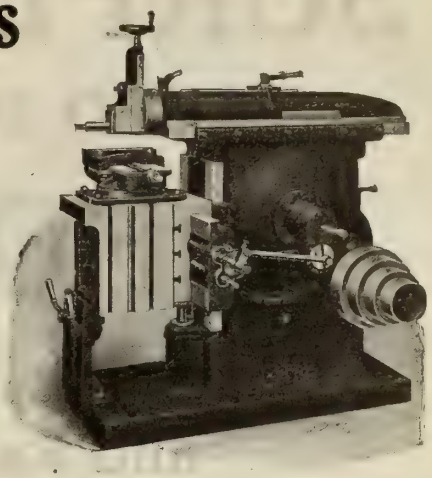

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75	2300	900
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200	2300	600
240	2300	600
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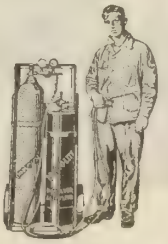

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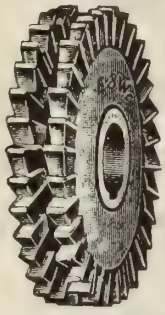

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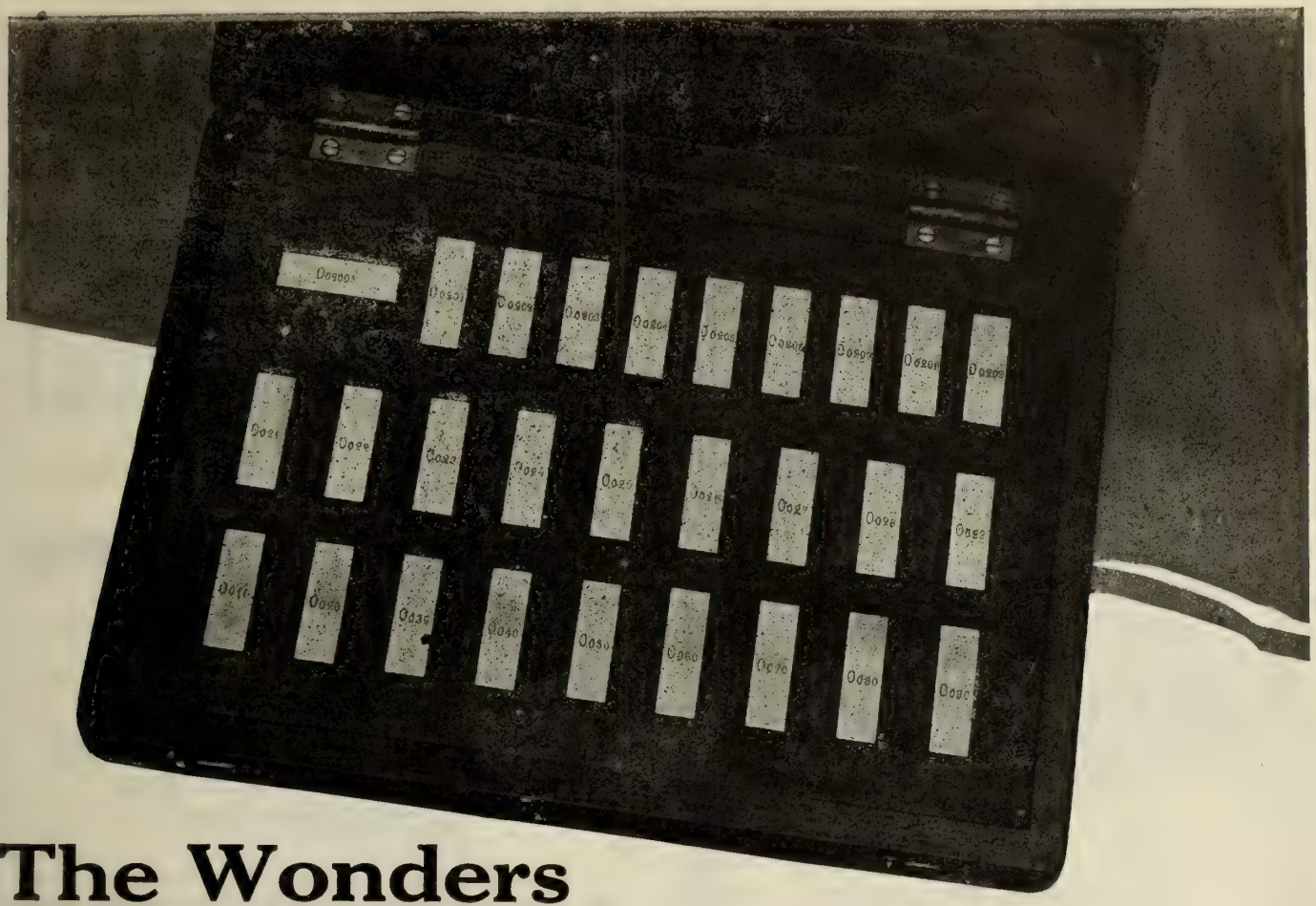

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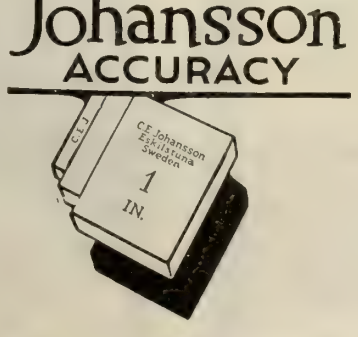

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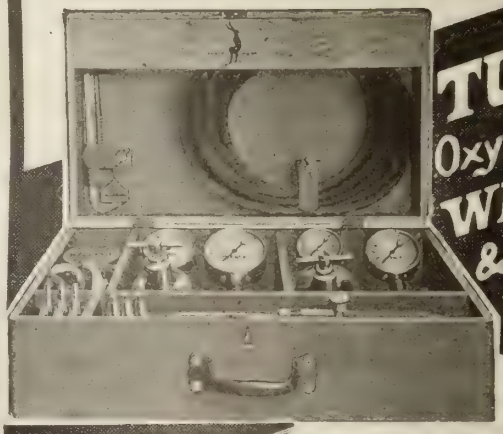

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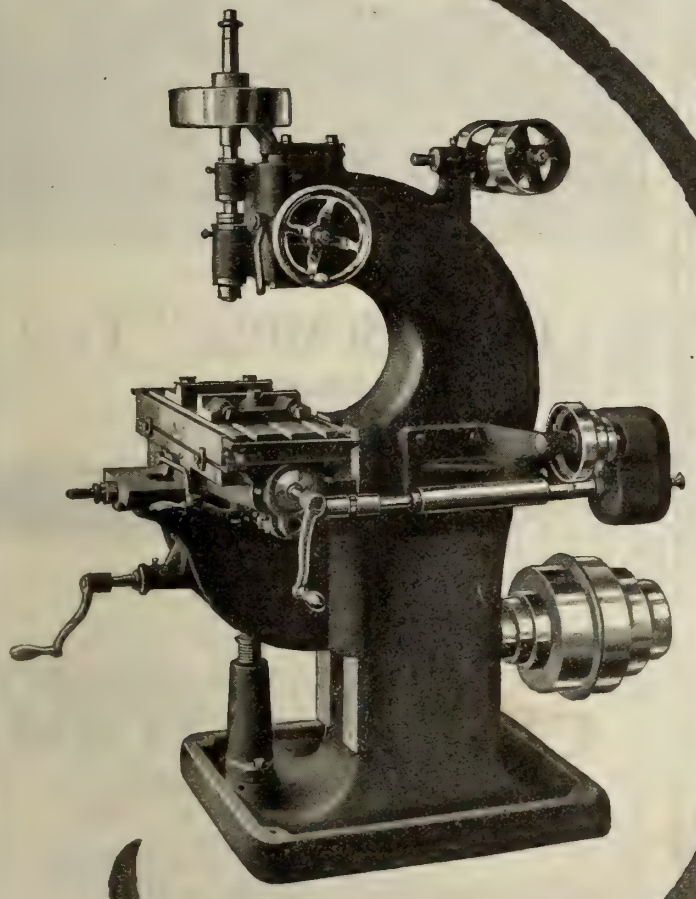

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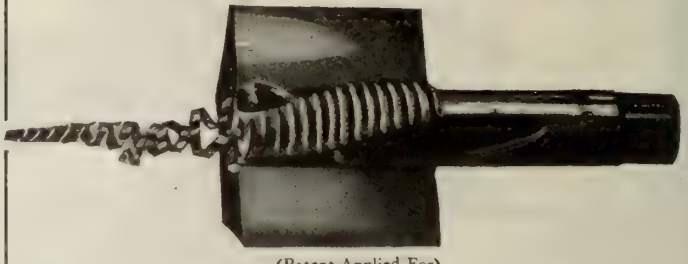

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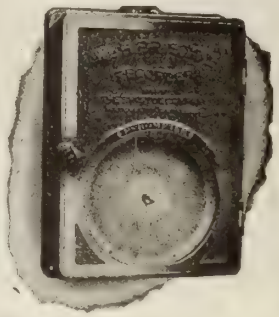

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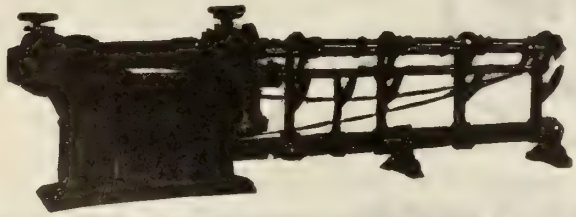

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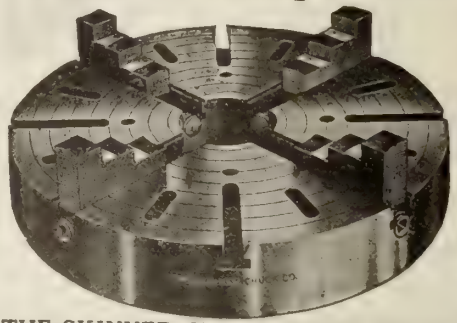

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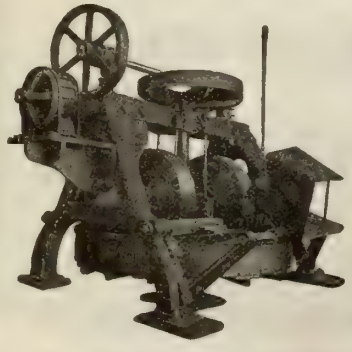

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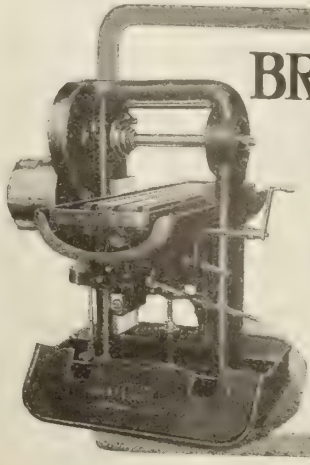

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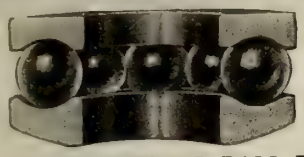

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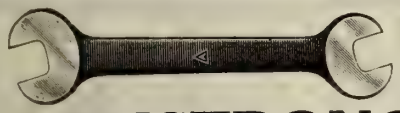

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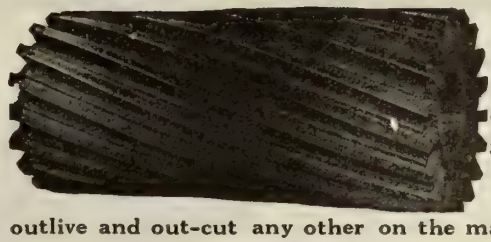

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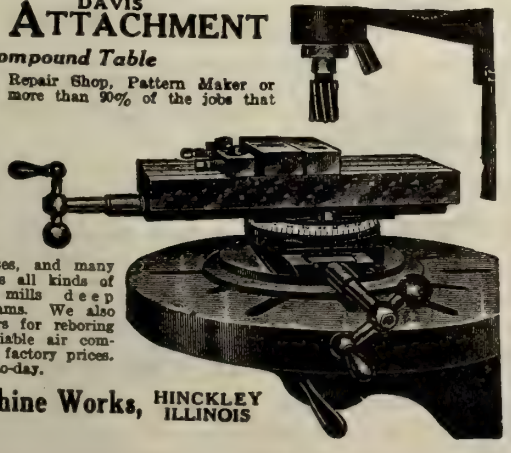

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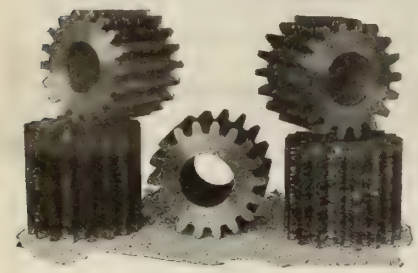

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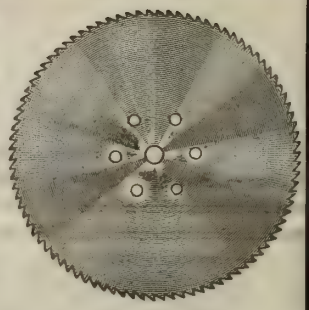

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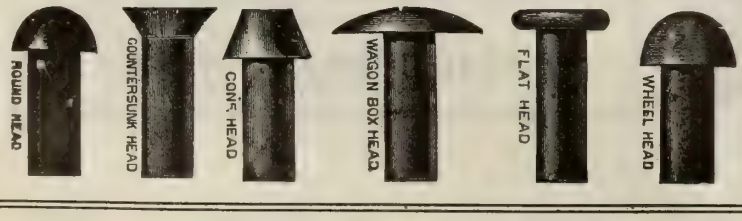

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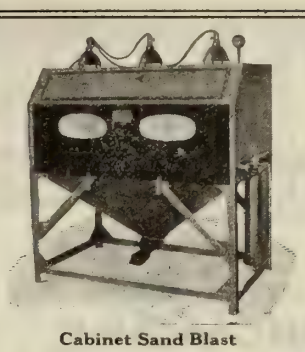

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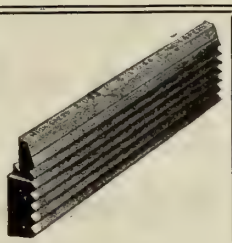

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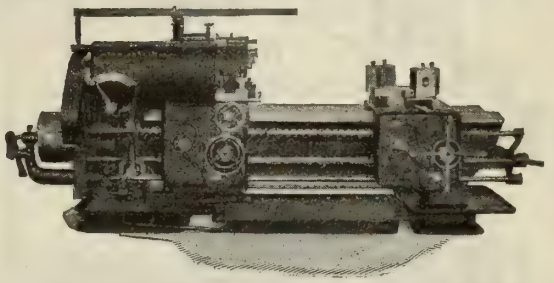

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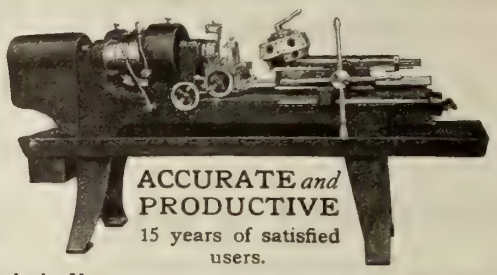

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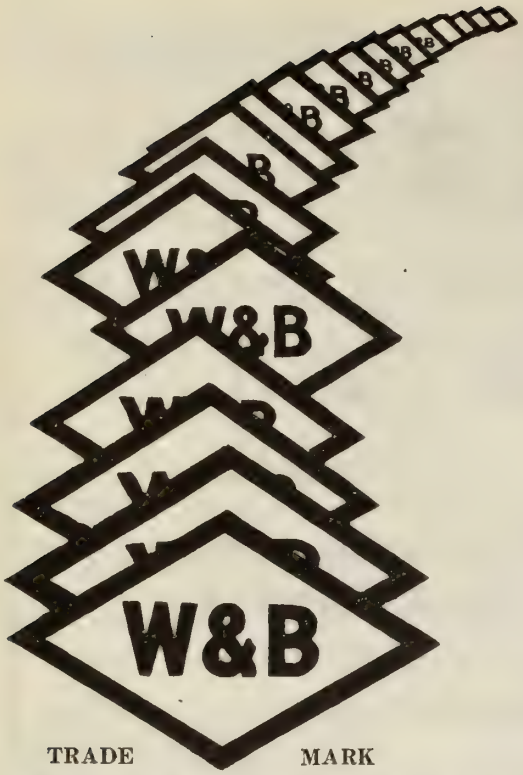

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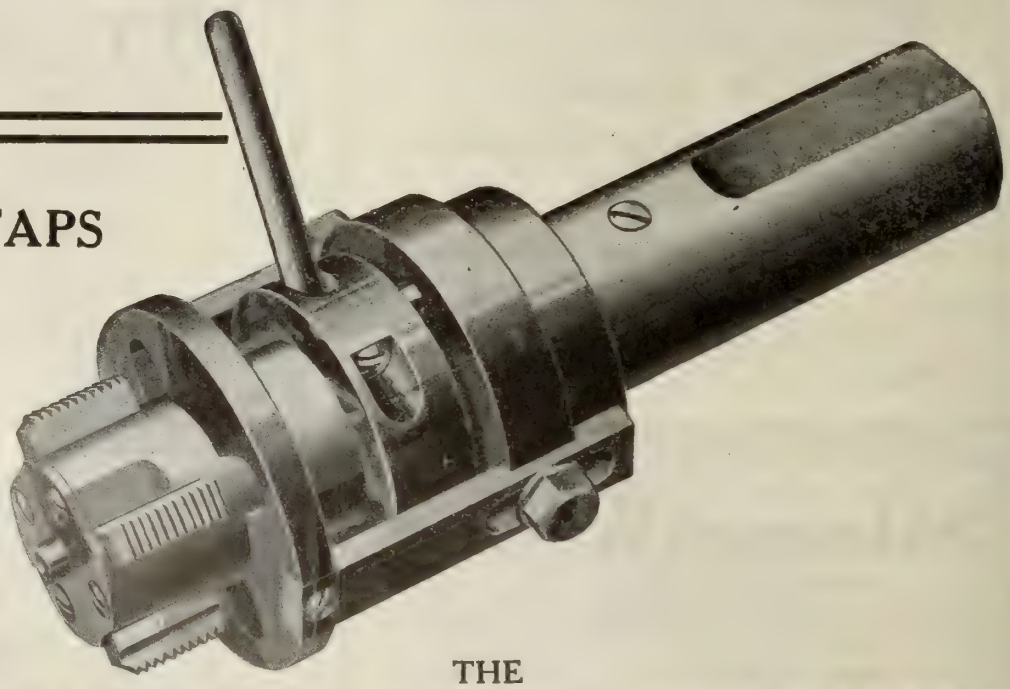

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Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que

AUTOMATIC METAL CUTTING-OFF MACHINES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros., of Can., Galt, Ont.
Aikenhead Hardware Co., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal
Canada Metal Co., Toronto.
G. F. Foss Mchy. & Sply. Co., Montreal.

AUTO SHEET METAL MACHINERY
Quickwork Co., St. Marys, Ohio.

AUXILIARY HEADS
Hoefer Mfg. Co., Freeport, Ill.

BABBITT METAL
Canada Metal Co., Ltd., Toronto, Ont.
Hoyt Metal Co., Ltd., Toronto.
Magnolia Metal Co., Montreal.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal.

BAND SAWS
Oliver Machy. Co., Grand Rapids, Mich.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal
Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto
The Gray Ball Bearing Co., Ltd., Toronto
Morrow Screw & Nut Co., John, Ingersoll
Rochester Ball Bearing Co., Rochester.
Williams & Wilson, Ltd., Montreal, Que

BALLS, STEEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Chapman Double Ball Bearing Co., Toronto
Boker & Co., Inc., Montreal, Que.
Gray Ball Bearing Co., Ltd., Toronto.
Rochester Ball Bearing Co., Rochester.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Limited, Montreal

BALLS, BURNISHING
Gray Ball Bearing Co. Ltd., Toronto.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

BARRELS, SAND-BLAST
Pangborn Corp., Hagerstown, Md.

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont.
Northern Crane Works, Walkerville, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie

BEADING MACHINES
Quickwork Co., St. Marys, Ohio.

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
G. F. Foss Mchy. & Sply. Co., Montreal.
Graton & Knight Mfg., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids

BELTING, BALATA
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co., Montreal.

BELTING, CHAIN
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Montreal.
Baxter & Co., Ltd., J. R., Montreal.
Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Graton & Knight Mfg., Worcester, Mass.
Jones & Glassco, Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
John Tullis & Son, Glasgow, Scotland.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto

BENDING ROLLS, PLUTE & AUGH
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Garlock-Walker Mach. Co., Toronto.
Williams & Wilson, Ltd., Montreal.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto.
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal.

BILLET MARKERS
Matthews & Co, Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLANKING
Hy. Hope & Sons of Can., Ltd., Peterboro

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

BLOCK, CHAIN AND ROPE
Fellows Bros., Ltd., Chadley Heath, Eng.

BLOCKS, CARGO
Fellows Bros., Ltd., Chadley Heath, Eng.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.
Wickes Bros., Saginaw, Mich.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield. Mass

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield. Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., B., Hespeler.
Landis Machine Co., W esboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Oliver Mach. Co., Grand Rapids, Mich.

Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown. Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Fellows Bros., Ltd., Chadley Heath, Eng.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.

CHAIN, WELDED COIL
Fellows Bros., Ltd., Chadley Heath, Eng.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BOOM, TIMBER
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FORGED
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., Inc., Fort Wayne, Ind.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positivte Clutch & Pulley Wks., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Bond Engineering Works, Toronto, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston,
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal. Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Banfield, W. H., & Sons, Toronto.
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.

COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

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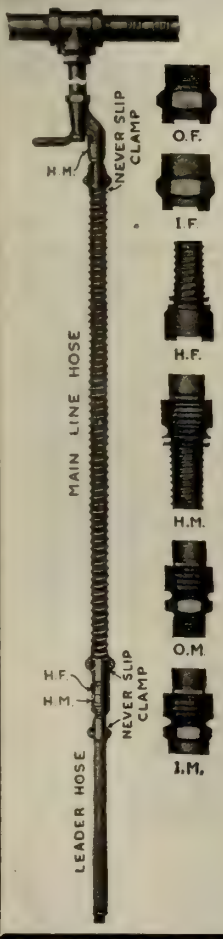

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Bowes Automatic Air Hose Couplings

Standard Equipment Everywhere

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE O.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.
STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ¼-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-in.

The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.

CLECO GROOVED HOSE NIPPLE

Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Use Annealed Wire No. 14

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Bulletin 34A, 41 and 43.

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Drop-Forged Safety Lathe Dogs

WHEREVER Lathes are used it is conceded that, no matter how good the machine tool may be, poor equipment makes its satisfactory operation difficult, if not impossible.

Why employ inferior equipment?—the best tools are always the cheapest in the end.

Williams' "Vulcan" Drop-Forged Lathe Dogs are absolutely safe and dependable. Their design, material and workmanship are the result of nearly half a century of constant effort to produce the best and only the best. Bent and Straight Tail—one or two screws, 16 sizes, 3/8 to 6 inches maximum capacities.

May we send you a copy of our Machinists' Tools Booklet ?

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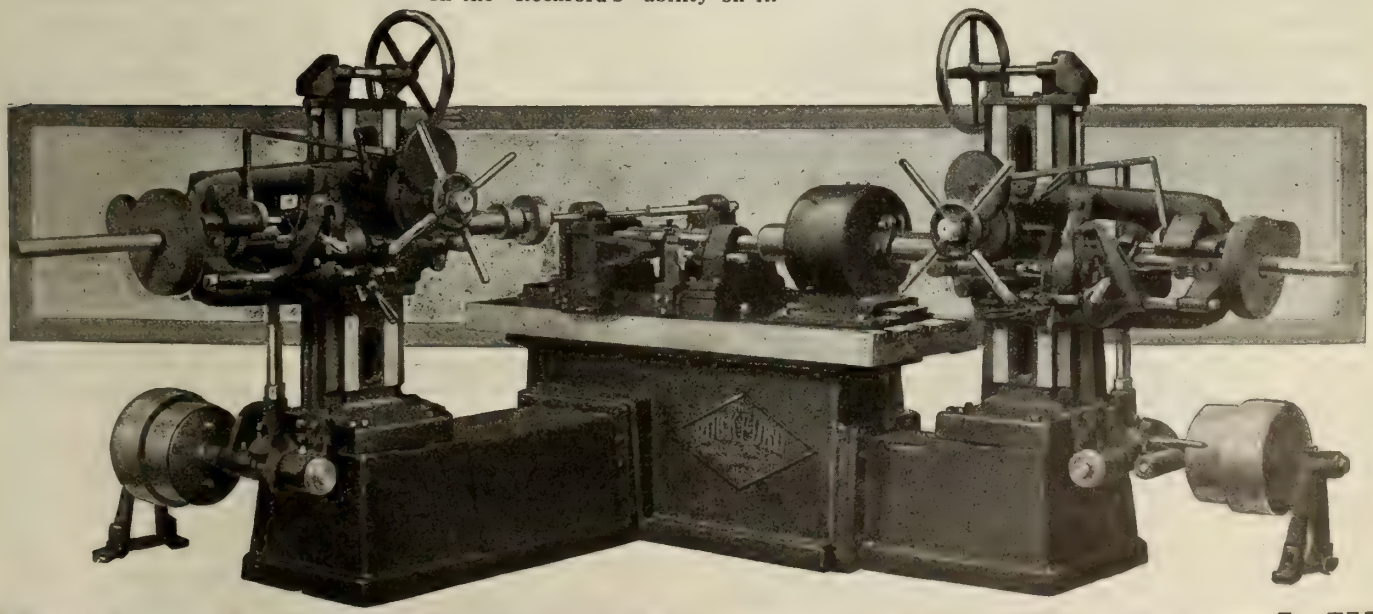
For Automobile Manufacture

This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



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Niles-Bement-Pond Co., New York.
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Independent Pneumatic Tool Co., Chicago.

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Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
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Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Williams & Wilson, Ltd., Montreal, Que.

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Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
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Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
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Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
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West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
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Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
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Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
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PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

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American Pulley Co., Philadelphia.
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Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
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Positive Clutch & Pulley Works Ltd., Toronto.
Standard Mach. & Supplies, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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American Pulley Co., Philadelphia, Pa.

PULLEYS. FRICTION. CLUTCH
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Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
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Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

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MacKinnon Steel Co., Sherbrooke, Que.

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Can. Ingersoll-Rand Co., Montreal, Que.
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Pratt & Whitney Co., Dundas, Ont.
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Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, KEROSENE, OIL, SELF-MEASURING
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PUMPS, SUD
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Consolidated Press Co., Hastings, Mich.
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Wickes Bros., Saginaw, Mich.
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Bertrams & Sons, John, Dundas, Ont.
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Garlock-Walker Mach'y. Co., Toronto.
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Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

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Niles-Bement-Pond Co., New York.

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Niles-Bement-Pond Co., New York.

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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

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Keystone Mfg. Co., Buffalo, N.Y.
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Whitman & Barnes Co., St. Catharines.

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Butterfield & Co., Rock Island, Que.
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Marshall, Son & Bunney, Toronto.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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Marshall, Son & Bunney, Toronto.
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Wells Bros. of Canada, Galt, Ont.

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J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.

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Morrow Screw & Nut Co., John, Ingersoll.
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Garlock-Walker Machinery Co., Toronto.

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Gisholt Machine Co., Madison, Wis.
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Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
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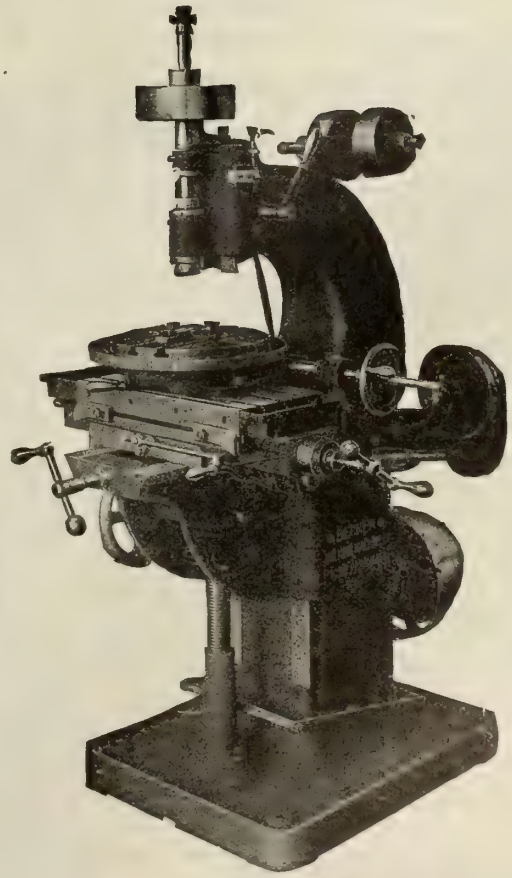

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Norton Co., Worcester, Mass.

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Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

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Wilkinson & Kompass, Hamilton, Ont.
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Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
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Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

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Williams & Wilson, Limited, Montreal.

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Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal.

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Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

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HOLDERS, ELECTRIC
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Starrett Co., L. S., Athol, Mass.

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Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal.

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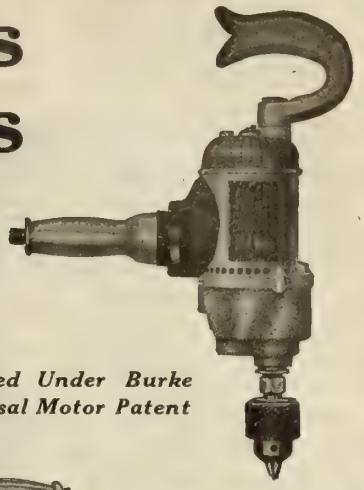

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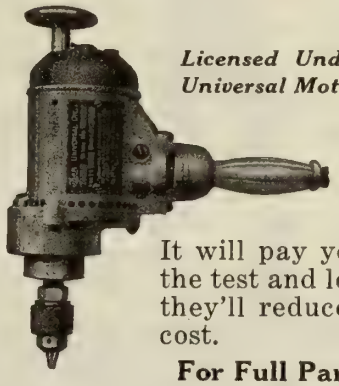

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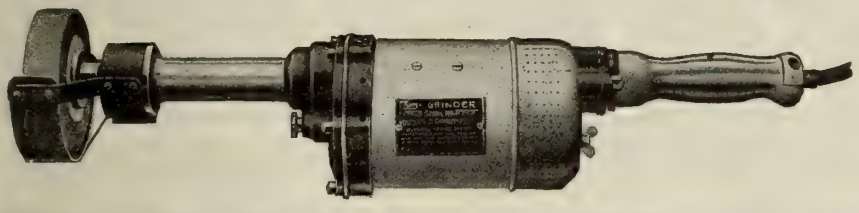

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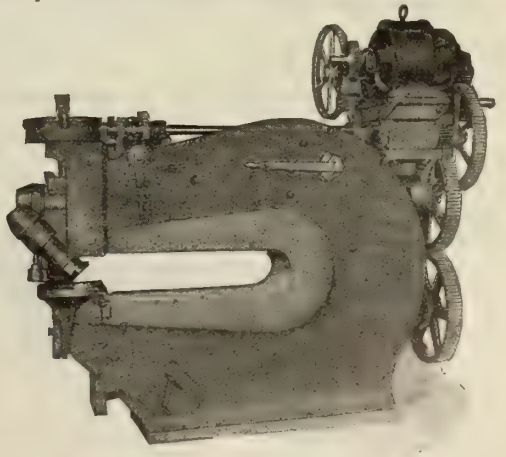

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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK

Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK

Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN

See Belting, Chain.

DRIVING TOOLS

The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM

Bowser & Co., Inc., Fort Wayne, Ind.

DRYERS, SAND

Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES

Baird Machine Co., Bridgeport, Conn.

DRUM CONTROLS

Elec. Steel & Metals, Ltd., Welland, Ont.

DUMP CARS

Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER. ARRESTER SYSTEM

Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT

Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS

Can. Blower & Forge Co., Kitchener, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES

Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES

Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACE

Electric Steel & Metals, Ltd., Welland.
General Steel Co., Milwaukee, Wis.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

Can. Driver-Harris Co., Walkerville, Ont.

ELEVATOR, ENCLOSURES

Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS

Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS

Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES

Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS

Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS

Wheel Trueing Tool Co., Windsor, Ont.

END MILLS

John Morrow Screw & Nut Co., Ingersoll

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Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL

Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE

Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS

Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS

Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS

Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRACTORS, TAP

Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS

Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS

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Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES

Page Steel & Wire Co., Adrian, Mich.

FANS

Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE

Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY

Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

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Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Simonds Mfg. Co., Fitchburg, Mass.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL

Bowser & Co., S. F., Fort Wayne, Ind.
Can. Wire & Iron Goods, Hamilton, Ont.

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FIRE BRICKS

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FIRE EXTINGUISHERS

Strong, Kennard & Nutt Co., Cleveland, O.

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Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS

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Wickes Bros., Saginaw, Mich.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
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Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON

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Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL

Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING

H. Hope & Sons of Can., Ltd., Peterboro.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING

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Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST

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Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING

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Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL,

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

Standard Fuel Engr. Co., Detroit, Mich.

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Dom. Forge & Stamp. Co., Walkerville.

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Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.

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GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

Bowser & Co., S. F., Inc., Fort Wayne.

GAUGES

Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS

Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT

Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD

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Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, THREAD

Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE

Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL

C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS

Can. Steel Foundries, Ltd., Montreal,
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST

Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS

Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY

Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE

Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL

Bridgeford Mach. Tool Wks, Rochester.

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Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN

Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM

Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

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Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

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Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY

Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GOVERNOR, WATER WHEEL

Wilson & Co., J. C., Belleville, Ont.

GRAPHITE

Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES

Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal.

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Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE

W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH

Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal.

GRINDERS, CUTTER

Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply. Co., G. F., Montreal.
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Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

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Puro Sanitary Drinking Fountain Co., Haydenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

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Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
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Greenfield Tap & Die Corp., Greenfield.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
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Wells Bros. of Can., Galt.
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Garlock-Walker Mach'y. Co., Toronto.
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Hamilton Mach. Tool Co., Hamilton.
Williams & Wilson, Ltd., Montreal.

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Fellows Gear & Shaper Co., Springfield, V.

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Algoma Steel Corp., Sault Ste. Marie, O.
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Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Rice, Lewis & Son, Toronto.

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Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

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Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

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SHEARS, PNEUMATIC
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Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
MacKinnon Steel Co., Sherbrooke, Que.

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Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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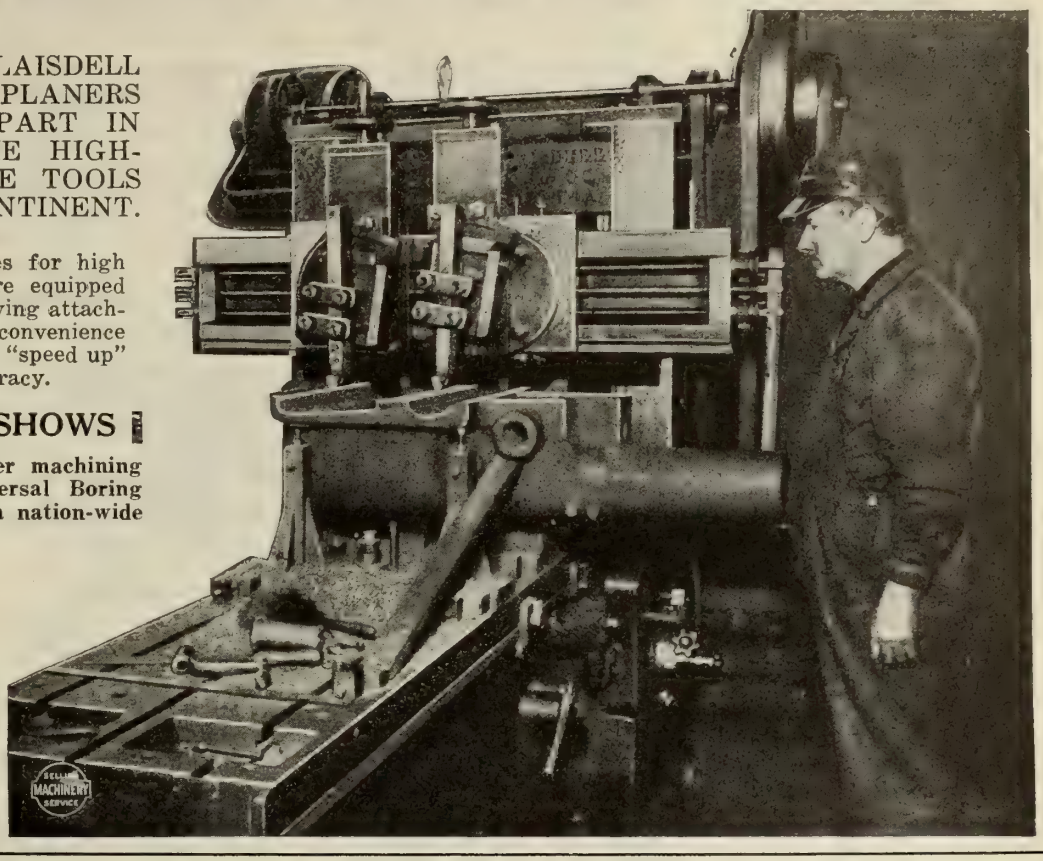

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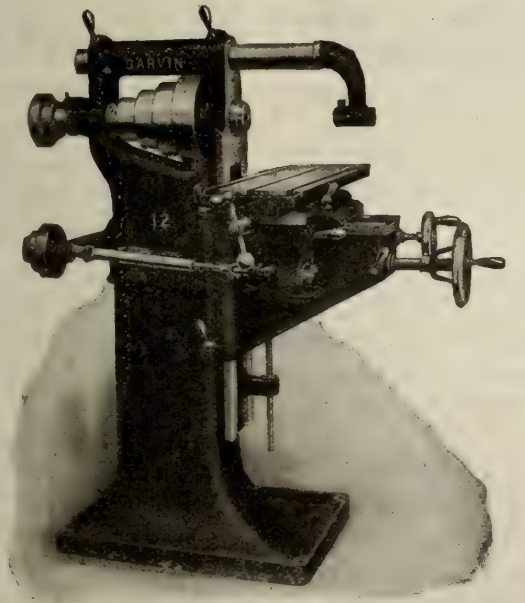

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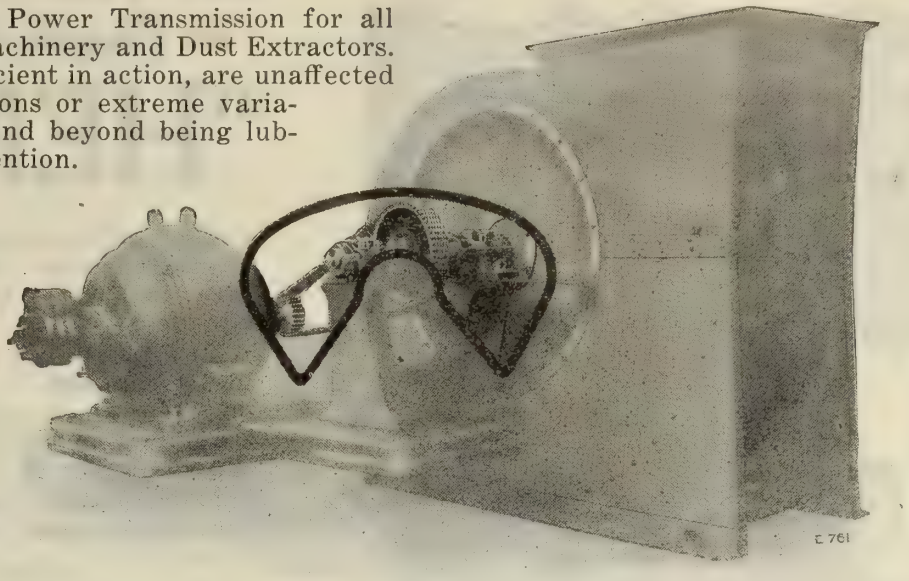

A 25" Keith fan, driven by "The Coventry" Noiseless Chain Motor of 7½ h.p., running at 950 r.p.m., fan 400 r.p.m. This illustration shows how floor space is saved by using chain transmission.

"The Coventry" Chain Company, Ltd., Coventry, England

CANADIAN AGENTS--TAYLOR & ARNOLD, LIMITED, Bank of Toronto Building, MONTREAL

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Vol. XXII.

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Wood Turret Machine Co., Brazil, Ind.

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Can. Link-Belt Co., Toronto, Ont.

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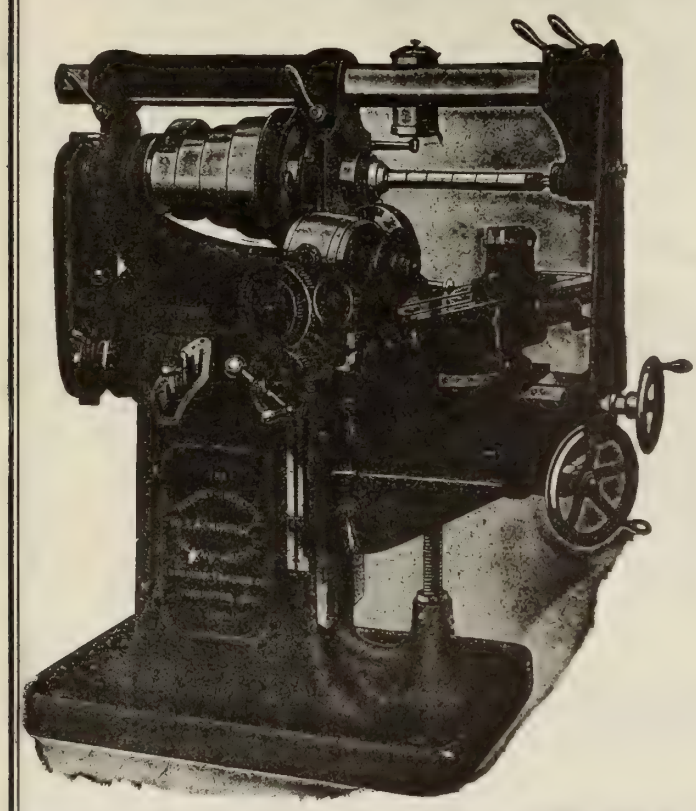

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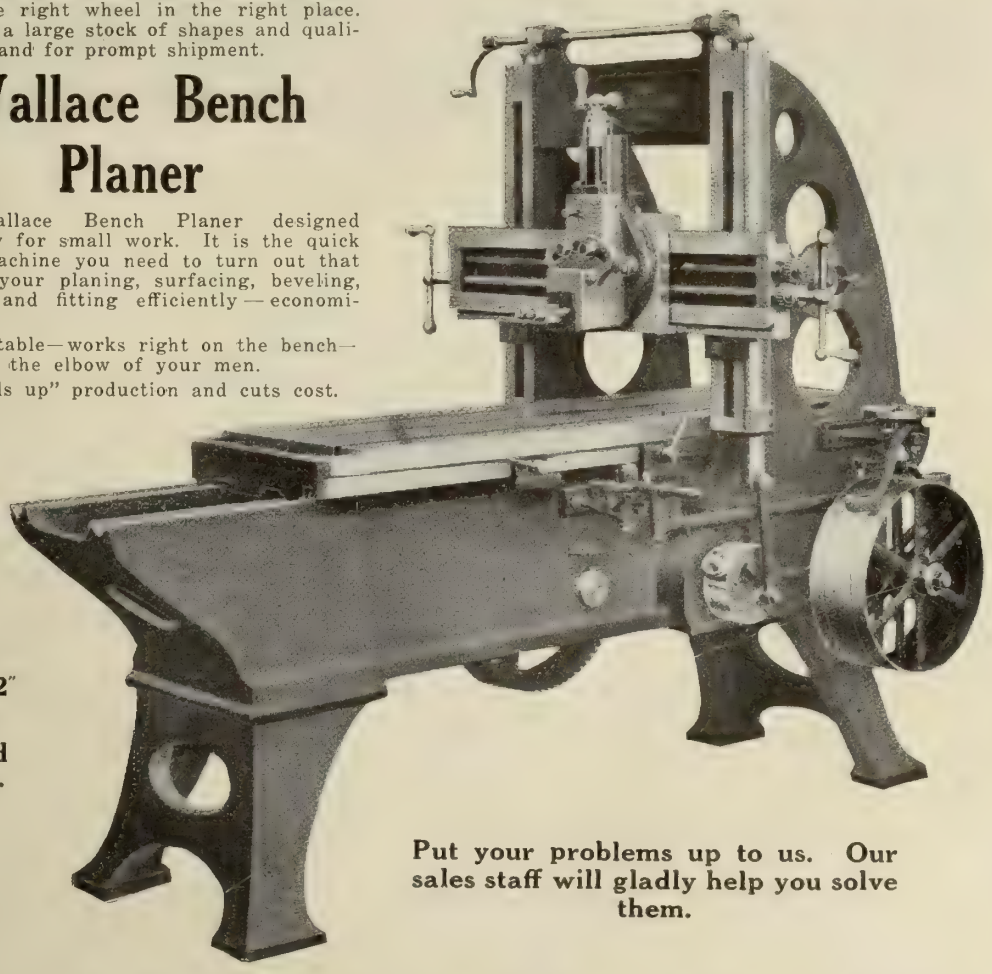

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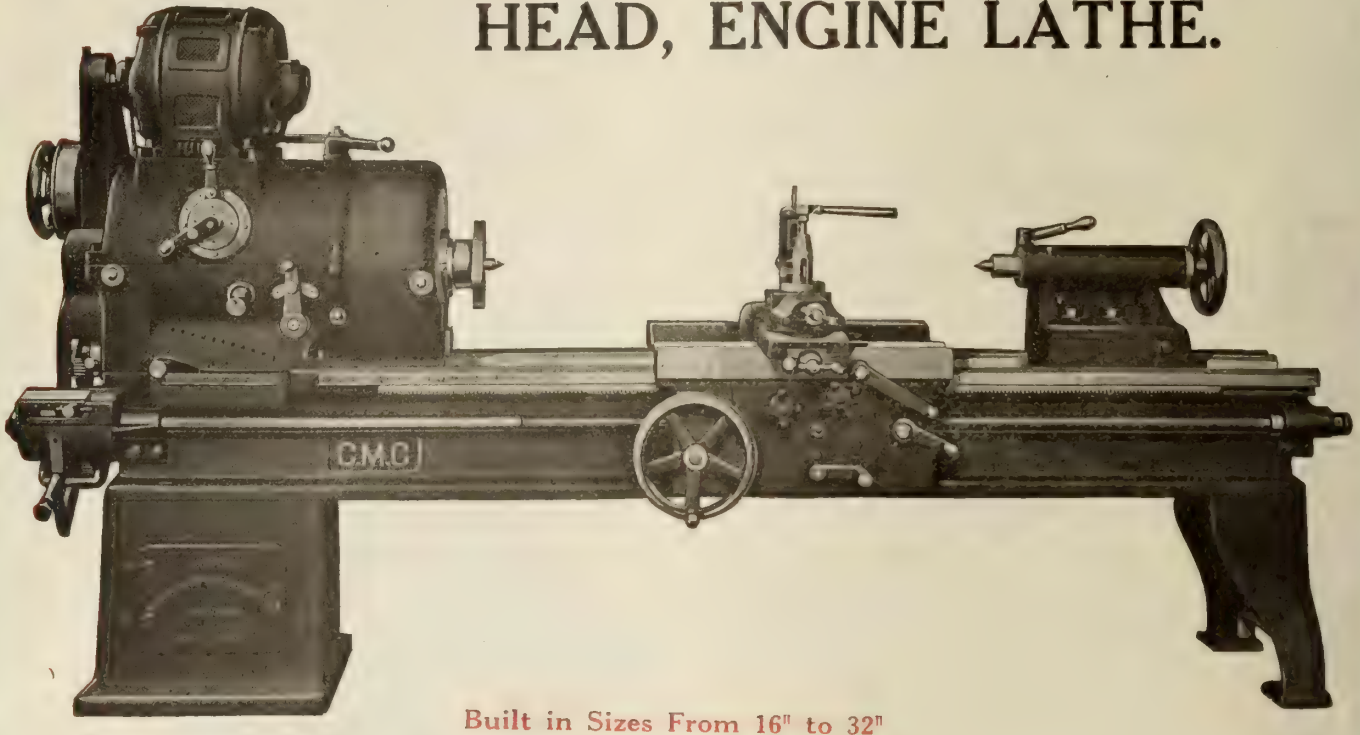

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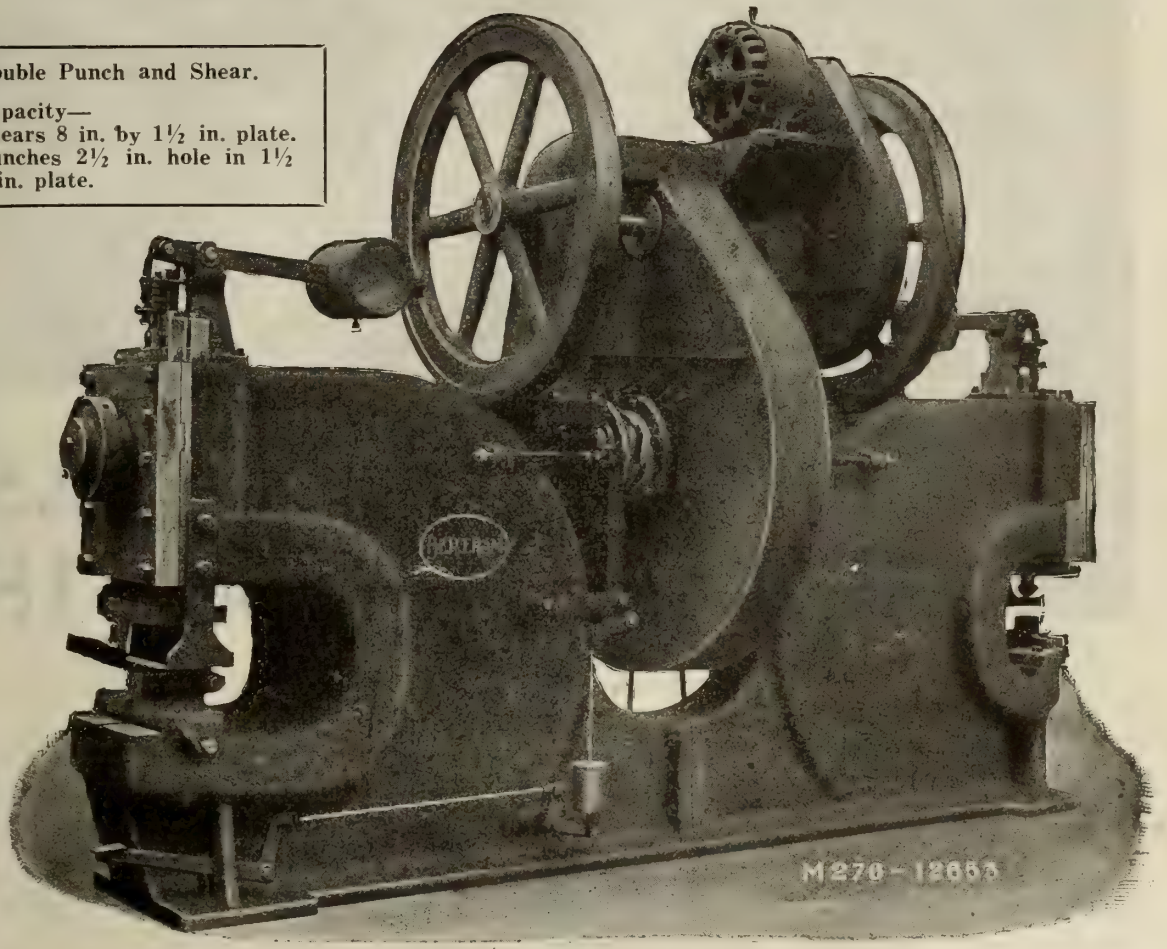

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General View of the Plant of the Algoma Steel Corporation from the Waterfront.

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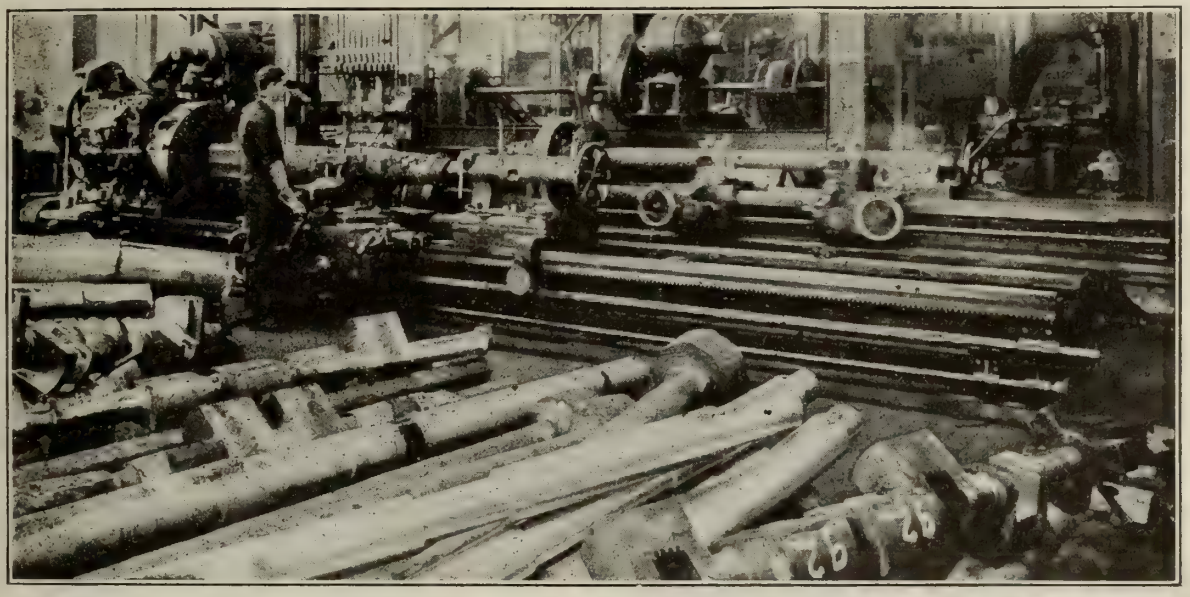

The above photograph shows a Bridgeford 27″ Manufacturing Lathe finish boring a cast-iron transmission housing for the new Fordson Tractor.

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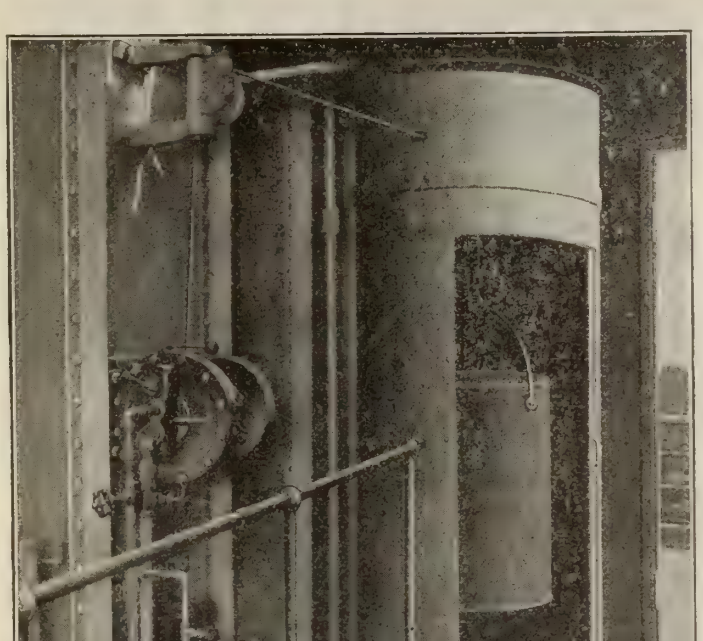

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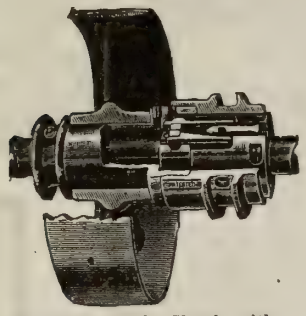

Standard Single Clutch with Pulley Mounted on Hub —Clutch Engaged.

MANUFACTURERS who are particular about keeping an established reputation equip all their machines with Johnson clutches. They recognize that superiority must be consistent in order to count. And Johnson clutches assure them of uniformly good service wherever they are installed.

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CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

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High Grade STEEL Castings
Of Every Description
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Forging Billets and Bars
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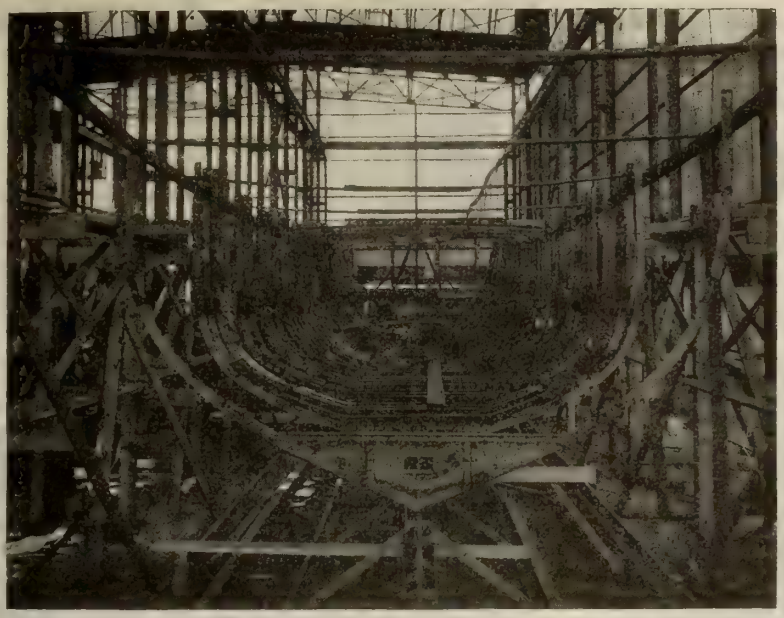

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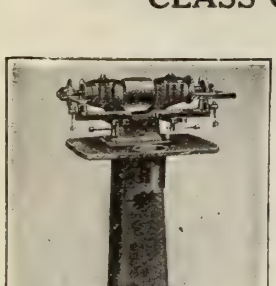
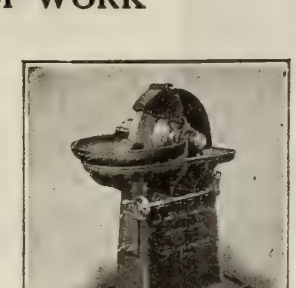
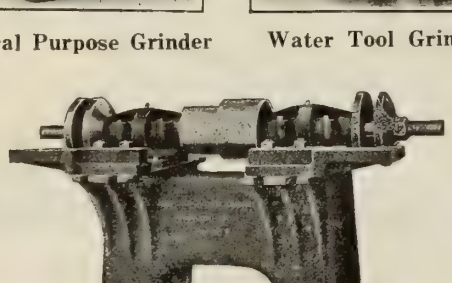


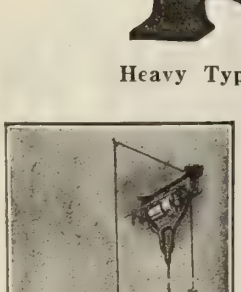
General Purpose Grinder



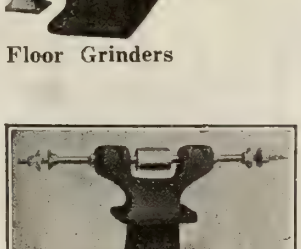
Water Tool Grinder



Heavy Type Floor Grinders



Swing Grinder



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Modern, rigid, well-balanced machines that give real grinding service.

Manufactured by

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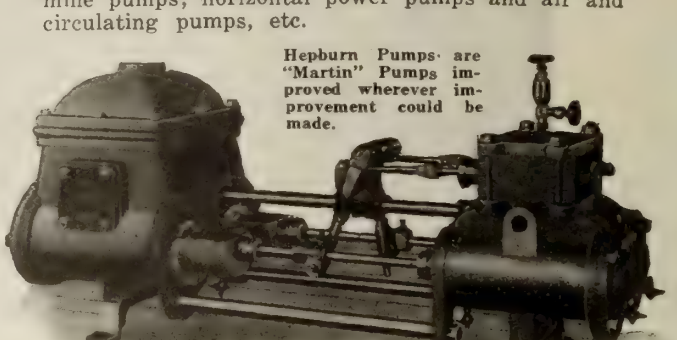
Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

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Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

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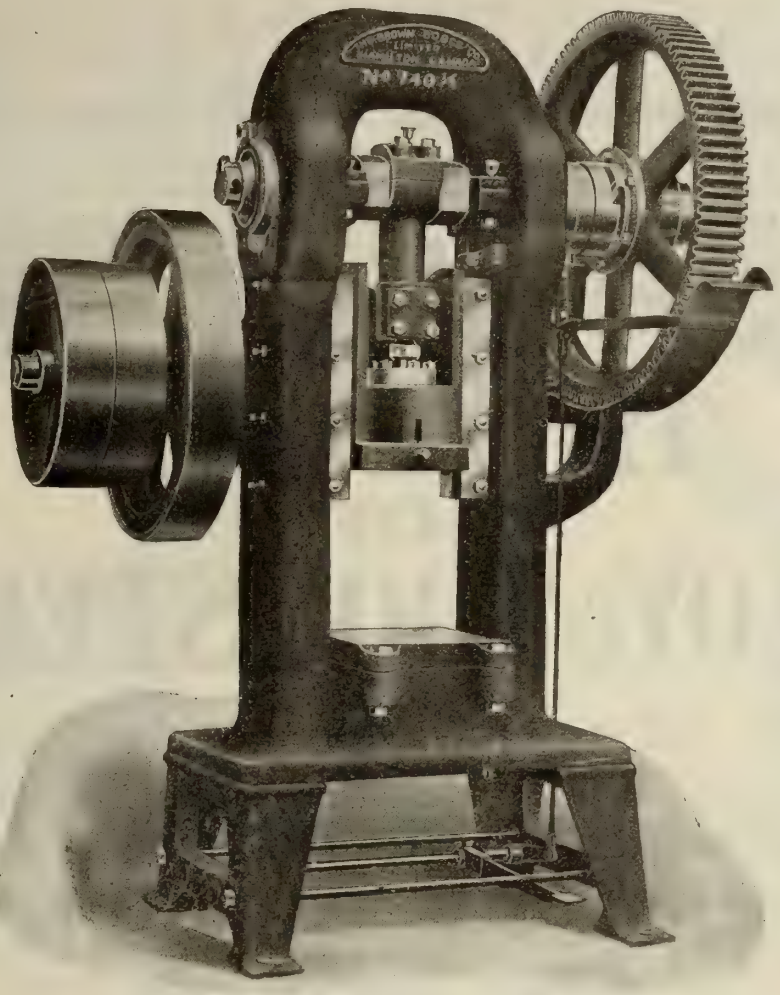

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The Manufacturer's Guarantee

Something you do not get with second-hand equipment, yet in many cases it will offset the difference in price between the second-hand and new machine.

Play Safe, get our prices on new equipment before you close for the old.

A large stock of different sizes and styles of presses on hand for immediate shipment.

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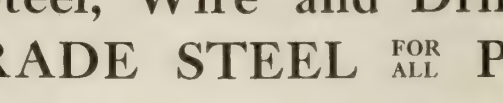
HIGH GRADE STEEL FOR ALL PURPOSES



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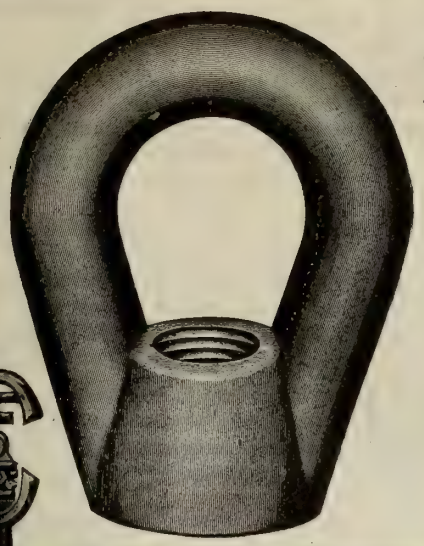

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all sizes

Produced at
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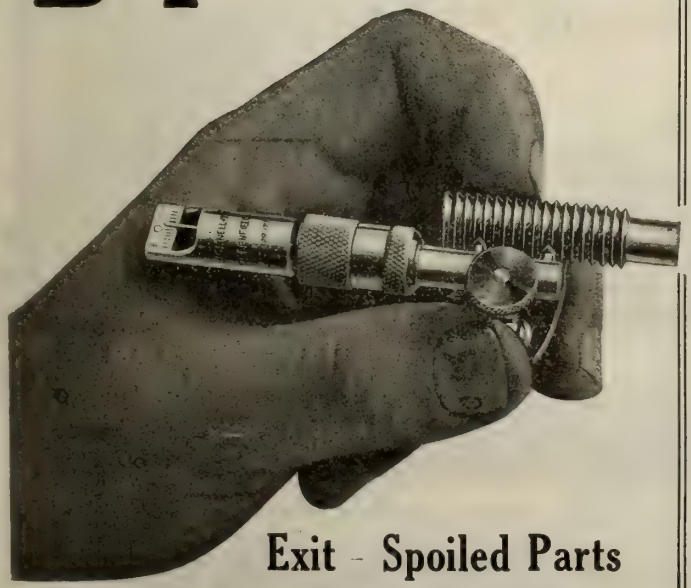

Exit - Spoiled Parts

Did you ever have to scrap a threaded part because of incorrect measurement in lead? Were you ever forced, during a rush job, to thread a part over again, because it didn't fit as it should?

B-T THREAD INDICATORS

enable you to get the right thread lead instantly and maintain a constant check upon it. They will detect errors of one thousandth of an inch—can be used for testing add and even pitches, as well as internal and external threads.

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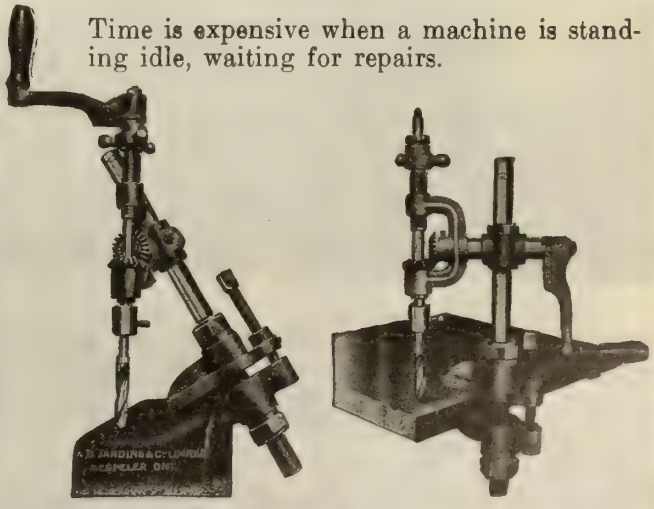
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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HIGH SPEED STEEL

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"DOUBLE WACO" 18% Tungsten, for Railway and Tramway Tires and Hard Metals
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In three qualities
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Round or Octagon
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Hack Saws

Cut faster!—repeated tests have proven the soundness of the Starrett system of designing different blades for different classes of work. It's the number of strokes to the cut that determines the comparative efficiency of blades—the number of cuts to the hour. And it is the ability of the Starrett blade not to only complete the cut with the minimum number of strokes, but to deliver a greater number of cuts during the life of the saw, that has made its reputation.

To get the most out of a box of Starrett blades, use the Starrett Hack Saw Chart 3, sent free upon request.

The L. S. Starrett Co.

The World's Greatest Toolmakers.
Manufacturers of Hack Saws Unexcelled.

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We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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Steel Ingots
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HARMET
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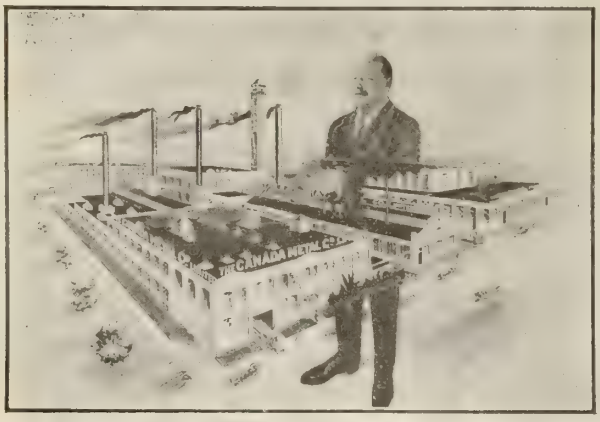

Here is a Plant at your Service

We Make

LEAD PIPE, SHEET LEAD, SOLDER

All Grades of BABBITT METAL, Ingot Copper, Tin, Lead, Brass.

THE CANADA METAL COMPANY LIMITED
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Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

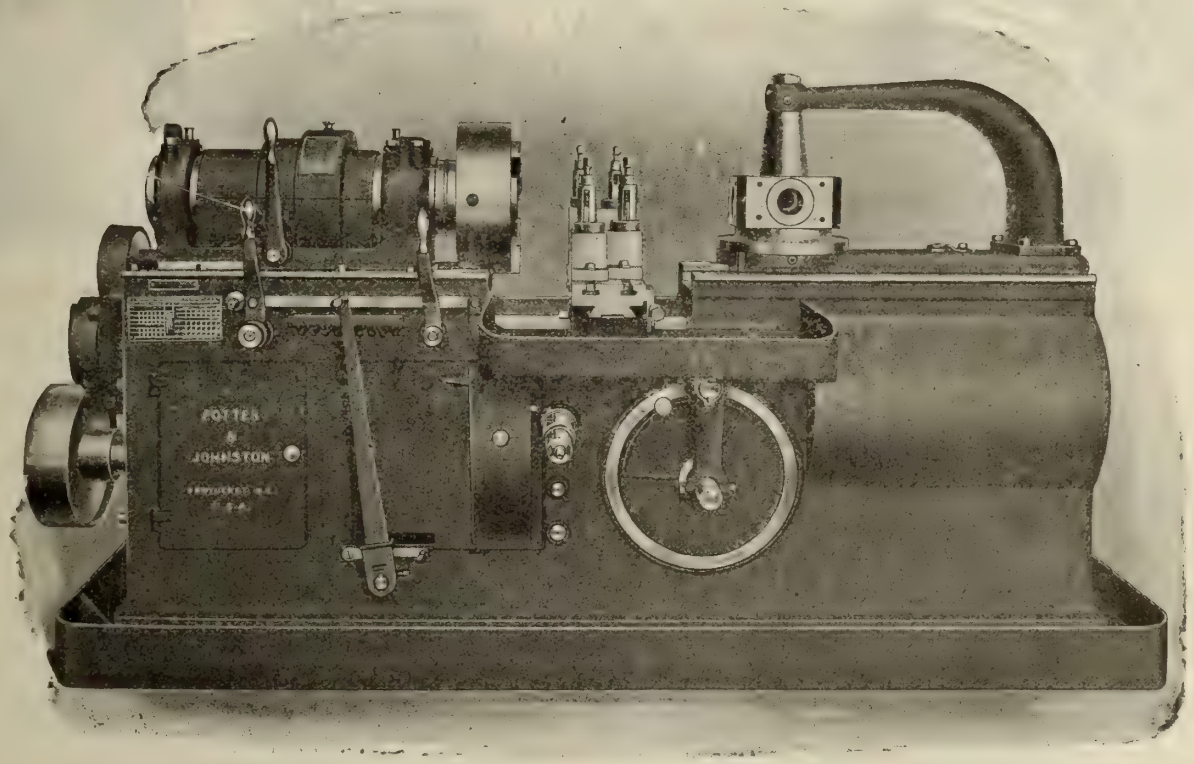
send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

POTTER & JOHNSTON

MANUFACTURING AUTOMATICS FOR ECONOMICAL PRODUCTION



6A Manufacturing Automatic

When times are dull you want to get full value from your labor—you cannot afford to do otherwise and stay in the game.

When times are busy you have hard work getting help.

A serious problem from either angle.

The solution: Potter & Johnston Manufacturing Automatics for all duplicate parts from castings, forgings, cut-off stock, up to 40 inches diameter and up to 15 inches long.

From two to a dozen cutting tools always in simultaneous operation. Instead of an operator for each machine, an attendant for from two machines to half-a-dozen.

If you have any doubts as to whether these Manufacturing Automatics will apply on your work, take it up with us and we will help you investigate.

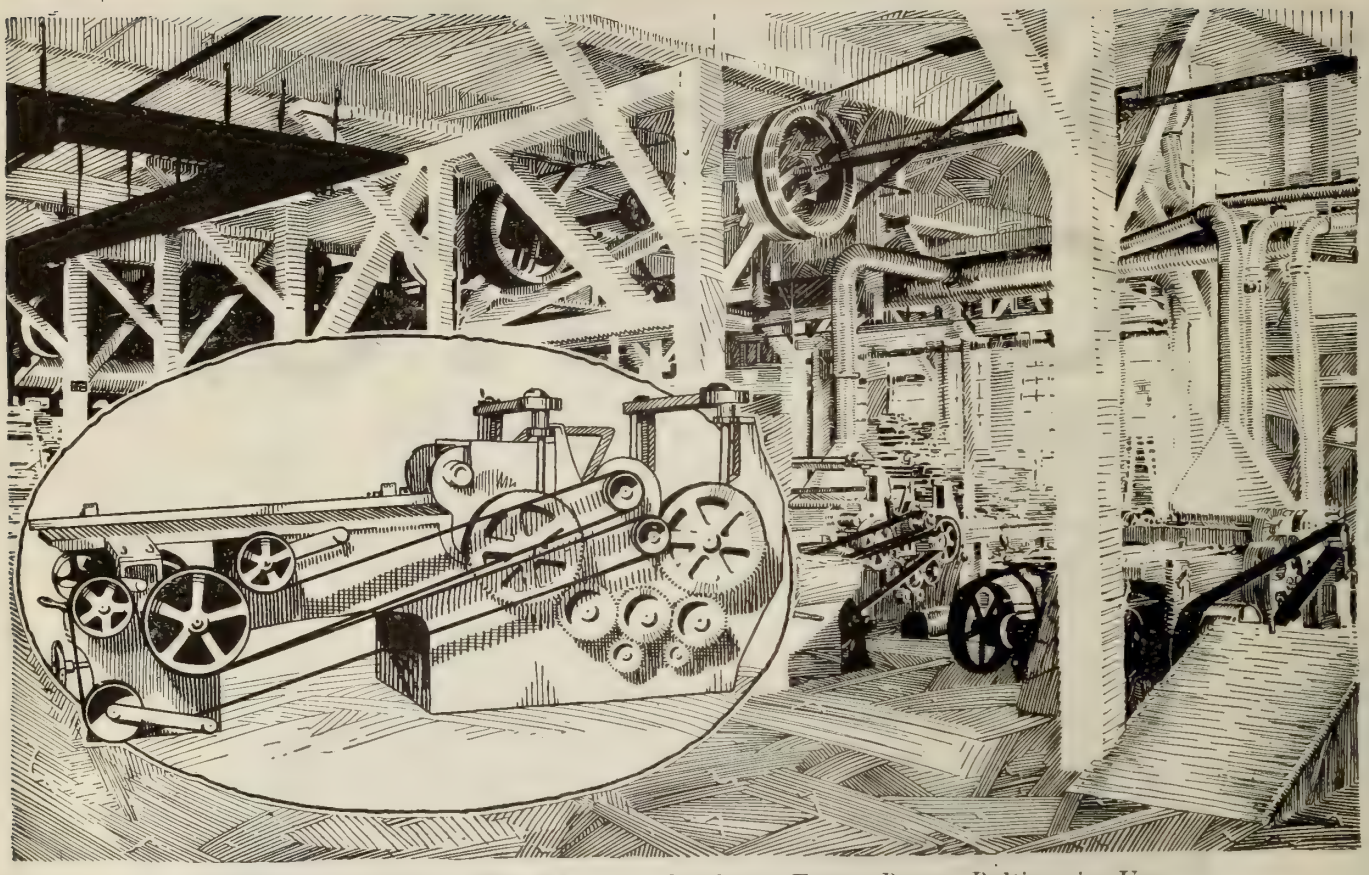
Descriptive Bulletin 39 on request.

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LTD.

HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA

WORKS AND WAREHOUSE: GALT, ONT., CANADA



Scene in the Haley Mill Showing Goodyear Extra Power Belting in Use.

Another Convert

HALEY & SON,
Lumber Merchants

Gentlemen:—

We want to tell you about the Goodyear Extra Power Rubber Belting we bought for our new mill two years ago and what great satisfaction this Belting has given us. As you are aware, we bought this kind of belting from you for the equipment of our mill **throughout,** even to planers and matchers. We were skeptical at the time about using this belting on our matchers, especially on the side heads, as that is a very trying place for any kind of a belt. We concluded we would try your rubber belting, as we thought then as a makeshift. Now it has been something over two years since we belted up our matchers with your belting and the original belts are yet on these machines and still giving good service. We thought where this belting of yours had proved so eminently satisfactory that we should tell you just as we thought about it and you know we are giving you this testimonial of Goodyear Extra Power Rubber Belting entirely at our own initiative.

Yours truly,
HALEY & SON.

GOODYEAR
MADE IN CANADA

Almost Unbelievable Power-Saving and Economy

Time and again we have found purchasers of Goodyear Extra Power Belting openly skeptical that it would live up to our promises.

Time and again they have told us not only of lower belting costs, but also of increased and faster production, time and power saved.

To-day there is no reason for any plant to buy belting on promises.

On file in our office are letters which enable you to buy belting by proof.

Records of Goodyear Belting performance.

Records of extreme long-life, which means economy.

Records of pulley-gripping, non-slip qualities which save power.

Records of work under strenuous conditions of heat, cold, damp, acids.

Records of strength and flexibility.

Records which prove that without Goodyear Extra Power Belting enough power is wasted in Canada every year by poor belts to pay a big dividend on Industry's capital.

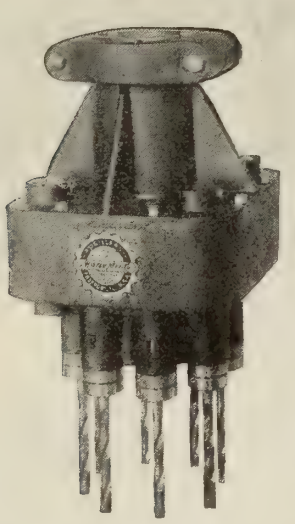
Some of this power is being wasted in your plant. Better belting, scientifically applied, will save you money. Without obligation to you, a belting man, trained by Goodyear, will call and make a record of your needs and experiences. Our recommendation will come from engineers who fit belts to conditions. Phone, wire or write the nearest branch.

The Goodyear Tire & Rubber Co. of Canada, Limited

Branches: Halifax, St. John, Quebec, Montreal Ottawa, Toronto, Hamilton, London, Winnipeg Regina, Calgary, Edmonton, Vancouver

EXTRA POWER BELTING

2 Minutes or 20?



This Is The Vital Question

Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time cost.

THE HOEFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Building, Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

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"Canada's Departmental House For Mechanical Goods"

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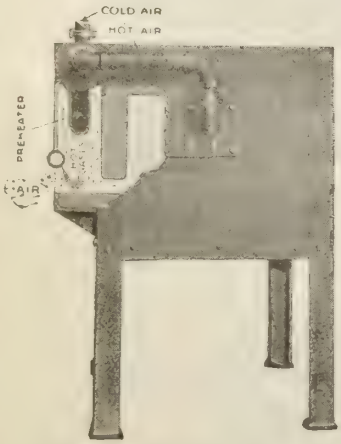
Cool Shop This Summer

if you use

ECONOMIZER FORGE



Showing deflection of hot gases, with induced air *toward* the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

Write to-day for catalogue 34-T

Canadian Representative:
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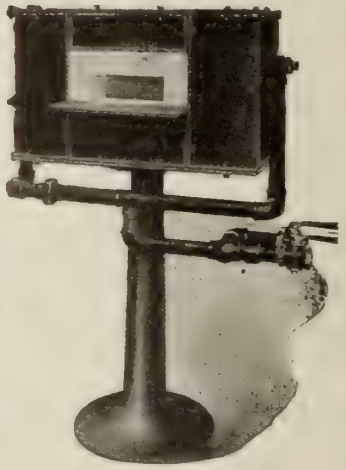
W. S. ROCKWELL CO. INDUSTRIAL FURNACES NEW YORK

STANDARD FURNACES

OIL or GAS

Prompt delivery on all tool room types



Cutting Tool Furnace

For
Annealing
Carbonizing
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High Speed Steel
Lead and Salt
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Furnaces built for special requirements

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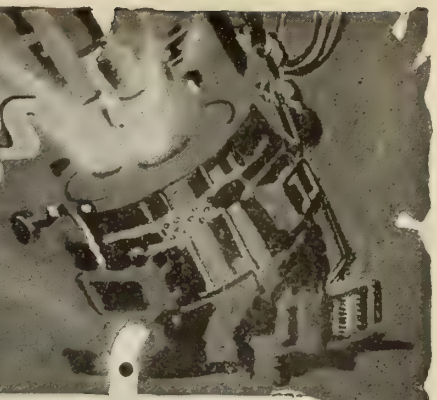
STANDARD FUEL ENGINEERING CO. DETROIT, MICH.

Nichrome Castings for Heat Treatment



Cast "Nichrome" Heat Treating Containers

Carbonizing and annealing boxes, and other heat treating containers must be durable to withstand the action of heat during operation.

Cast iron, cast steel, structural steel and wrought iron receptacles **crack, grow, scale,** or **warp,** their use is inefficient, involving costly maintenance due to additional expenses for labor, fuel, material and constant replacement.

Cast Nichrome boxes, pots, tube and retorts guarantee uniform high quality of product, increase the capacity of the plant, and reduce the cost of heat treatment.

Write for further particulars.

Manufactured under Henderson Patents.

CANADIAN DRIVER-HARRIS CO. Ltd.

WESTERN OFFICE AND DEPOT
CHICAGO
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CANADA

AMERICAN OFFICE AND WORKS
HARRISON, N. J.

BRITISH WORKS
MANCHESTER
ENGLAND

25

THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

The Nationally Known—First Quality

HIGH SPEED STEEL

is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

VANADIUM-ALLOYS STEEL COMPANY

Gen'l Offices: Pittsburgh, Pa.

Works: Latrobe, Pa.

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TORONTO	BUFFALO	CLEVELAND	CINCINNATI
MONTREAL	BOSTON	CHICAGO	DETROIT
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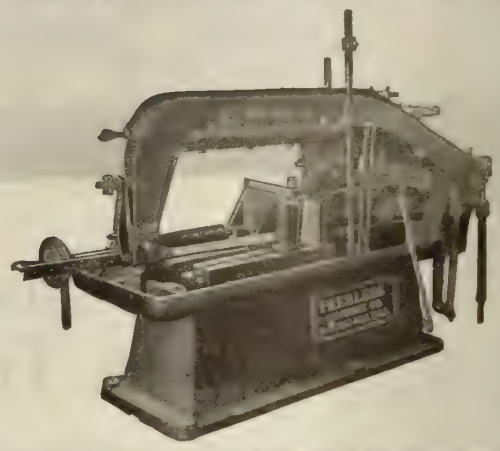
Peerless HIGH SPEED

Has Proven Its Efficiency Where Others Have Failed



DON'T turn down the "Peerless" because you have tried out other hack saws which did not answer your requirements.

Many concerns who were persuaded only with the greatest difficulty to try their first "Peerless," because they "just knew it would turn out like the others," are to-day among the largest and best-satisfied users of our High-Speed Saws.

The "Peerless" is different—and better. It does 50 to 100 per cent. more work, cuts with thinner saws and requires a minimum of attendance, saving time, labor, material, blades and floor space. What is your work? We can tell whether the "Peerless" will do it, and back our judgment with a 30-day trial. If it doesn't make good we pay freight both ways. Well?

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN

Protexal Clothing

Is made of specially treated fire, water and acid-proofed duck material.

Has extra fasteners on sleeves and trouser legs permitting their being tightly fastened around wrist and ankles. **No gaping garments to catch in machinery.**

Designed for service, comfort and protection, outwears regular overalls, extremely strong, comparatively light weight.

An exceptional garment at a reasonable price.

Suits, leggings, gloves, mittens that actually reduce accident hazards. Booklet D-2 shows the complete line of Protexal Clothing manufactured in our own plant.

Easiest to put on and take off.

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Safety and First Aid Equipment

Makers of Adjustoglas Goggles

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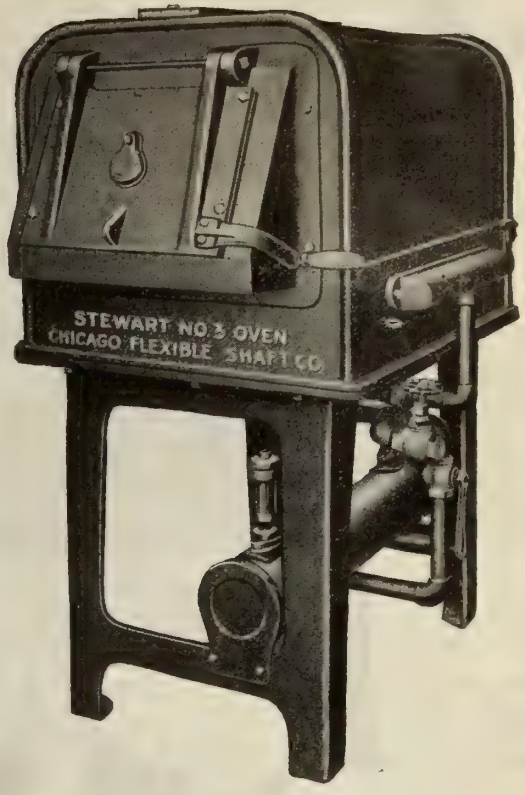
Gas Furnace Triumphs Over the Electric at Providence



Competition is keen in Providence, R.I., and therefore both the Electric Company and the Gas Company employ the best brains and selling talent on the market.

An Electric Furnace was recently installed in the Tool Room of a large manufacturing plant in that city, and it looked like a real triumph for the Electric Company, as the Gas Company, also, had been hot on the trail.

But the Gas Company wasn't discouraged.

They advised the customer to give the electric furnace the fairest kind of a trial.

They didn't knock.

But they did do a lot of figuring of costs, and the result was so convincing that the customer agreed to the installation of a Gas Furnace, on trial, and then things got exciting.

The Customer, the Gas Man and the Electric Man all three watched and checked the performances of both furnaces.

Here is what they found out:

1. The Electric Furnace was costing $20.00 per week.
2. **The Gas Furnace was costing $13.84 per week.**

The Gas Furnace has replaced the Electric in that Providence factory.

Stewart Gas Furnaces and Ovens

are doing more every day to demonstrate the superiority and the economy of Gas for Industrial uses over the use of electricity than any other one factor.

Is your Industrial Department aware of this, and if so are they using the information in your business-getting campaign this year?

There are over one hundred types of **Stewart Gas Furnaces and Ovens** being manufactured and sold to-day. Send for our illustrated catalog.

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WHETHER your lathe requirements must suit the rapid manufacture of intricate parts or versatile demands of modern tool room practice, one of the Whitcomb-Blaisdell Line will fit exactly your individual needs.
When you buy a Whitcomb-Blaisdell Lathe you get a big measure of service in return for every dollar invested. The entire line of W-B Lathes is distinguished for superior design, workmanship and material.
Rigid inspection and thorough working tests in our shops are your assurance of accuracy and dependability.

Whitcomb-Blaisdell Machine Tool Co.
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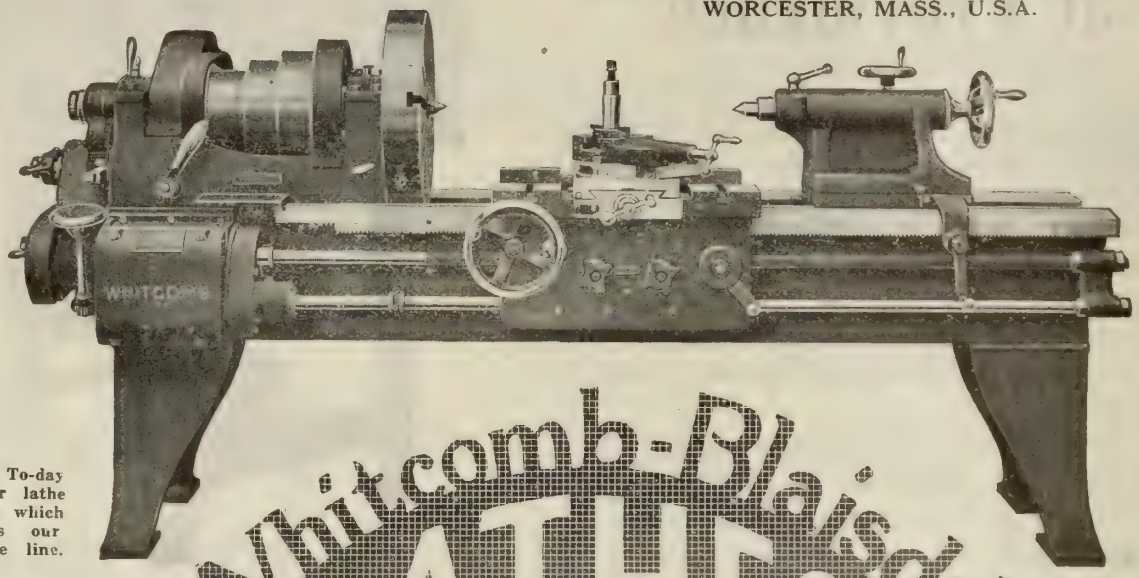

Write To-day for our lathe Catalog which describes our complete line.

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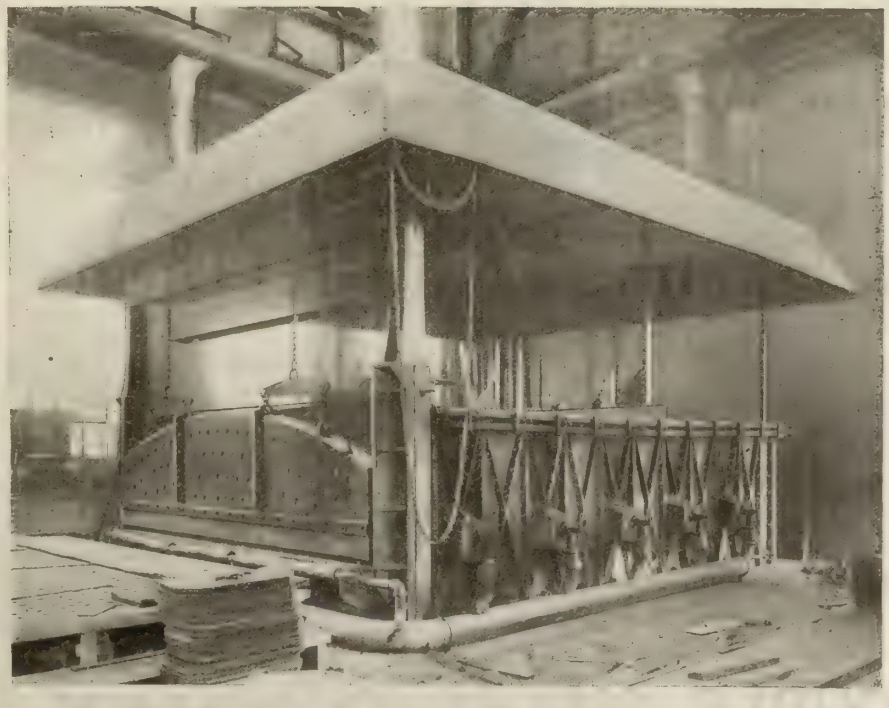

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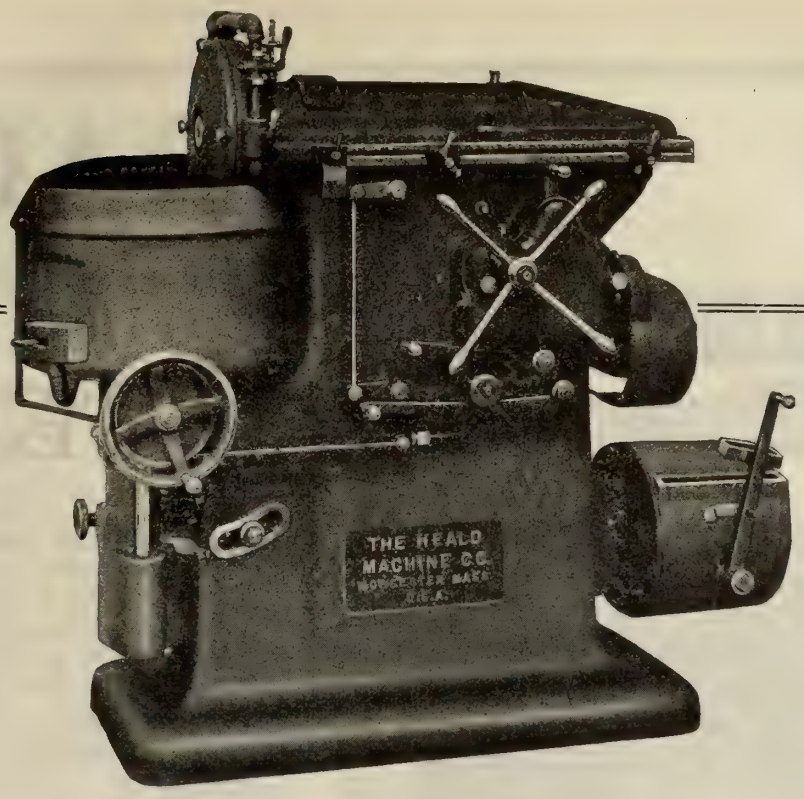

BUILT IN TWO SIZES 8" and 12".

The New Surface Grinder you have been looking for

The new HEALD No. 20 and No. 22 MACHINE is a simple, productive and accurate rotary surface grinder. That the new machines meet the first requirements can be seen from the photograph above.

In regard to production and finish, experiments have proven these new machines have no equal in the field to-day.

The WHEEL SLIDE is a massive casting having a flat and "V" way insuring continued alignment. Bearing surfaces are large and well protected. Spindle belt operates with a downward pull; an important factor in rigidity.

The chrome nickel WHEEL SPINDLE is mounted in large bearings, all adjustments of which are made at grinding wheel end through an opening in top of slide.

The MAIN DRIVE UNIT receives power from the main line by tight and loose pulleys, transmitting it directly by belt to main speed box, wheel spindle and pump.

MAIN SPEED BOX, situated on the rear of machine, furnishes power to wheel slide by a 3-step cone, and operates the chuck, which has three speeds, through a bank of gears. Wheel slide and chuck are independent of each other, permitting a large latitude in speeds and feeds.

Chuck spindle is driven by spiral gears, one of which is mounted directly on the spindle. Spindle itself is mounted in a sleeve which has vertical adjustment. Upper portion rests in a taper bearing, lower end being equipped with ball bearings—wear is automatically taken up. All control levers and adjustments are within easy reach of operator.

Complete water apparatus is furnished with each machine; built in two sizes, 8" and 12", with Heald Magnetic Chucks are regular equipment. Motor drive if desired.

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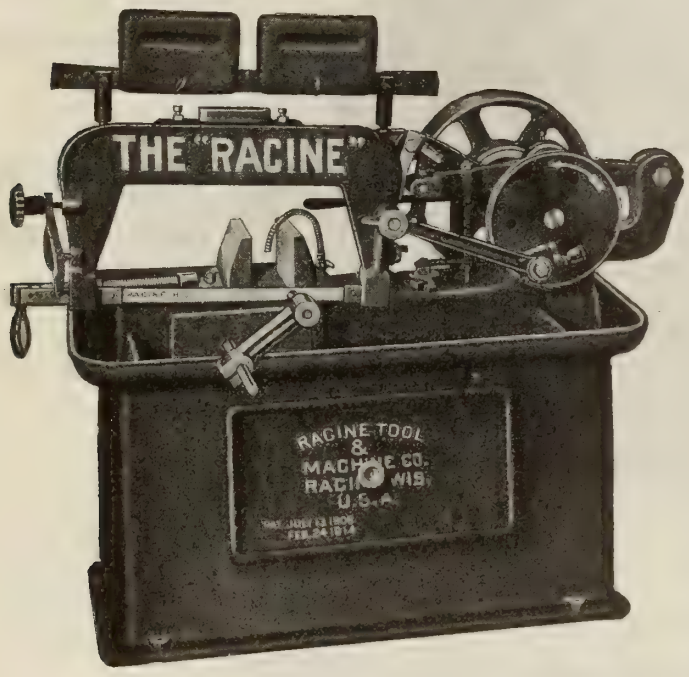
"THE RACINE"

HIGH SPEED METAL CUTTING MACHINE



Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

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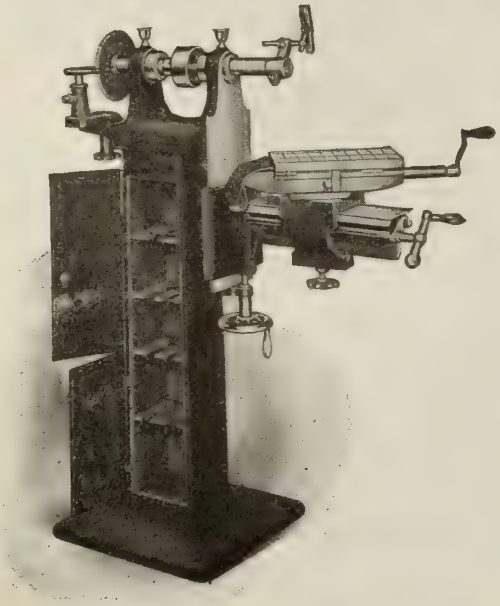
Melbourne Avenue - RACINE, WIS., U.S.A.

OBTAIN THE BEST RESULTS



GARVIN No. 3, Universal Cutter and Surface Grinder
Use Code—Banish

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL
CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

For Further Information ASK YOUR DEALER or WRITE US DIRECT

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Manufactured by

THE GARVIN MACHINE COMPANY

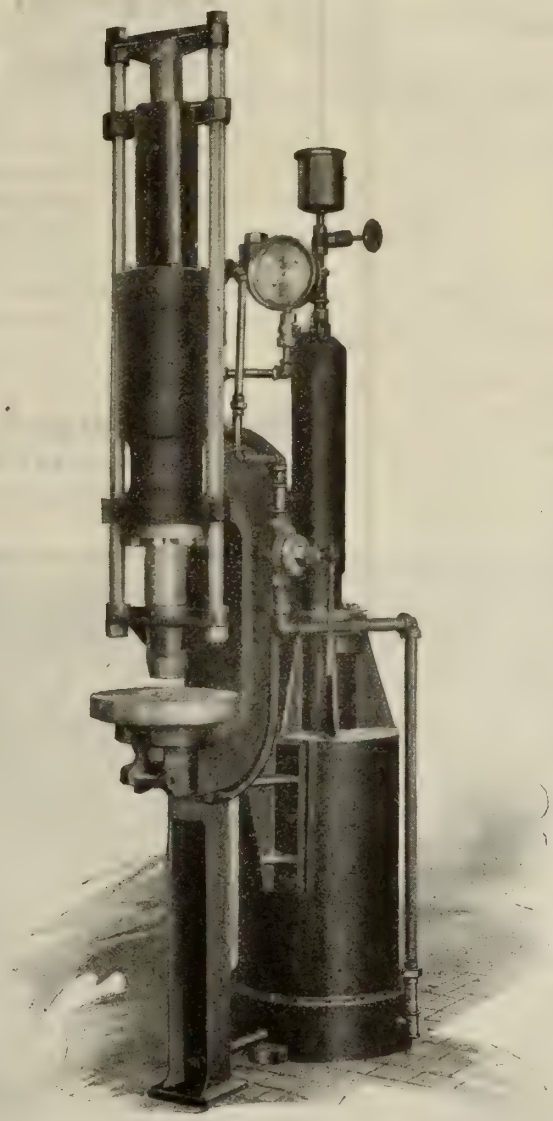
Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

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High Speed Hydraulic and Hydro-Pneumatic Machinery

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Notes On Grinding

NORTON COMPANY WORCESTER, MASS.

No. 62A

Use Wheels of Large Diameter for Snagging Castings

SALESMAN'S COMMUNICATION

"One of our customers has raised the question of whether the diameter of a wheel will have any bearing on the cost of grinding, especially so on heavy work like steel castings. This customer in question uses 18" diameter wheels on swing frames. Kindly advise me if you have an actual data on this."

THE REPLY

We have no actual figures to show what the effect of wheel diameter is on the cost of snagging castings, but perhaps a brief general discussion is in order.

To take an extreme case, we would hardly use a 4" diameter wheel to snag castings, for the principal reason that you could not remove metal fast enough. Under usual power conditions for a 4" wheel it would slow down and stop just as soon as any considerable pressure was put upon it. Now an 18" diameter wheel, driven with proportionately larger belts and greater motor power, would have sufficient momentum to keep going, even under great pressure. There is no question that theoretically there is something to be gained from this flywheel effect which keeps the speed up and hence tends to reduce the wheel wear.

Another point is worth considering, and that is the arc of contact. The larger the diameter of the grinding wheel, the more cutting grains are at work each second, due to increased arc of contact. This makes for two things—faster cutting and less wheel wear.

Still a third factor is the greater economy in abrasive consumption that always exists when the grinding wheel is large and up to speed. Say that a steel foundryman is snagging drawbars with an 18" diameter wheel. Each drawbar ground requires an average abrasive consumption of about 2 cu. in. Now a wear of 2 cu. in. on an 18" diameter wheel represents a much less reduction in diameter than a wear of an equal amount on a 14" diameter wheel. The more a wheel reduces in diameter for each piece ground, the less its surface speed and the smaller the arc of contact. Unless the correct surface speed is maintained almost absolutely, both of the factors mentioned tend to make the grinding wheel wear out fast and hence lower its efficiency.

Now, these considerations are somewhat theoretical, but sound. They point to the use of as large a diameter grinding wheel as can be employed, taking the type of machine and the strength of the operator into consideration. We should advise the use of at least 18" diameter wheels on the swing frame grinding machines, and larger if within the limits that the machine operators can stand.

Our customers buy wheels for this purpose ranging from 16 to 24" diameter, the majority being 18" and 20" diameter.

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

ELECTRIC FURNACE PLANTS NIAGARA FALLS, N. Y. CHIPPAWA, ONT.

NEW YORK STORE 151 CHAMBERS ST. CHICAGO STORE 111 NO. JEFFERSON ST.

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Forgings, Stampings or Pressed Steel Parts

An attractive catalogue showing the facilities this company has for producing Forgings, Stampings and Pressed Steel Parts—particularly in large quantities—sent on request.

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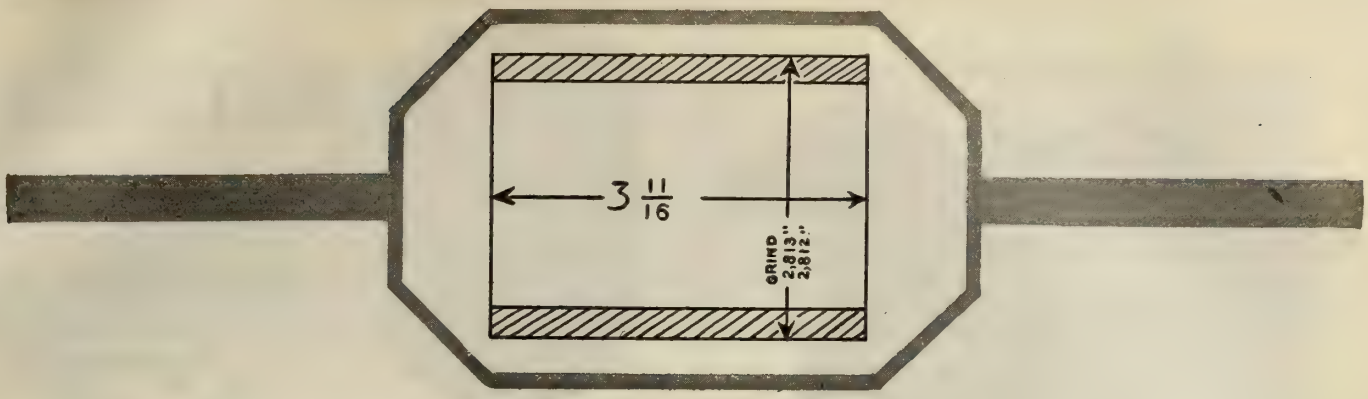

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The Norton Grinding Company can help you keep down your manufacturing costs, improve the quality and finish of many of your products, and increase the output.

One of the best known agricultural machinery manufacturers uses large numbers of bronze bushings for connecting rods in a large 75-h.p. motor built by them. This concern finishes them on a 6 x 32-in. Norton Grinding Machine. The operator removes 1-32 inch stock and is allowed a tolerance of 0.001 inch. His average output is one every minute. Our Service Department will gladly furnish you with information on plain grinding. Perhaps you have work that could be done more profitably that way. Send us your blue prints.

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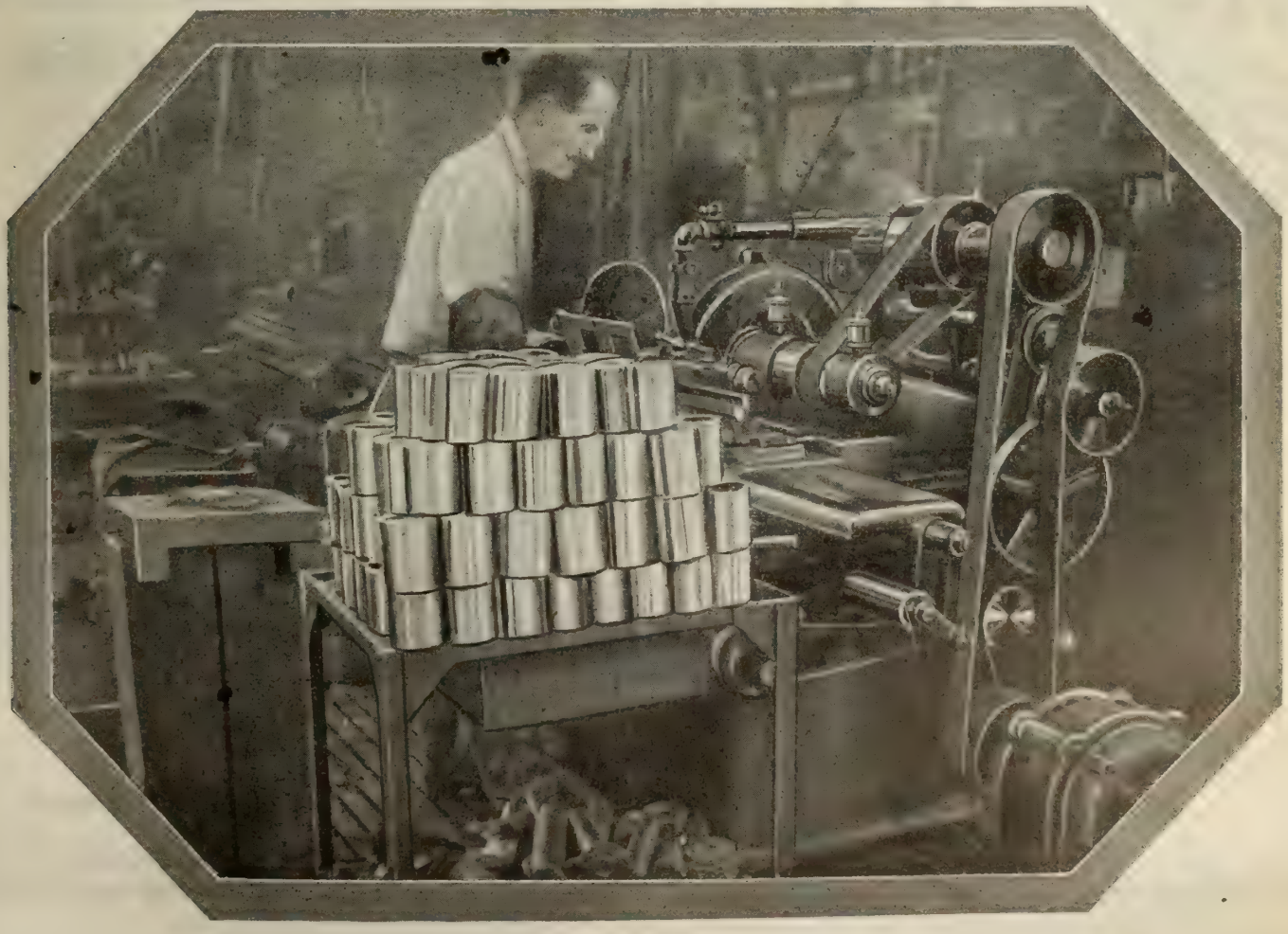

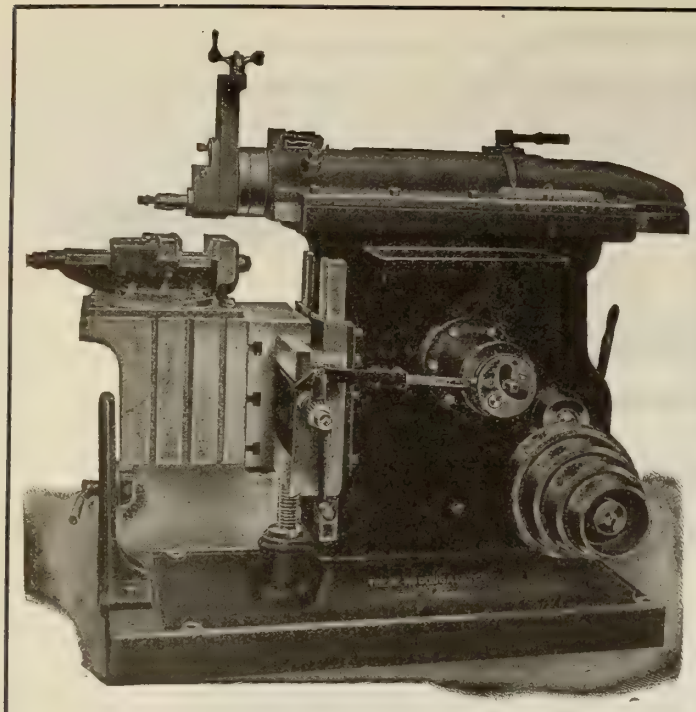

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Combine the best features of all machines which have hitherto been placed upon the market, and nothing has been included, except those points which experience has shown to be essential.

An examination of the construction will reveal features that make for increased production, ease of operation and accuracy.

Write for descriptive literature.

The R. McDougall Company Limited

Manufacturers

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Matthews' Letters and Figures are hand made from carefully selected tool steel. The characters are neatly formed, producing stamps that make easily read and durable marks on all classes of products. They reduce considerably the cost of high grade marking.

Try them! Mark your next order — "MATTHEWS' Letters and Figures."

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JAS. H MATTHEWS & CO. - Pittsburgh, Pa.

Steel Lettering, Dies and Stamps

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
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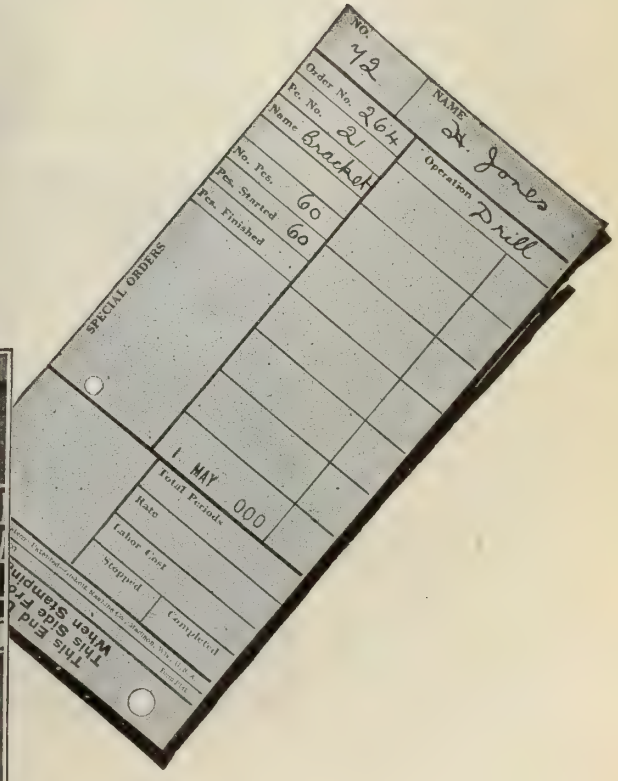
They are relieved of clerical labor. Each Periodograph time ticket is a voucher for work done. Full credit is given for accomplishment. Work is laid out in advance; no hunting up the foreman when changing jobs. Entire working time given to producing.

The workman is only *one* angle. Let a Gisholt Salesman point out the others.



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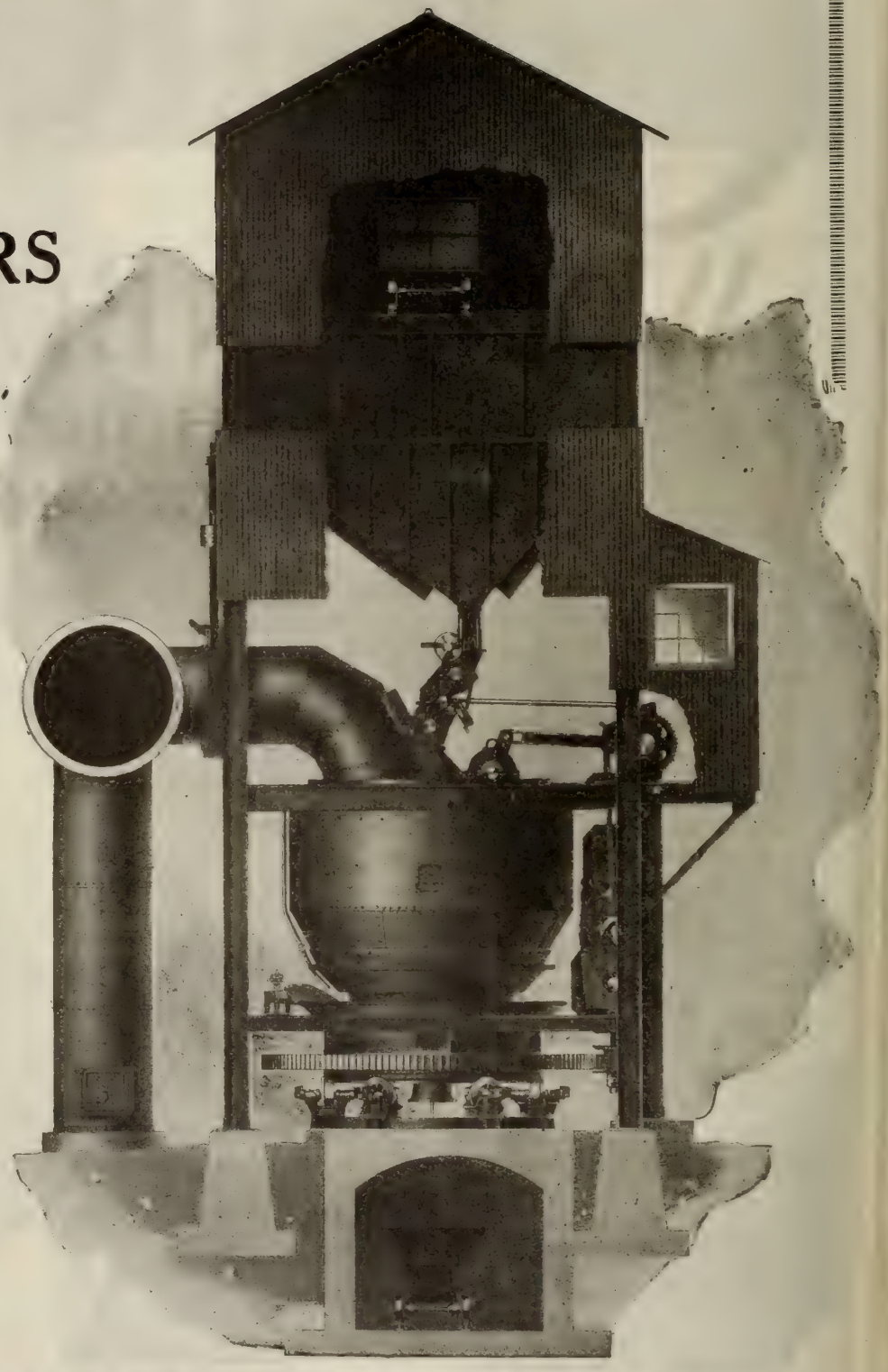

THE Wellman - Seaver-Morgan Company is prepared to install complete producer gas plants—including building, producers, coal and ash-handling equipment, gas flues and valves, or it will supply the gas producer alone.

The W-S-M organization with many years' experience in this line have incorporated in the Hughes Gas Producers correct mechanical principles and excellent materials—resulting in a producer that assures uniformity of performance, low maintenance cost and a minimum labor charge.

A new bulletin giving a detailed description of this producer has just been issued. Shall we mail you a copy?

THE WELLMAN-SEAVER-MORGAN CO.

CLEVELAND, OHIO, U.S.A.

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 8 Toronto, August 21, 1919

Reducing Press Accidents by Sane Treatment

Through the Courtesy of the National Safety Council We Are Able to Present to Our Readers Photographs of Various Safety Devices on Presses Which Have Proved Most Successful

ACCIDENT records show that more injuries occur on power presses than on any other machine, except, perhaps, the circular saw. This pamphlet will discuss especially the metal-working press, or "punch press," the use of which is so rapidly increasing; but many of the principles herein described can be applied, with a little ingenuity, to similar machines in specialty manufacturing, leather working, printing and binding, soap making, and other industries.

Causes of Accidents

In practically all press accidents, the operator's fingers are caught under the ram, at the point of operation. This is due to (1) the press repeating, (2) the operator leaving his hand between the dies as the ram descends, or (3) an unexpected stroke caused by accidental tripping.

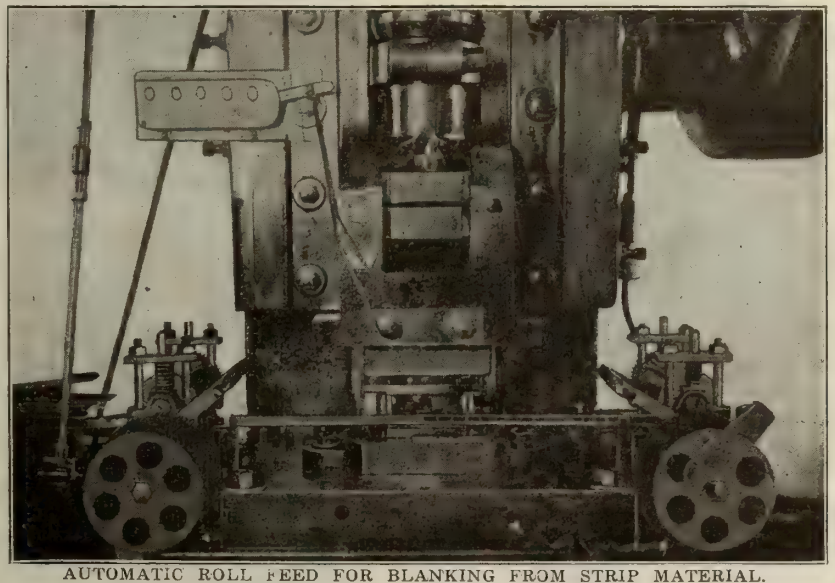
The report of the Industrial Commission of Wisconsin for the year 1917 shows that of 343 punch press accidents, 333 (or 97 per cent.) occurred at the working point, and that of 111 permanent injuries resulting from these accidents, 110, or over 99 per cent., occurred at this point.

Over 99 per cent. of the cost of these accidents, including compensation and medical attention, was chargeable to accidents occurring at the point of operation. This is convincing proof that to prevent press accidents a study of the operation of each press must be made, to eliminate, if possible, the need of the operator placing his hands between the dies; or, if this is impracticable, to install a guard which will prevent the operator's hands being caught between the dies when the ram descends.

Automatic Feed

The most effective way to remove the operating point hazard is by using an automatic feed. It is difficult to develop a satisfactory feed for some operations, but if the problem can possibly be solved, a marked increase in production (as well as safety) will result. Types of automatic feed include the following:

(a) Roll Feed. This may be used in most operations where strip metal is passed through the press for blanking. These rolls, driven by small gears, or by a belt, feed the stock through the machine, and the operator's hands need not be placed between the dies.



AUTOMATIC ROLL FEED FOR BLANKING FROM STRIP MATERIAL.

(b) Plunger Feed. The plunger pushes the work under the ram at each stroke; the operator places the work in a vertical feed chute, the plunger operating at the bottom of the chute.

(c) Chute Feed. The press is inclined; the material is placed in an inclined chute and slides by gravity under the ram.

(d) Dial Feed. The work is carried under the descending ram by a revolving dial, fed by hand or by a gravity chute.

(e) Revolving Dies. Two or more dies are constructed on a plate, which revolves at each stroke of the ram. The operator places the work in an empty die; when the die plate revolves it carries the work under the ram.

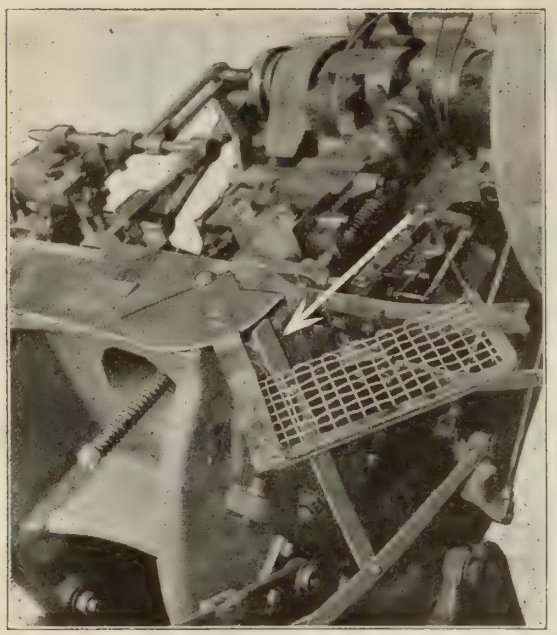
(f) Sliding Dies. Each operation slides the die from under ram. The operator loads the die, and with the down stroke the loaded diet slides back into position.

The principal hazards of an automatically fed machine occur when adjustments are being made, or when dies are being changed. If the plunger makes a stroke at such a time a serious injury may occur. Every such machine should be equipped with an automatic stop which will lock the machine whenever continuous operation is interrupted. The plunger and dies should be enclosed, if possible, to remove all danger of operator's hand being caught.

Blanking

In blanking operations, especially when hand-fed, the plunger should be enclosed at the front and both sides by a guard of wire mesh, perforated metal or wired glass, leaving just enough space under guard to admit the stock. If of a metal, the guard should contain a slot through which the operator can view his work. For hand feeding, this guard must fit the die closely; it should, therefore, be readjusted, or a separate guard provided, by the die maker or die setter whenever a new operation is put on the machine.

A telescope guard, attached to the ram,

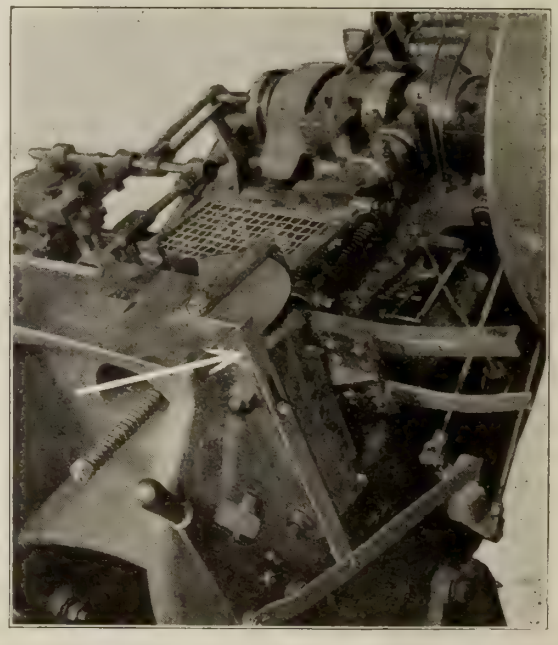


LOCKING DEVICE FOR CLUTCH OPERATING LEVER. NOTE THAT WITH GUARD OUT OF POSITION LEVER IS LOCKED SO THAT PRESS CANNOT BE STARTED.

CHUTE WITH DIAL FEED. MATERIAL IS CARRIED TOWARD THE DIES BY THE REVOLVING DISC.

GRAVITY CHUTE FEED.

AUTOMATIC PLUNGER FEED.



LOCKING DEVICE FOR CLUTCH OPERATINC LEVER. NOTE THAT THE GUARD IS LOCKED IN POSITION BL ROD CONNECTED TO OPERATING LEVER.

is sometimes used in place of a basket enclosure.

In large blanking operations, using long sheets of metal, the operator must ordinarily reach through the machine for the stock, unless a helper is stationed behind the machine. This hazard may be avoided, and the speed of operation increased, by the use of a vacuum pick-up controlled by the operator.

Many of the devices discussed under "Forming" may be used for blanking, but do not furnish as complete protection as a plunger enclosure.

Forming

For many forming operations an automatic feed can be devised and the plunger enclosed. With hand feeding, a fixed plunger enclosure is often impracticable. In such cases particular attention should be given to the design of dies, and in addition a device should be provided which will minimize the possibility of the operator's hand being left between dies. Each of the following types has its particular field of usefulness:

(a) A sweep bar or gate, which swings across or moves upward in front of dies, or moves across lower die, as the ram descends, and thus pushes hands out of danger. Such a guard should be operated by movement of ram, not by treadle.

(b) A swinging, sliding, dropping or expanding gate which forms a guard in front of dies before ram descends. This is operated by the treadle. If hand is in danger the gate cannot close and the treadle will not operate.

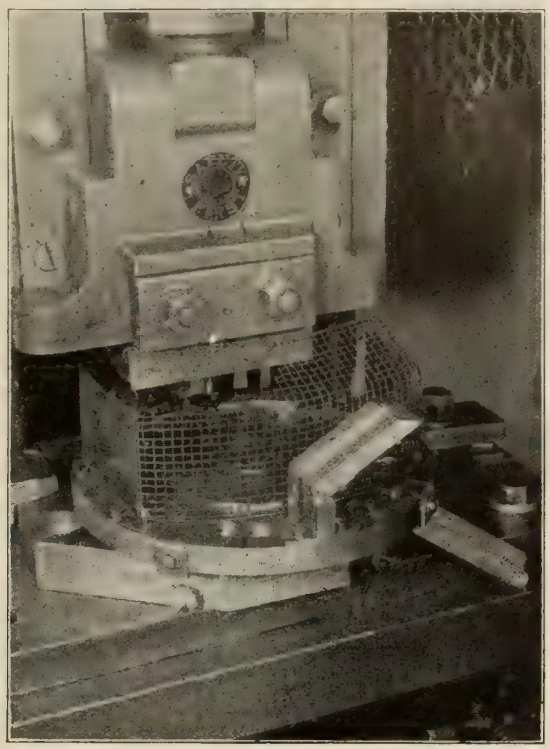
(c) A two-handed lever or push-button device which requires the use of both hands to trip the press or release the foot treadle. Where several men are employed at one large press, an electric control may be arranged with push-buttons in series, so each man must press two buttons (one with each hand) before the press will operate.

(d) Tell-tale device which warns the operator of descending ram if his hands are in danger zone. These are not positive in action because they do not remove the hands from between the dies.

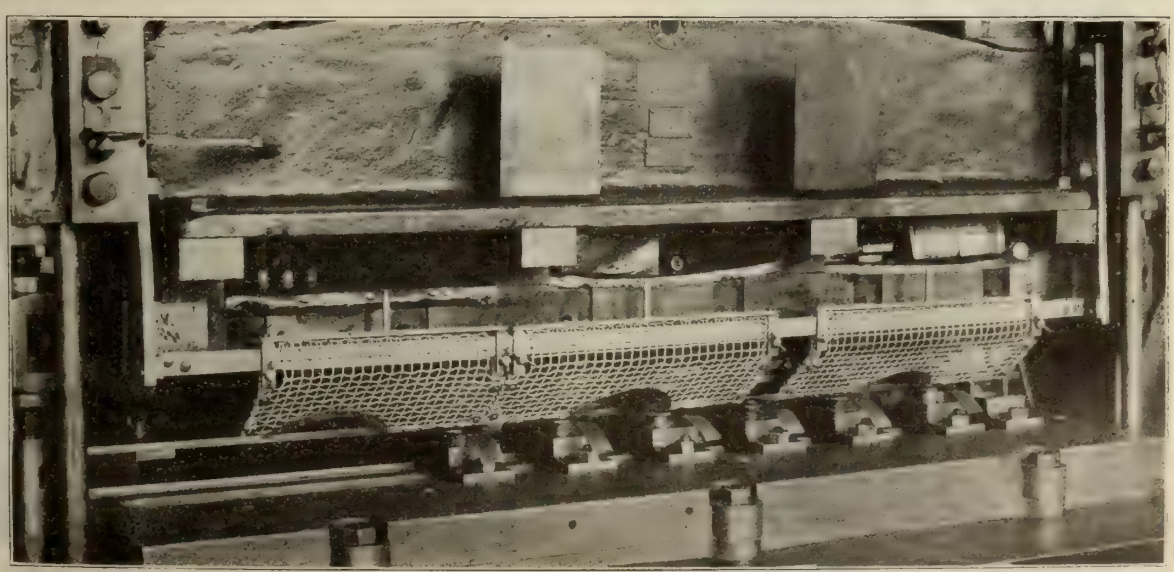
(e) Tweezers, picks, air suckers, or electro magnets, with which the material may be placed between the dies. The use of these hand-feeders frequently increases the output as well as decreasing the hazard.

Removing Stock From Press. Many accidents result from workmen's hands being caught while removing stock from press. In many operations the work is liable to adhere to the die, and a stripper or a kick-out device should be provided. A picker, or compressed air, may also be used to remove the work.

Blanking and forming are sometimes done in one stroke of the plunger; the cutting die blanks the piece and the forming die completes the operation. This double operation is often dangerous unless special methods are used to decrease the hazard.



REVOLVING DIES AND CHUTE FEED. PIECES ARE PLACED IN CHUTE, AND DROP INTO DIE, AND ARE CARRIED UNDER PLUNGER BY THE REVOLVING DIE PLATE. PIECES ARE DISCHARGED THROUGH CHUTE SHOWN BELOW PLATE.



GUARD FOR DIES FOR GANG PRESS.
Guards may be adjusted along length of supporting rod. Enough space is left for feeding material, but not enough for fingers to be placed under plungers.

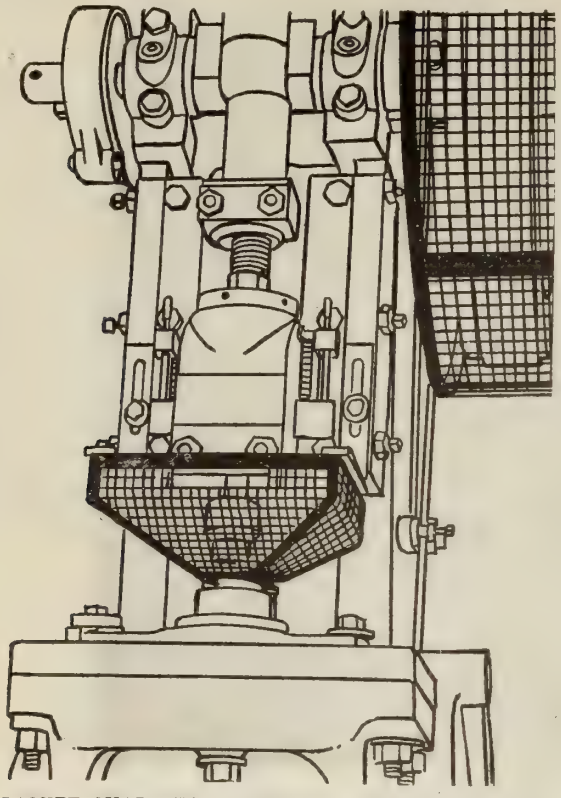
Discipline. Most of the safeguards described in paragraphs 10-12 can easily be put out of use by the operator, or can be wrongly adjusted so they will give

little or no protection. Such types of guards are valueless unless they are kept in proper adjustment and the use of them strictly enforced.

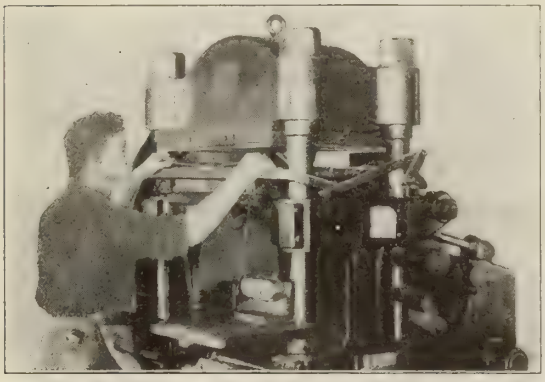
Die Making

The safeguarding of presses should begin with the design of the dies. As much study should be given to the safety of the operator as to the mechanical efficiency. Safety in press operation can only be secured by keeping the operator's hands out the danger zone. Although mechanical safeguards are designs for that purpose, practically all types of guards may be rendered ineffective by the operator or by error.

To be continued

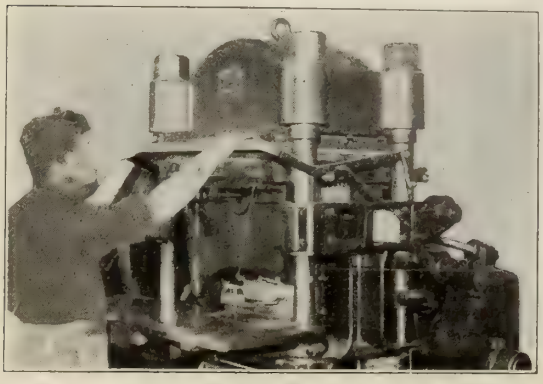


BASKET GUARD FOR BLANKING. FRONT AND BOTH SIDES ARE GUARDED. OPENING AT BOTTOM IS JUST LARGE ENOUGH FOR PLUNGER TO PASS THROUGH. THIS GUARD INCREASED PRODUCTION, SCRAP MATERIAL BEING USED.



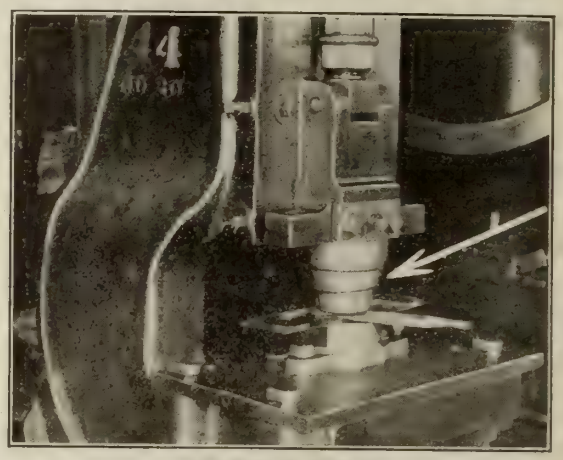
SAFEGUARD FOR STAMPING OR EMBOSSING PRESS.

Guard lies against platen and does not interfere with placing material in press.



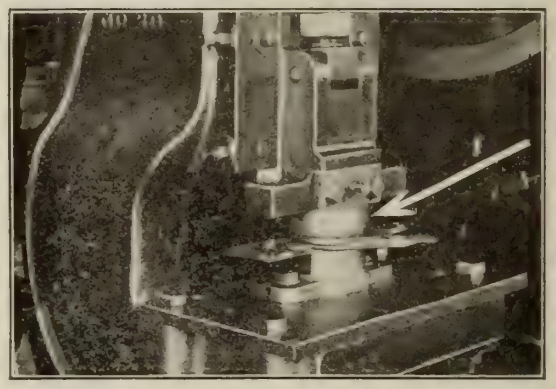
SAFEGUARD FOR STAMPING OR EMBOSSING PRESS

The upward stroke of platen, by means of two pins and a bell crank, pushes guard upward and outward, thus removing operator's hands from danger zone.

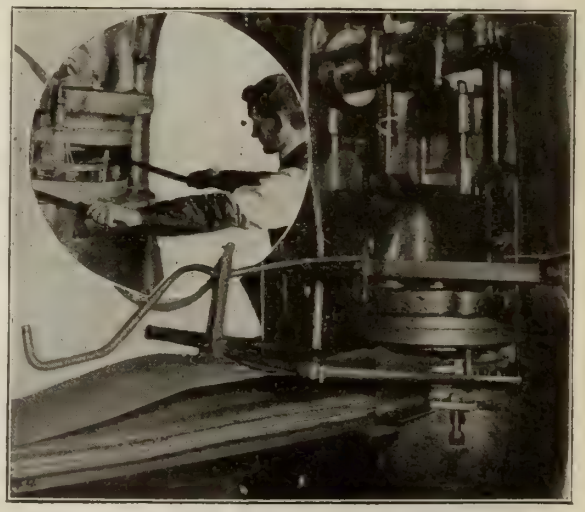


TELESCOPE GUARD.

This guard surrounds plunger and is fastened to head so that as ram descends the parts telescope one within another. At the top of stroke enough space is left for feeding stock, but not for getting fingers under guard.



TELESCOPE GUARD SHOWING RAM AT LOWEST POINT OF STROKE.



SUCTION DEVICE FOR FEEDING HEAVY SHEETS.

Operator at front of machine grasps the handles and pushes the device back on supporting rod until it comes in contact with top sheet of material. When lever controlling air valve (attached to handle) is pressed, the sucker picks up sheet and operator then pulls it toward him. (The large view shows rear of machine, with material in position for first punching.) Operator then grasps sheet by the front corners and continues to feed through machine. The use of this device has done away with need of a helper and has increased production.

Shop Arithmetic, Simple and Compound Levers

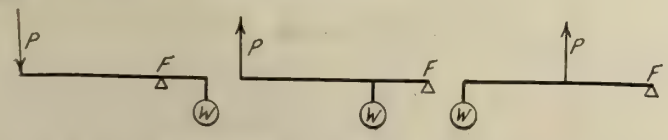
Tenth of a Series in Practical Mathematics for the Mechanic and Those Learning the Machinist Trade—Simple and Compound Levers Met in Every-Day Practice Are Discussed in This Issue

By J. H. RODGERS

IF the design and construction of machinery is traced back to its origin it will invariably be found that the elementary principle that predominates is that of the lever, in one or other of its many forms. A brief study of any piece of mechanism will readily prove this assertion. Two other fundamentals might be classed as primary factors—that is, the cord and the wedge—but these two latter are nearly always associated with that of the lever, and could well be considered incidental to the lever principle. The lever in its simplest form might be termed the pioneer machine, as man in his prehistoric state used the limb of a tree as a lever, to move the rock to and from the opening of his cave, to protect him from the perils of the outside world. In the present day the lever in itself retains all the theoretical advantages—no more or no less—that it did in the olden times, but the requirements of modern methods has compelled men to develop it to its highest state of efficiency, so that in many of the intricate mechanisms of to-day, the lever, as a common lever, has practically disappeared, especially to those unable or unwilling to observe the development of the evolution.

The lever is a bar or beam that is capable of turning about a fixed point that is called the fulcrum. The lever, commonly recognized as such, is a straight bar supported at the fulcrum, with the force applied at a relative distance from the weight and the fulcrum, so that the two former are in equilibrium. The principle, however, need not, and as a matter of fact, is not restricted to a straight bar, but may be applied in one of many forms, such as gears, pulleys and arms of any desired shape, but the underlying principles are never altered.

The three factors—apart from the lever itself—that constitute the practical application of the lever, are the fulcrum F, the power P, and the weight W; the position of the former to the latter determining their respective values and the classification of the lever. As there are three factors in the makeup, it follows that there will be three types of levers, and these are shown in the sketch below.



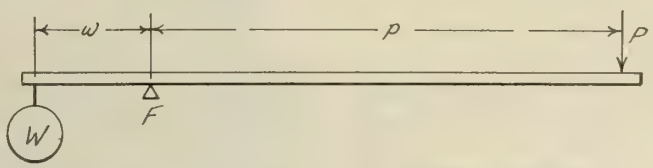
At A is shown the first form, where the fulcrum comes between the force applied and the weight supported. At B is shown the lever of the second form, where the weight is supported between the fulcrum and the force applied. The third form is shown at C, and here the power acts between the fulcrum and the weight. The classification—weight—that is generally given to any object, is the force of gravity or the attraction of the earth for that body. It is impossible to eliminate this natural force, and it is ever present in all substances, but by means of various devices, its action, apparently, may be suspended, only, however, to be transferred to another body, as the initial attraction still exists, being active through the other medium. For example, suppose a force of 100 lbs. at P, in the first form of lever, supports a weight of 100 lbs. at W; the weight is temporarily suspended, but the force of gravity still acts through the lever and the fulcrum, with the result that the downward pressure of 200 lbs. is exerted at the fulcrum F.

As stated above, the value of the power and the weight is dependent on their relative distance from the fulcrum. In working out problems involving the principle of the lever, the application of ratio and proportion is extensively used.

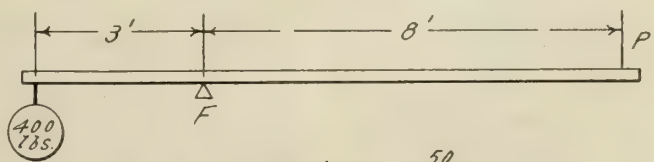
When a weight is supported on a beam or a lever, it always has a tendency to revolve about the point of support or fulcrum; this action is called the moment of the force and may be determined by multiplying the weight or force by the distance from the fulcrum. Equilibrium is attained when the force moment balances the weight moment. To lift a weight the power moment must be slightly in excess of the weight moment, but this need not be taken into account when calculating such problems in ordinary shop work.

The equation for all lever calculations may be stated as follows: Force multiplied by the force arm equals the weight multiplied by the weight arm. In the expression of a formula and using the letters as shown in the sketch, the equation would be:

$$P \times p = W \times w.$$

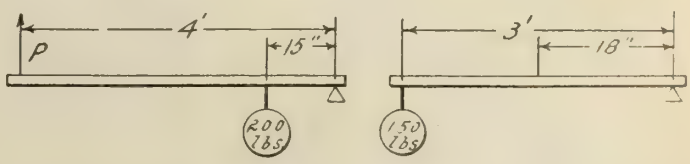


A concrete example of the above may be given. Suppose it is desired to support a weight of 400 lbs. at a distance of 3 feet from the fulcrum, and the power arm is 8 feet long, and on the opposite side of the fulcrum; what force would be required?



$$W \times w = P \times p \qquad P = \frac{W \times w}{p} = \frac{400 \times 3}{8} = 150 \text{ lbs}$$

The solution for the second form of lever is similar to the first, and the advantage is practically the same, the difference being that the force acts in the opposite direction to the weight—upwards. In the third form the action is the same as the second, but the mechanical advantage is lessened owing to the



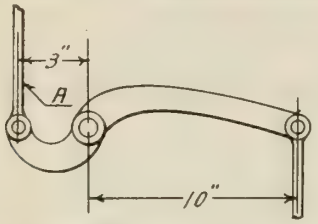
$$P = \frac{W \times w}{p} = \frac{200 \times 15}{4 \times 12} = \frac{125}{2} = 62\tfrac{1}{2} \text{ lbs.}$$

$$P = \frac{W \times w}{p} = \frac{150 \times 3 \times 12}{18} = 300 \text{ lbs}$$

fact that the power applied must be greater than the weight supported. Below are examples of the two latter forms of simple levers.

It will be seen from the above that, when the power acts between the weight and the fulcrum it must be greater than the weight; therefore, for general purposes, the efficiency of such an arrangement must necessarily be considerably less than the levers of the first and second orders.

In the examples that have just been given, only straight beams have been considered, but it is seldom that these ideal conditions will occur in practice, and in many instances it is not advisable that they should. The fundamental principles, however, are the same in every particular; and that is, that calculations for the different moments must be made on the 90 degree basis, where the arm length is taken as the perpendicular distance from the direction of the pull or force applied to the point of support. The principal objects of irregular shaped levers is to avoid interference with other parts of the mechanism when in motion; sometimes the shapes are designed for appearance only.



The above sketch shows a type of lever that is frequently met with in machinery, and in this particular case the primary factor is the movement of the ends to operate slides or valve spindles. In the example here given it is required to find the throw of an eccentric or the lift of a cam, operated on the long arm, to give a vertical movement of 1⅜ inches to the rod A. To the right is shown a skeleton drawing of the centre lines of the lever, and the arc passed through in making the cycle. To find, by calculation, the required throw, use the principle of proportion as explained in a previous lesson.

$$3 : 10 = 1\tfrac{3}{8} : X$$

$$X = \frac{10 \times 1\frac{3}{8}}{3} = \frac{\overset{5}{\cancel{10}} \times 11}{3 \times \underset{4}{\cancel{8}}} = \frac{55}{12} = 4{\cdot}58 \text{ in.}$$

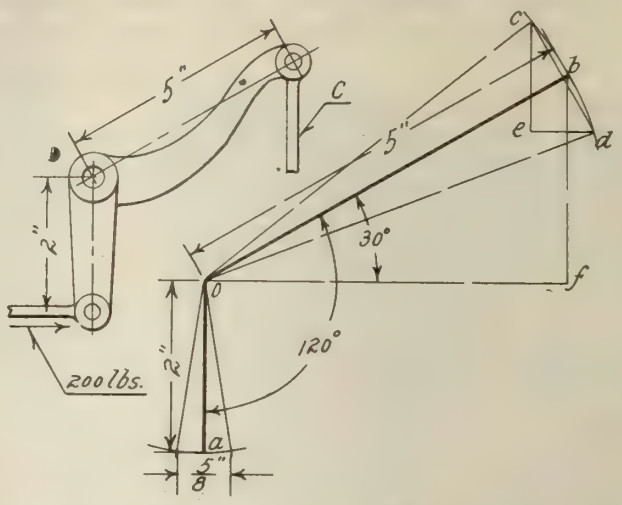
It often happens that a lever may be placed in a position that a direct right angle pull is impossible.

In the sketch shown the rod B is to have a movement of 5-8 of an inch, and is to overcome a resistance of 200 lbs. With the dimensions given, what will be the vertical movement of the rod C, and the force required to overcome the pressure acting at B? The length of the chord c-d, at the extremity of the long arm, can be found by proportion, thus:

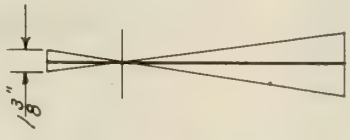
$$\tfrac{5}{8} : c\text{-}d = 2 : 5$$

$$c\text{-}d = \frac{\frac{5}{8} \times 5}{2} = \frac{5}{8} \times \frac{5}{2} = \frac{25}{16} = 1\tfrac{9}{16} \text{ inches.}$$

It will be seen, however, that the upper end of the vertical power rod C will travel through the arc c-b-d, but due to the inclination of the arm at the angle of 30 degrees to the horizontal, the



throw of the crank at the lower end of the rod C will only require to equal the length c-e of the right triangle c-e-d. This length may be found by "trig" and



the rule to apply would be: Side adjacent equals hypotenuse multiplied by cosine, or:

$$\text{Side Adj.} = \text{Hypot.} \times \cos. = c\text{-}e = (c\text{-}d) \times \cos. 30$$

$$c\text{-}e = 1\tfrac{9}{16} \times {\cdot}866 = 1{\cdot}353 \text{ inches.}$$

As b-f is the direction of the power pull the moment for the power arm must be found by multiplying the power applied by the length of the line o-f, perpendicular to the line b-f. This length can be determined by the formula:

$$\text{Side Adj.} = \text{Hypot.} \times \cos. = 5 \times {\cdot}866 = 4{\cdot}33 \text{ in.}$$

Then the power required to overcome the resistance of 200 lbs. at the short end of the bell crank would be:

$$2 : 4{\cdot}33 = X : 200 \quad \text{or}$$

$$X = \frac{2 \times 200}{4{\cdot}33} = \frac{400}{4{\cdot}33} = 92{\cdot}4 \text{ lbs.}$$

FORD-SMITH MILLING MACHINES

Unfortunately our composing room dept. made a rather peculiar error on page 10 in advertising section of our Aug. 7th issue.

This referred to the Ford-Smith Machine Co., Ltd., of Hamilton, Canada, who are well known for their line of milling machines.

The advertisement was made to read "Mining Machines" in place of "Milling Machines."

The corrected advertisement appears on page 74 of this issue.

The earliest known mention of cigars is in a book published in 1740 under the title of "Distresses and Adventures of John Cockburn." It appears that Cockburn was cast on a desert island in the Bay of Honduras, from which he swam to the mainland, and thence travelled afoot to Porto Bello, a distance of 2,600 miles. Here he met some friars, who gave him some "seegars" to smoke. "These," he says, "are some leaves of tobacco rolled up in some manner that serves both as pipe and the tobacco itself." Though this is the earliest date at which cigars appears to be mentioned by that name, so far back as 1498 two soldiers sent by Christopher Columbus to explore Cuba told their companions on their return how the natives carried in their mouths a lighted firebrand made from the leaves of a certain herb, rolled up in maize leaves. The description of an Indian method of smoking given by Lionel Wafer, in his "Travels in the Isthmus of Darien," in 1699, shows that they then smoked cigars made just as they are made now.

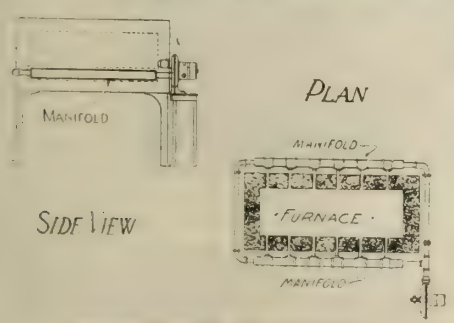
A Combination Gas or Electric Blow Torch

With an Improvised Furnace, of Ordinary Firebrick, You Can Produce the Same Results as With a High Temperature Furnace. That is—if You Use a Torch as Herein Described

By FRANK C. PERKINS

THE accompanying illustration, Fig. 1, and drawings, Figs. and 3, show the operation of a gas-electric blow-torch, developed at Cleveland, O. It is stated that with an improvised furnace of ordinary firebrick, using the gas-electric blow torch, one can produce the same results as with a high temperature furnace—and at only a fraction of the cost. It requires neither engine, compressor, nor any special alteration of equipment. It is self-contained, requiring only connection with the electric light socket and the gas line, to produce a clean, even temperature up to 2,500 degrees Fahrenheit.

It is pointed out that it takes only a minute to put the blow torch into operation as it is only necessary to turn on the current, light the gas, and it is ready. It is instantly adjusted to any position or angle, and it can be carried anywhere in one hand. The cost of operation is only from five to ten cents per hour, and the intense heat produces results in time and money saving almost beyond computation. There is practically no machine shop, blacksmith shop, automobile repair shop, welding shop, or factory where metals are used and heat is required that a gas-electric blow torch cannot be used to advantage. It is convenient, economical, and most satisfactory as a heating equipment for hardening (including high-speed steel), tempering, annealing, forging, brazing, making shrink fits, pre-heating for acetylene welding, babbitting, removing

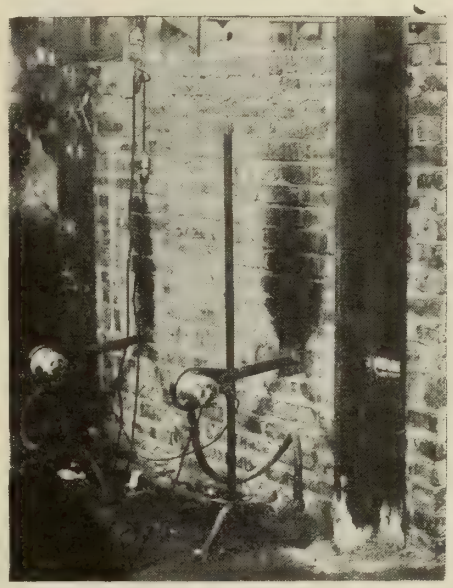


OTHER VIEWS OF FURNACE.

babbit from bearings, melting various metals, also for making pattern castings, straightening bars, shafts, frames, axles, crank shafts in centre, and bending tubing and heating rivets.

It is used to advantage for hard soldering, fitting boiler patches, skin drying, molds, heating core ovens, repairing tools, drying cores, repairing patterns gates, riveting frames, housings and spindles, also for removing old insulations from stators, armatures and soldering large commutators, removing pulleys.

It is claimed that one of these burners has been developed which is extremely useful for small soldering jobs—for brazing or for heating parts in inaccessible places, and it can be either attached to the regular burner or can be made extremely flexible by using the reducer,



ILLUSTRATING THE IDEA, AND INSTALLATION.

as illustrated, and a short length of hose. The maximum flame length is about 10 inches, the diameter 1½ inches at its largest point. The minimum flame length is three inches, with a diameter of one inch, tapered to a cone. The maximum gas consumption is 52 cubic feet per hour with natural gas, and 70 cubic feet per hour with artificial gas. The minimum gas consumption is 18 cubic feet per hour with natural gas and 25 cubic feet per hour with illuminating gas.

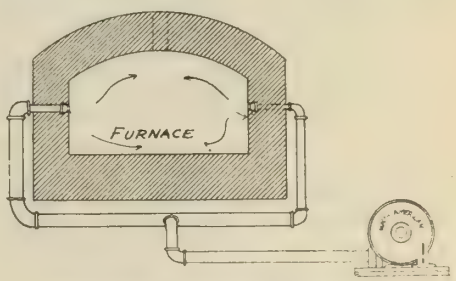
Another blow torch attachment has been designed which gives the same satisfactory results when used for small hardening or melting furnaces. The reason for using this attachment is to prevent the burning of the nozzle when it is inserted into the furnace. Gas is protected into the furnace and does not burn on end of nozzle. Changing from the blow torch to the furnace burner can be done in a moment by simply slipping the one off and the other on.

The oil-electric blow torch operates with the same high efficiency as the gas-electric torch, the only difference being its ability to burn kerosene. This oil-electric blow torch is fitted with a specially designed kerosene oil burner. This burner operates on the atomizing principle, but is also fitted with a vaporizing coil to gasify the fuel after the burner has been in operation long enough to heat the coil.

The particular feature of the oil-electric blow torch is that it will light instantly without pre-heating. It produces a clear luminous flame of approximately the same temperature as the gas-electric torch. Its range of control is excellent—furnishing a maximum flame length of about 24 inches with a diameter of 5 inches at its largest point.

The electric blow torch will also burn either natural or artificial gas successfully and is fitted with a gas control cock the same as the gas-electric. Thus this torch is really universal. It can be used in the city for the many heating and repairing jobs to which it is adaptable, and it can be easily transported to the country or to any district where there is no gas, and used with oil. The maximum kerosene oil consumption of the oil-electric blow torch is approximately 2½ gallons per hour—the minimum 1½ gallons per hour.

The gas-electric blow torch has a blower of extremely substantial construction, which will operate continuously for practically any length of time, due to the fact that over-heating of the motor is absolutely prevented by the air entering the blower which must first pass around the motor before entering the fan chamber. The gas enters through the opposite side, and the mixture of air and gas is made perfect by



SECTION THROUGH FURNACE.

the rapidly-revolving fan. When the mixture leaves the fan chamber it is a perfectly homogeneous mixture of air and gas of the most combustible nature. Both the volume of air entering the blower housing and the supply of gas is under instant control. The motor is entirely enclosed to prevent dirt or dust getting in contact with the bearings and other moving parts, and the constant cooling blast of air keeps it in perfect running condition.

The Various Mechanical Properties of Steel

Taking Up the Consideration of the Question of Brittleness, Together With Investigation of Failures of Various Kinds. A Paper of This Nature on Steel is Especially Valuable at the Present Time

By W. H. HATFIELD, D. Met. of the Brown-Firth Research Laboratory, Sheffield, Associate Member

(Continued from last issue)

IN a recent paper previously referred to, Rosenhain and Hanson describe an investigation into the cause of cracking in a thick boiler plate. The failure examined occurred in the last stage of manufacture, that is, cracking during cold bending. The authors present interesting data, and the results of subsidiary experiments bearing upon the case. They deduce that the cause of failure lay in the growth of large crystals in the ferritic bands, claiming such crystalline growth to be responsible for the low impact value of the material, and that the low impact value of the material was an indication of the mechanical properties which produced failure. The processes through which this particular plate had passed were those through which other plates had passed which had not cracked, and the author's conclusions would have been more convincing if they had definitely shown that successful plates had not possessed the same features which they condemned in the plate which had failed. One would rather suspect that the breakage of this plate was due to the presence of mechanical defects or the production of small incipient flaws by over-bending in the cold. Unfortunately, the stages of bending are not published. The author discusses this paper now, since it has a direct bearing upon the technical points which he hopes to bring forward later.

Another well-investigated failure is that of the St. Neots rail. This failure was the subject of a Board of Trade Inquiry. It has also been dealt with by Dr. Arnold, F.R.S.; Dr. Stead, F.R.S., and others. Here we have an extremely valuable instance of a failure with many well-authenticated details. The rail was 22 years old, and it had worn down 5-16 in. under traffic abrasion; it then subsequently smashed into a number of pieces, causing the well-known disaster. One eminent investigator states that thousands of rails of worse composition had served satisfactorily. The mechanical properties, as shown by the tensile tests, were good. One extremely important feature, however, seems to be that the upper surface of the rail consisted in many parts of a martensitic layer (layer of hardened steel). This layer contained thousands of hair cracks. Such a martensitic layer may conceivably have been produced by abnormal effect of the brakes, and such a layer would yield the minute cracks just described under subsequent usage. The main points that it is wished to record are:

1. The original satisfactory condition of the rail as proved by the satisfactory behaviour over 22 years.
2. Its mechanical condition.
3. The presence of surface cracks.

Leaving this case for the present it is proposed to describe an interesting case which recently came to the author for investigation. He was informed of a case in which a piece of structural steel (angle-iron) made from shell discard, had broken sharply in two with a blow from a 14-lb. hammer. The fracture is illustrated in Fig. 1, page . He was incidentally informed that this occurrence had raised grave doubts in the minds of the firm concerned with regard to the advisability of the extended use of such material. In due course the pieces came into his hands, and an investigation was entered into with considerable enthusiasm, as here indeed was apparently an instance of really brittle steel. In the first place the chemical composition of the material was determined, and it was immediately found that the steel was not shell discard but low-carbon structural steel. That discovery, in itself, as will be appreciated, was quite an important one when present circumstances are considered. The figures obtained in the analysis were as follows:

	Per Cent.
Carbon	0.09
Manganese	0.65
Silicon	0.017
Sulphur	0.038
Phosphorus	0.061
Tungsten	Nil
Chromium	Nil
Nickel	Nil
Vanadium	Nil
Titanium	Nil

Microsections were prepared and the microstructure of the steel studied. In Fig. 2 will be found a photograph of the unetched structure which gives an idea of the amount of non-metallic inclusions present. There is, of course, always more or less of this non-metallic matter in these structural steels, and its layout is always parallel to the direction of rolling; hence in this particular instance the inclusions were in path at right angles to the fracture. In Fig. 3 will be found the etched structure at 100 diameters and the amount of pearlite, together with the size of crystal, can be studied. In Fig. 4 will be found the microstructure of the material at 500 diameters, and this particular photomicrograph enables the condition of the pearlite to be examined. The author did not consider that the micro-examination brought out anything abnormal, but found that it confirmed the results of analysis.

The mechanical properties of the material were next studied in proximity to the fracture. The tensile values, includ-

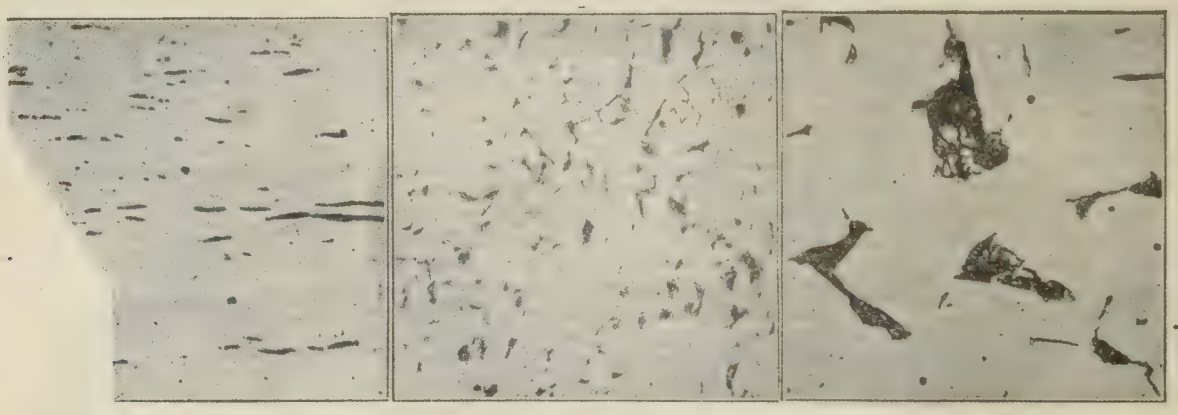


FIG. 2—UNETCHED x100 DIAM. FIG. 3—x 100 DIAM. ETCHED. FIG. 4—x 500 DIAM.

ing the elastic limit (limit of proportionality) were determined, and then the different values were obtained under the Arnold, Charpy, Izod, Fremont, Sankey, and Stanton tests. The hardness was determined by both the Brinell and Shore methods; the results will be found in the following table, whilst the full details of the actual tests will be found in Appendix I:

Tensile—	
Elastic limit	15.9
Yield-point	20.9
Maximum stress	29.4
Elongation of area	30.0
Reduction of area	61.9
Alternating Impact, etc.—	
Arnold alternating-stress test	211 reversals.
Charpy impac ttest	2.9 kgm. or 20 ft.-lb.
Izod	50 ft.-lb.
Frémont	23 kgm. 90 deg.
Sankey Alternating-bend test	33 bends 2,320 ft.-lb.
Stanton repeated-blow test	635
Harness—	
Brinell hardness number..	120
Shore Scleroscope number.	20.5

It is considered that these values are of much interest. In the first place, the Arnold and Sankey tests give too good values for the steel to be considered brittle. The Charpy, Izod, and Fremont gives values which must be considered very good, therefore the steel is not brittle under the notched-bar tests. For 28 tons to 32 tons steel the tensile values must be considered quite satisfactory. Why, therefore, should this angle-iron of good composition, microstructure, and mechanical tests break with a single blow from a 14-lb. hammer? The explanation appeared to be forthcoming as a result of a careful examination of the fracture. At the point marked by the arrow there was a discoloration indicating a sharp, already-existing crack of small area. The author considers that this crack led to an undue concentration of stress, and that, in spite of the good qualities of the material, fracture extended right through the piece in the manner described. Continued observations, both in this country and abroad, have readily and finally established that the sharpness of a notch or the gradually decreasing value of the radius at the bottom of the notch, accentuates its effect in reducing the amount of energy absorbed in destroying an impact test-piece. It is now firmly established that the stresses become increasingly great locally to a notch according to its sharpness. Professor Hopkinson, in one of his papers has observed quite truly that if the bottom of the notch or crack were infinitely sharp, this concentration of stress would cause the production by a small force of a high local stress at the base of a notch or crack sufficient to exceed the strength of the material and cause a continued propagation and development of fracture. In other words, failure such as occurred in this piece of structural steel, in some of the cases of boiler plate failures and, in the author's opinion, in the St. Neots rail, have been due to existing cracks of considerable "sharpness," which have, by their creation of unduly high local stress, exaggerated abnormally the work which the material was locally called upon to do. Impact values may vary considerably in a given steel, but a high impact steel as already shown, is not impervious to disastrous failure under conditions such as those just discussed.

It will be noted in the case of this piece of structural steel just described that the Stanton value is low. In a 60-tons tensile steel values of 6,000 to 8,000 blows are obtained. In this particular instance the energy of blow was exactly the same, and the low value is explained by the low elastic limit. It will be observed that this low value (Stanton) was obtained in spite of a high notched-test value. The general argument for the utility of the notched impact (single-blow) test usually relies on the claim that through inadvertence or design, sharp corners, notches, defects, even cracks have to be counted under actual service conditions.

Surveying notched-bar, impact and "fatigue" tests generally, the author considers that one definite fact is apparent, namely, fatigue tests with notches, such as the Stanton test, do not show any relationship to the impact values. For instance, two high-tension steels of a suitable elastic limit otherwise identical, one giving 50 ft.-lb. under the Izod, whilst another gives 8 ft.-lb., will be found not to show anw disparity under Stanton test, both breaking under that form of test at something like 7,000 blows. As an instance of actual observations made, the diagram shown in Fig. 5 is instructive. There will be found the results of tests on six 60 tons to 65 tons steels. The full tensile values, together with the Stanton, Izod and Charpy values were obtained. It is clear that everything else being equal, the incipient cracking prior to rupture of the material occurring at the notch of the Stanton test-piece should, on the above argument, have been prevented from developing by the high impact value of the material, thus providing a discrimination. To the author's mind it would appear that the inference to be drawn from this and other data which will be provided later, is that once the elastic range has been passed, final rupture cannot be prevented by variations in impact value. Hence arises the fundamental importance of thoroughly considering the distribution of stress and the providing of a sufficient factor of safety in relation to elastic range.

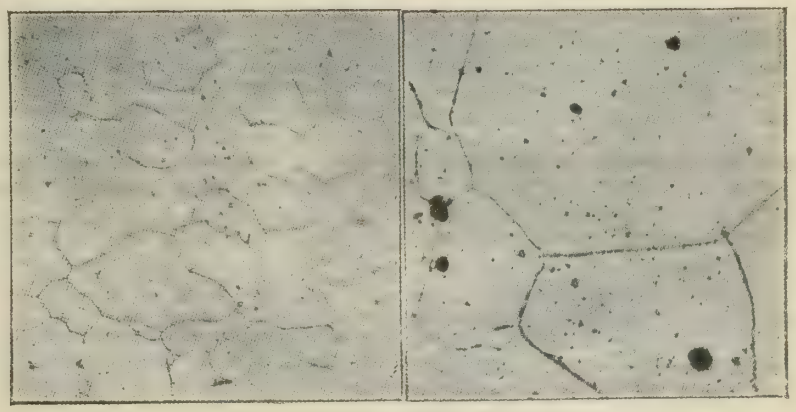


FIG. 6.—WROUGHT IRON AS RECEIVED x 100 DIAM. ETCHED x 500 DIAM.

A Discussion of the Methods Employed For Mechanical Testing

As regards the tests now in use for the mechanical testing of steels and irons, it may be safely said that each provides information of value. This may be stated without excepting any individual test. How are we to judge the relative value of the diverse means of testing from the engineers' point of view? It would appear that those tests are most instructive concerning the ultimate behaviour of the steel, which nearest approximate to, or reproduce, the conditions under which the steel has to serve. The tensile and torsion tests are of particular value, and in most cases clearly give a direct indication as to the suitability of the material. Particularly useful for purposes of design is a more complete knowledge of the elastic range under these two forms of test. Until more ready means of determining the limit of proportionality in the tensile test than the present-day extensometer can be obtained, such determinations cannot become routine tests, but the engineer might usefully obtain sufficient number of such readings to assist him in more accurately calculating his safe ranges of stress.

As regards the tensile test we have much to learn, and investigations such as those which have of late been pursued by Professor Dalby, F.R.S., are invaluable. He and other workers have advantageously shown the value of the detailed study of even our most commonly employed tests.

(To be continued)

In the slang of the United States, a "dago" is any dark-skinned foreigner from Southern Europe or Spanish America, especially an Italian, a Spaniard, or a Portuguese. In his "Life of Commodore Perry" (the American naval officer who opened Japan to commerce in 1852), Dr. William Eliot Griffis says: "In Spanish America 'Santiago,' 'San Diego,' 'Iago,' and 'Diego,' are such frequently recurring vocables that the Yankee sailors call natives of these countries 'Dago men,' or 'Diegos.'"

WHAT OUR READERS THINK AND DO

When is a Parting Tool Not a Parting Tool?

On July 17th We Published Mr. Ernest's Views on the Subject of Parting Tools. Here Are Two More, With Still More to Follow. Have You Sent in Your Idea Yet?

CUTTING-OFF IDEAS
Of S. G. Macklin

Regarding cutting-off tool discussion, I wish to continue where Mr. Ernest left off.

Having called your attention to the importance of a level bottom to the tool and proper side and end clearances, which have been well determined and can be obtained from any chart, let me suggest that the top rake and cutting edge can be made to suit various conditions.

The tool as made by the tool grinder is usually left level and square on the top.

Now, any tool which has been used a long time turning high carbon steel will have a little pit behind the cutting edge, proving that the flow of metal is decidedly tangent to the diameter. Now, this square cutting edge is on the same plane as a horizontal centre line, whereas the flow of metal being tangent must be so to a perpendicular one.

To accommodate this condition is the first consideration, for it is evident that the metal will pile up on the tool until there is sufficient pressure to compel it to change its direction of travel. The conclusion we have now reached being that we must grind a slight curve as our means of creating favorable conditions.

Observation of this one point will be the best guide.

We now have a tool that will offer the least resistance to the metal, and if we can insure the chip being of less width than the groove we wish it to pass out of, we can cut for months and not worry much.

When the metal meets the resistance of the tool there is as great a tendency to overcome this resistance sideways as endways. I mean that the chip has a natural tendency to spread.

We will grind our tool, not square across the end, but ever so slightly rounding. This gives the chip a natural tendency to curl its edges and make it narrower than the space cut.

It is this one thing more than any other that makes the difference between a good tool and another one on the same piece of stock.

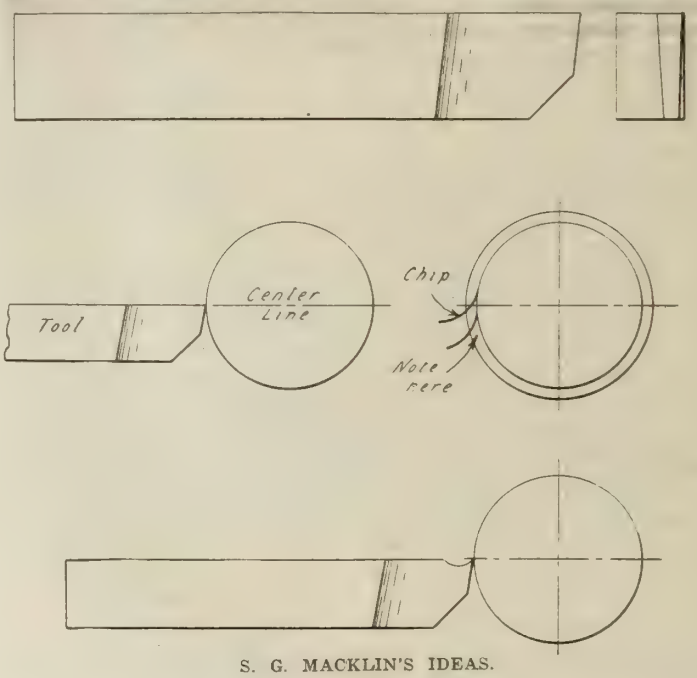
Many young fellows who think that cutting off stock is an art, that one has to be born with the know-how and so on, will realize that after many tries and careful grindings the cut-off tool got their goat, and with their patience all gone and a feeling of madness and despair, they grind again with a to-hell-with-it feeling, and the thing worked fine.

I offer this last as a suggestion that it is not the swearing that helps the job, but the ever so slightly rounding cutting edge.

The proof of these theories can be found in every-day practice.

If it is not so the metal on the sides of the cut will pinch and bind just as a board does on a rip saw.

But there are ways of using and keeping such a tool. The ideal cutting-off tool is the forged one with clearance below the top face and its clearance behind the point. Unfortunately this makes a weaker section where the stress is greatest. And workmen are prone to grind this forged tool on the top face, so that very soon it ceases to be the thing we so proudly forged, and gets shoved aside, the workmen meanwhile hunting for a better tool and growling about the "poor tools they have in this shop." It is difficult to reforge a tool so misused. The best way is to cut off the remaining part of the blade entirely and begin anew. The writer likes such forged tools and has been able to get the maximum of life from them when used personally, although the cost of the forged tool is almost as great as the inserted blade type, but prefers the latter style for all-round shop use.

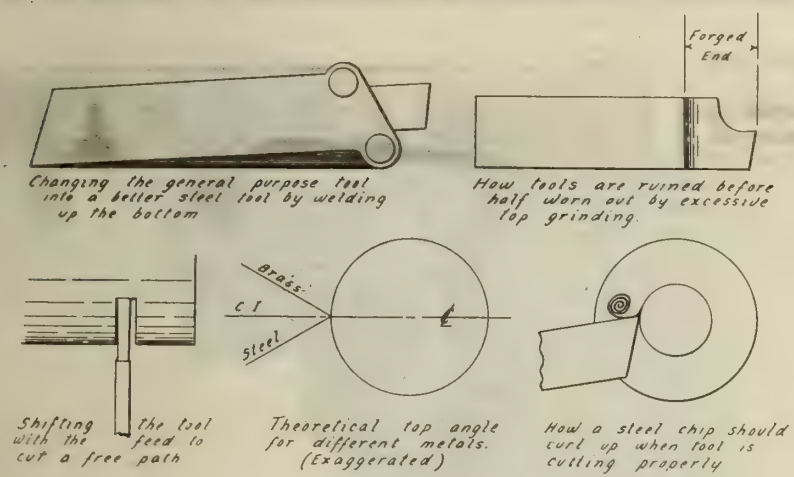


S. G. MACKLIN'S IDEAS.

CUTTING-OFF TOOL DISCUSSION
By Donald A. Hampson

The point that any cutting-off tool or parting tool must be wider at the extreme end than back of it is well taken.

A careful observer will have noticed that any tool cuts small when dull, and practically all tools will cut a path slightly in excess of their own width when sharp. So it is with the parting tool. If the edge is dull, ad particularly if the two corners get worn a bit, the tool will pinch and tear. More frequent touching on the front and less heavy grinding after it gets dull will be far better for the work. As it is hard to keep up the sharp corners in everyday hustle, some men grind them off into a 45 degree bevel of about a sixty-fourth in length. This seems to work well.



DONALD H. HAMPSON'S IDEAS.

Much of the work that is cut off has to be faced again or the end surface does not have to be particular anyway. A trick that will speed up this work remarkably is to cut a swath say a thirty-second wider than the tool by moving the carriage back and forth that much as the feeding-in takes place. This keeps a clearance on the tool at all times and permits a much higher rate of feeding. Moreover, the sides of the cut will look fully as good as the one where the tool got stuck and broke once or twice. This simple trick was passed along to the writer in Uncle Sam's country a number of years ago, by "a man from Canada," and it has been worth money to know it.

Many men make a mistake by overfeeding at the start. On a job of large diameter or a rough casting, they shove the tool in so hard or else have the lathe running so fast that the edge goes off on the first revolution. Thereafter they have trouble with the tool and consider themselves lucky if they get through the piece without a break. If the scale had first been ground off or cut away with another tool the cut would have been started correctly and under no handicap. A slower speed with patience is usually the "make haste slowly" of cutting off.

With tools of the Armstrong variety, the forging expense is entirely avoided and a well-shaped tool provided at the start. Mr. Ernest's trick of swelling the end of the blade to make a wider cut is good but the writer has seldon seen blades soft enough to do this. It will be found, however, that the necessary clearance is provided in most cases by keeping a sharp front edge and by cleaning the sides of the blade of the scale and black from hardening. Another advantage of this kind of tool is that almost any poor fist of a workman can sharpen it.

Poorly fitted and badly worn surfaces on the lathe are a source of trouble, but a free-cutting tool will make them less troublesome. Oil or compound of steel should be applied so it reaches the cutting edge; a drop there is better than a can spilled over the lathe, and then with a sharp tool, properly set, the chips will curl out with that peculiar hiss so welcome to the machinist.

Causes of tool breakage, other than already mentioned, are too much clearance on the front of the tool (which takes away the bearing and allows the tool to feed in too easily and too fast) and lack of rake on the top surface (which makes the tool grind and push the metal off instead of shearing it). True, the top of the tool may be ground at an angle forming a "lip," but as mentioned with the forged tool, this soon makes a great deal more grinding necessary or the reshaping of the tool.

The writer has bettered the standard tool holders in this respect by welding up the bottom full from heel to the screw boss. By so doing the blade is permanently fixed at an angle of about 7 deg. and an improved cutter for steel is thus arranged. It works well on cast iron, too.

Before hardening forged tools they should be set up on a planed surface and checked for clearance from the top down. If they don't show up correct in such a test with a square they should be ground or cut off in the shaper until they do. And a test for decreasing thickness back of the point should be made. It is often easier to correct defects here by filing than to do it with the wheel after the tool is hard.

A good way to ease up on the cutting-off tool on deep work follows. Suppose the cut is 2 in. deep; then, instead of setting the blade out two inches from the holder set it only one inch and cut that much with the stronger, stiffer tool. Set the tool out another half inch and cut that far. Finally cut the last half inch only with the weak tool.

Very often a parting tool is used full depth on a job that has a portion of the cut turned away afterwards. A better way is to do the other work first (as for instance, chamfering the heads of two bolts made together) and then cut off with the blade through the short section, avoiding the long cut and the tendency to rub on the sides.

Much of the trouble with such tools comes from not being properly set. They must be set with sides parallel to the cross feed or with equal side clearance to prevent crowding to one side with the attending crocked cut and broken blade.

Eggs are reported to be selling in some Russian cities at the equivalent of $5.10 apiece in currency. Russian currency is made by the process of running slips of paper through a printing machine. A good egg should be worth a lot of it.

After a survey of conditions the country over, the National Industrial Conference Board announced that the cost of living for American wage earners was 71 per cent. higher in July, 1919, than at the outbreak of the world war in July, 1914. This was said to represent an advance of 6 per cent. since March, 1919, and of 12 per cent. since June, 1918. The increase of 71 per cent since July, 1914, compared with an increase of 61.3 per cent. up to March, 1919, of 65.9 per cent. up to November, 1918, and of 52.3 per cent. up to June, 1918. The total increase for the five years' period on food was 85 per cent.; shelter, 28 per cent.; clothing, 100 per cent.; fuel, heat and light, 57 per cent.

For hundreds of years Mexican Indians had a horror of what they called the pest spot of Lake Chapala, near the shore at Tizapan, say the "New York Evening Post." They would not bathe in it or sail around it, declaring that the water was oily. Then, after a time, they cautiously began to paint their wooden boats with this oil, which proved so effective in keeping out the water that it became the general custom to use it. They did not know that this was petroleum gushing up through the water—a magnificent flow, about two miles out in the lake, which to this day gushes apparently without varying. When the water is low, petroleum floats in solid masses, each large globule weighing about twenty-five pounds.

Paris fashion reports tell of dresses in kid such as gloves are made of, and of trimmings of kid and patent leather on all sorts of outer garments. Leather being so scarce in Europe that boots and shoes have reached unprecedentedly high prices, it is to be requisitioned for other articles of dress also. That is the way of fashions. When leather is very plentiful again it will vanish from the costumes, and cloth-topped boots and whole cloth shoes will be in favor. It is a paradox.

DEVELOPMENTS IN SHOP EQUIPMENT

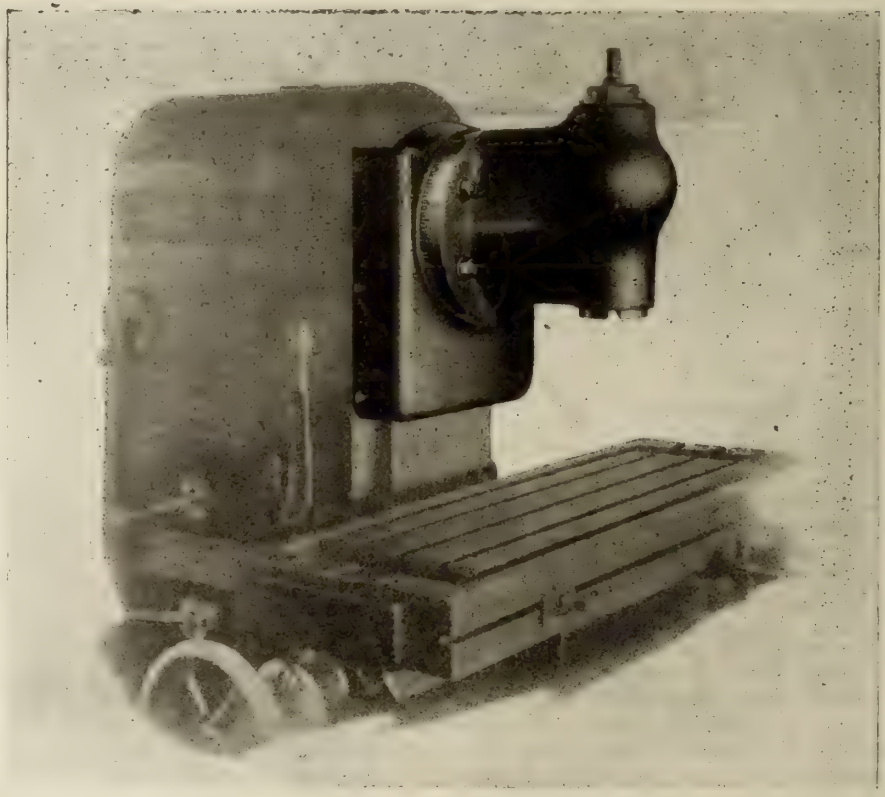
VERTICAL SPINDLE MILLING ATTACHMENT

Every machine shop at sometime or other has work that can be more advantageously performed with a face mill on a vertical spindle. To meet the demand of those who cannot keep a vertical milling machine busy, theere is always the vertical spindle attachment, which will give the range of a vertical milling machine on ordinary classes of vertical milling work.

The Cleveland Milling Machine Co., of Cleveland, Ohio, have developed a fixture of this nature, and a glance at the illustration will serve to show its general construction.

This attachment is of very rigid construction and capable of milling up to the capacity of the machine and is easily mounted on the face of the column.

The drive is taken from a gear fastened to the nose of the spindle, which in turn drives the spur gear on the horizontal shaft and the spindle is in turn driven by large mitre gears. All gears and shafts are made of steel and enclosed, running in bronze bearings throughout. The bearings on the spindle are the same as the milling machine spindle and form two taper cones in opposite directions adjusted by a nut on the outside of the spindle. The base of the head is graduated so that it may be set at any angle in a vertical plane parallel with the elevating screw. The distance from the face of the column to the vertical spindle and the distance from the nose of the spindle to the top of the table in the highest and lowest position covers the range of the ordinary vertical spindle milling machine. This attachment, when clamped in position on the dovetail slide of the column which extends above the centre line of the spindle, is as rigid as if it were a part of the milling machine.



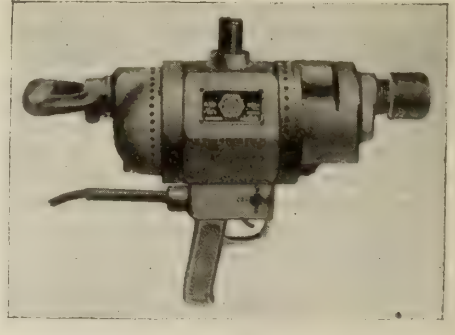
CLOSE UP VIEW OF THE ATTACHMENT.

GENERAL SPECIFICATIONS

	No. 1	No. 2	No. 3
Distance from Face of Column to center of Vertical Spindle..	10¾"	12½"	15"
Distance Nose of Spindle to Table—			
Highest position	1¼"	1½"	2"
Lowest position	16½"	16½"	18½"
Cross Range or Machine	8"	10"	12"
Longitudinal Range of Machine	22"	28"	34"
Taper Hole in Spindle	No. 10 B.&S.	No. 11 B.&S.	No. 12 B.&S.
Net weight	200 lbs.	245 lbs.	350 lbs.
Shipping weight	225 lbs.	300 lbs.	415 lbs.
Code Word	Abba	Abbot	Acorn

BLACK & DECKER ELECTRIC DRILL

The Black and Decker Manufacturing Company, 105-115 South Calvert St., Baltimore, Md., has recently added a new size to its line of portable electric drills. The new machine is shown in the illustration, and has a capacity up to 9-16 in. in steel, and is provided with a No. 1 Morse taper socket. It is stated the machine will drill a 9-16-in. hole through machine steel at rate of 1½ in. per min. without overloading the motor. The housing is of Magnalite, an aluminum alloy. The gears are packed in grease in a separate grease-tight compartment, and the drill spindle runs in a long bronze bushing, thrust being taken by a ball-thrust bearing. The motor is air cooled and will run continuously without overheating. The Morse taper socket is in the form of a separable sleeve secured in the drill spindle by means of a large knurled nut. By unscrewing this nut the entire taper socket is easily removed from the spindle. The drill shank protrudes slightly beyond the end of the taper socket, in order that the drill may be removed. This construction is used, for if it was necessary to leave room for the drift-pin slot the machine would be considerably less compact, and the end of the spindle would be some distance from the bearing. The machine has the customary pistol grip and trigger switch, which characterize Black & Decker drills. The machine weighs 21 lb., has a no-load

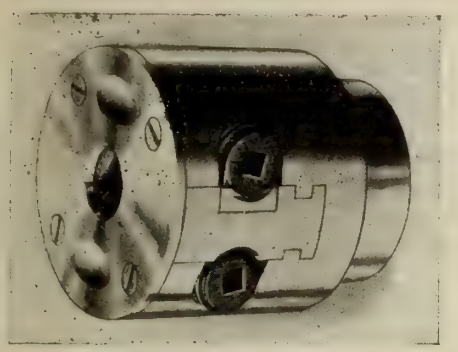


GENERAL VIEW OF DRILL.

speed of 600 r.p.m. and is supplied with interchangeable spade handle and breastplate, as well as electric connecting cable.

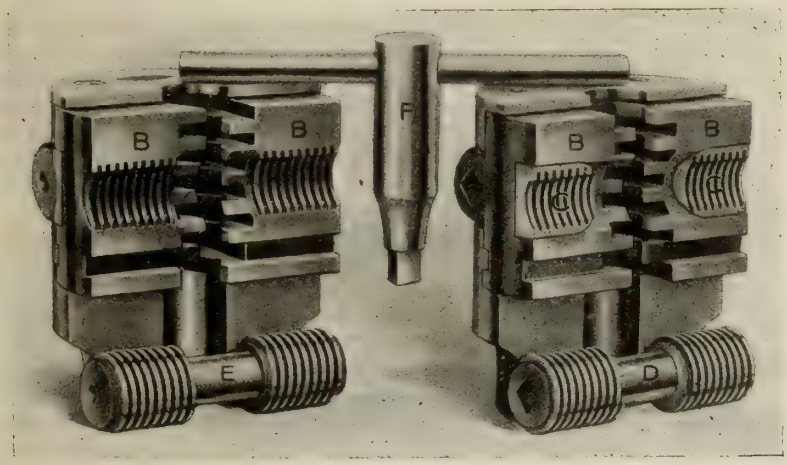
MARVIN & CASLER DRILL CHUCK

In the accompanying illustarations is shown the Casler twin screw drill chuck, which is a recent product of the Marvin & Casler Co., Canastota, N.Y.



GENERAL VIEW OF THE CHUCK.

The body of this chuck is made of close-grained cast iron, and jaws and screws are of tempered high-carbon steel. The claim is made that the combination of cast iron and steel gives long life to the wearing surfaces between the body, jaws, and screws. It will be seen that the body is reinforced by a steel cap plate, which prevents it from spreading when under strain; and a secondary screw doubles the grip of the drill chuck jaws and allows the drill to be driven to the limit of its strength. When using the chuck, the primary screw E, Fig. 2, is first operated to grip the drill shank between the jaws, and after this primary screw has been set up, the secondary screw D is operated to bring the floating nuts C against the ends of the pockets in the jaws B. The tightening of this secondary screw D results in producing a grip on the drill shank that is claimed to be twice as great as that obtained from a single screw. All parts of the chuck are made interchangeable to facilitate replacement, and there are no projections likely to catch the work or injure the operator.



SECTION THROUGH THE CHUCK.

NEWTON CENTERING MACHINE

The newly designed centering machine, illustrated and described herewith, is a recent development of the Newton Machine Tool Works, Philadelphia, U.S.A., for centering rough and irregular forgings.

Two universal centering vises of the interlocking type are supplied with the machine. The jaws are adjustable by means of a screw giving a capacity for rounds from 2 in. to 12 in. in diameter and of any desired length.

Vices are adjustable on the bed by means of rack and pinion.

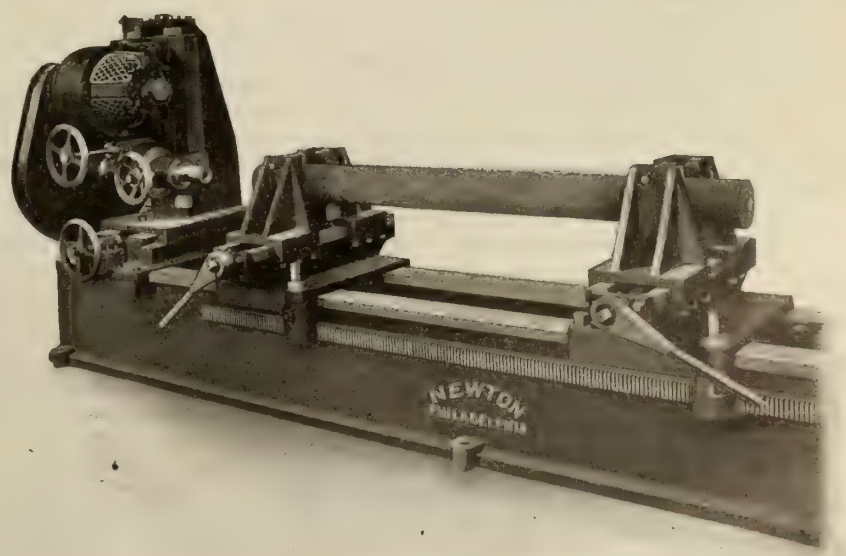
The spindle is of forged steel, 3 in. in diameter, running in bronze bushed bearings, has 4 in. cross and 4 in. of vertical adjustment, with 8 in. of hand feed.

The cross and vertical adjustments are equally divided from centre line of work.

The drive is by direct connected motor through a bronze driving gear.

Alignment of all adjustable parts is maintained by adjustable taper shoes.

Table of dimensions: diameter of spindle, 3 in.; in-and-out adjustment of spindle, 8 in.; vertical adjustment to spindle, 4 in.; cross adjustment to spindle, 1 in.; length of base, 16 ft.; width of base, 22 in.; distance centre of vise to top of base, 15½ in.; maximum distance centre of spindle to top of base, 17½ in.; minimum distance centre to spindle to top of base, 13½ in.



GENERAL VIEW OF THE MACHINE.

The All-Way Oiler Manufacturing Co., of Toronto, have placed on the market various oiler devices well worthy of investigation. The All-Way oiler is applicable to oil guns, combination filler and funnel, and the All-Way oil can.

Briefly, the oiler is the regular type of can fitted with flexible steel spout, made to bend in any desired angle or position without breaking or interfering with the flowing of the oil. There is no waste of oil when using this type of oiler, as the spout always reaches the desired spot.

At the end of spout a cleaning device is installed, which merely takes a second to operate. This same device also prevents oil from flowing too freely, thereby wasting.

The complete oiler is strongly made of copper-plated steel in different sizes.

Mr. H. Obee is manager of this concern handling these very useful lines.

Returns prepared at Washington indicate that stocks of food in storage in the United States on June 1 last were 20 per cent. greater than a year before, and the prices, where not higher than in 1918, were quite as high. There may be a suggestion of relief in such a situation, even if the profiteer is doing his best to prevent it. It costs money to keep foodstuffs in store, and the holder, if he does not sell, has to provide it.

One way to save time and eye strain is to prepare a large chart in the form of a stenciled board. This is made large enough for figures to be easily read from any part of the stock-room.

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The Canadian National Exhibition

BEFORE the publication of next week's CANADIAN MACHINERY the Canadian National Exhibition will be in full swing. The last five occasions of this great fair have been held with the shadow of war hovering over, but they have achieved a great measure of success. This year, with the doubts and uncertainties of the war period put behind, it should surpass any previous attempt in both the number of its visitors and the excellence of the exhibits. Apart from the exhibits themselves, there will be much of a spectacular nature, to attract the seeker after fresh sensations. The presence of the popular son of our democratic King will also lend a fillip to the fair.

One of the finest features of this annual gathering is the opportunity it gives for Canadians to become acquainted with each other, and to learn the good points of parts of our broad country of which he has but the most vague ideas. There are many good people in Ontario who can expatiate largely on the wonderful mineral resources of their native province, who express extreme surprise when they are informed that Quebec produced the largest part of the world's asbestos supply. The man from the Western coast, who is apt to look on anything east of the Great Lakes as hopelessly slow and out-of-date, may feel like revising his opinion after a few days spent at the "Ex." Anything that can help to overcome the narrow sectionalism that is the bane of this country is doing a valuable work.

Paying for the War

THE aftermath of Great Britain's long struggle is reflected in the speech of Mr. Lloyd George, warning his countrymen of the necessity of buckling down to earnest work to pay their debts. Great Britain poured out her blood and treasure with a lavish hand, and gave of what was her most vital asset unsparingly, that is her superb merchant fleet. Although the returns for the quarter ending June 30th show that she is beginning to pick up in this direction, she is still a long way behind, and the production of the coal mines has fallen off lamentably. With more men than ever before employed in the mines, the short hours and higher wages have increased the production cost enormously. The attitude of the labor unions under these circumstances is hard to understand. What benefit will accrue to them if they kick the country into bankruptcy is difficult to imagine, and we cannot think that the sound common-sense of the British people will allow the warning to go unheeded. There is a lesson to be gained from the British situation that should not be lost on some of the malcontents in Canada.

THE COUNTRY will sympathize with Sir Robert Borden in his unfortunate accident, which compels him to remain in bed while the festivities are in progress. However, it might be worse. In days gone by, a slip by a public man on the steps of a club when leaving would have given rise to many unkind conjectures.

DR. R. J. McFALL must be trying to get a position abroad. He has now got up and said right out that the price of beef has dropped. To call attention like that to a thing that nobody had even noticed, is sure to get him disliked. We expect to hear shortly that he has received an appointment to investigate the clothing situa- in the Solomon Islands.

As a fundamental thing it might be well to say that labor should practise as well as preach. That is, take the same attitude towards capital that it asks capital to assume towards labor, live up to its agreements with capital, and be responsible for its acts.

"Scientific management" does not mean giving the smallest possible wage and selling the product in the dearest market—it means the greatest possible output with the least possible expenditure.

There is no doubt that there would be room for still further reductions in hours, and for considerable improvements in both time and piece rates, if we could as a nation accept the theory that when we are at work we should work with all our might.

The prospect for a broader development of the chrome iron deposits of the Eastern Townships is one of considerable interest to Canada as the deposits are quite extensive and have not been worked to advantage for many years.

Prior to the war these were worked by open cuts or quarries but the process became expensive and dangerous as operations descended to considerable depths and had to be abandoned owing to the low market price for the commodity. The big deposits which have served the big steel producing centres of the world are in Rhodesia and New South Wales, so that during the war the commodity advanced to a high price around $32 per ton.

SOME critics in England consider the money grants to the successful military and naval leaders as rather niggardly, if anything. Well, what does a half million pounds or so amount to in these days, when wealth is computed in billions?

Another Viewpoint on the Accident Question

By ALBERT HEPWORTH

In your August 7th issue of CANADIAN MACHINERY you print a short article by Master Mechanic on the needlessness of accidents.

Master Mechanic treats this as a matter that is up to the individual workman. So it is, BUT legislation for the protection of the employee is to-day making big strides, and while individual carelessness is responsible for most accidents the law seems to hold the employer responsible because, theoretically, he should see that there was no opportunity for carelessness.

This attitude is rather hard, but it has ended those little shops where five machines were crowded in where only two should have been, where a tall man had to be careful in straightening up for fear of hitting his head against the countershaft, or where one had to bend under the belting should one wish to leave his machine. The writer has worked in some of these machine shops.

Some accidents are no doubt hard to avoid. A man might suddenly be taken ill and so become caught in a machine despite guards, an emery wheel might burst when put in motion, and a piece escape from the guard with enough velocity to inflict serious injury, a shaft hanger may snap under some sudden tension and come crashing down, a punch press may repeat, etc. The first of these is so rare as to be nil; the second can be reduced to nil by careful instruction of the operator, so that he will handle the wheels as they should be handled and not thrown around every time they are changed; the third can best be eliminated by the use of a steel hanger, as this hanger will bend rather than break, and the fourth can be reduced to a minmum by careful and forceful instructions to both the die setter and operator, etc.

Accidents described under your sub-heading, "Don't Take the Short Cut," are simply up to the management, because the first rule of all safety-first campaigners in any shop is that safety first rules and regulations are to be enforced regardless of the prejudices or the position of the objectors.

The writer a few years back was employed in a press shop, where methods of production were rather loose. Of course, the rate of accidents was high. The introduction of state insurance quickly brought the state inspectors on the back of the officials, because of the high accident rate, and something had to be done.

It was pointed out that large concerns having special departments for employment adopted a physical examination, and it was decided to adopt this; and eventually discharge all those not up to standard. I, though in charge of a department, was automatically in line for discharge and it gagged.

Noting that the slackness over the shop was the same I had eliminated in my department, I took the bull by the horns and saw the manager, and in the end the promise was given me to have my views laid before the executive board. This led to the appointment of myself to the following new duties: (1) That all applicants for a job be subjected to a physical examination and the jobs graded, for it was felt that, whereas a physically perfect man ought to be less liable to cause an accident, this did not at all hold in practice, in fact, the reverse seemed to hold; (2) that a perpetual shop inventory be held and kept up; this eliminated a great waste, and in the case of piece-workers a great deal of intentional or unintentional over-counting; (3) that all safety guards be put up and kept up, I being responsible to see that they were; (4) that all employees were instructed in the methods of safety.

The plan of combining these duties was, of course, only feasible in a small shop, but it has been found not only there, but in larger shops that the making of one man responsible for the application of safety devices has tended to decrease accident.

In the above case we found that during six months this system was in operation (I left to take another position then) not an accident occurred, and as far as I know this still holds good, though I have been out of touch with this plant.

Accidents, like the poor, we have always with us, but they can be reduced to a disappearing point.

The State and Government Insurance Departments will hold the employer rather than the employee responsible; in fact, accusations of gross negligence or carelessness on the part of the workman, unless proven beyond dispute, will not exonerate. Elimination of accidents is up to the employer to a great extent. This does not mean increased cost, but will certainly mean higher production and more contented men. The employer who insists on safety first may in many cases be called a crank, but his shop will not be called a butcher shop.

The above, I hope, will give you some light on accident prevention, and I hope will answer in part the question contained in the last paragraph of the article by Master Mechanic.

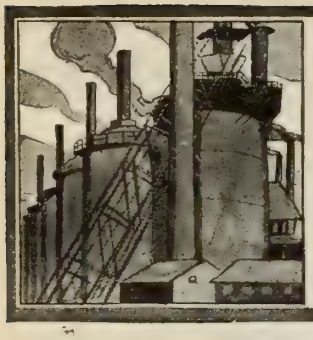
Dissolve one part of pearl ash in about eight parts of water; add one part of shellac and heat the entire mixture up to the boiling point. When the shellac has completely dissolved, cool the solution, and saturate it with chlorine until the shellac precipitates out entirely. When it is redissolved in alcohol, it makes a varnish which is as transparent as any copel varnish, and more satisfactory for a large number of purposes. This is a trade secret worth knowing.

To conserve the fats contained in the table refuse and dishwater of the soldiers' mess, the British military authorities installed grease traps. The fat collected in these traps averages more than one ounce for each man daily. The trap consists of a tin-lined wooden box, divided into two compartments by a partition that does not reach the bottom by about four inches. The dishwater and the table refuse are poured through a strainer into the vat. As the water cools, the fat forms a crust on top and is skimmed off.

A friend of mine who does heavy work of various kinds which requires gloves, and heavy leather gloves at that, advises me that gloves can be made to wear almost like iron by applying axle grease sparingly and being very careful not to get it on the cloth stitching, as the axle grease may disintegrate it somewhat.

Valuable china may be mended with the following mixture, and when dry it will resist hot water and ordinary usage. Mix a teaspoonful of alum and a tablespoonful of water. Place in a hot oven until it is quite transparent. Wash the broken pieces in hot water, dry and put them into the oven until they are warm; and while still warm coat the broken edges with the mixture thinly and quickly as it sticks instantly.

A handy paint mixer has recently been patented, consisting of a handle to which are secured two metal blades, intersecting each other at right angles. The lower portion of each is of dovetail shape, while above it is a pair of wings. This device is operated by immersing the blades in the paint, and then revolving them rapidly by placing the handle between the palms of the hands and moving them back and forth, as if rubbing them together.



MARKET DEVELOPMENTS

Dealers Report Continued Steady Buying

Machine Tool Dealers, Machine Shop Supply Men, and Steel Warehousemen All Report Steady Buying in Small Quantities—Automobile Trade Good Buyer

IN SPITE of embargoes, railway shopmen's strikes, and other strikes and threats of strikes, machine tool dealers, machine shop supply men and steel warehouse men profess themselves well satisfied with the situation. One machine shop supply man stated that the last two weeks were the best he had had this year, although all his business was made up of small orders. This shows that most of the small machine shops are keeping busy. An outstanding feature is the steady demand for material from the automobile trade, while railways are also buying freely, as reported last week.

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REPORTS from the United States show that there is a general stiffening of prices in the iron and steel markets. This is chiefly due to a better demand, but threats of further tie-ups due to various strikes make producers inclined to be conservative. There are so many factors to be taken into account that it is hard to keep track of them. The strike of the ore dockers stopped the movement of ore from Lake Superior, and the railroad car shop workers' strike produced a shortage of cars. Increased wages to railroad workers will bring about higher freights, so it is only natural that producers want to see just where they are heading. Basic pig iron has been sold in England at 165 shillings, considerably lower than American iron could be delivered there. There is considerable enquiry for export iron and the lowering of freights to Great Britain has enabled some orders to be booked for there.

* * * *

STEEL scrap has weakened somewhat from last week's prices, but it is thought that this is but a temporary condition. The labor situation is again affecting buyers of this trade, and the conditions are generally unsettled.

THE MARKET IS DULL AND UNSTEADY

Special to CANADIAN MACHINERY.

MONTREAL, Que., Aug. 18.—A combination of circumstances exist at present to make the current market of uncertain character. To the middle summer season, which is invariably associated with a decline in industrial activity and reduced demand, is added the disturbing element of labor unrest, a factor that is influencing the market conditions to no small degree. Conservative methods are the rule when sales are made, as the future is more or less obscured in the developments that are daily altering the outlook of business. Industry to-day is very much regulated by the attitude of labor and their demands, and while these, to some extent, are in keeping with the general conditions, the disorganization that is resultant of strikes and wage demands, is not conducive to normal industrial enterprise. The mills are not disposed to accept far future bookings, owing to the uncertainty of production costs, and consumers are only covering their immediate needs, the principal reason being the same as that of the producers. Many of the steel districts in the States are either affected by labor troubles or by the threatened demand for increased wages, factors that may ultimately result in early shut-downs, or curtailment of output. The general effect of a strike of any magnitude is felt all along the line, and when production stops at one point, the falling off in demand is at once transmitted to all other branches. It is this unrest among employees that prevent a more liberal policy of reconstruction. Many manufacturers of steel supplies and products are disposed to operate on a low profit basis in an effort to curb the demands of the men, but if wage increases are granted it must mean a further advance in steel prices. Steel activity in this district is confined to current requirements of consumers and the demand is about normal. The curtailment of operations at the Sydney plant of the Dominion Iron and Steel Co. is affecting the other areas that supply the basic materials of the steel mill of the company. The production of ore at Wabana will gradually ease up as a result of the reduced requirements. The limestone quarries of the company in Newfoundland has also suspended operations, as about a year's supply is now on hand. With mill quotations firm, dealers here have made no change in prices.

Single Machines Predominate

No new developments have taken place in machine tools of late and the general situation is virtually the same as it has been for the past couple of months. The volume of business passing is not great, but is of a character to encourage the dealer. The number of sales is the feature of interest, and while few of these run not more than one or two machines, the greater distribution compensates for the loss of larger orders. Like many other industries, the machine tool business is affected by the labor unrest, directly in some cases and indirectly in others. Uncertainty is the keynote and expansion or extension of manufacturing is difficult under such conditions. Supplies are moving with the usual freedom, but purchases are almost exclusively confined to current requirements.

Scrap Again Quiet

Market speculation is the chief factor affecting old materials at the present time, as the quiet demand does not tend to move the price of scrap one way or another. Some increased buying was felt a few weeks back, but this has been replaced by another dull period, in which the metal moves but slowly. The season

of the year may be partly accountable for this condition, as steel business is generally more or less affected about this time of the year. The apex of a few weeks ago has again been taken off and quotations show the market at a lower level, but the tone is one where anything may happen and it would not be surprising to see another reaction next week, with prices stronger. Coppers have declined about 2 cents per lb. in the past two weeks. Brass scrap is more firm, but has declined slightly in red brass turnings, also light and medium brass, which are one cent easier. Several steel lines show declines. Rails are down to $14.50 per ton, a drop of $5.50 in about three weeks. Wrought iron pipe has declined from $11 to $8 per ton.

STEADY VOLUME OF BUYING

TORONTO.—While there is no big buying being done, there is a steady volume of small orders which make business in most lines very satisfactory. As one dealer remarked: "We expected after the armistice to be able to take a six months' rest, but haven't seen the change yet." The unsettled conditions in the labor market are no doubt responsible for some holding back on the part of buyers, there is enough being done to make a very respectable turnover. This applies to machine tools and machine shop supplies generally. There are no price changes to record in the steel market, but they are in the air. Chain manufacturers held a meeting last week at which the price of chain was discussed, and, though nothing has been announced, it is expected prices will go up shortly on this material. There is a good buying of warehouse stocks, the railways being responsible for some of it, but the automobile trade for the larger part. Mills making automobile sheets are far behind on orders, and will not promise delivery in less than four to six months. This turns the attention of the makers to other sources of supply, that is the warehouses. There is not much demand for structural steel.

POINTS IN WEEK'S MARKETING NOTES

The continued unrest in the labor market is discouraging buyers of steel. Building construction falling off.

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Machine tool and machine shop supply dealers are doing good business, though there is no large single buying.

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There has been a dull week in the scrap metal market, with a drop of prices in steel making grades.

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The automobile trade is buying considerable quantities of sheets, and automobile and railway buying is keeping steel warehousemen busy.

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Basic pig iron from the Lorraine district of France has been sold in England at a much lower price than the American iron.

CONCERN IS FELT FOR FUTURE OF STEEL BUSINESS

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., Aug. 21—A much more conservative spirit is shown by both buyers and sellers, owing to recent unsettling developments, chiefly in connection with labor. The increased labor unrest makes it questionable whether manufacturing operations can be maintained at all points. The steel producers are less concerned over their own labor outlook than over the outlook of their customers. There is a possibility of a strike in the steel industry, but the prospect is very far from a probability. At the Detroit convention, over a year ago, the American Federation of Labor decided upon an aggressive policy of attempting to unionize the steel industry. At the Atlantic City convention last June the reports admitted that little success had attended the efforts, but since then the federation has been striving more earnestly. The information gathered by steel producers indicates that up to date nothing by way of organization has been accomplished that would make it feasible to attempt a strike. While the steel makers are very painstaking in gathering information, they admit that the possibilities of there being a strike may be greater than their information indicates.

Much more concern, however, is felt regarding the future operations of the steel industry's customers. There are involved three general classes of steel consumers, the railroads, the ordinary manufacturing consumers and those who might engage in large construction jobs of an investment character, such as factories, hotel and office buildings, power plants, bridges and the like.

As to the railroads, the demands of the brotherhoods for the Plumb plan of tripartite control obviously serve to make the future of the railroads still more uncertain, that such a radical and unpopular plan would really be adopted is improbable, but the time when the railroads will be placed in a settled position and thereby be able to engage in work of rehabilitation and expansion is placed farther in the future. In normally good times the railroads take, in one form or another, from 15 to 25 per cent. of the steel industry's output, and after a period of several years of particularly stringent economy they might be expected to take more, but now they are taking practically no steel and they will take no tonnage of consequence until their position is assured. The attitude of labor disclosed in the past fortnight defers the time when the steel industry can expect the railroads to be large customers.

As to ordinary manufacturing consumers, there are some strikes, and possibilities of others, and each strike temporarily deprives the steel industry of a customer.

It has become a generally accepted view that when there is a full normal demand for steel at least half the tonnage passes into works of permanent construction, classifiable as investments. Such construction requires favorable prospects for its inception. The investor must be assured that he would not save much money, in first cost, by waiting a year or two, and he certainly must be assured that if the job were undertaken, labor and materials would be continuously available until completion, for until completion the money spent is earning nothing. The increased labor unrest now manifest is observed to be having a discouraging influence upon investors. An evidence of this is the rate at which contracts for fabricated steel work are being placed. This business was growing very nicely in the second quarter of the year, promising eventual establishment of a rate of buying equal to the capacity of the fabricating shops, but in the past week or two the contracting has been distinctly lighter than formerly.

Presumably, as a result of these developments there is now a much more conservative spirit throughout the iron and steel trade. Producers are less willing to enter into contracts, fearing they may have trouble in making deliveries, while buyers are still less willing to make contracts. The volume of strictly new buying is much lighter than a month ago, but the volume of shipping orders, made up chiefly of specifications on old contracts, is heavy and is easily in excess of the rate at which material is being shipped.

Merely from the viewpoint of the business that the steel industry does not get the situation and prospects appear far from favorable, but from another angle this makes the situation all the more favorable, because with all these defects in the market situation there is a large demand for steel. The mills are operating at about 80 per cent. of capacity and no one seems to doubt but that the material made and shipped is going directly into consumption. With many buyers, particularly the railroads and investors, not represented, or, but poorly represented in the market, the volume of tonnage taken by others is large, much larger than anyone would

have expected. With only a moderate volume of additional business the steel industry would be operating at capacity.

It is now fairly well established that there will be no advances in the important finished steel products this year, unless there should be a wage advance, which at the present time seems improbable. The only reason it seems worth while to mention the fact that price advances are altogether unlikely is that a few weeks ago many steel producers, for reasons that were not entirely obvious, were talking about the probability of there being price advances.

The local pig iron market is strong, at least on the surface, the furnaces that are in operation being well sold up, while there is a fair running demand. Occasional lots of surplus iron, however, are sold with such difficulty that it is evident there are no large unsatisfied requirements. There are many idle furnaces and it is only occasionally that a furnace blows in. A demand for pig iron that would give the furnaces even moderately full employment can hardly occur without the large steel works buying pig iron. This they do when they are pressed for tonnage and have to supplement their own pig iron make by outside purchases.

The scrap market became weak and inactive a fortnight or so ago and has not since improved. The mills are all out of the market as to heavy melting steel, though some of them intimate they may make some purchases in a few weeks. Heavy melting steel is off about $2 from its high point of three weeks ago.

SENTIMENT AGAINST PRICE ADVANCES

Special to CANADIAN MACHINERY.

EW YORK.—Though on a supply and demand basis, prices are due for a revision upwards, the sentiment is against any advance at the present time. This is on account both of the attitude of labor and the general result on the high cost of living. Makers are not taking orders far ahead, except where the purchaser is an old customer. There is no demand as yet for heavy shapes, the general investment demand not yet having come out. The Railroad Administration has an enquiry out for 100,000 tons of rails, but this is evoking but little interest. At the time of the last enquiry $55 was quoted.

Warehouse business is quiet, except in sheets, for which some sizable orders have been placed. In view of the probable car shortage mills are requesting that they be allowed to ship sheets in any cars available, protecting the stock as well as they can, but forwarding at buyer's risk. This impending shortage of cars and the probable advance of mill prices is expected to stiffen prices shortly.

There has been good business in cast iron pipe lately, but an enquiry for about 900 tons of six-inch and larger brought out some low prices. Prices last week quoted for 6-inch and heavier were $51 to $52.30.

HIGHER PRICES ALL ROUND

Special to CANADIAN MACHINERY.

From every point comes news of stiffening prices for pig iron. Probably the only point where this is not true is in the southern areas. Following are reports from the principal United States points:

New York.—There is considerable strength to the market here, and a brisk business, both domestic and foreign, is being done. Several thousand tons have been sold for United Kingdom, and enquiries amounting to nearly 200,000 tons for export are out. Central Foundry Co. purchased 10,000 tons foundry for delivery in last half and first half of 1920.

Boston.—Prices have made a general advance above the $28 Buffalo basis for No. 2X eastern iron. The advance is from $1 to $1.50 per ton. There has been some buying for first half delivery, and enquiry for last quarter and first half is good. New England sales during the week are around 7,500 tons.

Pittsburgh.—With makers of foundry iron well booked up for the remainder of the year, there is a tendency to look askance at 1920 business. This is due to the uncertainty of the labor market. The foundry men are feeling uneasy over the prospect of very much higher prices, $35 per ton having been mentioned as a possibility. Sales of foundry iron are around 20,000 tons.

Chicago.—There is not much enquiry, but a fair amount of selling is being done. Enquiries are being followed by sales with little delay. The strike of railroad shopmen has interfered with shipments, but not sufficiently to reduce the melt. The American Radiator Co. has purchased 4,000 tons for its Birmingham plant.

Buffalo.—There is a large volume of buying being done in spite of increase in prices. The aggregate sales amount to between 40,000 and 50,000 tons. Quotations are as follows: Basic, $26.75; No. 2 plain, $26 75 to $28; No. 2 X, $28 to $29; malleable, $27.25 to $29. Nearly all sales were for last half, a small proportion being for first half of 1920.

Cincinnati.—The situation here may be classified as a waiting one. There is not much prompt iron to be had, except in the case of furnaces which have off iron they are anxious to be rid of. The Jackson County district is tied up with labor troubles. While prices have been advanced no business is being done at the new rates.

St. Louis.—There has been a little buying for last quarter and first quarter of next year. 1.25 to 2.25 silicon is quoted at $26.75, with differentials on higher grades. Some foundries which had bought enough iron for their estimated consumption have had to purchase small additional tonnage.

Birmingham.—Selling is good, and it is expected that three more furnaces will be put in blast this month. There is no tendency to look for 1920 business on the part of furnaces, who are not even making any efforts for fourth quarter selling. No. 2 foundry is on a basis of $27.75.

Philadelphia. — While business has reached a fair aggregate total, it is much less than previous weeks. Furnaces are mostly asking higher prices. Copper free low phosphorus iron is quoted $36 to $38 furnace according to analysis.

LABOR UNREST UNSETTLES MARKET

Special to CANADIAN MACHINERY.

The market through various causes is unsettled. The labor situation is affecting the market in some cases, and prices have weakened. Following are quotations from various United States centres:

Boston.—Brisk business and tightening prices are in evidence here. There has been some buying of heavy melting steel for Pittsburgh delivery and prices ranged from $21 to $22.50. No. 1 machinery has been active and has sold at $28 for future delivery.

Philadelphia.—Steel scrap has weakened in some cases as much as $1 per ton from last week's prices. Cupola scrap on the other hand has shown greater strength, now being quoted at $25 to $26. The labor situation has been the cause of weakening in steel.

New York.—There is a good demand for steel making grades, although the Pittsburgh buyers are not in evidence. Pennsylvania buying is good for the eastern part of the state, and the quotations on heavy melting are from $15.35 to $16.50 f.o.b. New York. The labor situation is making buyers more cautious.

Pittsburgh.—With buyers inclined to stay out of the market till the labor situation is clearer, and other buyers being about stocked up, scrap has weakened in all grades. The drop is about $1 per ton all round.

Buffalo.—The scrap market is dull here, though it is probably but a temporary condition. Prices are being maintained, and it is thought that there will be renewed buying of heavy melting in the near future.

Cleveland.—Notwithstanding a weakened market, dealers are very hopeful for the future. They point out that the demand for the finished product is heavy, and this is bound to be reflected in the scrap market. A sale of heavy melting involving 50,000 tons is reported, the price ranging from $19 to $23.

Chicago.—Although prices have halted after the long-continued advance from the spring, it would only take a small resumption of buying to bring them back again. Here, as elsewhere, the uncertain state of the industrial world is affecting the scrap market, which is always susceptible to these influences. Quotations for spot business are some-

what lower than the lately prevailing rates.

Cincinnati.—A dull market with prices unchanged is the condition here. Dealers are slow in buying outside iron that may be held up in delivery, cars being scarce and the labor situation unsettled. Railroads are not offering anything.

Birmingham.—Buying is light, but prices remain firm. Heavy melting is quoted much higher than buyers are willing to consider. All grades show strength.

READERS—ATTENTION!

AS no doubt readers of CANADIAN MACHINERY are well aware, Toronto Exhibition opens on August 23rd. Mechanics as a rule make their headquarters the Machinery Hall while at this fair, so a word to the wise is sufficient.

At the east end of this Machinery Hall, the **Garlock & Walker Machinery Co.** are going to have a display of more than ordinary interest. They have taken over a very large space, in fact 1,400 square feet of floor area, in order to show to best advantage the various machine tools they intend exhibiting.

Many of these machines will be in actual operation, with experts from the various factories operating them at full capacity. These gentlemen have been brought for a two-fold purpose, first to demonstrate the field and scope of their machines, and second to answer any questions relative to these machines. They invite close inspection, and will be only too pleased to give those interested all possible information. They particularly desire that questions be asked.

Included in this exhibit will be:

A **"Gooley-Edlund Inc. Co. Briggs Miller."** Of course, the Briggs Miller is well known as a manufacturing miller with wonderful capacity, so that this feature will be of keen interest to those wishing greater production where a miller can be used to advantage.

Then there will be a **Steptoe 24 in. single pulley drive shaper,** also a **Bath No. 2 Universal Grinder,** adaptable to practically any grinding operation.

There will also be a **Fitchburg 8x36 Cylindrical Grinder,** whose qualifications are already well known to the machine trade.

A **heavy duty Ryerson-Conradson single pulley drive plain milling machine** will also be shown.

Another feature worth while will be a complete line of **Thor Pneumatic and Electric tools.** This alone is worthy of attention.

Some other interesting features will be a **Lodge & Shipley three step cone 24 in. engine lathe, a Sibley sliding head drill press, a Rockwood back geared drill, and an Edlund sensitive drill press.** All these will be of the latest design.

A **Kelley Routing Machine** will also be shown, with samples of work turned out by this interesting type of machine tool.

Perhaps two of the biggest features of this exhibit are the remaining ones to follow:

The first of these is the **Adams Short Cut Lathe.** This lathe has never been exhibited here before and will prove an eye-opener to the progressive manufacturer, foreman or mechanic. Compact, accurate and built for manufacturing duplicate parts, this machine is indeed a study in good design. Six changes of speed are provided in an all geared head, and automatic stops, etc., etc., form a part of its equipment.

Automobile manufacturers, or, in fact, anyone desirous of making duplicate parts, would do well to look into this new machine tool.

Last but not least comes a varied line of **Cataract Machinery.**

A **Cataract sensitive drill,** with countershaft and back drill chuck will be shown. **A No. 3 Cataract Lathe,** with automatic chuck closer, together with screw slotting device, and medium weight turret, will be exhibited. This machine will also have a double cross slide.

Then there will be a **No. 4 Cataract Lathe** with thread chasing attachment. There will also be a No. 3 lathe with screw cutting, grinding, face and angle plate attachments, fully equipped with drill chuck and scroll and independent chucks.

A **No. 4 Cataract Bench Miller** will also be shown.

A **No. 7 Cataract Turret Tool Post lathe** will also form a part of this exhibit.

To show that a series of machines may be self-contained, the **Cataract** exhibit will also include an **R4 underdrive bench outfit.**

This arrangement will show four lathes, all self-contained and mounted on a special stand, together with a special underdrive.

A motor in convenient position on framework will drive the complete outfit.

Other interesting machines will also be shown, but space does not permit of further detail.

Enough to say to our readers in general that a visit to this exhibit will more than repay them for time spent in looking over this up-to-the-minute company's effort to place before those interested, a complete and varied line of machine tool equipment.

The McAlear Manufacturing Co. has recently moved into a new factory at Southwestern Avenue, Chicago, where they will manufacture their complete line of power plant and heating specialties, including packless radiator valves. They are issuing a new catalogue, dealing with these lines, which will be forwarded on request to any interested party.

The Algoma Steel Co. will have completed by November 1st their new rolling mills, wherein they will be able to manufacture beams and channels up to and including 15 in.; Z bars, rounds and squares, up to 14 in., and angles from 6 by 6 in. to 1¼ by 1¼ in.

Diamonds to the value of $856,000,000 have been mined in South Africa.

RECEIVE IMPERIAL SERVICE MEDAL

The following servants of the Canadian Department of Railways and Canals have been awarded the Imperial Service Medal:

Albert J. Atkinson, time-keeper, Moncton; Placide Babineau, carpenter, Moncton; Alexander Bain, station agent, Riverdale; Geo. T. Biddington, locomotive fireman, Moncton; John S. Cameron, section foreman, Penniac; W. D. Cantwell, toolroom keeper, Charlottetown; John Corbett, section foreman, Moncton; Harry Cummings, hostler, Stellarton; Aime Dumas, conductor, Riviere du Loup; John A. Fraser, machinist, Moncton; J. M. Grant, section foreman, Riviere du Loup; Jos. Guay, brakeman, Levis; Alfred Lebel, conductor, Riviere du Loup; Charles Mercier, engineman, Riviere du Loup; R. W. Orchard, conductor, Mont Joli; Jules P. Parent, engineman, Riviere du Loup; A. C. Reid, carpenter, Moncton; Francis W. Rioux, engineman, Riviere du Loup; Jos. Scott, engineman, Riviere du Loup; Benjamin Steeves, section foreman, Campbellton; Matthew C. Webster, station agent, Pictou; Job Yeo, engineman, Charlottetown.

"What a different world this would be if we used our eyes to see the best in others and encouraged each other by speaking of it."—The Three Partners.

Don't let your competitors fix the price of your product—fix it yourself to cover your costs and a reasonable profit.

Apply common-sense with your cost system. The easiest way sometimes is the best way. Keep everything simple. Don't make anything harder than it ought to be. But remember to keep the main idea constantly in view—"I want to know my costs!"

Ho! ye who in the workshop toil and sweat the long day through, remember that it's harder still to have no work to do. Ho! all who labor, all who strive, ye wield a mighty power. Do with your will, do with your might, fill every golden hour. The glorious privilege to **DO** is man's most noble dower.

A concern has been formed in Denmark to begin the manufacture of typewriters.

It is said that the waste of timber in the yellow pine industry alone is sufficient to furnish raw material for the daily production of 40,000 tons of paper, 3,000 tons of rosin, 300,000 gallons of turpentine and 600,000 gallons of grain alcohol.

An American contemporary prefers the old name of "hobo" because it is easier to pronounce than the modern name of "Bolshevik."

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	.....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75

Toronto price:—
Silicon..2.25% to 2.75% $32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bas, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 lbs. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$27 00	$27 00
Electro copper	26 00	27 00
Castings, copper	26 00	25 00
Tin	60 00	58 00
Spelter	10 00	10 00
Lead	7 25	7 00
Antimony	10 25	10 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.
Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.
Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 50	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	17 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	15 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	8 00	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net.
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe, wrought	8 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	14 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜ and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd. brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and emi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts,	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

LeBLOND
HEAVY DUTY
Universal Millers

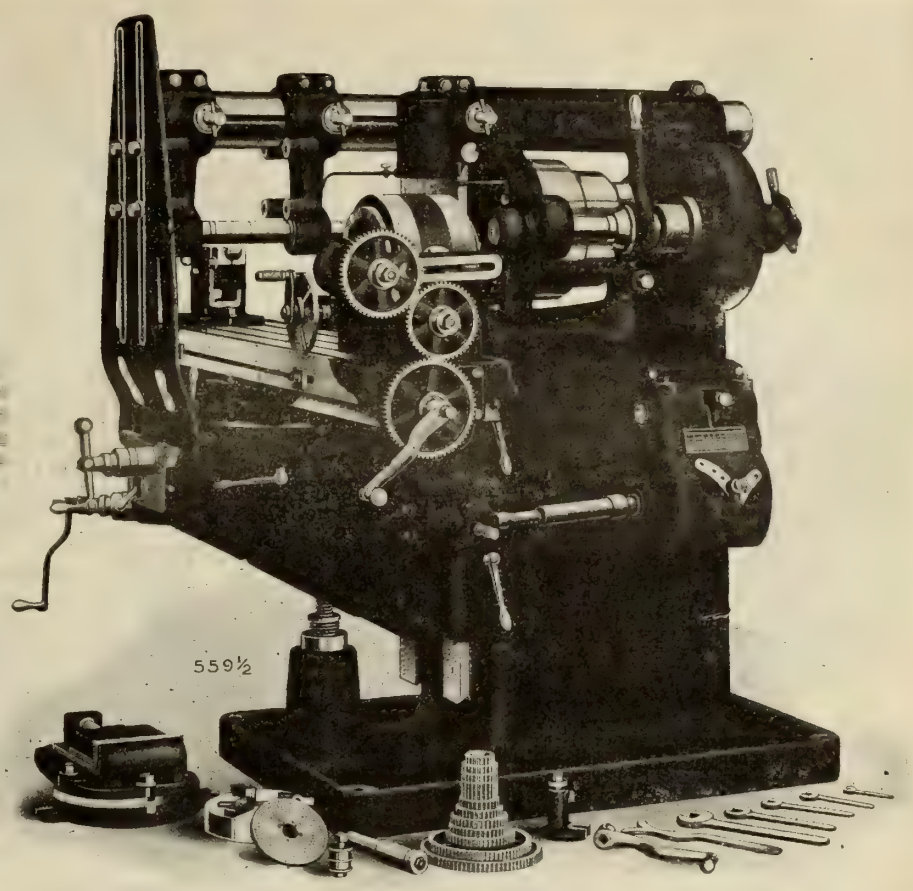
Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control.

Carried in stock by

The A. R. Williams Machinery Co.
LIMITED
TORONTO



Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited
Steel Foundry Division, Lachine Canal
Head Office: 187 Delisle St. MONTREAL
Phone Victoria 1492

MORROW SCREWS MORROW
DRILLS FILES
MORROW NUTS MORROW

THE MORROW PLANTS AT INGERSOLL

are an example of what can be attained by years upon years of skill, and honesty of purpose and liberal *treatment of customers.*

The company and the men are in perfect harmony—some of the men have worked continuously here for over 30 years—like one big family—from 300 to 700 people, all proud of their product and all striving with one object to give you the very best, *Twist Drills, Set and Cap Screws, Nuts,* etc., that are produced anywhere.

Every article, whether screws, nuts or drills, is guaranteed fully—you must be satisfied or your money will be refunded.

Ask Your Jobber

John Morrow Screw & Nut Co., Ltd.
Ingersoll Files Are Good Files

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus 10 to 40	
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 50
Premier, 10¾ oz.	....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	.....
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08½**
Grits, 80 and finer	**.06**

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium, carbonate	..
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2.25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

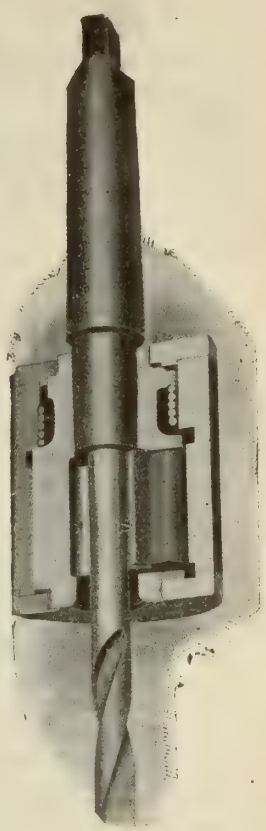
Prices per lb. unless otherwise stated

Use Wahlstrom Chucks

POSITIVE DRIVE
AUTOMATICALLY
SELF-CENTERING
NO SLIPPAGE

Aikenhead's

Wahlstrom Attachment



Speed Up Production in Your Machine Shop

Consider the merits of an automatic chuck that keeps the spindle of every drill press running without a second's stop.

Calculate the money value of the minutes saved by the Wahlstrom chuck each time a tool is changed.

The Wahlstrom chuck—not the operator—centres the tool perfectly. It enables the operator to make tool changes in less than two seconds. Spindle of machine never stops. And there is absolutely no delay because of tool slippage. For no tool gripped by the jaws of a Wahlstrom chuck can slip. If the resistance on the tool is great, the holding power of the jaws increases.

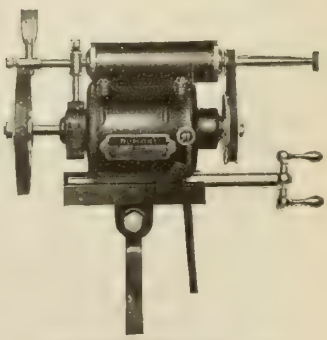
Send for Bulletin

Aikenhead Hardware Co., Limited

17, 19, 21 TEMPERANCE STREET - TORONTO, CANADA

Aikenhead's

DUMORE ELECTRIC GRINDERS



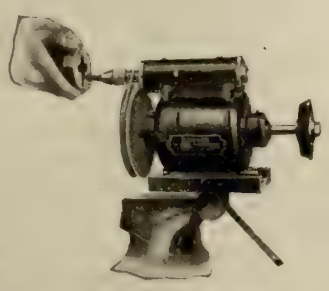
EQUIPMENT A

General Tool Room use. Includes high-speed internal spindle. Reach, 2 inches; speed 30,000 R.P.M.; motor spindle speed, 10,000 R.P.M.

Invaluable for Accurate Grinding of Tools

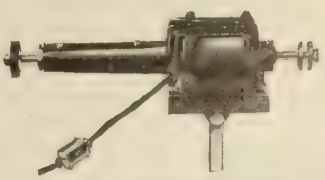
These grinders are designed to meet the requirements of the manufacturer who desires a light grinder which will do accurate work, and at the same time does not wish to invest in a large and more expensive tool. The Dumore grinder can be quickly attached to lathes or other machine shop equipment. Their scientific construction entirely eliminates vibration and work done is accurate and free from chatter marks.

Write to-day for descriptive literature.



EQUIPMENT C

Button Die Grinder. Speed 50,000 R.P.M.



EQUIPMENT B

Deep Internal Work. 10-inch extension arm. Speed, 10,000 R.P.M.

AIKENHEAD HARDWARE, LIMITED

17 TEMPERANCE STREET, TORONTO

RESEARCH IN METALLURGY

Scientific research in metals and their properties has made considerable progress during the last few years, and the results of the work done is startlingly shown in the proceedings at the annual meeting of the Institute of Metals, held in London.

A paper by Dr. Rosenhain describes the method of preparation of a number of copper alloys and gives the results of tensile and hardness tests carried out on them. The alloys were intended to meet very stringent requirements involving extensive cold-working, so that high tensile strength with great ductility was aimed at. The alloys dealt with fall into two main classes. The first class consists of alloys of copper with aluminum, with manganese, and with both aluminum and manganese. Difficulties were experienced in casting these alloys into slabs, and special methods of casting were adopted. A process sometimes known as "pressure casting" which has been developed and patented by Mr. F. Tomlinson, was eventually adapted for use with these alloys and proved very successful. In this method the liquid metal is forced, by means of externally applied air pressure, through a feeder tube dipping into the molten metal nearly to the bottom of the crucible and communicating with the bottom of the mold. Alloys cast by this method were subsequently rolled into strips. The results of tensile tests show that a very high degree of ductility can be obtained, together with considerable tensile strength, by the use of manganese. For example, the alloy containing 7 per cent. aluminum without manganese has a tensile strength of just under 40 tons per square inch, with an elongation of 17.5 per cent. in the "as rolled" condition, while after annealing it still has a tensile strength of 27.5 tons per square inch, and the remarkable elongation of 71 per cent. The second class consists of alloys containing no aluminum; these are mainly combinations of manganese and zinc, or nickel and zinc, with copper. They were cast successfully with the aid of borax as a flux, and were subsequently rolled into thin strips of excellent quality. Of this series the strongest alloy is that containing 3 per cent. manganese and 10 per cent. zinc, which, in the old rolled condition has a tensile strength of 47 tons per square inch, with an elongation of 3 per cent., and in the annealed condition a tensile strength of 23 tons per square inch, with 36 per cent. elongation.

The effect of work on the metals and their alloys has elicited considerable attention of late years and the variations in their physical and mechanical condition that result from the application of work have been very fully investigated. Hitherto the hard metals and alloys have received the closest attention, whilst such metals as tin and lead have scarcely been considered. This is unfortunate, since many of the phenomena with which one is confronted in the case of the cold-worked hard metals and alloys might, by much study, be rendered explicable.

The researches of Goerens and Webster (among others) and of Alkins, in particular, have demonstrated that a very marked change in the physical and mechanical condition of the metals and their alloys is reached when the same have been deformed by certain well-defined amounts. Alkins, for example, has shown that when a copper bolt, previously annealed at 600 deg. C., and 9-16 in. in diameter, has been reduced in diameter about 29 per cent., it is so changed in condition that its ultimate strength in tension tends towards a constant value over a narrow range of reduction.

It has now been determined by Mr. Owen W. Ellis that the effect of cold-work upon a 39 per cent. zinc-copper alloy that he finds evidences of an inversion in the mechanical properties of the alloy in the neighborhood of 58 per cent. reduction in thickness of a strip. While the results of tensile tests of samples of the material that have been subjected to varying degrees of deformation are not of themselves conclusive, the results of Brinell hardness tests and of micrographic examination appear to afford satisfying evidence of a somewhat similar phenomenon to that recorded by Alkins.

An explanation of this peculiar change in condition is thought to be found in an extension of the law of annealing for strained metals and solid solutions propounded by Hanson at the last meeting of the Institute of Metals. This law stated that "for every degree of deformation there is a critical recrystallization temperature at which crystal growth is extremely rapid, and the size of the crystals produced by this rapid growth is the greater the smaller amount of deformation proceeding such annealing." This law appears to admit of the possibility of the temperature of the working of the metal or alloy coinciding with the "critical recrystallization temperature at which crystal growth is extremely rapid." It might even be inferred that the converse of the above law is true.

The process of cold work, viewed in the light of Reilby's theory, may be considered to result in the production of amorphous matter at the expense of the crystalline matter. It is suggested that there is at all stages of deformation a tendency for the reaction to take place, and that as the deformation to which the material has been subjected increases, so does this reaction continue, suffering a change in its rate when the critical degree or range of deformation has been attained. A graphic representation of these conditions results in the drafting of a curve representing the relation between the degree of deformation and the mechanical property which is almost identical in type to those obtained as a result of mechanical test.

A remarkable proof of the existence of the inversion in other alloys of copper is also afforded by the results of experiments made with a view to determine the power absorbed in the rolling of alloy strip. The power-reduction curves for 70-30 brass and for 20 per cent. nickel-copper for example, show most sharply-defined changes in direction, these changes in direction appearing to vary according as the mass of the material to be treated is changed.

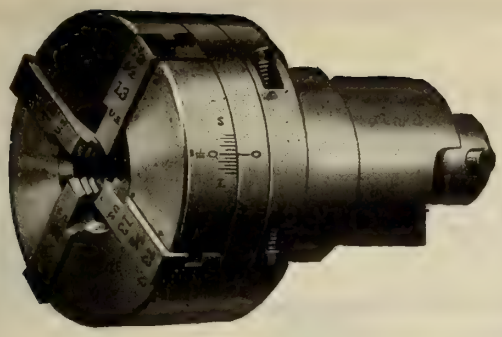
The above hypothesis as to the nature of the inversion in the property-deformation curves of the metals and alloys has been put forward, but no definite reason as to the cause of the inversion has been given. The processes of rolling and of drawing are such as result in the formation of a "strain gradient," to employ a term introduced by Jeffries, of most pronounced character within the materials undergoing deformation. As Jeffries has shown, a strain gradient produces a recrystallization gradient, and this, under proper temperature conditions, will produce exaggerated grain growth according to the germinative hypothesis. That the proper temperature conditions may be obtained, provided deformation is carried to sufficient extent, has, it is thought, been proved.

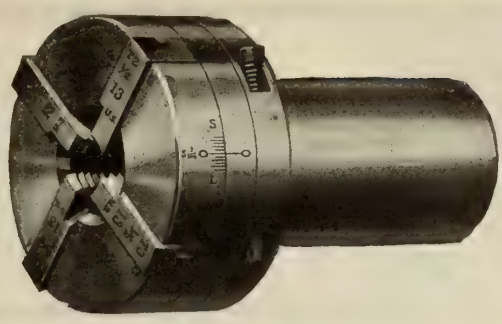
That these things are of intensely practical value must be patent to all and not to those concerned with the cold-working of metal alone. Both users and manufacturers of extruded rod, for example, have seen, not a few times, material showing very obvious signs of exaggerated grain growth. That this result may be obtained in the actual process of extrusion, given the correct conditions of temperature and of deformation, appears to probable rather than possible.

In conclusion, Mr. Ellis refers also to the exaggerated grain growth that may be produced as a result of stamping certain zinc—coper alloys—not, happily of the best types for general engineering work, within certain temperature ranges.

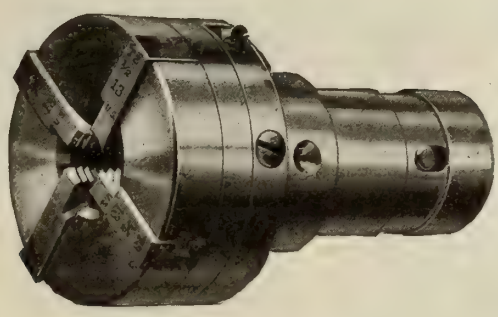
The tenacity-reduction curve shows a marked check in the rate of increase of tenacity at about 50 per cent. reduction in thickness, corresponding to the change of state, previously shown by Alkins to result from the progressive cold drawing of copper wire at a similar stage of reduction. There is a corresponding change in rate of decrease of percentage elongation and in rate of increase of scleroscopic hardness. The existence of another change at 80 per cent. reduction is suspected, as indicated by inflections in the tenacity curve, and the hardness curves. The scleroscope-hardness figures reach a maximum at this stage, but the auto-punch figures show a marked acceleration in the rate of increase.

A limited number of annealing experiments were carried out at temperatures of 600, 750 and 800 degrees centigrade, and the results point to incompleteness of softening of the severely worked strips as compared with the moderately-worked strips. The results of tensile tests, hardness test, and microscopic examination are in agreement, whilst scleroscopic tests on strips annealed at 750 deg. V., indicate the existence of a maximum at about 80 per cent. reduction. With the more severely worked specimens, after annealing, the strain structure on the polished and etched surfaces is visible without the aid of a microscope.





Geometric Solid Adjustable Die Heads



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Apart from the fact that it is not equipped with the self-opening feature or the roughing and finishing attachment, the Geometric Solid Adjustable Die Head is the same in principle and construction and will do equally as accurate work as the other styles of Geometric Die Heads.

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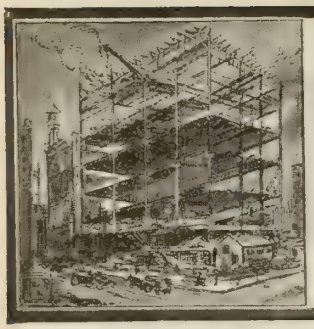

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

TRADE GOSSIP

Bond House Expands.—The Atlas Bond and Security Corporation, which recently underwrote the securities of the Anglin Norcross Construction Company, has opened branches in Toronto and Ottawa.

To Manufacture Fish Leather.—An American firm has been looking over the ground in Kingston, Jamaica, with a view to establishing a tannery for fish hides. The skins used would be those of sharks and other non-scaly fish.

Strike Thought Broken.—The Mine Managers' Association has held a meeting with the executive committee of the proposed new union of miners. They did not give out any statement of what transpired, but it is generally thought that the back of the strike has been broken.

Railway Shop Busy. — The Leaside shops of the Canadian National Railway are pretty busy these days. There are about twenty locomotives in the shops for repairs besides several coaches. About 300 men are employed at present, and skilled mechanics are being taken on daily.

Good Crop Prospect.—The Ontario crop situation is very promising, according to the Ontario Commissioner of Agriculture. Crops in Northern Ontario are further ahead this year than they have been at the corresponding time in previous years.

New Re-insurance Corporation. — A new company known as the Re-Insurance Corporation, Ltd., has been incorporated in England with a capital of £500,000, the shares being of the par value of £1. The corporation is closely associated with the Yorkshire Insurance Company.

New Toronto Factory.—A new suspender plant is to be erected on Spadina Avenue between Adelaide and Richmond Street at an estimated cost of $135,000. Mr. Henry Greisman, head of the King Suspender Company, is the interested party. The building will be of mill construction and be six storeys high.

New Cable Line.—As a result of the long-felt dissatisfaction with the Pacific cable service between the U. S. and Japan, a group of Japanese business men are floating a company with a capital of about $25 000 000 for laying a new cable line. American capital will likely be enlisted as well as Japanese.

Guelph Industry Expands.—The International Malleable Iron Company of Guelph have called for tenders for the construction of a new machine shop and warehouse. The building will be one storey in height and will be 189 feet by 120 feet, of concrete and brick, and will cost about $33,000. The architect is W. A. Maloney.

Motion to Wind Up.—A number of the shareholders of the Imperial Steel & Wire Company having made an application for the winding up of the company, Mr. Justice Kelly has adjourned the application to September 11th. In the meantime he has appointed Mr. G. T. Clarkson to make an examination into the affairs of the company.

Good Roads Movement.—It is understood that the Government is about to appoint an honorary advisory board which would assist the Department of Railways and Canals in its work for good roads. The personnel of the new board is stated to be made up of the following gentlemen: Mr. C. A. Magrath, late fuel commissioner; J. P. Mullarkey, of Montreal, and Mr. Home Smith.

Kingston Wants Elevators.—Kingston is going to make a bid to be the grain transhipment port in place of Port Colborne. The city council is going to urge the Dominion Government to build large elevators there. They point out that it will take two years to rebuild the elevator at Port Colborne and by that time the Welland Canal will be finished and Kingston will be the logical point for the steamers to bring their grain cargoes.

Pulp Mill Changes Hands.—The Aroostook Pulp and Paper Mill, which has been closed for some weeks, will be taken over and operated by a new company. The plant was built in 1917 and is well equipped, having a daily capacity of 60 tons, and employing about 200 men. The interest has been purchased by Mr. Gould and H. B. Stebney of Boston, and the plant will soon be in full operation and eventually will be extended. Mr. A. R. Gould, the president of the new company, is well known through his connection with the St. John Valley Railway.

New Welland Measurements. — The Department of Railways and Canals has issued a report on the alterations to the Welland Ship Canal. Its present length is 26¾ miles and comprises 25 lift locks, the dimensions of which are 270 feet by 45 feet, with a depth of water on the sills of 14 feet. The proposed canal will be 25 miles long, and the number of locks will be reduced to seven. These locks will be 800 feet in length by 80 feet in width in the clear, and the depth of water on the sills at extreme low water in the lakes will be 30 feet. The width of the canal at bottom will be 200 feet, and for the present the canal reaches will only be excavated to a depth of 25 feet.

Salving Port Colborne Grain.—It is understood that practically all the grain which was stored in the destroyed elevator at Port Colborne, owned by the United States Government, will be saved. It will be shipped to Montreal for transhipment overseas. In connection with this, a meeting was held in Montreal between the Harbor Commissioners, the Railway Board and the city Administrative Commission, when it was decided to put in two extra tracks on the harbor front to handle the extra grain. It was estimated that some 60,000,000 bushels would be shipped to Montreal from Port Colborne.

Airplane for Morrisburg.—Handley-Page, Ltd., have secured a Dominion charter to engage in a general aeroplane business in Canada. The capital stock will be $2,500,000, and the head offices of the company will be at Morrisburg, Ont. The directors named are William Harold and Admiral Mark Kerr, London, Eng.; Harry Clark, Montreal; Fred Chalmers and W. H. Gannon of Morrisburg.

Bridge Destroyed by Fire.—The forest fires that are sweeping Deer Lake have destroyed the C. N. R. bridge between Deer Lake and Burger. The C. N. R. trains are using the C. P. R. tracks for their through traffic. The local service is completely tied up. Alarm is felt for several families of settlers of whom no word has been heard for some days.

PERSONALS

Mr. M. W. Ferguson, who has been in the employ of the city of St. Thomas for the past six years as city engineer, has resigned his position.

Mr. D. A. R. McCannel has been appointed city engineer for the city of Regina. He has been in the service of the city since 1911, and for the past two years has been acting city engineer.

Mr. M. L. Cantell, C.E., has been elected a member of the Royal Society of London, England, according to recent advices. Mr. Cantell is a Provincial Government engineer of Manitoba, and resides at St. Boniface.

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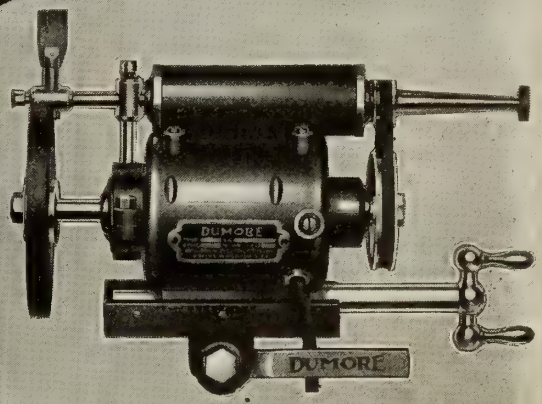

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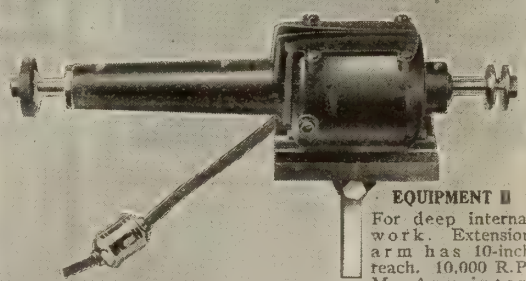

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TENDERS

The Patricia Mining Company, Boston Creek, are in the market for equipment for mining and mill plant.

Tenders will be received up till August 25 for bridges and culverts of concrete in the township of York. Plans and specifications can be seen at the office of the township engineer, Frank Barber, 40 Jarvis Street, Toronto.

The School Commissioners of Halifax, N.S., are asking for tenders, which will be received till August 30 for the erection of four new school houses, complete with heating and electric plant. For information apply S. J. Wilson, secretary, School Commissioners' Office, Halifax.

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The Board of Education of Peterborough are asking for tenders for a public school. Tenders will be received up to September 1 and plans and specifications can be obtained from W. & W. R. L. Blackwell, architects, Room 17, Bank of Commerce Building, Peterborough, or Melvern F. Thomas, 229 College Street, Toronto.

The Toronto Board of Education are asking tenders for an addition to Keele Street School. Tenders open till August 27. Specifications and information can be obtained at the office of Messrs. Chapman & Oxley, Harbor Commission Building, Toronto. Tenders will also be received by the same authority for addition to the Duke of Connaught School, Morley Avenue, and specifications can be obtained from the architect, Mr. J. Siddall, 250 Confederation Life Building, Toronto.

MARINE

Washington.—The United States War Department has announced the assignment of four of the fastest transports to the mail service between New York and Brest. The four vessels will be the George Washington, Leviathan, Agamemnon and America. The Shipping Board has now received 3,000,000 tons of shipping from the army authorities.

Sydney, N.S.—The huge Bayley raft, which was being towed over to Europe by the ocean-going tug Humber, broke adrift in a heavy gale off the coast. The tug has arrived in Sydney with part of the raft, and will proceed to sea to pick up the other part immediately. The raft has been ready for sea for the last two years, but owing to war conditions could not be taken across.

Port Stanley.—A diver is to be sent down to examine the hulk of the vessel discovered between Port Stanley and Rondeau. This is thought to be the wreck of the car ferry Bessemer, for which an unsuccessful search has so long been kept up. Pieces of the wreck were pulled up as much as two hundred feet apart, and this inclines the captain of

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the searching tug to the opinion that he has at last discovered the missing vessel.

New York.—Word was received by wireless here that a collision had taken place off the Jersey coast between the outbound United States Shipping Board steamer Point Judith and the Norwegian steamer John Blumer. The John Blumer returned to New York in tow. The Point Judith was built by the Shipping Board last year, and is a vessel of 1,699 tons. The John Blumer is owned by C. H. Sorensen, and was built in 1914 and registered 1,481 tons.

Vessel Tears Out Gates.—The steamer Aztec, of Buffalo, while entering Lock 17 of Cornwall Canal, snapped a rope, and the way on the vessel caused her to push open the lock gates. The result was to put the lock in communication with the high level water, which rushed in and tore the gates away completely. The resulting flooding of the surrounding country resulted in the drowning of a boy who was on the bank, and two companions had a narrow escape of sharing his fate. They saved themselves by climbing a telegraph pole.

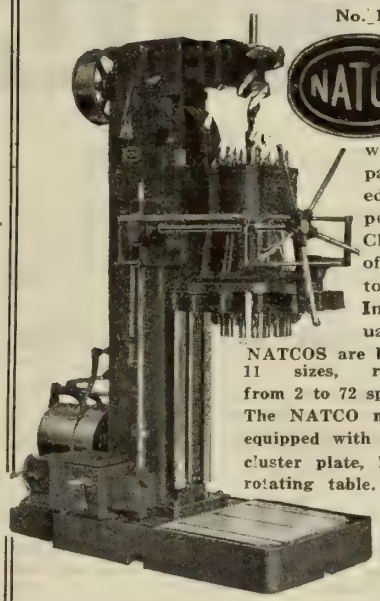
OBITUARY

The death occurred recently at the residence of his father, 676 Shaw St., Toronto, of Edmund F. Bradley. Death was due to heart failure. Mr. Bradley was local manager of the Erie City Iron Works.

From Saranac Lake, N.Y., comes the announcement of the death of Mr. Wayland Williams, of Laurie & Lamb, engineers, Montreal. Mr. Williams, who was 52 years of age, was at one time connected with the famous old Laurie Engine Works.

Mr. Samuel G. Lester, who was master mechanic of the Dominion Bridge Company, Ltd., died suddenly at the Royal Victoria Hospital, Montreal. He was 43 years of age, and for twenty-one years had been in the employ of the Bridge Co. He is survived by a wife and one daughter. He was a son of the late William Lester, of Toronto.

No. 14



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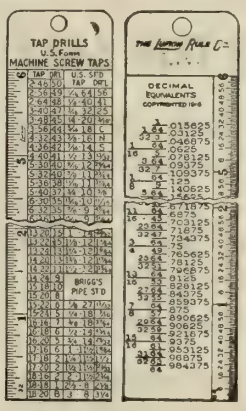

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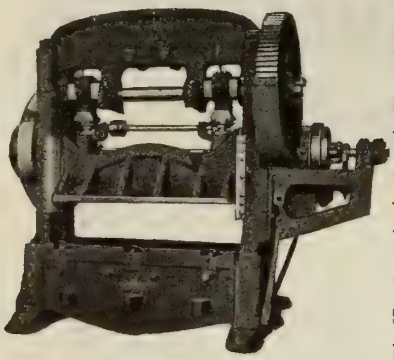

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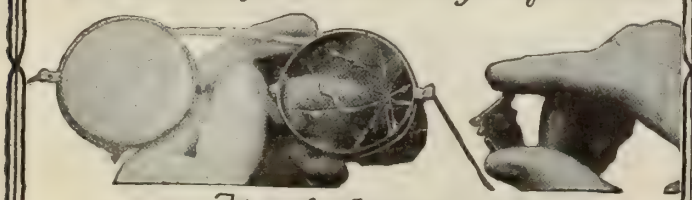

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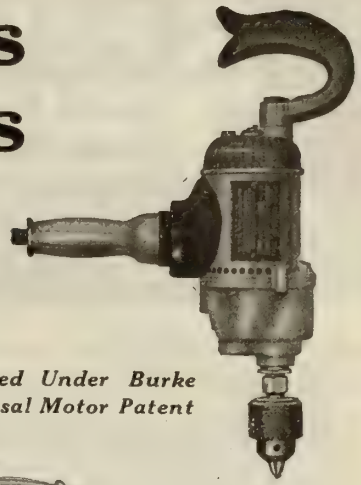

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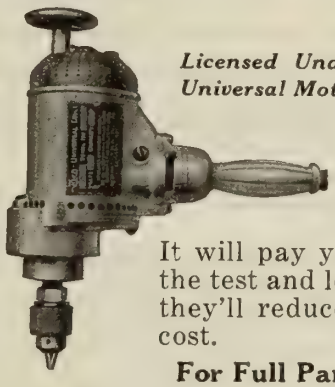

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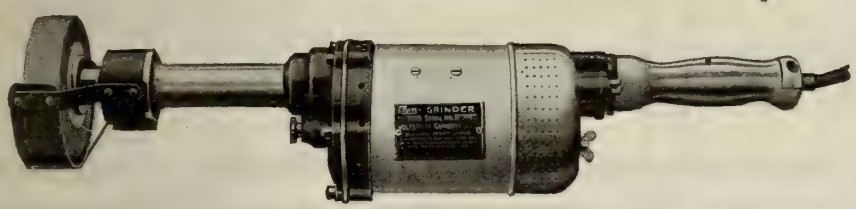

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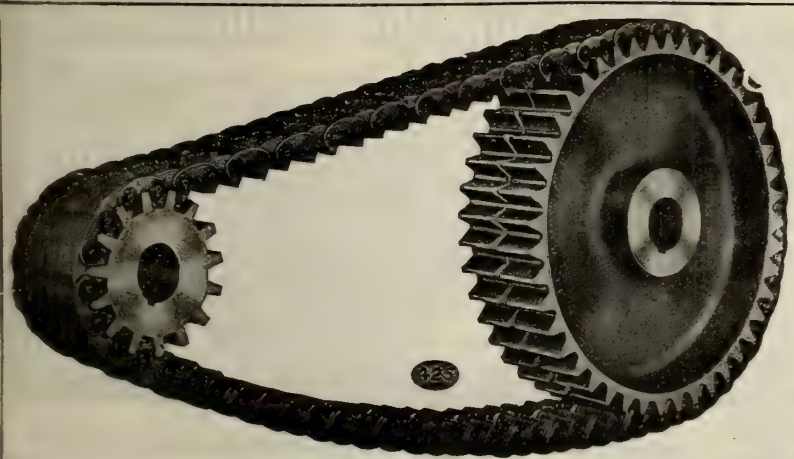

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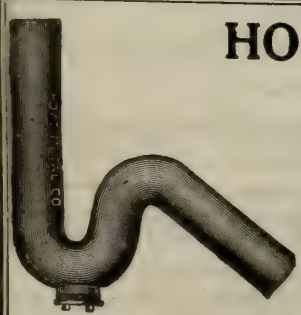

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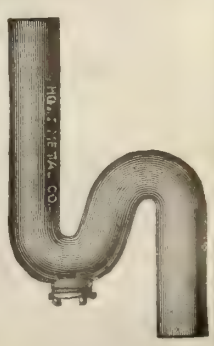

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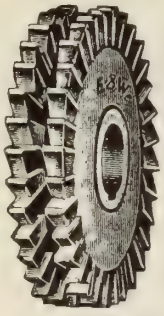

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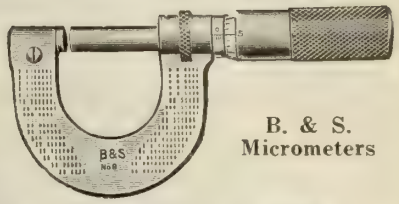

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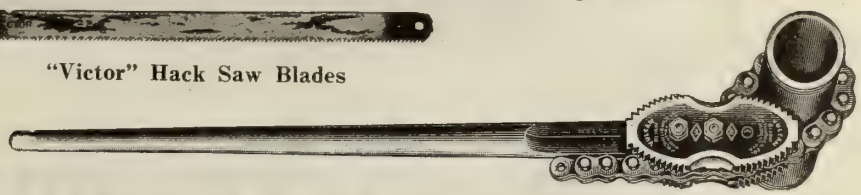

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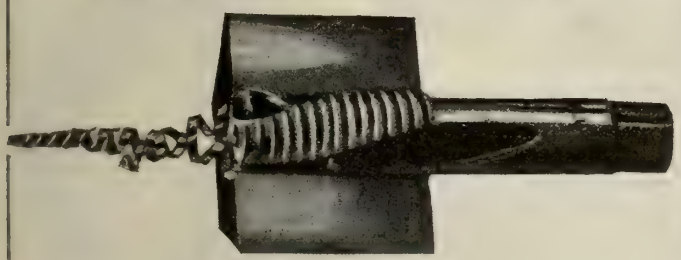

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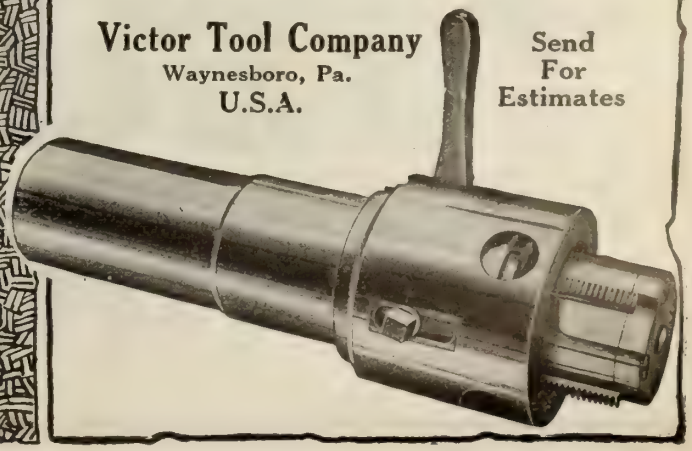

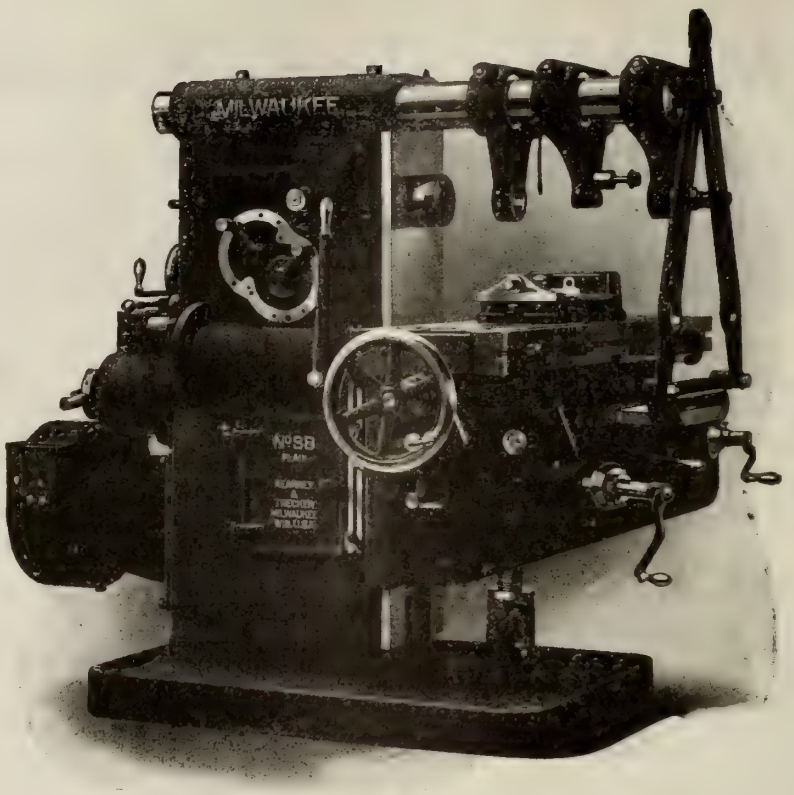

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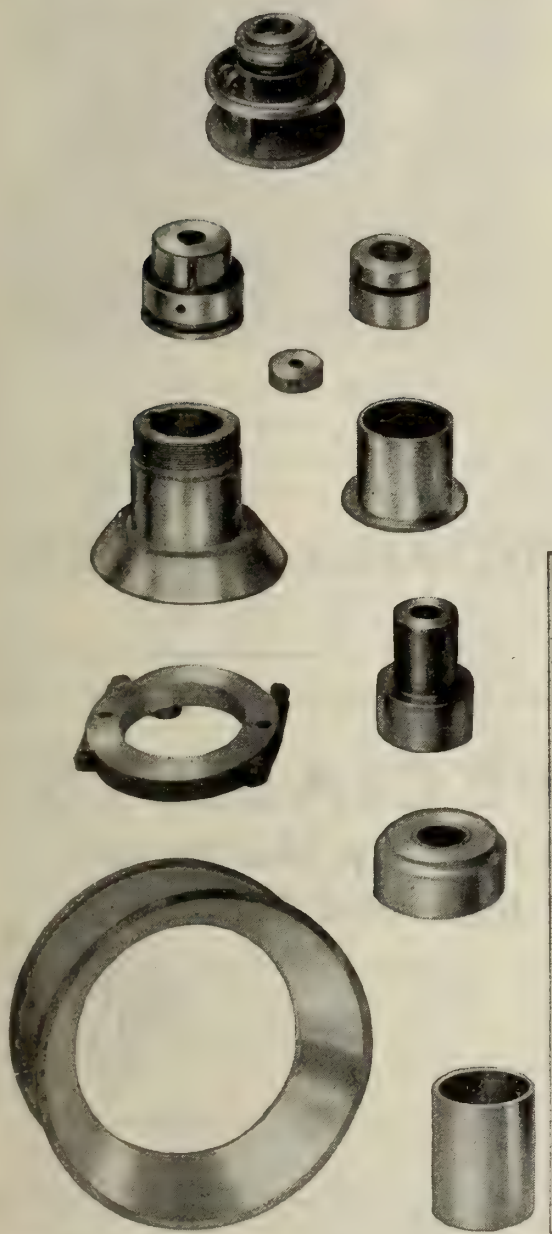

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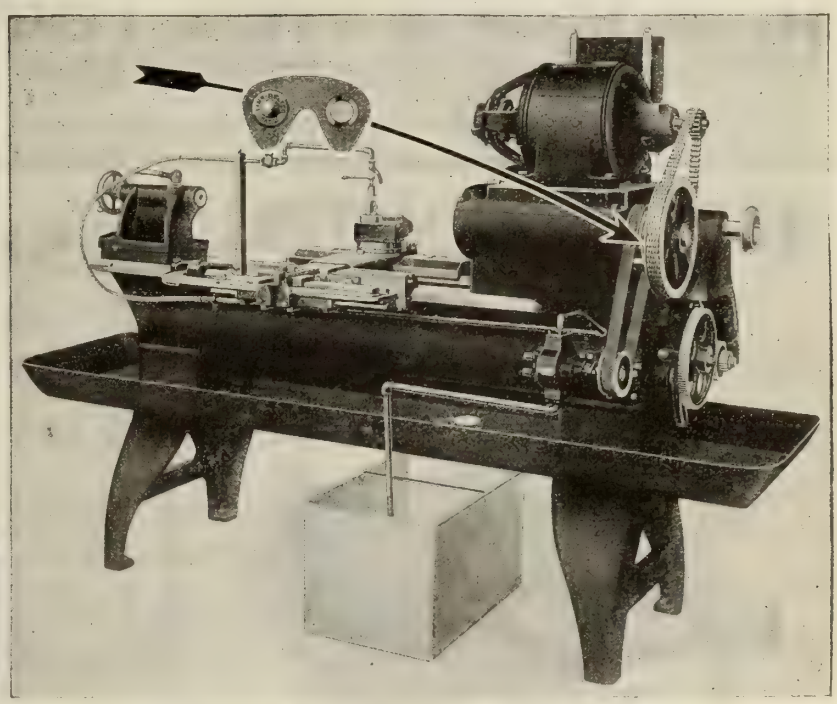

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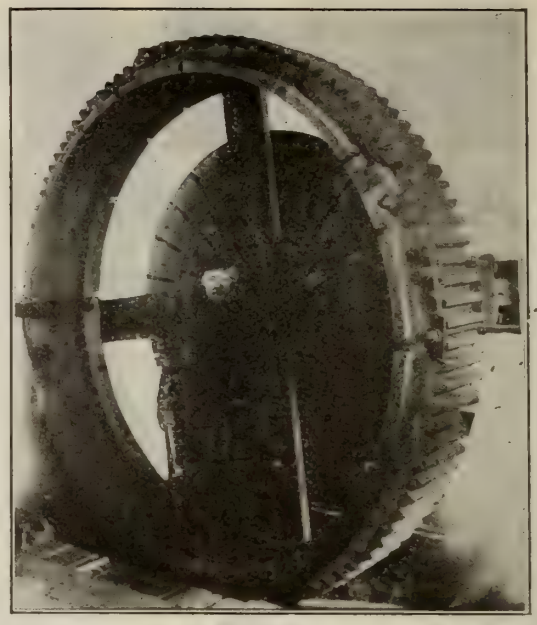

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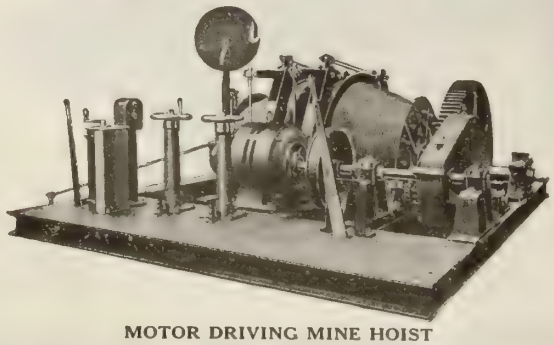

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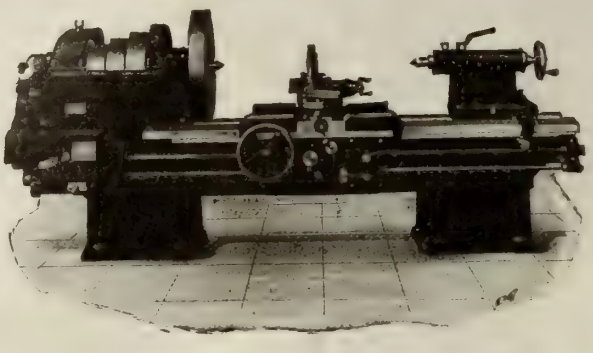

Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.

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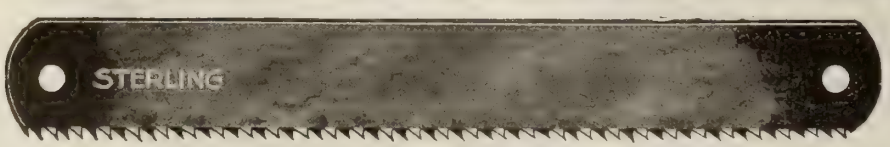

Guarantee satisfaction. A trial will convince you of their superiority.

Insist on securing the "STERLING" Brand.

Manufactured by

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built by

Universal Grinding Machine Company

Fitchburg, Mass. U. S. A.

FITCHBURG

Plain Cylindrical Grinders

Built by

Fitchburg Grinding Machine Co.
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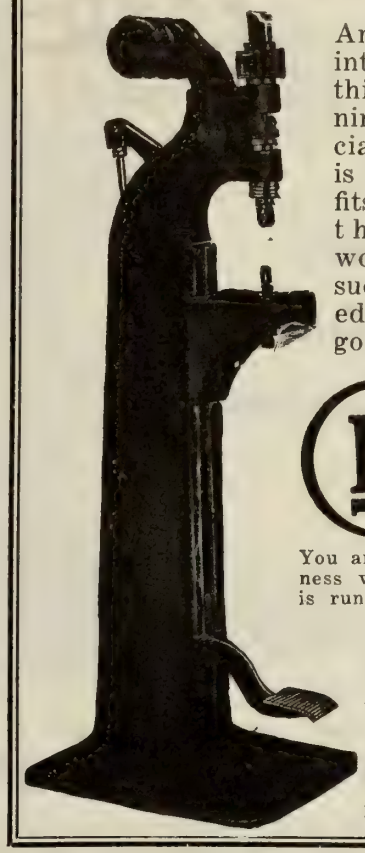

Anybody with ordinary intelligence can operate this Rotary Rivet Spinning Machine. No special skill is required. It is a tool that perfectly fits labor conditions as they exist to-day. A woman can operate as successfully as the skilled mechanic who has gone to the front.

The GRANT is Noiseless

You are assured of perfect quietness wherever the **Grant Rotary** is running. And it spins a perfect polished rivet head every second without breaking or marring the casting. Rivets tight or loose. Write for details.

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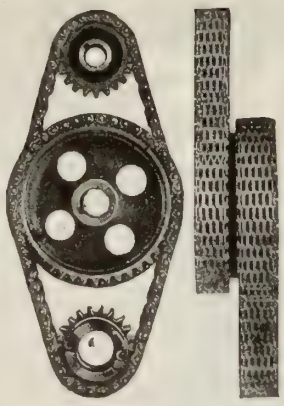

War Record Not Made Public

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-7 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
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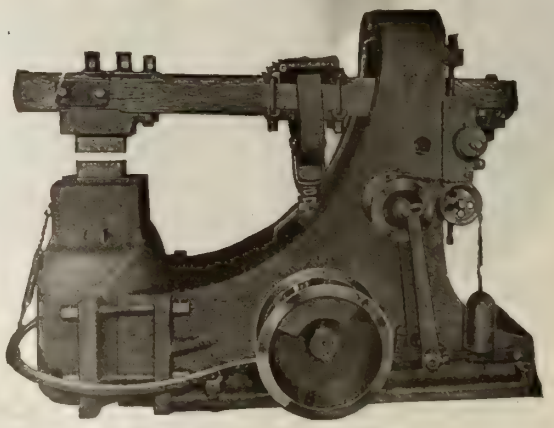

The Rochester Helve Hammer

The Mechanic who works comfortably does the best work in quick time. He gives you WORTH-WHILE results. You can't pry him loose from a superior tool. He brags about it. Give the chap a chance who uses the Helve Hammer. In 9 cases out of 10 he'll say, "The Rochester Helve" for mine. He is the man who knows the 100% Satisfaction Helve. We can't tell you all its distinctive features in this brief advertisement, so we ask you to write for our Helve Hammer Book.

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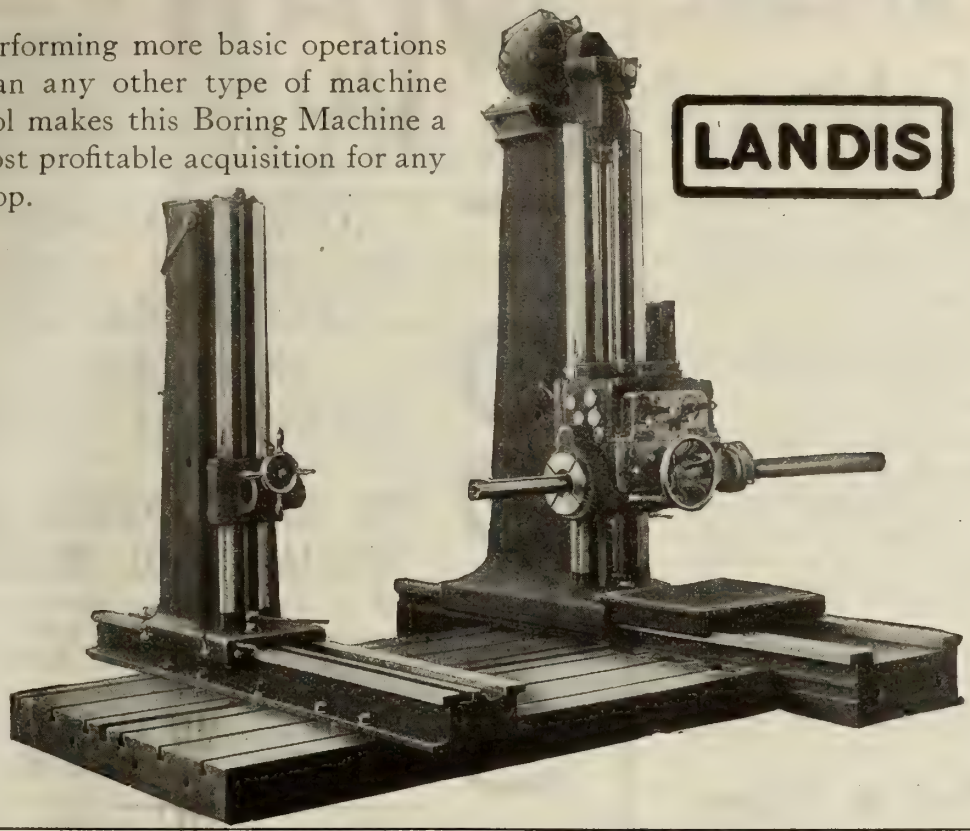
Performing more basic operations than any other type of machine tool makes this Boring Machine a most profitable acquisition for any shop.



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Simple
Durable
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Continuous Operation with little or no upkeep is the record of this machine.

Full details in catalog.

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"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

Six Post Readers in New Cabinet

FORMER Finance Minister Cashen, who, following the crisis which led to the resignation of Premier Lloyd, of Newfoundland, has been called upon to form a Ministry, has already selected nine members to act with him.

Six of these, including the Premier himself, have been regular readers of THE FINANCIAL POST for some time.

This does not only indicate the quality as well as the extent of our circulation, but indicates also that men who carry big responsibilities find THE POST of value to them. It indicates, therefore, the approval which is meeting the effort of our editors and the great importance and value of the business information to which subscribers have access through the columns of THE FINANCIAL POST.

When the Government of Newfoundland was recently arranging the flotation of a $5,000,000 bond issue THE POST'S opinion as regards some methods of marketing was quoted by members of the Cabinet.

The Financial Post at Ottawa

IN the Dominion House of Commons the other week the attention of the Government was drawn to an article in THE FINANCIAL POST containing a reference to the financing of Roumanian orders through an agency established in London by Sir Clifford Sifton. Sir Thomas White mentioned that in reading his FINANCIAL POST that week, he had formed the opinion that the reference was to private marketing of bonds.

Keen Business Men and Cabinet Ministers Read the Post

SIR THOMAS WHITE, with other Cabinet Ministers and prominent Canadian men of affairs, have found THE FINANCIAL POST of swift and sure business service. When you "get down to business" you want the plain facts—all of them—without frills—and quickly. You get them like that in THE POST. THE FINANCIAL POST will keep you informed on Canadian business matters in a way unrivalled by any other publication. Send for a subscription to-day. The price is $3.00 per year, and you have only to fill in this form:

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Reduce Your Milling Costs ⅓ to ½

Don't use a big machine for milling small parts! By adopting the U.S. MILLER you can do the work just as efficiently and at a greatly reduced cost — as much as 1/3 to ½ lower.

The U.S. MILLER stands alone in its class for capacity, accuracy and speed.

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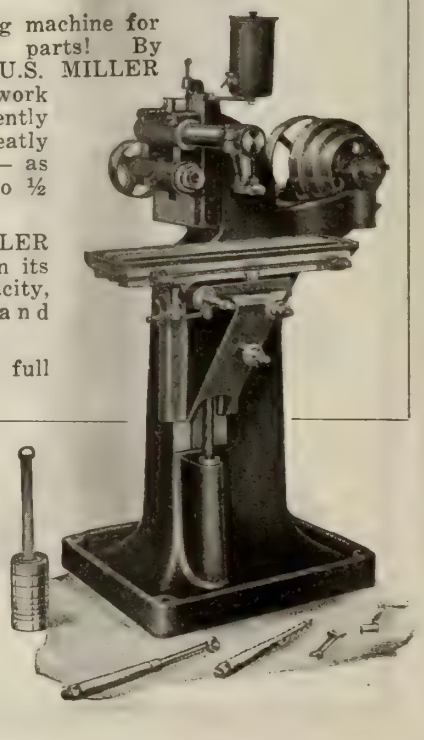

United States Machine Tool Co.
CINCINNATI
Ohio U.S.A.

The Secret of the Strikes

Most Canadians are asking "What is the cause of the 'Great Unrest' "? Is it the fault of labor—or of capital?—or is it the result of German propaganda? Do you know of the real reason for the labor disturbances in Canada, and elsewhere? Are YOU thoroughly familiar with the ins-and-outs of the plans which threaten a world-wide "tie-up?" This is something that should be understood by every Canadian. And every Canadian should read "The Secret of the Strikes," by Lieut.-Colonel J. B. Maclean in the August issue of MacLean's Magazine. It is brimful of startling and authoritative information regarding this great problem. Read it carefully. It starts on page 33, August MacLean's.

"The Lecturer At Large"

Stephen Leacock is one of the continent's greatest humorists. "The Lecturer at Large" is one of the best humorous sketches that he has written. It is made up of what he terms "a few painful reminiscences of the platform" in the course of his lecturing up and down Canada. Get your family around you and read the sketch aloud—it's a rare treat.

Other Big Features

"A Party in the Making." By J. K. Munro. Illustrated by William Casey. An article on the political situation, giving a great deal of inside information with reference to recent developments at Ottawa.

"Solving the Problem of the Arctic." By Vilhjalmur Stefansson. The fifth instalment of his story of the five years' explorations that he conducted for the Dominion of Canada.

"The Unspoiled Country." By Harold C. Lowrey. A descriptive article of a part of Canada which is little known to Canadians generally, Temagami.

"Petite Simunde." By Arthur Beverley Baxter. Illustrated by E. J. Dinsmore. A charming romance of the war. The author will be remembered favorably for his "Mr. Craighouse of New York, Satirist."

"The Seven Blue Doves." By W. A. Fraser. Illustrated by Charles L. Wrenn. The fifth of the Bulldog Carney series and in some respects the best. It is a mystery story.

"His Majesty's Well-Beloved." By Baroness Orczy. Illustrated by C. F. Peters. The second instalment of this splendid romantic novel of the colorful era of Charles II.

The Month's Vital Question

Turn to page 34, August MACLEAN'S, and you will find timely and interesting information regarding the High Cost of Living—a problem of large proportions.

The Review of Reviews

Here are a few of the articles chosen as the best published during the past month in all magazines:—Britain Winning Supremacy of the Air; Has Japan Two Governments?; Kaiser Employed Famous Beauties; The New Triple Alliance; Mammoth Animals in Alberta.

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Try it Yourself

The best argument in favor of throwing away files the moment they become dull is to try filing a job yourself with a dull file.

If it makes you irritable, think what effect it must have on a man who has to file all day long.

Don't let your men work with dull files. Tell them to turn them in when they become dull.

When buying, specify Famous Five Files. You get a good run of sharp service from them because each file is accurately cut, well balanced and properly hardened.

NATCO

On Flange Work

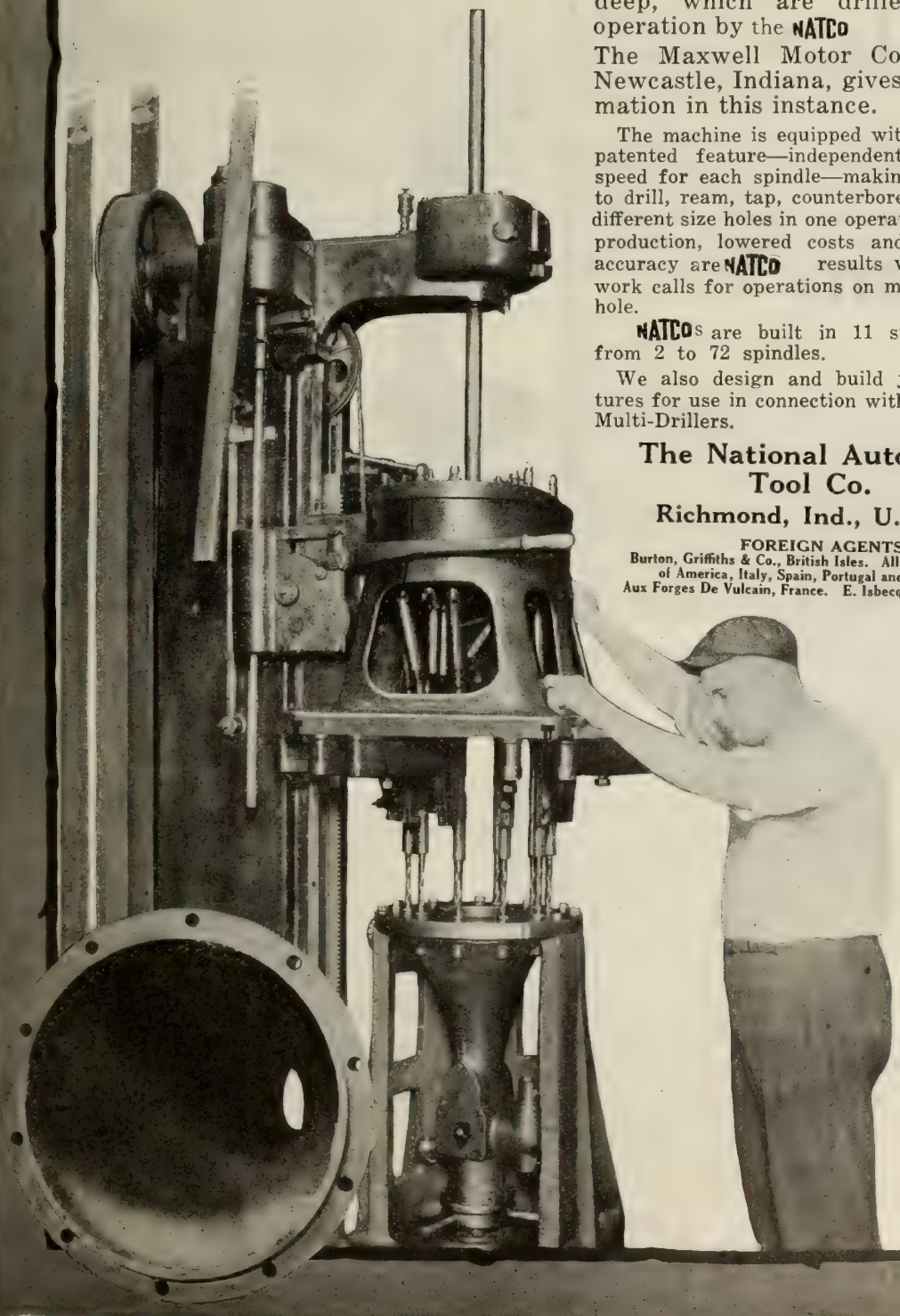
The drilling of 15 Rear Axle Truck Housings is completed every hour. Each housing has 10 holes 1⅜ in. deep, which are drilled in one operation by the NATCO

The Maxwell Motor Company of Newcastle, Indiana, gives the information in this instance.

The machine is equipped with the NATCO patented feature—independent change of speed for each spindle—making it possible to drill, ream, tap, counterbore or spotface different size holes in one operation. Greater production, lowered costs and dependable accuracy are NATCO results whenever the work calls for operations on more than one hole.

NATCOs are built in 11 sizes ranging from 2 to 72 spindles.

We also design and build jigs and fixtures for use in connection with the NATCO Multi-Drillers.



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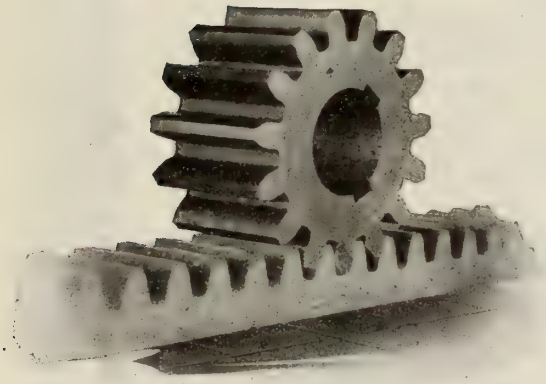

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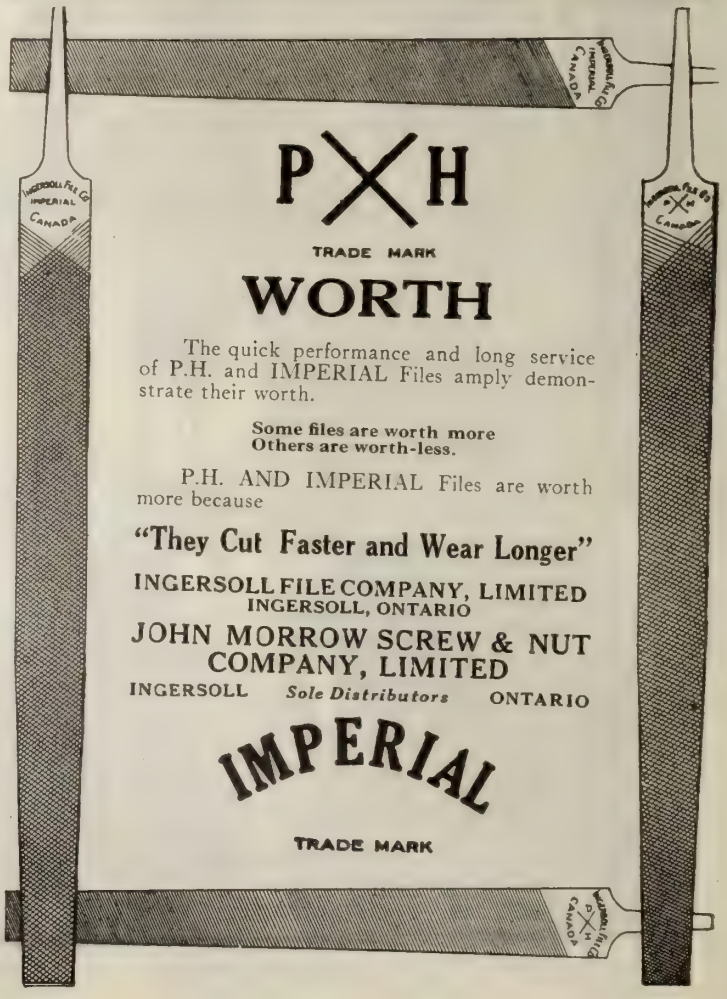
The Canadian Disc Sander is 90% Dustless

Think what a godsend that it is to the pattern shop! Hundreds of prominent concerns are profiting immensely by using these sanders.

Two types of Canadian sanders are built—the Disc Sander and the Oscillating Spindle Sander. Both machines are equipped with New Departure ball bearings and General Electric motor. The table in each case can be tilted by a hand adjustment, 45 degrees down or 15 degrees up. Power is obtained by plugging into a lamp socket. Canadian Sanders are extraordinarily well built and are guaranteed against all defects.

Ask for Bulletin and Prices.

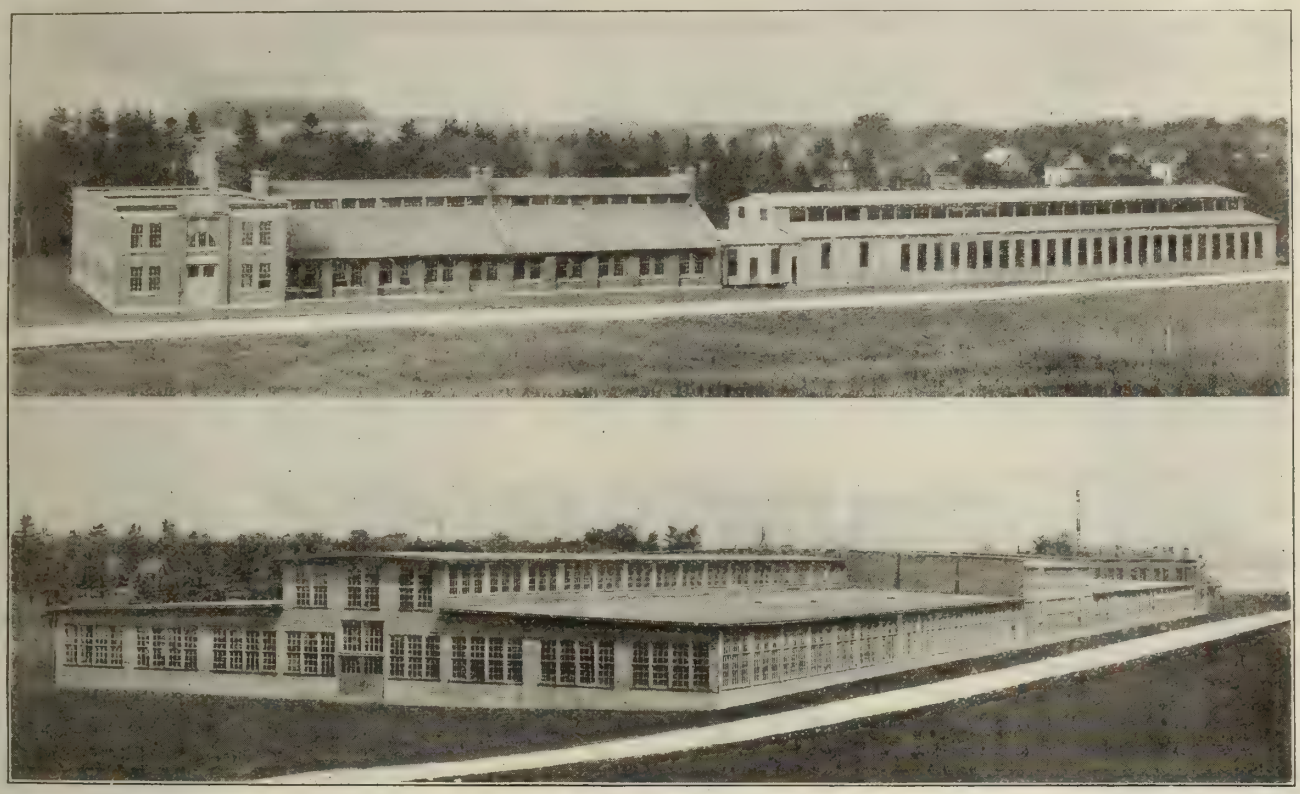
Canadian Sander Mfg. Co.,
Incorporated
Brockville, Ont.



PLANT FOR SALE

A large plant, idle since shell-making stopped, for sale at a very low price.

Total floor space, 109,500 sq. ft.



PLANT OF PEMBROKE IRON WORKS LIMITED
PEMBROKE, ONT.

Total area of property, nine acres.

This large plant, consisting of three separate buildings, approximately 1,000 ft. long, with a width of from 50 to 140 ft., has a floor space of about 109,500 sq. ft., and with an area of nine acres gives ample room for storage or expansion. The large building at the bottom contains 85,000 sq. ft., built in 1918, frame construction ; building in upper left, built in 1909 for a stove foundry, brick construction, has a cupola, contains 18,380 sq. ft.; building in upper right, frame construction, built in 1916, contains 5,520 sq. ft. These three buildings can be used separately, each for a different line of manufacture. Railway running across the property, and Muskrat River bordering it. Price of entire property, $50,000.00.

The Town of Pembroke is situated at the junction of the Ottawa and Muskrat Rivers, and is favorably located between the East and West, being on the main line of three transcontinental railways.

Pembroke is a well-known lumbering centre, and has an abundance of raw material available for manufacturing purposes, such as pine, spruce, birch, maple, ash and poplar, which can be brought in by water and rail at a minimum of cost. Unlimited Hydro-Electric power obtainable at very low rates. There is a plenitude of labor available, both male and female. An unrivalled opportunity for an industry to start up with a small outlay.

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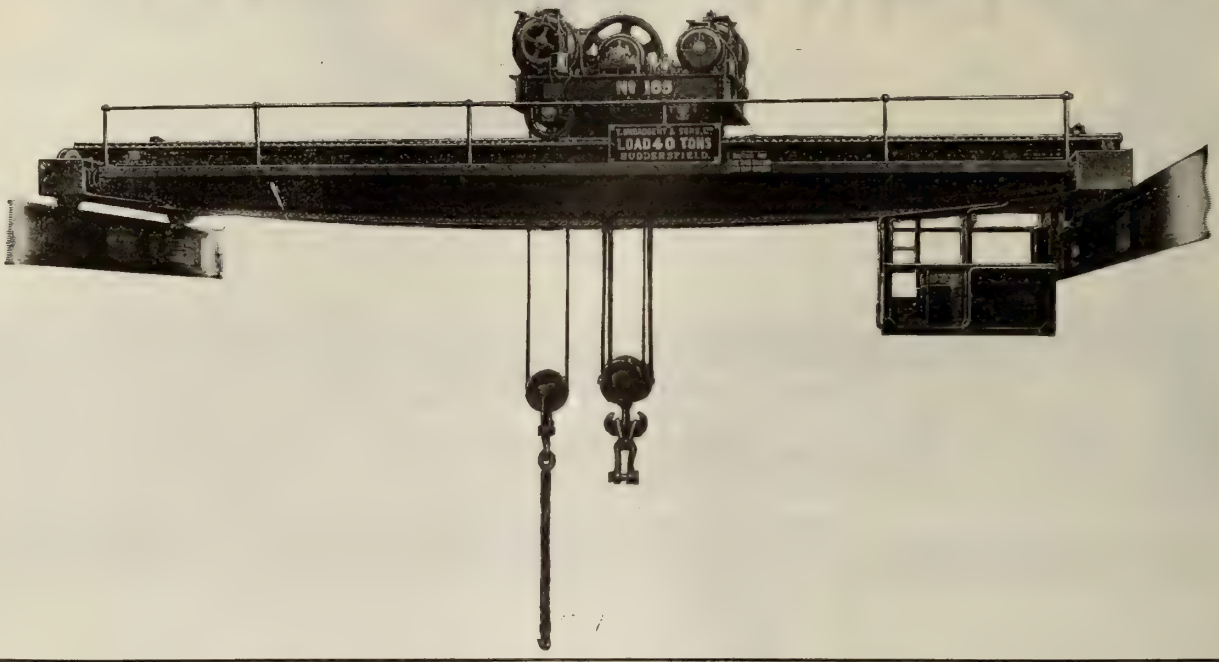

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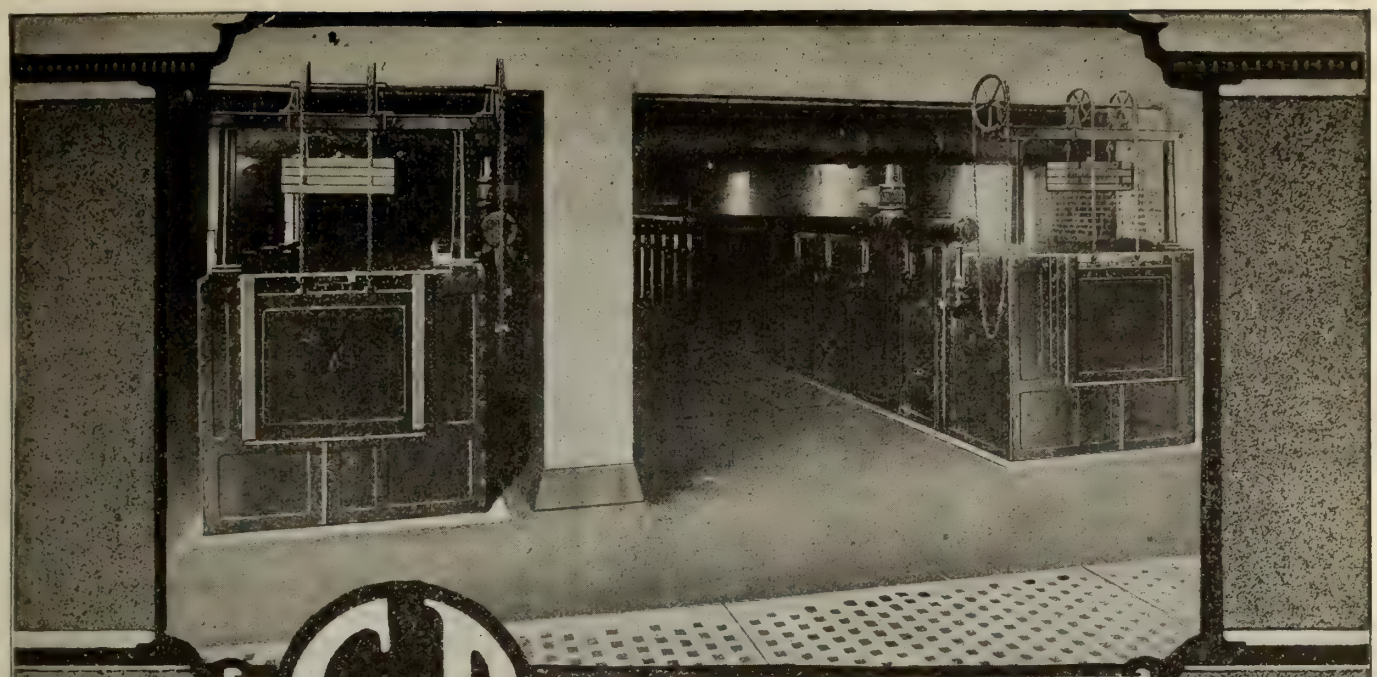

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The name of Gilbert & Barker stands to-day as the "symbol of service" in the heat treating field. G. & B. furnaces are designed right, built right and installed right.

There is a Gilbert & Barker furnace for every heat treating requirement. Our engineering department will give you expert advice without obligation.

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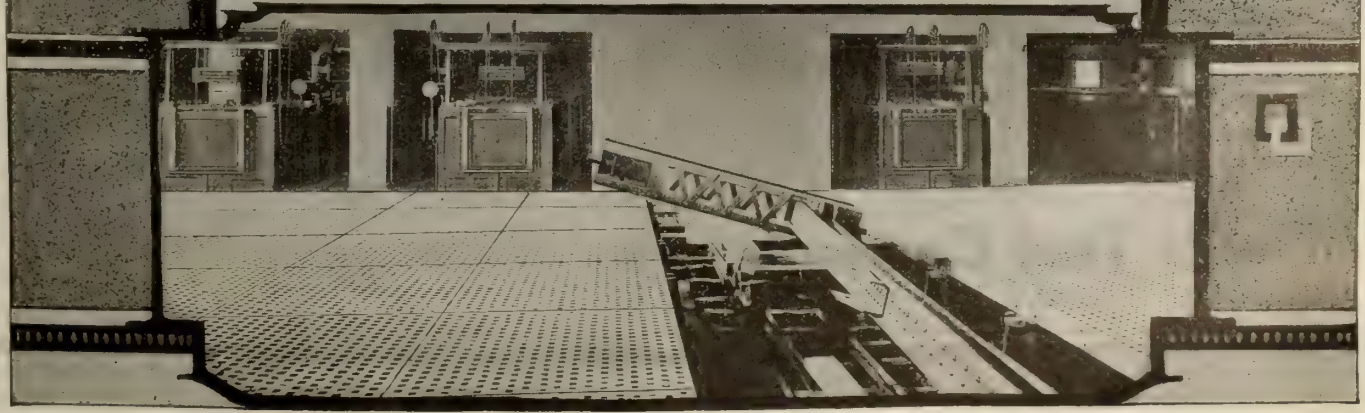

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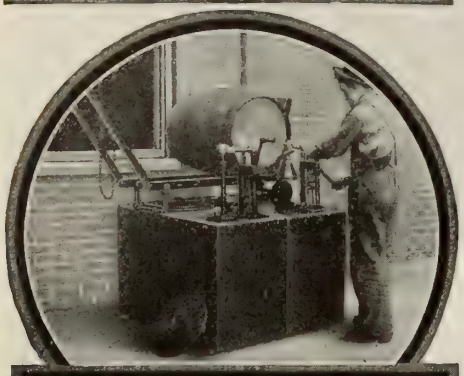

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STOP WASTING LABOR IN HANDLING OILS

Do away with the back-breaking, disagreeable labor in storing and handling oils.

With Bowser Storage Equipment the heavy work is done mechanically—there is no wasted energy—all oils are easily and quickly put into storage by gravity.

Save With BOWSER Systems

Distribution is done by accurate, rapid self-measuring pumps—no oils are left in shipping containers to dry up, leak and seep away—none is lost through spilling or dripping faucets. Every operation in the use of oils is done in a systematic, safe and saving manner.

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Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

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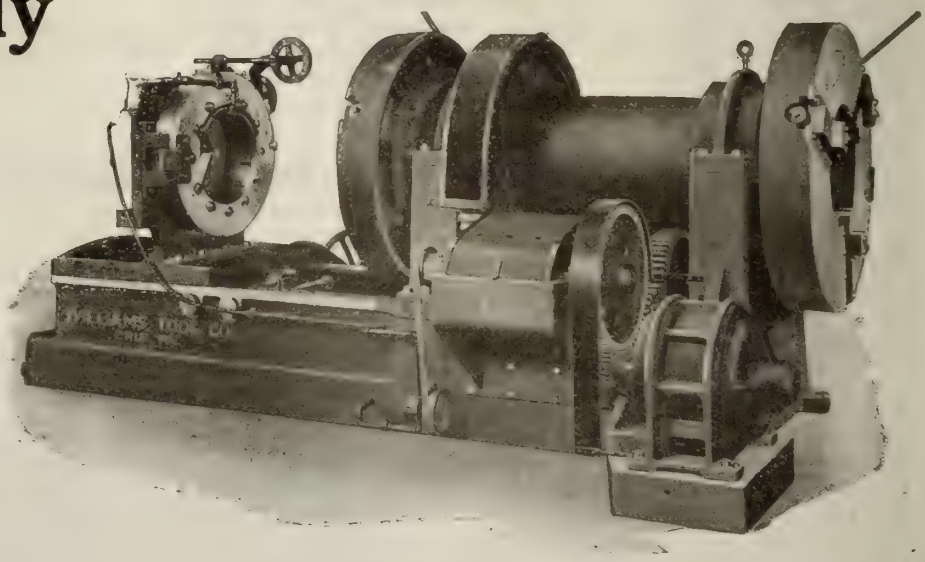
For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



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The William Kennedy & Sons, Limited, Owen Sound

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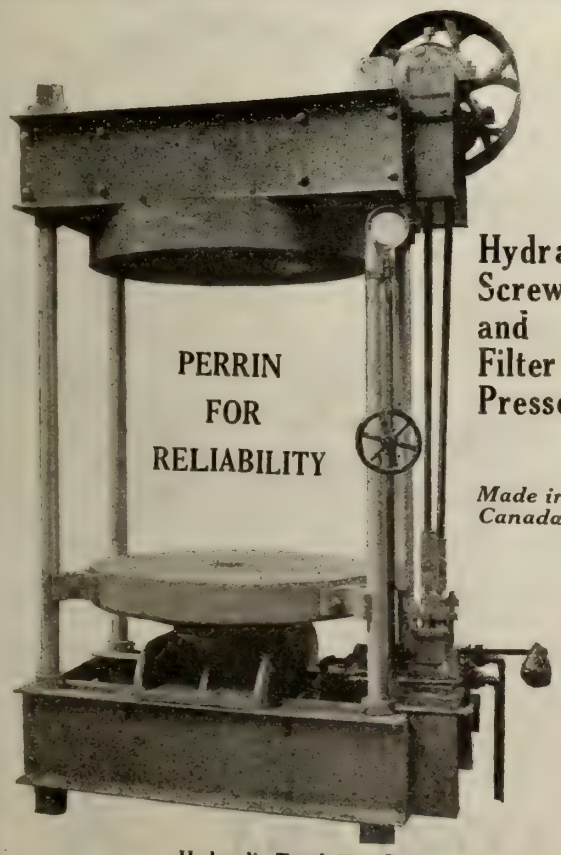

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That Puts Dollars in Your Pockets

Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions, in your pocket by the installation of this machine.

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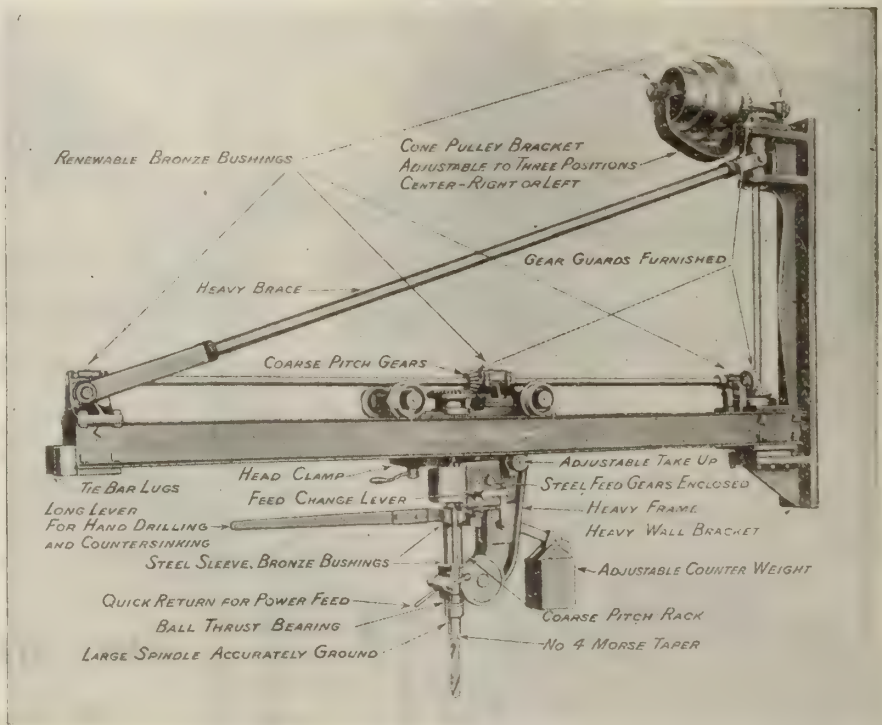
MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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No lathe is more simple in operation.

4 levers give 10 speeds. (20 with double friction countershaft). Accuracy .0005 in 18″.

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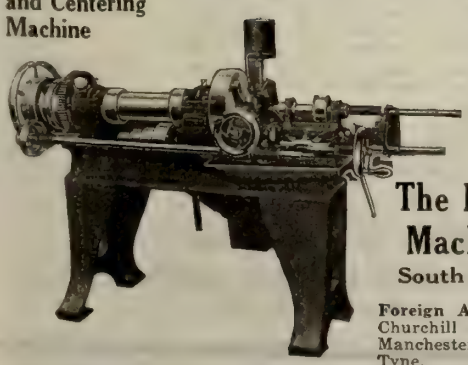
Builders of
THE LATHE WITH THE PULL.
THE LATHE OF SIMPLIFIED ACCURACY.

One Cuts Up
Another Cuts Down
and
They Both Cut
At Once

Hurlbut, Rogers Cutting-off and Centering Machine



Here's Real Economy

This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools—one cutting up and the other cutting down; each holding the work against the other. What is the result?—**the production is doubled and the cost is cut in half.** Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

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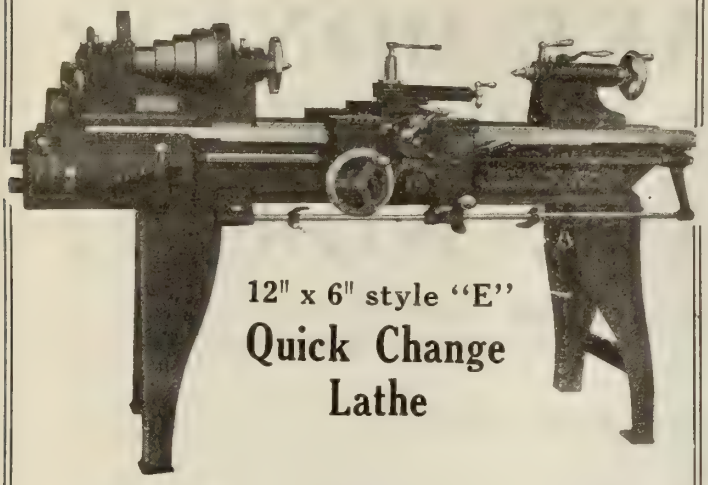

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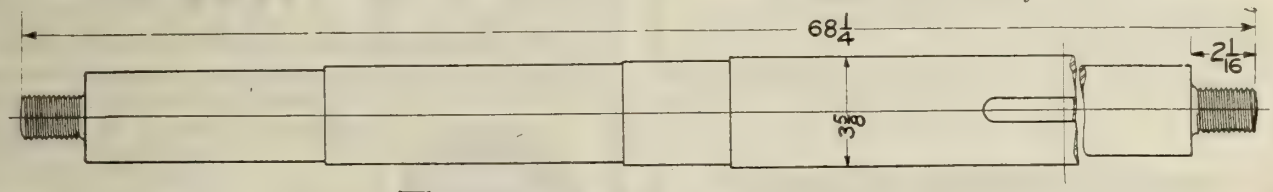
MILLING FEED—4.35 per minute.
MATERIAL—Machinery steel.



Tractor Axle Operation
TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the centre and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

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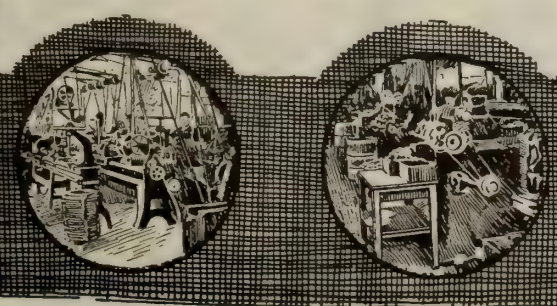

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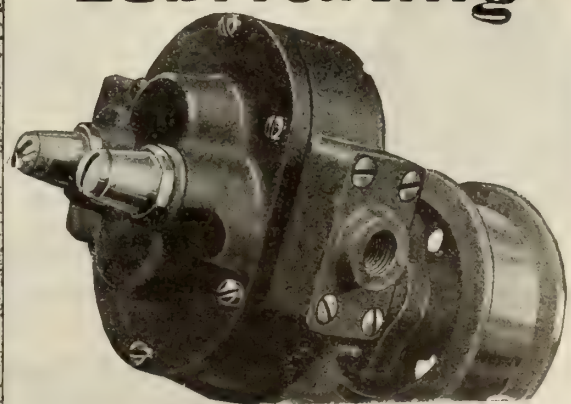

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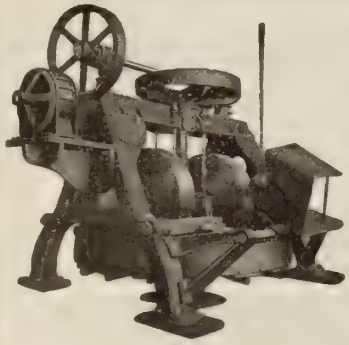

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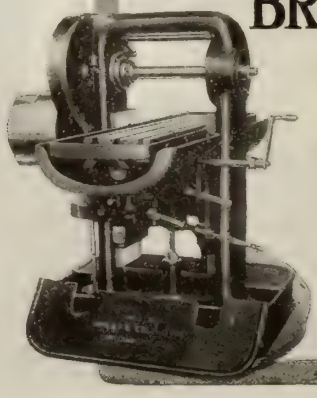

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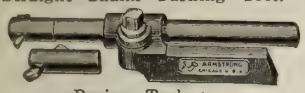
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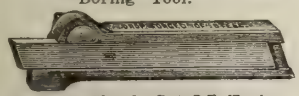
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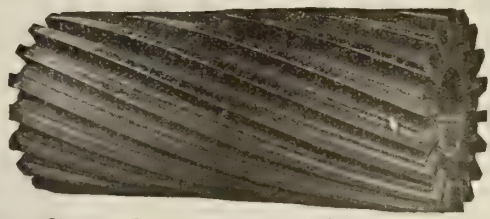

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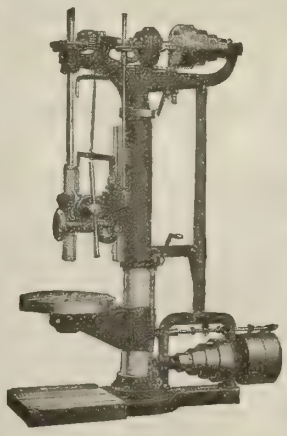

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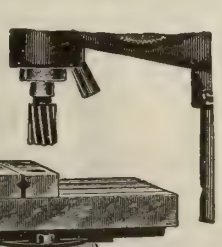

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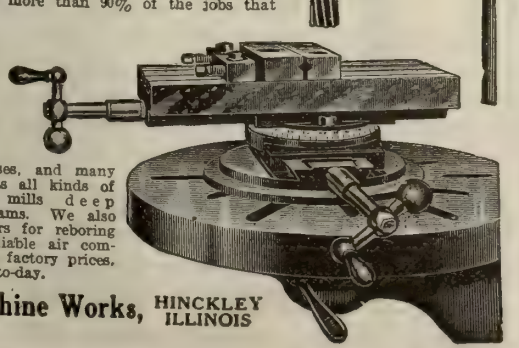

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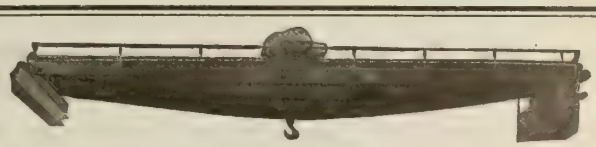

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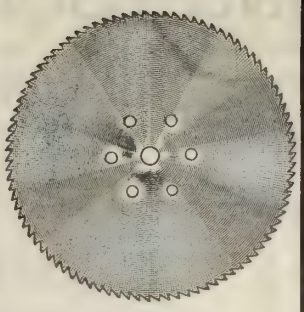

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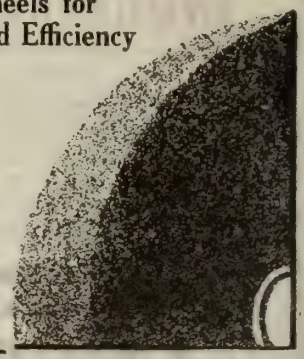

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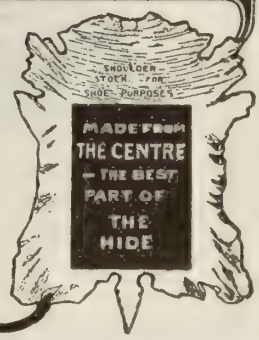

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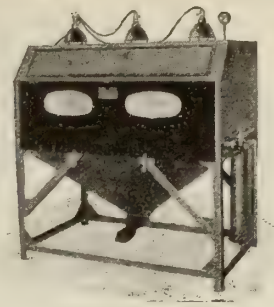

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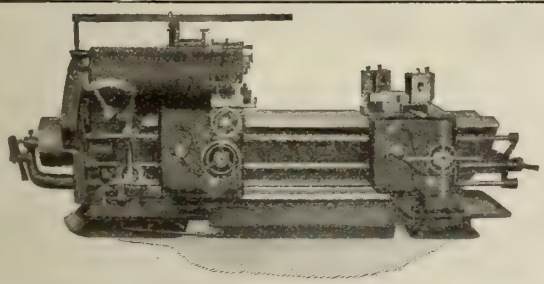

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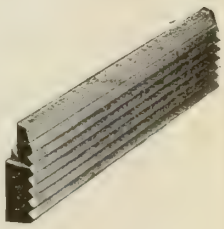

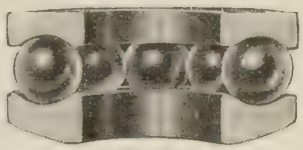

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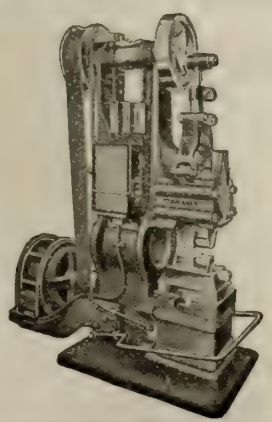

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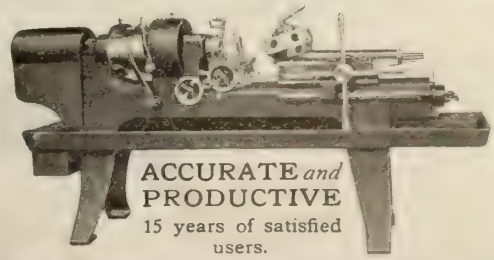

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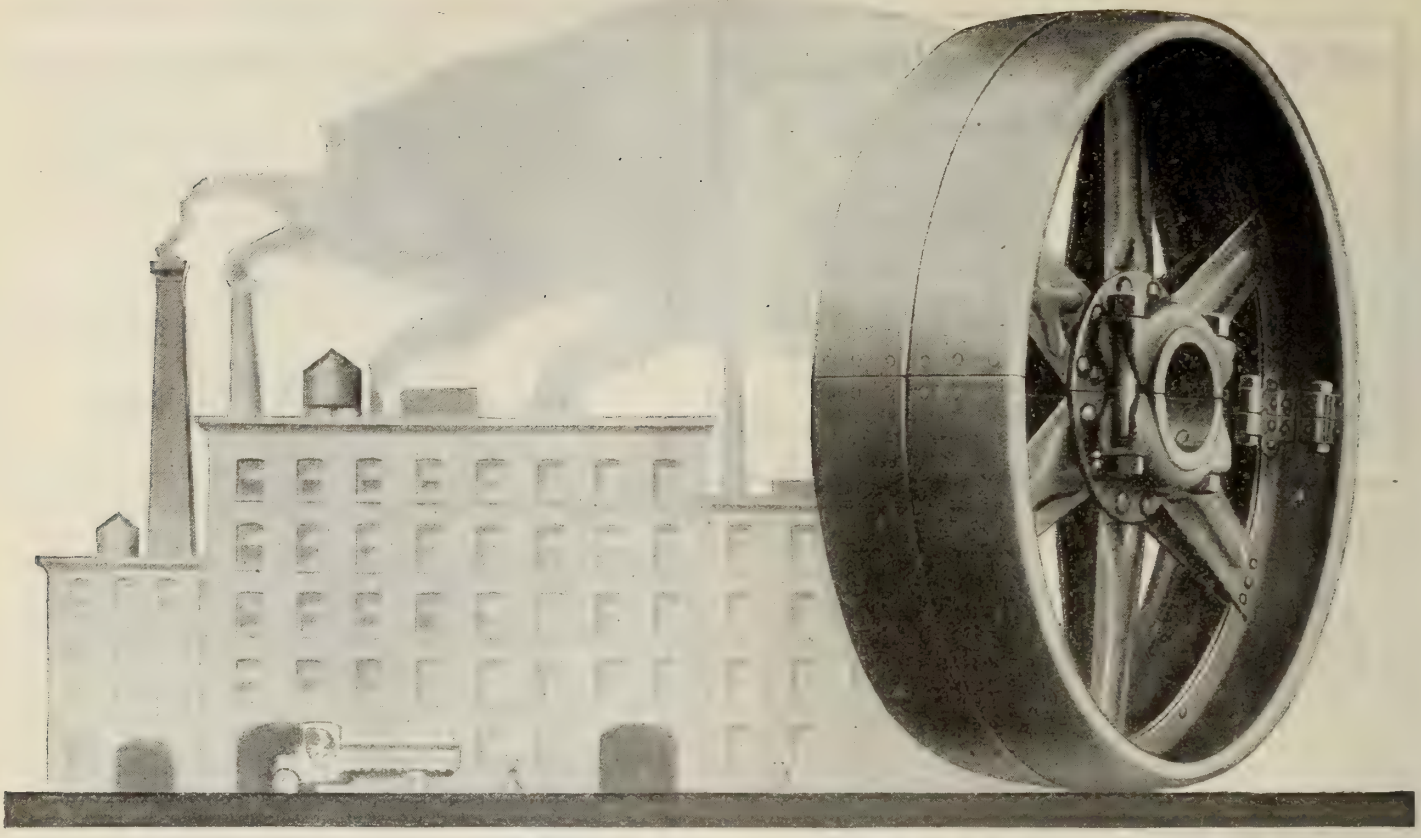

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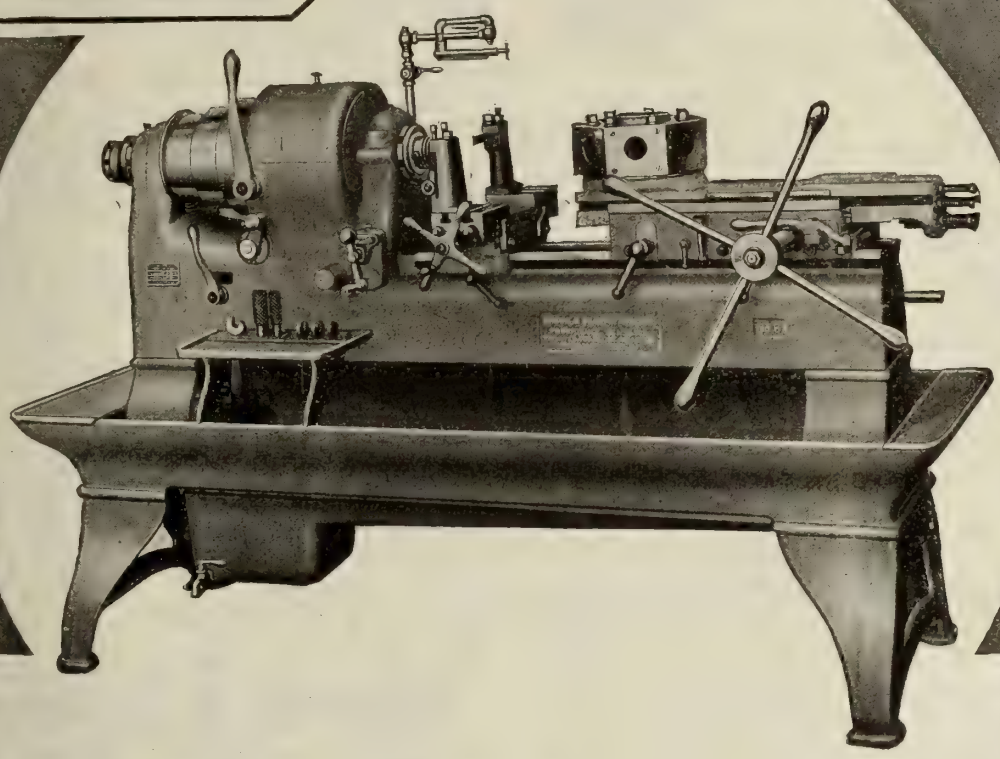

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Independent Pneumatic Tool Co., Chicago.
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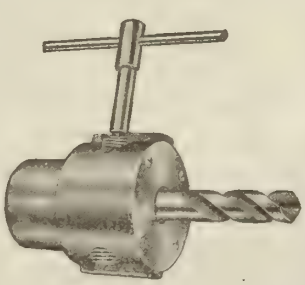
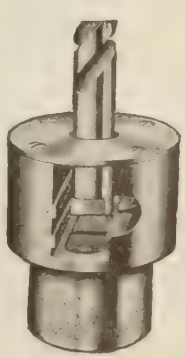


UNION

POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



UNION Manufacturing Co.

New Britain, Conn.

New York 26 Cortland St.

Makers of a complete line of chucks

Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK

Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK

Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN

See Belting, Chain.

DRIVING TOOLS

The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM

Bowser & Co., Inc., Fort Wayne, Ind.

DRYERS, SAND

Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES

Baird Machine Co., Bridgeport, Conn.

DRUM CONTROLS

Elec. Steel & Metals, Ltd., Welland, Ont.

DUMP CARS

Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER. ARRESTER SYSTEM

Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT

Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS

Can. Blower & Forge Co., Kitchener, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES

Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES

Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACE

Electric Steel & Metals, Ltd., Welland.
General Steel Co., Milwaukee, Wis.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

Can. Driver-Harris Co., Walkerville, Ont.

ELEVATOR, ENCLOSURES

Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS

Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS

Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES

Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS

Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS

Wheel Trueing Tool Co., Windsor, Ont.

END MILLS

John Morrow Screw & Nut Co., Ingersoll

ENGINES, STEAM, GAS, GASOLINE

Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL

Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE

Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS

Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS

Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS

Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

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Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS

Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS

Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES

Page Steel & Wire Co., Adrian, Mich.

FANS

Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE

Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY

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Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES

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Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Sim & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

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Can. Wire & Iron Goods, Hamilton, Ont.

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Strong, Kennard & Nutt Co., Cleveland.

FIRE BRICKS

Harbison-Walker Refractories Co., of Canada, Montreal, Que.

FIRE EXTINGUISHERS

Strong, Kennard & Nutt Co., Cleveland, O.

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Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS

Wickes Bros., Saginaw, Mich.

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Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON

Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING

Victoria Foundry Co., Ottawa.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

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John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING

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FRICTION LEATHERS

Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING

Can. Consolidated Rubber Co., Montreal.

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Bowser & Co., S. F., Inc., Fort Wayne.
Gilbert & Barker Mfg. Co., Springfield.

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Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING

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Standard Fuel Engr. Co., Detroit, Mich.

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Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

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GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

Bowser & Co., S. F., Inc., Fort Wayne.

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GAUGERS, CALIPERS

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GAUGES, MERCURY COLUMN, DRAFT

Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD

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Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE

Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL

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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST

Katie Foundry, Galt, Ont.

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Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY

Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE

Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL

Bridgeford Mach. Tool Wks, Rochester.

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Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN

Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM

Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

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Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

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Fellows Gear & Shaper Co., Springfield, V.

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Morse Chain Co., Ithaca, New York.

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Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

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Strong, Kennard & Nutt Co., Cleveland.

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Oliver Machinery Co., Grand Rapids, Mich

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Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

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Wilson & Co., J. C., Belleville, Ont.

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Rice Lewis & Son, Toronto.

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Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal.

GRAVITY CARRIERS

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Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE

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Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH

Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal.

GRINDERS, CUTTER

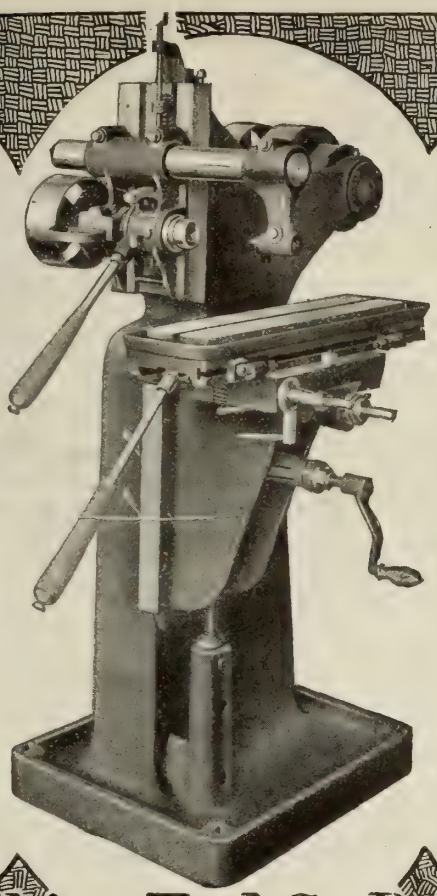
Brown & Sharpe Mfg. Co., Providence, R.I.
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.

The "BRISTOL" Hand Milling Machine

Extensively used in the manufacture of small parts where accurate duplication is essential. Illustration shows our number 1 Heavy Type Hand Miller.

Specially designed for use on work where heavier machine than standard type is necessary.

BRISTOL



Convenience Assures Big Production

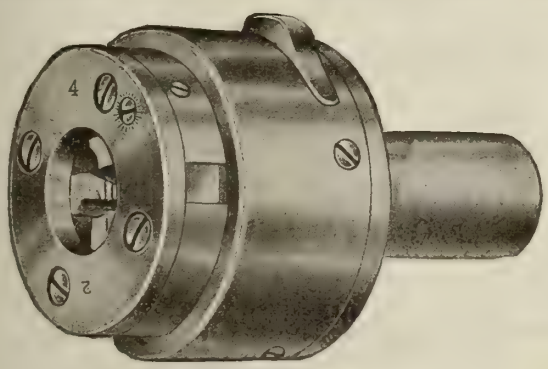
The lever controls make a very convenient method of operation, though crank is furnished for table feed for use when so desired.

Users acknowledge these machines to be exceptional producers, proving in many cases more satisfactory than milling machines of the more expensive type.

Write for catalogue.

BRISTOL

The Bristol Machine Tool Co. Bristol, Connecticut



H&G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

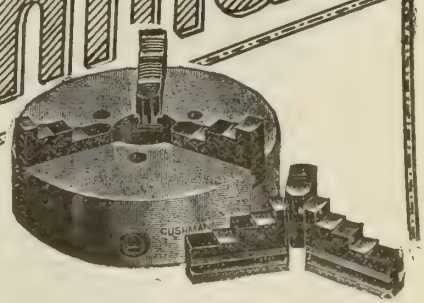
All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.

New Haven, Conn., U.S.A.

Cushman



The "Cushman" Chuck of to-day is the fruit of nearly sixty years of Chuck building

And right from the start in 1862, they have been known throughout the industry for their high quality Material and Workmanship.

The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

Cushman Chuck, Hartford, Co. Conn

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LeBlond Mch. Tool Co., R. K., Cincinnati
Norton Grinding Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal.

GRINDERS, DIE AND CHASER
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

GRINDERS, DISK
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Ford-Smith Mach. Co., Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, DRILL
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Foss Mchy. & S'ply. Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
United States Elec. Tool Co., Cincinnati.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal.

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Brown & Sharpe Mfg. Co., Providence, R.I
Foss Mchy. & S'ply. Co., G. F., Montreal.
Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

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Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Electrical Tool Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Wisconsin Electric Co., Inc., Racine, Wis.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Grant Mfg. & Mach. Co., Bridgeport, Conn
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
United States Elec. Tool Co., Cincinnati.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.
Wilkinson & Kompass, Hamilton, Ont.

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Cleveland Pneumatic Tool Co., Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
MacGovern & Co., Montreal, Que.

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Bristol Machine Tool Co., Bristol, Conn.

GRINDERS, TOOL AND HOLDER
Armstrong Bros. Tool Co., Chicago.
W. F. & John Barnes Co., Rockford, Ill.
Blake & Johnson Co., Waterbury, Conn.
Blount, & Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

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Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

GRINDERS, VERTICAL, SURFACE
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Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

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Cincinnati Elec. Tool Co., Cincinnati. O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford, Ont.
LeBlond Mch. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York, N.Y.
Norton Grinding Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wiss.
Williams & Wilson, Ltd., Montreal.

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Norton Grinding Co., Worcester, Mass.

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Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Norton Co., Worcester, Mass.

GRIT, ANGULAR
Pittsburgh Crushed Steel Co., Pittsburgh.

GUARDS, WINDOW AND MACHINE
Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods, Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland.

HANDLES, BALANCE, CRANK AND MACHINE
Williams & Co., J. H., Brooklyn, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply. Co., G. F., Montreal
Fry's (London), Ltd., London, England.
Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

HACK SAW FRAMES
Aikenhead Hardware Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal.

HACK SAWS, POWER
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.

HAMMERS (DROP), MOTOR AND BELT DRIVEN
Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
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Canada Machinery Corp., Galt, Ont.
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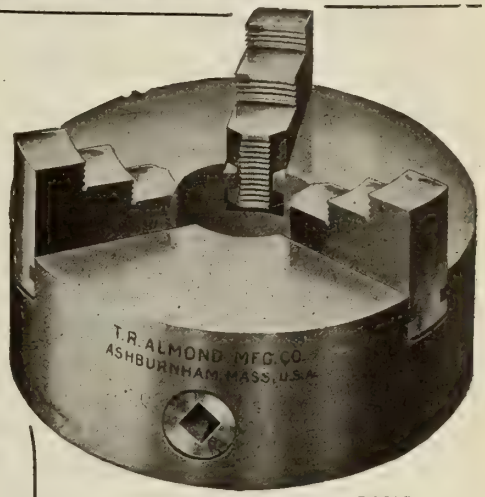

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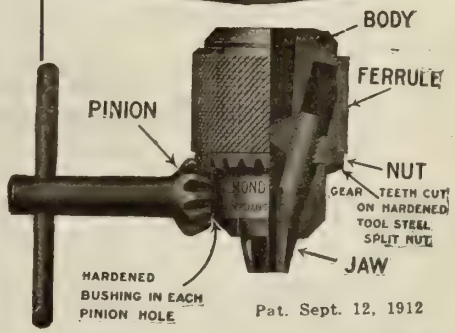

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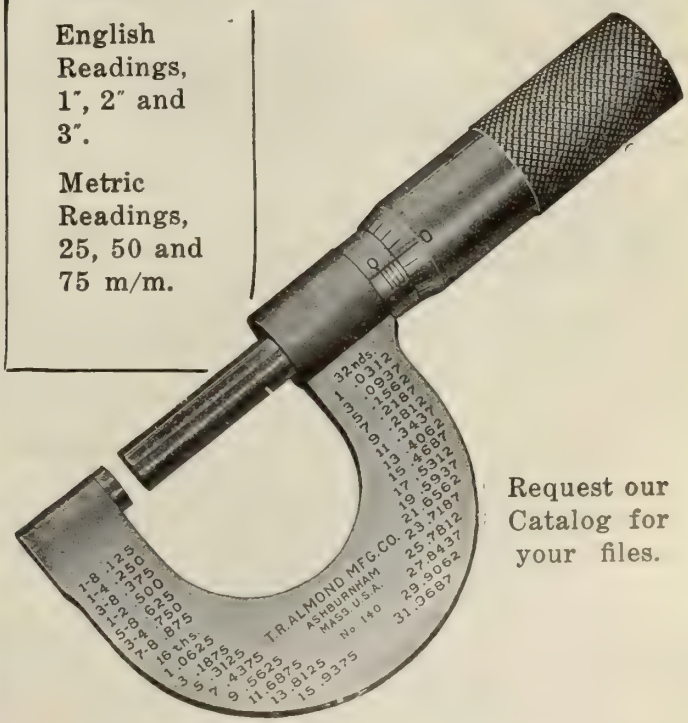

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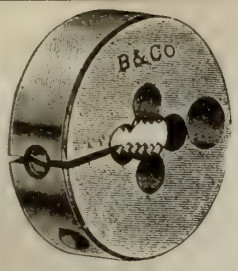

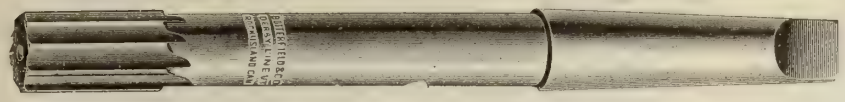

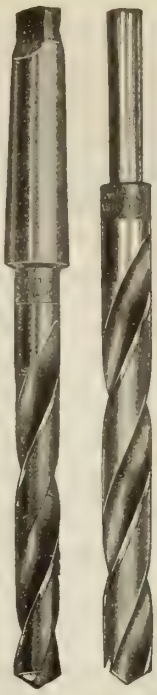

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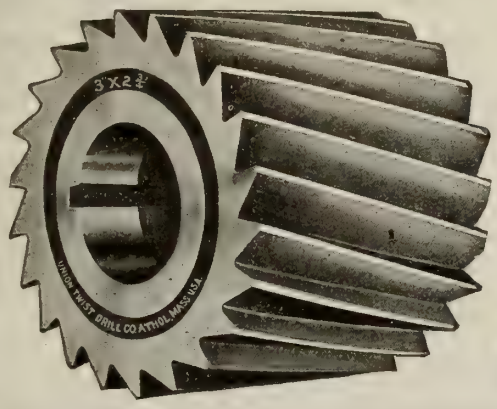

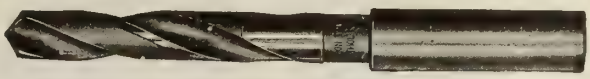

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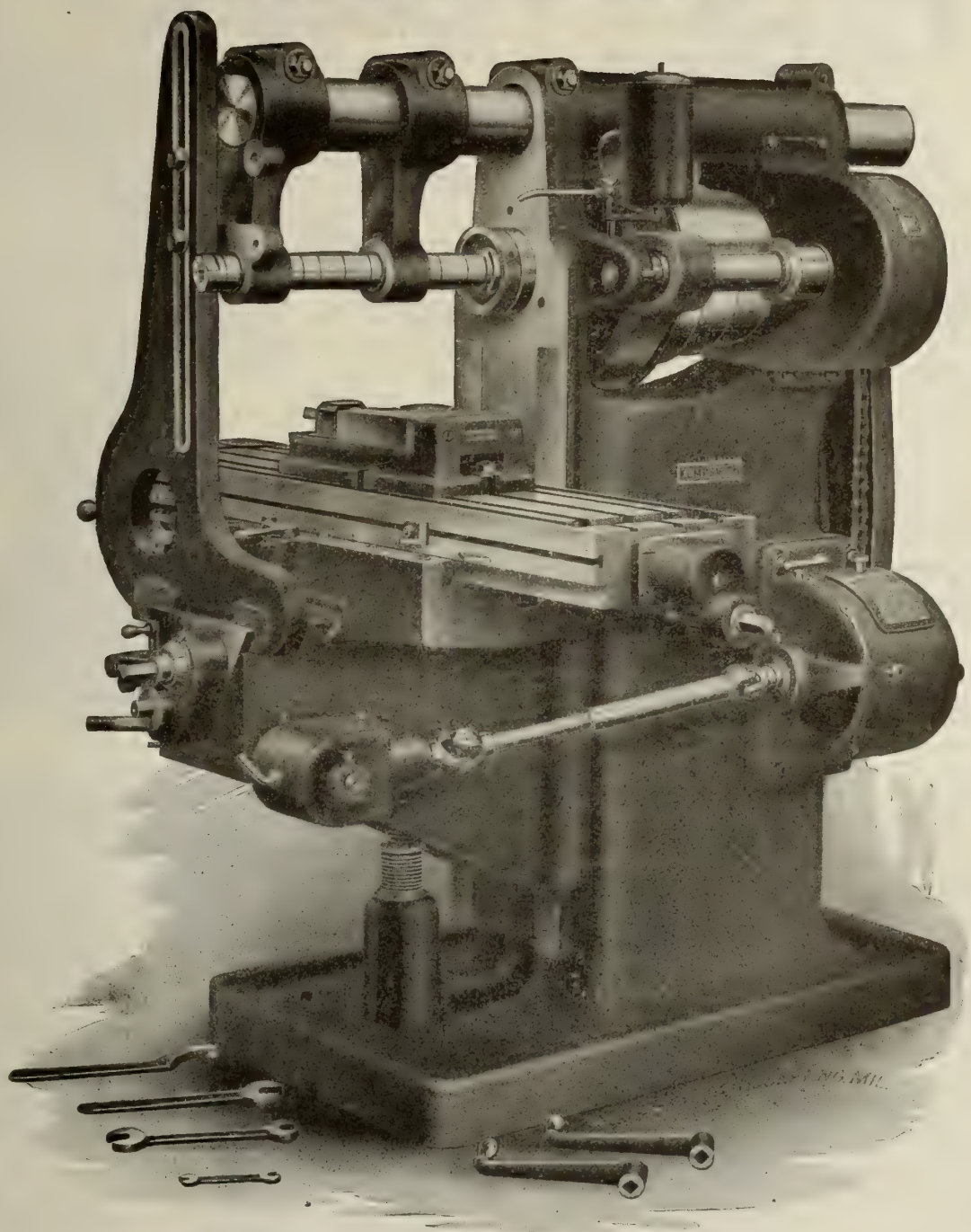

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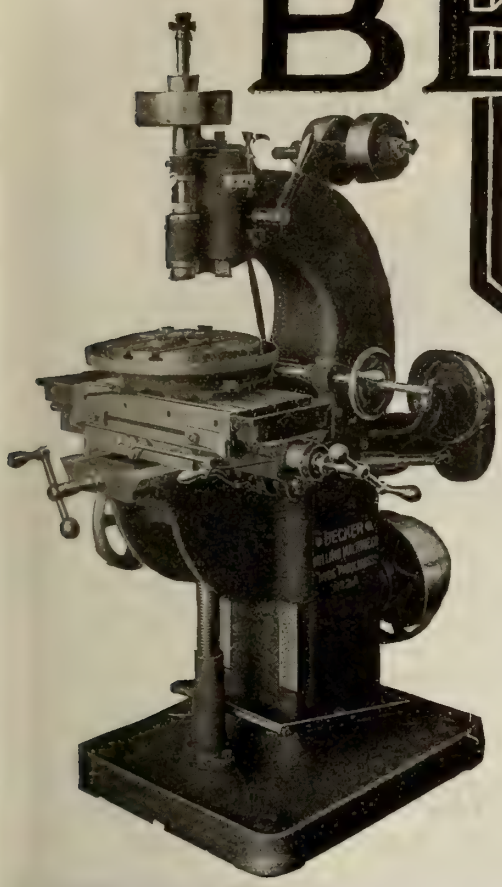

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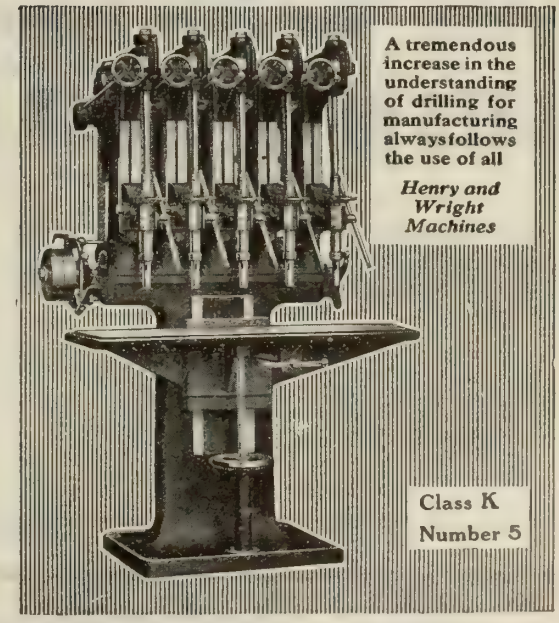

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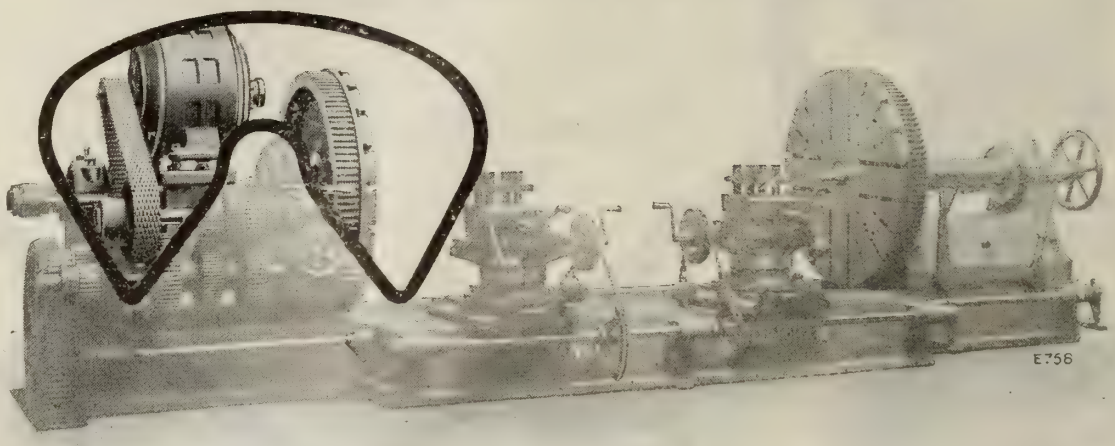

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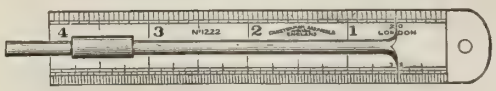

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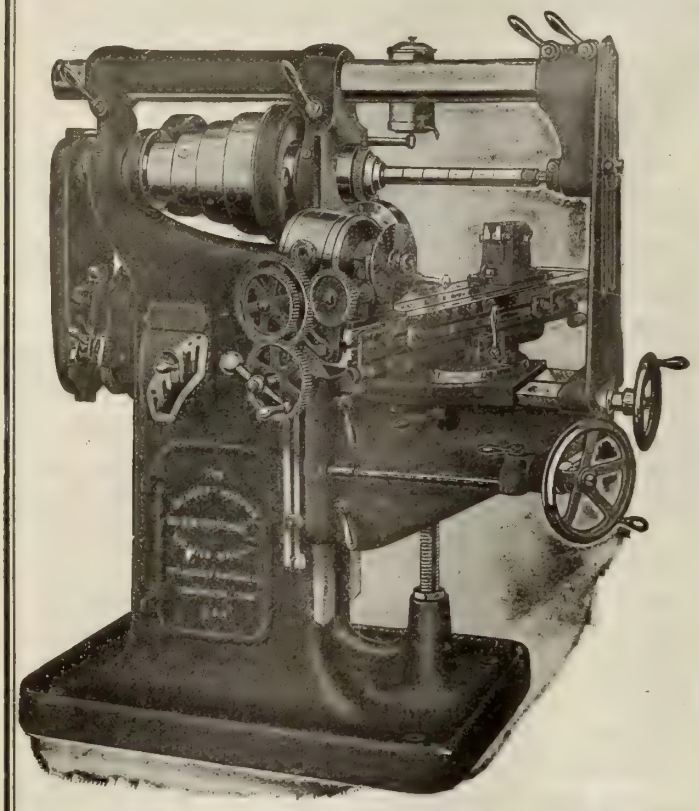

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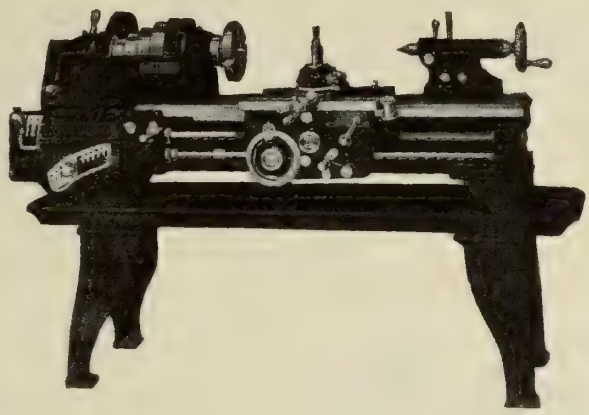

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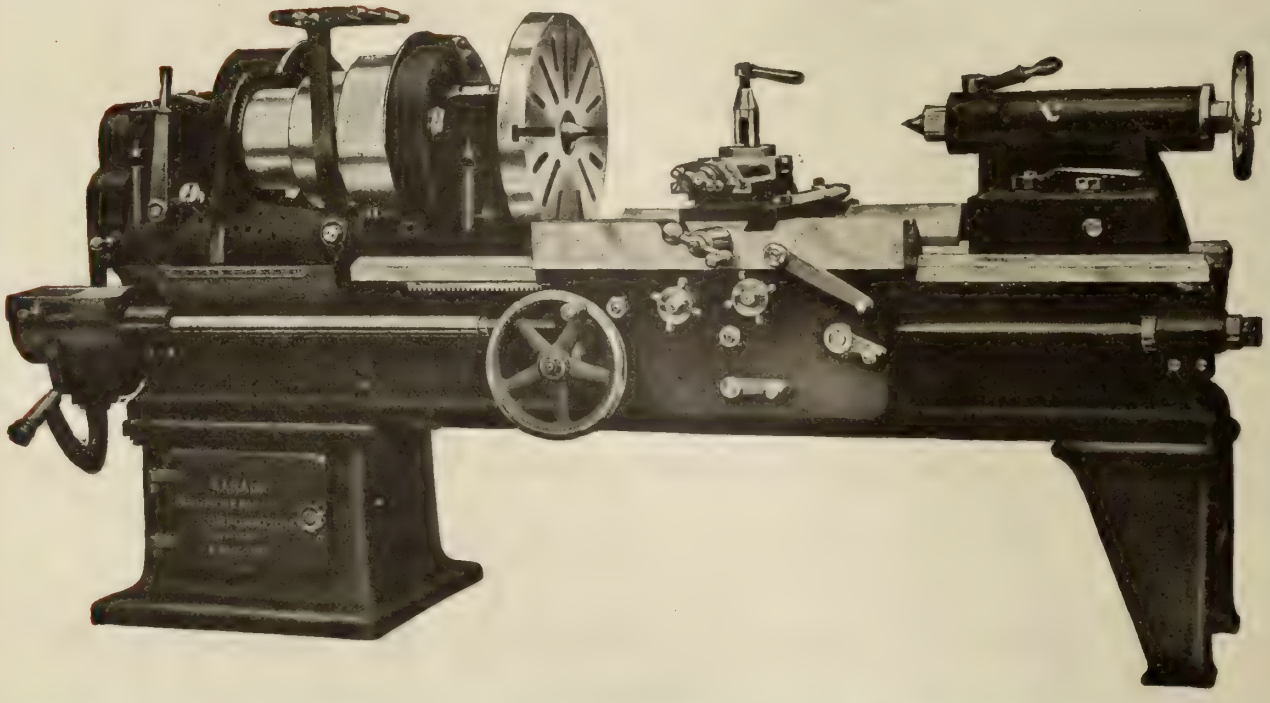

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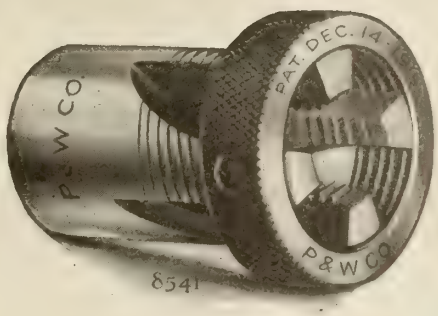

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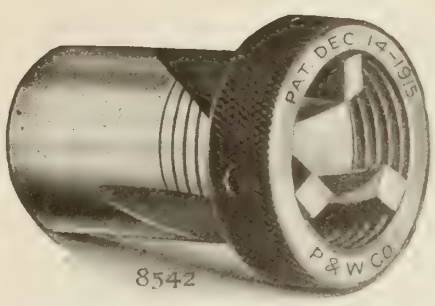

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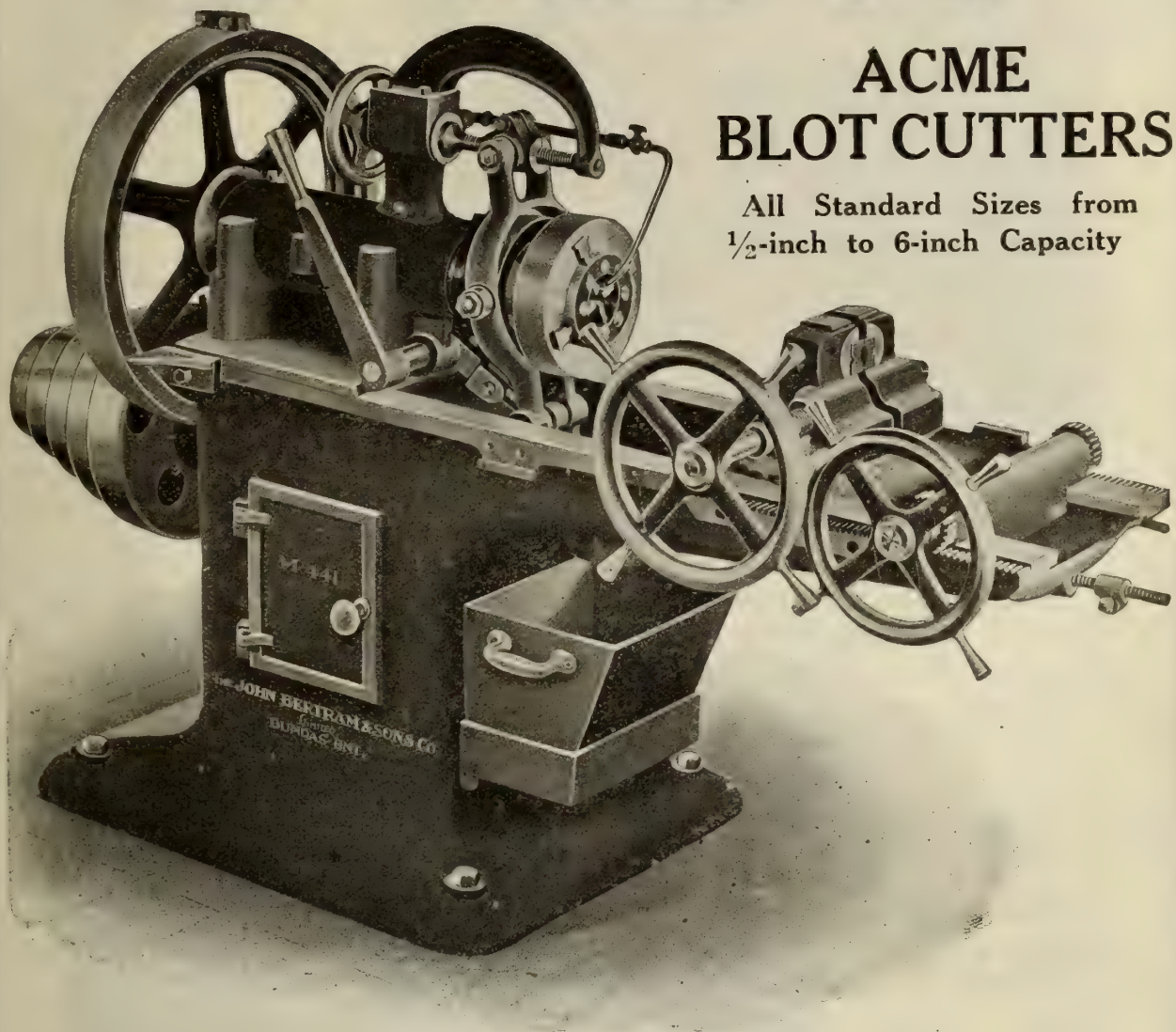

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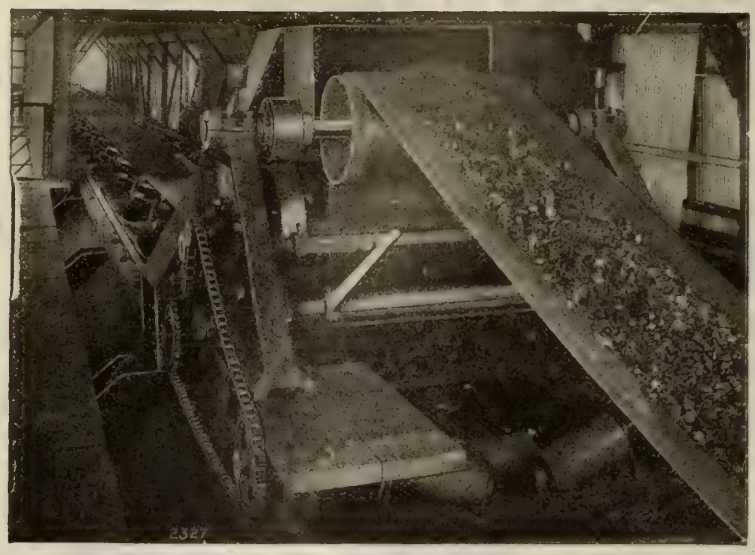

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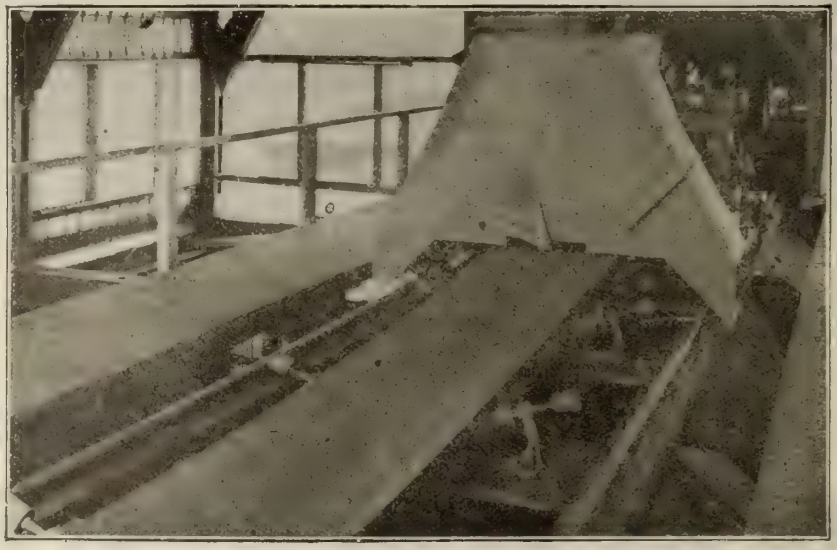


FEDERAL ENGINEERING CO., LIMITED

172 John St., Toronto

BY-PRODUCT COKE
SULPHATE of AMMONIA

"HAMILTON" PIG IRON
Basic Malleable Foundry

STEEL & IRON BARS
OPEN HEARTH STEEL SHEETS

FORGINGS
Car Axles
Shape and Drop Forgings
Carriage and Automobile Hardware

POLE LINE HARDWARE
(Black and Galvanized)
Pole Steps
Cross Arm Braces
Guy Clamps
Guy Rods

SCREWS
Steel, Brass and Bronze
Wood and Machine Screws

NAILS, SPIKES & RIVETS
Wire
Cut
Boat and Horse Shoe Nails
Railway
Pressed and Drift Spikes
Tacks
Shoe Nails
Steel and Copper Rivets
Burrs

Purchase the Products of Canadian Mills

TO uphold the Glory we have jointly earned—to honor our noble dead—to comfort the wounded, and extend to the men returned the hand of prosperous welcome, we must cast aside all forebodings and face the future with unbounded courage and confidence and, without a shadow of doubt, declare to the World that this Nation, which was so quickly and successfully transformed to a War basis, can be depended upon to revert to Peace conditions with equal success. The buyer and seller must recognize their duty to the Nation and co-operate fully to the end that all products that can be produced in Canada by Canadian workmen shall not be purchased elsewhere.

OUR Duty is plain; Canada with Canadian labor and capital can produce, manufacture and distribute products sufficient to keep the wheels of industry turning to the limit. The song of Prosperity and Happiness should ring out all over the land. Let us sincerely pledge to the extent of our needs, to purchase materials produced in Canada by Canadian Workmen, and the result of our efforts will return to us the Blessings of a Prosperous and Happy Nation.

THE
STEEL COMPANY
OF
CANADA
LIMITED
HAMILTON MONTREAL

RAILROAD TRACK MATERIAL
Angle Bars
Track Bolts
Tie Plates
Tie Rods
Spikes

WROUGHT PIPE
Black Pipe
Galvanized Pipe
Nipples
Couplings

LEAD PRODUCTS
Lead Pipe
White Lead
Shot
Putty

WIRE
Steel & Brass
Copper & Bronze
Heavy and Fine
Bright Annealed
Coppered
Galvanized and Tinned
Stranded
Steel and Copper Cable
Clothes Line
Staples
Barb Wire
Woven Wire
Fencing
Fence Gates

Bars
Blooms
Billets
Wire
Wire Rods
Sheets
Horse Shoes
Angles
Channels
Plow Beams

General View of the Plant of the Algoma Steel Corporation from the Waterfront.

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15″, all standard sections of ANGLES from 6″ x 6″ down to 1¼″ x 1¼″, ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14″ wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process. and can be furnished in all grades from the softest rivet stock to high carbon special spring material. Motto: "Quality and Service."

MARK OF ALGOMA O.H. QUALITY

The following are the sections which will be rolled:—

ANGLES—Equal Leg—
6 x 6″—5 x 5″—4 x 4″
3½ x 3½″—3 x 3″
2½ x 2½″—2¼ x 2¼″
2 x 2″—1¾ x 1¾″
1½ x 1½″—1¼ x 1¼″

ANGLES—Unequal Leg—
6 x 4″—6 x 3½″—5 x 4″
5 x 3½″—5 x 3″—4½ x 3″
4 x 3½″—4 x 3″—3½ x 3″
3½ x 2½″—3 x 2½″—3 x 2″
2½ x 2″

BEAMS—
15″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

CHANNELS—
15″, 13″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

ZEES—
3¼ x 5 x 3¼ x 5 x 5/16″
3 5/16 x 5 1/16 x 3 5/16 x ⅜″
3⅜ x 5⅛ x 3¾ x 7/16″
3 1/16 x 4 x 3 1/16 x ¼″
3⅛ x 4 1/16 x 3⅛ x 5/16″
3 3/16 x 4⅛ x 3 3/16 x ⅜″
2 11/16 x 3 x 2 11/16 x ¼″
2¾ x 3 1/16 x 2¾ x 5/16″

ROUNDS—
All sizes from ½″ up to and including 4″.

SQUARES—
All sizes from ½″ up to and including 3″.

FLATS—
All sizes from 1 x ¼″ up to and including 14″ wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

PIG IRON—
Machine Cast Foundry, Maleable and Basic.
Sulphate of Ammonia.

NITRE CAKE.

For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.
Your enquiries and business will be appreciated.

ALGOMA STEEL CORPORATION

SAULT STE. MARIE, ONTARIO

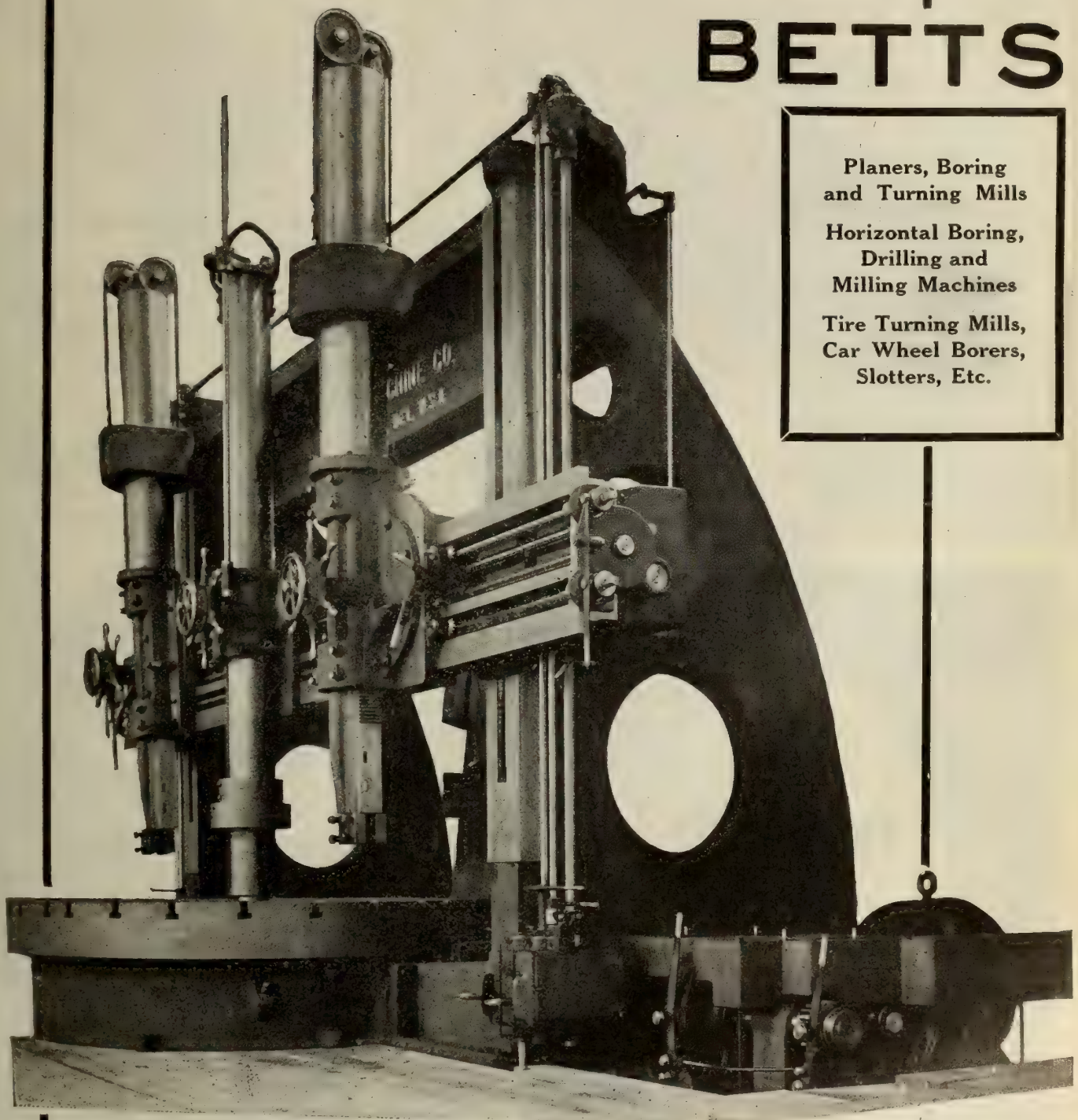
"Machine Tools That Produce—"

BETTS

Planers, Boring and Turning Mills

Horizontal Boring, Drilling and Milling Machines

Tire Turning Mills, Car Wheel Borers, Slotters, Etc.



HEAVY BETTS DUTY

BETTS MACHINE CO.

408 BLOSSOM ROAD ROCHESTER, N.Y.

STEEL PLATE AND STRUCTURAL STEEL WORKS

A small part of a 14-foot penstock recently built for the Canadian Light and Power Company. This is the third contract executed by our Jenckes Plant for this concern.

We are prepared to make prompt delivery of:

Air Receivers and Tanks of all kinds
Boilers, Breechings and Stacks
Penstocks, Flumes and Wheel Casings
Elbows and Special Shapes
Ore Buckets, Cars and Skips
Steel Towers, Columns and Girders
Steel Roof Trusses and Balconies
Steel Railway and Highway Bridges
Steel Crane Runways, etc.

Ask our nearest branch for estimates.

Canadian Ingersoll-Rand Co., Limited

Sydney Sherbrooke Montreal Toronto Cobalt Winnipeg Nelson Vancouver

Swedish Steel & Importing Co., Limited

Montreal New York Toronto Denver

Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK SS DOUBLE ESS

PROMPT SHIPMENTS from large stock

WOLFRAM

MADE IN THE U.S.A.

HIGH SPEED STEEL TRADE MARK

A Keen Cutter

Is Both

Strong in the Neck

VULCAN CRUCIBLE STEEL CO. Aliquippa ESTABLISHED 1900 Pa: U.S.A.

Represented in Canada by Messrs Norton Callard & Company Que. Montreal

Illustration shows a Wilt Twist Drill in active service at the new shops of the Canadian National Railway, Leaside, Ontario.

Wilt Quality improves production and cuts drilling costs to a minimum.

This is no theory, no untested statement, but an established fact backed by many of the largest manufacturers throughout Canada. For steady, reliable output of work that is satisfactory from the standpoint both of quantity and quality there is no better choice than WILT products.

"Where there's a WILT—There's the Way"

WILT TWIST DRILL COMPANY

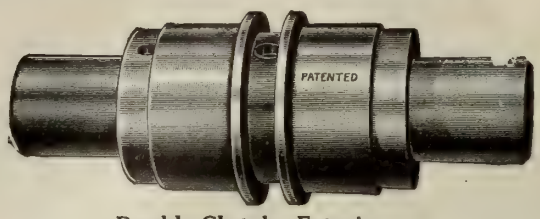
OF CANADA, LTD. WALKERVILLE, ONT.

London Office: Wilt Twist Drill, Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England.

Manufacturers of a paramount line of Twist Drills, Reamers and Milling Cutters

THE JOHNSON FRICTION CLUTCH

The Clutch of a Thousand Uses



Double Clutch—Exterior

THE JOHNSON FRICTION CLUTCH

Every day we are called upon to do something new with Johnson clutches. The demand for a practical friction drive spreads over an unlimited field. And the "Johnson" is the one clutch that can always answer. No matter how strenuous or how delicate the service, no matter how difficult the situation—we have the clutch that will handle it. Get acquainted with an all-round clutch.

WRITE TODAY FOR OUR YELLOW DATA SHEETS

Canadian Agents:

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CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

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Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

Send us your drawings for estimates.

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED
WELLAND ONTARIO

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Forging Billets and Bars

Electric Furnace, Alloy Steels

Die Blocks

Annealed—Heat Treated

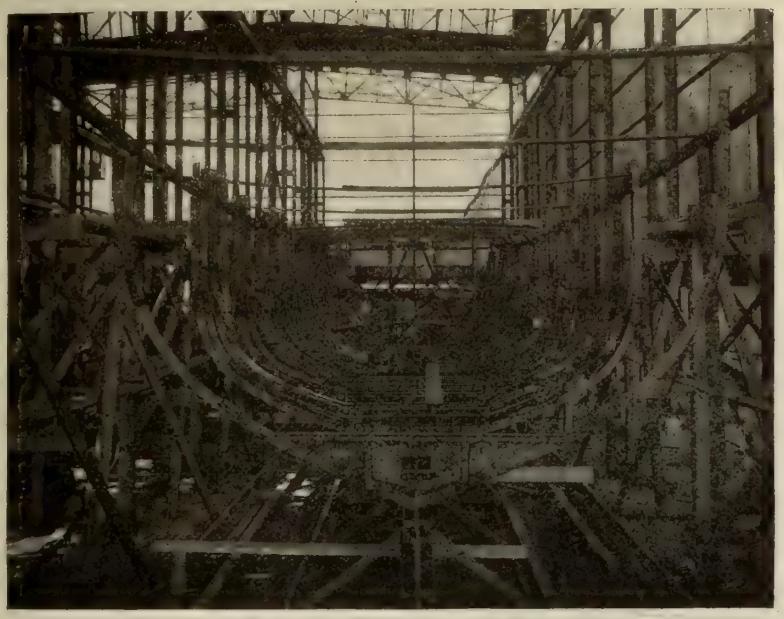
Piston Rods

Rough Turned—Annealed—Heat Treated

High Speed Steel

General Steel Company

Milwaukee, Wisconsin
DETROIT—823 Dime Bank Building



SHIP CASTINGS

IN STEEL

STERN and RUDDER FRAMES,
SHAFT BRACKETS, ANCHORS,
ETC.

CANADIAN
STEEL FOUNDRIES
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Transportation Building, Montreal

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium — make this a steel of truly remarkable cutting properties.
We know "Electrite" cannot be bettered — and stand ready to prove it to you.

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ELECTRIC STEEL CO.
LATROBE, PA.

High Speed Steel

Uranium

STEEL STAMPS

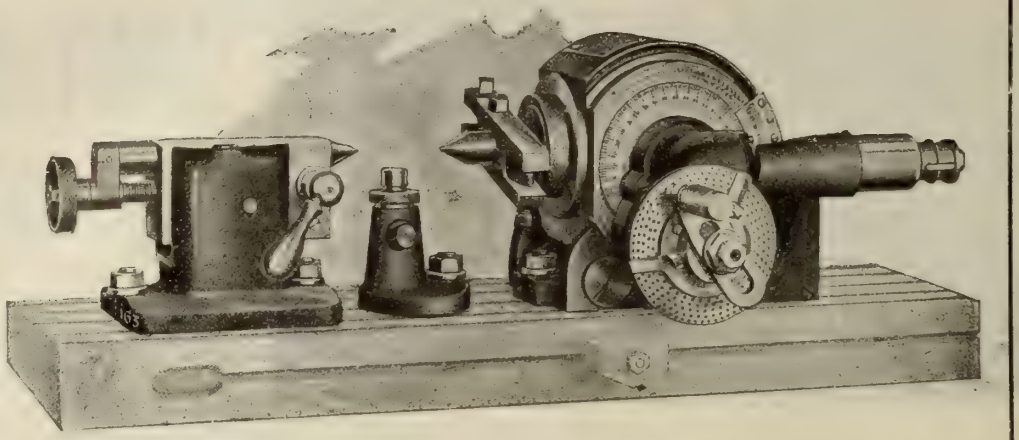
FOR MARKING ALL CLASSES OF METAL WORK

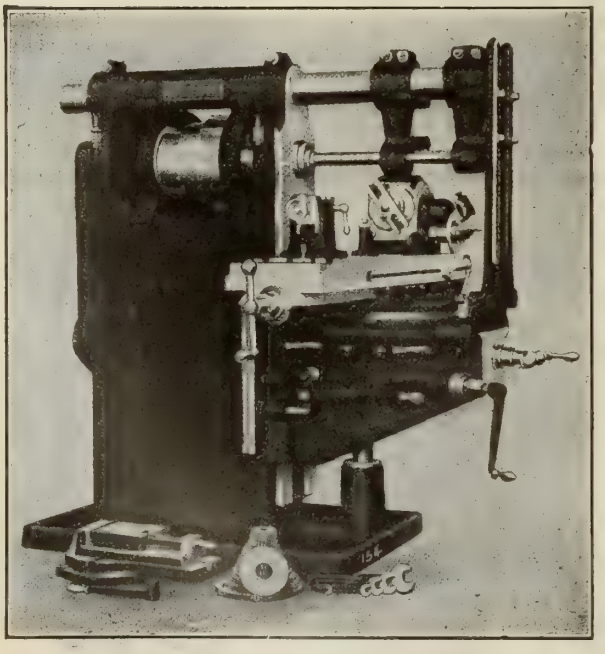
We will Give You Satisfaction on all Work of this Kind.

Send for Prices

PRITCHARD-ANDREWS CO.
OF OTTAWA
General Engravers and Die Sinkers
264 SPARKS ST. OTTAWA, CAN.

The Dividing Head





FORD-SMITH MILLERS

The Miller of high-grade construction—fast, accurate and durable.

The care used in the building of Ford-Smith Dividing Heads is a fair gage of the workmanship in the entire machine. Each Head is thoroughly tested for accuracy so that every finished Head comes within the closest practice limits, giving satisfactory results.

Manufactured in Canada by

THE FORD-SMITH MACHINE CO., LIMITED

HAMILTON -- CANADA

Foreign Agents: W. E. Storey, 3 Arundel St., LONDON, ENGLAND
Gollin & Co., MELBOURNE, AUSTRALIA

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

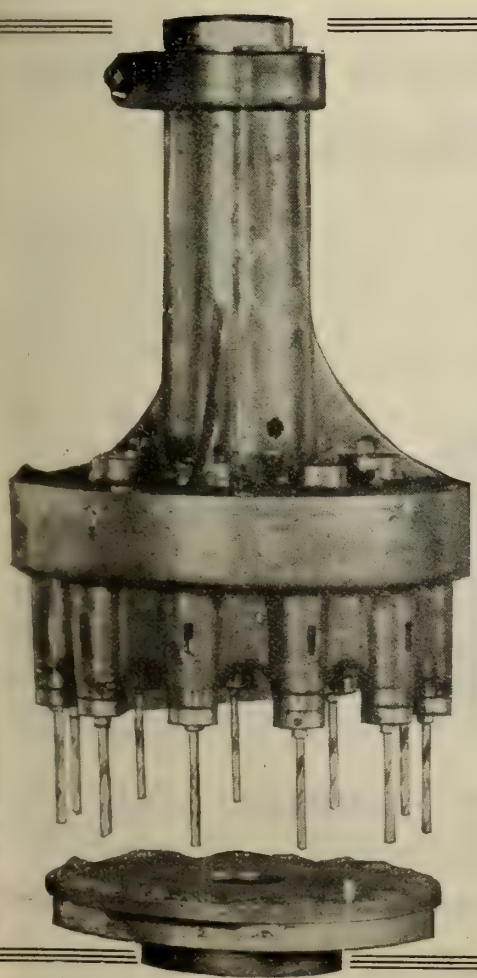
We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Western Sales Offices:
Room 14 WindsorHotel
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process



SPEED UP THE WORK

Rising costs are knocking the bottom out of profits these days! Materials and labor are up. No chance to reduce them. But you can speed up your work. The Hoefer Manufacturing Company has a proposition that will cut your drilling cost. Not guesswork, either, but on a basis proved by experience.

By using Hoefer Auxiliary Heads you can drill ten, twelve or more holes in the same time as one. Not only do you save the drilling time, but also the time lost shifting the jigs and raising and lowering the spindle for the extra holes.

360 manufacturers, 99 distinct lines of business—probably some of your competitors—employ Hoefer Auxiliary Heads to increase profits. They say the Hoefer Auxiliary Heads pay for themselves in 30 to 60 days.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. Made by expert toolmakers and guaranteed to handle accurately the work for which they are designed.

Investigate now. Stop the leakage of dollars due to the use of single drills. Write for catalog and send blueprint of some of your work for estimate of time and cost.

The Hoefer Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Bldg., Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Bldg., Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

The Canadian Fairbanks-Morse Company, Limited
"Canada's Departmental House for Mechanical Goods"
Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
Winnipeg Saskatoon Calgary Vancouver Victoria

HŒFER Auxiliary Heads

MEN whose souls have been tried in the Crucible of War Time Service will not easily forget those forces, either Human or Mechanical, which were instrumental in achieving Victory.

"Red Cut Superior"

The Nationally Known FIRST QUALITY

HIGH SPEED STEEL

Is a Fighter for Efficiency in Peace Times and War Times.

Are your Tools made of Red Cut?

VANADIUM-ALLOYS STEEL CO.

General Sales Offices, PITTSBURGH, PA.
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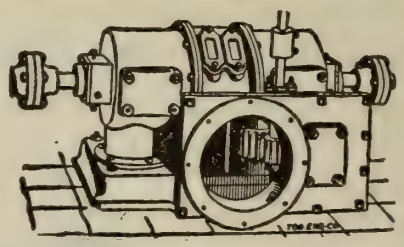
BOSTON
BUFFALO
CINCINNATI
CHICAGO
CLEVELAND
DETROIT
PITTSBURGH
MONTREAL
NEW YORK
TORONTO

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.
Can supply complete equipment, including flume, turbine and power transmission.
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

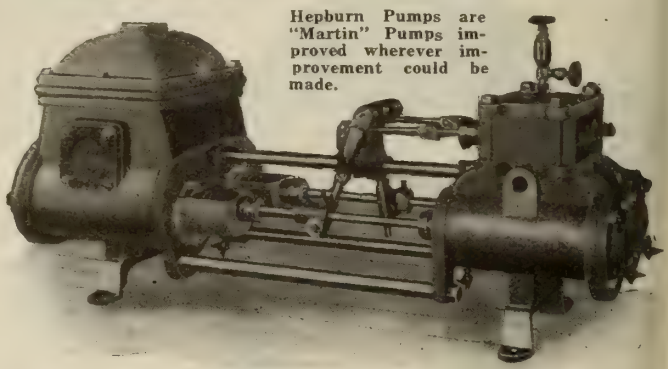
We solicit your inquiries.

THE J. C. WILSON MFG. CO.
LIMITED
BELLEVILLE, ONTARIO

Hepburn Pumping Machinery

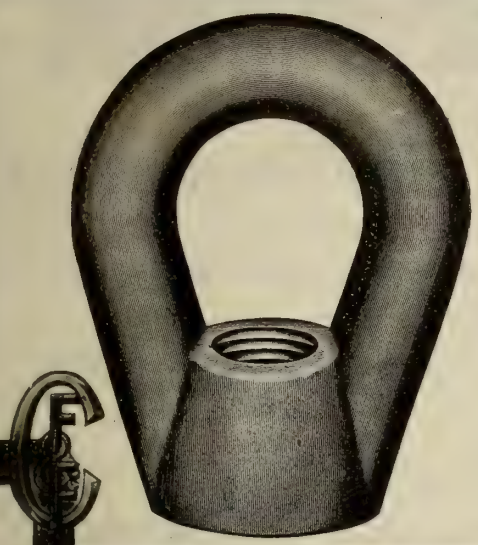
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.



JOHN T. HEPBURN, LIMITED
18-60 Van Horne Street Toronto, Ontario

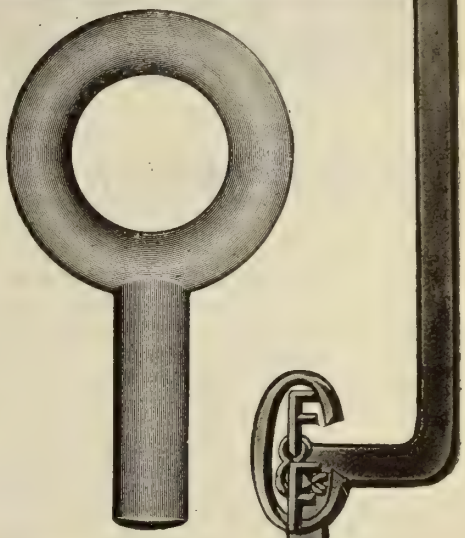
CANADA
FOUNDRIES & FORGINGS
LIMITED



DROP FORGED STEEL

all sizes

Produced at
Canadian Billings & Spencer Plant
Welland, Canada



LOCOMOTIVE AND CAR WHEEL TYRES

HIGH-SPEED AND CARBON TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE IN CANADA

ARMSTRONG WHITWORTH
OF CANADA, LIMITED

Head Office:
298-300 St. James Street,
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Works:
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Branches:
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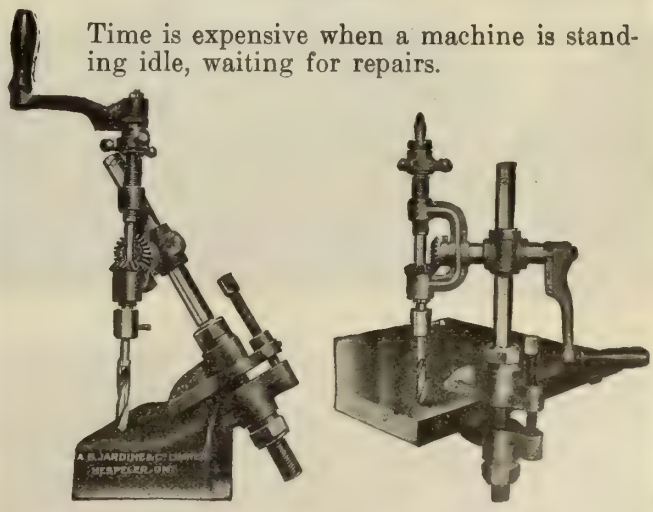
27 King William St. HAMILTON
McArthur Building WINNIPEG

Jardine Universal Ratchet Drill

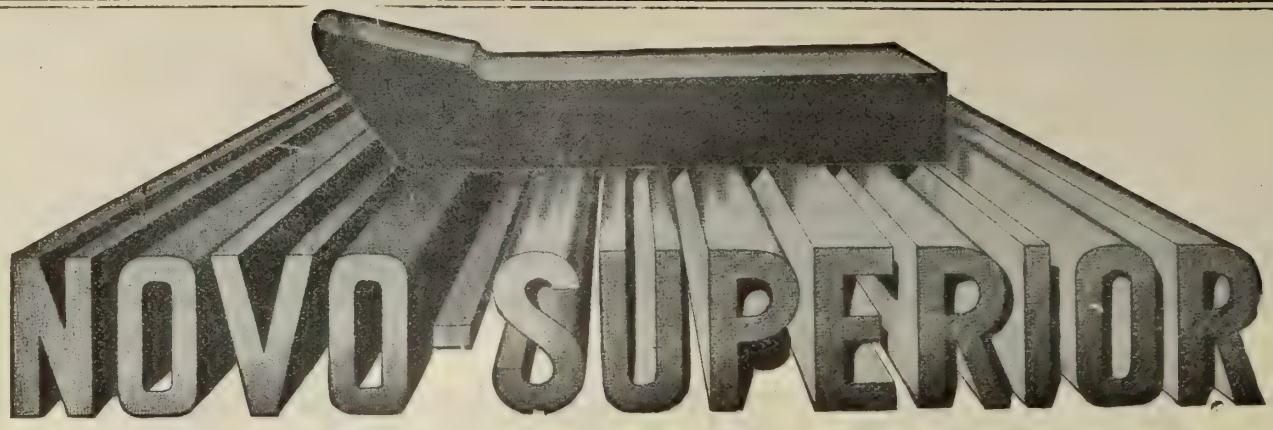
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESP ELER, ONTARIO



HIGH SPEED STEEL

INTRA STEEL *GIBRALTAR STEEL*

Tool Steel for Every Purpose

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.
Music Wire for Springs, Steel Balls
Cold Rolled Mild Steel for Shafting, Etc.

We call to your particular attention that we make a specialty of and solicit your inquiries for

Circular Saws—for wood and for hot or cold metal cutting
Machine Knives—for cutting wood, paper, tobacco, agricultural.

PILOT STEEL & TOOL COMPANY, Limited, 322 St. James St., MONTREAL

Sole Agents for JONAS & COLVER, LIMITED Novo and Continental Steel Works, Sheffield, Eng.
H. BOKER & CO., Inc. New York, N.Y.

Coal
Coke
Iron Ore

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
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M.A. HANNA & Co.

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FIRTH'S Speedicut HIGH SPEED Steel

Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England

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J. A. SHERWOOD
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"WACO"

HIGH SPEED STEEL

"WACO" TRADE MARK

"DOUBLE WACO" 18% Tungsten, for Railway and Tramway Tires and Hard Metals
"WACO" 14% Tungsten, for Turning, Planing and Slotting Tools, Milling Cutters, Taps, Rimers, Twist Drills

TRADE MARK

CARBON TOOL STEELS
for
Engineers', Railway, Boilermakers', Shipbuilders', Miners and Blacksmiths' purposes in various qualities
Diamond Special Extra Best Quality Best Warranted Warranted Ordinary
Each quality supplied in different tempers to suit tool required

DIE STEELS
for
Screwing Dies, Stamping Dies, Top and Bottom Nail Dies, Cartridge Dies, Mint Dies, Dies for Hot Stamping, Drawing Dies

COMBINED IRON AND STEEL
for
Beds, Dies, Machine Irons, Blades, etc.

MINERS' DRILL STEEL
In three qualities
Extra Special Special Ordinary

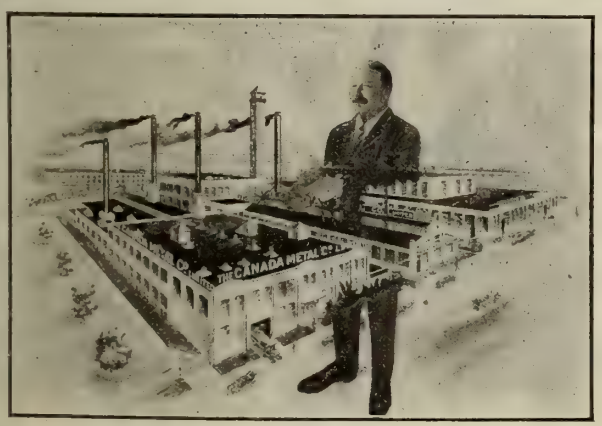
HOLLOW DRILL STEEL
Round or Octagon
Stainless Cutlery Steel Single or Double Shear Steel

SPECIAL MAGNET STEEL
Hammer and Wedge Steel, Scythe and Sickle Steel
"WACO" High Speed Twist Drills Carbon Twist Drills

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
WM. ATKINS & CO., LIMITED
SHEFFIELD - - ENGLAND

PRICES ON APPLICATION FOR IMPORT OR STOCK ORDERS



IMPERIAL GENUINE BEARING METAL
For High Speed, Heavy Engine Bearings.

HARRIS HEAVY PRESSURE
For General Machine Bearings.

ALUMINOID BEARING METAL
For Light Countershaft Work.

THE CANADA METAL COMPANY LIMITED
Toronto Montreal Winnipeg Vancouver

THE

TRADE K–T MARK

FOUNDRY
GALT - ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

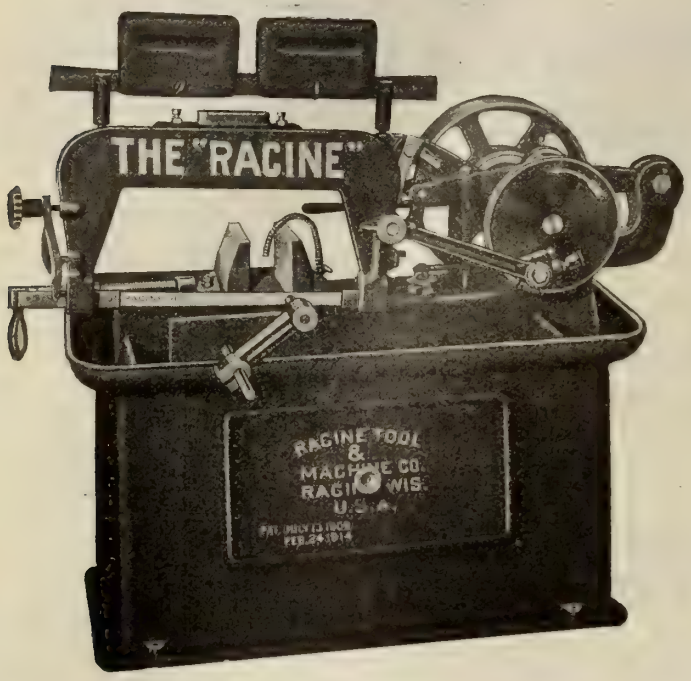
If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue - RACINE, WIS. U.S.A.

SIMONS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER

CUT GEARS
Theoretically Correct

PROMPT SERVICE

ROBERT GARDNER & SON
LIMITED
52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

Announcing the

International Machinery Exposition

This Fall in Grand Central Palace, New York, there will open the most advanced enterprise in the Machinery Industry announced since the signing of the Armistice.

This huge INTERNATIONAL MACHINERY EXPOSITION, which will occupy 50,000 square feet of floor space in the largest exhibition building in existence, will be a remarkable permanent display of all that is most modern and best in the great production machinery industry. Included in it will be displays of the most modern engines, lathes, milling machinery, planers, drills, screw cutters, awl presses—boring, can-making, wood-turning machines, etc. It will be one of the eight or more permanent expositions operated by the Merchants and Manufacturers Exchange of New York in this largest of exhibition buildings.

Thousands of manufacturers, buyers, purchasing agents, dealers, jobbers, engineers and others from all over the globe will visit the Machinery Exposition in this great trade mart. The buying power of these visitors will run into billions of dollars. There has been an urgent need for a long time for just such a permanent exposition.

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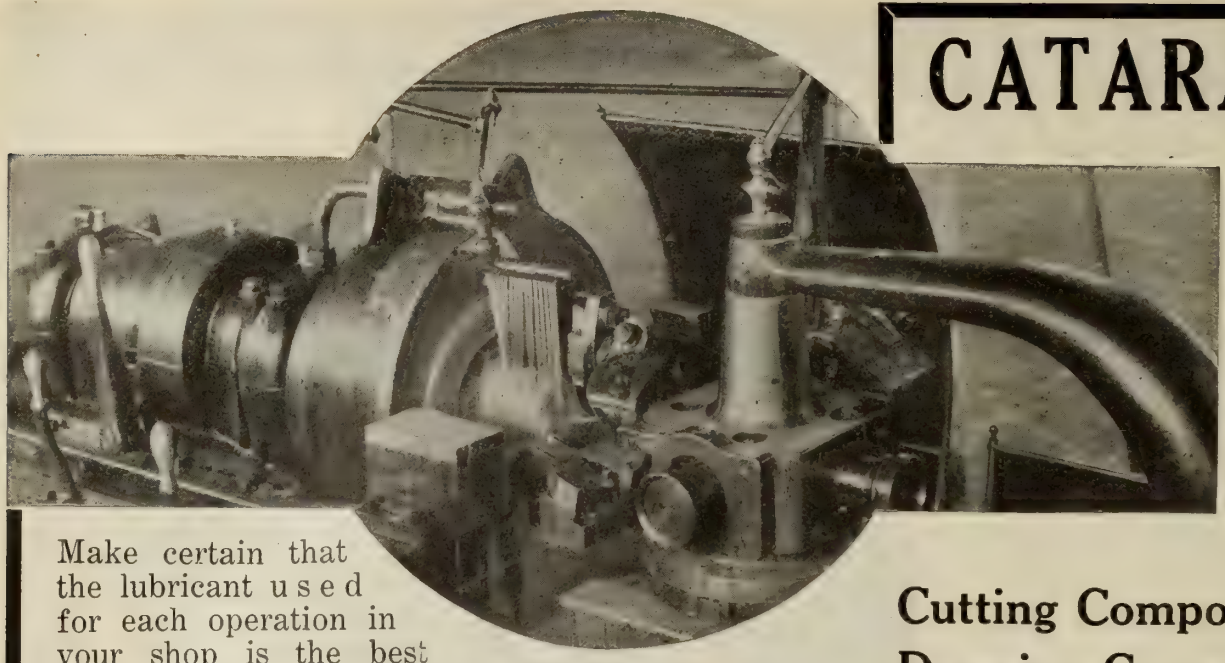

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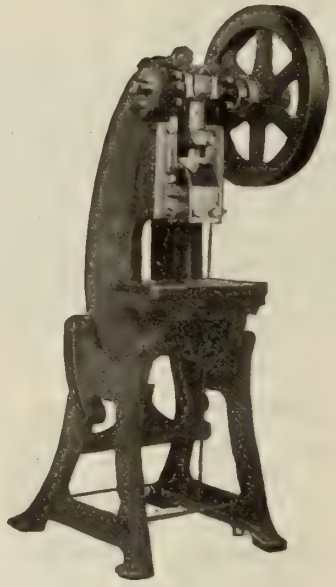

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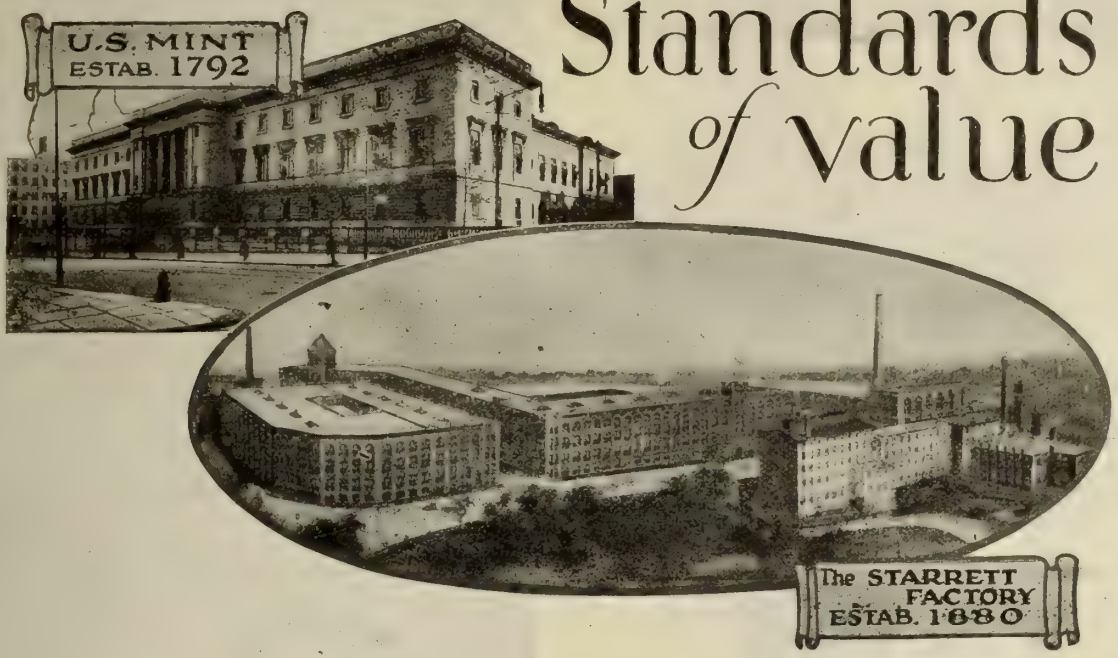

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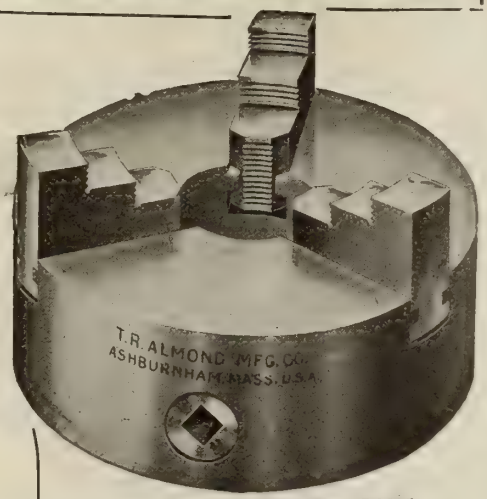

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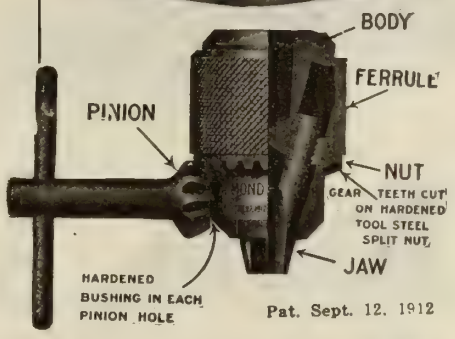

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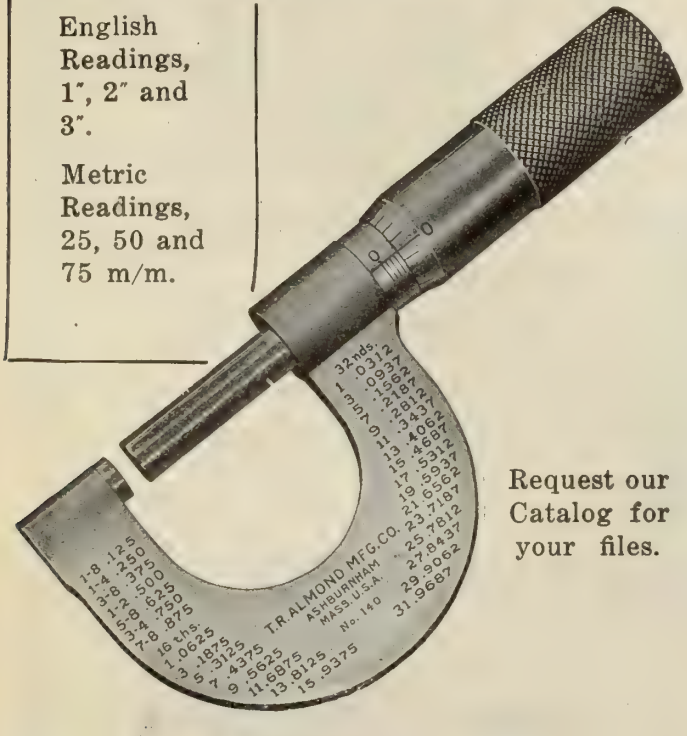

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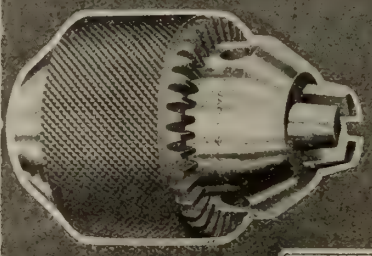

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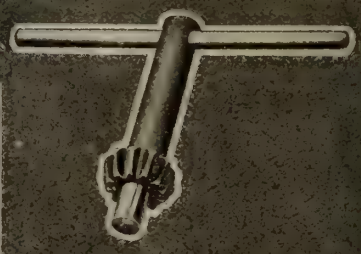

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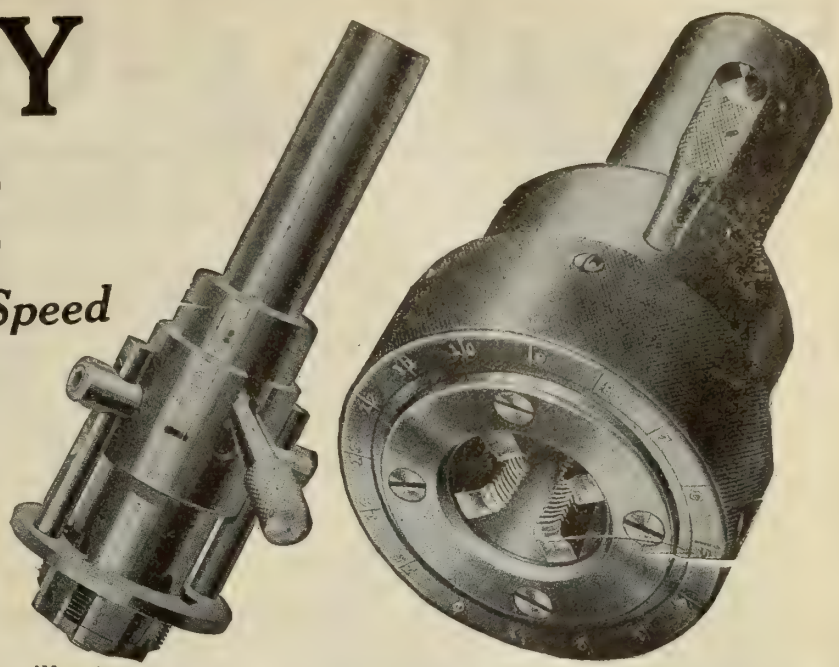
Promote Accuracy and Speed



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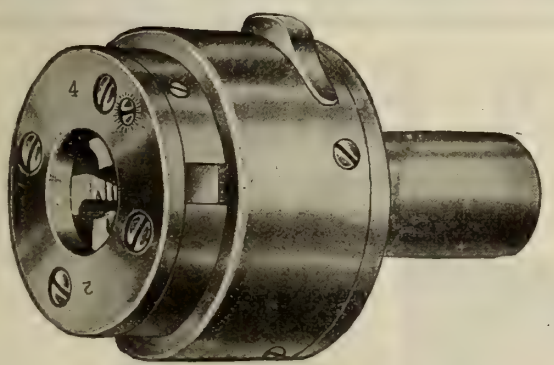

H&G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

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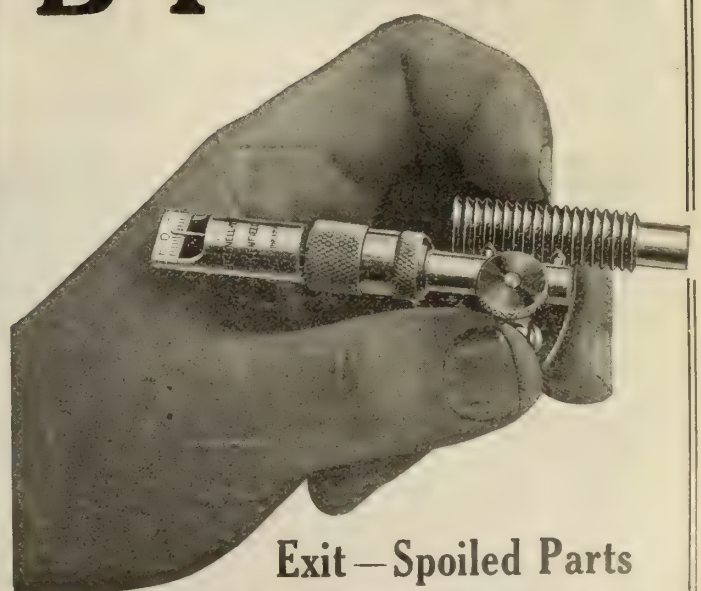

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Did you ever have to scrap a threaded part because of incorrect measurement in lead? Were you ever forced, during a rush job, to thread a part over again, because it didn't fit as it should?

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Will give you a short cut to lower-cost thread milling.
Study the blue print and time study as given below.

MACHINE—Smalley-General Thread Miller No. 2.
THREAD—1½ in. diameter, 2 1-16 length, 6 pitch U.S. standard.
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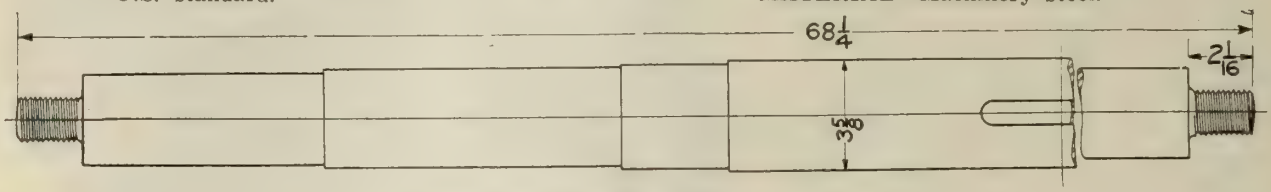
MILLING FEED—4.35 per minute.
MATERIAL—Machinery steel.



Tractor Axle Operation
TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the centre and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

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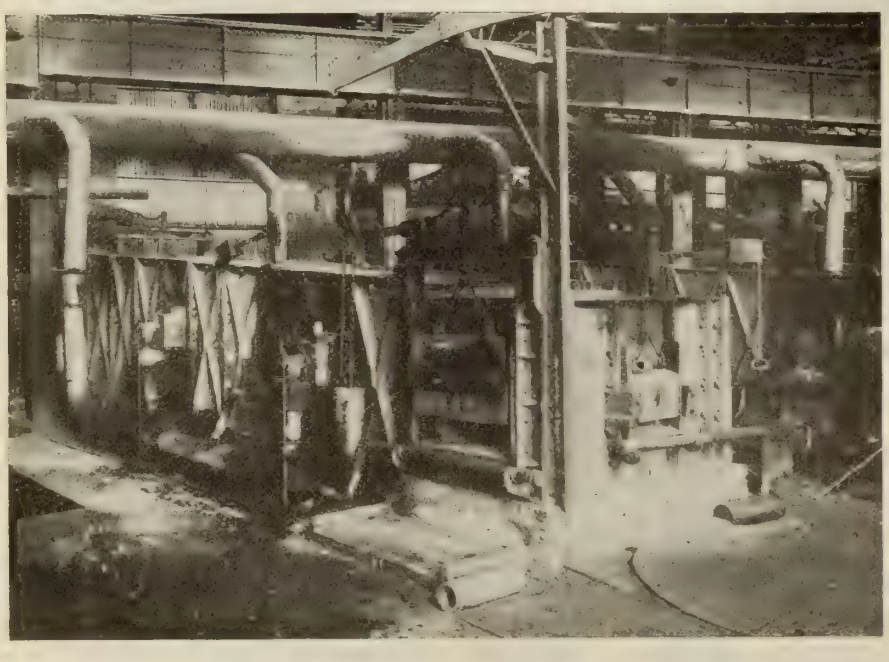
demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



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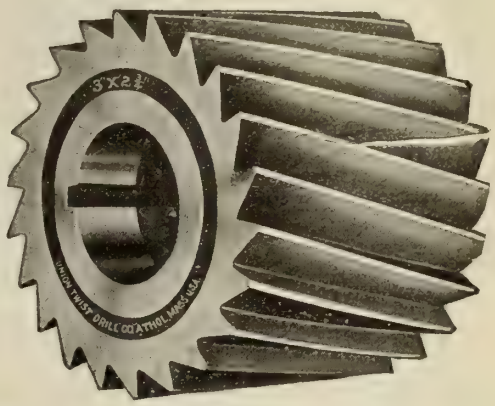

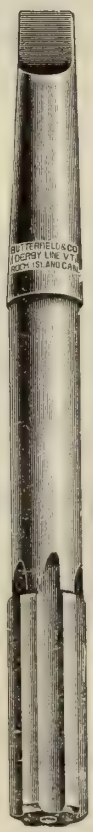

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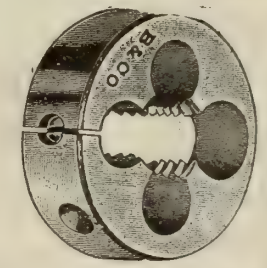

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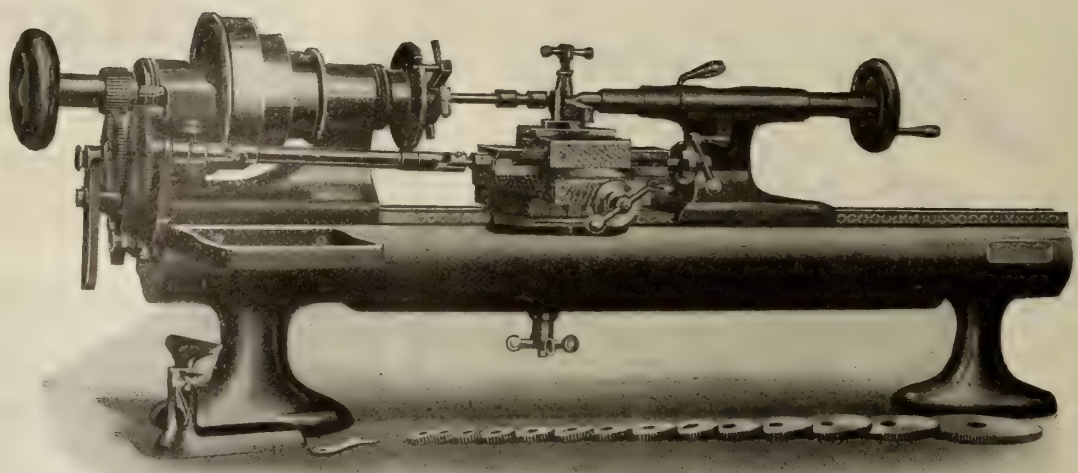
Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



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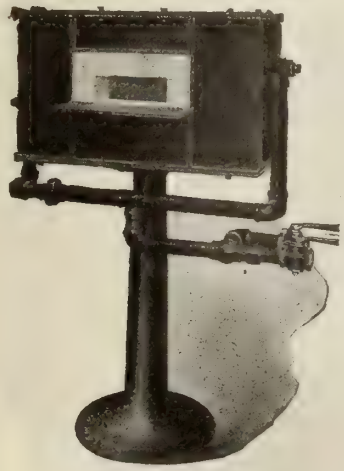

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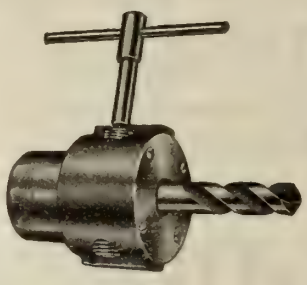
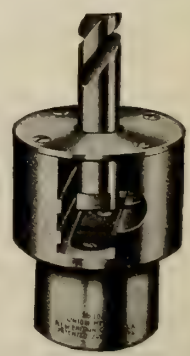


POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



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Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't been for that defective part, defective because it was improperly heat-treated.

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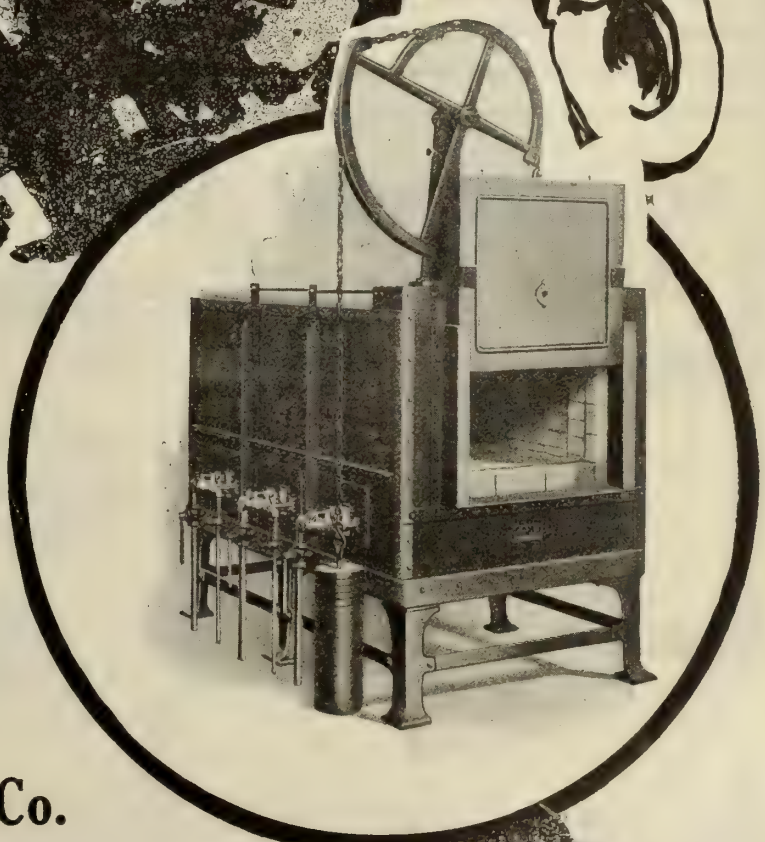
To-day is a better day than to-morrow—write.



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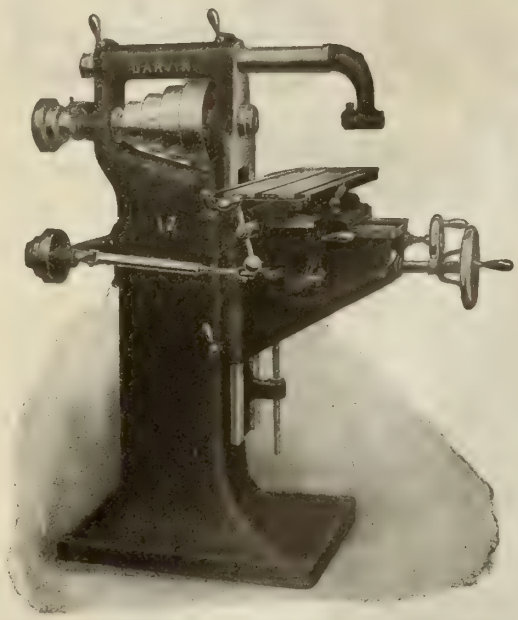

No. 12 Plain Milling Machine-Use Code Abrade

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments .....18 x 6 x 15 in.

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We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

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Bristol Vertical Milling Machine

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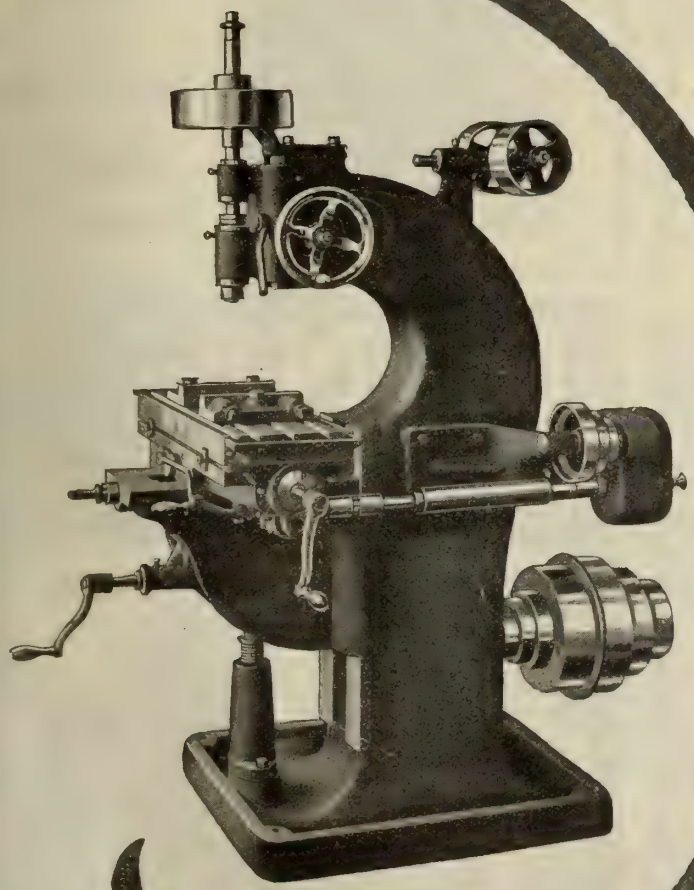

Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

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Notes On Grinding

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No. 64A

Semi-Steel

The composition and physical properties of semi-steel are not generally understood, and this often leads to difficulties in selecting proper grinding wheels. Semi-steel is a cast iron alloy and must be classed as cast iron, although it is really of a little higher grade and somewhat stronger than ordinary gray iron. Table 1 will show its chemical properties as compared with those of gray iron.

TABLE I.

Analysis of Gray Cast Iron and Semi-Steel.

	Silicon %	Graphite %	Combined Carbon %	Total Carbon %
Gray Cast Iron	2.00	3.10	0.30	3.40
Semi-Steel	1.75	2.80	0.40	3.20

Although semi-steel could undoubtedly be made from materials which are commonly used for cast iron, it is practically always produced by charging with these a certain amount of steel scrap to bring total carbon desired.

Because steel has a higher tensile strength than cast iron, many have inferred that it was the steel addition which made semi-steel stronger than the ordinary gray cast iron. The rather unfortunate name, semi-steel, apparently was given because of the steel used and the intermediate strength which the resulting product possessed. However, during the melting down of the charge the steel scrap becomes molten and its constituents merge with those of the other iron material charged.

The physical properties of the steel which have been used in the mixture have been entirely obliterated during the melting process. You will note from Table 2 that the tensile strength of semi-steel is increased somewhat over gray cast iron, but that it is still far below that of cast steel. Its weakness under shock is also shown in the number of blows required to break a bar of given size. Its resistance to shock is only a very little greater than cast iron, only half as much as malleable cast iron, and one-eighth as much as cast steel.

TABLE II.

Alloy,	Tensile Strength lbs. per sq in.	No. of Blows to Break.
Cast iron (gray)	23,400	7
Semi-steel	35,050	11
Mall. cast iron	37,140	22
Cast steel	72,120	92

This places semi-steel quite definitely in the cast iron class, and CRYSTOLON wheels will be found more efficient generally than wheels composed of regular ALUNDUM. In a few cases, however, regular ALUNDUM and No. 66 ALUNDUM have been used to good advantage on semi-steel piston rings and such articles.

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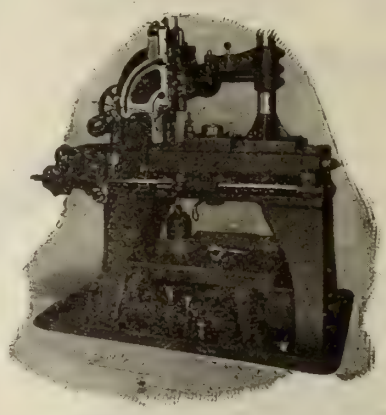

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The photograph, taken in the plant of the Torbensen Gear & Axle Company, shows a Norton Machine grinding the tapers for axle bearings of two-ton truck.

The limit of tolerance is .0005 in.
The material is chrome vanadium steel.
The size: rough, 2.190; finished, 2.165.
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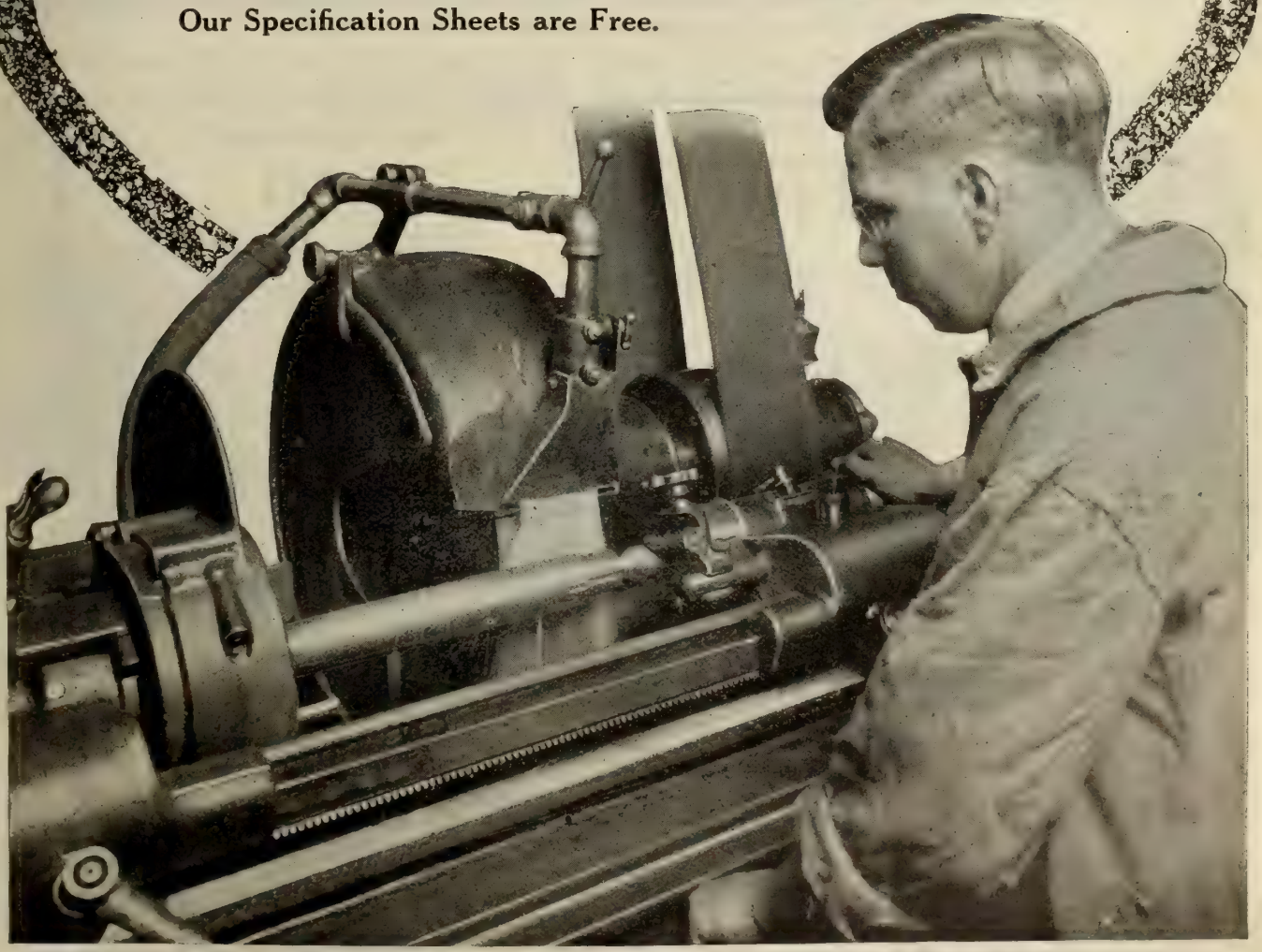

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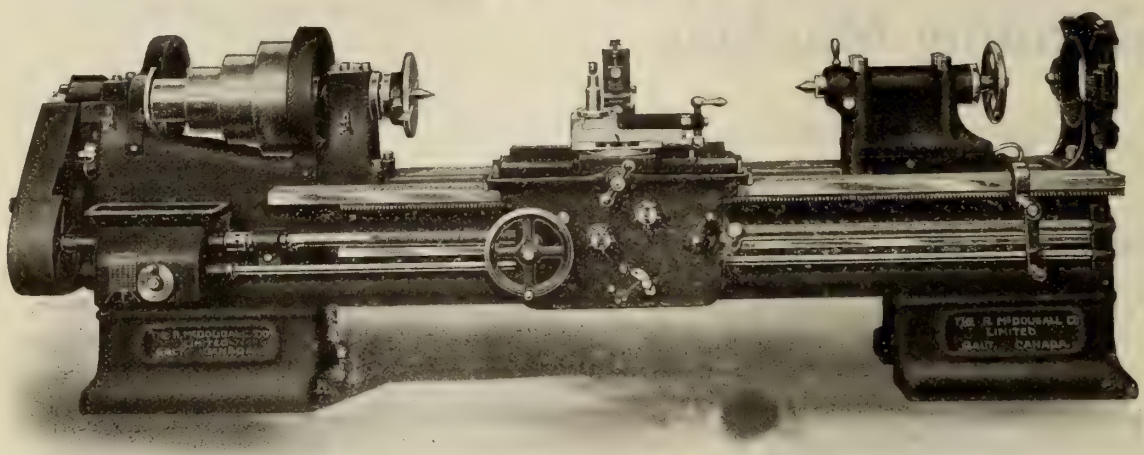

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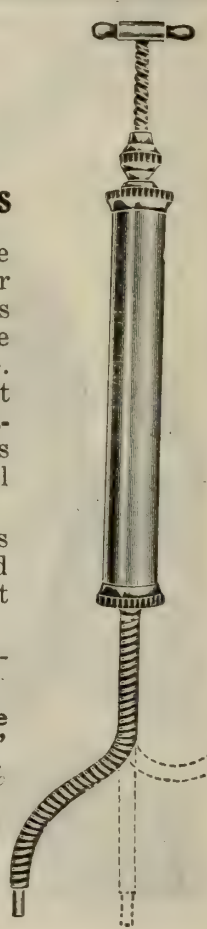

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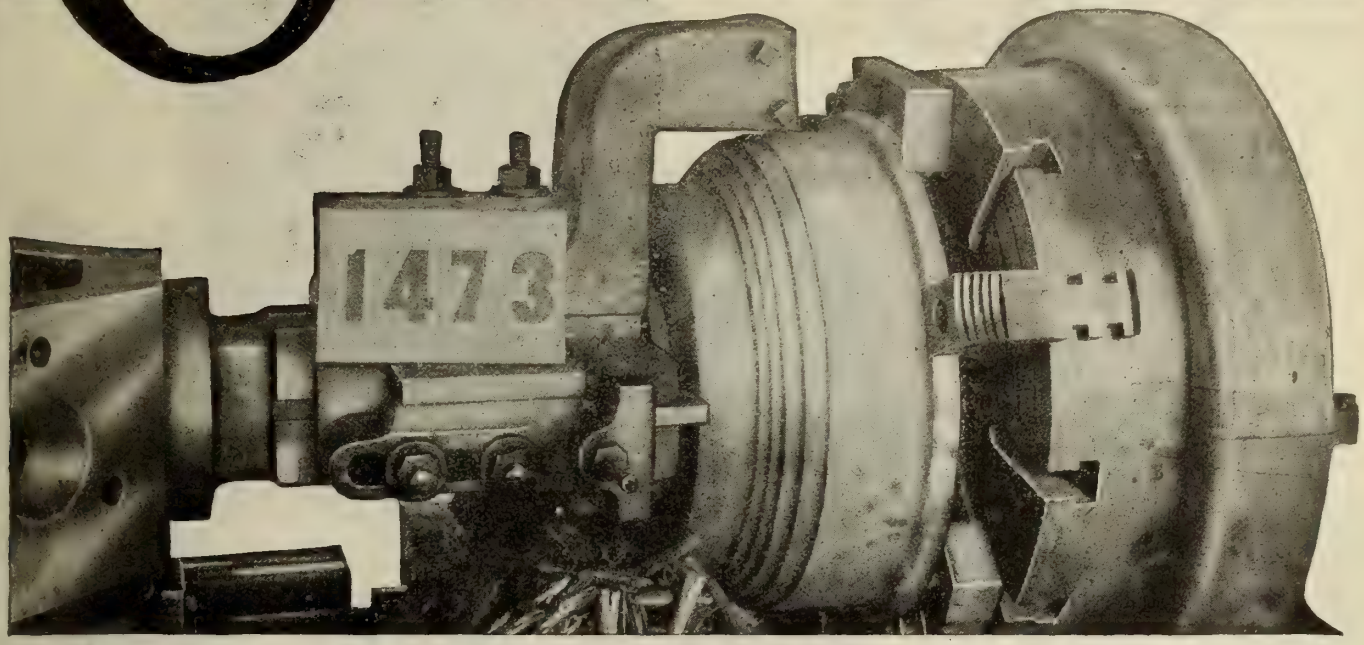

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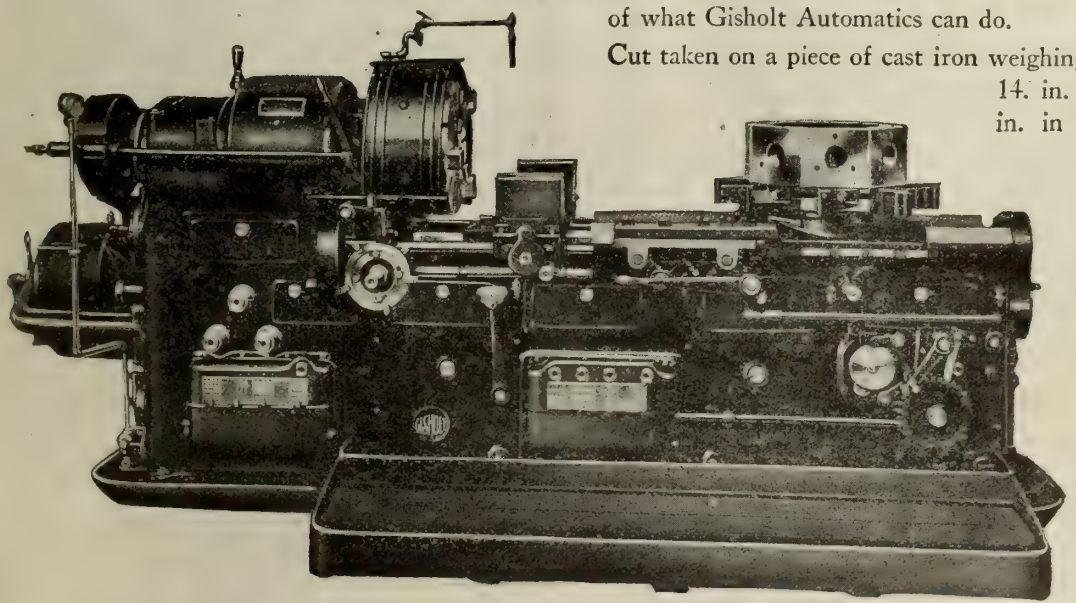

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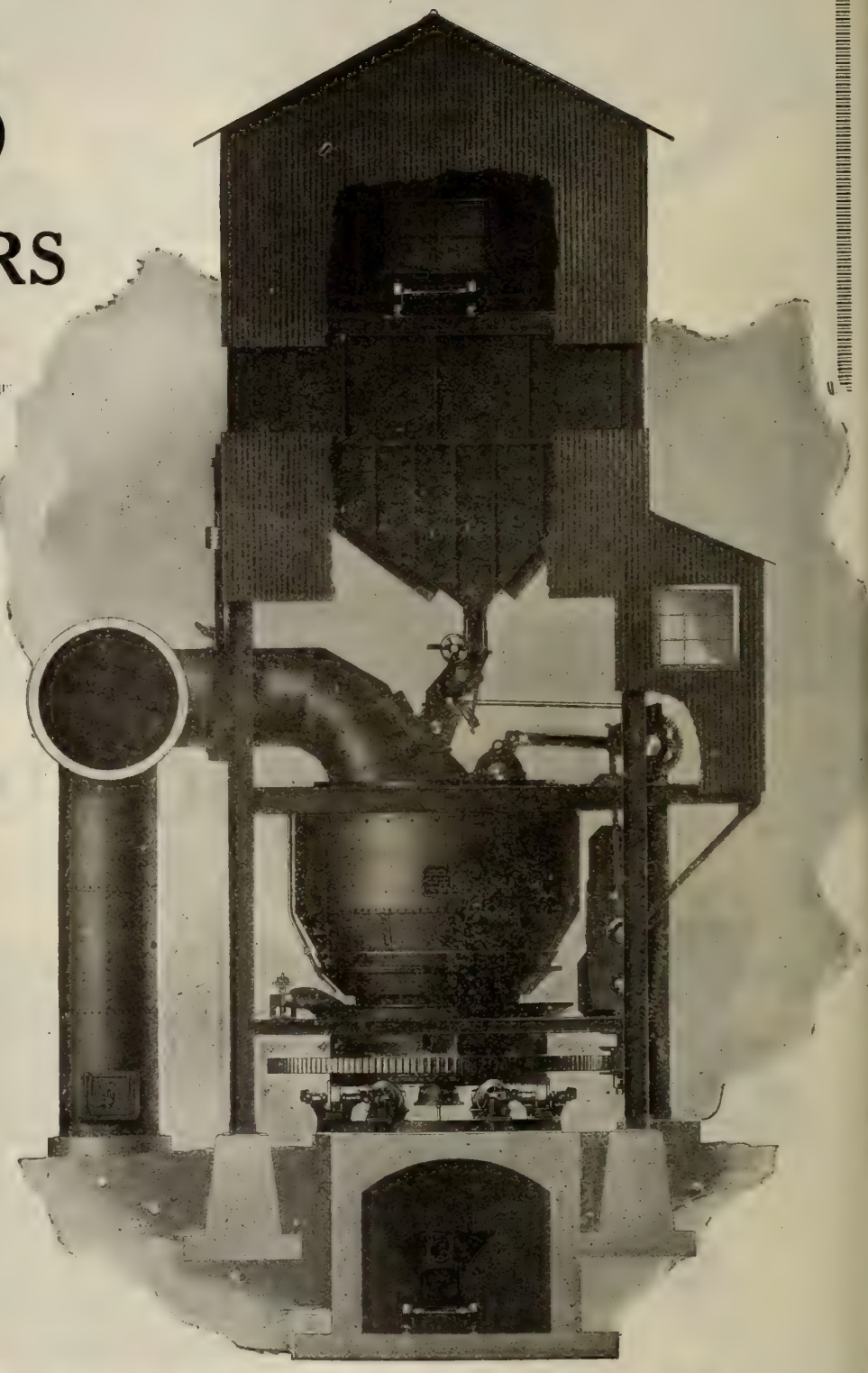

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 9 Toronto, August 28, 1919

The Use of the Crane in Modern Industry

Various Illustrative Examples of Crane Installations as Adopted in Various Lines of Industry. Without These Most Necessary Aids in Speeding Up the Work, We Would Be in a Sorry State

By J. H. MOORE, Associate Editor Canadian Machinery

TO thoroughly cover the field of usefulness of cranes in the industrial world would take a volume, but we will, in a brief way, discuss this subject, more by illustrations than by words, for after all, pictures will bring to the eye far better than written description could ever do the wide variance of their uses.

The Chain Block

Let us first consider the chain block. Of course we will not attempt to say that the chain block is always the most suitable device, but there is many a case where a chain block is the best possible solution to your handling problem.

A properly-designed chain block will perform a great number of lifting oper-

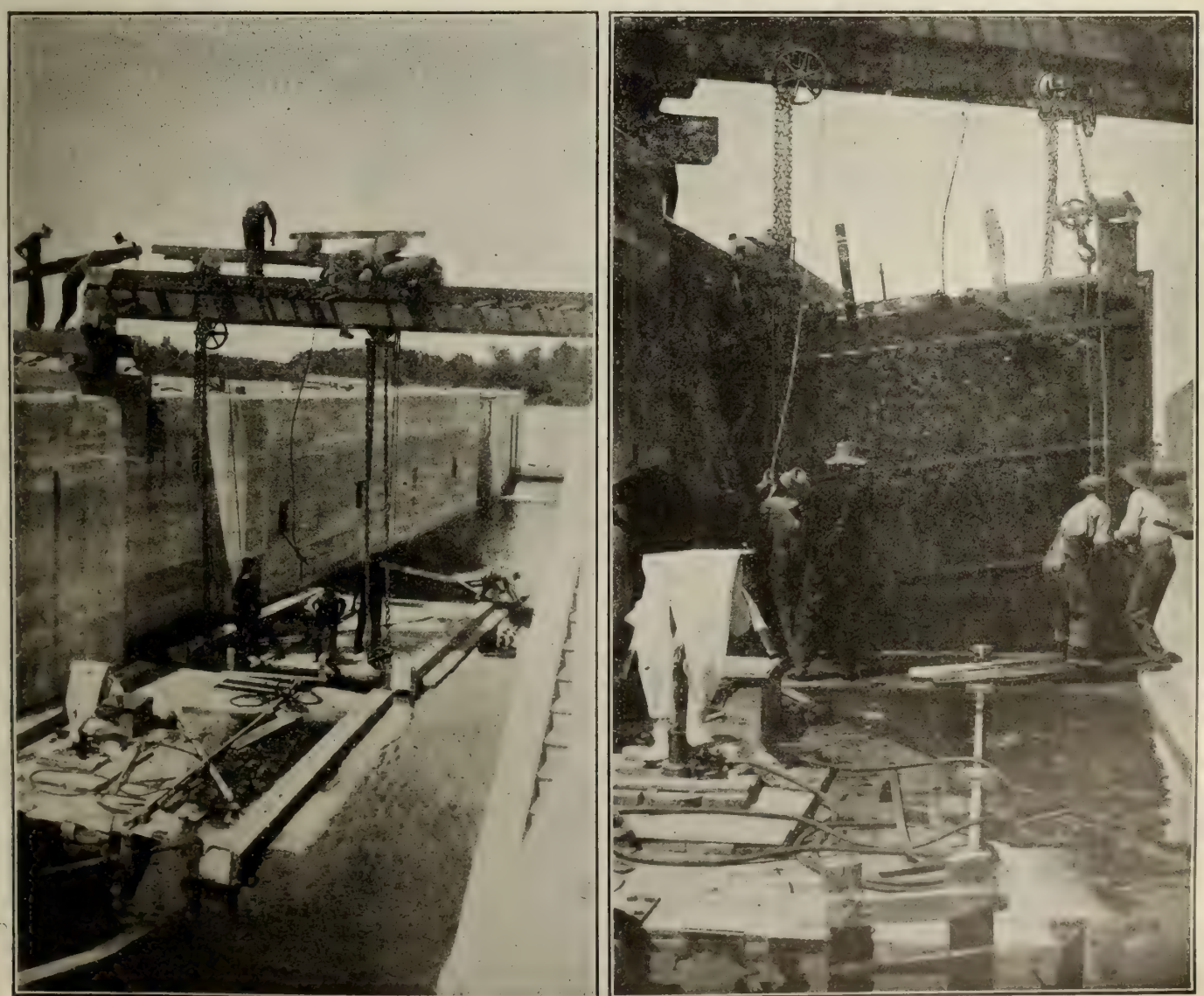


FIG. 1.—A VIEW SHOWING HOW TWO 10-TON MORRIS WORM-GEAR CHAIN BLOCKS WERE USED ON CONSTRUCTION WORK.

ations with very little capital investment, and when the chain block is carefully manufactured the operating expense will be reasonably small.

There are various styles of these chain blocks, one of which is the worm-gear design. This type is a light rugged hoist, very popular among contractors, erectors, and constructional men generally, because it is easily handled and will withstand a great deal of rough usage. Where there is any danger of a load coming suddenly on the hook, such as the slipping of a heavy piece, this as a particularly suitable type of hoist, especially when fitted with a shock absorber.

In capacities of ten to sixty tons the worm-gear chain block is superior to any other type. The worm and worm wheel reduction lends itself admirably to obtaining the high purchase necessary to lift a heavy weight without the use of an excessive number of sheaves and falls.

Spin Gear Blocks

This type of block is already well known for its general efficiency. For regular day-to-day service this type of block is ideal. A machine shop without a few of these blocks installed is like a boat without water to float it—not of much account.

Then there is the triple gear chain block, and the gravity-lowering chain block. These are all, so to speak, offshoots of the former, and each type accomplishes its own particular purpose. So now, since we have briefly discussed these various types let us see some of them in actual use.

At Fig. 1 we illustrate two 10-ton worm-gear chain blocks on construction work. The particular work being done is that of lifting into position the ponderous lock gates of the Severn Canal. This operation, without the use of blocks of this nature would indeed have proved a difficult task, but as arranged the job was a very easy one.

The Machine Shop

The use of spur-gear chain blocks in the machine shop is not as common an occurence as it should be.

It stands to reason that if a workman cannot handle his work easily his movements will be slow and clumsy. Should the lifting part be very heavy, he soon acquires a distaste for his work, and thus production suffers.

A scheme to help the workman accomplish better and quicker work is shown in Fig. 2.

Here we illustrate how the operator at the grinding machine can be relieved of considerable labor by means of a spin-gear chain block.

The Overhead I-Beam System

By the use of overhead I-Beam runways, further advantage to the shifting and lifting problem is obtained. To state all the uses where I-beams can be used is impossible, for practically every condition imaginable lends itself to this method. For example, let us take two widely different examples. A certain firm which were dipping a considerable amount of steel sashes, installed an overhead I-beam system, with the necessary curves, etc, and in conjunction with this installed a small air hoist. Their production soared beyond even their most sanguine expectations after this installation.

The other installation was in a certain warehouse where the overhead system was placed in operation. It was desired that only a single track be laid, or rather hung, as the I-beam is suspended from

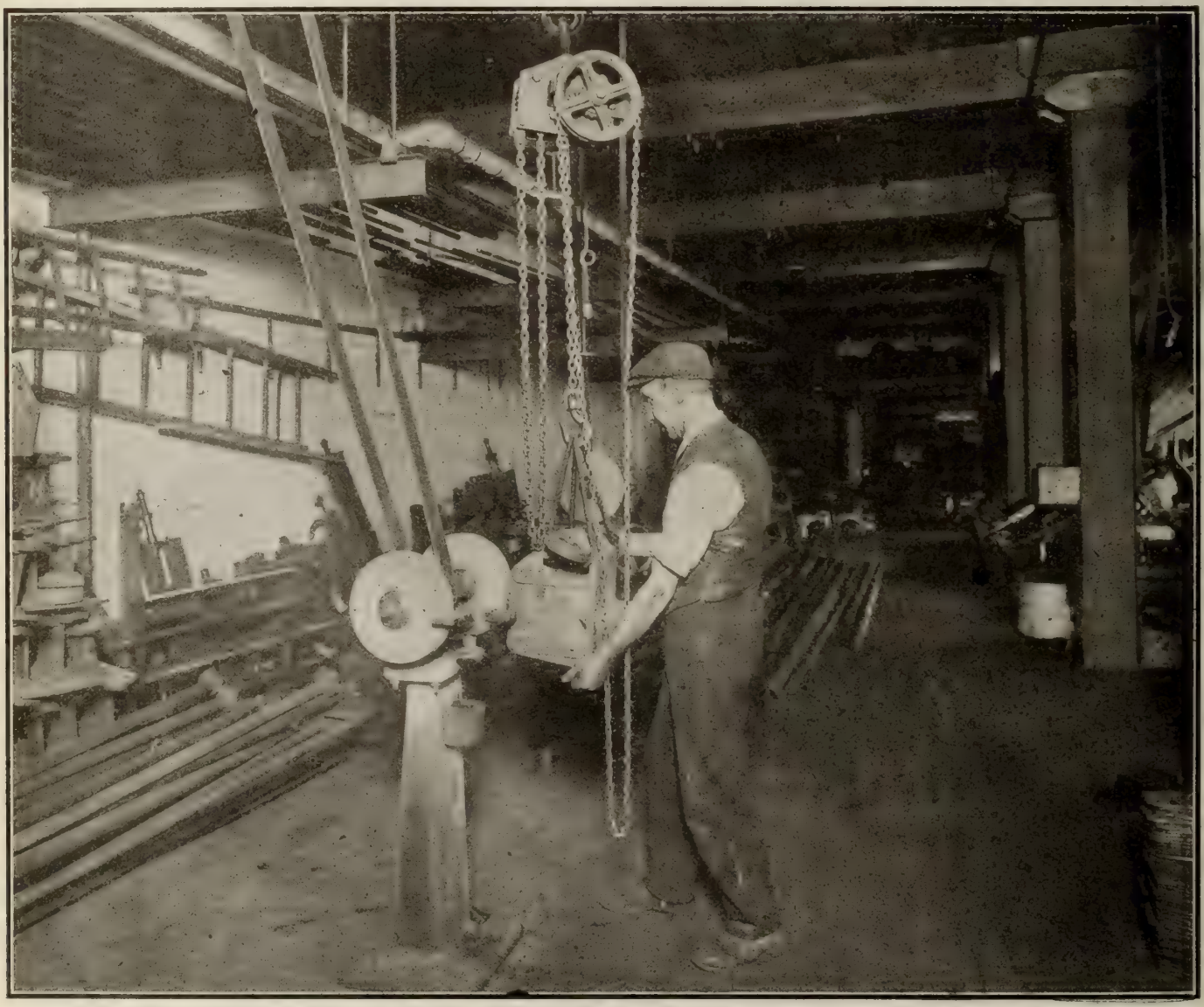


FIG. 2.—USING THE MORRIS SPUR-GEAR BLOCK AT THE GRINDING WHEEL.

the ceiling, and yet it was often quite necessary that men pass each other with loads. A by-pass was installed with splendid success, and the problem, if such we could call it, was solved without effort.

The advantages of this overhead system are without number, for by means of switches, by-passes, etc., you can practically run your crane system to every accessible corner of the plant.

Post Jib Crane

A crane of great service in the foundry or forge shop is that of the jib crane. At Fig. 3 is shown a typical installation of a jib crane, used to lighten labor and speed production at the steam hammer.

The crane used is of the V10 type, with a capacity of two tons. The freedom of action which this crane affords is easily seen, and on work of this nature cannot be excelled. It tends to make satisfied workmen and increases production to a remarkable extent.

Another place where jib cranes can be used to good advantage is at the shipping platform of the smaller shop.

The Overhead Crane

Last, but not least, we show the heavier style of hand-operated overhead crane. In an engine room such as shown, an installation of this nature is absolutely essential. The 30-ton type G crane, as it is called, has a span of 68 feet, and has twin lifting gears. With an equipment such as illustrated, should any repairs or lifting be necessary, you have to hand the means of easily accomplishing your desire.

As a summing up we can safely say that cranes fill a much felt want in the industrial field, and by a careful study of how they had best be installed we open up the way for increased production and better satisfied employees. The various illustrations throughout this article were kindly loaned us by the Herbert Morris Crane and Hoist Company, of Niagara Falls, Ont., who are well known in the crane industry of to-day. Of course it is absolutely impossible to show even a small portion of the various installations as placed by this firm, but we have at any rate brought out the importance and necessity of this type of shop equipment.

It was recently stated in a French journal that the necessity of purchasing foreign coal might be relieved by developing the water power of France, which is estimated at 10,000,000 horse-power, as compared with 7,000,000 horse-power for Norway and 6,000,000 horse-power for Sweden. Before the war only about 750,000 horse-power was used, but a further 450,000 horse-power was developed during the war, and by the end of 1921, 1,600,000 horse-power, or 16 per cent. of France's resources, will be worked. This leaves a huge amount of water power in reserve, and, in addition, there are large potential resources in the rivers of Indo-China and French West Africa. One million water horse-power would lessen the consumption of coal for power production by at least 3½ million tons, costing about 300 million francs, and the comparison is the more striking when it is remembered that a hydro-electric installation has eight times the average efficiency of steam engines.

A copper alloy said to have the hardness of steel and of great tensile strength has been successfully experimented upon in France. It consists of 1 lb. each of chromium and aluminum, and adding 22 lbs. of copper, 5 lbs. of nickel and 4 lbs. of zinc, with intervals of between half an hour and an hour between the successive

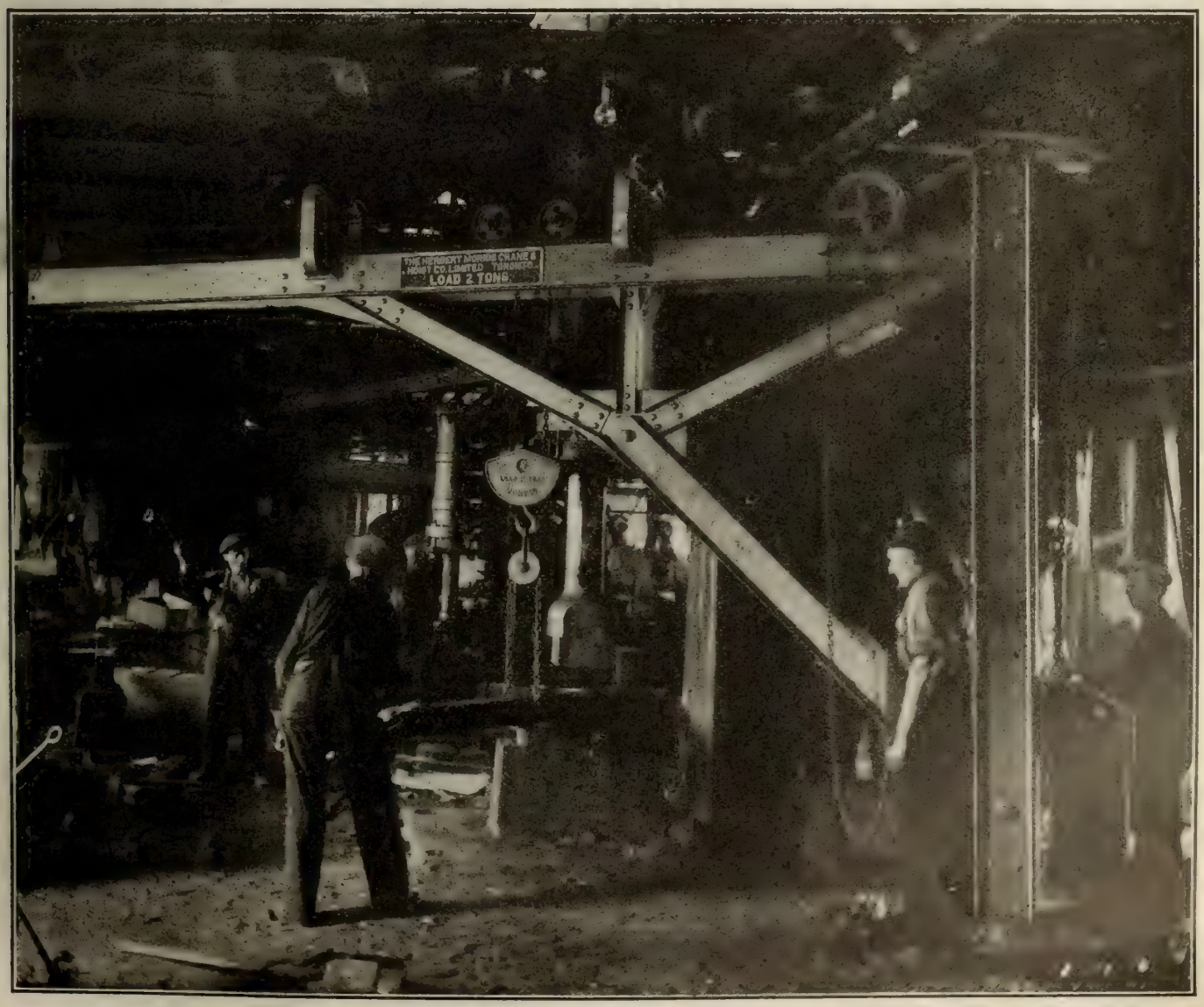


FIG. 3.—TYPE U10 MORRIS JIB CRANE SERVING STEAM HAMMER

additions to the fused mixture. By varying the proportions of chromium and copper the alloy is said to give a considerable range of properties, with adaptation to many uses.

Where asbestos and some other materials are utilized for gaskets, they are apt to stick to the metal and upon overhauling must be scraped off. This means making new members and a loss of time and a source of expense. A tight fit may be made by rubbing the packing and metal parts with dry graphite, which is not affected by heat and will allow the gaskets to be removed as a whole.

Everybody knows how hard it is to pour graphite from any ordinary container without having it spill or come out too fast and make everything black. If the graphite is put in a discarded tooth-powder can (the kind with the regulating slot in the top) not only can its flow be regulated but it is kept clean and dry.

To preserve drawings, wash the drawings well with a solution of isinglass. Prepare another solution by dissolving 1 oz. of Canada balsam in 2 oz. of best oil of turpentine. Coat the drawing with this, using a camel's hair brush to obtain an even surface.

Asbestos is a Greek word, meaning "unquenchable," but used in the sense, "inconsumable." It consists of silicon magnesia and lime of pyroxene. It was woven into cloth by the Greeks for wrapping dead bodies when they were burned in the funeral pyre that the ashes might be preserved. In ancient times the lamps that were always kept burning in the temples had wicks made from asbestos fibre. For many years after the revival of industrial activity asbestos was little used in the arts, and it is only recently that its usefulness has been fully recognized.

If a little potassium chloride is added to glue, it will tend to prevent cracking or peeling when exposed to heat.

The hardness of water is usually expressed in degrees, one degree being equivalent to a solution of one part by weight by carbonate of lime or other hardening salts to one hundred thousand parts of water. Wells generally contain the hardest water, 35 degrees of hardness being common. With water of one degree of hardness, the water contained in a single big tender would deposit 75 lbs. of mud or scale-making sediment.

Wash the files in warm water to remove the grease and dirt, then wash in warm water and dry by heat. Put 1½ pints of warm water in a wooden vessel, put in the files, add 3 ounces of blue vitriol, finely powdered, and 3 ounces of borax. Mix well, and turn the files so that every one may come in contact with the mixture. Add 10½ ounces of sulphuric acid and ½ ounce of vinegar. Remove the files after a short time, dry, rub with olive oil, and wrap in porous paper. Coarse files should be kept in the mixture for a longer time than the fine ones.

An Italian metallurgist, C. Rossi, of Legano, claims to have produced an acid-proof iron alloy by melting pig iron and ferro-silicon in an electric furnace with a small amount of iron sulphide as flux. The alloy contains from 13 to 21 per cent. of silicon.

FIG. 4.—A 30-TON TYPE "G" CRANE, 68-FT. SPAN, WITH TWIN LIFTING GEARS, AS INSTALLED BY THE MORRIS CO.

The Various Mechanical Properties of Steel

Taking Up the Consideration of the Question of Brittleness, Together With Investigation of Failures of Various Kinds. A Paper of This Nature on Steel is Especially Valuable at the Present Time

By W. H. HATFIELD, D. Met. of the Brown-Firth Research Laboratory, Sheffield, Associate Member

(Continued from last issue)

THE wide variation in values obtained certainly point to indication being obtained of some intrinsic merit of the material.

In the author's opinion, the Stanton test or some modification of it, in which the force of the blow is capable of being varied with the elastic range of the steel, seems to be capable of offering much useful information to the engineer. This test is one which certainly does approximate to the conditions existing in some slightly over-stressed parts. The values obtained are influenced apparently chiefly by the magnitude of the elastic range, and are not much influenced by notched-bar brittleness; neither do they appear to be influenced by that property in the materials which are brought out in the Arnold and Sankey test. The elastic range is not, however, the only determining factor. In making these comments, it is only fair to state that the author has hitherto only employed the standard conditions laid down for this test in the Appendix. In support of the Stanton method the whole of the experimental work of Wöhler draws us to the same conclusion. The author has much sympathy with the view expressed by Stanton and Bairstow,* when they say: "For determinations of resistance to shock under approximate working conditions, the test should be one in which the energy absorbed in plastic deformation is at a minimum, since plastic deformation has little relation to its construction value." Single-blow impact tests do not afford sufficient information for the engineer, and the author feels that he has provided data in this paper sufficiently conclusive to indicate that such single-blow impact tests, depending as they do upon the energy absorbed in plastic deformation above the elastic limit, yield insufficient and probably no data as to the elastic range, and the behaviour of the material within that range.

There are no doubt concrete cases where each test will provide data of particular service in some field of engineering; and the careful study and selection of the tests to be employed in each field merits, and will repay the most careful attention of the engineer. This paper has dealt with the response of different steels to the more simple forms of test. An examination of the nature of the stresses acting on various parts of machines and structures will indicate that in many cases the stresses are not of a simple character but are combinations of tension, compression, shear, etc. To the designer who wishes to create a reasonably safe design, and at the same time to economize and get the most out of the material employed, a knowledge of the behaviour of the material under these complex stresses is important. Much interesting work has been done in investigation of the effects of such stresses, notably by Guest, Hancock, Mason, Scoble, Smith and also by A. J. Becker, of the University of Illlinois. The presence of a second stress at a given point in the material, in a direction at right angles to the first, modifies the response of the material to the first stress, as would be expected. To the author it appears that a complete experimental study of all the different combinations of stresses likely to be met with in practice carried out on all those materials of construction likely to be employed, would constitute a work of far-reaching value to engineers.

*Proceedings, I. Mech. E., 1908, page 889.

Impact Tests

There are obviously many instances in which it is expedient that steel shall be stressed beyond its elastic limit, and, therefore, in such instances, some knowledge of the behaviour of the material under impact tests is generally considered instructive. Various types of tests have been devised, all with the purpose of measuring the relative brittleness of metals. They include impact-bending tests, impact-tensile, and impact-crushing tests. The author's remarks are intended to apply chiefly to those tests described in Appendix I. In all these impact tests the value obtained is essentially dependent upon the energy absorbed by the material in plastic deformation, and the experimental work by different investigators has generally been with a view to determining the factors which affect this absorption of energy. During recent years much progress has been made. For instance, it is now definitely established that the properties of the material as shown by the static tensile tests, that is, elastic limit, yield, ultimate stress, elongation and contraction of area, fail at times to reveal differences brought out under the notched-impact tests. It is generally established that, everything else being equal, the harder the material the smaller the energy required to produce rupture under the notched-impact tests. There are, however, instances where steels of the same hardness give widely different values under the impact test, and in some such instances the tensile test and, for that matter the microscope, utterly fail to give any indication of the difference in the material. It is in this respect that the Izod, Charpy, and such impact tests given information of interest. Two pieces of the same steel may be hardened and tempered to have similar tensile properties, and yet have widely dissimilar properties under the notched-bar impact and notched-bar slow-bending tests. Much work has been done in this direction by a number of investigators, but a complete and valuable treatise on this subject was presented by Captain Philpot some months ago.* In this paper, Philpot confirms the earlier work of Stanton and Bairstow,† indicating that the shock in the test is not the determining factor, and shows that the type of notch is essential. He records a number of interesting experiments in which notched bars are broken under a static load and such disparities in values as are obtained under the Izod notched-bar impact tests are equally well brought out when the load is slowly applied. His experiments also clearly indicated that up to, and for some considerable distance beyond, the range of pro-

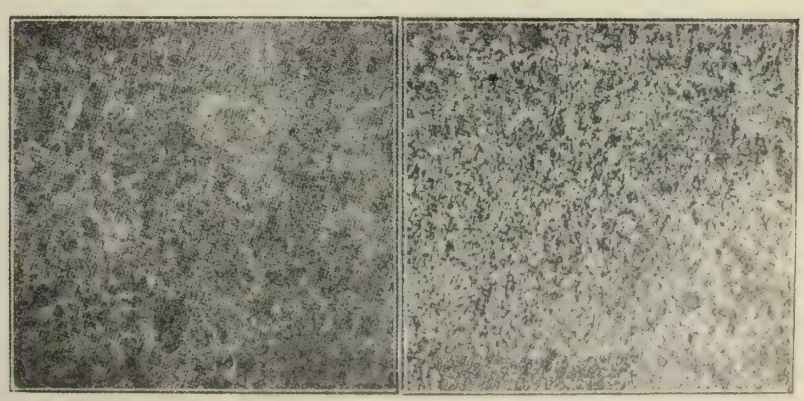


FIG. 7.—BAD CONDITION NICKEL-CHROME STEEL.
X100 DIAM. ETCHED. X500 DIAM.

*Inst. Auto. Eng., 1918.
†Proceedings, I. Mech. E., 1908, page 902.

portionality, the behaviour of the two steels was identical. These facts are of fundamental importance to engineers.

The influence of the shape of the notch has been very thoroughly investigated, and it is clearly shown that with increasing sharpness of notch the discriminating value of the test is increased. As an instance of the comparative effect of the shape of the notch, it may be pointed out that the Charpy test with a 2-3 mm. radius, shows a much less disparity in the materials in unlike condition than does the Izod test; a reference to Fig. 5 (page 618), which contains the results of the Izod and Charpy tests, will confirm this.

It was long thought that the speed of application of, and the total energy of the blow had an influence upon the energy absorbed in breaking the test-piece. This has now been shown to be a mistaken view. There are several sets of experiments now in existence covering this point, and the author has published the result of investigation,‡ in which it is clearly shown that with Izod impact-pieces breaking with an absorption of 20 ft. lb. to 25 ft. lb. energy, it is immaterial whether the blow be 150 ft. lb. or 50 ft. lb.

Other points have been taken up such as the effect of the temperature at which the test is carried out, and a bibliography is attached to this paper for those interested in the subject, Appendix II.

As regards repeated-impact tests, the total energy required to fracture the test-piece increases as the number of blows required increases. This is largely due to the fact that each blow includes a certain amount of energy necessary to produce the elastic deformation, and this proportion naturally forms the larger percentage of the energy of the blow when the blow is small in value. As to the actual energy absorbed in plastic deformation it is an open question as to how this value is affected with the reduction in the force of the blow. There appears to be in all repeated-impact tests a limiting value of blow which can be indefinitely withstood by the material.

The author is, however, only dealing with the impact test in so far as it is of interest as indicating dangerous brittleness in steels from the engineer's point of view. From this standpoint it might be useful to endeavor to trace the mechanism of the action of rupture in one of these tests. For this purpose it is proposed to discuss the Izod test. The actual pressure exerted by the knife-edge on the piece is determined by the amount of resistance which the piece offers to deformation. The resistance commences at zero and increases rapidly at first, presumably in proportion to the deviation of the piece from the vertical. This phase will only continue during elastic deformation (which is extremely small), owing to the piling up of the stress near the bottom of the notch, and the elastic limit of the material will be reached locally at a very early stage, whilst the remainder of the test-piece will be almost unaffected. At this stage plastic deformation commences. In non-brittle materials it is to be anticipated that plastic deformation will then proceed, with the drawing out longitudinally and contraction of area of the steel close to the bottom of the notch taking place. The region affected plastically will gradually enlarge, the outlying portions being always less severely strained than the original base of the notch. In this way the deformation continues until the most drastically deformed portion has received the maximum drawing out of which it is capable, and then it will crack. The crack, once in existence, will rapidly spread. The base of it (when definitely formed) being sharper than any notch made by machining, causes such abnormal local stressing relative to the surrounding material, that the original crack always extends in preference to rupture, commencing afresh at any other point. The back face of the test-piece (not notched) is all the time under compressive stresses, but owing to the more uniform distribution, the actual maximum compressive stress at any point, before permanent deformation occurs, is very small in comparison with the tensile stress at the notch. During the plastic deformation, however, this compressive stress increases, and it may reach such a value that locally there may be fracture by shearing, and an appreciable bulging similar to, but not so marked as, that of the ordinary bend-test. A slight modification of shape of section on the notched side, feebly imitating that in an ordinary bender, is to be expected. The form of fracture usually indicates whether an appreciable amount of plastic deformation has taken place at the fractured portion, previous to the progression of the crack. In brittle materials the "crack" appears to be first started at a very early stage of the plastic deformation. It may be suggested that the bulk of the energy absorbed in the test is that due to the work done on the test-piece, in plastic deformation previous to the commencement of the crack, very little being absorbed before this begins (elastic deformation), and very little after, that is, during the extension of the crack. The relative proportions of the three stages of work will obviously vary with different materials, or conditions of the same material. It would appear from this argument that a governing factor in determining the amount of energy absorbed in the test is the degree to which the material can be plastically deformed before the formation of a "crack." This would be expected to run parallel with the elongation per cent. of a tensile test-piece (or preferably with the reduction of area per cent.) and a low elastic. While this generalization is in the main borne out by impact values, the agreement is only approximate, and, as previously discussed, there are exceptions. It must, therefore, be concluded that failure as at a shoulder or the bottom of a notch, is determined not only by the degree of deformation but also by the manner of distribution of the stresses.

In the latter sections of this paper results of experimental work will be given in illustration of the diverse values obtained from different materials, and at this stage the author proposes to content himself by showing that even wrought-iron of the highest ductility is susceptible to variations in notched impact test values, the values under static test remaining practically constant. He was successful in obtaining a bar of excellent wrought-iron. In Fig. 7, page 228, will be found the microstructure of this material in the condition as received, at 100 diameters and 500 diameters respectively. It will be seen to consist entirely of iron crystals, the only other constituent being a little slag left in during the process of manufacture. Any slag present in the test-bars experimented upon ran the length of the bar, being striated at right angles to any blows reviewed in impact testing. Chemical analysis curiously enough showed that this specimen of wrought-iron contained a little carbon, the value being somewhere between 0.05 per cent. and 0.08 per cent. As regards other constituents, the silicon was 0.03 per cent., manganese 0 08 per cent., sulphur 0.013 per cent., and the phosphorus 0.019 per cent. It will thus be seen that we have here an exceptionally pure commercial wrought-iron. Tensile, Izod impact, and Brinell determinations were done upon this material in different conditions, and the figures derived from determinations on a selection of the treatments are given in Table I.

These experiments establish that in a most ductile iron with an elongation of 40 per cent., and a reduction of area of over 60, the impact values may vary from over 70 down to nearly 20 without the values under the static test being seriously affected. These few tests have been selected from an investigation at present in progress, and the author does not propose to burden his paper with a metallurgical discussion of the results. Suffice it that here we definitely have curious anomalies from the metallurgical standpoint. but data sufficient to show that even the most ductile materials can

TABLE I.—TENSILE IZOD IMPACT AND BRINELL DETERMINATIONS ON WROUGHT-IRON.

(Fig. 6.)

Condition.	Elastic Limit.	Yield-Point. tons per sq. in.	Maximum Stress.	Elongation. per cent.	Reduction of Area. per cent.	Fracture.	Izod Impact. ft.-lb.	Fracture.	Brinell Hardness Numbers.
As received	8.5	9.26	18.93	40.0	64.71	Fibrous	62	Fibrous	67
Quenched from 300 deg. C.	..	6.74	17.09	43.0	64.71	Fibrous Silky	77	Fibrous	65
Quenched from 770 deg. C.	..	9.82	18.48	41.5	64.7	Fibrous	22	Coarsely crystalline	67
Quenched from 950 deg. C.	..	8.0	18.8	38.0	63.6	Fibrous	22	Coarsely crystalline	73
Quenched from 950 deg. C., tempered 650 deg., and air-cooled	..	9.36	18.52	44.0	64.71	Fibrous Silky	71	Fibrous	65

‡Journal of the Iron and Steel Institute, 1917. vol. ii., page 112.

be made susceptible to notch brittleness without their ductility having been destroyed. The micro-examination of impact test-pieces after deformation has already been published by the author.*

The question which has to be decided is whether we must dissociate notch brittleness from true brittleness, which must be admitted is occasionally experienced in steels; but the author proposes to defer his deductions until the concluding pages of this work. The problem to be solved is this: can, and will really brittle steel give satisfactory results under static tests, or does it need a sharp notch to bring out the evidence of brittleness.

From a theoretical point of view it is eminently desirable that we should form some idea as to the reason for variable values obtained from notched-bar tests, other values being constant. Captain Philpot in his paper, to which reference has already been made, suggested segregation between the crystals as the cause, but the author cannot accept that explanation, since he has difficulty in conceiving the segregation of material in terms of the size of crystals at a temperature at which such effects are known by metallurgists to be produced. If two pieces of suitable nickel-chrome are hardened and are then subsequently tempered, say at 600 deg. C., one being quenched in water and the other being very slowly cooled, it will be found that the one which has been quenched from the tempering temperature in water will have a high impact value, whilst the one which is cooled slowly will have a low one. This is a statement which applies to many, though not all steels, and which is now definitely accepted by metallurgists. It is the author's experience, and he knows it is also the experience of many others that the microscope utterly fails, even at the higher powers at present available, to bring out any adequate indication of differences in structure sufficient to account for the large difference in impact value. It therefore follows that it is reasonable to suppose the cause to be more deep-seated and probably lies in the ultra-microscopic arrangement of the material. It has occurred to the author that if the ultimate arrangement of the atoms could be visualized it would be found that, on quenching from the tempering temperature, the material had been trapped in a—from a crystalline standpoint—meta-stable condition, that is, the atoms would not have had the opportunity of finally attaining their stable positions in the systems of the crystals. He would therefore suggest that if after the tempering has been done at temperatures such as that under discussion, and the cooling be permitted to take place at a slow rate, resulting in a low impact value, the atoms have had the necessary time and opportunity to take up their stable situations in the crystal.

He would then argue that the reason for the difference in the manner in which the crack is extended is to be found in the relative facility with which it can travel through the diversely orientated crystals. It appears to him to follow that in a perfect crystal, cleavage planes mill offer planes of weakness along which the crack may readily run, whilst in the unstable state in which the perfection of the arrangement is not attained, he would submit that it is conceivable that the crack will not travel with the same ease. It will be seen that this line of reasoning would presuppose fracture through crystals in both ductile and "notch-brittle" material. This is contrary to the views held by some investigators, but the author, in all seriousness, considers that it yet remains to be demonstrated that fracture frequently takes place along the crystalline boundaries. For instance, he would argue in this way: a crystalline fracture leads one to suppose that there are a number of minute planes reflecting light. Since the crystals of the metal with which we are dealing have no external geometrical form, it is difficult to conceive how such externals of the crystals, if they were separated, could present facilities for the reflection of light in the manner which to him appears perfectly obvious from crystalline fractures. It might, therefore, be thought that he would suggest that the fibrous fracture associated with high impact values with its non-crystalline appearance, would represent the separation between the crystals; such, however, is not his view, since he holds that in the fibrous fracture a sufficient explanation is found of the fact that in the transit of the crack through the crystal in this case, there is a good deal of deformation and distortion along the cleavage faces. Arguing back from the above to the region of fact, it will be remembered that we have a mass of evidence to show that most successful parts which have been submitted to the most stringent service, have had a low impact value. The inference which might be made from the foregoing is that the impact values induced by quenching from tempering temperature, involving as they do a meta-stable condition from a crystalline standpoint, also involve a crystalline instability which will probably be affected by the work which the parts are called upon to do under certain conditions of service. One fact is, however, obvious, that if it is necessary to quench from tempering temperatures to obtain high impact values, internal stressing will accompany the result, and it is an open question whether, if for no other reason, it is not better to be satisfied with reasonable impact values produced by relatively slow cooling rather than endeavor to produce the other condition of the material.

A Truly Bad Condition

Some time ago the author investigated the properties of a nickel-chrome forging which had been placed in a bad condition by an unsatisfactory final treatment. The intimation was that the Izod test-pieces in breaking absorbed no energy. The latter comment was somewhat exaggerated. However, the results of a detailed investigation into the mechanical properties are instructive. The figures obtained were as follows:

Elastic limit	13.3 tons per sq. in.
Yield-point	32.1 tons per sq. in.
Maximum stress.	44.5 tons per sq. in.
Elongation	9.0 per cent.
Reduction of area	16.6 per cent.
Izod	3 ft.-lb.
Charpy	0.31 kgm. (2.2 ft.-lb).
Stanton	666 blows.
Brinell	210

It will be seen that the steel was in a really bad condition. The impact tests clearly showed brittleness, but this was also to be seen by the tensile in the low ductility. It may be stated that the tensile values were true ones, not being in any way affected by defects such as frequently reduce ductility. The true elastic limit was low as also was the Stanton result.

A shipbuilding record was made in Belfast, Ireland, recently when the workmen completed a ship in five working days after the vessel was launched.

In a paper recently read by D. M. Buck before the American Society for Testing Materials, it was brought out that very small amounts of copper have the effect of reducing corrosion in steel. Tests were made of open hearth steel with various copper additions, so that there was from 0.012 to 0.254 per cent. of copper in the ingots. These were rolled into sheets and exposed to the atmosphere in the Connellsville coke region, together with a number of pieces in which there was no copper. It was found that a mere trace of copper was sufficient to prevent rapid corrosion.

Those using articles made of rubber that frequently lose their elasticity through oxidization may restore the material to its original condition by a simple process. Soak the part in a mixture of one part of ammonia to two parts of water. It is particularly well adapted to the restoring of rubber bands, rings and small tubing that are ready to become dry and brittle.

An unusually large weld was made recently by the Thermit process on the stern frame of the SS. Northern Pacific, which was lying at New York. The frame was broken when the vessel run aground in a fog, and is a hollow casting about 2 ft. in diameter with walls 3 in. thick. The weld required 1,400 lb. of Thermit, and proved entirely successful.

The best practice, which is practically the same as the safest practice, in the use of dissolved acetylene under pressure for welding purposes, seems to be to limit the number of storage cylinders in the building, so far as practicable, to those in actual use, or enough additional cylinders to complete one day's work. Used cylinders should be removed from the premises and returned to the manufacturer for recharging as rapidly as possible.

Handling the Product by "Trucktractor"

A Very Novel Adoption of a Tractor and Truck Combination is Herein Described. Moving Freight Cars, Trailers or Other Vehicles Becomes Part of Its Day's Work, or It Can be Used Independently if Desired

By HARRISON JENKINS

A VERY interesting adoption of the tractor and truck combination as suited to shop conditions is shown in the various illustrations throughout this article.

The Clark Tructractor Co. of Chicago, Ill., are the makers of this type of truck, and Fig. 1 shows a separate view of the apparatus.

These trucks have proven themselves to be great labor savers, and well adapted for use in the machine shop and foundry. Such firms as the Hyatt Roller Bearing Co., Clark Equipment Co., Stewart Motor Truck Co., Barney-Floyd Co., Ohio Steel Foundries, National Malleable Casting Co., Jeffery Mfg. Co., and others, have found this truck a wonderful time saver.

Its flexibility is a big feature, as it can turn on a very short radius (see Fig. 2), which is a decided advantage in many cases. The design is such that the truck body is built so close to the ground, and is so powerful that it can be used for every purpose from carrying a full ton load of shavings from the lathe, foundry sand, red hot forgings or castings, finished or unfinished parts from one machine to another or between plants. It will operate on rough roads as well as on factory floors. It will plow through snow or mud, through foundry sand, or on oil-sodden floors.

It is built and put together by efficient and highly experienced workmen, under the supervision of high-class engineers, and made to stand up under the most severe industrial service.

Some of the tasks it has been performing for the past year and a half are as follows: Moving freight cars, heavily loaded trailers, and carrying loads up to a ton and a half constantly—day after day—without breakage or mechanical troubles. The fact that it operates on 8 gallons of gasoline, ordinary working day, makes it a most economical machine.

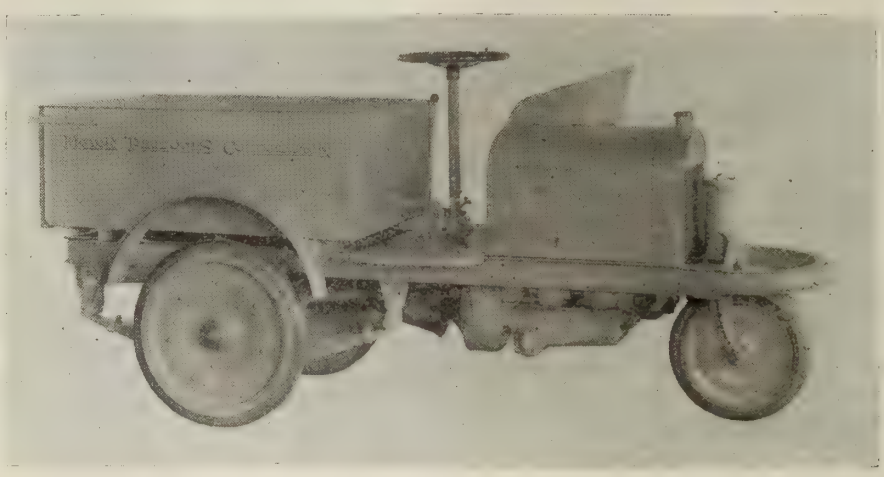


FIG. 1.—GENERAL APPEARANCE OF THE TRUCK.

Its ability to run 24 hours a day without being laid up for recharging and its economical operation, coupled with the lack of breakage, makes this machine an exceptionally efficient and satisfactory one for commercial purposes.

The fact of its having nine and one-half inches of ground clearance and an abundance of power, makes it possible to manipulate on rough ground, foundry floors, factory yards and bad roads. Sand and mud do not prevent this machine from successfully and quickly performing its duties under all weather and factory conditions.

Its great range of speed (from ½ of a mile of 15 miles per hour) permits the Clark tructractor to creep through congested places and around sharp corners, deliver its load exactly in the place desired, without danger to machinery or employees, and to run at high speed through open places and in the traffic of roads and city streets.

One of the machines was recently driven from Buchanan, Michigan, to Chicago, Illinois. This machine was stopped at several of the large industrial plants on the way and most interesting demonstrations were held. It covered a distance of 143 miles in one

FIG. 3.—USED IN CONJUNCTION WITH THE TRAILER.

FIG. 2.—TURNING IN A SHORT RADIUS.

FIG. 4.—USING THIS TYPE OF TRUCK IN THE FOUNDRY.

day and arrived in Chicago in first-class condition, ready to begin regular routine work in one of the well-known institutions.

The fact that this machine is built entirely of metal and that its centre of gravity is very low, makes it a most satisfactory one for foundry and forge shop use. Extreme changes in temperature do not affect its operation. Hot castings and forgings can be carried from one section of the plant to the other—quickly and without damage to the machine. It thus speeds up production, prevents congestion and increases the efficiency of these plants. It has a surprising drawbar pull and is capable of moving loaded freight cars without straining any of its parts. Heavy trailers are transported from one part of the plant to another at high or low speeds, ranging from ½ mile per hour to 15 miles per hour.

The truck is very simple to drive and operators soon become efficient and dart in and out of narrow doorways, here and there among the machines, into the sand blast rooms, about the foundry and along the highways, carrying material from department to department—from foundry to the shipping platform or station.

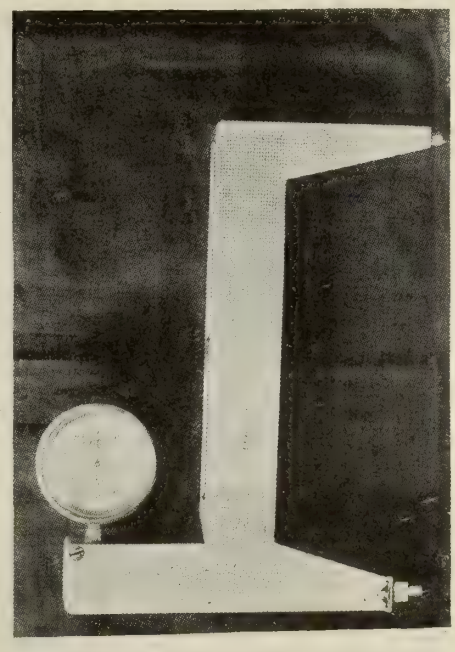
It has a carrying capacity of one and a half tons, and is supplied with either platform, cargo or dump body.

Other information desired will be given on request by the makers of this truck.

TESTING REINFORCED CONCRETE BUILDINGS WITH STRAIN GAUGE

By FRANK G. PERKINS

THE accompanying illustration shows the construction of a strain gauge of Professor H. C. Berry, of the University of Pennsylvania, for use in measuring strains in reinforced concrete buildings, as utilized by D. C. Hooker, of the Seattle Building Department. Its unusual features include a frame without rivets or screws, the side plates being joined to the spacing lugs by the electric welding process. It has checkered side plates to give better grip for the hands and a clearance of 3 in. to enable readings to be made on steel embedded deep in the concrete, also a specially constructed fulcrum joint for the movable leg. The one-piece frame is so rigid that side pressure, giving unconsciously when making observations, has comparatively little effect on the readings and there are no rivets or screws to work loose or throw unequal interior strains on the frame.



VIEW OF THE STRAIN GAUGE.

It is pointed out that the three-inch legs allow measurements on the deepest layer of steel in four-way flat slabs, and the checkered plates reduce the strain of continued reading by improving the grip of the hands on the instrument. The trunnions of the movable leg are held up into position in the notches of the frame by a spring, guarded by a cover plate. Both the spring and the cover plate are square, with a square hole in the centre of each through which the movable leg passes. The cover plate is held in place by four counter-sunk screws, which are screwed home in the frame and thus have no tendency to work loose.

It is held that as the instrument is used only in testing buildings, the gauge length is fixed at 8 in., this length being considered most practicable for all round use. The dial can be revolved any part or all of the revolution to eliminate parallel in reading on floors, ceilings or columns, and to permit the dial end to be held in either the right or left hand. It is of interest to note that the instrument is constructed throughout of Invar steel. The dial is an Ames gauge, graduated to thousandths of an inch, and as the proportions of the movable left are one to five, the instrument therefore records strains of .0002 in. The gauge was designed by D. E. Hooker and constructed for Professor Berry by F. F. Metzger, of Philadelphia.

GEARED HEAD LATHES

Lathes with geared heads for either belt or motor drive are announced by the Cisco Machine Tool Co., Cincinnati. The geared head on the belt-driven machine has a double friction countershaft, one friction running 300 r.p.m. and the other 130 r.p.m. The 300 r.p.m. friction has control of 10 spindle speeds, 300 and 200 with back gears out, 214, 146, 116, 78, 54, 36, 29, and 19 with back gears in.

The 130 r.p.m. friction has control of 10 spindle speeds, 130 and 88 with back gears out and 93, 63, 50, 34, 23, 15, 12, and 8.5 with back gears in. There are four levers, including the back gear lever, required for these changes. One handle controls the friction on the spindle and two handles control the shifting of four back gears on the eccentric shaft. A pull pin in the face gear is used to run straight from the spindle when the back gears are out. The eccentric shaft lever or back gear lever meshes back gears with spindle gears. On the spindle are a friction and six gears, on the back shaft four gears, on the drive shaft two years, all gears and spindles being of 0.40 to 0.45 carbon steel. Except the drive shaft gears, which are rawhide, all geared heads have ball bearings.

In applying the motor to the geared head a plate is placed on the top of the regular geared head with a bracket on the plate for an intermediate stud. On the intermediate stud is a rawhide intermediate gear. A pinion is placed on the motor and a gear on the drive shaft, both pinion and gear being made of steel. The gears are covered and the spindle speeds are 220 and 150 r.p.m. with back gears out and 158, 107, 86, 58, 40, 27, 21, and 14 with back gears in.

The lathes are made in four sizes, 14, 16, 18 and 24-in. For motor drive, these lathes require a 2½, 3, 5 and 7½-h.p. motor respectively. The manufacturer specifies a General Electric motor at 1,700 r.p.m. for direct current or a Westinghouse motor at 1,800 r.p.m.

A Detail Study of the Manufacture of Silica

A Complete Description of Its Analysis, Density, Porosity, Temperature, Etc., Are Contained Herein. To Those Interested in Such a Subject, This Article Should be of Keen Interest

By M. E.

THE manufacture of silica products employed in the Martin or similar furnaces is carried out with compact siliceous rocks, suitably ground, about 2 per cent. of slaked lime being then added, with sometimes a little clay or ground bauxite, and the whole is worked up into a body which can be moulded directly in metal moulds or by means of a machine press which gives sharp angles; it is not necessary to employ a powerful pressure. The pieces are afterwards dried, then carried to as high a temperature as possible in the kiln. The silica products met with in commerce can be arranged in three broad categories: (1) Those which include large grains; (2) those which include medium grains; (3) those which include small grains. These grains of rock, large or small, are all surrounded by a fine mass made by the mixture of finely ground lime and silica, forming a kind of cement adhering to the grains of rock.

Analysis of silica products can be made by two processes; either by the quantitative analysis of each of its elements, or by estimation in the state of sulphates of the elements of other than silica. In this last process, which is rapid but imperfect, the lime, alumina, etc., are treated all together, without paying attention to their proportions, but it is indispensable to know the quantity of alumina contained in these products, for, if it is in excess, it brings about a lowering of the softening and fusion points.

Physical studies of silica products comprise observations on changes of volume, density, porosity, and mechanical resistance under the influence of high temperatures. For this purpose tests are carried out: (a) On products such as proceed from factories; (b) on the same products submitted to 1,710 deg. C. for an hour or two, or to 1,650 degs. C. for the time necessary for their complete expansion.

The tests on products made by the trade include determination of density, porosity and resistance to crushing at ordinary temperature.

Density.—Apparent density and absolute density are measured; the measure of this last provides a first indication on the thermal conditions in which the product was burned. The density of quartz is about 2.66; under the action of heat, when it attains its total increase in volume the density is about 2.32. Quartzites present analogous results. The density of flint varies between 2.60 and 2.62; after burning at a high temperature this density is no more than 2.22. If, for example, this absolute density is not above 2.45 to 2.50, it is certain that the burning has neither been high enough nor long enough; if this density is below 2.40 and tends to approach 2.35, their burning can be considered satisfactory. Silica products based on compact flint present smaller absolute density, which should approach 2.25 and tend towards 2.22.

Porosity.—Porosity is determined by finding the weight of water which the very dry siliceous product absorbs during a stay of twenty-four hours in water. Porosity depends on several factors, and particularly on the nature of the rock, the size of the grains, the composition of the cement, etc. Certain bricks have a porosity of 8 per cent.; others have higher porosities, sometimes reaching 20 per cent. This porosity should increase when the products are heated to 1,710 degs. C., if they are of good quality, too great a porosity facilitates absorption of slags in the Martin furnace, and accelerates wear of the bricks.

Resistance to Crushing at Ordinary Temperatures

The resistance to crushing is very important. In Martin furnaces, and especially in the arches, the part of the products which is in contact with the gases in combustion increases in volume, the arches swell, and pressure—often very high—results in different directions. Just at the periods of tapping or of changing the furnaces there are great variations of temperature which bring about contractions or expansions. During these operations the bricks should resist changes of pressure without being crushed or cracked. The resistance to crushing at ordinary temperature is measured by the process adopted by the Conservatoire National des Arts et Metiers, where half bricks are operated on. This resistance depends on the quality of the grains of the rock, and the quality of the cement which surrounds then: it is greater when the porosity of the products is small. According to the physical properties of the products the resistance to crushing varies from 120 to 500 kilog. per sw. cm.

It is preferable to proceed with these tests on whole bricks which have been heated to 1,710 degs. This operation is performed in a Bigot and Bodin recuperating furnace. If the condition of the pieces permit, their expansion, density, porosity and resistance, to crushing tain only 85 per cent. of silica and 15 per cent. of foreign matters, are as rewhen cold and at 1,500 degs. are then determined. When taken from the recuperating furnace, if the pieces have been clearly softened and deformed, or have melted, they are of inferior quality and are not suitable for use in the Martin furnaces. Where they have resisted without either melting or being deformed three principal cases occur: (1) As the temperature is raised, the siliceous grains increase in volume and porosity. The cement which surrounds them is partially vitrified, contracts, and resists (without cracking) the expansion of the silica grains. Experience proves that the porosity of these products decreases in proportion as they are taken to higher temperatures, and that the best silica products present this peculiarity; (2) creased, their porosity has increased, and it more finely and not use large grains. In the case of Souvigny quartzite, which expands 10 per cent. and a quartzite American sandstone which expands 15 per cent., the volume of a cube of the first with side 10 becomes 1,331, at 1,710 degs., and a similar cube of the second becomes 1,520; the volume of the first gas increased 33.10 per cent., and that of the second 32 per cent. In order to obtain an equal increase of volume it would be necessary to crush the American sandstone finer than the Souvigny quartzite; (3) porosity, after heating to 1,710 degs., has slightly increased, resistance to crushing at ordinary temperature has perceptibly decreased, and resistance to crushing at 1,500 degs. has become null.

Careful examination shows that the grains of siliceous rock have become friable, the chief material employed being such as falls into powder at 1,710 degs. The porosity of these grains has increased considerably; the cement has preserved its consistency and has not cracked, but when a trial is made for resistance to crushing at 1,500 degs. the cement softens, and the grains no longer having any cohesion, the products crush under slight pressure. The quality of these products is defective; it is like those which are made with a mixture of rocks of good quality and rocks of which have become exhausted at high temperature.

The study of silica products with the microscope shows that tridymite is formed rather rapidly in the presence of lime at high temperature—this formation being much slower in the parts of rock grains which are not in contact with the lime.

It is rather difficult to state precise rules on the subject on account of the variety of the principal materials. The principal qualities required of silica products: (1) Refractoriness as high as possible and above 1,710 degs; (2) increase of volume as small as possible; (3) crushing resistance as high as possible when hot and at ordinary temperature; (4) small porosity. Attention should also be drawn to two particular points, the grinding the rock and the burning of the products.

The existing practice is to use heavy vertical mills. The ground material is

afterwards sifted in order to separate over-large grains, which are reground. The apparatus used in the sifting room allows no separation of very fine elements, fine, medium, and coarse. Vertical mills destroy part of the angles and the ground material is never of constant composition because it remains for a longer or shorter time in contact with the grinder, or because the pieces of rock to be crushed offer very variable resistances to crushing. It is certain that manufacturers will be induced, sooner or later, to make use of processes analogous to those used in the abrasives industry—crushing the rock, grinding in cylinders, a sifting which allows classification of the grains and separation of the fine dust constituting the basis of the cement which serves as agglomerant. These processes give grains with sharp edges. They allow exact determination of the proportions of grains of different sizes separated by the sifting rooms. Manufacturers will thus have the possibility of making products with angular grains, of constant composition as regards grain size, and including a known proportion of fine.

These products are burned at as high a temperature as possible, viz., about 1,600 degs., at which temperature a few hours' firing suffices in order to obtain a good result. At present most manufacturers use intermittent kilns, which only permit temperatures of about 1,400 degs. to be contained in the middle; it is necessary then to maintain the products at this temperature for long hours in order to obtain a transformation and a partial expansion of the silica; a considerable expenditure of fuel and a magnified duration of the burning result. In some of these kilns the setting in, the burning, the cooling, and the drawing from the kiln, require about three weeks.

As a result of repeated trials made in a tunnel kiln between 1,500 degs. and 1,550 degs., the duration of a good burning according to the tonnage to be produced per twenty-four hours, varies from four to five days from the moment the products enter into the tunnel until the moment they go out of it.

The examination of a number of bricks taken from open hearth furnaces shows the influence of density and porosity on crushing resistances; they give valuable indications as to the condition of the bricks in the furnaces and the essential principles which should be conserved in the management of these furnaces. It also demonstrates two very plain facts, contrary to the opinions generally approved at present, viz: (1) It is admitted that silica products are only of good quality if they include 94 to 95 per cent. of silica. But the experiments show that the grey parts of the bricks which contain only 85 per cent. of silica and 15 per cent. of foreign matter are as refractory as products with 95 per cent. of silica and that thanks to their feeble porosity they are far superior as regards crushing resistance at all temperatures; (2) It is equally admitted that an excess of lime and of iron oxide is detrimental in silica products, and that it is only necessary to exceed the proportion of 3 to 4 per cent. for these two elements combined. But in the grey part of the bricks the proportion of these two elements varies from 10 to 14 per cent.

The following table recapitulates some of the physical tests which have been made in the course of these studies:

(a) Brick of good quality.
(b) Brick which cracks at high temperature.
(c) Brick made with rocks friable at high temperature.
(d) Brick from a Martin furnace, unattacked part.
(e) Brick from a Martin furnace, brown part.
(f) Brick from a Martin furnace, grey part.

	A	B	C	D	E	F
Fusion points	1,750°	1,730°	1,730°	1,730°	1,710°	1.730°
Linear expansion at 1.710°, per cent.	1.60	5.90	4.00	2.50	....	....
Porosity (water absorbed), per cent.	12.00	9.5	10	10.5	2.1	0.3
Porosity after heating at 1,710°, per cent.	9.7	16.10	12	9	....	....
Crushing resistance at ordinary temperature	121	480	160	166	1,115	1,415
Crushing resistance at ordinary temperature after heating at 1,710°	...	nil	52	...	....	....
Crushing resistance at 1,500° after heating at 1,710°	77	nil	nil	37	52	138

The crushing resistance is expressed as kilogms. per sq. cm.

INTERNATIONAL MACHINERY EXPOSITION ANNOUNCED

Announcement of the International Machinery Exposition to be held in Grand Central Palace, New York City, has been made by the Merchants' and Manufacturers' Exchange of New York. This is to be one of the most advanced steps made in the machinery industry since the war ended, and will be a permanent affair. October 15th is scheduled as the opening date, at which time it is expected that hundreds of machines will be in actual operation on the floor. The exposition will occupy 50,000 square feet of floor space, in the high structure, which is the largest exposition building in the world and will include a most comprehensive display of modern engines, lathes, milling machinery, planers, drills, screw cutters, presses, boring, can-making, woodturning machines, etc.

The Merchants' and Manufacturers' Exchange, which operates Grand Central Palace, is owned and controlled by the Nemours Trading Corporation, of which Alfred I. duPont is president. It has nineteen branches and 3,000 selling agencies throughout the world, and is one of the most remarkable organizations of the sort in existence. The Merchants' and Manufacturers' Exchange will operate eight permanent industrial expositions in the Palace on the eight upper floors of the 12th storey building. The four lower floors will be used for temporary exhibit, such as the annual automobile show, motor boat, flower show, etc.

Visitors at the International Machinery Exposition will also find the other expositions in this building of considerable interest, included among them are the International Factory Appliance Exposition, International Mining Machinery Exposition, International Farm Tractor and Implement Exchange, and International Exposition of Mining Industries, etc. The advantages of the great world trade clearing house are obvious. Manufacturers will have their exhibits side by side, affording easy comparison. Interchange of ideas and the opportunity to observe what is new and improved in machinery, will be of decided benefit to all who are connected with the industry. Then, too, familiarity with the implements and machinery of one industry so often leads to appreciation of their applicability to another.

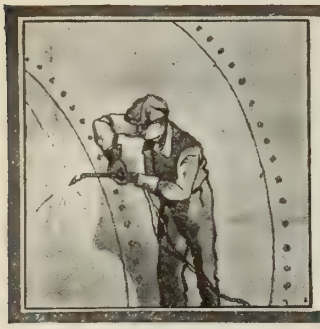
Lloyd L. Warfield is manager of the Machinery Exposition and will be assisted by an able staff. Fred W. Payne is general manager of the Merchants' and Manufacturers' Exchange, and has general supervision of all of the expositions. Inquiries should be addressed prior to Sept. 15th to Suite 421, 405 Lexington Ave., New York City, and after that date to Grand Central Palace.

Three fires started in a large grain elevator recently within 5 ft. of each other, at intervals of one hour. Experiments by electricians developed the fact that the fires were caused by wheat dust collecting on a 16 candle-power, 55-volt, ordinary incandescent lamp. The dust ignited from the heat from the globe, fell to the floor and ignited litter lying there. Further experiments showed that the defect may be entirely corrected by the installation of double globes, or, in other words, encasing an ordinary globe within a thin glass covering. This modifies sufficiently the intensity of the heat, but does not reduce the light.

Of the total output of crucible and electric steel in Germany, for 1917, 349,480 tons, 62 per cent. was produced in the electric furnace. One-third of this quantity was produced in induction furnaces and two-thirds in arc furnaces, the induction furnace apparently being preferred by the works producing high-quality steel. The average capacity of the electric furnaces built in Germany during the war was 6.7 tons. The figures for Austria-Hungary, which, much lower, show sensibly the same ratios, except that two-thirds of the electric output was obtained from induction furnaces.

As apprentices progress in their work they often find themselves in need of such tools as scales, micrometers, dividers, centering devices, and so on, but without the funds to provide them. One of the foremen in the Scovill Manufacturing Company's plant, realizing this, has adopted a method whereby these tools may be easily supplied. Each worker gives him 50 cents a week. As they at different times come in need of a certain tool, it is purchased with the money.

This instils in the boys the saving habit and helps them provide themselves with a set of high-grade tools.



WELDING AND CUTTING

Welding Jigs and How to Overcome Distortion

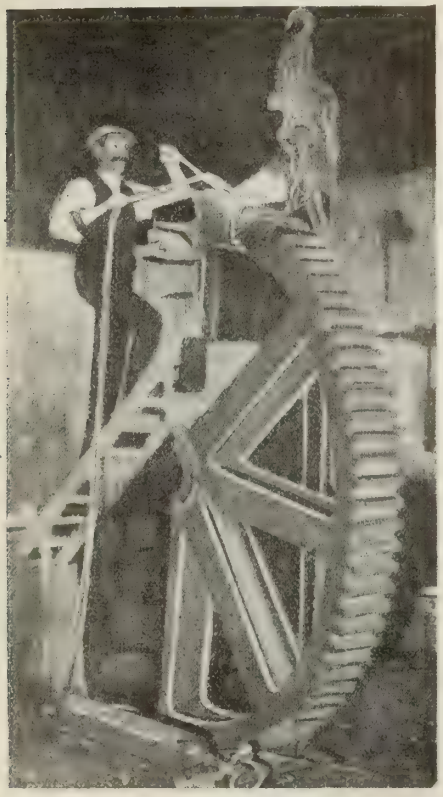
The Subject of Welding Jigs, and Various Methods for Overcoming Distortion as Presented by a Paper Read at a General Meeting of the British Acetylene and Welding Association

By C. S. MILNE

(Continued from August 14th Issue)

With regard to Mr. Metcalf's point concerning the rubber tubes in the machine in Fig. 31, these should not get entangled, as the machine is turned back to its original position after each cut; this unwinds the tubes again.

In reply to Mr. Pickett, Mr. Milne said: Much research into the welding of copper has been made recently. If one uses pure electrolytic copper one gets in the weld a large amount of copper oxide, due to oxidization during welding, but by using copper rod for filling in, which has a very small proportion of phosphorus in it, one eliminates the oxide and one gets a thoroughly sound joint. The great trouble is the large expansion of copper. Whether pure cupper or phosphor is used, it is very weak at high temperatures, and if you get any strain on it before it get down to a fairly low temperature, the weld or metal adjacent to the weld will crack as concentration takes place.



WELDING FRACTURE IN RIM OF CAST-IRON GEAR WHEEL TO TRANSMIT 240 H.P.

The only thing to do is to try to find some method of relieving the strains until it has cooled, but in most cases of repair work, particularly in flat surfaces, it is very nearly impossible to do that. Copper welds can be made, and are frequently made in new work, and, when one cuts through a section of them and makes a microscopical examination or analytical test, one finds the weld absolutely sound, the trouble is that copper has little strength while hot to stand contraction.

Mr. Gardner asked whether I made allowance for contraction in welding by means of my machine. Well, I did not. In this case (Fig. 29) there is a seam right round the article, and when you are welding it you have got to tack in a few places to hold it together. You may have trunnions to swing it on, but whatever you do it is impossible to make any allowance for contraction whether the work be done by hand or by machine. In the machine I intended to tack in three places to hold the parts together and the contraction would have had to look after itself. The bomb ends being more or less hemispherical in shape, would give somewhat to this contraction.

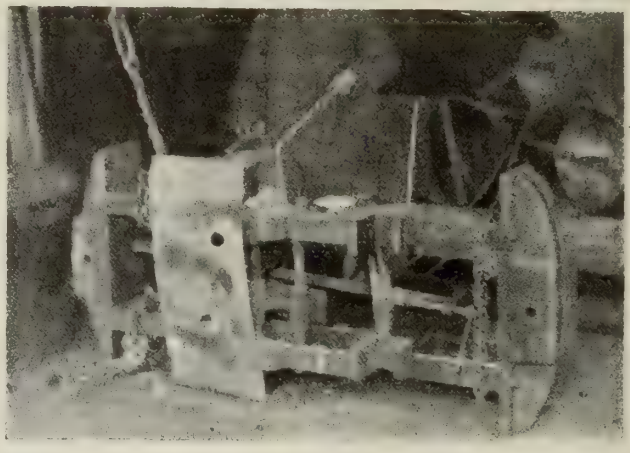


FIG. 35.

Mr. Hoddle asked whether my welding machine will be perfected. I do not suppose my bomb welding machine will ever be perfected, but I am hoping shortly to resume my investigations in regard to a machine which will be suitable for welding longitudinal or circumferential seams in such things as barrels and jacketted pans, etc., and I hope in six months time I shall be able to go to Mr. Hoddle and say I have got a machine to sell him.

Mr. Thomson remarked that I had not shown any examples of welding motor parts. I thought the motor side of this business had been done to death. If Mr. Thomson cares to come down to my works any day I shall be glad to show him anything from half a dozen to a couple of dozen cylinders in the process of repair. Our method of repairing a cracked cylinder head is to cut a piece

out of the jacket so that we can get at the head to weld and afterwards replace and re-weld the jacket, when cold we test it with water pressure; we then send it back to the owner as good as ever it was.

My thanks are due to our president, Mr. Jackson, for the great assistance he rendered in trimming up some of my sentences. I also wish to thank Mr. Hoddle for the kind loan of a lantern which was of great assistance in producing satisfactory slides.

The president in conclusion said: There is only one more word to be added, and that is to thank Mr. Milne for all that he has done and for all that we must have gained by out attention here to-night. I would just add that, as Mr. Milne is a member of the association, I shall not ask you to pass a formal vote of thanks, because he feels that he has only done his duty in giving us this information to-night.

The company then inspected the apparatus which Mr. Milne had brought for the benefit of the association.

Production Speed on Oxy-Acetylene Cutting

Here is an Answer to the Numerous Papers, Written on War Applications to the Oxy-Acetylene Process. This Was Presented at the Annual Convention of International Acetylene Association at New York

By R. R. BROWNING, Vice-President Oxweld Acetylene Co., Chicago

DURING the course of this victory convention, we have listened or will listen to a number of excellent papers on war applications of the oxy-acetylene welding process. These articles, as well as the large number which have appeared in trade papers, including our own official organ, "The Acetylene Journal," are of the greatest interest to those in the industry, proving, as they do, the wonderful development of the process in the field of production.

The majority of these articles deal principally with welding applications, and the very important part which oxy-acetylene cutting took in war work has been given little or no attention. This neglect is not intentional, but is due to the fact that oxy-acetylene cutting so naturally fitted into war production that even those who used it hardly gave it proper credit.

Business men in this country knew early in 1916 that production of war material would have to be speeded up to meet the demands of the Allies. This speeding up process was general throughout all essential industries, and the value of the oxy-acetylene cutting process, always in the first ranks as a time and money-saver, commenced to be recognized more thoroughly as a necessary part of the production system.

The demand for steel of all kinds to be used in shells, ships, guns, artillery, etc., became tremendous, with the logical result that scrap metal was required by thousands of tons. The use of the oxy-acetylene cutting process in wrecking old boilers, ships, tanks, etc., for steel scrap, increased to such a point that portable outfits were carried to most inaccessible places in country districts, the process applied, and charging box steel scrap produced for shipment to the mills. It truthfully can be stated that without the oxy-acetylene cutting process the scrap market would have been in an absolute panic to supply the tremendous tonnage demanded.

With the inauguration of submarine warfare by Germany, it became immediately apparent to the American shipbuilding industry that steel ships without number would be required. The oxy-acetylene cutting process, which since its introduction into this country has been used by the steel ship builder, was one of the first processes to be called upon to speed up production in old, as well as in new, shipyards. The development of the applications in the shipyards occasioned by the demand for more ships was a matter given special attention by the Welding Committee of the United States Emergency Fleet Corporation, by the American Bureau of Shipping and by Lloyd's. The result was the application of the process to such important work as the following:

Cutting or trimming of plates and structural iron to shape.

Making man-holes, portholes, patches, ventilator and funnel openings, stairway openings, mast openings and headlights.

Trimming stem and stern posts.

Cutting frames and "between rib" plates.

Cutting shafting, pipes, chains, rivets and scrap.

The majority of these applications were made absolutely essential during the war in the speed-up schedule required through the time limit placed on production, a most interesting example being that of cutting portholes.

It has always been customary in shipyards to punch a large number of holes with a ½ inch or ¾ inch punch around the periphery of the proposed porthole. The central portion or plate was in this manner removed and the edges then trimmed by means of a chipping hammer. An average of one and a half hours was required to make in this manner a 12 inch diameter porthole, whereas with an oxy-acetylene circular cutting blow pipe and a simple attachment, the portholes were, during the war, and are now, completed in an average time of five minutes each. This not only shows a considerable saving in time and cost in doing the work, but it can also be said that the finished porthole, as made by the oxy-acetylene cutting process, is better in appearance than that of the older process.

The process had been for years applied to the cutting of armor plate, but during the war the increased efficiency of heavy ordnance made it absolutely essential to increase the thickness of armor plate used on battleships and coast defenses. The oxy-acetylene process took care of this increased cutting limit in many instances in the manufacture of new armor plate. As a result of the change of armor plate construction made necessary by the war, Government proving grounds such as that conducted at Aberdeen, Md., were called upon to test, seemingly without limit, all kinds of armor plate. After this plate had been hit by several shells it was, of course, only suitable for further use as scrap. The question, however, was to reduce it to handling size, so that it could be remelted. A specific example of this can be quoted from work done at the Pittsburgh Crucible Steel Co., Midland, Pa., where thousands of tons of this scrap armor plate, averaging 16 to 17½ inches in thickness, was cut by the oxy-acetylene process. Working cost showed the actual cutting of this material at the very low figure of 1 3-10c per sq. in. and the wonderful speed of 3 lineal inches cut per minute. This speed is the more remarkable when one stops to consider the high percentage of chrome and nickel contained in armor plate.

Shortly after the United States took up arms against Germany, contracts were placed with numerous steel foundries throughout the country for castings to be used in the construction of naval and field guns. One of these castings, called the gun slide, is most difficult to manufacture. It has a trunnion or projection of metal on each side, which is very heavy compared to the walls of the casting and in order to eliminate shrinkage and cracking when the casting cools, the trunnion has to be carried clear across the casting. After the casting is cooled that part of the trunnion that passes the bore of the casting in which the gun rides has to be removed, and as the bore is circular, about 12 or 14 inches in diameter, varying with the size of the gun, to remove this part by machine would be very slow and costly, so that a number of foundries used to splendid advantage the Staybolt oxy-acetylene cutting blow pipe for removing the surplus metal. Such companies as the Superior Steel Casting Co., West Steel Casting Co., the Linderman Steel

Machinery Co., and the McCord Co., used the process, securing a good, smooth cut without injury to the walls. The time saving as compared with older methods was a tremendous factor in the speed of production.

Essential applications of the character already given might be continued without number, such as the application made by the Illinois Steel Co., of South Chicago, in cutting torpedo heads by means of the blow pipe, or of the work done by the Radiograph and the Oxygraph in cutting irregular steel shapes, but further remarks in the paper will be confined to what was probably the greatest example of the application of oxy-acetylene cutting made during the war, namely, the nicking of steel bars for the producing of shrapnel and high explosives or gas shell cases.

Long before the armistice was signed, many large plants in this country were engaged, in whole or part, in the making of shell cases, and the final overwhelming superiority of the Allies was undoubtedly due to the unlimited supply of artillery ammunition. It is a well-known army saying that "He who has the better artillery wins the battle," and especially was this true in the world war.

The United States Government had for some years made shells of various sizes in some of its arsenals, and, in addition, a few large steel companies, such as Bethlehem and Midvale, had ordnance departments previous to the war. When the appeals and orders from France, England, Russia, etc., commenced to reach the steel and forge men of America, a mighty upheaval took place. Large plants in all sections of the country turned from making bolts, nuts, air brakes, cans, machinery, etc., to the more urgent necessity, shells.

In the making of steel shell cases it had always been customary to take the long bars of shell steel as they come from the rolling mills, and by means of power driven saws, with teeth of high speed steel, cut them into billets or slugs so that the forging might then be made, the machining accomplished and the shell case assembled into the finished death carrying shrapnel.

Such companies as first entered into this new work during the years 1916 and 1917, for example, National Tube Co., McKeesport, Pa.; Bartlett-Hayward Co., Baltimore, Md.; Barney & Smith Co., Dayton, Ohio; Milton Mfg. Co., Milton, Pa.; Tennessee Coal Iron & Railroad Co., Birmingham, Alabama, realized immediately that if the tremendous production asked for was to be obtained that some other method of cutting bars and billets would have to be found which could be easily and quickly applied and which would be so fast that the big forging presses would not be idle a moment for lack of slugs.

Oxy-acetylene cutting just naturally filled the gap as no other method could, and the wonderful production figures as given below were attained in the majority of the hundred or more plants engaged in this work.

Hot saw or friction saw nicks gave

Diam. of bar. Inches.	Billets per 8-hour day per operator.	Average depth of nick.	Aver. cost per slug of nicking, including gases, labor and breaking.
3 2-10	2000	¼ inch	1.55 cents
5⅜	800	⅜ inch	4.8 cents
9	250	¾ inch	7.5 cents
11¼	100	1 inch	20 cents

only about one-quarter of these production figures, while the cost was more than double that of the oxy-acetylene method. It was also found that nicks made by the oxy-acetylene method doubled the number of good breaks as compared with that of the saw method. In addition, nicks made by means of saws did not break as close to the vertical plane or with as good a fracture as the bars nicked by the oxy-acetylene method. These two latter points were of special interest to the manufacturer, first because with the clean break the forgemen were enabled to place the billet directly into the die as it came from the breaking press or hammer and without difficulty centre the piercing punch, and secondly through the securing of a clean fracture inspection of the steel by Government employees was greatly facilitated.

When the process was first applied for the nicking of steel bars, the groove or nick was made to considerable depth and over the entire circumference of the bar. As time went by and the knowledge of experience was secured, the nicking depth was decreased and the cut was made usually over one-third of the circumference. No additional weight or power in the hammer or breaking press seemed to be necessary, and the breaks were even better than when the whole circumference had been nicked. The increase in speed and the decrease in costs were, of course, items of interest, especially to the larger manufacturers, where production of twenty-five to thirty thousand slugs per day was maintained as an average. Naturally various methods of holding the hand, or machine type, cutting torches used in this application were originated by the various users. Many of these devices were unique, but the majority were simple in character and made provision primarily for the holding and position adjustment of the blow pipe.

The majority of the installations consisted of Duplex Acetylene Generator, oxygen manifold, and the requisite number of hand or machine type cutting stations to give the production required.

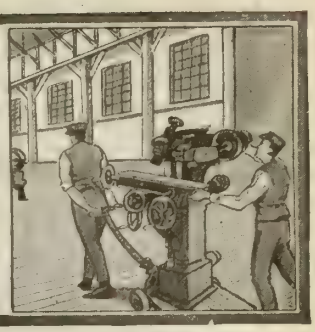
The process was also applied in some cases to the trimming of the shell edge after machining of the outer and inner surfaces, thereby increasing the speed of this operation as compared with the ordinary cutting off tool in the lathe by over 50 per cent. A similar application was also made of removing the nubbin or small end remaining at the nose of the shell case after machining in the lathe had been completed.

During 1917 and 1918 many large concerns took up the manufacture of shells, and practically without exception the oxy-acetylene nicking process was used to secure the large production demanded in their contracts. More prominent among those who did work of this character are the following:

New York Air Brake Co., Watertown, N. Y.
American Can Co., Edgewater, N.J.
American Steel Foundries, Chicago.
Milton Manufacturing Co., Milton, Pa.
National Tube Co., McKeesport, Pa.
Twin City Forge and Foundry Co., Stillwater, Minn.
Worthington Pump and Machine Co., Jeansville, Pa.
Pennsylvania Seaboard Steel Co., New Haven, Ct.
American Motor Truck Co., Newark, Ohio.
Bartlett-Hayward Co., Baltimore, Md.
Hewitt Steel Co., Newark, N.J.
Tennessee Coal, Iron and Railroad Co., Birmingham, Ala.
Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Williams, White & Co., Moline, Ill.
American Rolling Mill Co., Middletown, Ohio.
William Wharton, Jr., Co., Easton, Pa.
Ingersoll-Rand Co., Phillipsburg, N.J.
Crucible Steel Co., Harrison, N.J.
Central Steel Co., Massillon, Ohio.
Detroit Steel Castings Co., Detroit, Mich.
Standard Forgings Co., Indiana Harbor, Mich.
Bethlehem Steel Co., Steelton, Pa.
Barney & Smith Co., Dayton, Ohio.
Curtis Manufacturing Co., St. Louis, Mo.
American Tube & Stamping Co., Bridgeport, Ct.
Laconia Car Works, Laconia, N.H.
E. W. Bliss & Co., Brooklyn, N.Y.

Reference has been made in this paper only to the application in production work, but we must not forget the thousands of applications which were made in the maintenance of plant equipment in conjunction with the oxy-acetylene welding process, thereby keeping producing equipment at top-notch speed. The further use of the process in such special applications as the cutting of steel lake steamers into two sections so that they might be passed through the Welland canal on their way to the ocean to do their bit in carrying the boys across to France, the application made by the English in removing sections of submarines or other vessels in order to allow the release of imprisoned persons, and it is further rumored that the Germans used the oxy-acetylene cutting process in the destroying of artillery which they had to leave behind in their flight. Can we not, therefore, in true justification, state that the oxy-acetylene cutting process must be, and is, recognized as one of the decisive factors in the winning of the war?

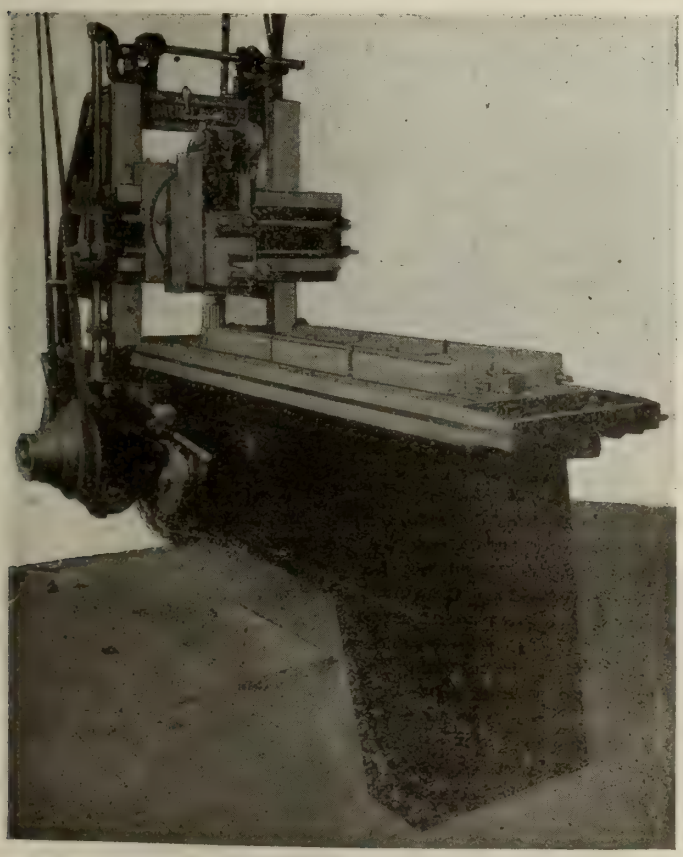
DEVELOPMENTS IN SHOP EQUIPMENT



MULTIPLEX MACHINE TOOL

FOR handling repair work in power plants, engine rooms, or on board ship, and to meet the requirements of general repair shops and garages, the Multiplex Tool Co., Inc., 76 S. Eighth St., Brooklyn, N. Y., has developed what is known as a "universal" machine tool which provides for the performance of those classes of work that are ordinarily performed on planers, lathes, horizontal and vertical boring machines, slotters, milling machines, drilling machines, and gear-cutting machines. From the accompanying illustrations, it will be apparent that so far as its general appearance goes, the design of this machine is more nearly like that of a planer than of any other standard tool. At the right-hand side, there is the usual planer driving mechanism, with forward and reverse belts and means of obtaining the required feed movement of the tool. As this part of the machine does not represent an important departure from standard practice in designing, the following description will be concerned chiefly with the mechanism at the left-hand side of the machine, from which power is taken for driving all of the different attachments that provide for performing the various operations on this machine. A detailed description will also be given of each of these attachments.

Before starting to give an explanation of the way in which the different members of this universal machine tool function, it will doubtless be desirable to make a general statement of means which are provided for the performance of lathe work, horizontal and vertical boring, milling, drilling, slotting, and gear-cutting operations. In order to do so, attention is first directed to the driving pulley at the left-hand side of the machine. From the shaft that carries this pulley, power is transmitted through bevel gears to a vertical shaft running up beside the housing. There are two bevel gears at the lower end of the vertical shaft, each of which meshes with a bevel gear on the pulley shaft. By means of lever on side of machine, provision is made for clutching either of these gears to the shaft in order to drive it in a forward or reverse direction. Through a pair of spiral gears, this vertical shaft transmits power to a horizontal splined shaft in the cross-rail, which transmits power through bevel gears to a vertical spindle mounted in bearings in the planer head. The small level shown provides for the manipulation of a clutch by means of which either of two bevel gears may be secured to the vertical spindle to provide for driving it in a forward or reverse direction. This vertical spindle is made with a tapered socket in which milling cutters or twist drills may be mounted, using an adapter bushing if necessary, or a gear furnished with a tapered shank to fit the socket may be mounted at the lower end of this spindle in order to provide means of driving the lathe head or the horizontal boring head.



ROUGHING OUT A SADDLE ON THIS MACHINE.

For the performance of slotting operations, a special attachment is permanently secured to the right-hand side of the planer head, power for driving this attachment being transmitted from the vertical spindle through a pair of spiral gears to a horizontal shaft that carries a slotted crank disk, in which the position of the crankpin may be adjusted to provide for obtaining any required length of stroke for the slotting tool. For vertical boring, a rotary work-table is provided, which is driven from a spiral gear that can be seen on the vertical driving shaft at the left-hand side of the machine. From this gear, power is transmitted through a horizontal shaft that is carried by a bracket bolted to the face of the housing, and thence through bevel gears to another horizontal shaft on which there is a worm that meshes with a worm-wheel connected to the rotary table. It will, of course, be apparent that in connection with this rotary attachment, use is made of a tool mounted in either the vertical spindle or clapper-box of the planer head, according to which is most convenient for the particular job on which the machine is engaged.

Lathe Headstock and Tailstock

The lathe head is driven by a bevel pinion carried on a tapered shank which fits into the vertical spindle of the machine. This pinion meshes with a bevel gear on the lathe head, and it will be seen that back-gears are furnished, as in the case of engine lathe heads of standard design. There are also studs at the end of the head on which the necessary combinations of change-gears may be mounted to provide for the performance of a wide range of thread cutting operations. Such operations are handled with the work mounted on centres; and to provide for traversing the tool along the work, use is made of a combination cross-slide and longitudinal slide that is mounted on the main table of the machine between the headstock and tailstock. Longitudinal movement of this slide is

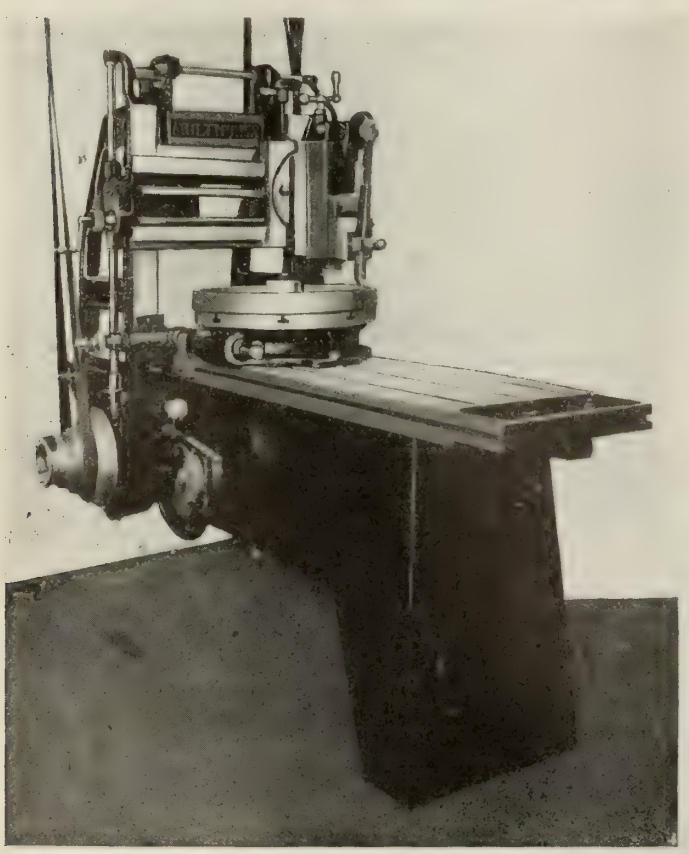
accomplished by means of a lead-screw which is rotated from the lathe head by means of a universal pointed rod.

In addition to its use for thread cutting, the lathe attachment can be utilized for the performance of various turning and facing operations; also, there is a dividing head mounted on this attachment which provides for the performance of gear-cutting operations and for such work as milling the sides of hexagonal and similarly shaped pieces. Almost any work for which a dividing head would ordinarily be employed can be done on this attachment. For gear cutting, the blank is chucked on the lathe into the tapered socket of the machine spindle. Then the traverse movement of the planer table is used to feed the work past the cutter. When the cut has been taken, the table is returned to the starting point and the work is indexed, using the dividing head to obtain the necessary spacing, after which a second tooth is cut. This process is repeated until all of the teeth have been completed.

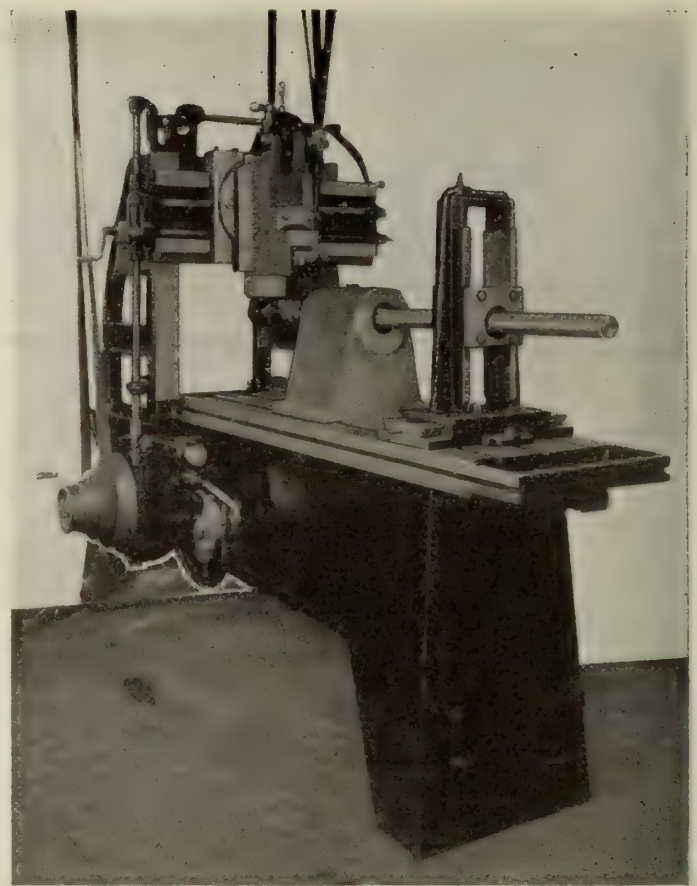
Horizontal and Vertical Boring Operations

For use in performing horizontal boring operations, there is an auxiliary attachment which is bolted onto the bottom of the planer head, provision being made for driving the horizontal spindle of the boring attachment by means of a bevel pinion carried by a shank which is fitted into the socket of the spindle carried by the planer head. This pinion meshes with a bevel gear on the horizontal spindle of the boring attachment, in which any required form of boring-bar, twist drill, or other tool may be mounted. Where a boring-bar of considerable length is to be utilized, an out-board support must be provided, and on the Multiplex machine this is furnished by a steadyrest having a bearing of the proper size to receive the outer end of the boring-bar.

In the kind of shops where the Multiplex machine is likely to be used, it will frequently be found necessary to handle such work as boring out a bearing and facing both ends of the bearing housing at accurate right angles with the bore. Such work may be done very nicely by means of this horizontal boring attachment. After the bore has been finished, a facing tool is mounted in the horizontal spindle and one end of the work is faced off. In order to assure having both of the end faces at accurate right angles with the bore, care must be taken not to disturb the setting of the work until the job is finished. Hence, the method of procedure is to raise the cross-rail and run the planer table through to a position where the opposite end of the work can be reached. Then the horizontal boring attachment is reversed, end for end, to enable the facing tool to complete the job by finishing the opposite end of the casting.



HORIZONTAL TURNING—FINISHING A GEAR BLANK ON ITS OUTSIDE DIAMETER.



HORIZONTAL BORING—NOTE THE TABLE IS FEEDING AGAINST THE CUTTER.

Vertical boring operations are performed on the Multiplex machine through the use of a rotary table on which the work is carried. The means that have been provided for driving this attachment have already been described. The rotary table may be used for the performance of vertical boring operations done with a tool carried by the clapper-box, or use may be made of an end-mill mounted in the main spindle of the machine. Ingenious mechanics will find many ways of using this equipment for handling the great variety of work that comes to the average jobbing shop, for the performance of which several different machine tools would otherwise be required.

Milling and Drilling Operations

Either milling or drilling operations are performed with an end-mill or twist drill mounted in the main spindle carried by the planer head. An important feature of the design, in so far as the performance of these two classes of operation is concerned, is that the planer head is mounted on a gradual swivel so that the spindle carried by it may be set at any required angle for performing milling or drilling operations in other than a vertical position. Any point can be reached around a complete circle. Power cross-fed and longitudinal feed movements are provided for the performance of milling operations; the transverse feed is accomplished by means of a screw in the cross-rail of the machine, which traverses the head along the rail; and for the longitudinal feed movement, the bull wheel and rack are driven at a slow speed in order to

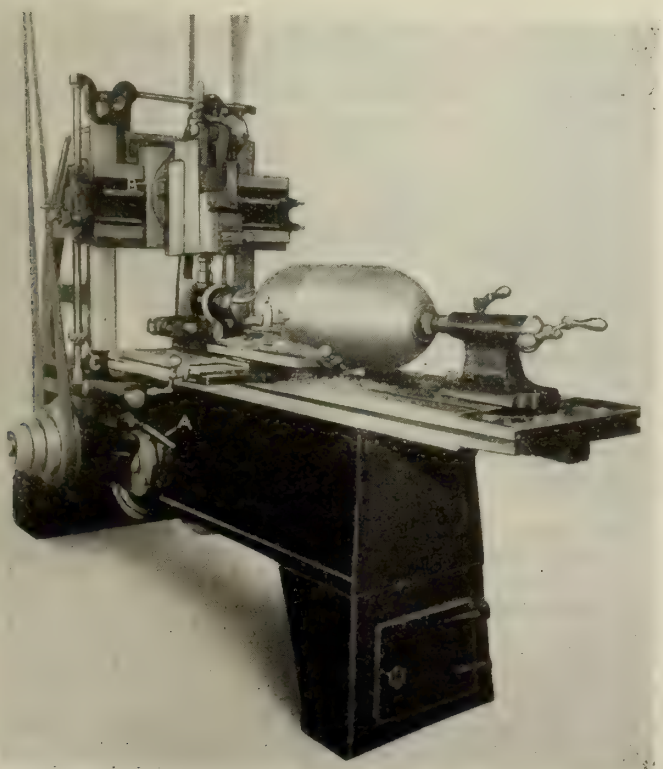
feed the table along the bed of the machine at the proper rate. This feed movement is obtained by driving the bull wheel at a low speed through a universal jointed rod, which takes power from the driving pulley at the left-hand side of the machine. On both the longitudinal feed and cross-feed movements, friction clutches are provided, and if so desired, these clutches may be released by simply turning a knurled sleeve, after which a hand-crank may be used for obtaining a rapid traverse or quick adjustment, according to the conditions of operation that are needed.

Slotting Attachment

A description has already been given of the arrangement of the slotting attachment, but attention should be drawn to the fact that the graduated swivel, on which the main head of the machine is mounted, provides for swiveling the slotting attachment so that it may be used for cutting die openings to obtain the required clearance, or for the performance of keyseating or slotting operations in tapered openings, etc.

Adaptability

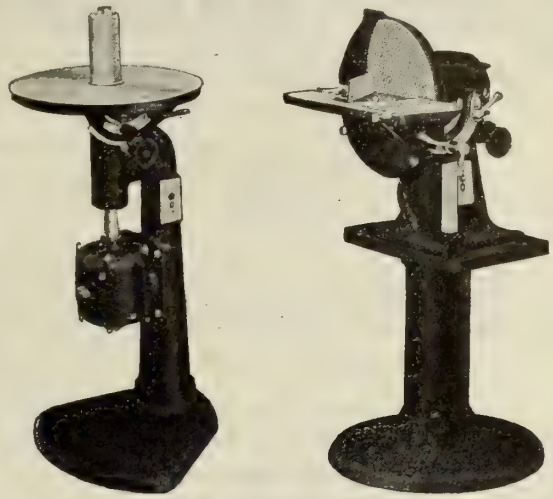
With a machine of this type, there are very few among the great variety of shops which come to a shop engaged in the performance of general machine work, which cannot be handled; and it will be of interest to note in this connection, that any of the attachments provided for use on this machine can be set up in not over fifteen minutes. One of the most important claims made for this Multiplex machine tool is that it is able to handle all of the operations which have been mentioned, without occupying any more than would be required to set up a small-sized planer. Any combination of operations can be performed on a piece of work without requiring its setting on the tables to be altered. This is often an important feature in assuring accuracy in combination boring and facing operations, etc.



TURNING BRASS STUDS ON AN 11-INCH MORTAR SHELL.

SANDERS NOW MADE IN CANADA

THE Canadian Sander Mfg. Co. have equipped a plant at Brockville, Ont., for the production of disc and spindle sanders, they having secured the Canadian rights of the Syracuse Sander Co. Plans have been made to cover the Canadian market thoroughly with these maximum time-savers. The field not only includes pattern



SPINDLE AND DISC SANDERS.

shops but woodworking concerns of all kinds and those institutions where instruction is given in pattern-making and woodworking.

The Sanders are portable, have direct motor drive and are equipped with ball bearings. They are guaranteed for one year against electrical and mechanical defects, can be plugged into any lamp socket and are very easily moved about in the shop. The disc sander has a 15″ disc, table 8″ x 20″; table is 38″ from the floor, tilts 45 degrees downward and 15 degrees upward; weight, 350 pounds; speed, 1,725 revolutions per minute. A vacuum system collects 90% of the dust. The same description applies to the spindle sander. The table is 20″ in diameter, there is absolutely no vibration, weight 200 pounds; oscillating movement 1⅛″; rolls 2″ x 9″ and 3″ x 9″. The equipment of the disc sander includes one motor, one extra metal disc, six garnet discs, half gallon cement, gauges, and six centre points. The spindle machine equipment includes a motor, two rolls and a half gallon of cement.

The plant at Brockville is located in the building formerly occupied by the McArthur Belting Co., the latter having recently moved to the Halls, Limited, building.

Motor vehicles are used extensively for war purposes, but they have not entirely displaced horses. According to a statement by the British Premier, Lloyd George, the British alone employ 2,000,000 horses in their armies. 5,000,000 horses and mules are in service on the West front. Many a ship-load of mules and horses has gone from this side across the "pond" to the allies in France and England.

During their recent raids on Paris the German aviators were greatly disconcerted by rockets which the French sent up and which discharged, before dropping, parachutes with brightly burning fuses. These parachutes dropped slowly and their fuses cast a brilliant glare upon the hostile airplanes, making them a good target for the anti-aircraft guns. It is a safe guess that the free fireworks were not enjoyed by the Germans.

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OUR readers, and particularly those personally acquainted with Col. J. B. Maclean, President of the Maclean Publishing Co., will learn with deep regret and heartfelt sympathy of the sudden death on August 17, of his son and only child Hector, aged sixteen years.

Hector was on a camping trip with Upper Canada College boys and was taken suddenly ill with acute indigestion. He was rushed in to Temiskaming, where medical attention was secured, but they were unable to save his life.

The Exchange Rate

THE why and the wherefore of the exchange rate on money passing from this country to United States, or the other way, is not clearly understood by many. As far as this country is concerned, it simply means that we have bought too much from United States, in proportion to our sales to them, and the balance is enormously against us.

But apart from that the thing is being abused, and it does not work out fairly even in this country. In the larger centres, where banks are plentiful and easy of access, the exchange rate can be secured for any American money that one may have. There are other places, though, where dealers regard American money as not one whit better than Canadian, especially when it is coming their way, although it is worthy of notice that very seldom does any of the American currency get handed out in the way of change.

United States is not in an enviable position by reason of the rate of exchange which it is able to declare against the money of the world. The Italian lire, the French franc, the British pound sterling, the Canadian dollar—they have all been discounted and set back severely in United States markets. It simply means that the purchasing power of all this currency is severely discriminated against in the U.S. markets. There is nothing new or startling in the situation, as history will show, if one cares to go back a few years to the American Civil War, that their dollar on this side of the line was regarded as being worth only sixty cents, a discount more severe than has been put on the currency of any Allied country in the markets of United States.

The rapidity with which the exchange rate changes is something that causes no small amount of worry. For instance, one day the British pound, which should be worth $4.86⅝, brings in New York $4.19¾, while on the very next day it is slated at $4.12¼.

The most natural thing in the world is that the nations whose money is at a discount should seek to avoid making any more purchases than they can help in the market where the discount exists. Nations are the same as individuals, and that is the course the individual would pursue. Were he to find that his dollar was being pruned by five cents at a certain store he would look elsewhere, and he would buy at that store only when circumstances made it necessary that he should do so. That is the very thing that is happening in United States. Their exports are falling off, and as the rate of exchange becomes more severe, or even sustained, they will continue to fall off. It certainly is not to the advantage of United States to have the purchasing medium of its customers at a discount and it is a condition that, in the long run, hurts many and benefits few.

There should be no barrier in the way of adjusting this matter. It is the veriest nonsense to tell us that a Canadian dollar, because it is spent in New York, is only worth 95 cents, and there are plenty of places where they will credit only 90 cents against it. That Canadian dollar has security behind it second to none. Likewise it is fallacy to say that a British pound is worth only some $4.12 or $4.19, as the fluctuations of the day may indicate. A British pound is worth $4.86⅝, no matter whether it is offered as payment in New York, London or Toronto. It has value behind it, and it is tough business that it should be discounted because the British nation was up to its neck in fighting the battles of the world, and had to import and import to keep going, regardless of any such puny peace-time matters as balance of trade.

The Governments of the Allied countries should get together on this matter and straighten it out. It is to the benefit of United States that it should be done, and done quickly. The exchange drives trade away. It does not attract it.

THE peace treaty having been duly signed, the anti-Bolshevik forces have proceeded to boot the Bolshevik out of Odessa.

* * *

SPEAKING of hardy perennials and annuals of all sorts, the chap who bobs up each year at the fall fair to guess your weight within three pounds easily heads the list.

* * *

THE German mark is so severely discounted now that it pays European firms handsomely to do their purchasing in Germany. In other words, they can make quite a big mark with the little German mark.

* * *

THE Prince of Wales, while in Toronto for a couple of days, shook hands with some 4,000 people, attended 'steen banquets and about 17 other functions. He had to smile under all sorts of conditions, stand when any person would want to sit, and be cheerful to prunes and good fellows alike. To say the least that's not our idea of having a real honest-to-goodness pleasant time.

* * *

CARUSO has an offer to go and sing in Mexico at $10,000 per night. Without going to the extent of disclosing names we know of several folks who will holler themselves hoarse for a whole month for that figure.

Upward Trend of Steel

ACCORDING to reports reaching here from the steel centres of United States there is a serious situation facing that industry just now. It is not that they have no business or poor bookings. The very reverse is the condition. They have a tremendous amount of business on hand. In some lines the mills have practically withdrawn from the market, as they have more on their books than they can handle.

Labor trouble has not hurt the steel industry of United States very much this year. We may have imagined that all the labor trouble there was on this continent had camped in the cities of Canada, particularly Winnipeg and Toronto, and so far this is probably fairly correct.

Labor troubles threaten to grip the steel industry now in an effort to unionize it, a feat which has heretofore been unsuccessful, although several times attempted. Such a step will touch practically the whole steel industry of United States.

Were this to happen it would mean an almost instantaneous shutting off of certain supplies as the warehouses are not heavily stocked in many places. It would also result undoubtedly in a stiffening of prices because there would be only a very limited supply of material to go around a great many pressing calls.

It is hard to see where lower levels of steel can be looked for at present. Indications are in the opposite direction. This paper is not an apostle or an advocate of higher values, but there are circumstances now that seem to point to higher steel prices before very long. Right in this province there are indications of this. One contract for bars was offered to the rollers at their old price, and it was a nice straight run in good lengths, but the mills turned it down, being booked up and not at all anxious for more business at present figures. Warehouses in several cases are in the market replenishing stocks, doing so because they have figured it out that buying now is good business, and they are out to protect themselves as well as their trade.

The Value of the Exhibition

TORONTO Exhibition has grown well and grown largely, but that building decorated with the name "Machinery Hall" has not grown along with the rest of the institution. It is now as it has been for many years.

It is not an easy matter to get a showing that will be representative of Canadian industry in the mechanical world. Much of the most interesting machinery is heavy and difficult to transport, and it is not an easy matter to get it erected and in operation to the best advantage.

There are many lines of machinery also that have nothing but a spectacular or passing interest for those who flock to the exhibition. Makers of machine tools, for instance, do not sell to the crowd. It may be very interesting and gratifying for them to have a big crowd around watching their machinery in operation, but that is not nearly as satisfactory to the business office of the firm as getting two or three real prospects in the corner and talking brass tacks to them for half an hour. There may be tens of thousands of spectators and never a single purchaser or prospect for a future sale.

The firm that benefits most is one having something of popular interest and appeal for sale. A fair of this sort is a great place to show the fine points of a washing machine, electrical goods, etc. There are thousands of interested spectators for the demonstrations that may be given, and in that number there are thousands of prospective purchasers. The same can be said of firms that have machinery on exhibition that has a special appeal to the agriculturist. The farmer is a good buyer just now. He already leads the automobile procession. He has the money and he is, through force of circumstances, and a desire to advance, going in for the purchase of farm machinery that will make him less dependent on farm help.

For these reasons and others it is a difficult matter to get together an exhibition that would be thoroughly representative of Canadian machine tool trade. Those that are exhibiting have done well, although the exhibits are not by any means limited to Canadian products. The present premises are not such as will bring out the best exhibits. They are cramped, none too well lighted, and the space available is too limited.

The Way of the World

"All our straw hats marked away down. $3 hats to go for $1 in this clearing out sale."—Advertisement.

Of all the things that make me sick, and turn me boilin' mad. and make my countenance and purse alike feel flat and sad, it is to read such things as this—I feel most awful mean to think my joyous braided hat is only worth one bean.

It's only just a month ago I tried to make a splash, and peeled three legal dollar bills from off my scanty cash.

And when I donned that three bone lid I felt just like a sport, or like a fashion plate that walks on Broadway in New York. But every gump that meets me now, and every ragged kid, will make a nasty face and snort: "Oh you one dollar lid!"

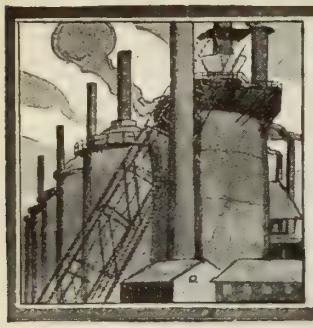
The old hat was a fearful thing, it was a sight to see—it looked as though it had been worn way back in '93. But even so it makes me sick, it gives my brow a pain to think of those two worthy beans I breezed away in vain.

But every dog has had his day, and so has every hat, the trouble comes when these here things don't know just when to scat.

You may be worth a pile to-day, with money in the bank, you may have quit the common clay and be a man of rank. But your time comes, and out you go with dull and sickening plunk, to camp with other has beens upon the pile of junk.—ARK.

—Tuthill in St. Louis "Star."

"Sit down, you're out of order."



MARKET DEVELOPMENTS

What Will Happen In The U.S. Steel Market?

Strike Shadow Causes Some Uneasiness, And Buyers Cannot Secure Definite Promises at U.S. Mills—Extensive Selling of Agricultural Machinery is Reported to Have Taken Place

NOT so very many weeks ago buyers were hesitating about going into the steel market to make purchases for future needs in large quantities. They preferred to buy for actual requirements, and to pay warehouse rather than mill prices for what they secured. Now the chances are that a large buyer would find it very difficult to get a mill to give him anything like a definite delivery promise. The uncertainty that exists regarding the labor situation in United States, especially as it centres around the steel mills, is having the effect of stimulating purchases in many lines, on the assumption that it may be hard to get supplies later on should the strike fever break out, as it threatens to do.

Canadian mills are well booked in some departments, and although no price changes have been made, there is a very plain intimation that bar mills will have new figures for the trade before very long. These mills have a lot of business now, and are not keen to book in some cases at prevailing lists.

Buying is quite general in plates, tubes, etc. In fact so urgent has been the call for plate in some cases that warehouse prices have been paid for tonnages that under ordinary circumstances would have gone to the mills. Delivery from the mills is not improving, this being especially true of the boiler tube situation where there is considerable spread now between the time of order and that of delivery.

The automobile business is still a good purchaser of machine tools, and other interests that have contracts from these firms are also buying. Dealers handling agricultural machinery report heavy sales. In fact one large distributing firm reported this week that they had sold their allotment of tractors already, including those that had been counted on to keep their sales force busy right up to the end of the year.

Scrap metal shippers are not selling very heavily, unless under contract, there being a feeling that it is good policy to wait until the New York and Chicago markets settle down. There seems to be a feeling that manipulation is going on in some centres, and holders of good qualities are simply letting matters stand. Prices remain stationary.

MONTREAL FEELS EFFECTS OF THE LABOR AGITATION IN THE STATES

Special to CANADIAN MACHINERY.

MONTREAL, Que., August 26.—While industry in this district is comparatively free from labor troubles, the situation, nevertheless, is more or less dominated by the developments in the States, as the market here is virtually a reflection of American conditions; this is characteristic of the steel trade, and until the general unrest has been removed the market here will naturally be influenced in no small degree by American conditions. Nothing is definitely known as to the possible attitude of the producers should labor force their hand, but, in the opinion of some dealers here, it would not be surprising if some of the mills were closed indefinitely. The policy of the mills in declining extensive orders for future delivery is a feature that emphasizes the serious possibilities that may arise within the next month or so. Steel trading in this district is not what might be called active nor can it be said that business is dull, as there is a steady though light demand for many classes of material. Some good trading has been done in light structurals. There is hardly any exception to the general rule of conservative buying as consumers are reluctant to purchase far beyond their immediate requirements. This attitude will probably continue throughout the year, and until such time as the prevailing unrest affects the market and general reconstruction. Non-ferrous metals are firm locally but show strength in the States. Machine tool business is light but steady. Iron and steel scraps are weak while old metals are taking on strength.

Metals Firm on Steady Demand

Little change is reported in the local situation and the demand continues steady but of comparatively light volume. There is an upward movement of metals in the States, but the strength has not, as yet, influenced the market here although there is a prospect of advances before the beginning of the month. Brass interests are steady buyers but just in sufficient quantities to satisfy present needs. Tin is moving freely at 60 cents per pound. Lead is in better demand and local prices have advanced ¼ of a cent, the quotation being 7½ cents per pound. Local dealers are quoting antimony at 10 cents, a decline of ¼ cent. on the week.

Higher Cost on Delayed Delivery

Little disposition is shown on the part of users of machine tools to buy in other than single or small quantities, but the volume of business done in this way is considerable and of a fairly steady character. No class of equipment is favored and apparently the business is widely distributed. A factor that adds to the difficulties of the dealer is the fact that price quotations are far from stationary, and where delays arise after a quotation has been made there is a likelihood that an advance may be made before the actual order will be placed. Another factor is the exchange rate when tools are brought in from the States. On extended delivery there is a great possibility that the ultimate cost of a machine will exceed the estimate made at the time the order was placed.

As stated by a dealer here, the duty charged is based on the price of the machine at the time of shipment, so that when an advance is made by the manufacturer, the added duty must be shouldered by the dealer, or some arrangement made between the dealer and the customer. There appears to be a tendency on the part of the Canadian manufacturer to follow in the wake of the American manufacturer and mark up his quotations so that they are slightly lower than what a customer could obtain a similar machine—for from the other side, and the result in many cases is that the American manufacturer gets the business. In spite of the steadily-increasing costs, however, the present inquiry is good and no falling off in general business is reported; in some instances the month's turnover has shown a slight increase.

Non-Ferrous Scraps Firmer

The disturbances that are prevalent throughout the steel producing industries in the States have had the effect of considerably curtailing the trading in old materials, especially iron and steel scraps, and in consequence the market here has felt the reaction that has taken place across the line. The interest of large consumers has fallen off considerably and dealers are awaiting further developments in the steel industry. The result of these conditions is shown in the quiet tone of the current market. Sales are very light but dealers are holding to last week's quotations, although the weaker tendency may influence prices before the week closes. The old non-ferrous metal situation is brighter and the increased strength of the metal market is reflected in advances in some of the scraps. Old coppers have been advanced 1 cent per pound, and in general the prices on all other metals are firm.

POINTS IN WEEK'S MARKETING NOTES

Labor troubles threaten to break out in the effort to unionize the steel industry in the United States.

—

Warehouses in many cases are buying now, looking for firmer prices in the near future in several lines.

—

Large sales are being made, especially in plate, some shipments being large enough to rank as fair-sized mill orders.

—

The report, published in these columns several weeks ago, of a ten per cent. reduction in the price of high speed and carbon drills, was not correct. The information was given to CANADIAN MACHINERY in good faith and published in the same way.

—

Large dealers in scrap material are not shipping, except on contract, until affairs in the U.S.A. markets become more settled. Prices, though, are firm.

—

The low value of the German mark at present makes it profitable to do business with that country, and U.S. machine tool builders believe it is keeping them from securing many European orders.

—

At present it costs a French firm $1.60 to buy a dollars' worth in New York.

GOOD BUSINESS IS COMING IN NOW

Dealers in Many Lines are Outspoken Regarding What They Are Securing Now

TORONTO.—There can be no doubt about the good business that is being done in every line, from machine tools' salesmen right through the lists to the warehousing interests. Buying is not restricted to any particular line, and in this, one finds good news. Purchasing is becoming quite general. Dealers also add that there is less of a tendency now to look out for used equipment, as in many cases the specifications now are for new goods entirely.

As far as the buying of machinery is concerned, the automobile business is furnishing the bulk of the business, and this is likely to develop in more ways than one. For instance, the building of a large plant for the General Motors at Walkerville is opening up several accounts for material that have been closed for some time.

"CANADIAN MACHINERY" several weeks ago published an item stating that there had been a ten per cent. reduction in the price of high speed and carbon drills, on the part of the makers. We have since been informed that this information is not correct, although it was given to this paper in good faith in the first place, and accepted as such.

Big Orders Placed

"The best two weeks of the year" was the way one of the largest warehousing interests sized up the business of the past fortnight, when discussing the market situation with CANADIAN MACHINERY this morning. This firm has a pretty warehouse in some lines as the result of heavy buying that has been going on. The demand for some of the lines has been urgent, plate being one of them. To show the business that is being done it might be mentioned that one firm took a shipment of forty tons from a warehouse stock, not being able to wait for mill shipment. Of course, the warehouse price is a stiffer one than mill shipment, but in this case it was delivery that was wanted and paid for.

Warehouses are buying quite heavily in some cases although in others they have not cleared out the large war stock that was being carried. One of the dealers stated this morning: "We are buying heavily now, because we confidently expect that prices are going up to a higher level than they are at present. There are labor troubles of several kinds on the horizon in the steel mills district, and these, along with other tendencies, are going to keep prices up. We regard it as a good policy on our part to buy enough now to put us in good shape for some weeks and months to come.

The Trend of Prices

If one doubts the fact that prices are headed upward, it is not hard to produce evidence. For instance, there was one order out this week for a large amount of bars for bridge work, the whole lot amounting to some 186 tons. The order was offered to one of the mills that usually has a pretty fair bar capacity, and it was thought that it was a very acceptable piece of business, as there was a section of 125 tons of ¾ roun in long strips, which would make a nice long run. However, the mills turned the business down flat at the market price, stating that they did not care whether they booked any more bars for six weeks, and that the price on this line was going to go higher. That seems to be the feeling in several centres, but so far there have been no definite increases announced to the jobbers. Prices from the warehouses are, therefore, just where they have been quoted for some time back.

Plate and tubes generally go pretty much hand in hand, and they are both moving out rapidly at present. Some of the larger boiler shops are very busy indeed, and are filled with work that will run on for some months to come. There is a nice large job, likely let by now, by some of the large Northern Ontario firms, that will call for a large amount of steel construction work. Tubes are not easy to get, dealers being advised by the mills that there is a shortage of skelp. Whatever the reason, it is a fact that deliveries are poor, and shipments are made on two months instead of two weeks in many cases.

The British Goods

Reference has been made in these columns before of the efforts that are being made to get British goods on the market again, and of the small success that is being met with. There is another case just now, and it will be rather interesting to watch developments and see what comes of it. One of the Ontario shipbuilding firms has a contract now, on which it is desired, for several reasons, to use British material as much as possible. The firm sent to several dealers in Toronto asking for quotations in British goods, especially chains and anchor. Reply was made that it was almost impossible to get a straight bid from British firms now, as their figures were filled with so many clauses regarding labor troubles and strikes, shipment, etc., that they could hardly be considered as a real bid. So the firm forwarded

a definite quotation from a U.S. concern and let it go at that. The shipbuilding people came back immediately asking for a quotation on the British goods, stating that they would be prepared to wait for six months for delivery. So there is a demand for the British made goods, if they can be supplied. The trouble is in many cases that they are not to be had.

The Machinery Market

There is a lot of business moving in the machine tool market. The same can be said of the motor market. Wood working machinery is also very brisk. The automobile business is doing a lot of buying now, and the firms that have contracts from that line are also in the market. Dealers handling agricultural machinery are doing in some cases a land office sort of business. One of the largest distributors stated to CANADIAN MACHINERY this morning that they had cleared out entirely their line of tractors already, including all that they had reckoned would be sold between now and the end of the year. They are having some more rushed along in order to make a showing at the Toronto fair this week. They had thought previously that they were booking plenty to hold their sales force for the entire year, but they are away out on their count.

There are some nice queries coming into the market now, especially for tool room stuff, and in nearly every case there are new machines being placed. Dealers find trouble increasing in securing anything like good deliveries, as the firms making machines that are much wanted are sold right up, and shipments come direct from factory.

The Scrap Metal Market

There is a feeling of doubt in the minds of some of the large dealers in scrap metals as to what the next move is going to be. There seems to be an impression that there is some manipulation going on in the larger consuming and buying centres, and until this is dispelled it is likely that there will be a tendency on the part of some of the larger dealers in Canada to sit tight. It may be that there will be a slight dip in values, but it is hard to see where it can last for any length of time. It is claimed by several that tho coppers and steel have reached their peak for some time at least, and that they are not due for much higher figures. However, there is no feeling that they will travel far in the opposite direction. Some of the smaller sellers feel that right now is a good time to sell their material, and they are still letting it go, particularly as the buyers here and in Montreal are standing behind the prices that have been ruling for some weeks past, and it hardly seems likely, unless something unforeseen happens, that there will be any reduction in buying values.

NEW YORK MARKET FINDS THAT EXCHANGE RATE IS HURTING TRADE

Special to CANADIAN MACHINERY.

NEW YORK, August 28.—There are indications that a considerable business in machine tools could be done with some of the European countries if it were not for the unfavorable rate of exchange. Moreover, this situation is playing right into Germany's hands, as the low value of the mark makes it extremely profitable for European countries to do business with Germany. Even France and Belgium may be forced, in self-protection, to buy German rather than American machine tools. To buy one dollar's worth in the United States requires the equivalent of $1.60 in French francs, and France certainly cannot pay such a premium for the privilege of buying here, except such things as she cannot procure elsewhere.

An inquiry for more than 400 machine tools for a complete automobile plant to be built in Sweden is being figured on by American tool builders, but here also the exchange rate operates against the orders coming to the United States. It is understood that the company prefers American tools, but may be forced to buy British or German make.

The Finnish state railways want about $50,000 worth of tools from the United States, but there is no international exchange between the two countries, so the business probably will go to England, which is buying Finland's dairy products.

The matter of credits is also an obstacle in the placing of foreign machine-tool orders here. Poland, for example, recently bought 150 locomotives from the Baldwin locomotive works and now wants 200 machine tools for a locomotive repair shop. In the case of the locomotives, the Baldwin Company arranged its own financing, and it seems probable that it will also equip a repair shop for Poland's railways, inasmuch as private banking interests are loath to grant the desired credits.

Japan in Favor

Japan is about the only important foreign buyer of American tools that can buy here on favorable terms. Considerable business has been closed with that country, and inquiries now in the market for equipping shipyards and other plants aggregate several hundred thousand dollars.

Expansion of the automobile industry continues, and two eastern "war plants" have passed into the hands of leading automobile concerns. The plant of the International Arms and Fuse Co., Bloomfield, N.J., has been sold to the General Motors Corporation, and the plant of the Duesenberg Motors Corporation, Elizabeth, N.J., has been acquired by the new Willys Corporation, which will use it for the manufacture of six cylinder motors for the new Willys car. The International plant was used during the war for the making of shells, fuses, etc. Practically all of its machine-tool equipment has recently been sold.

Domestic buying is fairly quiet, but this is not surprising as August usually is a dull month.

The Baldwin Locomotive Works, Philadelphia, has placed an order with the Niles-Bement-Pond Co. for 16 overhead cranes, eight of 20-ton and eight of 10-ton capacity. A small list of tools also was bought, all of this equipment being for a new cylinder shop at Eddystone, Pa.

MORE STACKS BLOWN IN

There is still a very good demand for pig iron although the sales are smaller than last week's. Prices remain firm with a tendency to increase, and more stacks are being blown in. Reports from United States points follow:

Philadelphia.—Quite a bit of 1920 first quarter business has been booked, although prices for this delivery are quoted $2 to $3 above present prices. Some foundry iron of the 2X grade has been sold at $28.50, but many makers look on $29 as the minimum for this grade. Basic is not active, but there is good enquiry for foundry iron for last and first-quarter delivery.

Boston.—Furnaces here are receiving small orders for last-quarter delivery, but no one seems to be anxious for first-quarter orders. The aggregate of the sales for last week was only 4,500 tons, which is one of the lowest, if not the lowest for the last two months.

New York.—Some foundry iron for the first half has been sold here at a price about $2 better than iron for this year's delivery can bring. The total of sales amounted to about 10,000 tons, and the market is strong. There is some good enquiry for export business, including 4,000 to 5,000 tons basic for England and Italy.

Pittsburgh.—The market in this district is pretty well sold up, and with the decreasing demand there is less talk of higher prices. Two stacks have been blown in, and two more are expected to be lighted during the next two weeks. There is an enquiry for from 5,000 to 10,000 tons basic not yet covered, but otherwise steel foundries are pretty well stocked up.

Buffalo.—With two makers out of the market, business has been pretty good during the week. One maker booked an order for 10,000 tons foundry iron, which about filed their capacity for the balance of the year. High silicon and high phosphorus grades are in good demand, as are manganese and manganesite. Enquiries for about 7,500 tons are reported.

Cleveland.—Makers are hanging back from 1920 orders, as they feel that it is too soon to form an opinion of the probable costs. There is a large volume of enquiries, and business which fell off

a little at the end of last week revived at the beginning of this week. Prices are firm.

Cincinnati.—Owing to the closing down of silvery stacks due to labor troubles, high silicon iron is hard to procure. Foundry iron is getting scarce and is quoted at $27.50, Birmingham, for 1.75 to 2.25 silicon. Consumers are buying third-quarter delivery iron to use in first quarter, as first quarter delivery iron cannot be obtained.

Chicago.—With most producers sold up to capacity there is every possibility of higher prices. Further production will be made as two stacks will be blown in very shortly. Southern iron is being beaten in the market here by iron from the Algoma Steel Co.'s plant at the Soo. Malleable is the most active, with silveries scarce.

NOW SEES A SERIOUS SITUATION AHEAD OF THE STEEL MARKET IN U.S.

Special to CANADIAN MACHINERY.

PITTSBURGH, PA., AUG. 28.—The iron and steel market has been dominated more or less in the past week by the labor situation and prospects, if the present uncertainty may properly be referred to as constituting "prospects." The steel mills have been almost entirely out of the market as sellers, except for the booking of such orders as regular customers insisted that they take, while they have been entirely out of the market as buyers, showing no interest whatever in such commodities as scrap, ferromanganese, ferrosilicon, etc.

While the market has been chiefly under the influence of the labor situation, it can hardly be said that the trade at large fully appreciates the seriousness of the situation. The large mills probably do, but even that is not certain. Some of the small mills apparently do not. Buyers have been showing apprehension that at some time in the not distant future there may be a restriction of output through labor difficulties, but few buyers seem to have realized that matters were likely to come to a head by September 1st. That, however, represents an opinion based upon the best collection of information obtainable.

Mills are fairly well sold up and buyers are of course, correspondingly well covered, i.e., the buyers who are jobbers or manufacturing consumers, while buyers who have construction work in view are in some cases covered and in some cases not. There is considerable tonnage involved in construction projects approved, but against which purchases have not been made, and most of this business is held up. For instance, there is a large building which it is desired to erect at once, and which will require 8,000 tons of concrete reinforcing bars. The buyer has been importuning one large mill after another to take the order, without success. A small mill could not handle the tonnage.

In present circumstances there is no issue in the market as to prices. Prices are now more thoroughly "stabilized" than even the Industrial Board of last March and April ever hoped to stabilize them, for no one would, of course, think of cutting prices at this juncture, while talk of advancing prices is altogether taboo. Labor is very restive and to advance any price would simply be to furnish ammunition to labor agitators. That is a fact that the United States Steel Corporation recognized three months ago, and made no secret of, but some of the independents have only lately grasped the point.

Labor Situation

There are really two labor situations. On the one hand the American Federation of Labor has been endeavoring to organize the entire iron and steel industry with the object of securing certain demands or calling a general strike. On the other hand several strikes have actually occurred, at widely separated points. In the past ten days, for instance, there have been three strikes in the sheet industry alone, at Wheeling, W. Va. Canton, O., and Newport, Ky. These and other strikes can hardly be regarded as directly a part of the American Federation of Labor program, for that contemplates a general strike and can hardly be aided by the men going off at half cock at this point and that. A definite indication that the detached strikes have no connection with the general program is that the strike at the steel and wire plant at Peoria, Ill., was settled a few days ago, and on the basis of the men being given a wage advance of 5 per cent. when their demand had been 12 per cent. advance. The Federation demands are much broader, and look more to working conditions than to mere wage rates. There is quite a collection of things they want, embodied in the list of 12 points formulated and made public July 20, including such items as the check-off, abolition of physical examinations, abolition of company unions, the eight-hour day, seniority to apply in employment and dismissals, etc.

The effort to organize the iron and steel trade was inaugurated at the St. Paul annual convention of the American Federation of Labor last year. At the Atlantic City convention last June a report was made, showing the progress had not been up to expectations, and giving the principal cause of the slowness of the work the fact that many municipalities, particularly mill towns in the Pittsburgh district, would not grant permits for holding labor meetings. Organizing efforts were increased, however. Sunday, July 20, a meeting was held in Pittsburgh of representatives of 24 labor organizations, the meeting enunciating a set of 12 demands and ordering that a strike vote be taken, to be completed in 30 days, the vote to be on the proposition, whether the men would back up the "National Committee for Organizing Iron and Steel Workers" should it consider it desirable to call a strike. Another union, that of hod carriers, was afterwards added, making 25. A point in this, as in all American Federation of Labor activities, is that each man must belong to the union particularly adapted. Among the 25 unions are those of blacksmiths, brick and clay workers, bricklayers, machinists, stationary firemen, etc., etc. The rank and file of the workers at blast furnaces and steel mills would belong either to the International Union of Mine, Mill and Smelter Workers or to the Amalgamated Association of Iron, Steel and Tin Workers.

The strike vote was announced at Youngstown on the evening of August 20, but was merely to the effect that 98 per cent. of the votes were affirmative. There is no line on the total number of voters. A statement merely of the number of voters, however, would not be particularly illuminating, and certainly would not be conclusive, for if the voters comprised only 10 per cent., or 20 per cent., of the total number of employees the question would be whether they are men engaged in such work that their withdrawal would cripple operations. For illustration, one of the 25 unions is the "Switchmen's Union of North America." If these men quit others might or might not take their places, but if no switches were turned it would be minutes in some plants and only hours in other plants before operations would have to cease.

On the date the vote was announced the committee decided to allow a period of ten days for the arranging of a conference with the employers, and the intimation has been that if within that period, which ends Saturday, August 30, the manufacturers do not agree to a conference a strike will at once be called. It is altogether improbable that the manufacturers will refuse to enter a conference and do nothing else. It is likely they will close their plants suddenly if they foresee a strike coming, although they may agree to confer. There being no organization of iron and steel manufacturers which the organizing committee can approach, its course was to address a lettter to Judge Gary, as the head of the dominant interest, and they followed this by going to New York in a body at the end of last week. Mr. Compers was expected to arrive in the United States from his trip abroad August 27, or before the time limit expired and in time for a conference.

A. T. Weldon, formerly assistant traffic manager of the C. P. R. at Moncton, N. B., has been appointed to a similar position with the Company, with headquarters at Montreal, succeeding Guy Tombs, who has resigned. M. F. Tompkins will succeed to the position vacated by Mr. Weldon.

Peace Time Exhibits In Machinery Hall C. N. E.

Manufacturers and Agents Have Representative Display of Machine Tools and Industrial Equipment at Canadian National Exhibition.

PEACE time activities are reflected in the various exhibits in Machinery Hall this year. The entire absence of shell machinery and munition-making apparatus is quite noticeable, albeit expected to those accustomed to the exhibits of former years. Space is again at a premium, and as usual comment unfavorable and forcible is apparent at the inadequate provision made for the machinery industry.

Exhibits

The Deloro Smelting and Refining Co. have an exhibit of their well-known Stellite alloy for cutting tools, comprising milling cutters, arc welded tools, etc. In addition to this they have an exhibit of the other products made at their refinery including cobalt and nickel metals and oxides, metallic powdered aluminum, refined arsenic, etc. Representatives, Thos. Southworth and B. Horwood.

Geo. W. Cole, Ltd. are exhibiting the Cole steam trap in its various designs. Cross-section models of the working parts of these traps are shown, and a typical double trap boiler feeding installation, together with other features, render this exhibit interesting to the power plant engineer. Representative, Wm. H. Rose.

Baines and Peckover are displaying concrete reinforcement materials in various forms, and Teralun anti-slip treads, plate and coal hole covers, Steelcrete expanded metal machine guards, etc. are also featured, together with an excellent display of Triumph superb high-speed steel, cold drawn and nickel steel bars.

The Dodge Co. are featuring steel pulleys, wood split pulleys, transmission chains, split clutches, hangers and bearings, conveyor material, gears, couplings, etc. Representatives, W. Burrows, S. M. Bowen, J. R. Gray.

The Cleveland Pneumatic Tool Co. of Canada, Ltd., are showing a complete line of pneumatic tools and appliances such as are used extensively in the shipyards of Canada and the United States. A line of compressed air drills, accessories and hose is also shown. Representatives, C. D. Garner, manager Canadian division, and D. C. Lacy.

The Garlock and Walker Machinery Co. have a very representative display of the various lines handled by their firm. These comprise a Gooley-Edlund Co. miller; a Steptoe 20-in. shaper; a Bath No. 2 universal grinder; a Fitchburg 8 by 36 in. cylindrical grinder, and Ryerson-Conradson single pulley milling machines. Their pneumatic and electric tools are also shown. The Cataract line of lathes is also shown in a very complete manner. Representatives, Mr. Garlock, Mr. Walker and Mr. Brown.

Jones and Moore have a representative display of their various motors and generators and of the American shoe machine for which they are the agents. This firm handles a large stock of Century motors for all conditions of service.

The Canada Machinery Corporation have a fine exhibit of iron and wood-working tools. This exhibit includes a straight-edging and jointing machine for furniture and piano factories, a hollow chisel mortiser, a heavy pony planer, and a universal rip and cross-cut saw. The iron working tools comprise a 20-in. back-geared power feed drill press, a 14-in. double back-geared quick-change engine lathe, a 20 by 22 in. back-geared crank shaper. The 14-in. quick-change tool room lathe is one of the newer products of this firm, and is notable for the ease with which all changes in feeds and speeds can be carried out. Representatives, D. King, M. M. Preston, J. C. Carley, P. B. Burton, H. O'Donnell.

The Canadian Ice Machine Co. have an excellent exhibit of refrigerating supplies and materials; fittings, ammonia, calcium, chloride, and other supplies being featured. This firm are the manufacturers of the York refrigerating systems and compressors, installations being made from ¼ ton up in the direct expansion, absorption or CO_2 systems, the latter being popular and of considerable adaptability for hospital and marine work.

The Cling Surface Co. are exhibiting for the eleventh consecutive year. The preservation and waterproofing of belts and the lowering of the friction load consequent upon the permissible slackness of the belts are shown to advantage by means of a one h.p. motor driving a three-plunger oil pump through a number of belts treated with cling-surface. Representative, G. W. Faatz.

The A. R. Williams Co. have an excellent display of iron and wood-working tools. A variety of drill presses is shown, including a 22-in. Barnes back-geared power-feed drill with automatic stop and sliding head. A heavy duty universal milling machine of Le Blond make is on display together with a universal cutter and reamer grinder by the same firm. A Gould and Eberhardt 24-in. crank shaper is shown, and a No. 4 Warner and Swazey universal turret screw machine is also displayed. A Le Blond 18 by 8 engine lathe, fitted with quick-change gears also forms part of the iron working tools. Marine internal combustion engines are shown together with others adapted to stationary use. Woodworking machinery is well represented by means of a 24-in. planer built by the MacKenzie Machinery Co., Preston; a 36-in. bandsaw, built by the Preston Woodworking Machinery Co.; a MacKenzie planer and matcher, and a MacKenzie saw table. The supply department is also well represented, featuring with Starrett tools and Brown & Sharpe cutters, reamers, etc., together with plumbers' and steam fitters' brass goods. As in former years, this excellent exhibit is under the charge of Mr. Cronk, and the arrangement is due to him.

The Chapman Double Ball Bearing Co. have, as usual, a most attractive exhibit of the various lines manufactured by them in the centre row at Machinery Hall.

In addition to the ball-bearing shaft hangers used in the line shafting, the exhibit includes bearings for all sizes of shafting up to six inches; also annular and thrust bearings for machinery, automobiles and trucks. Representative, Mr. Hocken.

D. K. McLaren Ltd., represented by Mr. W. S. Hamilton, sales manager, are exhibiting their line of single and double leather beltings, together with their waterproof varieties. In connection with these latter an interesting demonstration is given. Two belts are arranged to pass through pans of water while turning over pulleys. Other lines shown are the D. K. wood split pulleys, the Philips pressed steel split pulley and mill supplies for the carding, weaving and spinning trades.

The Goodyear Tire and Rubber Co. are showing a complete line of mechanical rubber goods such as thei fire hose, extra service pneumatic hose, and Goodyear cord hose, extra power belting, packings, perforated mats, etc. Representatives, W. H. O. Crosby, F. Woods, F. Fox, and E. Dodge.

The Dominion Belting Co., Ltd., are exhibiting Maple Leaf brand stitched cotton duck waterproof belting for transmission of power and conveying. This is shown in various sizes, and excellent literature is distributed, showing its capabilities and endurance. Maple Leaf belt dressing is also on exhibit. Representative, John Scott.

Cowan and Co., Galt, are showing some of their woodworking machinery. Among the machines on exhibit are a chain saw mortiser, a hollow chisel mortiser, a power feed rip saw, and a universal woodworker. This latter machine combines the functions of rip and cross-cut saws, buzz planer, borer and hollow chisel mortiser into one machine. A power jig saw is also shown, and a new machine recently patented is shown in their patent hoop bender. This ma-

Continued on Page 243

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	.....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$27 00	$27 00
Electro copper	26 00	27 00
Castings, copper	26 00	25 00
Tin	60 00	58 00
Spelter	10 00	10 00
Lead	7 50	7 00
Antimony	10 00	10 50
Aluminum	36 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$16 00	$13 75
Copper, crucible	19 00	18 00
Copper, heavy	19 00	13 00
Copper wire	19 00	18 00
No. 1 machine composition	17 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	15 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	8 00	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe, wrought	8 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	14 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 50
Premier, 10¾ oz.	....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08½**
Grits, 80 and finer	**.06**

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	**0 34**
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium, carbonate	..
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2.25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated

chine will bend barrel hoops without steaming and by an entirely new process. Representative, Mr. Cowan.

The Hoyt Metal Co. are featuring their lead-lined and resisting products such as valves, centrifugal pumps. Together with this line they are displaying their various other lines of metal goods such as solder, babbitt type metal, etc. Representatives, G. F. Allen, manager; S. Wheatley and W. G. Downes.

The Perfect Machine Co., Galt, are exhibiting a 12 by 6 in. lathe, a line of grinders with attached guards and a new line of buffing machines. Drilling machines and power hack saws are also shown. Representative, S. L. Clark.

The Lyman Tube and Supply Co. are featuring Shelby seamless steel tubing, together with the Chisholm and Moor anti-friction hoists. These latter are capable of 80 per cent. efficiency and are made in sizes up to 40 tons. Hyatt, Timkin and New Departure ball bearings are shown, together with electric railway supplies, made by the Electric Service Supplies Co. Chain belt and Rex products are also shown. Representatives, H. A. Jones, J. E. Openshaw, R. B. Bennett and Wm. Gardiner.

The Canadian Kron Scale Co. are showing a line of industrial scales. Representative, Mr. Smith.

The Wayne Forge and Machine Co. are showing their line of industrial brick and furnaces.

The Davis-Bournonville Co., of Toronto, have a fine exhibit of portable cutting and welding plants, acetylene generators and flare lights. An emergency cutting outfit for the use of fire departments is a feature that will attract notice. The No. 2 Oxygraph is an instrument to facilitate the cutting of any intricate shape in metal from one-quarter of an inch to 21 inches thick. The Radiagraph is another instrument on somewhat similar lines but used for cutting circles and straight lines. This can be bevelled to any angle, and the machines are portable. The firm is represented by J. F. Crowley.

Prest-o-lite have welding and cutting apparatus, supplies for same, contractors' flare lamps, dissolved acetylene and laboratory equipment on exhibition. They have also brazing and soldering apparatus, acetylene headlights for auto trucks, launches and locomotives. The representatives at the booth are F. T. Northwood, A. V. Tuthill, and A. W. Gimble.

The Climax Baler Co., of Hamilton, are showing a number of hand power balers for waste paper and other material which needs to be made up in small bales.

The John Hall & Sons, Ltd., Brantford, represented by Mr. Thompson, are showing several examples of their pipe threading machines. The large machine which can handle pipe from 2½ inches to 8 inches diameter is a fine looking piece of work, while the smaller sizes are also worthy of examination.

The Globe Engineering Co., of Hamilton, have quite a good variety of articles on view. Their lines include an electric welder, tool and cutter grinder, machine vices, lifting jack, and the Crowe roller bearing for automobiles. One of the most interesting exhibits is the loose chuck and special cutters for drilling square, triangular, hexagon or other angle holes. Several specimens of this class of work are on view. Mr. F. W. Robson is representing the firm at the Exhibition.

The Boiler Repair and Grate Bar Co., of Detroit and Toronto, have an exhibit of their shaking and dumping grate bars. These bars have been fitted in several

Continued from Page 240

local schools and public buildings. Mr. A. H. Hett and Mr. O. C. Hett are in charge of the exhibit.

The Canadian Hauck Burner Co., Ltd., are showing a number of their coal oil burners, which are in general use in foundry and shipyard work. Mr. Housel is in charge of the booth.

The Elliot Woodworker are exhibiting woodworking machinery, both electrically and gasoline-driven machines. A notable feature of these machines is the type of belt used, which consists of links of raw hide, with a steel core. This belt is claimed to be absolutely nonslipping. Mr. Elliot and Mr. Bradley are demonstrating these machines.

The British Aluminium Co., Ltd., have a number of different articles made from this light and strong material. These include cooking utensils, tubes, wires, cables, etc. There are also a number of pigs of the metal in the booth.

The Lightning Evaporator Co. of Dunham, Quebec, have one of their maple syrup evaporators set up all ready for use. The furnace is designed to burn either wood or coal, and the evaporator consists of a number of shallow vessels into which the maple syrup is poured. Mr. Len Emonds, of Smith's Falls, the Ontario agent for the company, is in charge of the booth.

The Clemens Electrical Corporation of Canada, with headquarters in Hamilton, are showing their electrical soldering irons, and as these irons work at a voltage of 8 volts, the necessary transformers are also included in the exhibit. An interesting feature of the booth is the J. C. refillable fuse, a very neat and economical type of this largely used article. The booth is in charge of Mr. R. C. Guest.

L'Air Liquide Society have a very ef-

A CROWD AT THE EXHIBITION GROUNDS

fective display of oxy-acetylene welding appartus, consisting of gas cylinders, torches of various kinds, and complete outfits made up ready for use. For those visitors who are not familiar with the class of work that can be done with these outfits, a lantern has been installed in the booth, which throws on a screen interesting illustrations of welding jobs. Mr. Turnbull and Mr. Godfrey are the representatives of the firm at the exhibition.

The Pratt & Whitney Company, Dundas, are showing a line of their tools, including cutters, drills, taps, effectively displayed in attractive show cases. Mr. Maver is in charge of the booth.

The Canadian General Electric Company have an electric welding exhibit on view, which they are demonstrating to anyone interested. The machines are the direct current type operating at 60 volts.

The Consumers Gas Company of Toronto have a number of gas furnaces of different styles on exhibition. These are for industrial purposes such as tempering tools, annealing etc. There are also various styles of gas torches and a brazing table autfit. These should be of interest to users of gas appliances.

The Dunlop Rubber Company, represented by J. R. Thompson, have a very effective display, consisting of a belt conveyor, elevator, and drive belt all in operation. The background of the booth represents a quarry in operation, showing the different uses to which rubber belting can be put in conveyor operations. They have also different types of rubber hose, and a full line of rubber goods.

The Allen GGeneral Supply Company, represented by Mr. Wilkes, are showing a number of power plant accessories designed to effect economy in fuel consumption. The well-known Venturi Feed Water Meter is the principal of these appliances, backed up by the Copes Boiler Feed Water Regulator, the Dwight CO_2 Indicator, and the Howell electric motor. In these days of high fuel costs, this exhibit should receive considerable attention.

The W. R. Sexton Boiler Setting Co. are displaying a full line of fire bricks, nonpareil grate bars and boiler settings. They have also a line of engine and pump packings, representing the William C. Wilson Co. in these lines. Mr. Sexton has charge of this exhibit.

The Thomas Davidson Manufacturing Company, of Montreal, have an exhibit of steel castings, made in their electric furnaces at Turcot. Prominent among these is a line of anvils, which attract considerable attention from visitors. A cast steel shaft in the rough state is also on view, with other products of the same material. The firm is represented by Mr. Flack the Toronto manager, and Mr. Wasson.

TWO BOOKS ON MACHINE AND FITTING SHOP PRACTICE

By GEORGE W. BURLEY, Wh. Ex. A.M.I. Mech. E.

These two books are published by Scott, Greenwood and Son, 8 Broadway, Ludgate, London, E.C.4., and comprise the following subjects, which are gone into in considerable detail.

Volume 1 takes up materials of construction, shop measurements, measuring instruments, gauging and gauges, setting out with tools and operations; the vice, the hammer and chisel, and the art of chopping; files, their forms and uses; and scrapers and scraping.

Volume 2 covers planing, shaping and slotting; drilling, boring and reaming; milling, and gear wheel cutting; lathe work, grinding and lapping; screw thread cutting, and interchangeable system of manufacture.

212 pages, and 194 illustrations, with 4 tables, comprise volume one, while 242 pages, with 238 illustrations and 9 tables forms volume No. 2.

These books have been written especially for engineering works' apprentices and college and technical school students for use in connection with their practical work.

Great attention has been placed on the actual working processes, operations, etc., rather than the machines themselves. This fact will be appreciated by student readers.

These books are both listed at the very reasonable price of six shillings net, and can be had direct from the publishers.

The American Malleable & Castings Association, Cleveland, have issued a book on Malleable Iron, which takes up the mechanical and physical properties of this material in an admirable manner. The composition of malleable cast iron is dealt with and the remainder of the book is devoted to the various physical and electrical properties which make malleable iron a useful material in the arts.

Messrs. Longmans, Green & Co., of New York and London, have just published a book by J. Mitchell, A.M.I.N.A., and edited by Edward L. Atwood, O.B.E., M.I.N.A., on Naval Architects' Data. The first pages of the book are devoted to formulae, tables, etc., which are in daily use by the naval architect. The following pages of the book are devoted to data sheets, in which all the particulars appertaining to calculations for a ship or a number of sister ships are collected together, with blank spaces opposite each one for the insertion of the figures. These are divided into sections, the first one being devoted to length, breadth, depth, speed, etc. Then comes numerals, midship sections, lines, estimating summary weights, rudder, bunkers, drafts, tonnage, freeboard, capacities of holds, shipbuilders' auxiliaries, engines, boilers, electrical installations, boats, etc. The book is printed on good paper and bound in cloth. It should, if filled up conscientiously, form a very valuable reference book for the naval architect and shipbuilder, in a compact and permanent form. The price is $3 net.

R. F. Baldwin, treasurer of the Oliver Machinery Co., Grand Rapids, Mich., will spend the week of August 25 on a fishing trip in Northern Michigan. He is an ardent fisherman.

H. R. Charlton, of the Grand Trunk publicity bureau, has been appointed to accompany H. R. H. the Prince of Wales while he is touring through Ontario on the Grand Trunk lines. Mr. Charlton has been the Company's representative on the various tours of visiting notables during the past twenty years. He was awarded the Order of the Sacred Treasure by the Emperor of Japan following the visit to Canada of the Prince Fushimi.

The S. S. Faraday, the largest cable laying vessel in the world, has just taken determined efforts of ventilating engin on a cargo of grain for overseas. The Faraday is over 20 years old and has laid practically every long distance cable in the world. During the war this ship put down a 1800-mile cable between Ireland and Newfoundland, and while on the work was escorted by a cruiser and a dozen patrol boats, succeeding in laying the cable on one trip, without a hitch.

About ten per cent advance has been made on transatlantic passenger rates, this being equal to $5 to $15 per trip. This action has been found necessary owing to the higher working costs due to the dock strikes in British ports, and the general advance in operating expenses. This new ruling went into effect on August 20.

According to the estimate of the British Advisory Committee of the Ministry of Reconstruction the existing airplane factories in England are capable of the production of 40,000 airplanes and 30,000 motors a year, and are able to supply spare parts for an air force of that size.

Electric Mine Hoists. What is said to be the first electrically driven mine hoist in the world was of 10-h.p. and installed at Aspen, Colorado, July, 1888. Contrasted with this is the hoist at the Crown Mines, South Africa, driven by two 2,000-h.p. electric motors.

Sydney Coal to Scandinavia.—The Furness-Withy Line recently made an experimental shipment of three thousand tons of coal to Norway. That the experiment proved successful is evident from the fact that an order for ten thousand tons has been received. This will be shipped in Norwegian steamers at the beginning of next month.

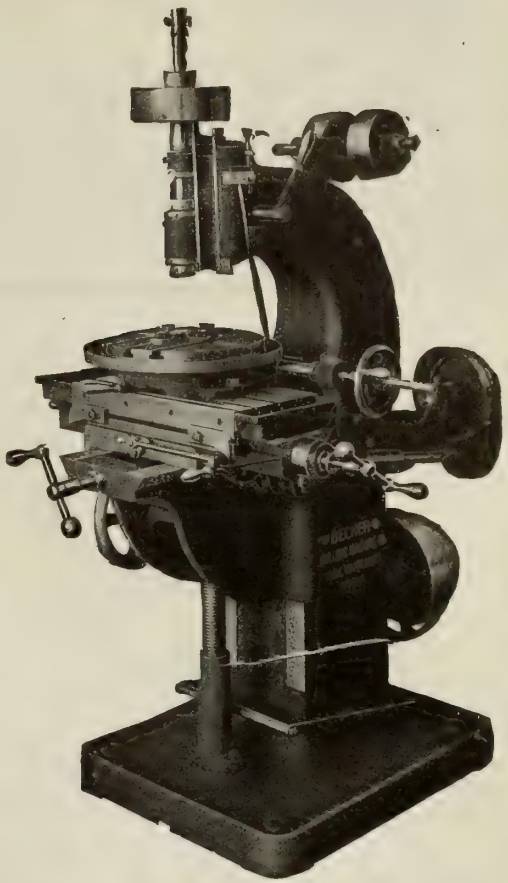
BECKER

Belt Driven Millers

The Machine that Gives the Smooth Finish

Stringent shortage of labor during the war put a premium on machinery of superior productive ability. Never was the capacity and value of Becker Millers better emphasized than during that period. And Becker Millers will always continue to demonstrate their ability to return maximum production for minimum expenditure of manual effort.

Send us blue prints of your work and other data and we will submit estimates on Becker production. Adopt this "safety-first" course; it may mean added profits to you.



The A. R. Williams Machinery Co.
LIMITED, TORONTO

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

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MORROW SCREWS MORROW

MORROWS

Whether you buy *Morrow* screws, nuts or twist drills, you *know* they are the very best that can be made anywhere. Then why not *insist* on *Morrow* make? (The jobbers will supply you, gladly). Every set and cap screw or nut (Plant No. 1), also every twist drill (Plant No. 3) is manufactured from material specially produced for the purpose. *Morrow* screws, nuts and drills may be higher in price but worth it because *you absolutely get more service.*

The Jobber Nearest You

deserves your support because he carries a stock of Morrow drills, screws and nuts for your convenience. *Ask him.*

Works at
Ingersoll - Canada

If you haven't used Ingersoll Files, you haven't used the best. *Get a sample from the jobbers and try it.*

MORROW DRILLS MORROW FILES MORROW NUTS MORROW

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Sydney, N.S.—The Sydney Foundry and Machine Company of Sydney, N.S., who conduct a large repair business in marine lines, are applying for a site upon which to build a dry dock for this port.

Fireman Scalded.—Through the blowing off of a cap on the boiler of the Smith Manufacturing Company, East Front Street, Toronto, a fireman was badly scalded about the face and arms. The man's name was John Smith, and he is 55 years old. He was removed to the St. Michael's Hospital.

Canners' New Offices.—The Dominion Canners have purchased new office premises in Hamilton. They have bought the old Bell Telephone building on Hughson street, the price being reported to be over $50,000. Their present offices are in the Landed Banking & Loan Building.

Steel Employees Want More.—Some of the employees of the Steel Company of Canada at their Hamilton works are demanding increases in wages. These men were not included in the recent 10 per cent. advance. The firemen are claiming an advance of 13½ cents an hour.

Lake Huron Steel Corporation.—A site has been secured at Goderich for this concern and all other preliminaries have been settled. The site comprises 250 acres along the shores of Lake Huron. The company undertakes to spend $2,000,000 in the first year, and $6,000,000 in the second year, in establishing its plant. The equipment will include six electric furnaces.

Improved Employment Conditions:—Reports to the Department of Labor from employers in the provinces of Ontario and Quebec show improved conditions. During the week ending August 9th, 2,686 firms increased their employees by 591, an increase of .2%, and a further increase was expected the following week which would bring it to 6 per cent.

Surveying for Hydro-Electric. — A start has been made on the long projected line from Port Colborne to Bridgeburg, the Hydro surveyors having started surveying the proposed route. The party have progressed as far as Fort Erie and are expected to finish shortly. As soon as the survey is complete it will be sent to the headquarters of the Hydro Commisison, and the purchase of the right of way will be taken up at once.

New C.P.R. Locomotives.—The new locomotives put into commission by the Canadian Pacific Railway are powerful machines. They will be operated on the Montreal to Toronto division, and are capable of hauling a train of 100 cars. They are in fact doing this daily between Smith's Falls and Montreal. The boilers hold over 11,000 gallons of water, and between Smith's Falls and the Outremont yards they burn 16 tons of coal.

Port Colborne.—The body of Alex. Beck, badly mutilated, has been found in the hold of the barge Quebec, but there has as yet been no sign of the body of Arthur Dunlap. Both men were missing from the time of the disaster at the grain elevator here. The barge was floated by the Clarence Lebau wrecking outfit from Toledo, and is now at the Government elevator dock. A considerable quantity of grain is still on board. The vessel is badly damaged, and a large amount of debris is on her decks.

An All-British Wireless.—The Imperial Investigation Board are now busy developing a scheme by which the whole Empire will be linked together by wireless. The invention is to link the Dominions to each other as well as to Great Britain, thus bringing into closer communication some of the further away dependencies, which have hitherto been rather out of it. This work will complete the work commenced by Sir Sandford Fleming many years ago with the submarine cable.

Stands by the Ferry Co.—Ex-Mayor Charles R. Tuson, of Windsor, is circulating a petition to withdraw all objections to renewal of the Windsor Ferry Co's license to operate between Windsor and Detroit. Mr. Tuson, in addressing the Chamber of Commerce, urged that the City Council were wrong in withholding their support from the Ferry Company in the latter's endeavor to get an extension of their franchise from the Dominion Government. He claimed that the slight increase in fare had met with no opposition from the public.

Shelburne.—Detroit, Brantford, and Toronto men are interested in the development of the oil or gas fields in the vicinity of Markdale, Grey County. A company is being organized under the name of the Detroit Canadian Oil and Gas Company, Limited, the capital being $60,000. The public will be offered $30,000 in $50 shares, and as soon as this amount is in the treasury, drilling will be commenced. Machinery capable of drilling to a depth of 4,000 feet has already been ordered. It is claimed that there is a rich field here awaiting exploitation.

The British Preference.—The list of goods to which preference will be extended if produced in the British Empire has been announced. Tea, cocoa, coffee, chicory, currants, dried and preserved fruits, saccharine, motor spirits and tobacco pay five-sixths of the full rate of duty. Motor cars, musical instruments, clocks, watches and cinematograph films pay two-thirds. Wine not exceeding 30 degrees proof spirit will pay 60 per cent. of the full rate, and wine exceeding 30 degrees 66 2-3 per cent. Unbottled still wines, 50 per cent. of the full rate of the additional duty will be charged. The preference will be extended on spirits by increasing the duty on spirits not produced in the Empire, four shillings per gallon on perfumed spirits, three shillings and fourpence a gallon on liquors, and half a crown per gallon on spirits of other descriptions.

TENDERS

The Hespeler Water Commission want tenders for the laying of 5,448 lineal feet of water mains. Tenders addressed to M. E. Jardine, Town Clerk, will be received up to August 30, and plans and specifications can be obtained from the office of the town clerk.

The Department of Public Works are calling for tenders for the construction of a wharf at Boisdale, N.S. Tenders will be received until 12 noon, September 3, and plans and specifications can be seen at the office of the district engineer, North Sydney, or at the Post Office, Boisdale, N.S.

The Department of Public Works are calling for tenders for the repair of the wharf at St. Jean D'Orleans, Montmorency County, Quebec. Tenders will be received until September 3rd, and plans and specifications can be obtained from the district engineer, Post Office, Quebec; Shaughnessy Building, Montreal and Post Office, St. Jean d'Orleans.

The Department of Public Works of Vancouver is calling for tenders for the erection and completion of a bridge on River Road, near Haney B.C. Plans and specifications can be obtained from the office of the District Engineer, Court

GEOMETRIC

"YOU CAN'T BEAT 'EM" SELF-OPENING DIE HEADS

It is not the manufacturers of Geometric Self-Opening Die Heads who make this statement, but the users of the tools.

This is the reason that besides being the originators, we are known as the

LARGEST AND BEST KNOWN MANUFACTURERS OF AUTOMATIC THREADING TOOLS

The big question is: Have you applied Geometric Screw Thread Cutting Tools to your threading work?

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

TRADE MARK
"HAWK" BRAND STEEL

REGISTERED U.S. PAT. OFFICE NOS. 50932-61340
CANADIAN PAT. OFFICE NO. 44

"HAWK VANADIUM"
TOOL STEEL

Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

Order "Hawk Vanadium" for your End Mills and cutters. Once known—always used.

Large Stock. Prompt Shipment.

Write for full particulars to

Hawkridge Brothers Company

Main Office and Warehouse:
303 Congress Street, Boston, Mass.
Storehouses Malden Mass.

STEEL
OF EVERY DESCRIPTION
SEND US YOUR ENQUIRIES.

MAPLE LEAF
STITCHED COTTON DUCK
BELTING
DOMINION BELTING CO. LTD.
HAMILTON CANADA

Upon the Health of your employees depend your profit and production

Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself. "Puro" saves 35% on water bills, too. You can attach it in a few minutes. Tell us how many men how many departments and we'll tell you how much the cost will be.

Puro Sanitary Drinking Fountain Co.

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BERTRAMS LIMITED
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Machine Tools
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BLACK DIAMOND OVENS

OVENS

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

Brantford Oven & Rack Co., Ltd.
Brantford, Canada.

BLACK DIAMOND OVENS

House, Vancouver, B.C., or from the Department of Public Works, Victoria, B.C.

The City of Moose Jaw wants tenders for the laying of sewer and water mains. Tenders must be in by Saturday, 30th inst. and plans and specifications may be obtained at the office of the city engineer.

MARINE

Quebec.—The steamer Glen Allen, belonging to the Kirkwood Line, on Montreal, has been put into drydock for an examination, after having scraped her bottom on the rocks a few miles west of the Quebec Bridge.

Quebec.—While entering Quebec harbor the steam barge Captain Dan, commanded by E. Gamache, struck a wharf and sank before she could be beached. The cook, Mrs. Annie Taylor, was drowned, but the rest of the crew were rescued from a capsized rowboat on which they had found refuge.

Quebec.—The salvage tug Lord Strathcona has been despatched to the aid of the steamer Admiral Hastings, which left Montreal for England recently, and is now ashore on Baggot Bluff, the south point of Anticosti Island. She reports being hard and fast, and unable to refloat with her own power.

Quebec.—S.O.S. calls were received from the steamer Verdullia, which had struck an iceberg in the straits of Belle Isle, while on a voyage from Quebec to England. After the first calls were received, a later one gave the information that the vessel was apparently not badly damaged, and was proceeding on her voyage.

Port Colborne.—While towing the steamer Glen Lyon down the canal to load paper at the Ontario Paper Mill wharf, the tug Alert caught on a shoal, and before the hawser could be released she was drawn under on her side and sunk. The crew all rushed to the high side and jumped when she commenced to capsize, and were rescued with some

Mining Machinery for Sale

Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.
Ingersoll-Rand 800 ft. Air Compressor.
1 Tube Mill Fraser & Chalmers 5 x 22.
1 Power & Mining 5 x 22.
Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

Zenith Coal & Steel Products Limited
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SAYS THE MASTER MECHANIC: The Greb Automatic Grip Puller is a One-Man Puller—Quick-acting, strong and simple in the extreme. May be locked in any desired position. A combination of two or three arms. Heavy Duty Size capacity 1" to 18"—Junior size capacity 1" to 7". Two sets of jaws furnished with each size.

TEN DAYS' TRIAL.—If your dealer or jobber does not have them we will send you one. Try it ten days. If not satisfactory, return to us and we will refund your money. We also make the GREB RIM TOOL.

THE GREB CO., 318 State St., BOSTON

difficulty from the canal. The Alert will be raised.

Prince Rupert, B.C.—The new car ferry slip at Prince Rupert has been commenced and is expected to be completed in October at a cost of $50,000. It will be built to accommodate a car barge carrying nine loaded cars, and three cars at a time can be unloaded or loaded.

Halifax, N.S.—The steamer "Chaudiere," of the Royal Mail Steam Packet Company's fleet, struck a rock going into Hamilton, Bermuda. There is a narrow channel between two rocks which come close to the surface and the vessel's starboard side struck one of these, tearing a hole in it. She had about 100 passengers for Barbadoes and Demerara, and these will have to be transhipped as she is too badly damaged to continue the voyage.

Collingwood.—The former lake steamer "Codorus" has been salved from the rocks at Escamanick Point in the Gulf of St. Lawrence by Capt. Reid of Port Huron. The vessel, which was formerly owned by the Anchor Line on the Great Lakes, was taken over by the United States Shipping Board and taken through the canals to the sea after being cut in two. She was joined together in Montreal, but her career on the salt water was brief. She was given up as a total loss, but after five weeks' work Capt. Reid was successful in floating her. He did the work on a percentage basis.

Halifax.—Six men of the crew of the schooner Francis A. were lost when the schooner was rammed and sunk by the steamer Lord Downshire, belonging to the Ulster Steamship Company of Belfast. The collision occurred while the schooner was fishing about 120 miles south of Halifax, in a thick fog, and the Lord Downshire was bound from Baltimore to Belfast with a general cargo. After the collision the steamer lowered a lifeboat and rescued fourteen of the crew of twenty, but the remaining six were never seen. The names of the men who were drowned were Capt. Percy Ross and Ainslie Ross his brother, both of Broad Cove, N.S.; Tom Muise, Belleville, N.S.; James Gardner, Argyll, N. S.; Joe Harris, Yarmouth, and Fred Fitzgerald, no address known.

Oil Tempered Steel Springs

—for every purpose and the best for each use.

Special styles of all kind to order.

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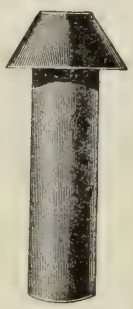

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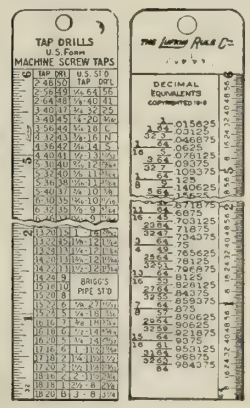

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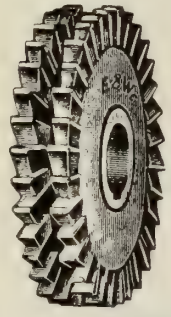

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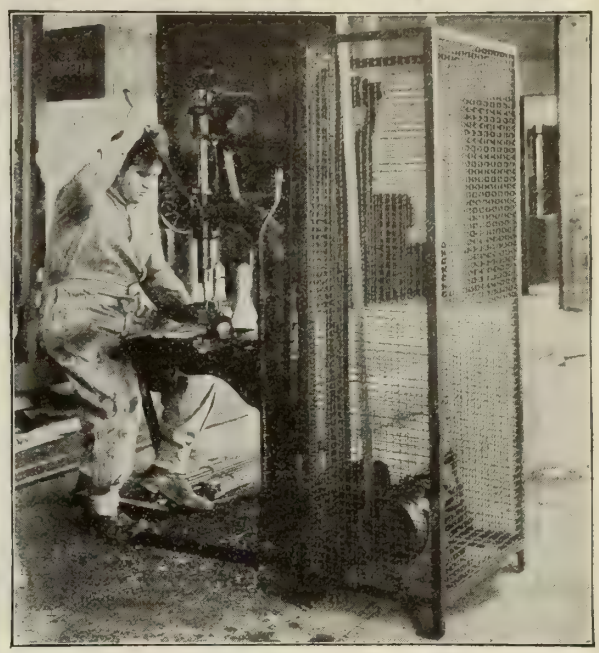

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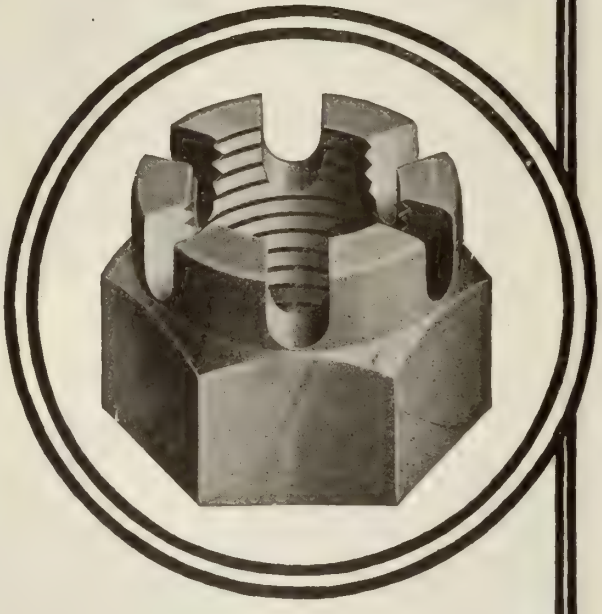

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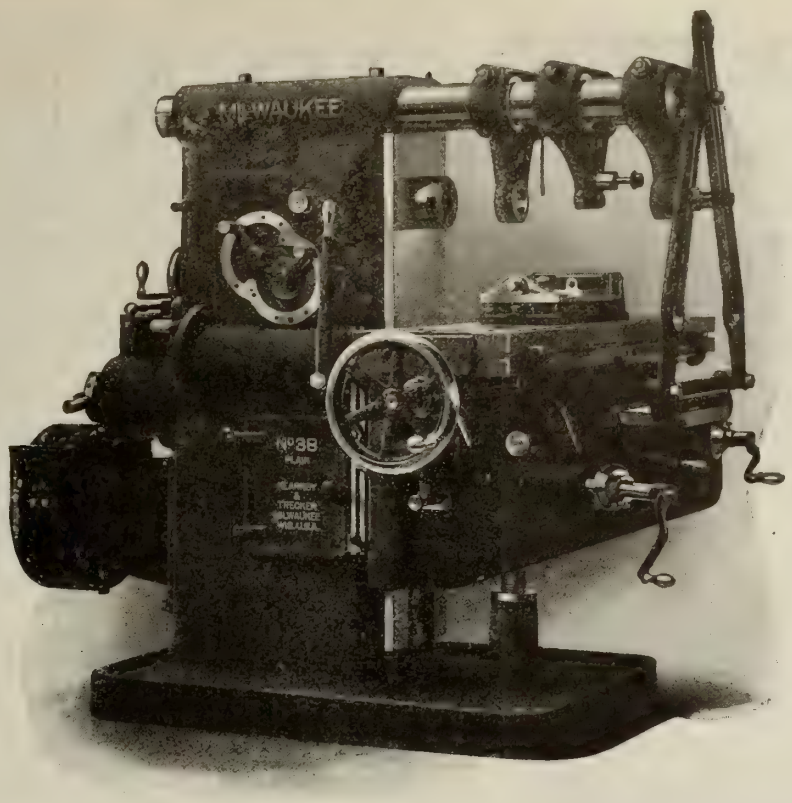

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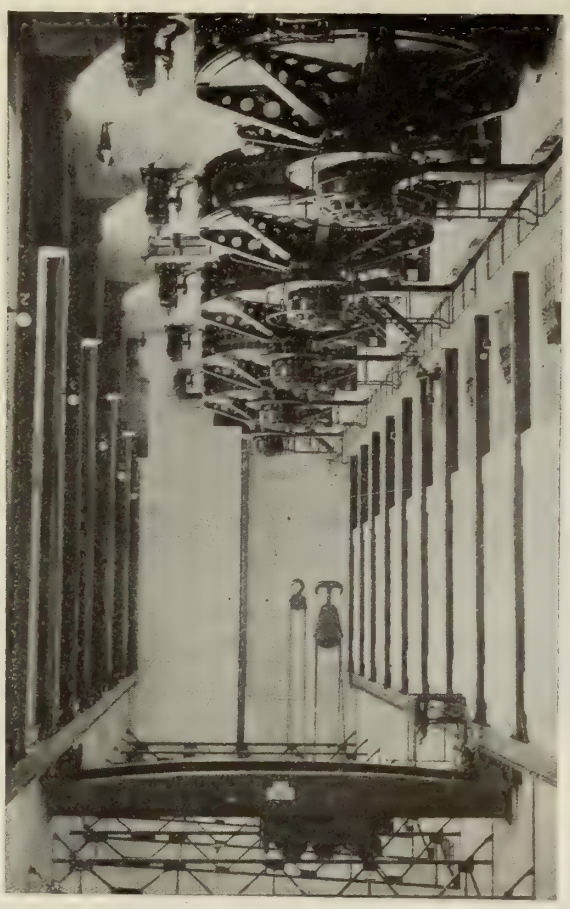

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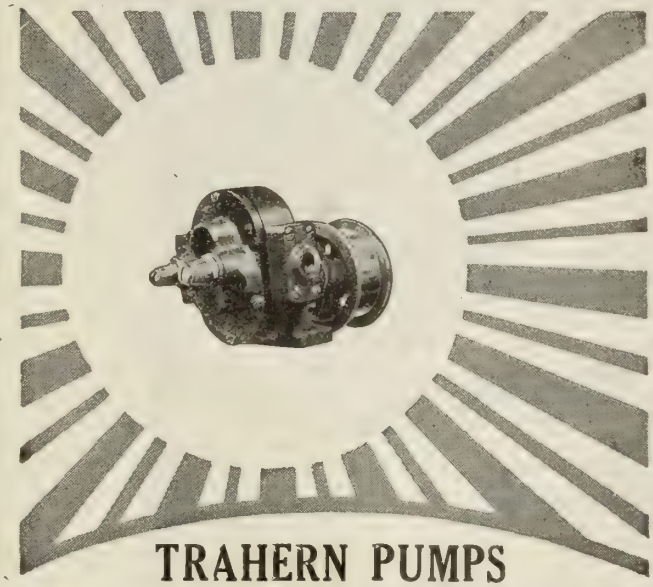

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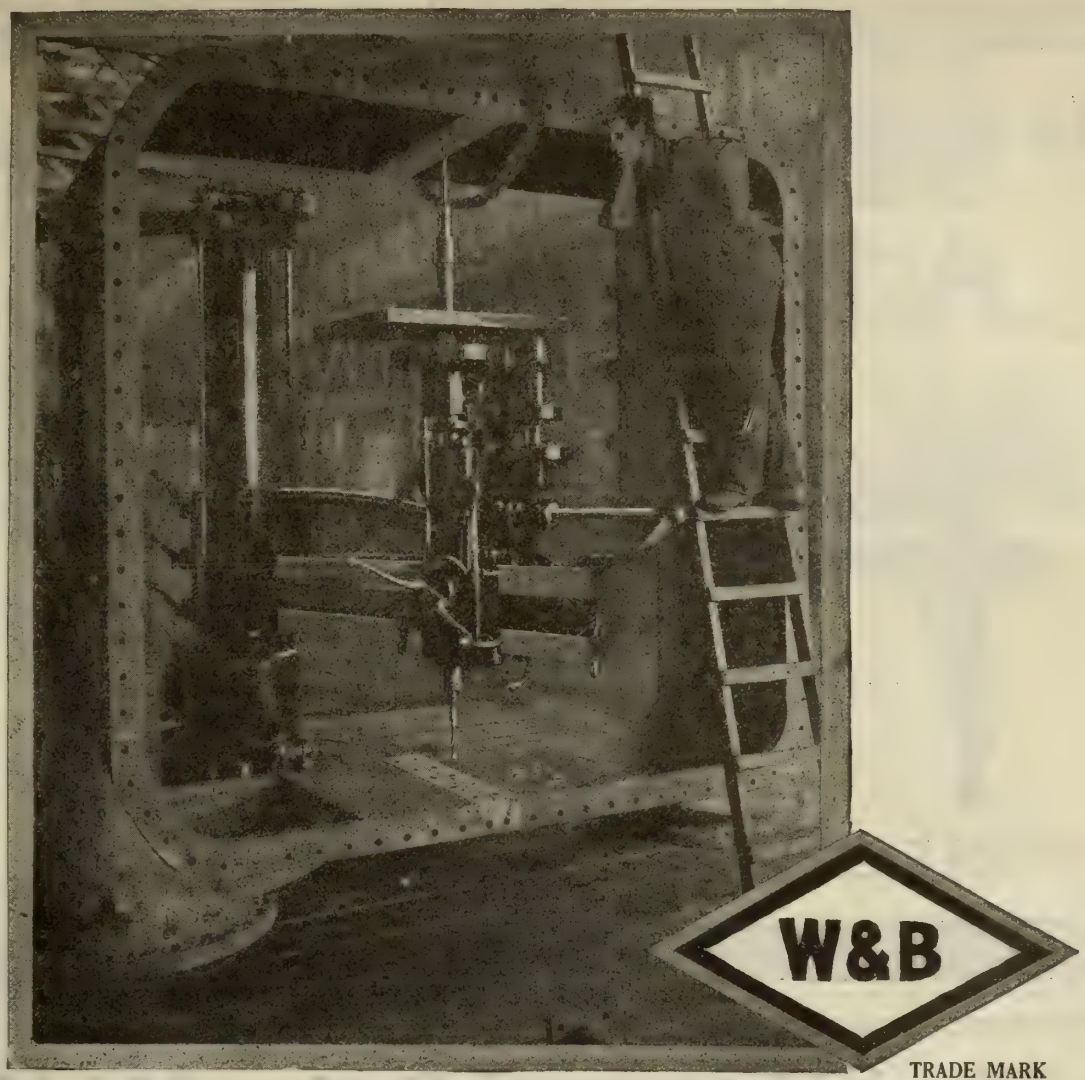

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Ten 7/8 inch tap holes (47/64) were required on each of two sides to a section of a huge marine condenser. To save the time and expense of turning this section over, and eliminate the possibility of breakage, this job was done easily and quickly as here pictured. A spindle was rigged up on top of a big 6-foot radial drill press and the holes drilled upside down.

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"STAR" LATHES

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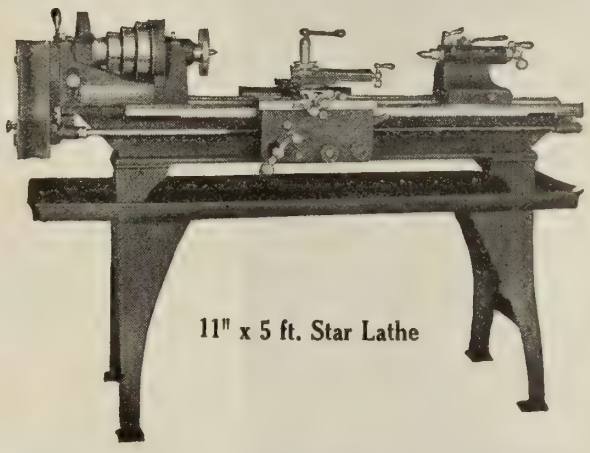

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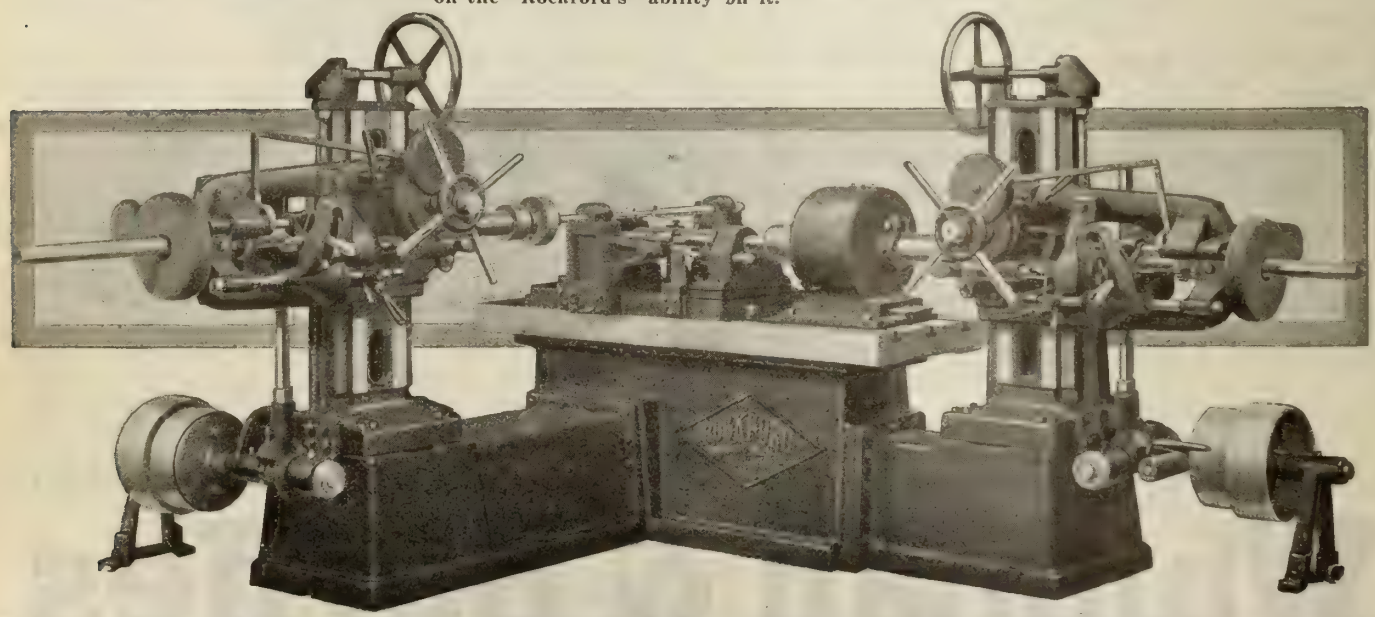

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9 ft.	18 ft. circle	12 ft.
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13 ft.	26 ft. circle	16 ft.

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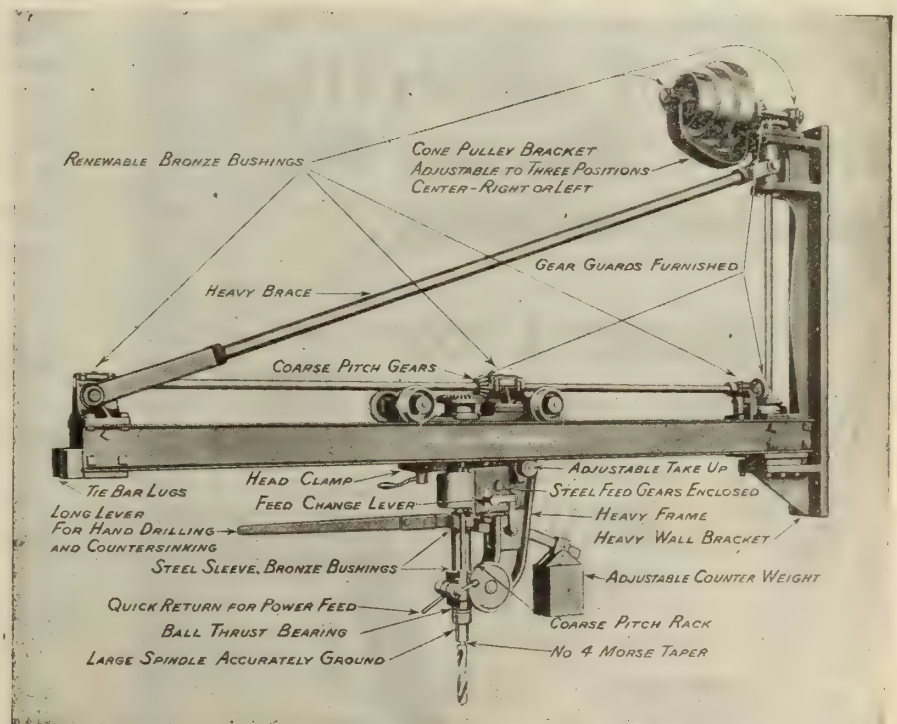

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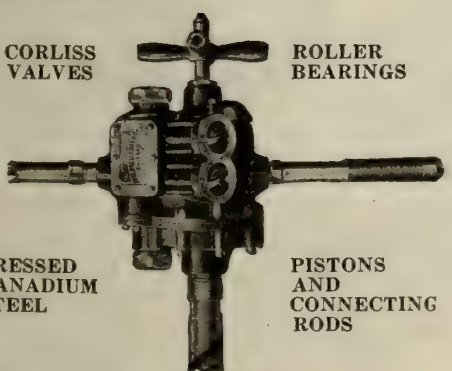

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ALL RECORDS BROKEN FOR SPEED, POWER and ENDURANCE

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4 sizes, 1 in. to 5 in.
All parts hardened and ground.

ELECTRIC DRILLS

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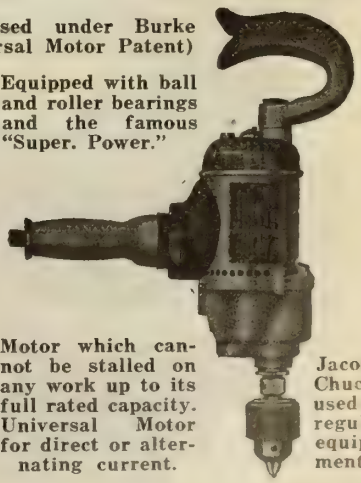
Equipped with ball and roller bearings and the famous "Super. Power."



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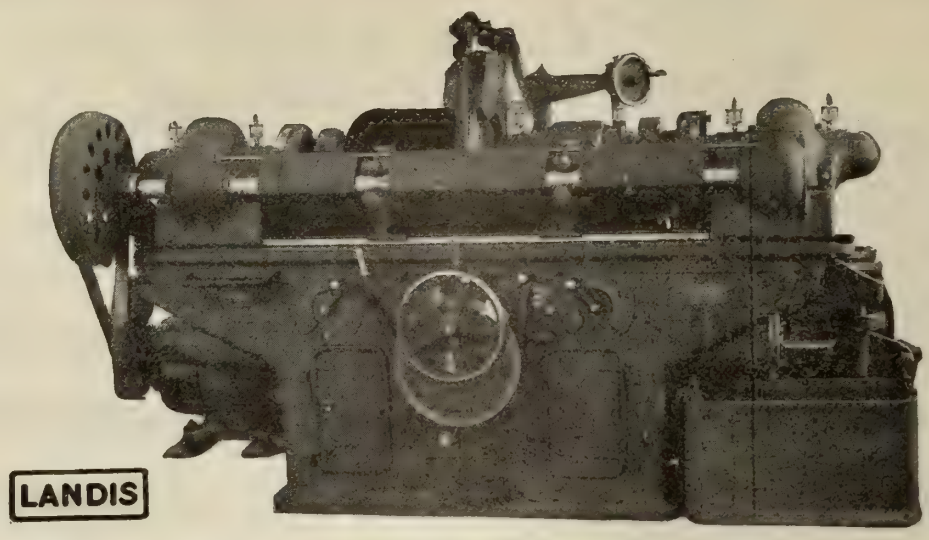

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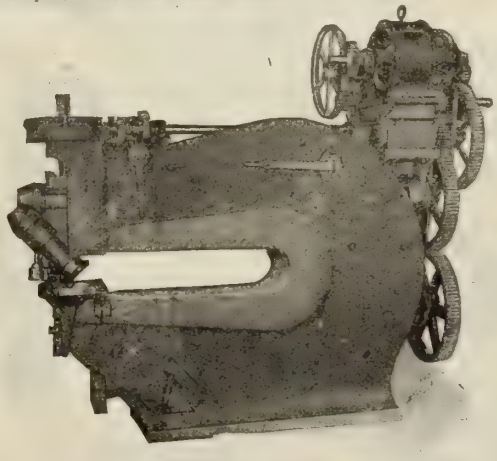

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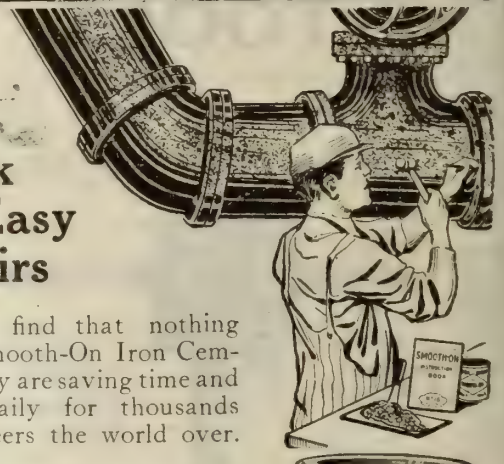

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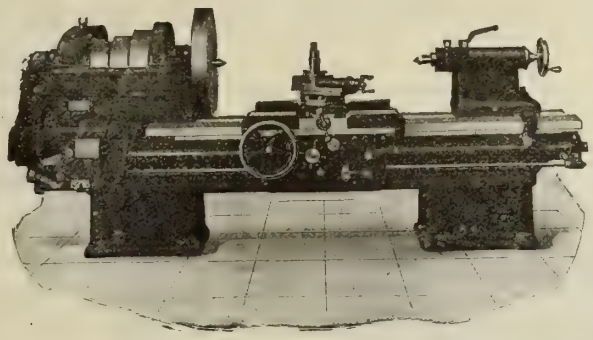

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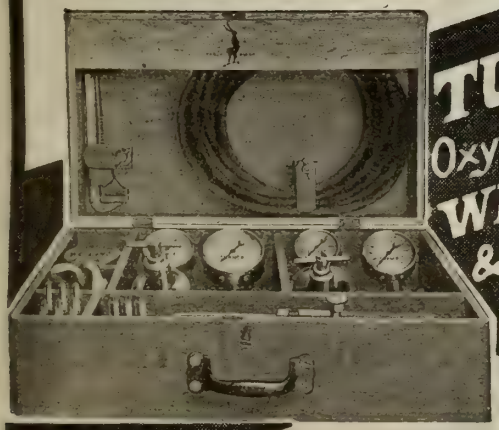

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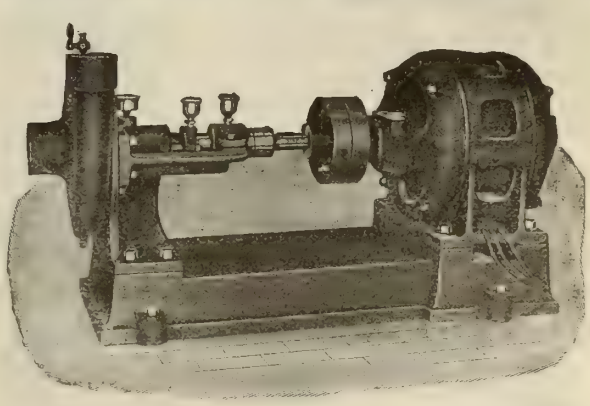

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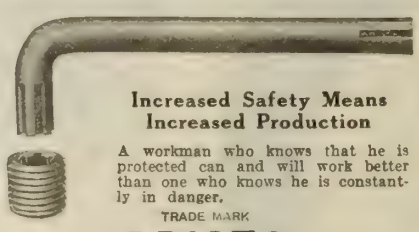

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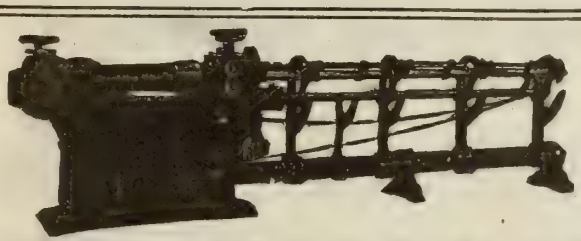
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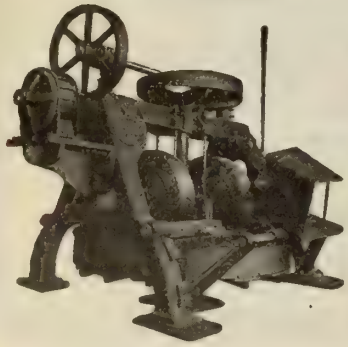
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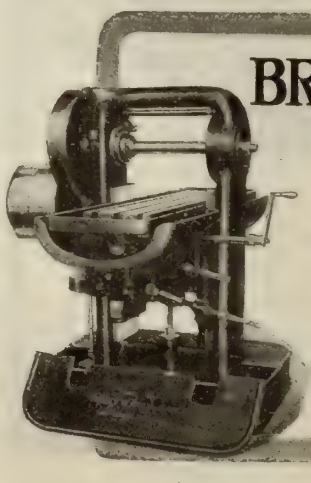
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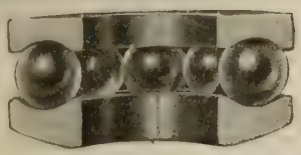

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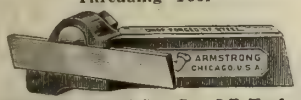

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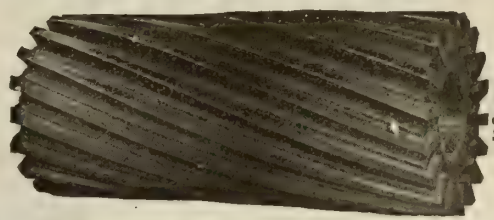

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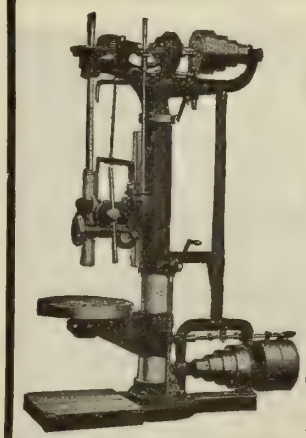

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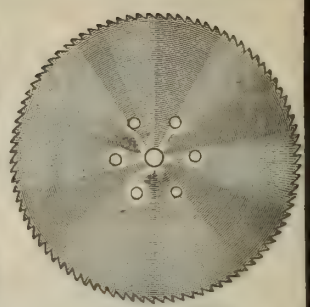

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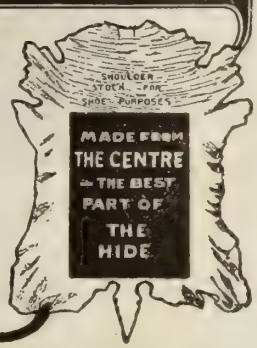

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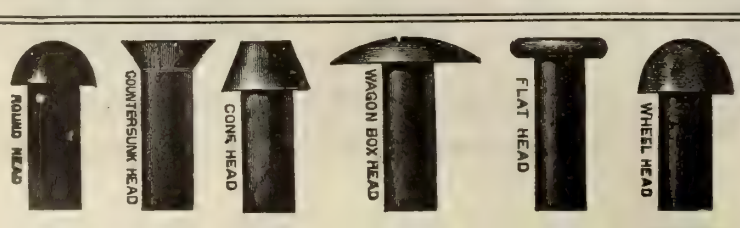

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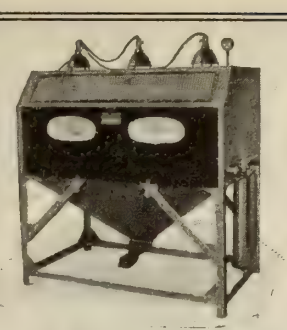

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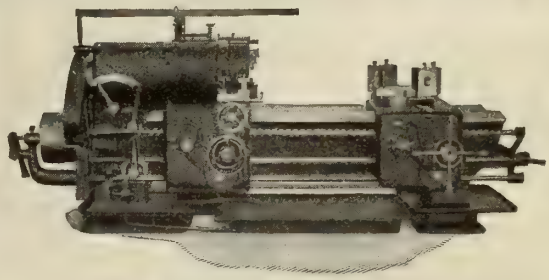

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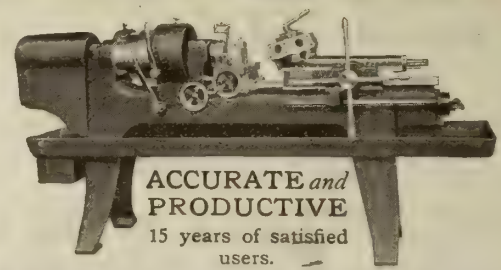

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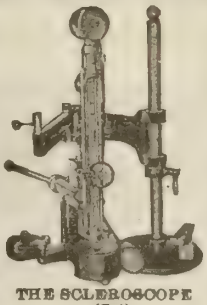

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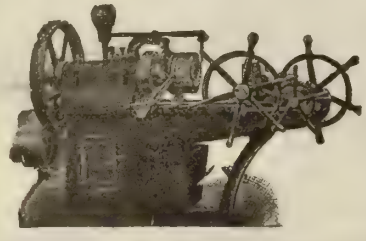

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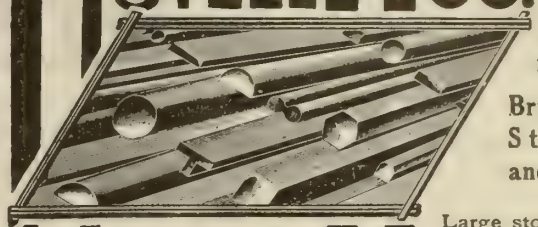

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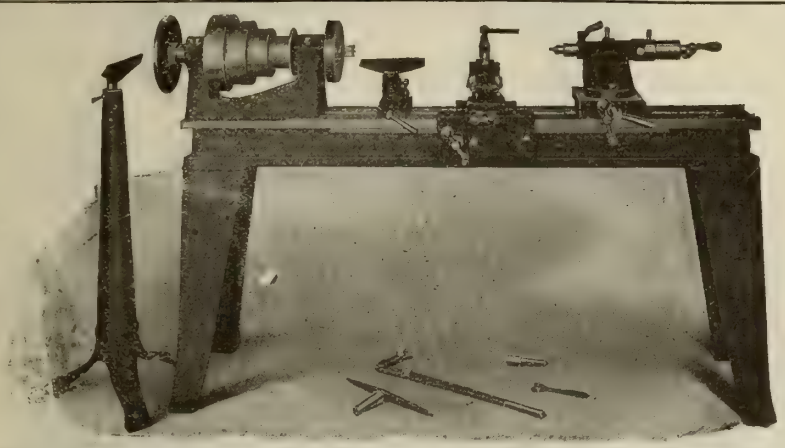

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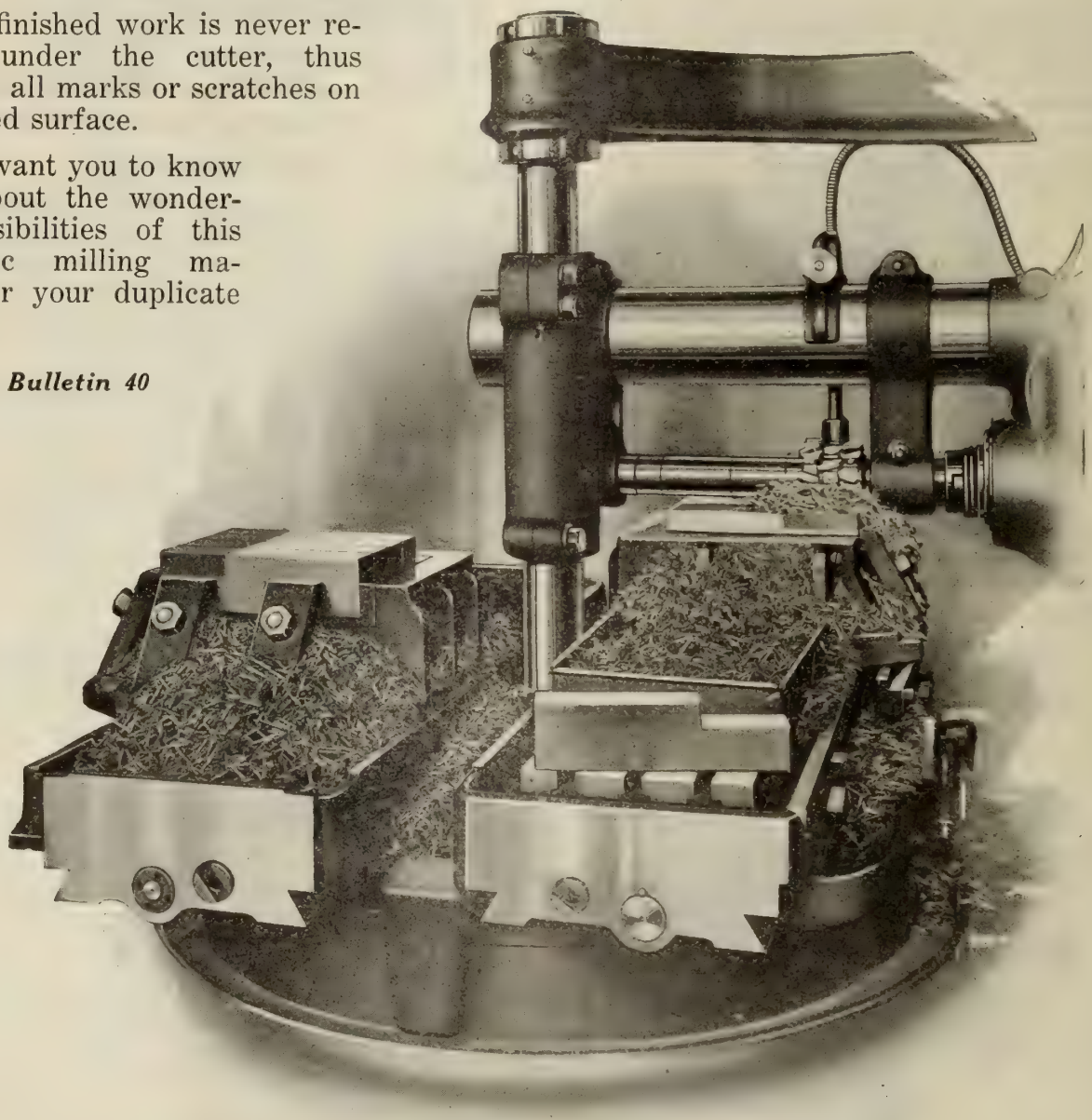

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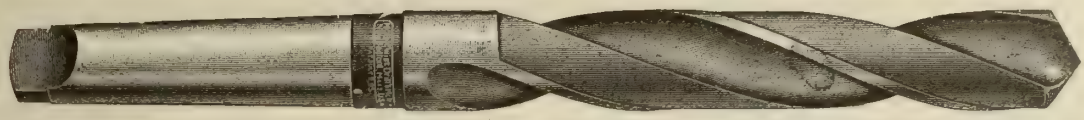

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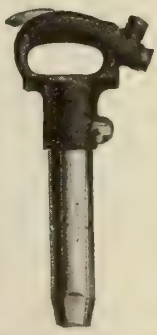

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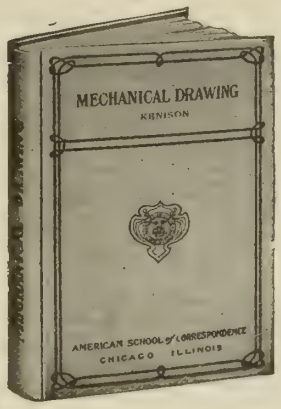

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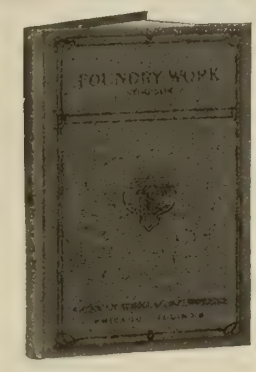

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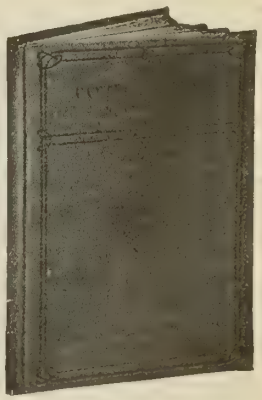

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GRINDERS, UNIVERSAL, PLAIN

Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

GRINDERS, VERTICAL, SURFACE

Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Montreal.
Heald Machine Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Grinding Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

GRINDING AND POLISHING MACHINES, PORTABLE, PNEUMATIC AND SPRING FRAME

Can. Fairbanks-Morse Co., Montreal.
Cincinnati Elec. Tool Co., Cincinnati. O.
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford, Ont.
LeBlond Mch. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York, N.Y.
Norton Grinding Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wiss.
Williams & Wilson, Ltd., Montreal.

GRINDING MACHINES, CAR WHEEL, CUTTER. CYLINDRICAL, CRANKSHAFT

Norton Grinding Co., Worcester, Mass.

GRINDING WHEELS

Aikenhead Hardware Co., Toronto, Ont.
Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Norton Co., Worcester, Mass.

GRIT, ANGULAR

Pittsburgh Crushed Steel Co., Pittsburgh.

GUARDS, WINDOW AND MACHINE

Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods, Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland.

HANDLES, BALANCE, CRANK AND MACHINE

Williams & Co., J. H., Brooklyn, N.Y.

HACK SAW BLADES

Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Fry's (London), Ltd., London, England.
Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
Standard Machy. & Supplies, Montreal.
Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

HACK SAW FRAMES

Aikenhead Hardware Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal.

HACK SAWS, POWER

Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.

HAMMERS (DROP), MOTOR AND BELT DRIVEN

Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

HAMMERS, HELVE POWER

Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal.

HAMMERS, CHIPPING, CAULKING, PNEUMATIC

Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

HAMMERS, MARKING

Matthews & Co., Jas. H., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE

Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, STEAM

Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAND PLANERS

Oliver Mchry. Co., Grand Rapids, Mich.

HAND LEATHERS OR PADS

Graton & Knight Mfg. Co., Montreal.

HANGERS, SHAFT

Algoma Steel Corp., Sault Ste. Marie.
Can. General Electric Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Standard Pressed Steel Co., Philadelphia.
Williams & Wilson, Limited, Montreal.

HARDNESS TESTING INSTRUMENTS

Shore Instrument & Mfg. Co., New York

HEAD, AUXILIARY

Hoefer Mfg. Co., Freeport, Ill.

HEATING AND VENTILATING ENGINEERS

Can. Blower & Forge Co., Kitchener, Ont.

HEAT TREATMENT OF STEEL

Gray Ball Bearing Co., Ltd., Toronto.

HEAT GAUGES, HARDENING AND ANNEALING

Shore Instrument & Mfg. Co., New York.

HELMETS, SANDBLAST, AMMONIA

Strong, Kennard & Nutt Co., Cleveland.

HIGH SPEED STEEL

See Steel.

HINGE MACHINERY

Baird Machine Co., Bridgeport, Conn.
Illinois Tool Works, Chicago, Ill.

HINGES

London Bolt & Hinge Wks., London, Ont.

HOBS

Greenfield Tap & Die Co., Greenfield, Mass
Illinois Tool Works, Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 316 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

HOISTS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTS, CHAIN AND PNEUMATIC

Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal.

HOISTS, ELECTRICAL

Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland.
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

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Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC

Electric Steels & Metals, Ltd., Welland.

HOOKS, BELT LACING

Clipper Belt Lacer Co., Grand Rapids.

HOPPERS

MacKinnon Steel Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, PNEUMATIC

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Garlock-Walker Machinery Co., Toronto
Independent Pneumatic Tool Co., Chicago.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, ALL KINDS

Int Mach. & Supply Co., Ltd., Montreal.

HOSE, SAND BLAST

Pangborn Corporation, Hagerstown, Md.

HYDRAULIC MACHINERY

Garlock-Walker Machinery Co., Toronto.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.
Williams & Wilson, Limited, Montreal.

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Taylor Instrument Co., Rochester, N.Y.

INDICATORS, SPEED

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES

Dickow, Fred C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal.

INDICATING INSTRUMENTS

Taylor Instrument Co., Rochester, N.Y.

INGOT METAL

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

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Nova Scotia Stl. & Coal Co., New Glasgow

INGOTS, FORGING AND ROLLING

Electric Steel & Metals Co., Welland.

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Consolidated Optical Co., Toronto.

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Hanna & Co., M. A., Cleveland, O.

IRON SAND

Pittsburgh Crushed Steel Co., Pittsburgh.

IRON, WROUGHT, ROLLED, PIG

Swedish Steel & Impt. Co., Ltd., Montreal

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Can. Fairbanks-Morse Co., Montreal.
Fellows Bros., Ltd., Chadley Heath, Eng.
Morris Crane & Hoist Co., Herbert Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont
Williams & Wilson, Limited, Montreal.

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Fellows Bros., Ltd., Chadley Heath, Eng.

JACKS, PIT AND TRACK

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Northern Crane Works, Walkerville.

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Skinner Chuck Co., New Britain, Conn.

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Gisholt Machine Co., Madison, Wis.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES

Canada Foundries & Forgings, Welland.

KEY SEATERS

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Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, M.
A. R. Williams Machy. Co., Toronto.
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Williams & Co., J. H., Brooklyn, N.Y.

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Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

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LATHES, BORING

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Cisco Machine Tool Co., Cincinnati, Ohio.
Wickes Bros., Saginaw, Mich.
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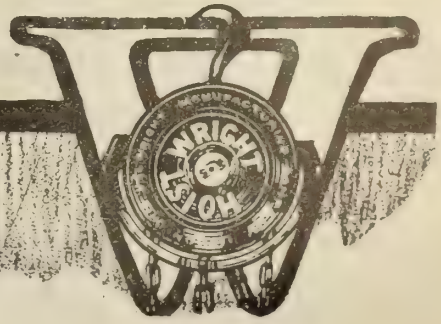

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Williams & Wilson, Limited
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Williams & Wilson, Ltd., Montreal, Que.
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Wood Turret Machine Co., Brazil, Ind.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

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See Belting, Chain.

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Williams Machy. Co., A. R., Toronto.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

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See Chemists.

METAL SAWS
See Saws.

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Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
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Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

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Bilton Mach. Tool Co., Bridgeport, Conn.
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Williams & Wilson, Ltd., Montreal, Que.

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Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Hardinge Bros., Inc., Chicago, Ill.
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Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

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MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

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Can. Fairbanks-Morse Co., Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

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Can. General Electric Co., Toronto.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Turner Brass Works, Sycamore, Ill.

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Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Boker & Co., Inc., H., Montreal, Que.
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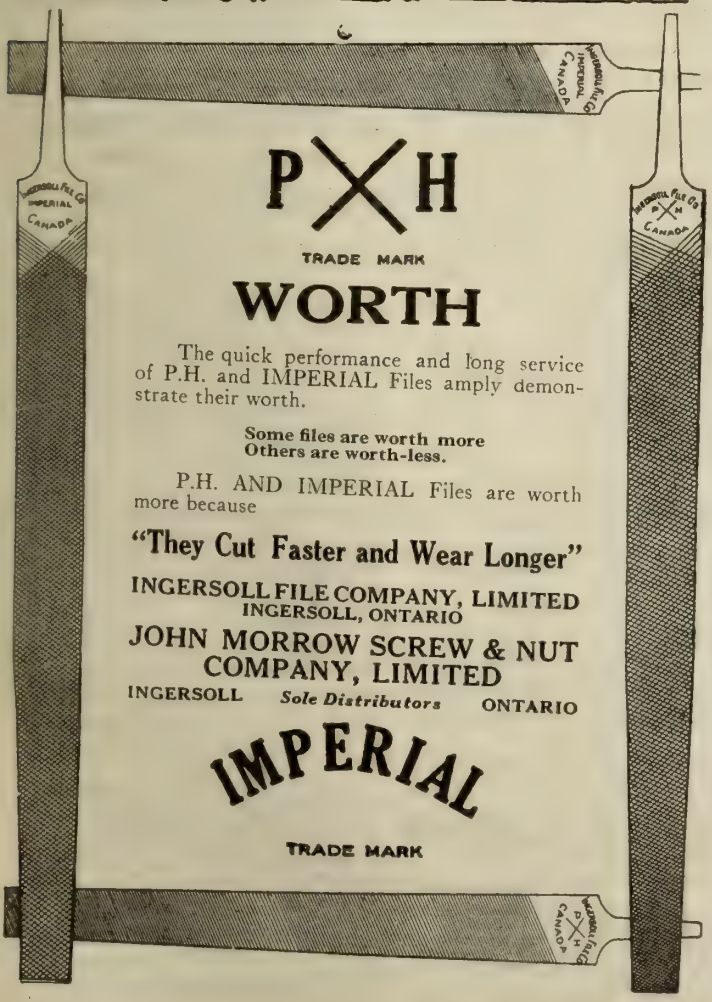

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RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
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Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
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John Morrow Screw & Nut Co., Ingersoll.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

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Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
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Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
The Quickwork Co., St Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEET METAL ROLLING MACHINES
Peck, Stow & Wilcox Co., Southington.

SHEETS, NICKEL, RESIST, ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHEARS, PLATE CUTTING, SLITTING
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL MACHINERY
Peck, Stow & Wilcox Co., Southington, O.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal.

SHEETS, CRUCIBLE, CAST
Kayser-Ellison & Co., Ltd., Montreal.
Ralph B. Norton, Agent, Montreal.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
MacKinnon Steel Co., Sherbrooke, Que.

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Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont.

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Brown & Sharpe Mfg. Co., Providence.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto,
Jas. Steele, Ltd., Guelph, Ont.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Banfield, W. H., & Sons. Toronto.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Marten Machine Co., Hamilton, Ont.
Sleeper & Hartley, Inc., Worcester, Mass.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Wilson & Co., J. C. Belleville, Ont.
William R. Perrin, Ltd., Toronto.
Windsor Mach. & Tool Co., Windsor, Ont.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS, SPIRAL, TOOL
The Dunbar Bros. Co., Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia.
Wilson & Co., J. C., Belleville, Ont.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link-Belt Co., Toronto, Ont.
Perrin, Wm. R., Toronto.
Wilson & Co., J. C., Belleville, Ont.

SPROCKET WHEELS, CHILLED THREAD
Katie Foundry, Galt, Ont.

SQUARES
Peck, Stow & Wilcox Co., Southington, Conn.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

STAYBOLT TOPS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS, SHEET BRASS, COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Hope & Sons, Henry, of Canada, Peterboro, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

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Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.

STEEL BALLS
See Balls Steel.

STEEL, CRUCIBLE TOOL
Atkins & Co., Ltd., Wm. Sheffield, Eng.
Illingworth Steel Co., John, New York.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL CHROME VANADIUM
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto.

STEEL CHROME NICKEL
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

STEEL CASTINGS
Joilette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
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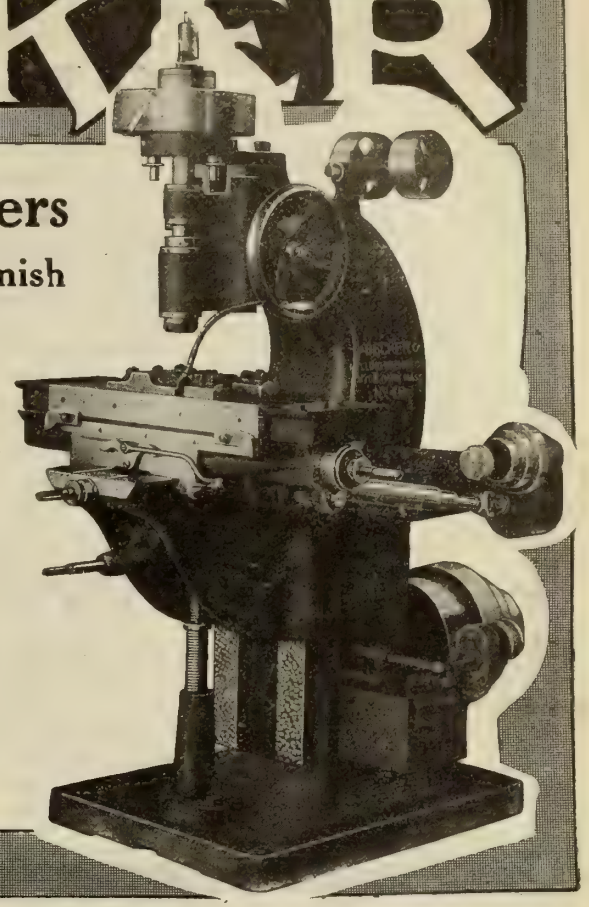

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Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Po.

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Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., J., New York.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Plewes, Ltd Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.: represented in Canada by Norton, Callard & Co., Montreal, Que.

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Illingworth Steel Co., John, New York.

STEEL, CRUSHED
Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL, ROCK DRILL
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Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
General Steel Co., Milwaukee, Wis.
Drury Co., H. A., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto, Ont.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

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Armstrong, Whitworth of Can., Montreal.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Wells Bros. of Can., Galt, Ont.

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Wells Bros., of Can., Galt, Ont.

STOCKS, PIPE
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Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

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Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Page Steel & Wire Co., Adrian, Mich.

SWITCHBOARDS
Can. General Electric Co., Toronto, Ont.

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Can. Steel Foundries, Ltd., Montreal.

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Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.

TANKS, LUBRICATING, OIL STORAGE
S. F. Bowser & Co., Inc., Fort Wayne.

TANKS, RUBBER CEMENT
S. F. Bowser & Co., Inc., Fort Wayne.

TANKS, STEEL, WATER PRESSURE
S. F. Bowser & Co., Inc., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal.
Toronto Iron Works, Ltd., Toronto.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke

TAPER PINS
Galt Machine Screw Co., Ltd., Galt, Ont.

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James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.

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Bicknell-Thomas Co., Greenfield, Mass.
Rudel-Belnap Mach. Co., Ltd., Montreal.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchy Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal.

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TAPES, POCKET
Lufkin Rule Co. of Can., Windsor, Ont.

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Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Po.

TAPS, GUN, HAND, BOILER
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

TAPS, STAYBOLT, TAPPER
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. F., Montreal.
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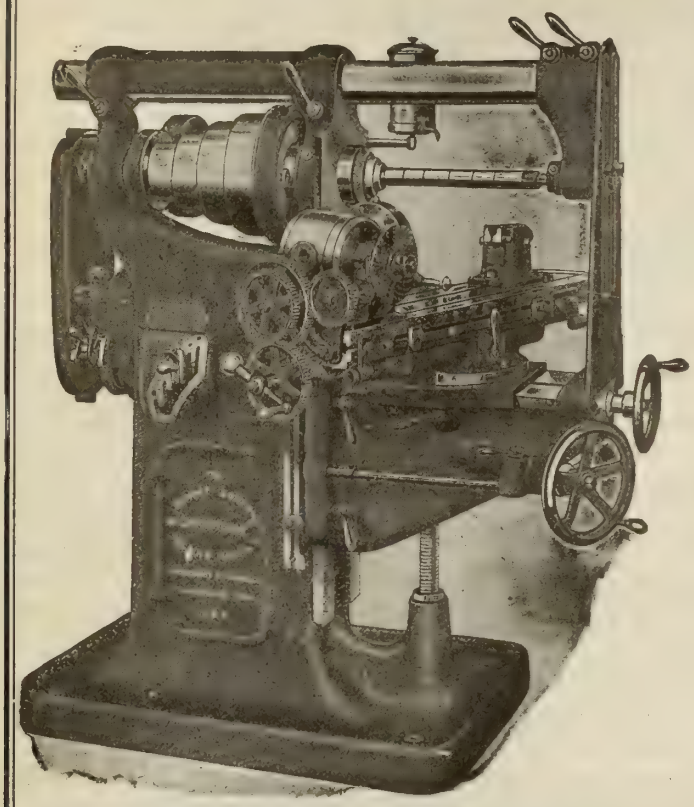

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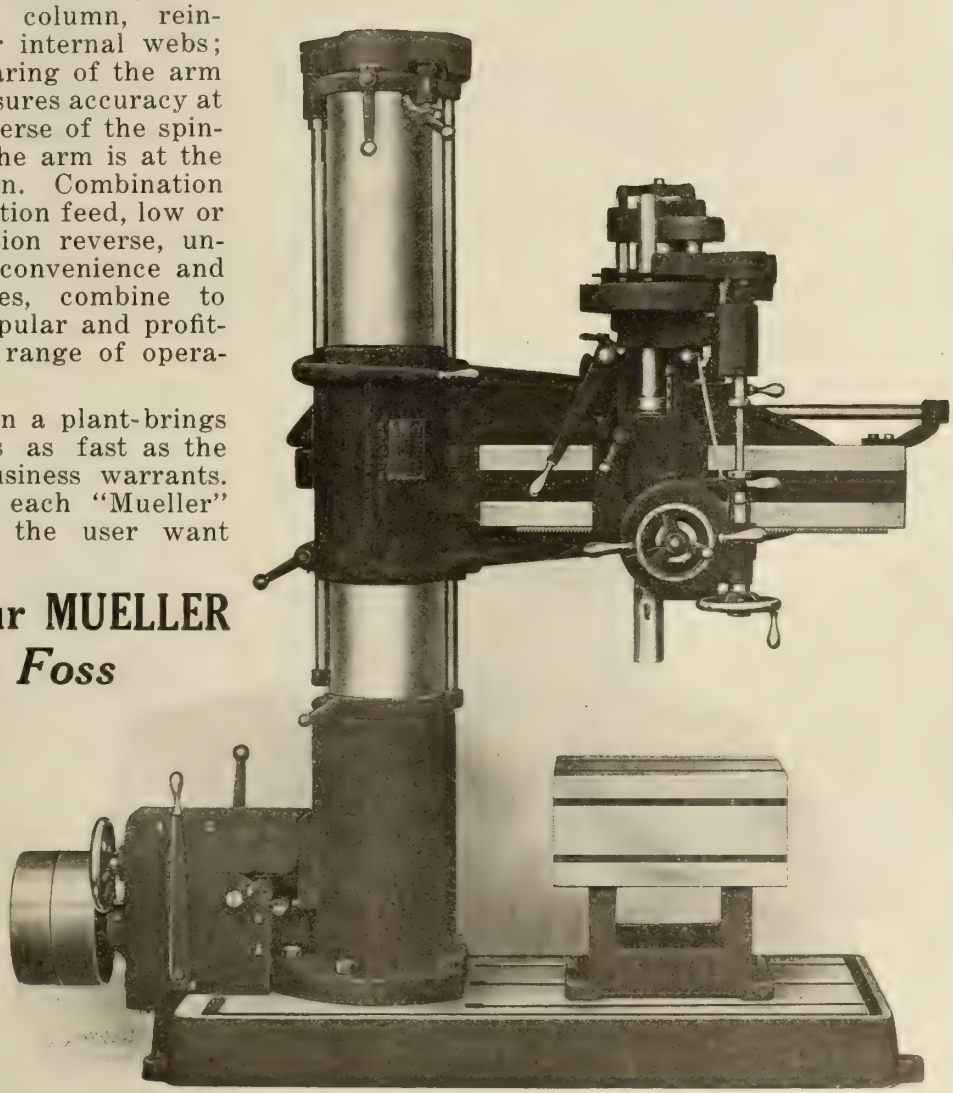

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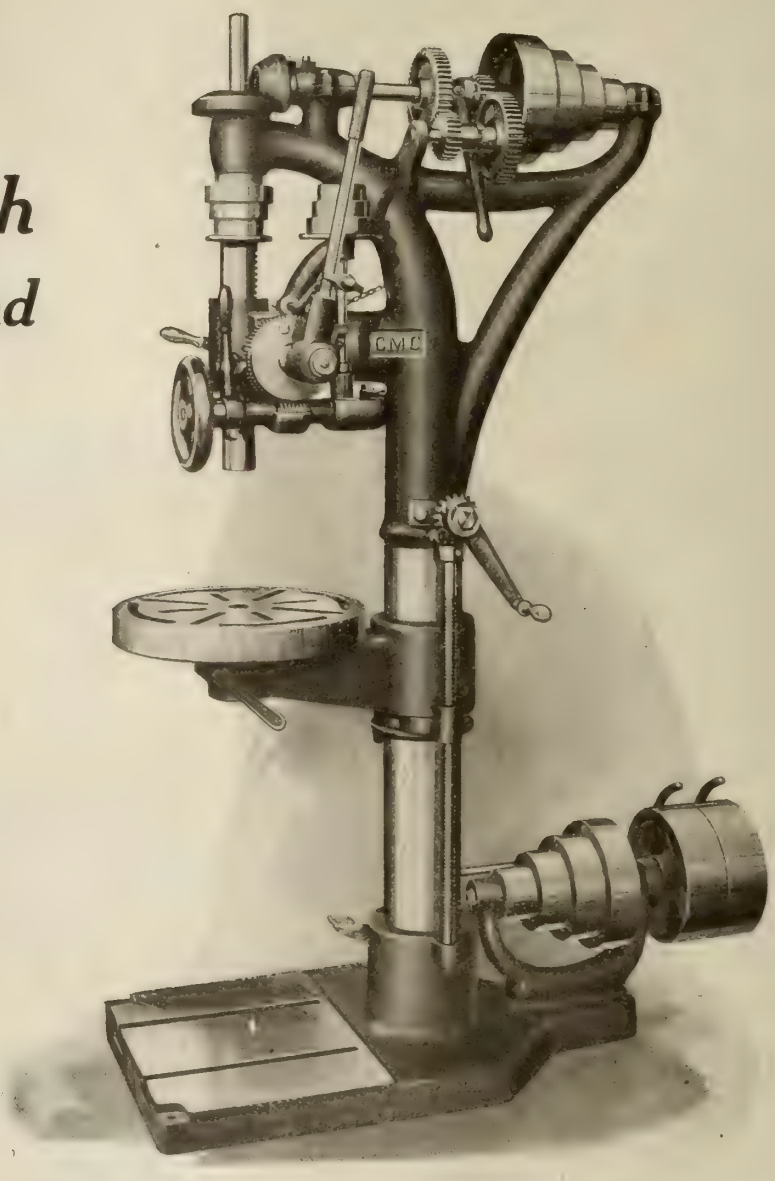

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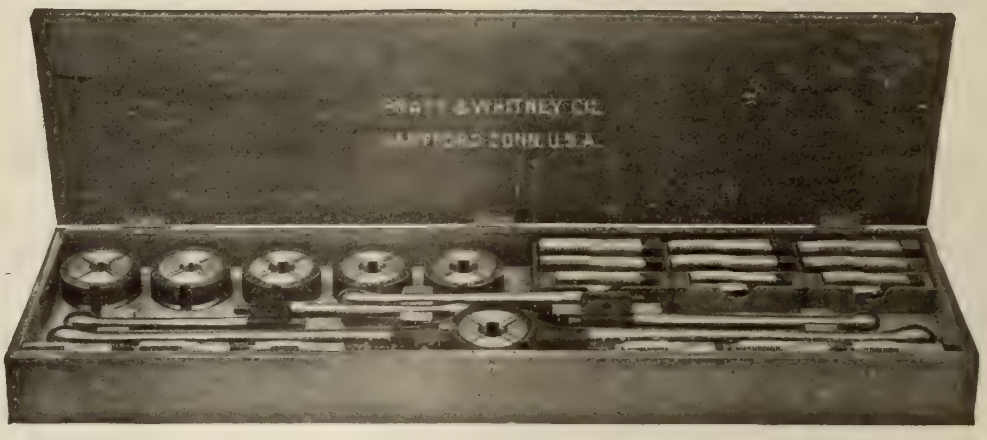

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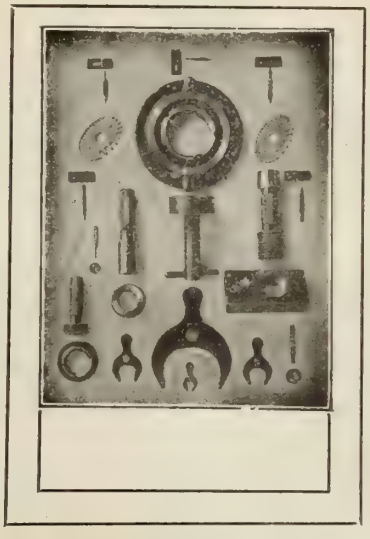

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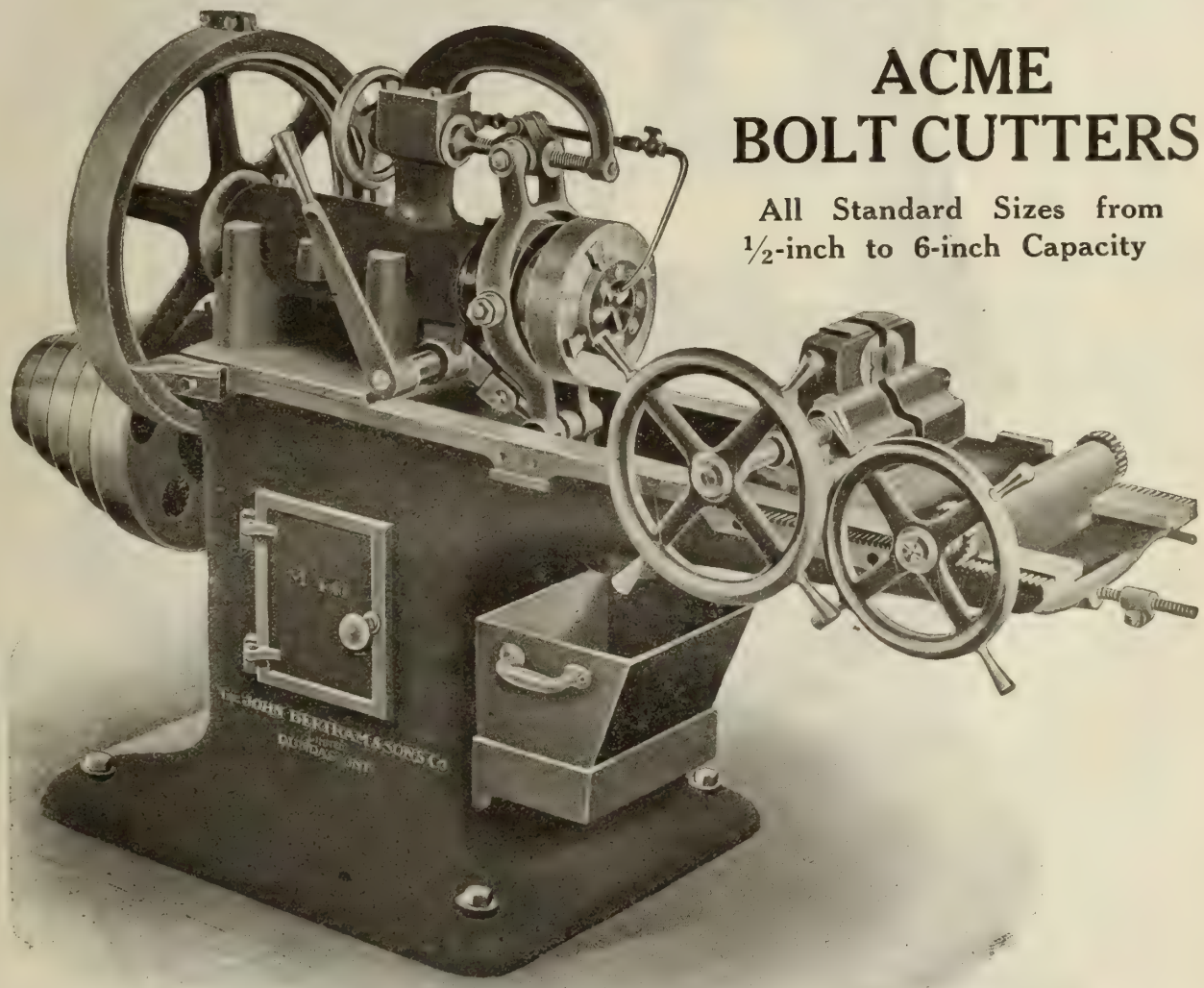

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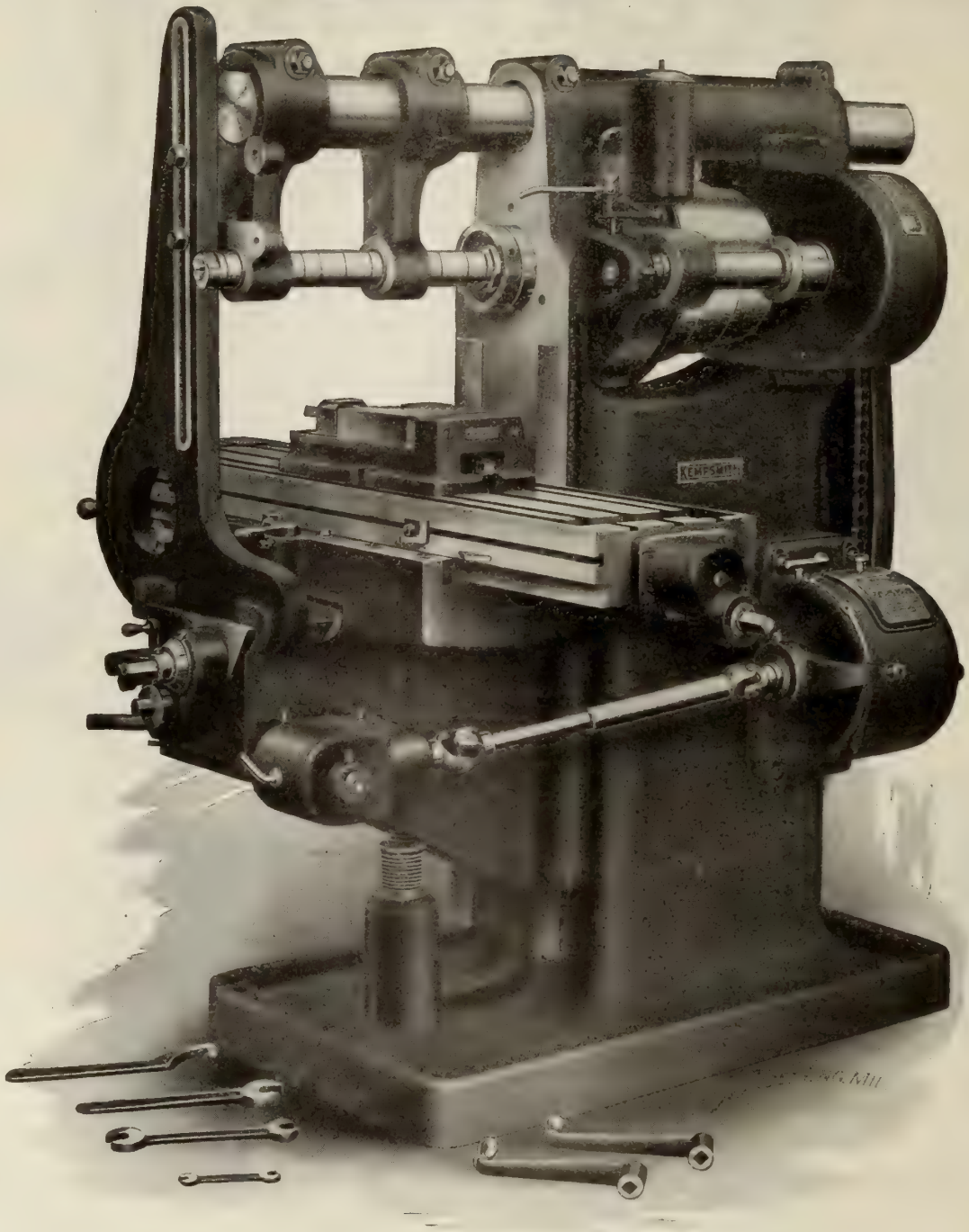

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Fencing
Fence Gates

Bars
Blooms
Billets
Wire
Wire Rods
Sheets
Horse Shoes
Angles
Channels
Plow Beams

General View of the Plant of the Algoma Steel Corporation from the Waterfront.

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼" x 1¼", ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14" wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process. and can be furnished in all grades from the softest rivet stock to high carbon special spring material. Motto: "Quality and Service."

MARK OF ALGOMA O.H. QUALITY

The following are the sections which will be rolled:—

ANGLES—Equal Leg—
6 x 6"—5 x 5"—4 x 4"
3½ x 3½"—3 x 3"
2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

CHANNELS—
15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5 x 5/16"
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3¾ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
2 11/16 x 3 x 2 11/16 x ¼"
2¾ x 3 1/16 x 2¾ x 5/16"

ROUNDS—
All sizes from ½" up to and including 4".

SQUARES—
All sizes from ½" up to and including 3".

FLATS—
All sizes from 1 x ¼" up to and including 14" wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

PIG IRON—
Machine Cast Foundry, Malleable and Basic.
Sulphate of Ammonia.

NITRE CAKE.

For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.
Your enquiries and business will be appreciated.

ALGOMA STEEL CORPORATION

SAULT STE. MARIE, ONTARIO

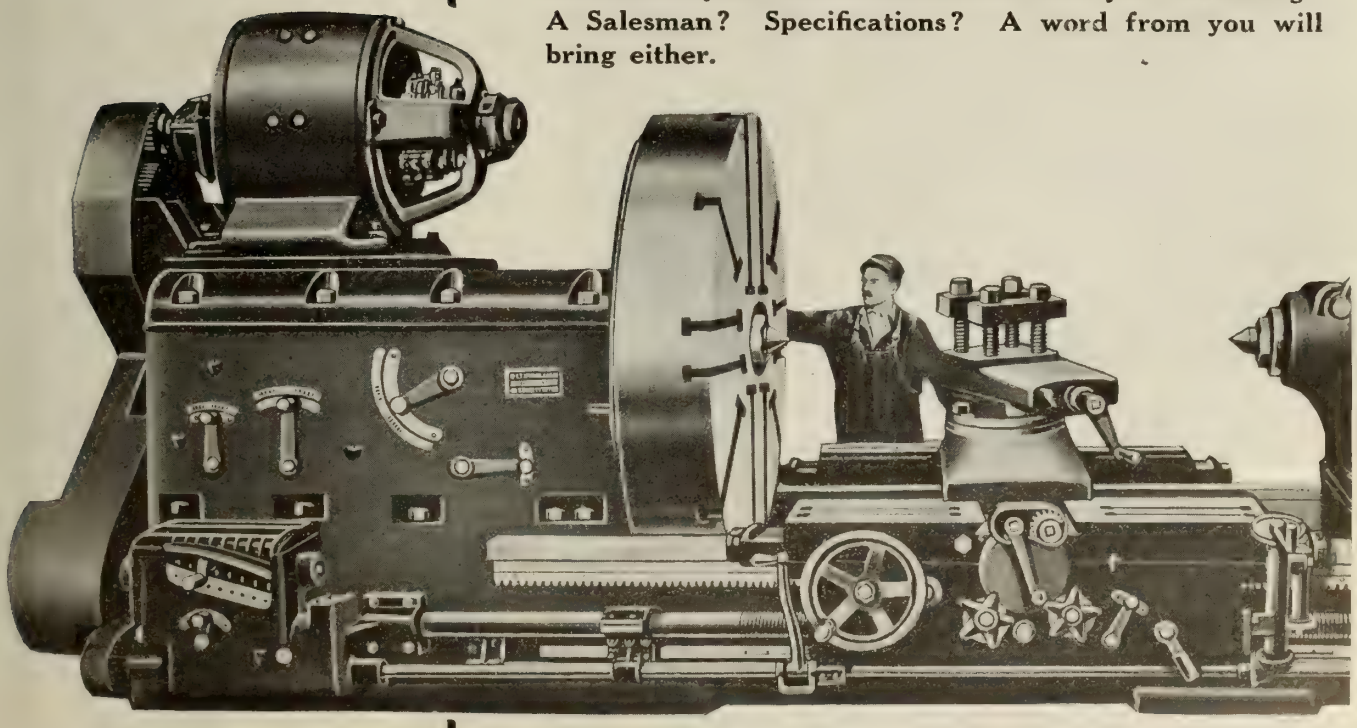
BRIDGEFORD

You Can Rely on BRIDGEFORD Lathes

Pace setters for twenty years in the heavy duty lathe field, BRIDGEFORDS can be depended upon absolutely. It would be like painting the lily for us to use the word "best" in connection with BRIDGEFORDS, but we are prepared to show you how you can increase production with BRIDGEFORDS.

Baldwin and American, in the locomotive field—New York Central, Pennsylvania, Southern Pacific, Santa Fe, in the railroad field—Cambria, Standard Steel Car, Bethlehem Steel, Standard Oil, International Harvester—all of these names are on our customer list. They are only a few of the prominent ones, though.

Let us send you a list of installations near you. A Catalog? A Salesman? Specifications? A word from you will bring either.



Makers of Heavy Duty Machine Tools Since 1861

BRIDGEFORD MACHINE TOOL WORKS

161 Winton Road Rochester, N.Y.

"LITTLE DAVID" PNEUMATIC DRILLS

Some Features Which Make "Little David" Drills

Economical
Speedy
Durable
Reliable

Ball and Roller Bearings

Drop Forged Gears (with cut teeth)

One Piece Connecting Rods

One Piece Gear Driven Rotary Valves

Simple and Accessible Construction

Completely Interchangeable Parts

Low Air Consumption for Power Delivered

Are desirable wherever there is portable drilling, reaming, tapping, flue rolling or wood boring to be done. They are also useful for valve setting and grinding, operating large gate valves, portable saws, boring bars, keyseaters, etc.

The "Little David" line embraces Reversible and Non-Reversible Drills, Close Corner Drills for drilling in cramped quarters, Wood Borers and Portable and Pedestal Grinders.

Catalogue 8607 describes "Little David" Drills in detail and contains some interesting information for users of pneumatic tools. May we send you a copy?

Canadian Ingersoll-Rand Company Limited

Sydney Sherbrooke Montreal Toronto Cobalt Winnipeg Nelson Vancouver

WILT

HIGH SPEED AND CARBON TWIST DRILLS, REAMERS AND MILLING CUTTERS

Quality Tools a Vital Necessity

Where there's a WILT—There's the way

Equip your plant with modern tools of the best quality. It is the vital necessity of the day to Manufacturers. Competition of the present and in the future demands it.

For your drilling, reaming and milling cutter operations, choose *WILT High Speed and Carbon Drills, Reamers and Milling Cutters.* As compared with any ordinary tool they cut faster, more accurately, require less power, require less re-grinding and give longer service—and they cost no more than ordinary tools.

Put them to the test—you'll find them best

Wilt Twist Drill Company
OF CANADA, LIMITED

Walkerville - - Ontario

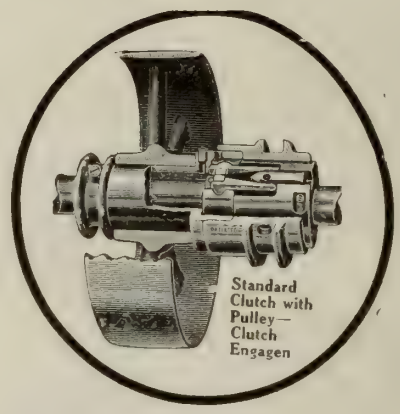
London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England

THE JOHNSON FRICTION CLUTCH

Clutches That Fit the Job

Misfits are always annoying—in power transmission they are usually costly. There is no excuse for having your clutches either overpowered or underpowered. We know from our long experience just what Johnson clutches will do.

If you will describe your conditions, we can meet them just right with a



JOHNSON
FRICTION CLUTCH
The clutch of a thousand uses.

WRITE TODAY FOR OUR YELLOW DATA SHEETS

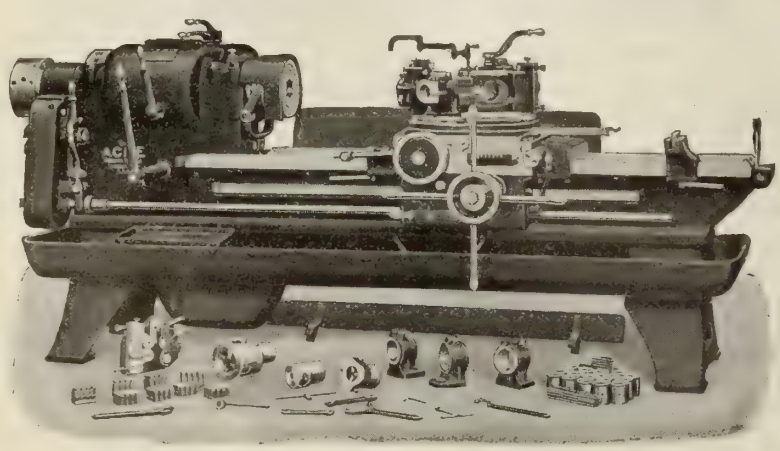
CANADIAN AGENTS:
WILLIAMS & WILSON, LIMITED, 84 Inspector Street, Montreal.
CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Doubly Efficient—Does Both Bar and Chuck Work

This Cincinnati Acme Flat Turret Lathe is a double-production, geared head machine of the sliding gear type. It operates on minimum power because the only gears running are those doing the actual work.

This machine saves remarkable time and labor machining either bar work or chuck work up to 16 in. diameter.



3¼ in. x 36 in. Flat Turret Lathe, Equipped for Bar Work.

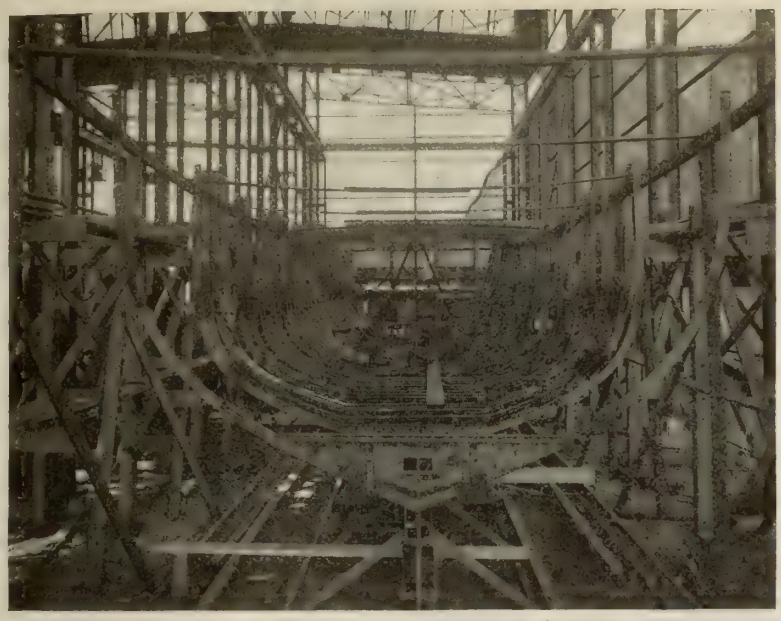
Head is cast solid with the bed. You know what that means: accuracy, rigidity, constant and perfect alignment of spindle with vees, upon which the turret carriage travels.

We also make a full line of Screw Machines and Turret Lathes.

Write for Valuable Bulletin

The Acme Machine Tool Co.
Cincinnati, Ohio

Canadian Agents: Rudel-Belnap Machinery Co., of Montreal and Toronto



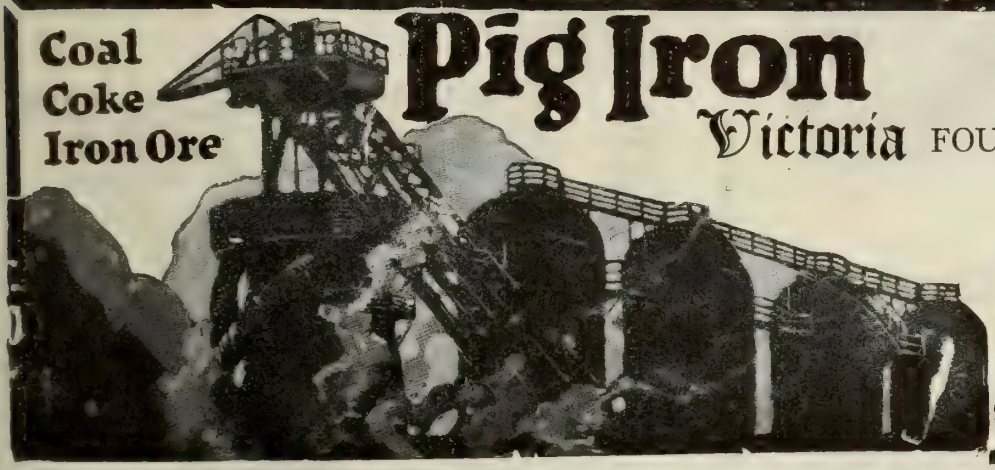
SHIP CASTINGS IN STEEL

STERN and RUDDER FRAMES,
SHAFT BRACKETS, ANCHORS,
ETC.

CANADIAN
STEEL FOUNDRIES
LIMITED

Transportation Building, Montreal

Coal
Coke
Iron Ore



Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
Port Colborne, Ontario, Canada

M.A. HANNA & Co.

Sales Agents:
CLEVELAND
Canadian Office:
904 C.P.R. Bldg., Toronto

FIRTH'S Speedicut HIGH SPEED Steel

Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

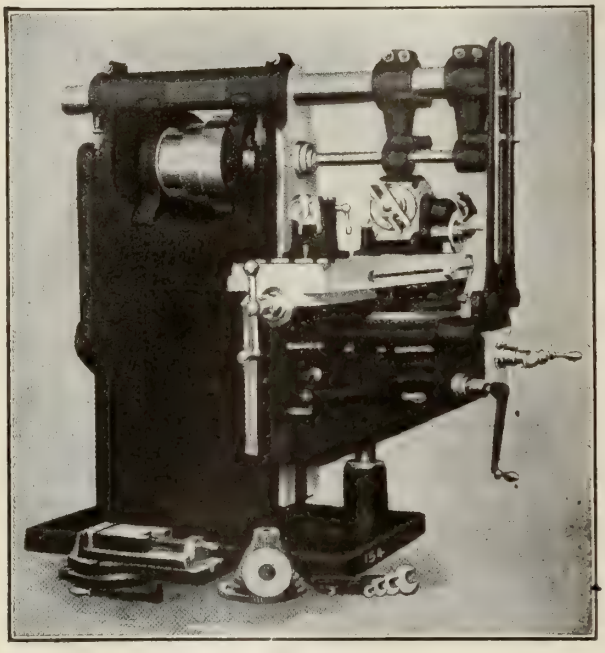
THOS. FIRTH & SONS, Limited, Sheffield, England

CANADIAN WAREHOUSES | 449 St. Paul St. West, MONTREAL
79 West Adelaide St., TORONTO

J. A. SHERWOOD
Canadian Manager

FORD-SMITH MILLERS

Attachments



No. 2 Full Universal

High productive service, efficiency, durability, thorough workmanship, best material and convenience in operation—all of these most necessary points are typical of Ford-Smith Milling Machines.

Superior standards in manufacturing coupled with rigid inspection of each detail of work guarantee accurate production and service.

Built by

The Ford-Smith Machine Co., Limited

Hamilton, Ont., Canada

War Record Not Made Public

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-7 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
Hartford, Connecticut

Dunbar

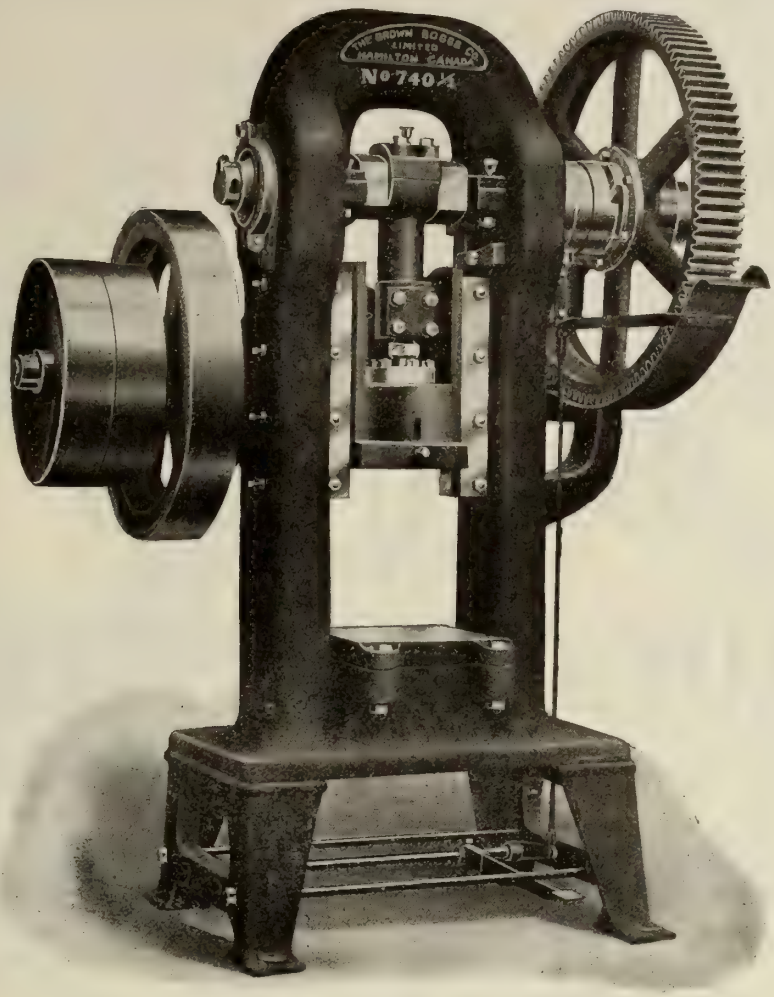
Springs *for* Every Use

We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and our experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for **accuracy** and **quality**. Send us specifications, for estimates.

THE DUNBAR BROS. CO.
BRISTOL, CONN.



No. 740½ Geared Press

The Manufacturer's Guarantee

Something you do not get with second-hand equipment, yet in many cases it will offset the difference in price between the second-hand and new machine.

Play Safe, get our prices on new equipment before you close for the old.

A large stock of different sizes and styles of presses on hand for immediate shipment.

The Brown, Boggs Co., Limited
Hamilton, Canada

Manufacturers of Sheet Metal Working and Tinsmiths' Tools and Machinery, Presses, Shears, Rolls, etc.

BRITAIN'S BEST

KE

BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and Cold Rolled Strips, Cold Drawn Cast Steel, Wire and Drill Rods

HIGH GRADE STEEL FOR ALL PURPOSES

KE KELOCK

Our Principal Trade Marks

KAYSER ELLISON & Co LTD

ESTABLISHED 1825 SHEFFIELD, ENG.

Complete Stock - Montreal Warehouse

RALPH B. NORTON

Agent

126 Craig St. West Montreal, Que.

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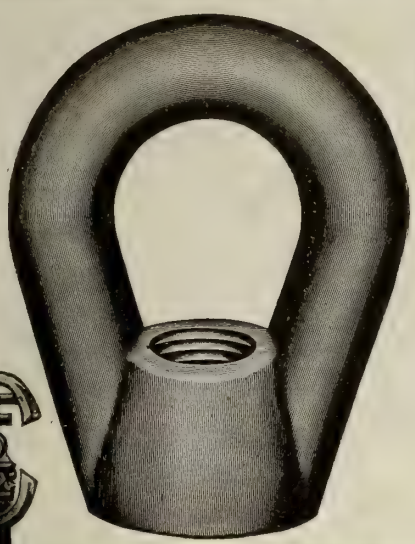
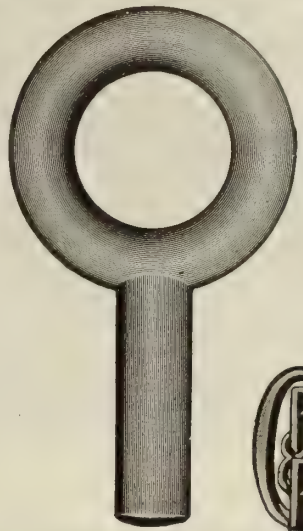
FOUNDRIES & FORGINGS
LIMITED



DROP FORGED STEEL

all sizes

Produced at
Canadian Billings & Spencer Plant
Welland, Canada



Crucible
AND
Open Hearth Steel

Tool Steel

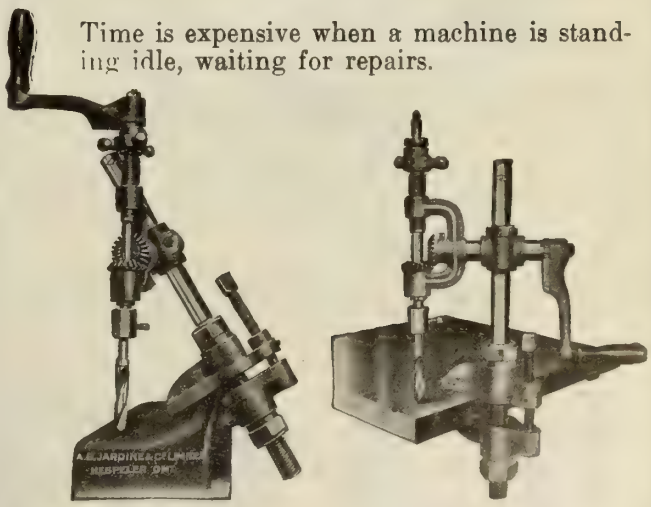
"ARGO" BRAND *HIGH-SPEED* STEEL

The John Illingworth Steel Co.
1856
Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
Montreal, Canada

Jardine Universal Ratchet Drill

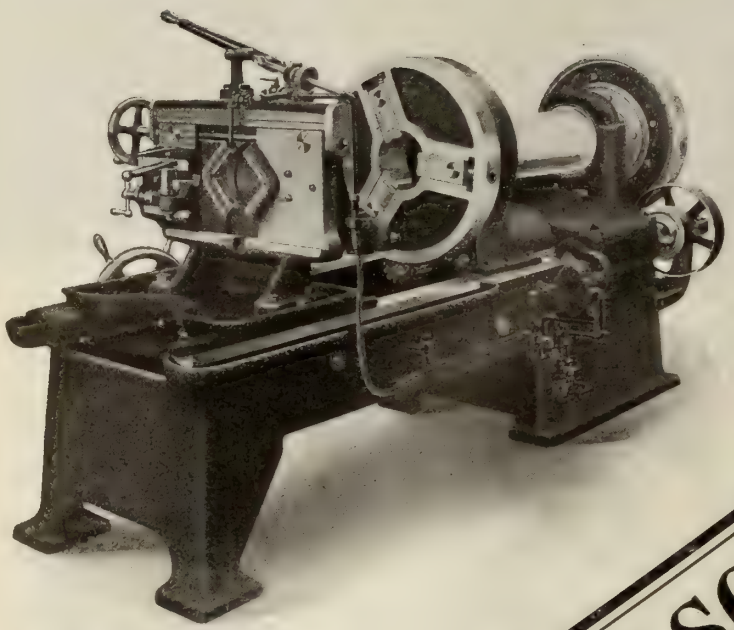
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO



OUR SPECIALTY
PIPE MACHINERY

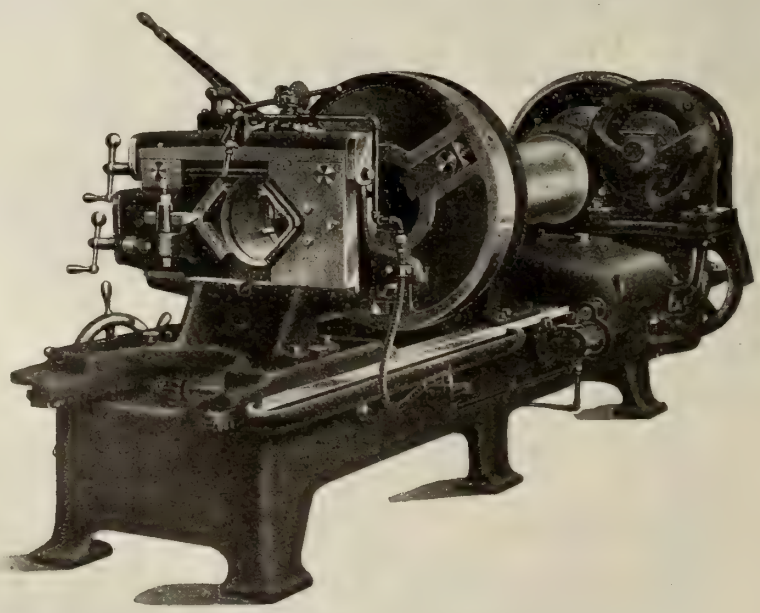
JOHN H. HALL & SONS, LIMITED

BRANTFORD, ONTARIO
MANUFACTURERS OF

Pipe Threading Machinery

No. 6 Belt Drive
Capacity 1¼ to 6"
Built to
Last

All
Sizes
Pipe Machines
Nipple Machines
Roller Pipe Cutters



No. 8 Motor Drive
Capacity 2½ to 8"

Write for new
Descriptive Bulletins
Just Issued

Accuracy

THE steady, even, smooth delivery of power through Link-Belt Silent Chain Drives hold constant the deflections in the machine parts with the result that the tool cuts away the metal without the tearing and chattering that occurs with the shock of high-speed gears, or with the creep and slip of leather belts.

This makes possible a greater degree of accuracy when finishing parts to a fine precisional standard and also provides a better finish.

Link-Belt Silent Chain Drives also increase output about 20%, reduce power required about 20% and increase the service obtained from cutting tools from 4 to 10 times. They are "flexible as a belt, positive as a gear, more efficient than either". Send for our Machine Tool Drive Book No. 312.

CANADIAN LINK-BELT COMPANY
LIMITED

WELLINGTON AND PETER STREETS, TORONTO

LINK-BELT
SILENT CHAIN DRIVES

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Western Sales Offices:
Room 14 WindsorHotel
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process

E S&M

ELECTRIC
Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

Send us your drawings for estimates.

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED
WELLAND ONTARIO

G G

Forging Billets and Bars
Electric Furnace, Alloy Steels

Die Blocks
Annealed—Heat Treated

Piston Rods
Rough Turned—Annealed—Heat Treated

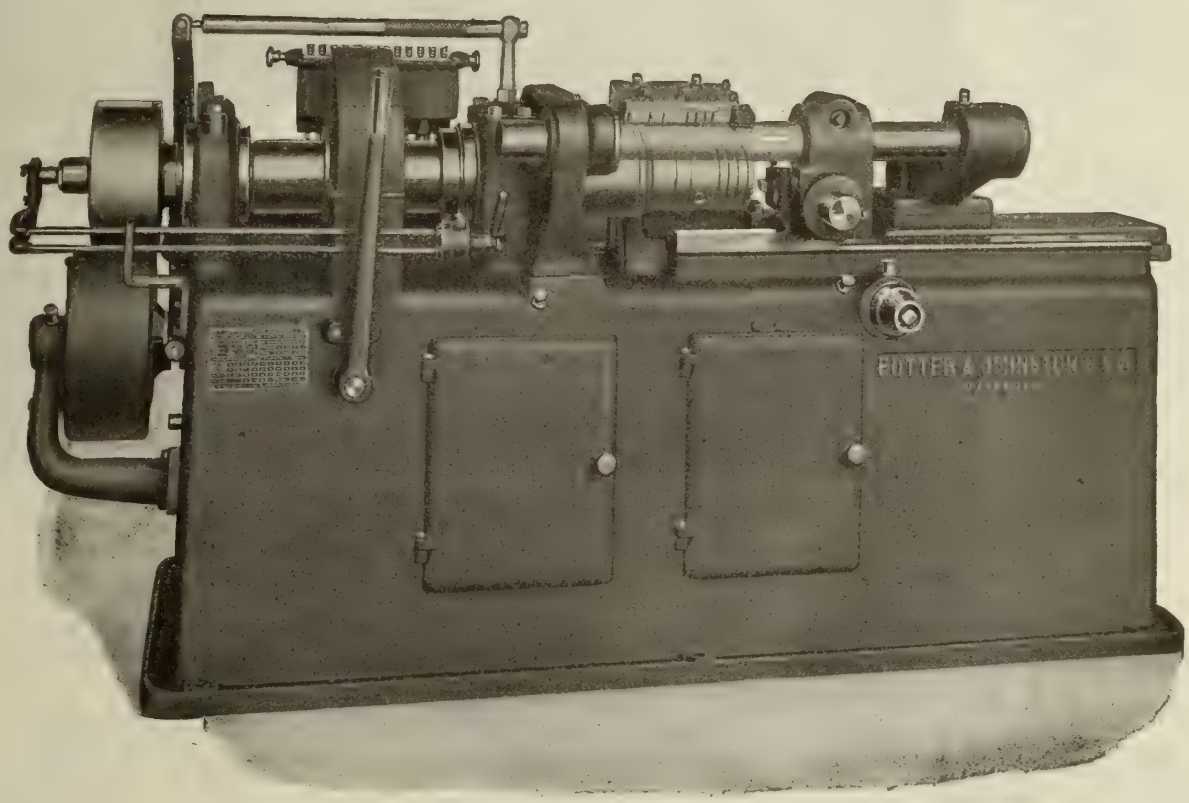
High Speed Steel

General Steel Company
Milwaukee, Wisconsin
DETROIT—823 Dime Bank Building

PISTONS AND PISTON RINGS MACHINED AUTOMATICALLY

Most Efficient. **Most Economical.**

One attendant operates two or three machines. Boring and turning tools piloted insures extreme accuracy and maximum output.



2P Combination Piston and Piston Ring Machine, showing method of automatically machining pistons, with air-operated drawback arbor, piloted turning tool holder, cross slide grooving and facing block. Over fifty machines installed by the largest Automobile builder in the world is a fitting testimonial as to the efficiency of the Automatic Piston and Piston Ring Machine. Let us have your drawings or samples for production estimate.

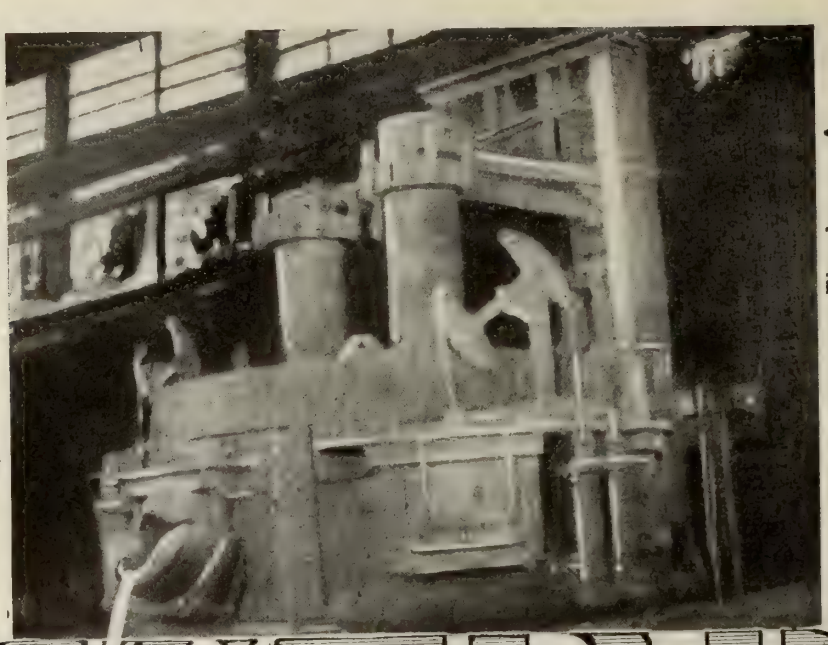
May we send you Bulletin 24?

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 1501 Royal Bank Building, Toronto, Canada

Works and Warehouse: Galt, Ont., Canada.



ELECTRITE

High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces — entirely infallible, automatically regulated, delivering the same result time after time.

Uranium — This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
LATROBE, PENN.

URANIUM

"WACO"

HIGH SPEED STEEL

"WACO" TRADE MARK

TRADE MARK

"DOUBLE WACO" 18% Tungsten, for Railway and Tramway Tires and Hard Metals
"WACO" 14% Tungsten, for Turning, Planing and Slotting Tools, Milling Cutters, Taps, Rimers, Twist Drills

CARBON TOOL STEELS
for
Engineers', Railway, Boilermakers', Shipbuilders', Miners and Blacksmiths' purposes in various qualities
Diamond Special Extra Best Quality Best Warranted Warranted Ordinary
Each quality supplied in different tempers to suit tool required

DIE STEELS
for
Screwing Dies, Stamping Dies, Top and Bottom Nail Dies, Cartridge Dies, Mint Dies, Dies for Hot Stamping, Drawing Dies

COMBINED IRON AND STEEL
for
Beds, Dies, Machine Irons, Blades, etc.

MINERS' DRILL STEEL
In three qualities
Extra Special Special Ordinary

HOLLOW DRILL STEEL
Round or Octagon
Stainless Cutlery Steel Single or Double Shear Steel

SPECIAL MAGNET STEEL
Hammer and Wedge Steel, Scythe and Sickle Steel
"WACO" High Speed Twist Drills Carbon Twist Drills

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
WM. ATKINS & CO., LIMITED
SHEFFIELD - - ENGLAND

PRICES ON APPLICATION FOR IMPORT OR STOCK ORDERS

Vulcan Tool Steels

for Every Purpose

"You can't make a silk purse out of a sow's ear"

and we have never tried to.

The fact that we have been making the finest Tool Steels

SINCE 1900

at the same location and for a steadily increasing number of *Satisfied Customers* is the best evidence that *we will continue* to make *only the best steels.*

Vulcan Crucible Steel Co.

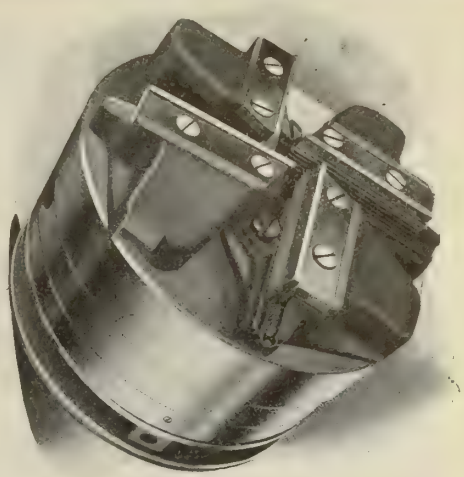
ALIQUIPPA *Established 1900* **PA., U. S. A.**

Makers of Wolfram High Speed Steel

BRANCHES:

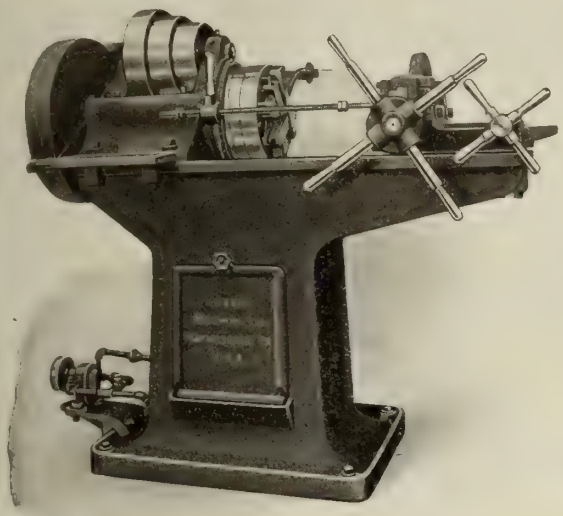
Boston	102 Purchase Street	Montreal	Herald Bldg.
Chicago	16-18 So. Clinton Street	Newark, N. J.	52 No. 11th Street
Detroit	310 New Telegraph Bldg.	St. Louis	1215 International Life Bldg.

"No Trouble to Make Them as Fine as Lathe Chased Threads"



said the user of Landis Threading Machines and this is not astonishing when you consider that the design of the Landis Die is but the combination of four lathe tools.

This design permits the chaser to be ground to suit the material being threaded whether it is iron, steel, brass, bronze, etc: In this manner an ideal cutting condition is obtained and the resulting threads cannot help but be accurate and well finished.



The chaser is tangentially disposed to the work and is located on a centre line. This means no drag, but instead a free cutting condition which permits of exceptionally high cutting speeds.

Apply the time-proven lathe tool principle to your threading by installing the Landis Die Head or Machine.

Details upon request.

Landis Machine Company

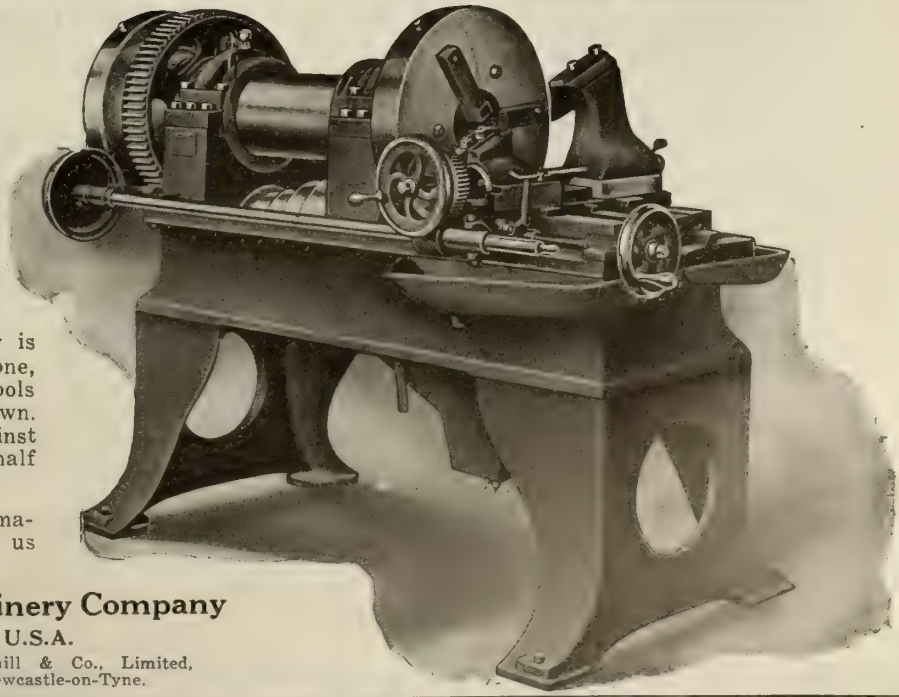
Waynesboro, Pa.

Cut Your Cutting-off Costs in HALF

HURLBUT'S

Patent Cutting-off and Centering Machines

TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.



Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

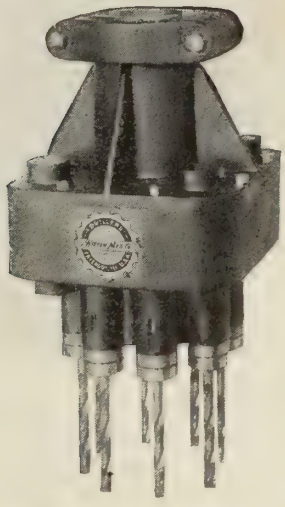
You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

The Hurlbut, Rogers Machinery Company

South Sudbury, Mass., U.S.A.

Foreign Agents—England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.

2 Minutes or 20?



This Is The Vital Question

Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time cost.

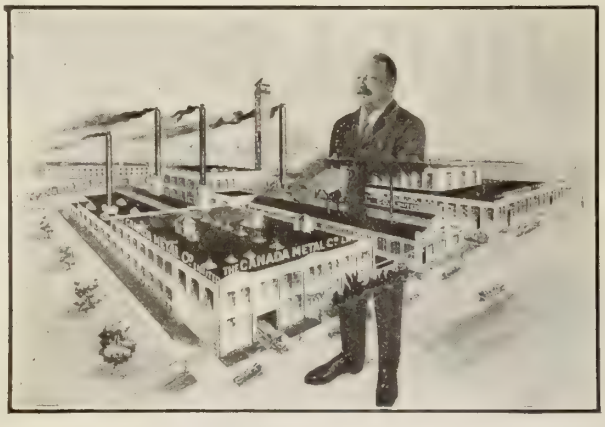
THE HOEFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Building, Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House For Mechanical Goods"

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria



IMPERIAL GENUINE BEARING METAL
For High Speed, Heavy Engine Bearings

HARRIS HEAVY PRESSURE
For General Machine Bearings.

ALUMINOID BEARING METAL
For Light Countershaft Work.

THE CANADA METAL COMPANY LIMITED
Toronto Montreal Winnipeg Vancouver

THE

TRADE K–T MARK

FOUNDRY
GALT - ONT.

Do Your Castings Cost Too Much?

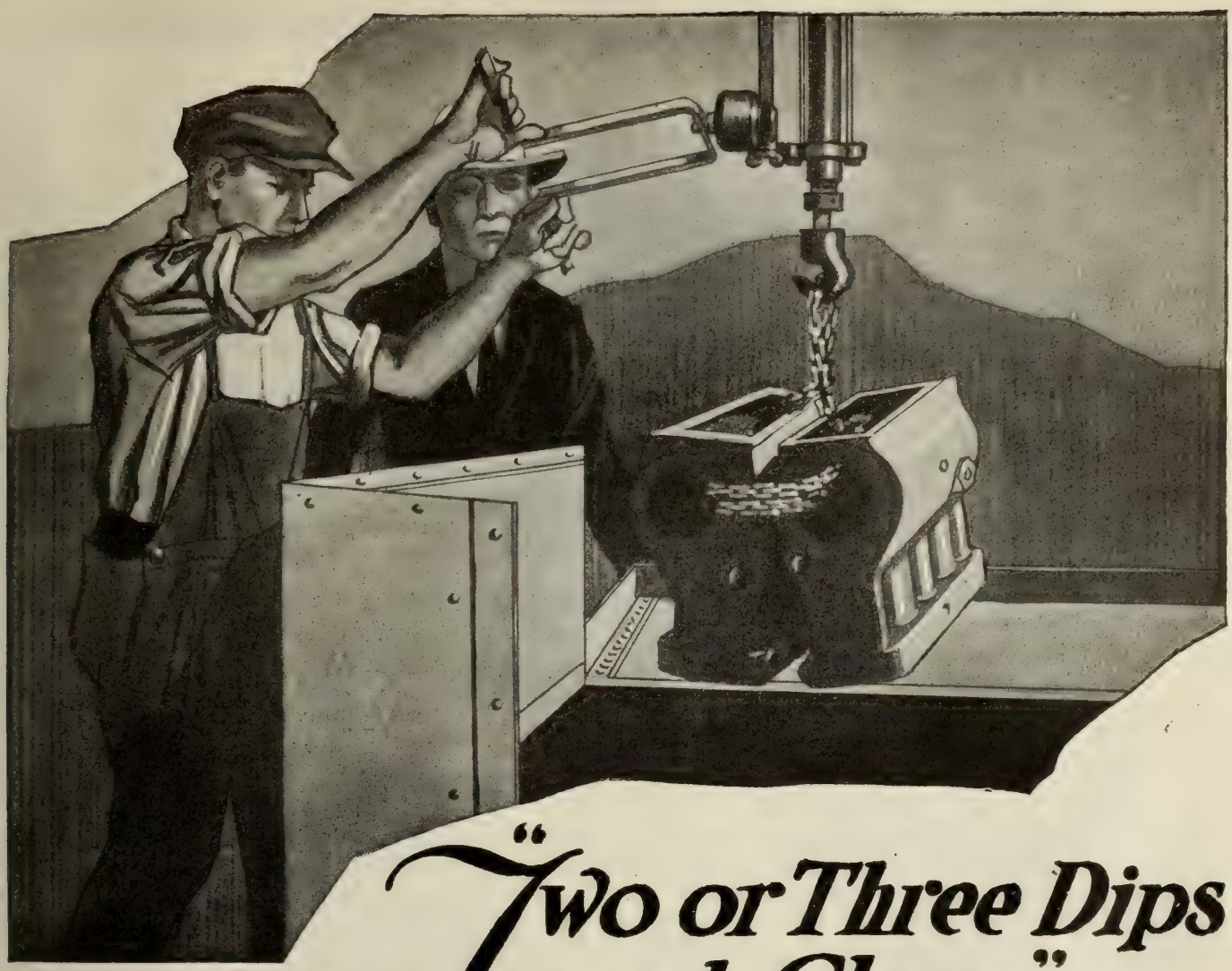
A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US



"Two or Three Dips —and Clean".....

"Two or three dips in the Oakite cleaning tank, and the cylinder blocks are clean.

"We use 4 ounces of Oakite to the gallon of hot water for the cleaning solution.

"Oakite keeps the cleaning department on time. It speeds up the work—and the motor parts come through *clean.*

"No more come-backs from the assembling room since we began using Oakite."

This Advertisement is one of a series based on actual occurrences. W. W.

Correspondence invited.

OAKITE MANUFACTURED BY
OAKLEY CHEMICAL CO.
44 THAMES STREET · NEW YORK

Confidence

CLIPPER belt lacing has the confidence of American manufacturers. A complete list of Clipper users would include the leaders in every line of American industry. We are proud to be able to count among our customers the following nationally known manufacturers. It is needless to say that none of their plants lack anything that will make them efficient to the last degree.

Waste has been reduced to the minimum. The saving of time has been made the study of experts, with the result that they have adopted Clipper belt lacing.

It is not an exaggeration to assert that Clipper belt lacing predominates in all the manufacturing centers of the world.

American Agricultural Chemical Co.
American Radiator Co.
American Straw Board Co.
Baldwin Locomotive Works
Belding Bros. & Co.
Berkey & Gay Furniture Co.
Bissell Carpet Sweeper Co.
Buck's Stove & Range Co.
Chicago Pneumatic Tool Co.
Columbia Graphophone Co.
Continental Motors Corporation
H. J. Heinz Co.
Hoover Steel Ball Co.
Hyatt Roller Bearing Co.
International Harvester Co.
International Silver Co.
J. B. Williams Co.
Macbeth-Evans Glass Co.
Midvale Steel & Ordnance Co.
National Lead Co.
Neptune Twine & Cord Mills
Owens Bottle Machine Co.
Packard Motor Car Co.
R. J. Reynolds Tobacco Co.
The Aladdin Co.
The American Woolen Co.
Timken-Detroit Axle Co.
United Shoe Machinery Corp.
Westinghouse Electric & Mfg. Co.
Willys-Overland Co.
Winchester Repeating Arms Co.
Yale & Towne Manufacturing Co.

These names (only a single one selected from any industry) are used by permission. Hundreds of others, equally representative, in all industries, might be listed if space permitted.

The Clipper Belt Lacer
Laces a Belt in Three Minutes

Any machine workman can lace a belt with the Clipper. The low cost of the Clipper makes it possible to maintain Clipper equipment at convenient points around the plant.

The Clipper makes a durable joint—one that pulls better and is safer—is flush with the belt on both sides and is more flexible than the belt itself.

The Clipper goes to you for free trial. It is perpetually guaranteed where Clipper hooks are used. The American Museum of Safety gave the Clipper the only gold medal ever awarded for metal lacing. Use of the Clipper in your plant will solve effectively your belt lacing problems.

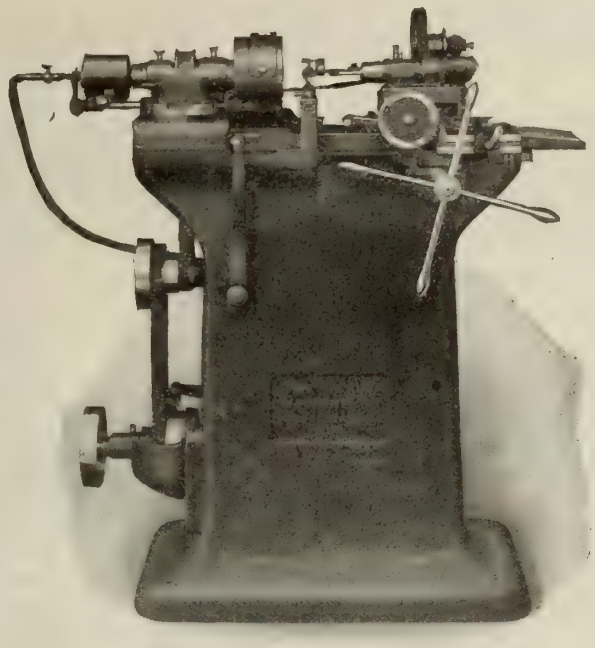
Some mill supply dealer in every city sells the Clipper

Clipper Belt Lacer Company

GRAND RAPIDS, MICHIGAN, U.S.A.

CAPACITY:

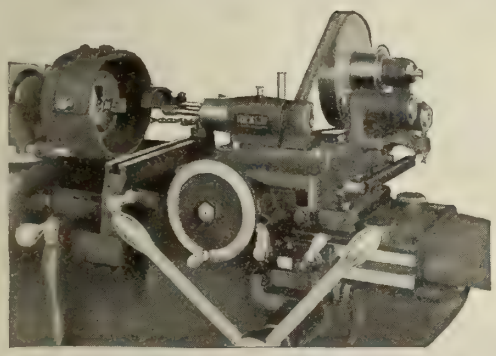
Grinds ¼″ to 2″ dia. x 4″ long.
Collet capacity ⅜″ to 3″ dia.
Swing 6″ dia. with water guard.
Swing 10″ dia. without water guard.
Diameter of workhead bearings 1⅝″ to 1⅜″ dia.
Net weight complete, 1,100 lbs.
Floor space 26″ x 50″.



FEATURES:

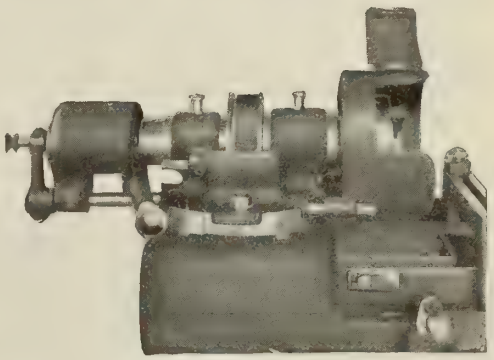
Automatic Brake for work.
Also stops flow of water.
Device for preventing distortion of work when chucking.
New Type 10 wheelhead.
Flexible idler—automatic wheel guard.
Positive stop for table.

FOR GRINDING SMALL SHORT WORK



New design type 10 wheel-head with flexible idler. This combination has proved unusually successful in giving finish and production.

NEW HEALD No. 85 INTERNAL GRINDER



Rigid workhead with massive bearings bolted directly to the base.
Lever which operates quick-acting collet.

A new spindle productive machine for small, short work. While it is simple to an extreme, the following features put it in a class by itself.

It is arranged so that movement of the pilot wheel to the right not only draws the wheel from the work, but automatically applies a brake, stopping the workhead and shutting off water supply.

The quick acting collet operated by a lever and which has a special adjustable compensating device against distortion of any thin work which is being held.

The table is provided with a positive stop accurately covering the travel, enabling the operator to grind up to a shoulder or any given point without danger of over-running. Lever for cross-feed of head is situated so it can be operated with the left hand while the right can still grasp the pilot wheel.

The machine is also equipped with flexible idler — automatic wheel guard — water attachments—and simple, single countershaft.

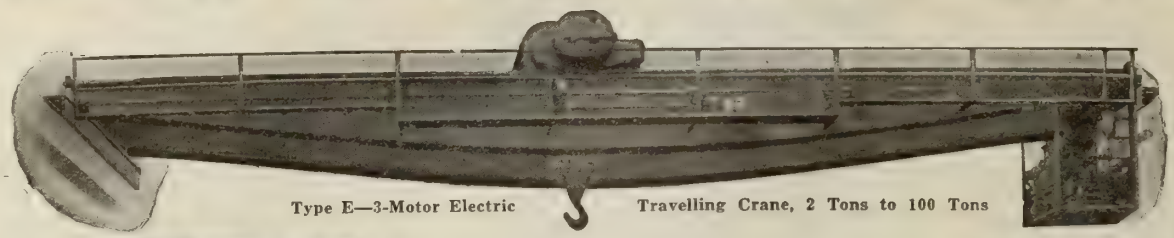
THE HEALD MACHINE COMPANY

WORCESTER, MASS.

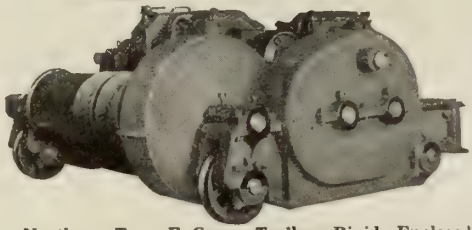
BRANCH OFFICES: New York, 839 Singer Bldg., Philadelphia, 1308 Commonwealth Bldg. Chicago, 26 South Jefferson St. Detroit, 401 Marquette Bldg. Cincinnati, 311 Provident Bank Bldg. Cleveland, 721 Engineers Bldg. Western Agents: Eccles & Smith Co., Los Angeles, San Francisco and Portland. Salt Lake Hardware Co., Utah and Idaho.
FOREIGN AGENTS: Alfred Herbert, Ltd., England. Societe Anonyme, Alfred Herbert, France, Switzerland. Societa Anonima Italiana, Alfred Herbert, Italy. F. W. Horne Co., Japan. Wilh Sonesson & Co., Sweden, Denmark and Norway. Henri Benedictus, Brussels, Belgium. American Machinery Syndicate, Spain and Portugal.

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

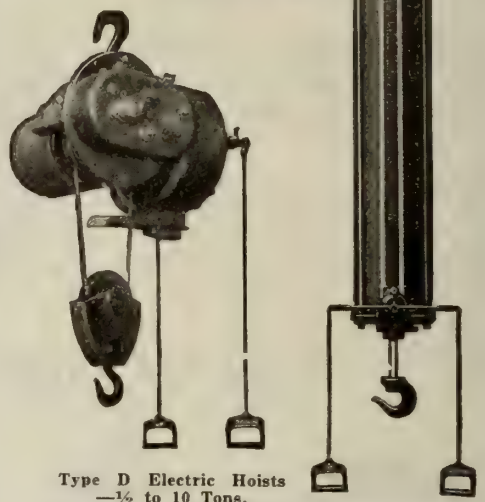


Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons



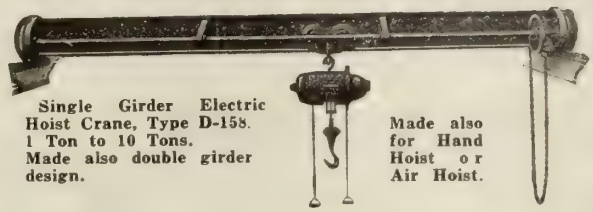
Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Type D Electric Hoists —½ to 10 Tons.

Type No. 20 Air Hoist.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Northern Crane Works, Limited

Walkerville, Ontario, Canada

Air Hoists, Trolleys and Tracks.

Swedish Steel & Importing Co., Limited

Montreal New York Toronto Denver

Direct representatives of foremost Swedish mills; makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK SS DOUBLE ESS

PROMPT SHIPMENTS from large stock

NOVO-SUPERIOR

HIGH SPEED STEEL

INTRA STEEL GIBRALTAR STEEL

Tool Steel for Every Purpose

Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY, LIMITED

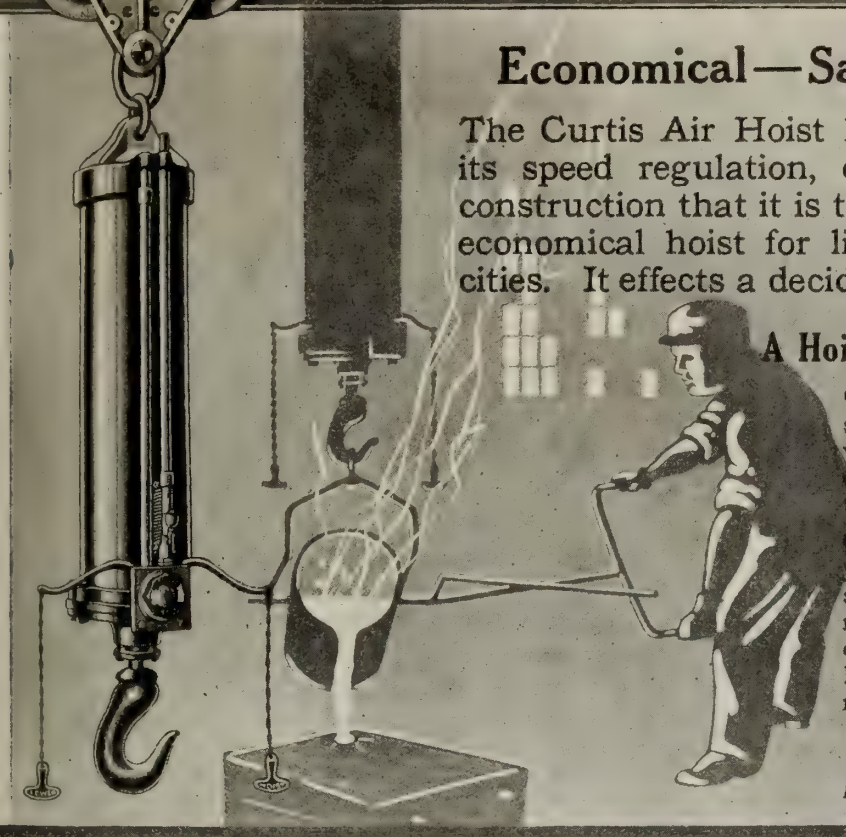
332 St. James Street, Montreal

Sole Agents for

JONAS & COLVER, LIMITED
Novo and Continental Steel Works, Sheffield, Eng

H. BOKER & CO., Inc.
New York, N.Y.

CURTIS *Air Hoists*



Economical—Safe—Dependable

The Curtis Air Hoist has been so perfected in its speed regulation, design and mechanical construction that it is the simplest, safest, most economical hoist for light and medium capacities. It effects a decided saving in man power.

A Hoist to Meet Your Needs

CURTIS AIR HOISTS have been successfully adapted to meet a wide variety of needs in hundreds of the leading industrial plants throughout America.

Our Engineering Department is at your service, ready to study any special conditions you have to meet and recommend suitable equipment. Illustrated descriptive literature and full information on request.

Curtis Pneumatic Machinery Co.
1585 Kienlen Ave., St. Louis, Mo.
Branch Office—532-A Hudson Terminal, N.Y.C.

"TALLMANS' SPECIAL" ARCTIC METAL

a medium-priced babbitt specially adapted for Saw Mill and Woodworking machinery.

Will remain cool under exceptionally high speed.

Its long life proves its efficiency.

Tallman Brass & Metal Limited
HAMILTON, ONT.

DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

INDUSTRIAL GEMS

THE GENERAL SUPPLY COMPANY of CANADA, LIMITED

OTTAWA	TORONTO	MONTREAL	WINNIPEG
356 Spark St.	38 Toronto St.	408 McGill Bldg.	85 Water St.

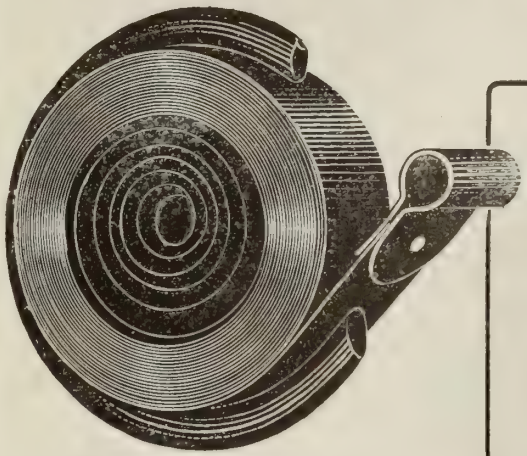
VANCOUVER
906 Vancouver Block

Sole Canadian Agents for

THE JOYCE-KOEBEL COMPANY, INC.
Formerly Geo. A. Joyce Co. Ltd.
NEW YORK LONDON

The Wallace Barnes Company

SPRINGS, WIRE & STEEL EST. "BARNES-MADE" PRODUCTS 1857 SCREW MACHINE PRODUCTS



"Barnes made for every trade"

A "Quality" Department

in which the customer's interests are safeguarded. A unique feature of our organization.

In this department is the record of every order, with full specifications and recommendations.

Throughout the entire time that an order is being filled, the Quality Department keeps up a rigid inspection, assuring the complete fulfillment of every order in every detail. "Barnes Made" Springs are consequently the realization of the buyer's exact requirements.

ESTABLISHED 1857

THE WALLACE BARNES COMPANY

FLAT AND WIRE SPRINGS OF EVERY TYPE

SCREW MACHINE PRODUCTS - HIGH CARBON COLD ROLLED STEEL

MAIN OFFICE AND WORKS. BRISTOL, CONN.

50 EAST 42ND ST. N.Y. CITY. BOOK BUILDING. DETROIT, MICH.

Quality Dept.

Individuality

A GREAT MAN wrote this: "I'm called away by particular business, but I leave my character behind me." And nobody had to guess whose character it was. Even if the familiar Red Cut label should disappear there would be no doubt as to the character of the steel that remained. More than ever would the quality shine forth in the results when it was worked. Adherence to the highest standard with an unvarying uniformity has placed a well merited reputation all its own on

"Red Cut Superior"

THE NATIONALLY KNOWN - - FIRST QUALITY

HIGH SPEED STEEL

THE BEST FOR ALL MACHINE WORK

VANADIUM-ALLOYS STEEL CO.

General Sales Offices - - - - Pittsburgh, Pa.
Works - - Latrobe, Pa.

BRANCHES

BUFFALO
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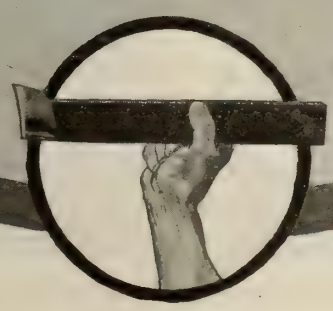


RED-CUT SUPERIOR HIGH SPEED STEEL — VANADIUM ALLOYS STEEL CO. LATROBE, PA. — TRADE "VASCO" MARK

CUT YOUR CUTTING COST WITH VICTOR Flexibles

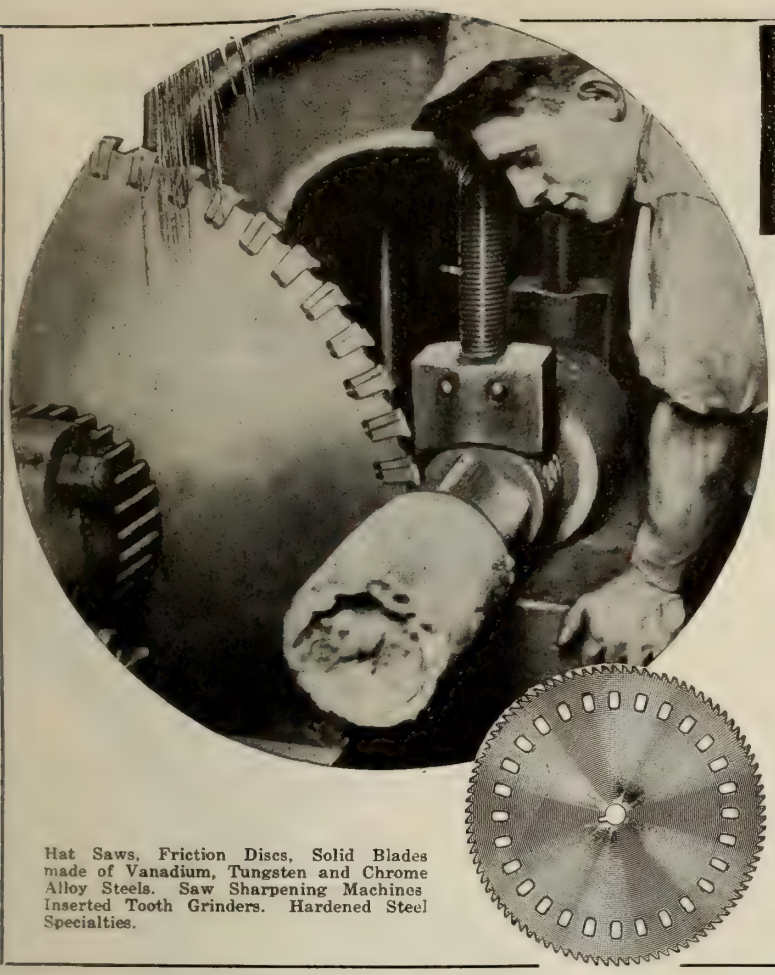
The high cost of tools should emphasize more than ever the importance of quality.

The high cost of hack saw blades ought to drive every hand blade user over to the saw that does not break in ordinary hand work.

VICTOR FLEXIBLE HACK SAW BLADES have exactly the same cutting power as the finest All-Hard on the market, and that they cannot be broken in use except by intentional abuse is an undisputable fact—which will represent a saving from twenty-five percent to thirty-three and one-third percent in breakage alone.

Seventy-five percent of the All-Hard blades used in hand frames break before they are worn out. Watch the All-Hard blades in your own shop and see the enormous amount of breakage—then use VICTOR FLEXIBLES and note the economy.

VICTOR SAW WORKS LTD - HAMILTON, CANADA



Hat Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines Inserted Tooth Grinders. Hardened Steel Specialties.

HUNTER
Duplex Saws

The selection of many of the best and largest companies in the country for cutting ingots, bars, forgings, castings, rails and structural shapes.

Their fast cutting qualities mean a saving of time and power, plus increased production.

Teeth are accurately formed, ground and set for highest speed and greatest endurance. Made in sizes up to 90 in. in diameter.

Write for price list and full particulars

HUNTER SAW & MACHINE CO.
Pittsburgh, Pa.

Standard the World Over

"THE RACINE"

HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue - RACINE, WIS. U.S.A.

To cut down the cost per cut

A Matter of Teeth

The efficiency of a hack saw blade depends almost entirely upon the rake, the "set," and the pitch or number of teeth to the inch.

There's no overhanging "hook" to the teeth on a Starrett blade. With proper adjustment of weight or pressure, they'll cut just as fast on the last cut as on the first. The teeth are uniform in shape, "set" and spacing. That's why every blade in a box of Starrett saws cuts alike.

Starrett Hack Saws are made in varying pitches or number of teeth to the inch, from 10 to 32, according to the work they are intended for.

Different kinds and shapes of metal need different blades for economical cutting. Get Starrett blades, use them according to the Starrett Hack Saw Chart and watch your cost per cut decrease.

Write for Catalog 21-"3". It's free

THE L. S. STARRETT CO.
The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

the blade

Use Starrett Hack Saw Blades

42-963

BROWN'S

Beaver Brand Metals

Copper, Brass, Bronze, Canada Silver, and Gilding Metal in sheets, rolls, plates and rods. Naval Bronze, Yellow Metal and Muntz Metal in sheets and rods for shipbuilding requirements. Specify Beaver Brass Rod for drilling and free cutting.

Link up with Beaver Brand Products—you'll like the quality, price and service.

Brown's Copper & Brass Rolling Mills, Limited

New Toronto, Ont., Can.

COPPER & BRASS BROWN'S QUALITY ROLLING MILLS

MALLEABLE AND CAST IRON PIPE FITTINGS

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

When ordering from your jobber be sure you buy—"the brand that has the quality." They are different. A trial order will convince.

International
Malleable Iron Company, Limited
Guelph, Ontario, Canada

A WALL RADIAL DRILL

That Puts Dollars in Your Pockets

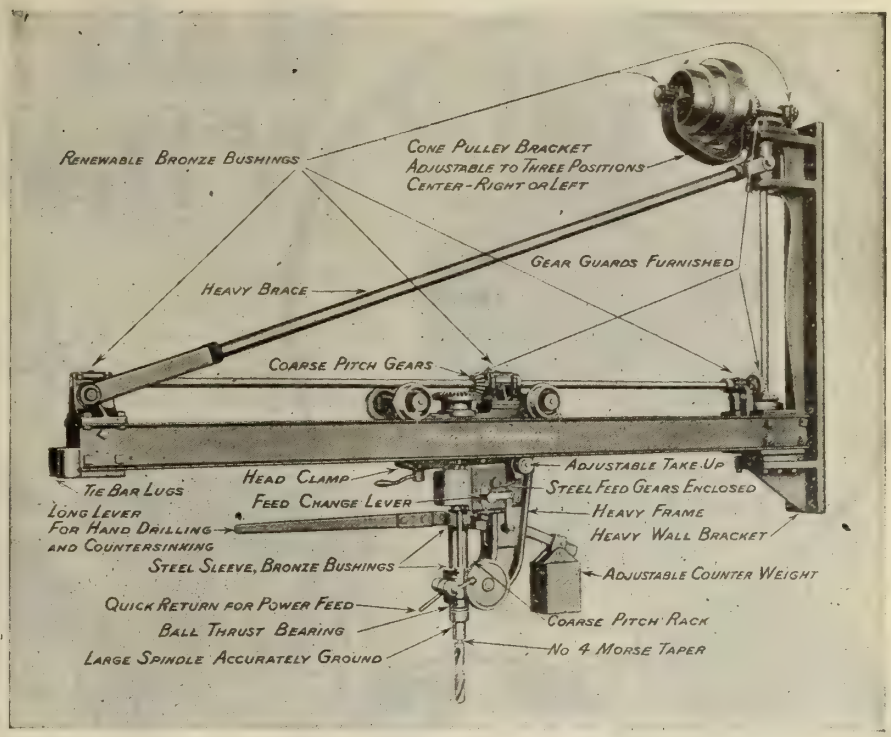
Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions in your pocket by the installation of this machine.

Send for Detailed Bulletin

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue **BOSTON, MASS.**

The Hammer With The Human Stroke

HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

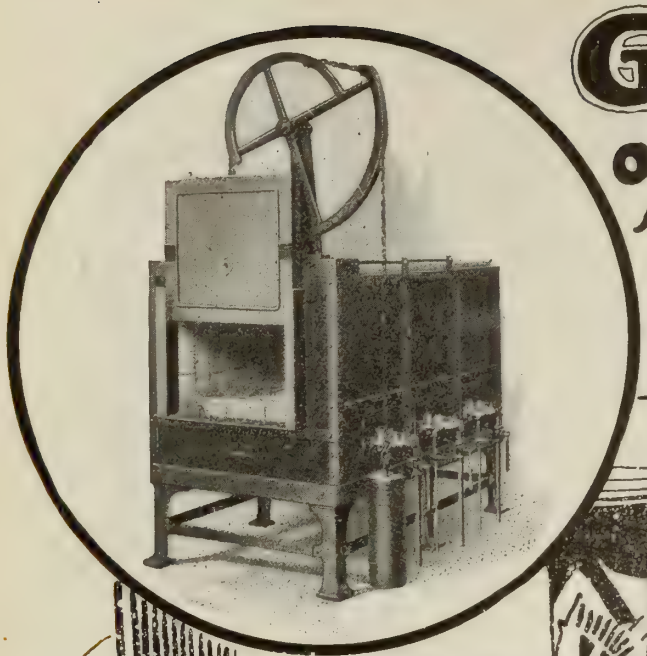
Send us sample assembly parts with rivets or sketch of your work,

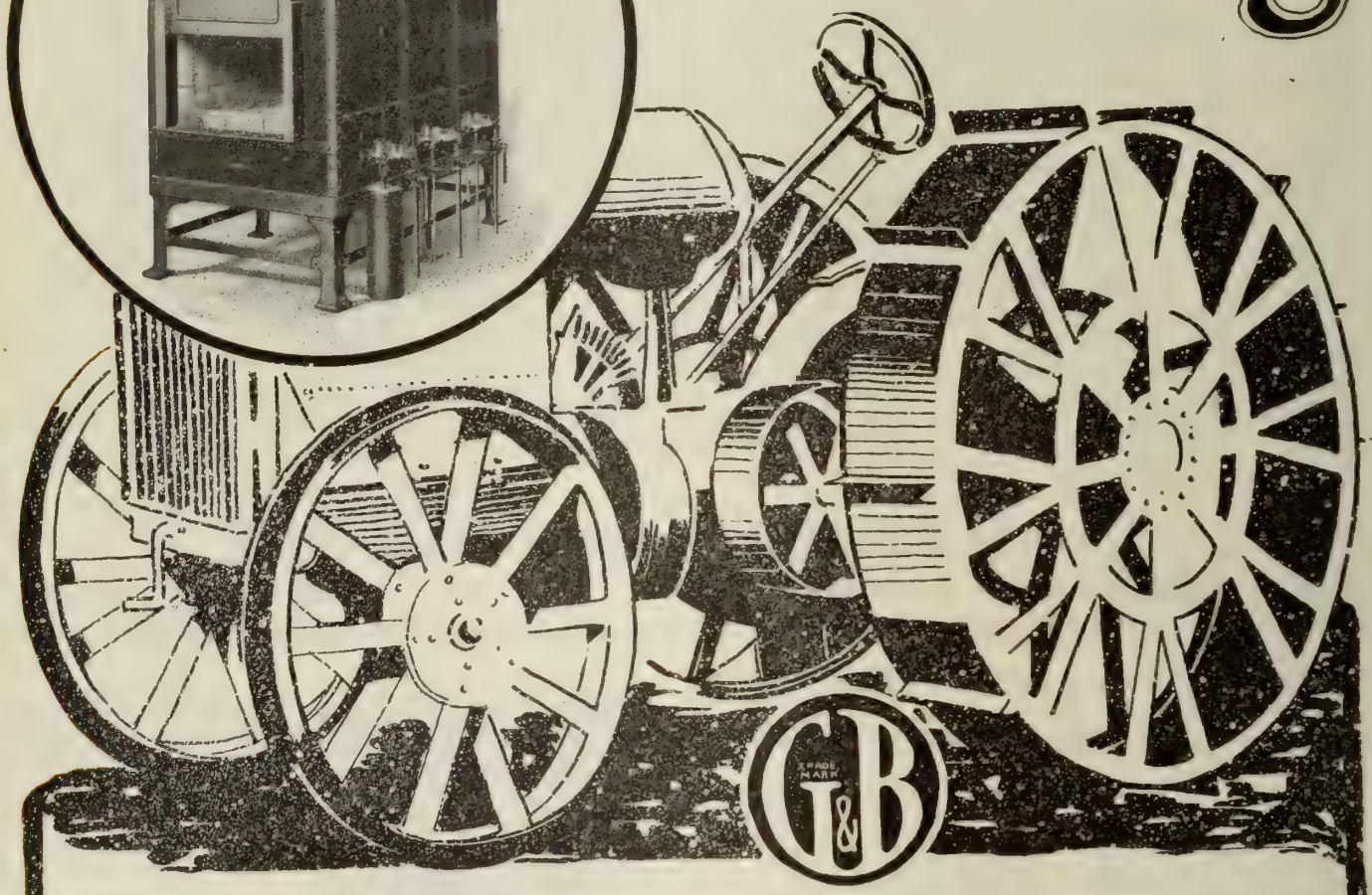
and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
ROCHESTER, N.Y.

G&B Method of Heat-Treating





Gilbert & Barker Method the Right Method of Heat-Treating

Used by the Largest Manufacturers of Autos and Trucks.

Whether you manufacture tractors—automobiles —trucks—crankshafts—camshafts —tools—machine parts or anything else that requires heat-treating unless you have the **right** kind of heat-treating furnace for the purpose, you are defeating your own purpose, that of turning out a first-class product of uniform high quality.

GILBERT & BARKER FURNACES INSURE PERFECT COMBUSTION—ABSOLUTE TEMPERATURE CONTROL UNIFORMITY OF HEAT

the result of which is an exceptionally high grade product which measures up to the best manufacturing standards. There is a G. & B. Furnace exactly suited to your requirements. Let our engineers advise you—write. **To-day is a better day than to-morrow to send for Bulletin 24.**

Gilbert & Barker Manufacturing Company

17 Union Street · **Springfield, Mass.**

ESTABLISHED 1865

New York Office: 26 Broadway. **Canadian Agents: Williams & Wilson, Limited, Montreal, Que.**

SAVED

In number of cutters used..... 66 2/3%
In take-down time..... 66 2/3%
In grinding time..... 66 2/3%
In setting-up time..... 66 2/3%

This is the record in another competitive performance of

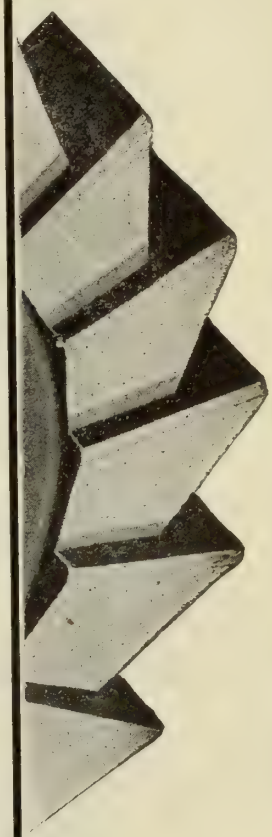
DAVIDSONIZED
HIGH SPEED STEEL TOOLS

Here are the facts as stated by the user of the tools, one of the best known big production plants (name on request):

"Up to the 12th of this month, there have been milled with these cutters 4,296 pcs., and the cutters are still in good condition.

"In competition we have so far used three other pair of different make cutters, all of which it was necessary for us to replace.

"We certainly are gratified at the wonderful performance of your cutters."



What It Means

On the face of it, a cutter which will outlast three others on the same work is worth three times as much.

But this is only a fraction of the advantage gained by this shop through the use of DAVIDSONIZED Cutters. Here are the other important items:

Increased production through gain of two-thirds the time formerly devoted to take-down and setting-up.

Reduction of overhead per piece through increased production.

Saving in labor item through reduction of grinding time.

Gain in good-will through better deliveries.

You, too, can save on all of these items by changing to Davidsonized Tools. The actual amount of saving will vary according to the nature of your work, but it will be big enough to interest you, whatever the conditions. Write for further particulars or ask for a representative to call.

The Davidson Tool Mfg. Corporation

Main Office: 118-122 Maiden Lane, New York
Works: 56-62 North 6th Street, Brooklyn, N.Y.

Canadian Fairbanks-Morse Co., Limited—Montreal, Toronto, Winnipeg

Aktiebolaget A. Bonthron, Stockholm, Sweden

Special Service
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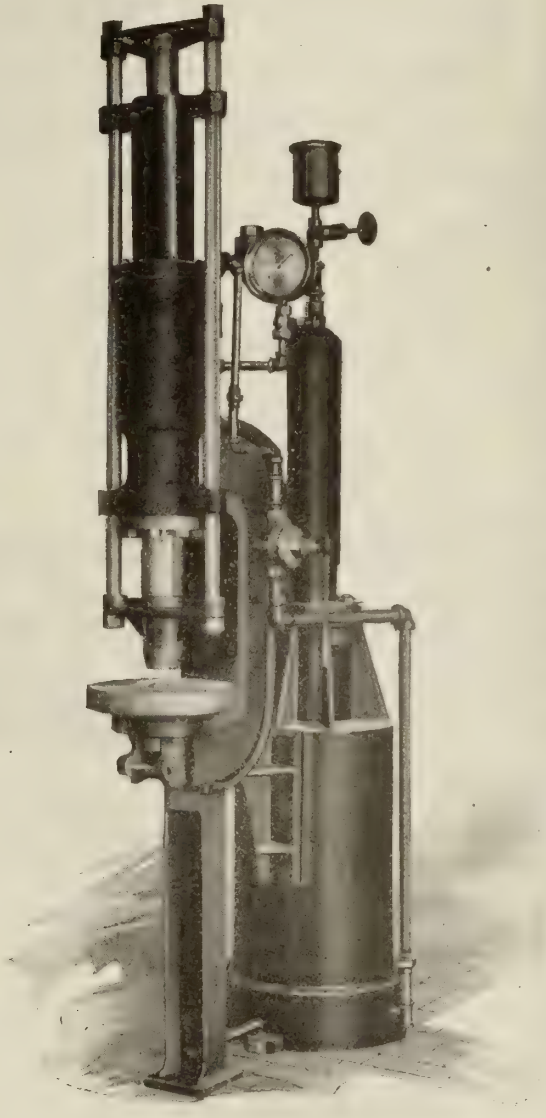

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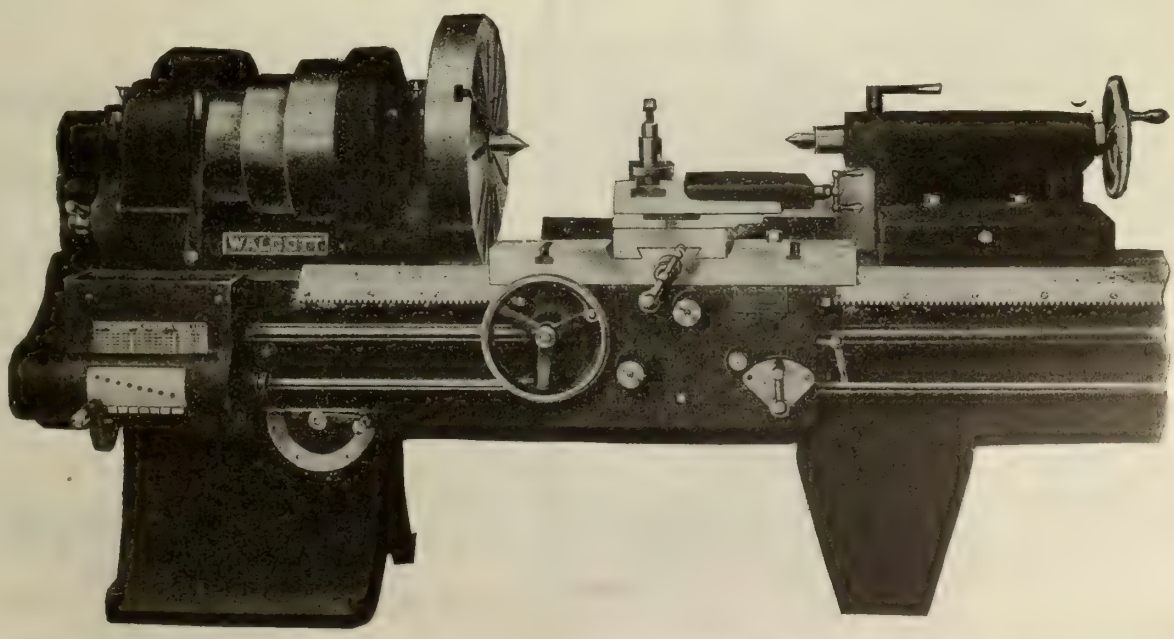

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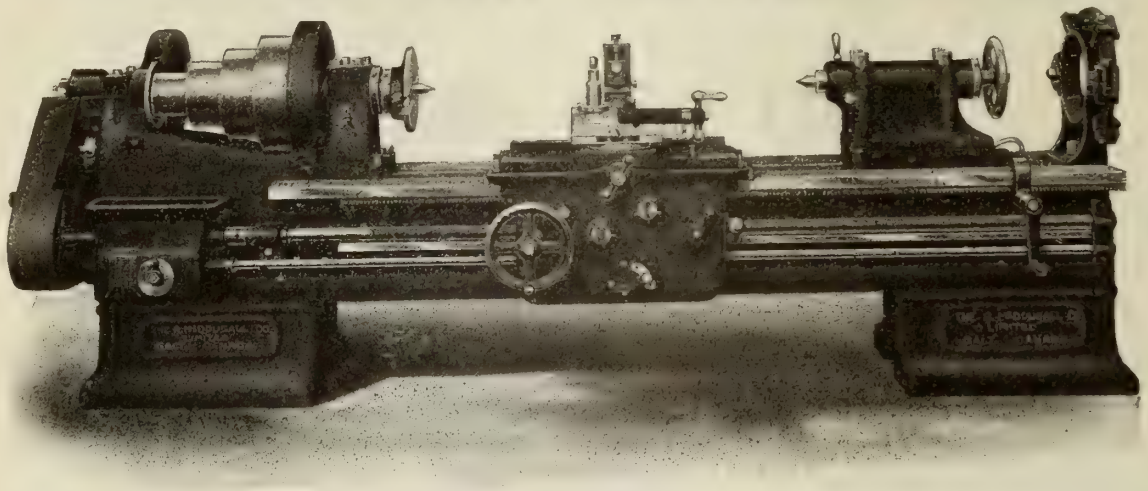

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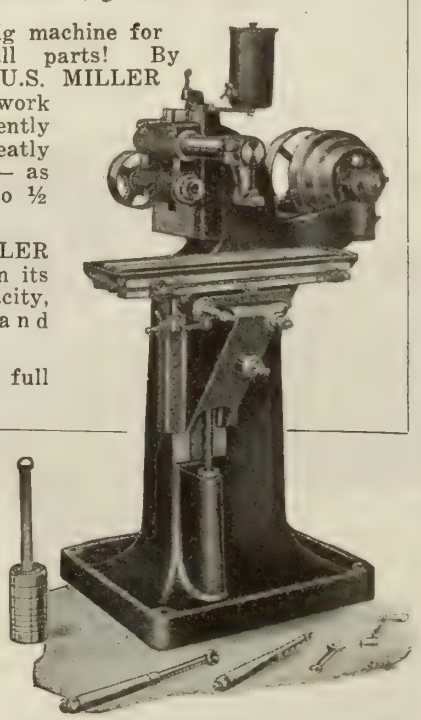

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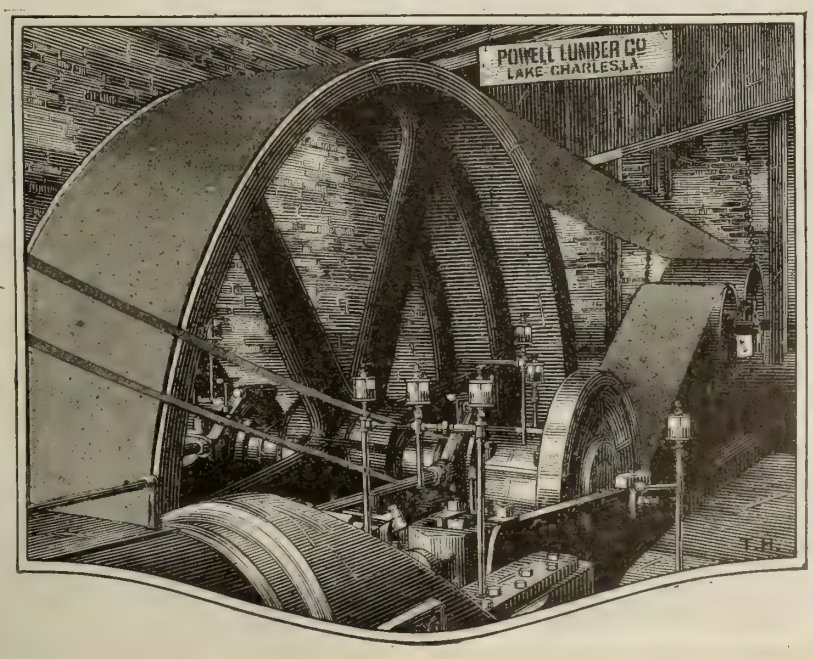
By means of standardized methods of grading and manufacture, together with extensive investigations in our Engineering Laboratory, our Engineers are able to specify the correct belt for a given drive. Tests show that a 14 to 16 ounce belt should be rated at not more than 90% of the capacity of a 16 to 18 ounce belt. Consult our Engineering Department.



Here is a 34" Gra-Knight 3-ply Belt 82½ feet long. It was installed in December, 1915, in the plant of The Powell Lumber Co., Lake Charles, La. 14 ft. Drive Pulley, 136 R.P.M. 52" Driven Pulley. Belt Speed 5900 F. P. M. 443 horse power. The cost per horse power per week to date is 1 1/3 cents with several more years service to come.

Notes On Grinding

NORTON COMPANY WORCESTER, MASS.

No. 54A

SOME FINE POINTS IN GRINDING

IT HAS BEEN BROUGHT to our attention that many of our operators of grinding machines to-day neither realize the possibilities of grinding nor of what vital importance it is to treat both the machine and grinding wheel with care and "respect."

A machine using a very wide wheel, say 10 inches or 12 inches, must have great rigidity and at the same time be capable of producing refined work. Imagine the forces present when a wheel weighing 150 or 200 pounds revolves on a spindle in plain bearings at 1,000 to 1,200 revolutions per minute. There must be accuracy to keep this spindle in perfect alignment so that the face of the grinding wheel will produce an absolutely straight cylinder, and the weight required in the base of the machine and the wheel slide to absorb all vibration caused by the revolving mass must be ample. Another factor that must be borne in mind is the resistance which is offered when the wheel is brought in contact with the work, as small particles of a very hard material are removed at an extremely rapid rate. It has been calculated that on a wheel 24 inches diameter and 4 inches wide there are 1,860,171,000 cutting particles coming in contact with the work each minute. The spindle bearings must be so adjusted that the boxes will be quite hot when the machine is in operation; in fact, a temperature of about 140 degrees Fahrenheit is desirable.

Limits on the work being ground of .0005 inch are very common, those of .00025 inch quite common, and in some cases requirements are so exacting that less than .00025 inch is demanded. It should also be borne in mind that when the work is reduced .00025 inch on the diameter the massive slide carrying the wheel spindle and the grinding wheel moves forward only half of this distance; in other words, .000125 inch. If it were possible to split a piece of tissue paper into twelve thicknesses the thickness of one of the resulting pieces would represent the motion of the wheel slide when the grinding wheel removes .00025 inch from the work. Bear in mind that this accuracy must be maintained not only where very small cuts are taken, but also under conditions where the object is to grind off as many cubic inches per minute as possible.

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

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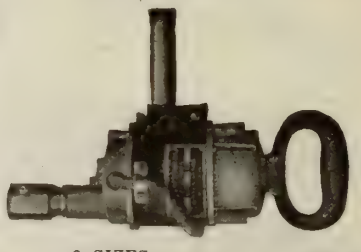

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All motors wound for 110 or 220 volts.

Direct or alternating current.

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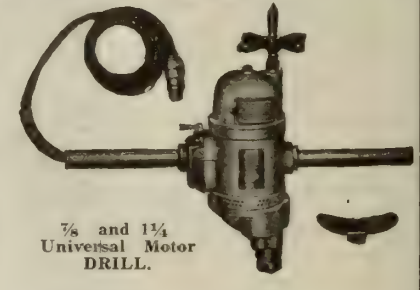

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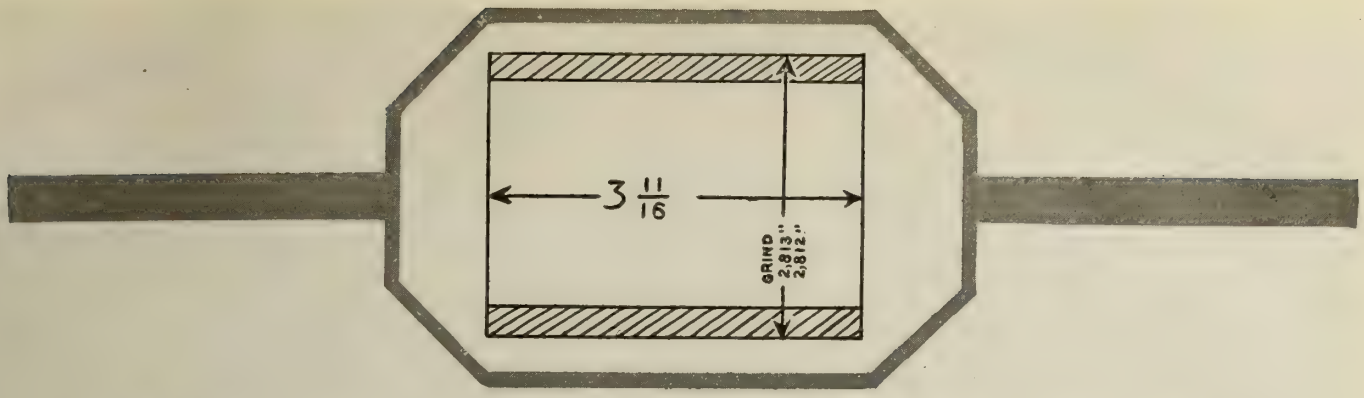

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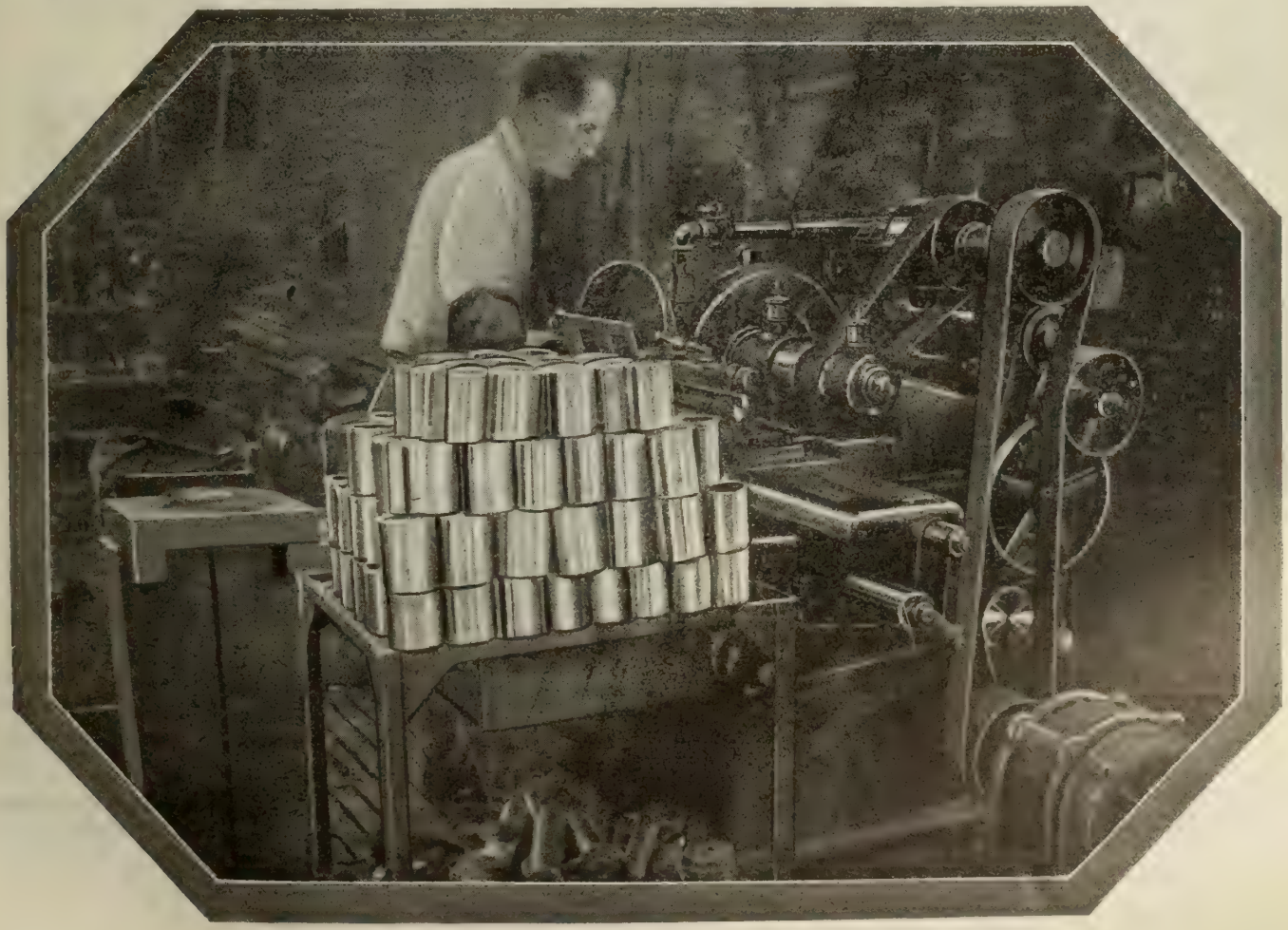

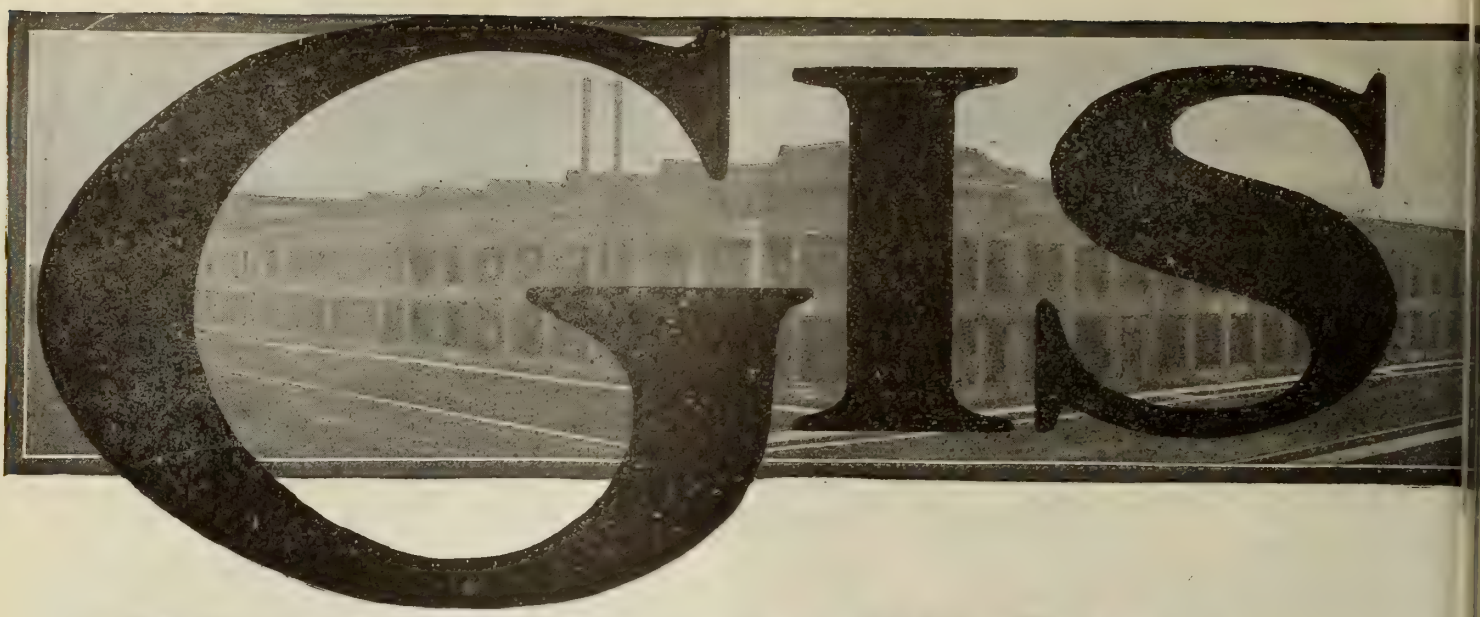

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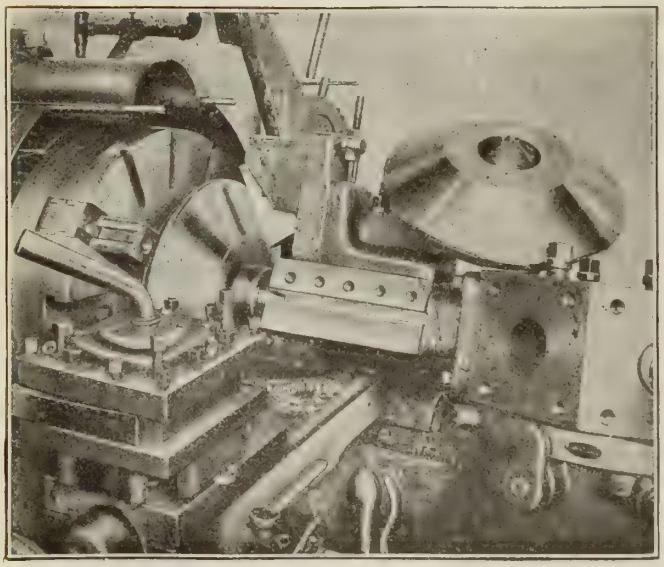

is to use the Gisholt Standard Turret Lathe. Quick time in producing bore. Rapid removal of scale and surplus stock. Finish cuts taken quickly and accurately. Large quantities without resetting. Superior finish. Typical advantages when you install Gisholts.

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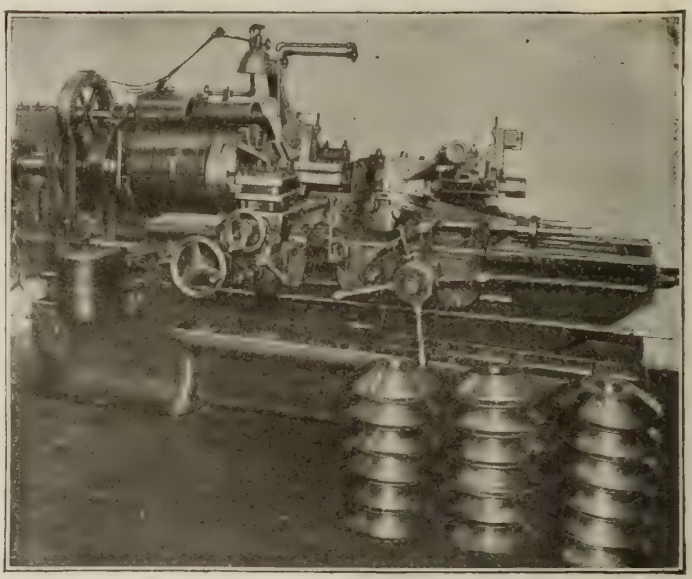

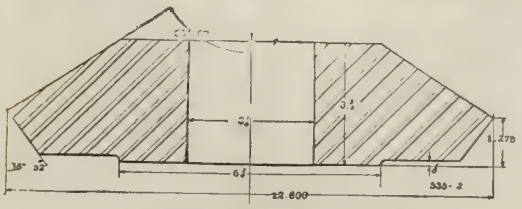

Cast Steel Bevel Gear—40 minutes.

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These producers need accurately ground tools. Gisholt Universal Tool Grinders will feed them tools ground to just the correct angle day in and day out. Result—increased production. Can you afford to withhold this added impetus to your men and machines?

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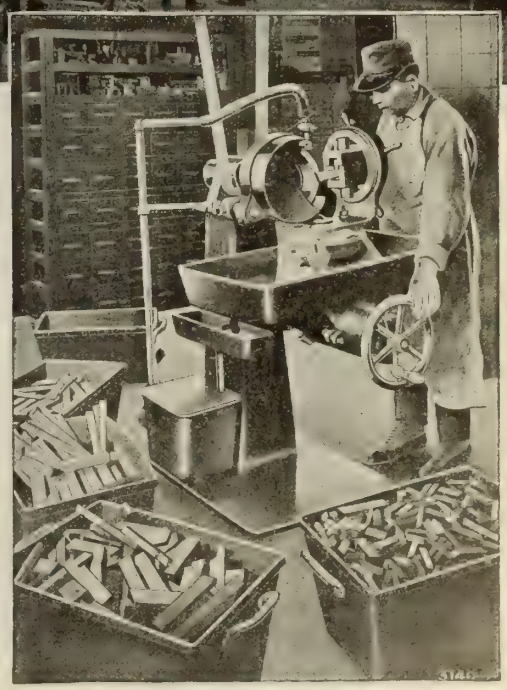

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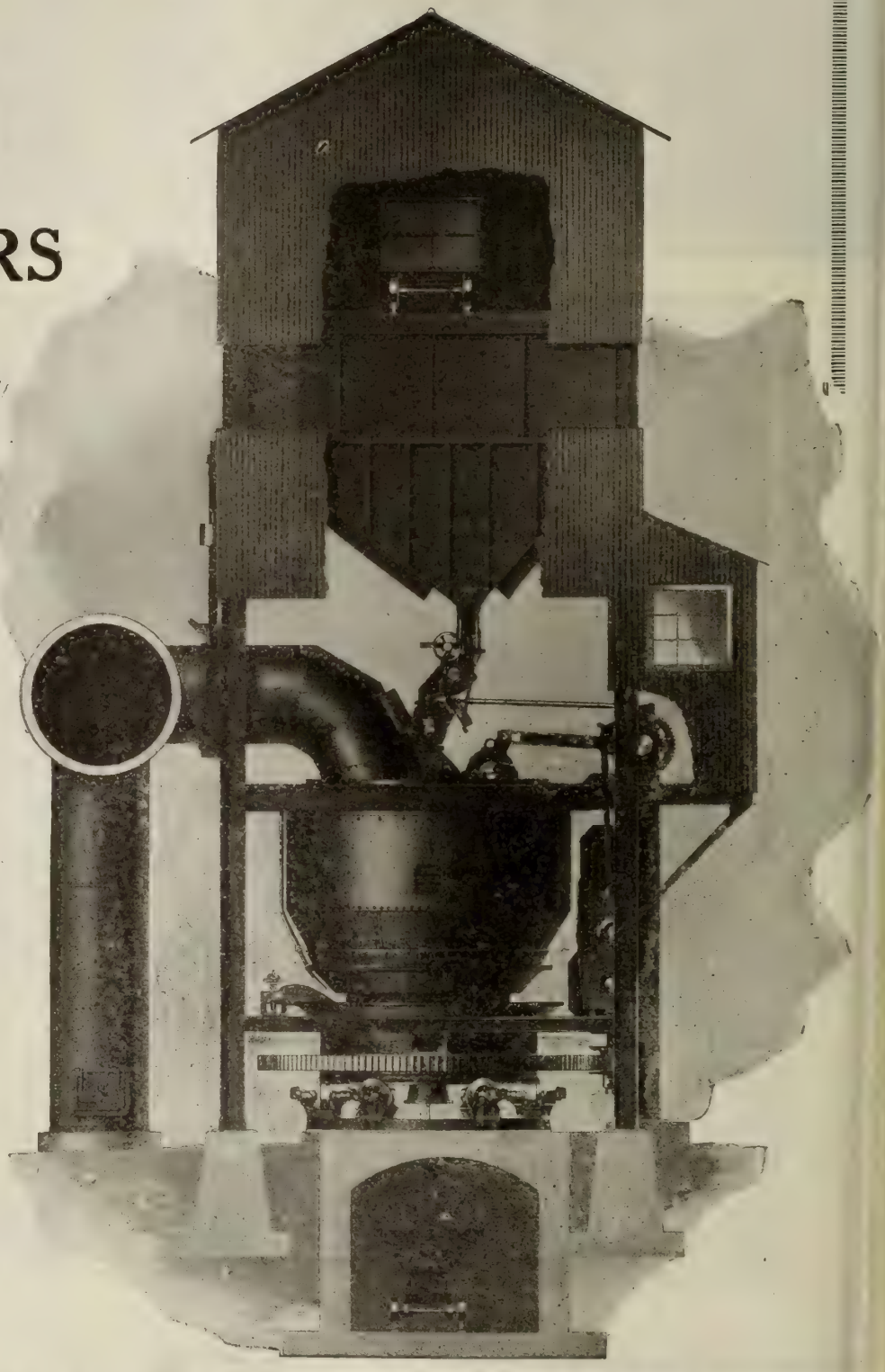

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A new bulletin giving a detailed description of this producer has just been issued. Shall we mail you a copy?

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Volume XXII. No. 10 Toronto, September 4, 1919

What is the Future of the Aircraft Business?

Will There Come a Time When Airplanes Are as Common as Automobiles? Peruse This Story and Learn How One Canadian Concern is Pioneering the Aircraft Industry

By J. H. MOORE, Associate Editor Canadian Machinery

WE hear in these post-bellum days vague prophecies of the future of the airplane. This is especially true of England, where the chief aim and object of those interested seems to be to secure undisputed supremacy of the air.

But in reading of these developments in other countries, we are often apt to forget our own shores, giving no credit to the efforts of those at home.

In fancy we hear some readers remark: "What developments are proceeding in the aviation line in Canada?" which prompts the remark: "That truly it is often the most deserving happenings that get the least publicity."

Not many miles from Toronto, at the already well-known spot named Leaside, there is proceeding one of the most wonderful ventures imaginable.

Of course, readers of CANADIAN MACHINERY remember quite well how Leaside became famous during the war time, with its munition plant and aviation field, and it is of the latter we wish to speak.

On the familiar ground where once the aspirants of Canada's aerial force looped and dipped, there now rests a peace-time aircraft industry, known as the F. G. Ericson Aircraft, Limited.

At the head of this concern is F. G. Ericson, himself (whose photograph accompanies this article), a clear-thinking individual, who talks of the aviation game—not as a game—but as a coming business, with practical knowledge of the industry to back it up. From the year 1911 he interested himself in aircraft, foreseeing its wonderful possibilities, and from this to 1913 was engaged in various phases of this interesting work. From 1913 he was connected with both the Curtiss people and the Canadian Aeroplanes, Limited, in the position of chief engineer in each case, and was also sent out to England and France by the U. S. Government to investigate aircraft conditions as practised on that side of the water.

At the cessation of hostilities the aircraft business looked as if it was about to die a sudden death (at least as far as Canada was concerned), but it was at this point that the firm convictions of Mr. Ericson held sway.

With certain business partners he purchased from the Imperial Munitions Board five hundred machines for resale to individuals, companies, or Governments in Canada, and the United States.

FIG. 1.—F. G. ERICSON, IN THE UNIFORM HE WORE WHILE ON DUTY FOR THE UNITED STATES GOVERNMENT.

This meant an investment on a large scale, and required real courage on both his own and partners' part, to stick their hands in their jeans for the real cash to purchase such a large quantity of machines, but they did it.

This, on top of the fact that they were keenly aware of the fact that even after they had the machines there still remained the task of convincing a doubtful public of the possibilities of flying and its advantages. They knew only too well that the average person looks on flying as a good way of committing suicide within the law, and that not only must they prove to the skeptics that flying was safe, but they must also instil the desire to own a machine.

As Mr. Ericson puts it, "We hope to correct the erroneous impression that people have regarding the aviation business being a dangerous one. The flying proposition is just as safe, if not safer, than crossing the corner of King and Yonge streets, providing you learn the business thoroughly, keep your head, and do not attempt foolish stunts.

Connected with Mr. Ericson are Messrs. C. Pearson and F. Webster, both of whom have also been connected with the Curtiss and Canadian Aeroplane Cos. before entering this latest concern, so that, if real, practical ability means assured success, this new industry is well equipped for bigger and larger things.

But to proceed with the details of the building up of this commercial aircraft industry.

Taking in a total acreage this firm covers about 400 acres, of which 100 is at Armour Heights and 300 at Leaside. At the Leaside field they have nine hangars and twenty-seven other buildings, including a dope shop, store room, repair shop, restaurant, fire hall, and a large three-storey building containing stock rooms, drafting rooms and offices.

These statements prove convincingly that this business is in the field to stay, and, if one may be allowed a prophecy, it will.

The whole affair has been gone into, not hastily, but with foresight and careful thought. At present the chief aim is to create a demand; later, extensive production will follow. At present the

designing staff are experimenting in various ways to increase the usefulness of the machines to civilian purchasers and in Canadian J.N.4, which is the standard model being built by this company, all such points have been kept in mind.

Mr. Ericson in designing this machine mentions that stability was aimed at above all other points. This feature makes for safety. Already he has transformed a two-seat machine into a three-seater with splendid success. The pilot in this new design sits behind the two passengers. This machine he has termed the Ericson Special Three.

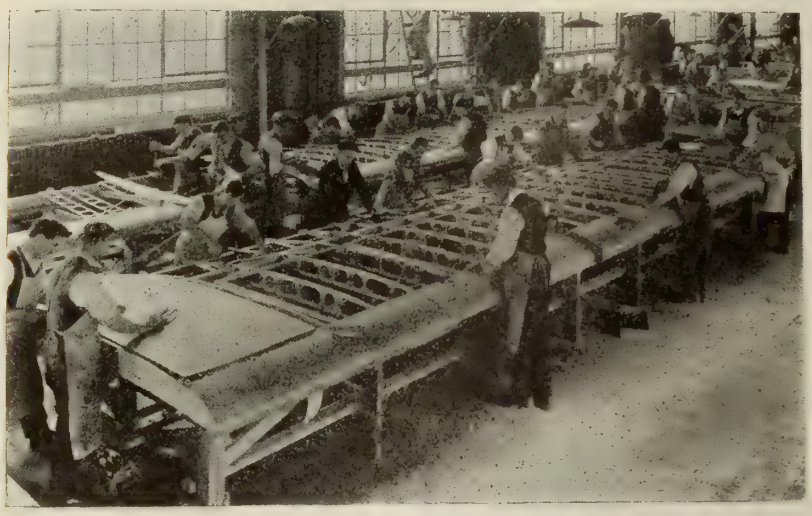


FIG. 2.—BUILDING UP THE WINGS OF THE J.N.4 MACHINE.

To give readers some idea of the construction of the wings on this J.N.4 plane, let us refer to the photo illustrating this work going on.

These wings are made practically of wood only, the only metal being the holding and fastening clips. Of course, the covering is made from linen of Irish first quality material, or from American cotton made specially for this aircraft work. This material is first stretched and fastened, later being painted over with dope, as it is called, until the complete wing is taut, and on being hit sharply with the finger issues a sound not unlike the skin of a drum. Four coats, as a rule, of this dope is sufficient. Four men and an inspector generally work on each of these wings, the inspector attending to various wings within his department. This mention of inspector brings up a very important point in this industry, namely, the absolute necessity of a rigid inspection system. Human life hangs on the words of the inspector as to whether he says O.K. or not, and realizing such to the full, no work is passed unless perfect in every way. Each and every portion, making up the plane, passes rigid test, then later a complete test is made which will be explained further on in the article.

One type of engine is at present used in these J.N.4 machines, which is known as the Curtiss OX5 motor. These engines have eight cylinders and develop 90 horse-power at a speed of 1,400 rev. per min. The swing a propeller 8 ft. 3 in., tip to tip. The general appearance of this motor is easily seen by looking at Fig. 3.

The Preparing of Propellers

The preparing of these propellers is a study in itself, so we will content ourselves with a brief description of the operations involved. Usually these propellers are made of finest quality quarter-cut white oak, laminated together, but walnut mahogany and birch are also used. Eight or nine laminations are generally used in the average propeller, each being carefully inspected before finally glued together. A special high test animal glue is used for such work. Of course, previous to any work being done on these propellers, all the wood is thoroughly kiln dried to remove all moisture, in order to prevent possibility of shrinkage. When we say that it takes about one month and a half to complete one of these propellers, readers can see that great pains is spent to make them perfect in every way. Otherwise they are useless. In some cases these propellers are made of two or three kinds of wood, but never more than three kinds at least over in this country. In Germany, however, they are not so particular, as they use as high as six kinds in one propeller. One particular propeller which the writer looked at closely had the following woods laminated together: mahogany, oak, birch, ash, beech and maple. Some combination, and yet it looked a mighty business-like article, and, according to various authorities, delivers the goods.

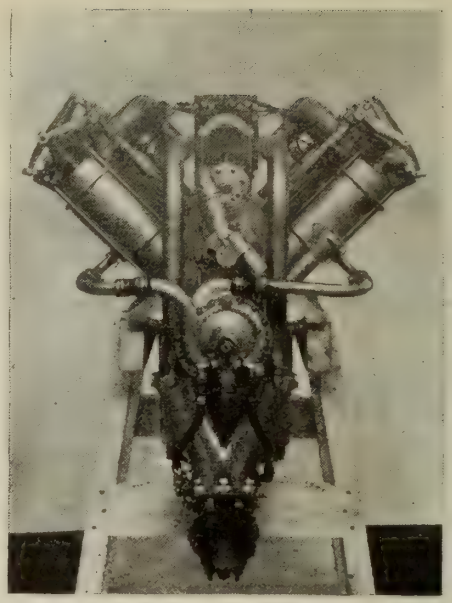


FIG. 3.—AN END VIEW OF THE AIRPLANE MOTOR.

Captured German Planes

Speaking of Germany brings us up to the point where we can speak with justifiable pride of the war trophies now resting at this field we speak of. Here are several types of German machines, which will do no further damage to our airmen, who so well coped in battle with them. Chiefly among these trophies is the machine already well known as the Fokker. One of these is shown at Fig. 4, in its war paint of camouflage. Seated in this machine is none other than Lieut.-Col. Bishop, V.C., D.S.O., M.C., C.D.F.C., Canada's famous airman, together with another airman of well-known renown, namely, Lieut.-Col. Barker, V.C., D.S.O., M.C., D.F.C. Certain of these machines are to be exhibited in flight over the exhibition, while others will be placed at stationary exhibits for the onlooker to gaze at to his fill. Note the German crosses under the wings on this machine shown on Fig. 4.

FIG. 4.—A CAPTURED FOKKER MACHINE, WITH LIEUT.-COL. BISHOP, V.C., D.S.O., M.C., C.D.F.C., IN THE PILOT'S SEAT.

Other types of German machines now at these hangars are the Roland and Junker. The former is a beautiful machine, with long graceful curves, almost

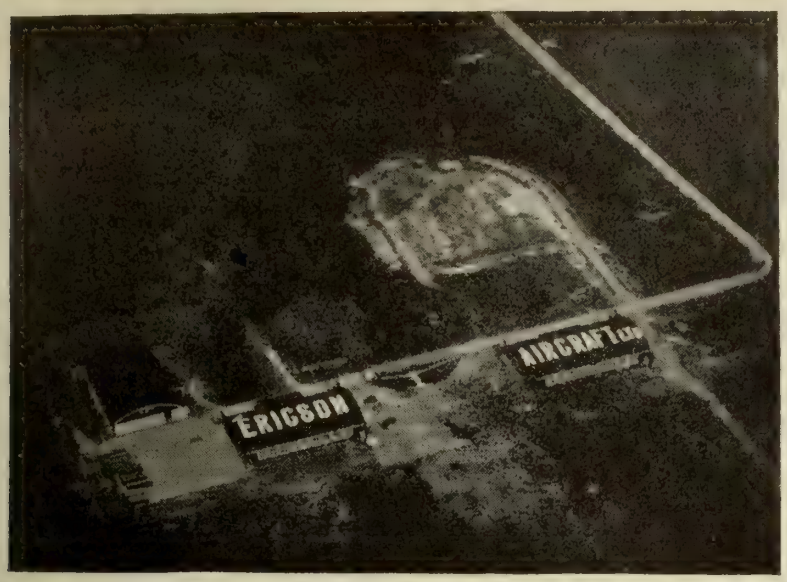


FIG. 5.—LOOKING DOWN ON A PORTION OF THE FLYING FIELD. NOTE THE BOXES ON THE GROUND CONTAINING CAPTURED GERMAN MACHINES.

like a huge fish. It is also colored in a lovely manner and looks anything like the prey seeking air carrion, which it proved to be in war time. This machine has a remarkable speed of 125 to 130 miles per hour. A Benz motor supplies the motive power for this machine; two machine guns also form a part of its equipment.

The Junker plane is of an entirely different nature, the complete engine as well as the pilot and observer being covered in with 3-16 in. armor plating. The wings and control surface are covered with corrugated sheet aluminium. This machine is also equipped with machine guns and receives its motive power from a Benz 260 h.p. motor. This type of machine was used for trench straffing, flying at low altitude and at a speed of 60 to 70 miles per hour.

At Fig. 5 we illustrate how three of the hangars look for an airplane at a height of 3,000 feet. The two hangars to the left of this photo are filled with German machines, while the boxes on the ground also contain some of these war trophies. It is interesting to note how clearly the name of this firm appears at such a distance.

Fig. 6 shows another remarkable aerial view from a height of about 5,000 feet. Here we see a picture taken in winter of a portion of country surrounding Leaside. By careful study Leaside can be seen in the background towards the right-hand portion of photo. A study of this picture will bring out clearly the advantage of aerial photography.

Speaking of winter brings to the writer's mind a statement made by Mr. Ericson, which is well worth repeating. "You ask what proof I can give you to the effect that flying intelligently is perfectly safe," he remarked. "Well, I'll tell you," and then he told the following facts:

Many of the machines which we purchased were at other points throughout the country, and, of course, the easiest way to do was to fly them into our headquarters here. We did so with not a single accident. We have had machines arrive in snow storms, hail storms and even when both rain and snow was falling, which is a nasty combination, yet no trouble. We even had men landing as late as 9 o'clock at night, when we built fires to guide their landing. "In some cases they landed with a 45 mile gale blowing," he said, but the writer was convinced without further details.

"Do you have much engine trouble," was another query popped at one of the officials of this concern, but the answer was readily forthcoming.

"We have no trouble, because we see to it that every engine is thoroughly tested. Each engine is placed on a block testing stand and tested in the following manner: For the first hour and a half the engine is run at 300 r.p.m. It is then stopped, oiled and inspected, then started once more on another 1½ hours run, at maximum speed of 1,400 r.p.m. A final inspection is now made and the engine must show absolutely no results of the strain. Providing it proves O.K. it is now installed in the machine and once more tested on the ground. This proving satisfactory, the machine goes on its trial flight. Of course, the other portions of the plane have all been thoroughly tested previously to this stage."

When up on its trial flight the machine is purposely put through all sorts of manoeuvres to place every strain on it, which would, or even might occur in an actual unforeseen condition. For instance, if by some means or other an aviator should come close to a tree, as shown on Fig. 6, he must make a vertical bank in order to miss the same. In this photo we see the machine just clearing the tree and starting to rise again. Such a stunt, of course, places considerable strain on the machine, which is what is wanted, for, on returning from its flight, the whole machine is gone over thoroughly before the final O.K. is placed on it as suitable for flying purposes.

The Staff

And now a word of the staff which devotes its time to this interesting work. Fig. 7 illustrates the staff as they appear en-masse. Approximately 200 employees are engaged on this work, and they co-operate as one big family.

To illustrate this point, let us quote what happened at what we believe is the first aerial picnic ever held:

On July 24th, with the aid of his executive staff, Mr. Ericson gave a picnic at the field for the benefit of his employees. The regular sports were held, but in addition to these regular sports, passenger carrying and exhibition flights were held, each employee desiring a flight going up. Five pilots handled the machines, their names being as follows: Capt. McCrudden, Lieut. McCarthy, Lieut. Moore, Lieut. Shiller, and Lieut. Colby.

Over 160 flights were made with absolutely no mishaps and even one lady 78 years of age partook in the flights.

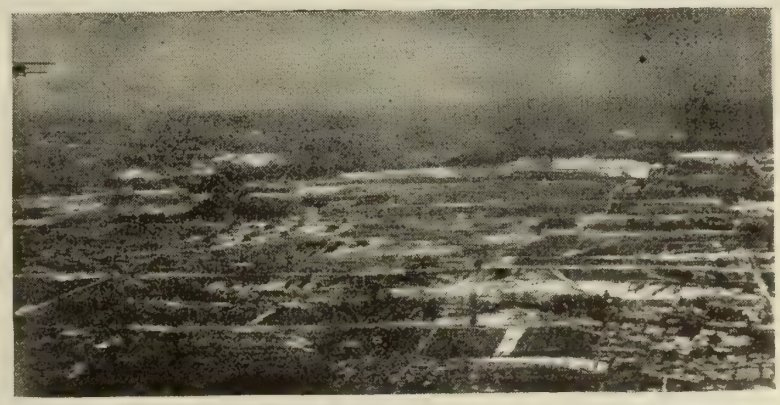


FIG. 6.—A REMARKABLE AERIAL PICTURE TAKEN DURING WINTER—THE WHITE STREAKS, OF COURSE, ARE SNOW.

This particular case caused much amusement, for this lady's son had worked on aeroplane work for 4 years but had never even been up in the air, and his mother thus showing him the way, made him the butt of considerable joking. The employees, after the picnic, presented Mr. Ericson with a handsome library table and chair, to not only show their appreciation for the good time enjoyed, but it also happened to be Mr. Ericson's birthday. This close relationship between employer and employees explains

FIG. 7.—MAKING A VERTICAL BANK, IN ORDER TO MISS THE TREE.

the harmony that exists in this concern.

And now as a sort of a conclusion, let us read what an Old Country air enthusiast has to say of the air business and its possibility. He starts off as follows: "The good time is coming." Every man his own aeroplane. This chap, for want of a better name, calls himself Windstick—so we will let him have his say:

"Why should you not own an aeroplane in the near future? If you can afford a small motor-car, there is nothing impossible about the prospect, when you remember that the best engineering brains in Britain are now busy designing it for you. A little runabout 'plane like this would not require overhauling oftener than once in every two hundred hours of flying, and the work would present very few difficulties to the mechanically-minded amateur. Its maximum speed would not be very high; say, sixty miles an hour. It would be capable of landing at about thirty miles an hour (thus lessening the liability to accident on alighting); as pressed metal would be largely employed in its construction it would be practically fireproof, thus doing away with the worst bogey of the air; and its running costs would work out at about three-pence per mile. (This figure is conservative, and has often been improved upon.)

The £200 Machine

The private driver will keep to the lower lanes of the air, and he will not need to work his engine at full power the whole time, as has necessarily been done in the war. The aeroplane will run for a year with nothing more than common-sense attention. This little machine, as designed (for it has been designed, you know, and flown), will be capable of taking off from the ground in a distance of twice its own length. It will have a self-starter, and the pilot's seat will be cosy, with a few simple instruments to navigate by. If his engine fails, the machine has a long "gliding angle," which will enable him to select a suitable landing-ground, where he can alight easily, insulated from all shocks by cunningly devised springing, and set about the necessary repair, or call up the nearest repair station on his miniature wireless set. He will store the machine at his club hangar for a nominal cost.

The price of such a little craft as this? Now that English factories are organized for "quantity production," and can make duplicate parts of high quality with fabulous speed, this need not be more than—guess?

Two hundred pounds! Just that.

The Week-End Flight

Imagine that your week's work is done, and that you have arrived at the communal aerodrome of the future. The mechanics have unlocked your shed, and wheeled your baby machine out on the grass, where she sways lightly in the wind, as graceful in her gleaming coat of yellow and silver as a bird on a bough.

You step into the comfortable, sheltered cockpit, where no worrying wind can reach you, clad in clothes which are electrically warmed by a tiny fan-driven generator which the wind of your passage revolves. A glance at the controls and the glistening dials in front of you, you press your foot on a button on the floor, and the engine roars into life. Across the sunny grass you speed, the machine hops once—twice—she is off, and you are master of the sky until Monday, which you need not think about!

The machine gains height, there is no vibration, only the pleasant, monotonous whirr of the propeller cleaving its way, and the hum of well-oiled machinery. The hangars below you grow rapidly smaller, the sun glistens on their roofs of corrugated iron, making them look like cubes of sugar. The machine heels over, and you look down the slope of the polished wing at the pretty mosaic of the brown and green earth. Church spires wheel below you as you turn, and the sound of the villages, the shout of a boy, the shrill yap of a dog, drifts dimly up to you.

In a minute it is dark, a thick enfolding moist blanket. You have run into a cloud. Quickly you are out again, and the sun beams with renewed vigor; you can still feel the genial warmth of it. But soon you will have "got your height," then it will be cold, and you will switch on the current that envelops you from head to foot in a grateful glow. You rectify your flight by a map which automatically unrolls before you, and you land when or where you like!

By reason of their swift intuition and light touch women are specially adapted by nature for the control of quick-responding machinery, and who knows but what the commercial fleets of the future will be largely "manned" by women pilots?

Airship Luxury

For staider passengers, who feel no need for haste, and do not feel inclined to go to the expense of a private aeroplane, there will always be the dirigible services. These great "rigid" flying machines, not dissimilar to the modern Zeppelin, but far less unwieldy, and immune from risk of fire, will operate over long distances.

As weight need hardly be considered, they will be fitted and furnished with a view to utmost comfort. You will feel as safe in them as you would in a mighty liner of to-day. There will be no perceptible motion, no pitching and tossing, and the huge craft will glide serenely through the skies with all the ease and confidence of the eagle.

There will be fine saloons with mahogany panelling, dainty tables and wicker-work chairs grouped enticingly on carpets of Utrecht velvet; and through the long windows of unbreakable glass the passengers will be able to drink in the marvellous panorama spread wide

FIG. 8.—HERE IS THE HAPPY FAMILY, WITH THE ERICSON SPECIAL THREE MACHINE, SPOKEN OF IN ARTICLE, SHOWING UP TO GOOD ADVANTAGE.

about them. Through occasional windows let into the floor they will be able to note every detail of a town as they pass silently and majestically overhead. There will be no smell, for the engine-rooms will be far away from the cabin, and sea-sickness, or its equivalent, air-sickness, will be a forgotten evil. *Should* anything by chance go wrong with the machinery, the great ships of the air can hover at anchor until it is rectified; there will be no "forced landings," and fuel can be taken on from ships at sea. Two hundred tons can be carried by such craft with ease!

Far from being over-fanciful, my picture, I am convinced, falls short of the aerial wonders awaiting us in the near future.

While we do not for one moment imagine that readers will agree with the above, still we must admit that all new inventions have advanced as a rule with very rapid strides, so let us watch the future of the aeroplane with keen interest, in the meantime taking off our hats to our Canadian Concern that has had the courage to lead the way on this side of the water.

The Art of Properly Grinding the Twist Drill

Being a Series of Notes and Sketches, Showing How to Grind Correctly Twist Drills, in Norton Grinding Machines. Mechanics in General Will Appreciate Such an Article

A CORRESPONDENT sends some notes and sketches on the grinding of twist drills in the Norton grinding machines. He gives useful particulars about suitable grinding wheels, speeds, feeds, order of operations, production times, and a few necessary fittings special to the job.

Grinding Wheels

For grinding the fluted parallel of taper shank drills or the whole lengths when the drill is parallel throughout the most suitable wheels are Norton 60 grit and N. to P. grade. For grinding shanks, taper or otherwise, in a plunging cut with wheels fully as broad as the shank is long, the most suitable wheels are Norton 46 grit L. grade or 24 grit C.L. grade.

Speeds

The grinding wheels should be run

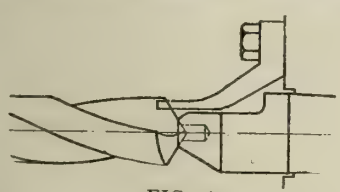


FIG. 1.

at a surface speed of 6,000 to 6.500 feet per minute for both traversing and plunging cut grinding. The workpiece in traverse grinding should be revolved at a surface speed of 60 to 80 feet per minute and for plunging cuts, at 40 to 60 feet per minute.

Machines

For drills of various sizes the most suitable Norton machines are: For drills up to ⅜-in. dia., 3-in. by 18-in. machine; ⅜-in. to 1¼-in. dia., 6-in. by 32-in. machine; 1 5-16-in. dia. and upwards, 10-in. by 36-in. machine. For grinding shanks, taper or parallel, in a plunging cut with wide or "formed" wheel, the 6-in. by 32-in. machine may be used if the shank is under 4-in. in length; but the best results are obtained in form grinding with the Norton 10-in. by 24-in. special purpose machine. The fluted portion should be ground by the traversing method only.

Drivers

A special driver is necessary so that the peg will enter the flute of the drill and leave the round surface clear for the grinding wheel. Fig. 1 shows a simple and effective design which may be attached to the driving plate where a running centre is used. If the drill is very small the driver may be modified for attachment to the running centre. Where a dead centre is used a slight modification would enable it to clear the centre. When the fluted end is ground as a separate operation the ordinary carrier is fixed on the shank end.

Grinding Allowance

The drills should have not less than 0.005-in. to 0.008-in. left on the diameter for grinding, after previous machining operations are completed.

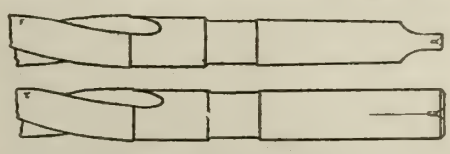
Small Drills

Drills up to ⅜-in. dia. may be classed as small, and generally have straight shanks parallel with the fluted portion. Those as small as 3-16-in. and under should be ground with a running spindle attachment. The full length is ground at one operation at the rate of about 60 per hour, but very small drills take longer owing to the inconvenience of handling them.

Many small drills are made with a slight taper on the fluted portion, the cutting end being the largest. Two operations are necessary with these, and each operation will take practically the same time as grinding the whole drill parallel. Grind the fluted part first.

Medium and Large Drills

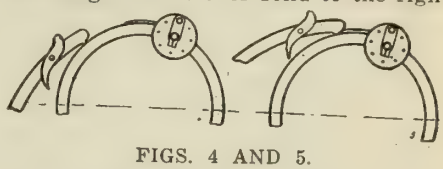
These are generally made in three forms; with round shank parallel with fluted portion as in Fig. 2, with taper shank as in Fig. 3, or with tapered square shank for ratchet or brace use.



FIGS. 2 AND 3.

It is usual to have a recess in both the forms shown in Figs. 2 and 3, and a slightly reduced portion from about the end of the flutes to the recess. There should also be a slightly reduced part in square shank drills. These parts need not be ground; the size of the drill is stamped on one of them, preferably on the smallest, or on one of the flats of the square shank.

In grinding any of these, put the carrier on the shank end. After putting the drill in the grinding machine centres set the left hand reversing dog so that the reversing lever is over solid to the right



FIGS. 4 AND 5.

when the corner of the wheel is over the centre of the recess. If there is no recess and the shank shoulder is larger than the drill, the wheel should just touch the shoulder. Then set the right hand reversing dog so that the table will reverse when the wheel overlaps the job by about an inch.

On starting grinding, bring the wheel forward to left hand end as already defined, and feed straight in to plus 0.002-in. of the required size. Put traverse belt and lever over for the second slowest table speed possible and put in traverse lever, thus removing all but 0.002-in. in one cut. The production rate for this cut should be 27-in. of length per minute on a 6-in. by 12-in. machine and 22-in. on a 10-in. by 36-in. machine.

Immediately this cut has been completed, swing over the two-speed traverse lever (on front of the machine) and finish to size in cuts of 0.0005-in. per traverse. The automatic feed pawl link should be set on the quadrant to give a feed of two notches (0.0005-in.) on each reversal of the table. The carrier can be put on the next drill while the machine is automatically making the finishing cuts. The actual grinding times for grinding the fluted parts of ¾-in. drills of 6½-in. standard length is 30 seconds, and 1¼-in. dia. 9-in. standard length, 40 seconds, both on the 6-in. by 22-in. machine. These times allow for removing up to 0.010-in. to 0.015-in. from the diameters.

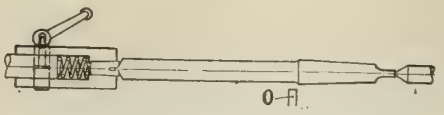
The positions of the automatic feed pawl are shown in Figs. 4 and 5.

Grinding Shanks

The shanks, parallel or taper, are most economically ground in one plunging cut on a Norton S. P. machine. A wide wheel is used, parallel or formed to the taper. The actual grinding time on, for

example, a No. 3 Morse taper shank or parallel shank of about the same length is 30 seconds for removing up to 0.015-in. from the diameter.

It is very often necessary to grind shanks in two operations on account of the slight distortion that occurs on some steels after grinding. This distortion is so slight that it is not appreciable on a parallel unless the gauging hole is very long, when a slight binding would be felt. It is more easily felt on a taper gauge. If it is found that the steel has this tendency, and two operations are necessary, reduce to 0.003-in. above size



at first operation. Lay the drills aside for at least 12 hours and then finish to size as a second operation.

Variation in Lengths

Where the drills as received for grinding are not exactly the same length a quick means of adjustment must be found, so that the shank may be ground at the correct distance from the shoulder. Fig. 6 shows a fitting which has been found successful and sufficient. A spring centre is fitted as shown, and a setting piece o is fixed to locate the shoulder. If adjustment is necessary, slack the spring centre clamp, with the workpiece between the centres, and adjust the shoulder to the setting piece by the tailstock screw. Then tighten the spring centre clamp and adjust the tailstock centre for running.

If good methods are followed throughout it is not difficult to grind twist drills to fine accuracy and in quick time.

Speed Up Production by Systematic Handling

It is a Recognized Fact That Any System Which Will Facilitate the Handling of a Product, Means a Lowering of Manufacturing Cost. Herein is Described One Lamson Method of Handling Goods

By J. H. MOORE, Associate Editor Canadian Machinery

IT is a well-known fact that in a plant of any size to speak of, there exists in some form or other a bugbear which we, in general terms, speak of as industrial leakage.

Industrial leaks are to a certain extent bound to occur in some form or other, for we cannot secure perfect plant efficiency any more than we can secure perpetual motion, but we can, by careful thought, trace the leaks to their source and improve these conditions as far as lies in our power.

When tracing the cost of a product and its existing high cost figure, it is often surprising to find how simple the remedy is. As a rule the trouble boils itself down to three things, namely: machine tool equipment, system of routing, or system of handling.

Generally the first item does not enter into the trouble at all, for in these modern days the up-to-date master mechanic sees to it that his shop is well equipped with the best time and labor-saving machines possible.

Unfortunately many of them stop at this point and do not consider the other two equally important points, namely, the routing and handling of the product.

To successfully reduce the cost of any product one must thoroughly study the course of the products' manufacture, routing the same in such a way that every possible lost motion is eliminated. No unnecessary jumps should be made, but the tool equipment should be so arranged that not only will the work pass along evenly and systematically but there must be no congestion at the various machines, for congestion means time wasted, worry, and added expense.

There was a time when it was considered all right to have hunkies (as we called them) bring us our material in almost any method as long as we got it. Usually these fellows were tall, husky chaps hired at about $1.25 per day, with very little brains more than that they only accomplish the certain task to which they were allotted. Often there was too much work given for each man to do, with the result that before long the work would pile around some particular operator's machine, with the outcome that production suffered and costs went up.

It took considerable time to convince certain plants where their trouble lay, but luckily at a later date they went after the trouble with surprising results.

Numerous methods have been employed, and one method which has improved the handling problem to a wonderful extent is that of the gravity system.

What is the Gravity System?

The gravity system is a series of rollers, which together form a roller conveyor. Each roller is mounted on a ball-bearing, which of course makes each roller sensitive to movement. This system uses the free power of gravity, which, so to speak, costs nothing, for gravity is always on the job at your command.

To quote what particular products can be carried by such a system is impossible, for practically all products having at least one flat surface can be carried direct on one of these conveyors.

To illustrate this system of moving material, let us consider Figs. 1 to 5.

Here at Fig. 1 we see a typical overhead installation, with the gentleman shown in the picture about to pull the handle of the switch in order to divert the product in desired direction.

This is one of the features which make such conveyors of great convenience, for the gravity system is flexible as a railroad track. Depending upon your required direction, the conveyor can be made to suit, and owing to the small space occupied by such a conveyor the

FIG. 1.—NOTE THE OPERATOR MOVING SWITCH, TO CHANGE DIRECTION OF PRODUCT.

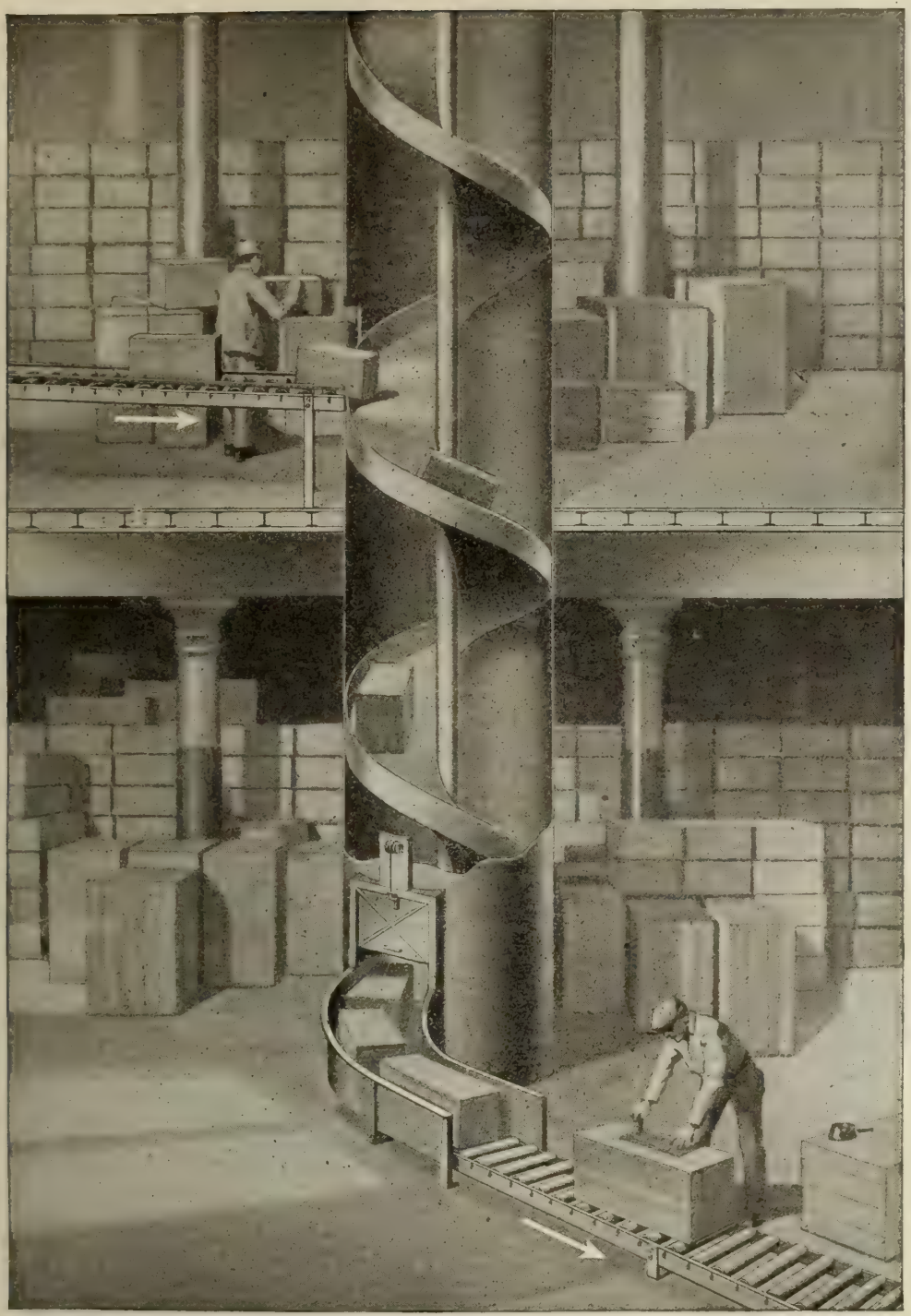


FIG. 2—A GOOD ILLUSTRATION OF A SPIRAL CHUTE BETWEEN FLOORS.

tracks can run between machines, around columns and obstructions without any trouble.

Production from a given floor area is increased in many cases over 50 per cent. More machines can be installed on floors that are clear of stock, while the machines can be kept up to capacity all day long, when conveyors properly placed keep the workmen supplied with materials.

To convey your product from floor to floor is a simple matter with the gravity system. A spiral conveyor or chute is arranged as shown at Fig. 2. The remainder of operation is self obvious. Place your product on the gravity conveyor on one floor, when it will enter the chute, descend to the desired floor, and once more be carried on to a further operation.

Use in the Machine Shop

To state all the uses of this type of conveyor in the machine shop would take a volume, but as one example, let us study Fig. 3.

The conveyor shown is used in the plant of the Domestic Engineering Company, Dayton, Ohio, for transporting their Delco light outfits to the shipping platform. The crates are bolted to the skids as the machines pass along the conveyor. This method naturally saves time and labor. The shipping address is also stenciled while the product is, so to speak, on the move. The crated machines are then conveyed direct to the waiting car or delivery truck as the case may be.

Use in the Foundry

Let us now consider two illustrations in the foundry. Fig. 4 illustrates to good advantage how separate portable sections of conveyors can be used with splendid results outside the plant altogether. Here we see the men busy unloading pig iron from cars at the plant of the Saco-Lowell Co., Lowell, Mass. By such a system they have been able to save more than half the labor in unloading and piling cars. Of course the conveyor, being of portable construction, can be shortened or lengthened as desired. The benefit of this is self apparent, so no further mention on photo is necessary.

The fifth and last picture in this article shows the same style system installed inside the foundry.

In this foundry, castings, as they come from the moulds, are carried on pallets or in trays to the sand-blast or pickle room. The conveyors are so arranged that they can be moved about the foundry wherever they are wanted. Flasks are also brought by conveyor from the storage to the moulding floor. Cores are carried in the same way from the core ovens to the foundry floors. Other uses for this type of conveyor are inumerable, but these two examples as already illustrated and described will suffice.

To summarize briefly, it might be said that the gravity system of conveying has proved by its results to be a direct killer of high handling costs, so that should you be contemplating some system of transporting your product in an efficient manner, it will be wise to consider this style of movement.

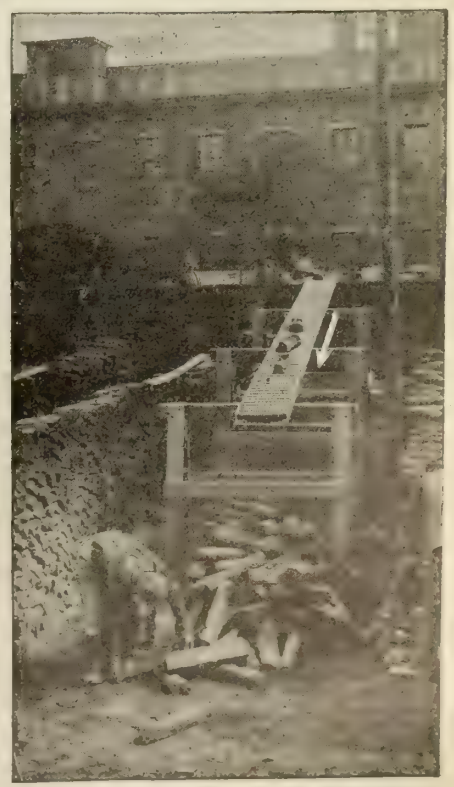


FIG. 4—GET RID OF YOUR CAR UNLOADING PROBLEMS IN THIS MANNER.

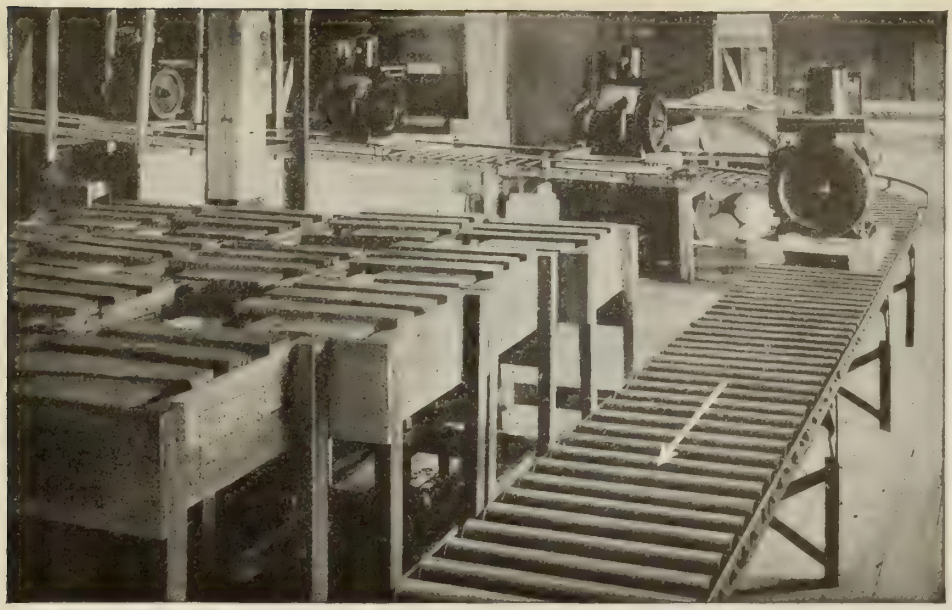


FIG. 3.—THESE DELCO LIGHT OUTFITS ARE CRATED AND STENCILED WHILE ON THE MOVE.

YARDS, FEET AND INCHES

It is interesting to study how standards of measurements are arrived at, or least how they were arrived at in days of old. It is doubtful if anyone would try to get up anything of the kind in these modern days. For instance, the "metre," which is the standard of measurement used in France, is based upon the length of a quadrant of the meridian, measured between the equator and the North Pole. The ten-millionth part of this quadrantal arc was adopted to be the lineal measuring unit. The reader will understand that a meridian is a line, or rather an imaginary line running from the North Pole to the South Pole, and, of course, passing straight through the equator at right angles to it. Correctly speaking, it goes right around, making a complete circle. Now if we take the quadrant or quarter circle of this meridian, which reaches from the equator to the North Pole, and divide it by ten million, we have the "metre" or the French standdard of measurement equivalent to 39.37 inhces, or 1.09362311 yards; the yard being the English standard measure of length, and having equally as interesting a history. The original way of proving the standard English measure was to find the length of a pendulum vibrating seconds of mean time in a vacuum at sea level in the latitude of London. The length of the pendulum which would make this beat in exactly a second, was supposed to be 39.1393 inches, or almost the same as the Frenchman's metre. Why they did not call this the yard is hard to say, but the yard had to be the proper fraction of this to make it 36 inches. Of course, in the first place, there were no inches, but the length of the pendulum divided by 39.1393 made an inch, and this multiplied by 36 made the yard. When the British Parliament Buildings were burned in 1834 the standard Imperial yard went with them, and when an effort was made to replace it by means of the pendulum, it was found to be inaccurate—so much so that finally all attempts at reproducing the lost standard by this means were abandoned. It was then decided to construct a new standard yard by reference to copies that had been previously made, and that had been compared with the original standard yard. The next thing was to get a material which could be relied upon of which to construct the new standard. This work was entrusted to Sir Francis Bailey, who, unfortunately, died before its completion. As the result of a great many experiments, Sir Francis had decided on an alloy composed of 16 parts of copper, 2½ parts tin, and 1 part zinc, as the most suitable material for a standard bar. This alloy is still known by the name of "Bailey's Metal." The work of restoration was finally completed by Rev. R. Sheepshanks, and the new standard imperial yard bar that he produced is now known as "Bronze" No. 1. It is made of Bailey's metal; it is 38 inches long and an inch square.

At a distance of 1 inch from each end of the bar, holes are drilled, in which gold plugs are inserted. The upper surface of the plugs is made to coincide with the axis of the bar, to obviate the influence of flexure. Defining lines are parallel, and at right angle to the axis. They represent the yard at a temperature of 62° Fah. Four copies, known as parliamentary copies, were then made and distributed to the Royal mint, and the Westminster Palace. The original bar is kept within the walls of the House of Parliament, while the copy known as "Bronze No. 6," which is the accessible standard used for comparison, is preserved in the strong room of the old Treasury. Additional copies were eventually made, two of which were delivered in 1856 to the United States Government. These are technically known as "Bronze No. 11" and Laow Moor Tron No. 57."

It is a curious fact that while the bars presented to the United States are the standard which Americans depend upon when great precision is required, no standard of length of the English system of measurement has ever been formally legalized in the United States, but in 1866, ten years after receipt of these bars, Congress passed a law declaring a metric bar in the possession of the Government to be the legal standard, so that the only standard of length recognized by law in the United States is the metric. However, Great Britain and Canada, as well as the United States, have used the old yards, feet and inches so long that it is doubtful if a proposed change would find much support, and while the pendulum system of finding the correct yard was proved to be a joke, it might be possible that if a pedestrian with a stride of a metre undertook to step off ten million paces from the equator that he would be a few kilometres astray by the time he reached the ninetieth degree, commonly known as the North Pole.

FIG. 5.—A FOUNDRY EQUIPPED AS SHOWN IS WELL ON THE WAY TO INCREASED PRODUCTION.

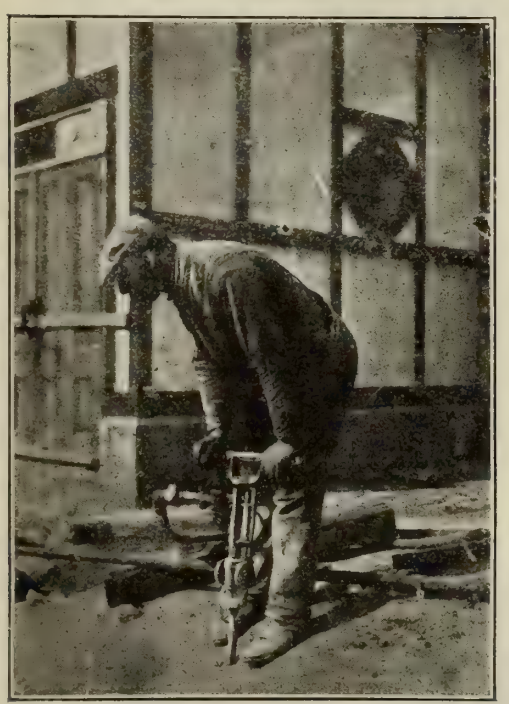
The Use of Compressed Air in Modern Industry

A Comprehensive Study on the Use of Air Operated Tools, in the Mining, Contracting, Foundry, Shipbuilding and Machine Shop Fields. Pumping by Compressed Air is Also Discussed

By A. W. SWAN

IT is a bold undertaking to attempt to give in one article of two or three thousand words a description of the hundred and one uses of compressed air in modern industry, just as it would be to give an adequate description of the part played by electricity in the same space. But electricity has its "press-agents," and the marvels of electrical engineering are far better known outside engineering circles than those of compressed air, although compressed air has almost as many applications.

One is apt to think of compressed air as a rival of electricity; it is quite true that in a few cases one has a choice between the two, but in the great majority of places where compressed air is at



JACKHAMER DRILL ON FOUNDATION WORK, ROMAN CATHOLIC CATHEDRAL, SHERBROOKE.

work, electricity does not offer a satisfactory alternative, and as a matter of fact most modern air compressors have electric drive.

Mining—Rock Drill, Etc.

Perhaps the greatest field of all for compressed air is mining. Since the earliest days of drilling rock by power there has been no serious rival to the pneumatic drill. Electricity is particularly adapted for rotating motion as in the ordinary electric motor; compressed air on the other hand is specially adapted to reciprocating motion as in the pneumatic rock drill, either of the older fashioned type, where the piston was rigidly connected to the drill steel, or the modern "hammer drill," where the piston is free in the cylinder, and literally hammers on the drill steel while the steel is mechanically rotated in the hole. Compressed air can be economically transmitted for long distances with very little loss of power such as occurs from radiation losses, where steam is used, and in mines where sparks of any kind would be highly dangerous—as in coal mining—compressed air is doubly necessary. The modern "hammer-drill" has been very highly developed, drilling 8 to 12 inches a minute in hard rock has become possible, and in fact, the problem now is more to find a drill steel which will withstand the tremendous power of the drill. Two main types of rock drill have been developed, the heavier two-man drill, usually mounted on a tripod or column mounting, and the lighter one-man drill for sinking shafts, etc., and weighing anywhere from 30 to 60 lbs.

Contracting — Rock Drill, Tie-Tamper, Cement-Gun, Etc.

The small rock drill of the jackhamer type is of great service to the contractor. One of the chief troubles in connection with the steam shovel is delay due to large boulders too big for the shovel to handle; in fact W. L. Saunders in his book on "Rock Drilling," estimates delays of thirty to fifty per cent. due to this cause. With a couple of small rock drills on the job, these delays can be largely avoided. Other uses for the small rock drill in contracting work are for breaking rock in foundation and trench work, etc. The photograph illustrates a jackhamer drill at work on the foundation of the new Roman Catholic cathedral at Sherbrooke, Que. This particular contractor has three small rock drills at work all the time on foundation and road work. In structural work the same tool is of considerable value. In reconstructing the Edison Works, Orange, N.J., after the fire in 1914, there were 9,500 window-bolt holes to drill in the concrete walls; this work was all done with the small pneumatic rock drill. For cutting out concrete foundations, drilling holes in concrete floors for machine foundations, etc., the same tool is handy. Still another application is in street railway work for chipping asphalt and concrete. In some cases the jackhamer type of drill is used for this work, at other times the pneumatic tie-tamper. Using the later type of equipment, the Elmira (N.Y.) street railway company found that the average speed was 47 ft. per hour per tool, which is very different from the speed with hand chipping.

The tie-tamper has quite an interesting history; it was at first introduced against some opposition on the part of railway men, but its use has spread so quickly that in five years it has become standard equipment on most of the great railway systems of the United States, and at the convention of the American Railway Engineering Association in Chicago this year one of the speakers declared that "No tool in recent years furnished to the track forces has filled a greater void than the power-operated tie-tamper." The pneumatic tie-tamper operates on the same principle as ordinary hand tamping; the outfits are self-contained, self-propelling, gasoline-driven compressor car with either two or four tamping machines.

PNEUMATIC TIE-TAMPER IN NEW YORK SUBWAY.

Before leaving the subject of contracting we must not forget the use of compressed air in connection with concrete, in the cement-gun and blowing concrete—both patented processes. In using the cement-gun the concrete is blown on as a spray, one of the chief applications of the process is in preserving existing structures such as bridges, etc. Blowing concrete is entirely different. In this process batches of concrete are blown from a central point through pipes to the forms; aggregates up to 4 inches diameter being used; the process is of special value in tunnel work.

Foundry—Air Hoists, Pneumatic Rammer, Sand-Blast, Pneumatic Chipper, Etc.

Coming now to manufacturing, the backbone of supply to most manufacturing plants is the foundry. Compressed air is so valuable in the foundry, and has so many widely varied uses that Mr. Robert L. Streeter has said, "It would not be very far from the truth to say that compressed air is as necessary in the foundry as sand is."

In the first place air hoists have quite a variety of applications. There are two

types of air hoist, each with a definite field of use. The direct-lift hoist consists of cylinder, piston—to which the hoisting rod is directly attached, and valve; and is much the simplest and cheapest form of power hoist, both in first cost and operating expense. The motor type of air hoist has a three-cylinder air motor geared to the hoist proper, the motor being of the same type as is used in the pneumatic drill. The motor type of hoist is not limited in lift as the direct lift air hoist is, and does not require so much headroom; on the other hand, it costs more to instal and operate. Both types find considerable use in foundry work, the direct-lift type for operating core, oven doors, etc., the motor type in operating jib cranes, and on runways to handle moulds, etc.

LITTLE DAVID PNEUMATIC RIVETER AT WORK.

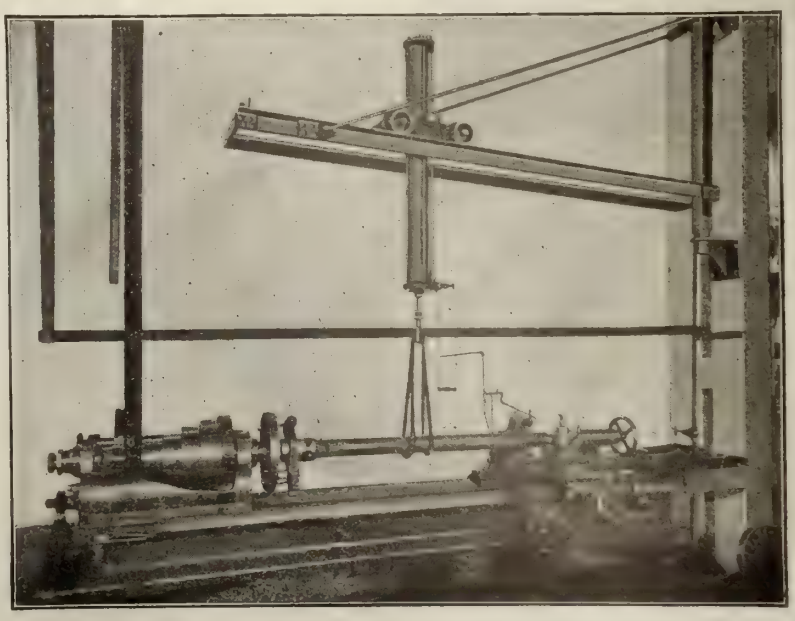
On the foundry moulding floor there are a number of ways in which compressed air is put to work. The core sand is conveniently sifted in an air-operated sand riddle; then there is the pneumatic sand-rammer, which is practically the ordinary hand-rammer operated by compressed air, that is to say the kind of work done by the pneumatic sand-rammer is similar to that done by the hand-rammer, but very much faster, and more uniform. Two types of pneumatic rammer are in use, for bench and floor. W. S. Armstrong, in an article on "Comperssed Air in the Foundry," which appeared in "Compressed Air," quotes a foundry superintendent of his acquaintance as saying: "The pneumatic sand-rammer for foundry work has demonstrated that it is one of the greatest friends and labor savers of the progressive foundryman to-day. When the sand rammer was first introduced there was some criticism concerning it, mainly arising from the natural antipathy mechanics have for anything in the machine line, but as the operators became familiar with its use and recognized its effectiveness, this feeling rapidly disappeared. To-day in our foundry the men take kindly to these rammers, and use them entirely for work of every description."

Power squeezers, roll-over, and pattern-drawing machines—all operated by compressed air—are made by a number of manufacturers such as Tabor, Mumford and others. These cut down the labor and time of making moulds.

Coming to the cleaning department of the foundry the sand-blast claims attention. Of all the various methods of cleaning castings the sand-blast is the best for the greatest variety of work. The sand cleans by a chipping action, and the thousands of sharp particles of clean sand make a good job and absolutely transform the appearance of a machine frame, for instance. Handles and levers that have been sand-blasted are much more pleasant to the feel, and the sand-blast is a valuable help to the inspection department in its search for defects in forgings; these show very plainly after being cleaned in this way. In the early days of development the sand-blast was none too healthy for the operator, but modern equipment with special rooms, etc., has done away with this difficulty to a large extent. A curious point in sand-blasting is that the right pressure to use depends to some extent on the material being cleaned Mr. R. L. Streeter, for instance, gives 60 lbs. pressure for brass and aluminum, 80 lbs. for grey iron and malleable iron, and 90 lbs. for steel castings.

Two of the large family of pneumatic tools are found working in the cleaning department of the foundry: the pneumatic chipper and grinder. Both of these are in use to remove fins, smooth down corners, and generally improve the general appearance of castings. In steel mills pneumatic chippers are also used to chip out seams in order to discover how deep they may be, and determine whether the billet or forging must be scrapped. The pneumatic chipper is an air-operated hammer, the piston moves freely in the cylinder and hammers on the chisel head. The chief point of design is the valve; the number of blows delivered per minute is in the neighborhood of two thousand, and for every stroke the valve must act just at the right time to reverse the flow of compressed air in the tool. Pneumatic chippers are made in various sizes for different classes of work. The pneumatic grinder is operated by a three or four cylinder air motor exactly the same as that used in the pneumatic drill.

A point that should be mentioned in connection with the use of compressed air in the foundry is the advantage of the use of this medium from the point of view of dust. The average foundry is about the most dusty place one could well imagine, and all equipment must be pretty well dust-proof or it will not last very long. Now all air-operated equipment has an exhaust to the air, and if there are any leaks they will be from the machine, not into the machine. Pneumatic tools and air hoists are made



DIRECT LIFT AIR HOIST SWING LATHE.

dust-proof, but even if they were not made dust-proof the air pressure would be sufficient to prevent dust reaching the interior of the machines.

Machine Shop—Air Hoists, Pneumatic Tools, Air Chucks, Etc.

Pneumatic tools find two main applications in machine-shop practice—in the vise department, and in assembly. All vise work includes a considerable amount of chipping, and this can, as a rule, be done better by the pneumatic chipper than by hand. In the assembly department, particularly where machines are at all bulky, there is work for pneumatic chippers, grinders, and drills. The work of the chippers and grinders is similar to their work in the foundry, removing fins, smoothing down corners, and giving that finished appearance that counts unconsciously with the purchaser. The pneumatic drill is handy on account of the fact that it is so readily portable. The main drilling of a shop is done, of course, on the ordinary drill-presses, but as a rule there are some of the holes that can be more conveniently done with the small portable pneumatic drill.

LITTLE DAVID DRILL AT WORK ON WOODEN SHIPBUILDING.

Air hoists have one of their main fields in machine-shop work serving machine-tools. As a rule the direct-lift hoist is best adapted for the medium sized tools, and the motor type for the heavier boring mills, etc., though the Canadian Pacific Railway, for instance, in their Angus Shops, Montreal, use the direct-lift type for some very heavy machine-tools—there is quite a vista of air hoists in these shops. The air hoist serving the machine-tool saves a great deal of time, and one man can run a machine without having to call on a mate for help every time he moves a heavy casting. It would scarcely pay to instal air hoists for machine-tools smaller than a 16 in. swing lathe—we do not advocate compressed air as the universal cure-all—but where the weight of the pieces handled is much over 50 lbs., the air hoist certainly saves money.

The war developed the air-operated chuck and mandrel for lathes. The writer made a number of time-studies on the Jenckes copper-band turning lathe for shells, which had an air-operated clutch with combined control. The average time for six-inch shells, table to table, was 28 seconds for a number of shells; in order to allow plenty of leeway the advertised time was made 40 seconds per shell—and the advertiser was not "drawing the long bow." In the six-inch shell shop of the Canadian Ingersoll-Rand Company, the direct-lift air hoist was used in a rather novel way as a "quick-return" on the boring machines. It was found that a four-inch hoist placed horizontally at the back of the machine, and yoked to the boring carriage was amply powerful enough for the purpose, and relieved the machine operator of a good deal of hard work with very little expense. Still another use for compressed air in this particular shell shop, and one that gained the official approval of the Imperial Munitions Board was the adaptation of the pneumatic drill to driving the screws of the shell boxes. These boxes had ten screws each, to be driven after the shell had been loaded in; the writer's time-studies average thirty-five seconds per box. And, by the way, there is no reason why this particular use for the pneumatic drill should disappear because the war is over.

Shipbuilding

It is no exaggeration to say that compressed air played a very important part in winning the war, the modern shipyard uses compressed air in very large quantities, and the speeding up of shipbuilding that took place in Canada, Great Britain and the United States in the last two years was due largely to the increased use of compressed air. The Hog Island shipyard of the U. S. Emergency Fleet Corporation, for instance, was equipped with the second largest compressed air plant in the world, with a total air capacity exceeding 80,000 cu. ft. per minute.

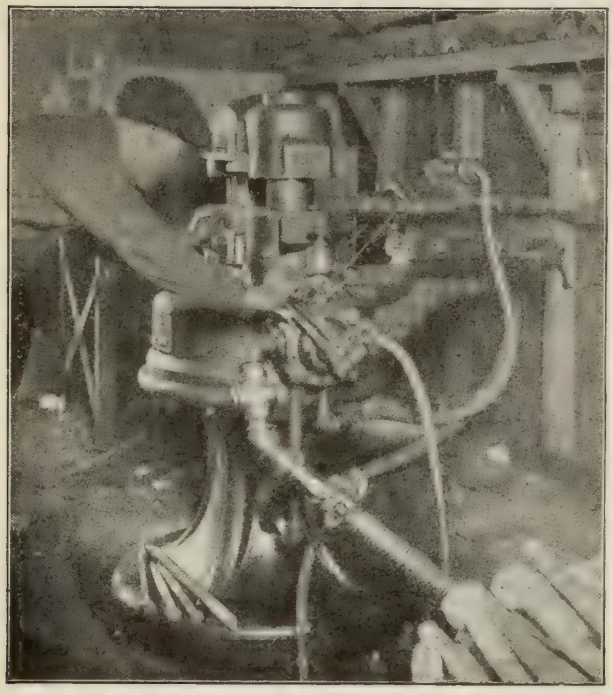
The use of compressed air in shipbuilding brought most into prominence is riveting. A large steel ship requires a million or more rivets to fasten together frames and plates; nowadays these are practically all driven by the pneumatic riveting "gun." For some classes of riveting, in plate shops, for instance, the hydraulic "yoke" riveter is used to advantage, but this machine is bulky, and not readily portable, so that it has little application in shipbuilding practice. There are many requirements for good riveting. "The holes must be in line, the plates must be well bolted together, the rivets must be hot enough to expand and fill the hole the entire length when driven, the holding-on device must hold the rivet firmly in place," etc. The riveting hammer for shipbuilding work weighs about 20 lbs., and contains a steel piston about 1 1-16 in. x 2 1-2 in. or 3 in., with a stroke of 6 inches. For "button-head" rivets a cup-shaped "set" is used which forms the head of the rivet while it is being driven; for "flush" rivets on decks, etc., the "rivet-set" is flat, and the rivet is first battered down, and formed by moving the riveting hammer around the head of the rivet. Although riveting by means of the pneumatic hammer is remarkably speedy, it must not be too fast or the rivet will not have time to shrink properly and fill the hole as it should; which fact makes one a little suspicious about some of the marvellous "records" that used to appear in the newspapers last year.

A. Mason MacFarland in his article on "Pneumatic Riveting Practice," which appeared in CANADIAN MACHINERY for April, 1918, has a pretty good story of the way in which riveting impressed a fair Vassar graduate who was visiting a shipyard. After seeing the rivet driving, she was asked what she thought about it: "It seems so foolish," she said, "to make all those little holes and then fill them up again!"

Among the factors of successful riveting mentioned above, that of correct lining up is important. In very rough riveting practice the holes in the plates are punched in the shop, and may not line up very well when the plates are actually erected. To secure correct alignment the modern practice is to punch the holes smaller than the final size, and ream them to correct size after erection, with pneumatic drills. This is, of course, expensive, but as the gain in strength in the riveted joint is estimated to be over 20 per cent., it is

PNEUMATIC RIVETER CAULKING OAKUM ON SHIP'S DECK, FRASER, FRACE, SHIPYARD.

well worth the cost. Pneumatic chippers are also used for the considerable amount of caulking to be done; for caulking oakum into wooden decks a special pneumatic tool is used. Among Canadian shipyards using this pneumatic caulker for ships' decks may be mentioned Fraser, Brace and Co., of Montreal. The same company has followed the lead of American shipyards in using an air-operated bolt-header adapted from the drill steel sharpener of mining practice. American practice shows that this machine is capable of turning out from 200 to 400 bolt-heads per hour as regular performance, and a variety of small forgings can easily be made on the same machine by using suitable dies.



LEYNER PNEUMATIC BOLT HEADER FORGING HEADS IN

Pumping By Compressed Air

Air lift pumping is not so well known as it should be. While not the most economical form of pumping point of power used, this system has very striking advantages for certain services. In the first place the system is simplicity itself, the whole outfit at the well consisting only of two pipes, an air pipe and a water pipe with a few fittings. The compressed air is supplied from an air compressor which need not be near the well and can conveniently be placed in an existing power house. This simplicity makes the air lift system ideal for isolated plants, villages, etc., for their water supply; for instance, Bishop's College, Lennoxville, Que., is supplied with its drinking water by an air lift taking water from a well 400 ft. deep, and enjoys much more healthy and better tasting water than the village of Lennoxville close by.

In air lift pumping the compressed air does not force the water to the surface as liquids are pumped from tank to tank in displacement pumping. The air is forced to the bottom of the well and mixes with the water forming a foam of bubbles, which is lighter than the water in the surrounding rock and is forced to the surface by the weight of the water surrounding it. To be successful the air must be thoroughly mixed with the water, and all air lift systems have special mixing chambers in which the air is delivered in very small bubbles. Another advantage of air lift pumping is that the water is automatically aerated, which improves it considerably for drinking purposes. In the Bishop's College installation the air compressor is in the main power house two or three hundred yards from the well, and the engineer needs to visit the well only once a week or so to inspect the casing and valves.

Displacement pumping by compressed air is used to a large extent in chemical plants to transfer acids and corrosive liquids; it is also useful for moving liquids containing grit or sand, as there are no moving parts to clog. In the acid plant of the Nichols Chemical Company at Capelton, Que., two compressors run continuously for this service alone; one of the chief advantages of this system of pumping is that in intermittent service a large volume of liquid can be moved very quickly by using the storage capacity of a large air receiver.

An increasingly important application of compressed air in the use of air jet for different purposes. In the first place oil and powdered coal are becoming more and more important as fuel for steam boilers. These cannot be successfully used without a special form of burner, which blows the oil or coal into the furnace, at the same time thoroughly mixing it with air. A large number of burners have been patented for both types of fuel, all, however, include some form of air jet, using either high or low pressure air. The air jet is also very useful in automobile factories for spraying paint and varnish; a number of largest plants paint all their motor cars in this way. In chemical plants, tanneries, etc., textile mills, etc., the air jet offers a simple method of agitating solutions in tanks, and a large amount of compressed air is used for this purpose. For cleaning electric motors, particularly industry surroundings the air jet has no equal; in machine shops the air jet is also handy for different purposes.

Perhaps one of the reasons why the important work of compressed air has been not so well known as it should be is that it has so many applications in so many different trades. For instance, everyone connected with shipbuilding knows all about the pneumatic riveter and drill, but he may not know so much about the importance of compressed air to the mining men, or the uses of compressed air in textile mills, for example. If this short article gives a rough idea of the wideness of the field of application of compressed air it will have accomplished something worth while.

It is only reasonable in concluding an article of this kind, giving the rough outline of what compressed air can do, to refer to the extensive literature on compressed air. Among the larger books there are two of a general nature by Robert Peele and Frank Richards; "Compressed Air for the Metal Worker," by C. A. Hirschberg, of New York, is smaller and more compact. There is also a journal dealing exclusively with compressed air engineering: "Compressed Air," published in New York. All of these are reliable sources of information on different phases of compressed air engineering.

AIR LIFT PUMPING INSTALLATION.

A Discussion on Radiometallography

Being a Few Practical Points From Papers Read at the Joint Meeting of the Faraday and Rontgen Societies. The Possibility of Utilizing X-Ray Examination for Welding is Spoken Of

The joint meeting of the Faraday and Rontgen Societies on April 29, at which there was a general discussion upon radiometallography, created a new interest in the application of X-rays to the examination of hard materials, such as steel and wood. At present, of course, the application of the method to steel is in a preliminary stage, and only thin sections can be radiographed, but there is every indication that before long great progress will be made; indeed, it is not beyond the bounds of possibility that portable apparatus will, ere long, be evolved, by the aid of which material and even structures can be examined in situ. To the inspecting engineer the future in this respect holds out great promise, whilst the saving of time and material will be considerable. We give a few practical points from the papers and discussion, a feature of which was the exhibition of apparatus and radiographs.

Sir Robert Hadfield, F.R.S., president of the society, in his introductory remarks, said it seemed to him that in this method of examination there was a great future for the detection of flaws and imperfections in various ferrous, non-ferrous, and other materials. One of the troubles of the past had been that X-ray examination could only be applied to comparatively thin sections of metal. Some investigators had been able to deal with iron and steel sections up to 4 inches in thickness, and he believed that new apparatus had been completed and was now at work in this country, with which it was hoped to be able to penetrate up to 9 inches thickness. Some time ago he had suggested to Professor W. H. Bragg that it would be most interesting to carry out X-ray examinations of various steels and ferrous alloys in order to ascertain whether their structure showed anything of a special nature. Professor Bragg, having expressed his willingness to do so, a considerable number of specimens had been prepared, as well as specimens of various elements. The latter were as pure as it was possible to get them, although in some cases the purity fell short of the ideal. That was particularly the case with silicon. These specimens of iron, nickel and cobalt had been submitted in the hope that study of their structure might lead to some explanation of the differences of their physical properties. It was well known that, notwithstanding the fact that these metals were in the same group in the periodic table, their physical properties were quite different, whilst the heat changes or critical points showed considerable differences. The critical point in nickel was 350 deg. Cent., in iron 770 deg. Cent., and in cobalt 1,100 deg. Cent. By "critical point" was meant the temperature at which each of the metals changed from magnetic into non-magnetic condition. As regards iron, its change was not quite so sudden. There was a loss of magnetic susceptibility at 730 deg. Cent., which did not completely disappear until about 770 deg. Cent. was reached. A similar range might exist with regard to nickel and cobalt, but these two elements had not yet been so carefully examined. Another curious point was that, so far as was known, cobalt, alloyed with iron, does not give a non-magnetic material. In the case of manganese steel, upon adding manganese in sufficient quantities, say 12 per cent. and upwards, notwithstanding the presence of some 80 per cent. of iron, the material became non-magnetic. In some way, between 24 and 26 per cent. of nickel made iron non-magnetic, but no alloy yet made of iron and cobalt appeared to be non-magnetic, which was rather a curious point, except that, of course, the much higher critical point of cobalt no doubt decided this point.

Professor Bragg then delivered a very interesting lecture on the elementary principles of radiometallography, and indicated the practical possibilities of this method of examination.

Lieut.-Col. C. F. Jenkin said that considerable claims had recently been made for X-rays as detectors of hidden flaws in steel. The only flaws in which he was interested were the hair cracks, which gave considerable trouble in aero engine crank shafts, and although there seemed to be no likelihood that X-rays could reveal them, he was persuaded to test the matter practically. Samples were therefore examined. They were pieces cut from crank shafts with large and relatively obvious flaws, but no trace of defects was shown by the X-rays. One sample, about 2 cm. thick, was cracked right through the thickness for a length of about 6 cm., but there was no evidence of the crack in the radiograph. If such large flaws could not be detected it was obvious that the method was useless for finding hair cracks.

Mr. Eugene Schneider, president of the Iron and Steel Institute, described in a paper the directions in which the method of examination by means of X-rays has been applied at the Creusot works. The general conclusions drawn from the work so far carried out are that in our present state of knowledge of X-rays and their production, the application of radiometallography enabled an examination to be made of ordinary steels, provided their thickness did not exceed 40-45 mm. This limiting thickness was reduced when the steel contained at least one constituent of higher atomic weight. It would be of inestimable value if ingots of 20 cm. could be radiographed, but unfortunately we had not yet reached that stage. Nevertheless, every step in the direction of finding a detector more sensitive to X-rays than those already known would lead to progress in radiometallography. Similarly, as the means of producing X-rays of high penetrative power were improved it would be possible to increase the scope of X-rays in the examination of metals. An interesting application of radiography referred to in this paper was as an aid in sorting out mixed bars of metal, obviating the necessity for a chemical analysis. If, for instance, carbon steel bars had been mixed with tungsten steel bars, they could be sorted out speedily. Bars of unknown composition and a bar of standard steel in these circumstances, could be placed on a slab, a radiograph taken, and the opacity associated with each bar measured. The values obtained could then be compared against a chart drawn up for steels of known composition and permitted of a deduction as to the nature of the various bars. Investigations have been carried out by means of X-rays at the Creusot works: (a) Into segregation and blow-holes and the influence of aluminium upon case steel; (b) The examination of steels containing different percentages of tungsten; and (c) the examination of compound steels.

The application of radiography to the examination of timber, both in the raw and finished state, was dealt with by Major G. W. C Kaye, with special reference to timber for aircraft work. In doing so, Major Kaye drew attention to the low efficiency of the apparatus now in use for dealing with steels. The efficiency of the X-ray tube, for instance, was of the order of one-tenth of 1 per cent. Similarly, the induction coil had a low efficiency, and a tremendous amount of work had yet to be done to improve X-ray apparatus.

In a joint paper by Sir Robert Hadfield and Messrs. S. A. Main and J. Brooksbank, reference was made to the possibility of utilizing X-Ray examination in connection with welding to ascertain the soundness or otherwise of the welds. The expense of the apparatus was admitted to be heavy at present, and its operation suited rather for an expert than for routine purposes. Attention was also called to the fact that at present X-ray examination does not magnify defects; hence its utility is limited to those defects which are of a size within the visibility of the naked eye. Consequently, as many of the defects in steel arise from microscopic causes, we must stil rely for their elucidation on micrography.

Another paper by the same authors described some work in connection with the

*From "Practical Engineer."

radiographic examination of carbon electrodes used for electric furnaces. The investigation was carried out in view of the trouble experienced with these electrodes in practice, and it was thought that radiographic examination might help to show internal causes accounting for their inconsistent behaviour. A number of electrodes from different makers were obtained, but the authors confess that not much light was thrown upon the matter. Whilst the work which was carried out was of great value to Messrs. Hadfield's, it is suggested that the best use of radiographic examination in this connection would be during electrode manufacture where variations of composition, baking temperature, etc., could be experimented upon step by step in the process.

Dr. C. A. Edwards (Manchester University) drew attention to the very great bearing which this work would have upon the future of all metallurgy, not only from the practical side, but also from the theoretical side. It was a great pity from the scientific point of view that the war started just at the moment when Professor Bragg had got out his important work, and he hoped that he would quickly get back to it on metallurgical lines and give metallurgists further important results.

Captain Jackson, Admiralty Inspector of Steel in Sheffield, said he had come to the meeting hoping that he would hear something which would be of practical value in dealing with the inspection of naval ordnance, more particularly in investigating cracks in material. Inspectors of such material desired to pick out flaws and to examine material very rapidly. An enormous amount of material went through their hands, but they had only been able to examine the surface of it in the ordinary way. The application of X-rays, however, would enable them to check whether there were internal flaws in the material without it being necessary to keep any permanent record of the observations, except in cases of defect or suspicion of defect. After listening to Professor Bragg, he almost hoped that they would be able to determine whether there were flaws. by merely passing the material before some form of screen, and by the shadow on the other side to reject or pass it straightaway. There was one very important development which apparently had not yet been reached, and that was the examination of heavy forgings. One of the troubles with heavy gun forgings was the question of small defects in the steel, particularly nickel-chrome steel. With this steel there were typical flaws which did not always appear on the surface. Perhaps it was found that in turning a gun forging certain flaws appeared. With further turning they disappeared, but other flaws made their appearance. When they came to the finished gun forging, perhaps there were no visible flaws, and then the inspectors had to make up their minds whether there were any flaws in the forging or not. As they could not see any they had to say there were none. In order, however, to accept forgings under these conditions, and so as not to run any risk in doing so, it was necessary to have a large margin of safety in the design, whereas if they could be perfectly certain that there were no flaws, that margin could be reduced. A large margin of safety meant unnecessary strength, the article was heavier than need be, and there was waste of material and waste of efficiency. Consequently, if X-Ray examination could be developed so that it was possible to thoroughly examine thick steel forgings to ascertain whether there were any flaws in them or not, it would be of great practical advantage in the development of ordnance. There was another direction in which such a method would be valuable. During the times of pressure through which we had recently been, the assembling and inspection of fuses had to be carried out with great rapidity ,and there was always the possibility of important components being left out. In two particular instances which came under his notice it was wanted to know whether components had been omitted from certain fuses, and X-ray examination would have enabled him to have examined the fuses without the trouble of having them taken to pieces to find out, and then having to reassemble them again. He did not know at the time that X-ray examination was a practical proposition, and the work involved was enormous.—"The Practical Engineer."

The "Engineer" publishes some concise data on the R 34's journey worth repeating. They comment as follows:

"The double journey across the Atlantic to America and back, of the Clyde-built rigid airship R 34, following within a month a non-stop aeroplane flight from Newfoundland to Ireland, represents a triumph for British aeronautics of no mean order. From the utilitarian point of view we may not have gained much from either flight, and from the commercial standpoint we may have demonstrated nothing except that the regular passage of the Atlantic by air is still too costly and uncertain to contemplate seriously. On the other hand, the flights have shown in an incontestable manner the vast progress which aeronautical design and construction have made in this country during the past few years. In both instances everything about the aircraft was entirely of British production, from the engines to the wireless equipment, from the metal of the airship's framework to the linen of the aeroplane's wings. The flight of the R 34 under the command of Major G. H. Scott was begun from the East Fortune Aerodrome at 1.48 a.m. G.M.T. on the 2nd of the month. After a comparatively uneventful journey—nothing worse occurred than the cracking of a cylinder water jacket, which was repaired with a piece of copper sheeting and chewing gum—the airship arrived over Newfoundland at about 2 p.m. on the 4th. Although the petrol carried amounted at the outset to 4,900 gallons—nearly 16 tons—the fuel supply began at that period to give some grounds for anxiety. Nevertheless the journey was continued, and in the end the airship landed at Mineola, Long Island, at 1.54 p.m. G.M.T. on the 6th with a petrol supply sufficient only for 40 minutes' further flight. The total time occupied on the journey of 3,130 sea miles was 108 hours 12 minutes. The number on board was 31. The airship was moored in the open, and as a result of straining at the mooring cable some slight damage was caused to the nose end. Temporary repairs were effected, and at 4.55 a.m. G.M.T. on the 10th the airship, after cruising over New York, left on her homeward journey, carrying 4,600 gallons of fuel. Favored by a following wind, the trip was carried through expeditiously, although one of the five engines was put completely out of action by the breaking of a connecting-rod. Clifden was reached at 8 p.m. on the 12th —61½ hours after crossing the American coast at Long Island, and at 6.57 a.m. on the 13th a landing was made at Pulham Aerodrome, in Norfolk, with 1,000 gallons of petrol still unused. It was originally intended that the vessel should return to its starting place, but the bad weather in Scotland rendered that course inadvisable. The homeward return journey occupied 3 days 3 hours and 3 minutes.

It has long been known that as the result of spontaneous combustion fires often originate in the interior of large coal piles, especially when the coal is fine and contains a large percentage of sulphur. Some of the recent coal-pile fires have demonstrated, however, that under favorable conditions spontaneous combustion is liable to take place even in piles composed of coal in large lumps. It depends principally upon the nature of the coal and upon the amount of rain to which the pile is exposed.

John A. Thomas, of Columbus, O., who made a special study of spontaneous combustion, is the originator of a simple and effective method of extinguishing such coal fires. The application of his method has prevented enormous damage in several instances, where fire had originated in large accumulations of coal.

Mr. Thomas uses a strong solution of bicarbonate of soda, which he throws upon the burning coal-pile by means of a force pump. The carbon dioxide released from the soda puts out the fire. The gas is assisted by the water which, by the heat of the burning coal, is transformed into steam.

By merely modifying wing curvature, aeroplanes of to-day could be made to fly at a speed of 250 miles an hour, according to a British captain who is considered an aeronautical authority. The obstacle that this would present, however, would be a minimum landing speed of about 150 miles an hour. Greater speed in the air is much to be desired, but no pilot is particularly anxious to bring a machine to earth at a rate such as that indicated.

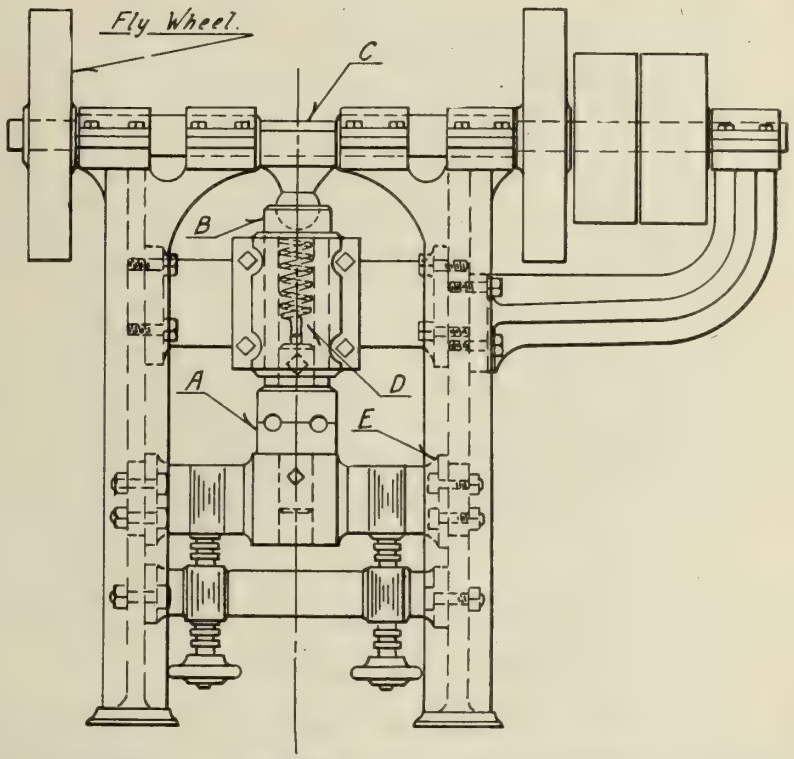
WHAT OUR READERS THINK AND DO

SWAGING MACHINES FOR SMALL SHAFTS

By GEORGE BARRETT

THE accompanying illustration shows a machine designed for swaging buggy and automobile shafts, textile machine spindles, and other work of a similar nature. The anvil block is secured in a cross bar that is bolted to the side supports of the machine. By means of two large square thread screws, the cross bar with the lower swage block is adjustable to the various sizes of dies. The top die is secured in the ram B, which is operated by the eccentric C on the main shaft. On the lower end of the eccentric sheave is a ball that fits into the bearing on the upper end of the ram B. The drive shaft is thrown off centre about ⅜ of an inch, which gives a working stroke to the ram of ¾ of an inch, and a speed of about 1,200 strokes per minute.

There is a key D driven through the central ram bearing, a slot in the ram being made for the vertical movement. The purpose of the key is to provide a thrust for the centre spring, the reaction of the spring being utilized to keep the ram pressed firmly against the ball. The key also serves to maintain alignment of the dies. The machine is belt driven and the shaft is provided with two heavy fly wheels which assure steady action when forging or swaging is in process.



GENERAL VIEW OF THE MACHINE.

FIRST-CLASS FLEXIBLE GRINDER IMPROVIZATION

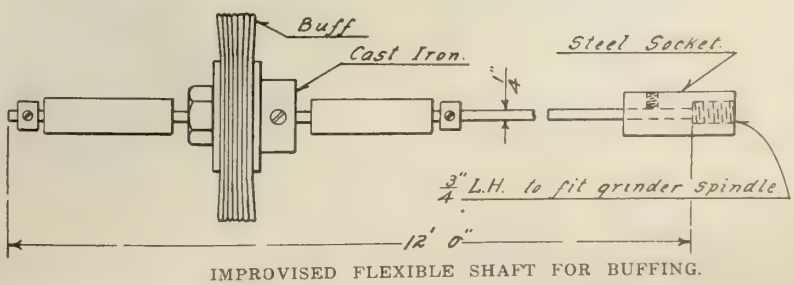
By Donald A. Hampson

We had buffing wheels and rouge, and did more or less polishing of a general nature, in fact we considered ourselves pretty well fixed for this kind of work, but a job came along one day that was beyond us, though it was really very simple with the proper tools. The piece was a built-up device for use in food production—a part about the size of a motor truck radiator, with a nearly-continuous sheet brass shell surrounding, and weighing in the neighborhood of two hundred pounds. This exterior brass surface had to be polished and buffed after the final assembling.

If there had been any kind of a flexible shaft in our equipment it would have been just another everyday job of buffing, but there was not, and we had to get the same results with some sort of a makeshift because the work was not of a size or shape to permit its being presented to a revolving wheel in the usual way.

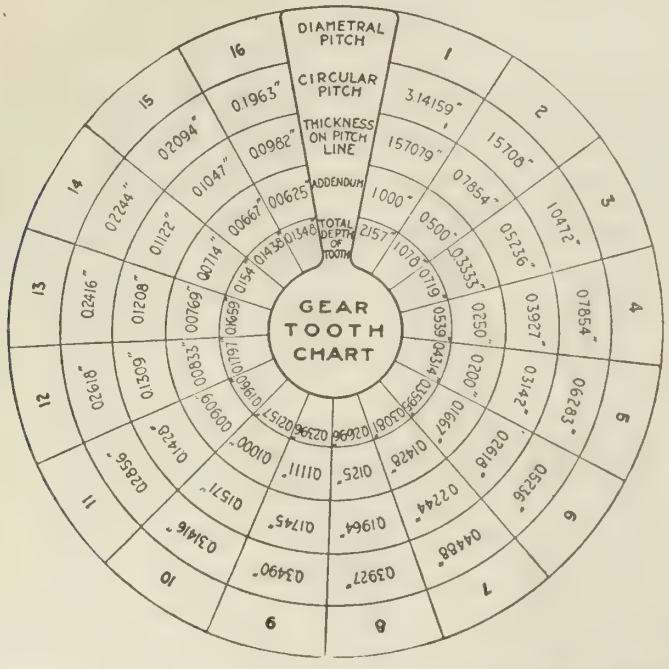
The drawing furnishes details of the "flexible shaft" outfit that was made up—and at no great cost, either. A 12-foot length of ¼ in. cold-drawn steel was set into a socket, or nut, that was threaded to screw on the free end of the Garvin tool and cutter grinder. Five-sixteenth inch holes were drilled through two 6-inch pieces cut from the handle of an old floor broom, these making the workman's handles with which to guide the buffing wheel. A piece of cast iron was turned up and threaded for a standard nut; between this nut and the shoulder of the cast iron piece the buff was held, sufficient grip and stiffness being provided by two flanges of ⅛ in. sheet steel sheared out. As will be seen, this wheel holder receives its drive from the shaft by the safety set-screws, and the roughest kind of collars retain the handles placed either side of the wheel.

In operation, the long length of the small shaft gives the desired flexibility. Use on other work than this one job has proved the rig to be worthy of more than passing notice. The work itself was supported on horses when polishing the broad sides and rested directly on the floor for polishing the edges. While there was some misgiving as to the "whip" of this slender shaft running at a high rate, no trouble was experienced—a one-hand grip would have answered



IMPROVISED FLEXIBLE SHAFT FOR BUFFING.

every purpose, except that of production. As a precaution, a hook was provided for the workman to place the shaft in when not buffing, and a support well weighted was placed midway up the shaft and limiting the shaft to a ring 6 inches diameter at that point. The work turned out was satisfactory in every way and the scheme served the purpose without any delay in getting equipment from a distant point—which we did not know at that time would ever be required again.



GENERAL APPEARANCE OF THE CHART.

A HOME-MADE GEAR CHART

By J. H. Moore

The writer during his drafting experience had considerable gear calculating to do, and naturally got fed up with looking up the tables, formulae, etc., so he devised and made the gear tooth chart shown in the accompanying illustration.

The figures are so arranged that they represent the values of the different diametral pitches.

By moving the centre piece to the pitch desired, all the other necessary dimensions can be read at a glance.

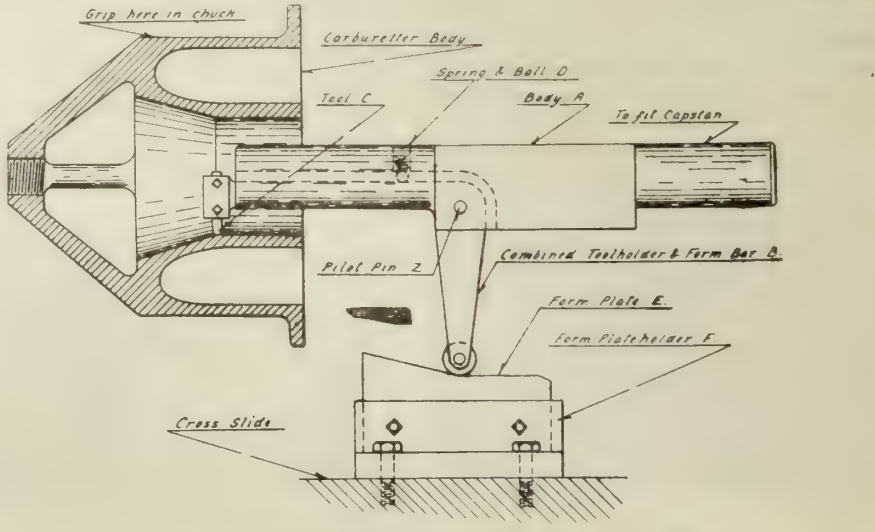
Readers will readily understand the saving of time by the use of such a chart, so as the time necessary to make one of these is a mere nothing, compared with the time saved, they cannot do better than get busy and make one for themselves.

SPECIAL RADIUS-FORMING TOOL FOR CAPSTAN AND TURRET

By G. Blake

The writer, during the war, had to undertake the machining of carburetter parts for aircraft, one of the main parts shown on the sketch, presented difficulties in the way of machining. The taper part at XY had to be machined from the base, gripping the casting (aluminum) in a 3-jaw chuck as per sketch. The following are the particulars of a special tool made to overcome the difficulty. The machine was an 8-in. capstan. The body A is of 2-in. square mild steel turned down on the shank end to fit the capstan head and turned down on the other end to clear the bore in the casting. A ½-in. slot ¾-in. deep was milled along the body to enable the combined tool-holder and form bar B to move up and down, pivoted at Z with a ¼-in. pin, the movement of the tool-holder being limited by the end of the slot milled in the body, with the spring and ball D to keep it rigid. The method of operation is as follows, the tool in the holder being sufficiently short so that it just cleared the parallel part of the bore and commenced cutting on the taper part. The form plate E was fixed in a special bracket on the cross slide. To take a second cut, all that was required was to move the carriage slightly back towards the capstan head, thus making the tool take a deeper cut. A small hardened cast steel roller, fitted in the end of the form bar B, facilitated the movement on the form plate E, which was made of cast steel hardened.

The tool was in every way successful. The cutting tool itself was ¼-in. square high-speed steel.



TAPER FORMING TOOL FOR TURRET LATHE.

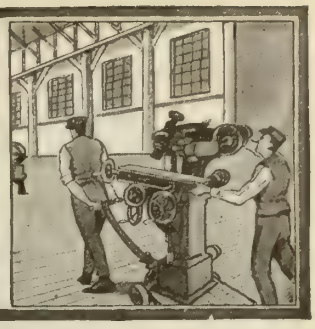
Renewing Operations.—The plant of the Dominion Alcohol Company, at Wotton, Wolfe County, Quebec, will resume operations after a shutdown of six months. The demand for charcoal and wood alcohol, which this firm manufactures, has become very heavy recently.

A fuel-saving measure, which Iceland authorities have found to be very satisfactory, consists in baking bread in a special bakery connected with the local gasworks. The waste heat from the gas plant is used to warm the ovens.

It is a common occurrence for a tap to break when tapping hard metal. If the tap is ground away on the point, so that the first five or six threads will be gradually bevelled, the risk of breakage may be largely avoided. The effect of grinding the end of the tap is to break up the chips into smaller pieces and thus prevent clogging the threads of the tap. This will be found to be especially advantageous in tapping very hard rolled steel.

Here is a little information which will help you to solve the vexing problem that is apt to be a hardy annual, i.e., how much coal to order in order to fill the bunkers, but without having to put some in an old barrel in the outhouse. A ton of egg coal contains from thirty-two to thirty-eight cubic feet, averaging about thirty-five. By measuring the cubical contents of your bin you will be able to estimate how much to order to fill them. This may be done by multiplying together the length, breadth and depth of your bin.

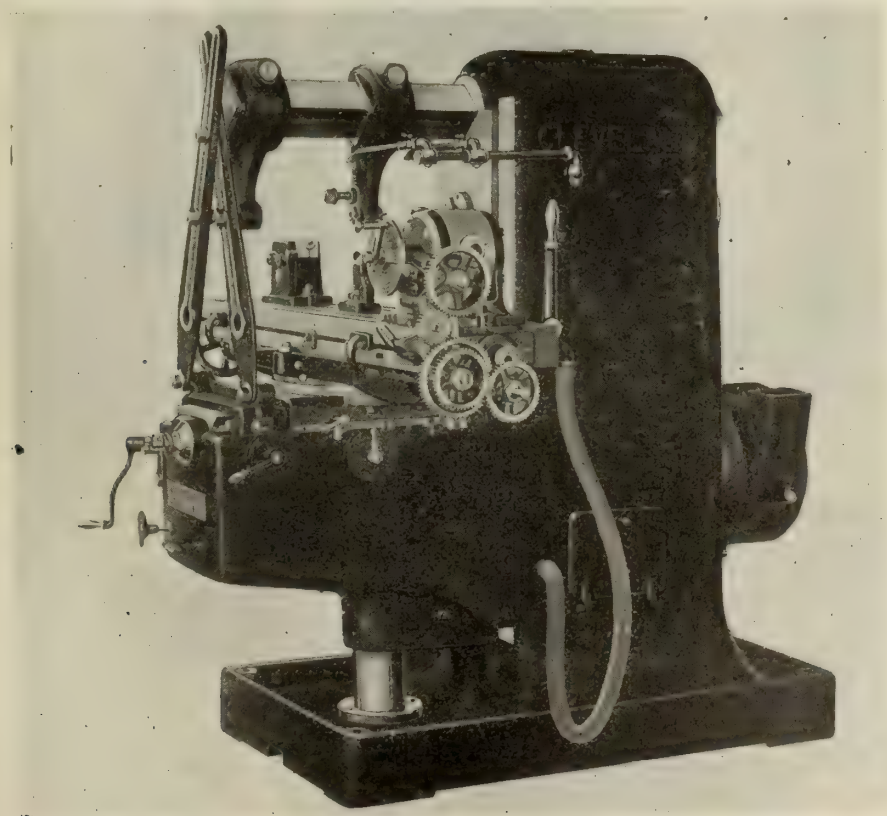
DEVELOPMENTS IN SHOP EQUIPMENT



UNIVERSAL MILLING MACHINE

THE Cleveland No. 1 universal and plain milling machines are of the constant-speed driven type, with 16 changes of feed and of spindle speed. Speeds and feeds are controlled by two levers of the ball-joint type, similar to an automobile gear shift. Changes for both speeds and feeds are obtained through sliding gears which are automatically lubricated. The square overarm and many other improvements are features. The illustration shows clearly the design of the universal type. The column is a complete box section of rigid construction. The base and column are cast in one piece to form a heavy ribbed semi-steel casting, tied together with vertical and horizontal walls. The only openings in the column are those necessary for the change gear levers on the front, the pulley drive housing in the rear, and the cutter lubricant tank on the left side of the machine. Opening of the column is absolutely unnecessary. All the interior parts are lubricated automatically, and all adjustments on the bearings are made from the outside. The dovetail knee slide extends upward to the overarm, thus affording ample surface for clamping the attachments. The depth of the column has been carefully determined in order to place the spindle and the shaft bearings in proper relation to each other to secure maximum rigidity. The dovetail slide on the face of the column is so constructed that the heaviest pressure is not taken at the thinnest section of the column wall as is often the case in milling-machine construction. The horizontal wall separating the lubricating oil reservoir from that of the cutter-cooling compound is designed to give added rigidity to the column. The lower surface of the base is finished to give it a firm foundation, while the contour of the upper surface is pan-shaped with depth enough to catch oil and chips, thus keeping the surroundings clean.

The knee of the machine is strong enough to bear any weight which may be placed on it while doing the heaviest work and has an improved dovetail slide. The bearing of the saddle is not on the thinnest section of the dovetail slide, but on the flat, wide surface, the narrow slide acting as a guide only. There is no bearing in the top of the dovetail guide, which eliminates the possibility of marring due to the operator laying tools on the top of the knee. The bearing of the knee on the column is carried well above the top of the saddle slide, thus giving the knee a longer bearing on the column and reducing the bearing pressure to a minimum. The feed box, as well as the knee, is entirely closed to eliminate the possibility of chips getting into the feed mechanism in the knee. The elevating screw is large in diameter and in one piece. By the use of the post the telescopic screw has been eliminated, the post acting as a support to the elevating nut and as a guide in the knee. The screw is operated with a double bevel gear, hand-feed and power-feed being independent of each other.



UNIVERSAL MILLING MACHINE.

Designers of machine tools find the table and saddle of a milling machine a most trying problem, as these parts are subject to tortional as well as bending moments; therefore these must be designed to resist continuous strains and also maintain their original accuracy. The table of the Cleveland milling machine is machined all over to insure proper alignment, as a table finished on one side only may warp. The bearings on the table are at the top of the saddle instead of at the bottom of the dovetail, a method which secures a large bearing surface and locates the bearings at a greater distance apart. These bearings are automatically lubricated by rollers in the saddle. The bearing on the saddle is also at its widest portion, and both saddle and table bearings are taken up with long taper-gibs which are provided with adjusting screws at both ends.

The square overarm provides positive alignment of the arbors and maximum rigidity of the arm pendants. If the arbor is not exactly true and the arm pendant is brought into place by the operator to accommodate the arbor, the arbor is working in a cramped condition and may break. With the square overarm it is impossible for the operator to place the arbor supports on the overarm and on the arbor in any other way than exactly in line. This simple principle of the square overarm eliminates the possibility of any revolving movement of the pendant and also gives greater bearing surface in column and pendants.

The flanged spindle does away with the overhang on the end of the spindle

as well as the trouble caused by cutters screwing fast on the spindle, and also allows the cutter to be run in either direction. On the flanged spindle is a face keyway, inserted into which are hardened steel jaws for driving arbors and face mills. It is unnecessary to remove these at any time to change from a face mill to an arbor, as the driving is done by the hardened steel jaws. The strain is, therefore, taken off the taper hole. The spindle is provided with a positive lock that enables the operator to loosen the arbor nuts with the least possible difficulty, and is also provided with a handwheel to revolve the spindle, a feature which the operator will find convenient on boring jobs and other milling operations. The spindle lock cannot be operated while the machine is running, nor can the main driving clutch be thrown in while the spindle lock is in this position. The bearings on both the front and rear of the spindle are taken up with a nut on the outside at the back end of the spindle.

All bearings in the column and knee are thoroughly covered with lubricant while the machine is running, thus relieving the operator entirely of the responsibility of oiling the most important parts of the machine and eliminating the necessity of oil holes in any of these parts. This system is highly efficient and is entirely automatic. The reservoir containing the oil has to be filled but twice during the year. As high-speed steel cutters are used almost entirely on milling machines, a reservoir of ample size for cutter-cooling lubricant has been provided. This medium is circulated by a centrifugal pump, which operates only when the spindle does, therefore it is not necessary to shut off the cutter lubricant when changing work or when stopping the machine to measure it. This pump operates automatically when the clutch is thrown in and the machine is running, and supplies a heavy flood of coolant at low pressure to avoid splashing and permit its use in the most ample quantities.

Speeds and Feeds

The speed and feed arrangements are both of the sliding-gear type. All sixteen changes of speeds, as well as feeds, are made by two levers located conveniently for the operator. The spindle speeds are sixteen in number, in either direction, and the feeds are sixteen in number, in either direction also, so that this machine will efficiently handle all classes of cutters. Speeds and feeds being in geometrical ratio, the correct changes of speed and feed for the work to be done can be made without trouble. All gears and shafts in the drive, as well as the feed, are of hardened steel, automatically lubricated, running in bronze bearings and protected against breakage by a safety device.

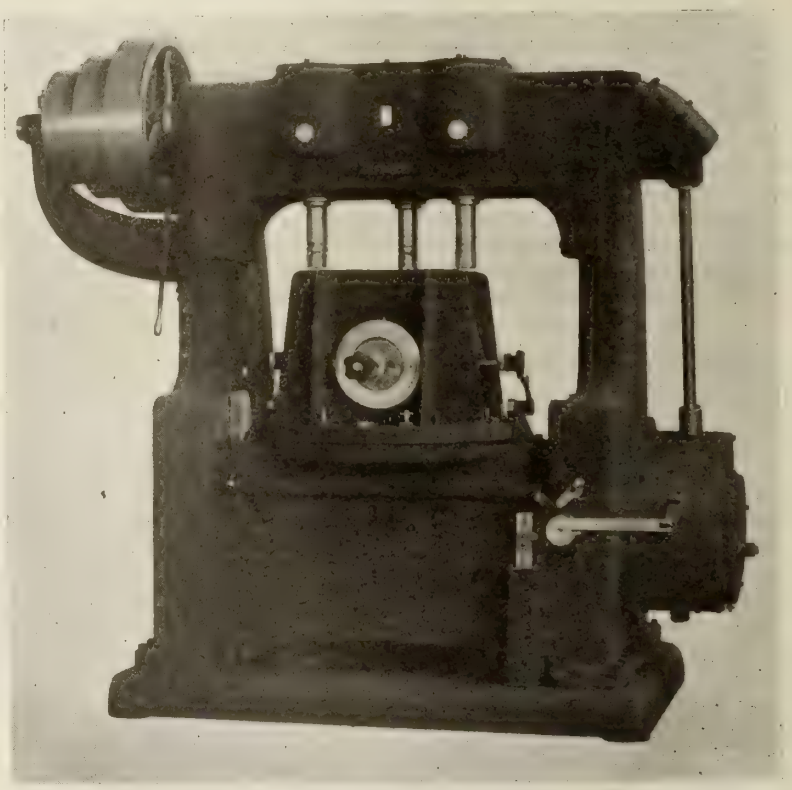
Power is transmitted through a constant-speed drive pulley and the machine is so designed that it requires no loose gears on the spindle. All shifting of gears is done on the secondary shafts below the spindle. The objectionable feature of the tumbler in both the main drive and feed works has been eliminated. The starting and stopping lever can be operated from both sides of the machine and the single pulley running at constant speed for the drive is protected by a belt guard, so constructed that it can be adjusted to any angle and any added extensions. The spindle reverse is contained within the machine so that right or left-hand cutters can be used, and all the speeds, feeds and other driving mechanism are self-contained within the machine. All power gear shafts between the drive shaft and the main spindle are in a vertical line to eliminate all side thrusts in the column casting. These machines are manufactured by the Cleveland Milling Machine Co., Cleveland, Ohio.

CYLINDER BORING MACHINE

THE illustration shows a new vertical gas-engine-cylinder boring machine equipped with a circular indexing jig that is a recent product of the Defiance Machine Works, Defiance, Ohio. The speed and feed mechanisms of this machine are somewhat similar to those incorporated in other machines built by this concern, but the rotating-jig fixture, together with the arrangement of the spindles, is said to be a new method of boring gas-engine cylinders. This method allows the machine to produce constantly and saves the time ordinarily lost in loading and reloading the fixture. The machine is a single-purpose tool and is built in three sizes, taking 36, 48 and 60 in. between the housings. The machine can be fitted with either two or three spindles or with two or three groups of spindles. When fitted with three groups of spindles it will rough-bore, semi-finish and ream gas-engine cylinders of either single units or a number of units cast en bloc, these three operations being accomplished at one time. The circular indexing jig is designed to hold four units, this method of construction allowing the three above-named operations to be carried on at the same time the operator is unloading and loading at the fourth station.

Lubrication is secured by means of a force-feed and splash system, this being made possible by the all-enclosed feature of the machine, both the feed and drive mechanism being tightly encased and practically submerged in a bath of oil, while the bearings are lubricated through individual leads from a force-feed mechanism.

The unit method of construction is followed throughout, each unit being accessible without disturbing other parts of the machine. The drive to the spindle is from a three-step cone pulley through steel worms and bronze worm gears, but instead of driving the spindles by means of keys as in common practice, large tongue drives are cut integral with the spindles and mesh with grooves in the worm gears. This construction is located close to the spindle nose and as used in conjunction with the worm gear is said to effect a very smooth and powerful drive which reduces the possibility of torque in the spindle to a minimum and eliminates the chatter of the cutting tools. The spindles themselves are of hammered stock supported in three bronze bearings. The nose bear-



DEFIANCE GAS ENGINE BORING MACHINE.

ings are of conical shape with a means of adjustment, while end thrust is carried on two sets of SKF ball bearings. Momentum of the spindles can be overcome after the power has been shut off by a friction brake located in the drive pulley and operated by a lever within reach of the operator. The boring tools are fitted to the spindles by tapered shanks and are securely held in place by long bolts passing through the spindles, this method of construction eliminating the possibility of the tools being extracted from the spindle on the return feed.

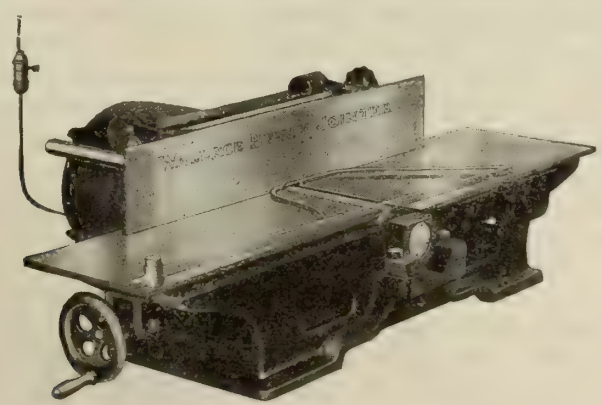
All feed-shaft bearings are bronze bushed, while end thrusts are carried on SKF ball bearings. The feed changes can be made by removing the gear-case cover and changing two gears. A hand adjustment for the table is provided, and when in operation the table feeds the work to the cutters, and when through, the cut automatically reverses on fast travel, returns to the loading position and stops.

The table is raised and lowered by jackscrews, each screw being retained in a jack and actuated by a worm and gear through a bronze nut which is sleeved to the worm gear. Each jack is a unit in itself, and its contents are packed in grease. A means is also provided for adjusting the screws independently to maintain alignment of the table. All thrusts are carried on SKF ball bearings. The jackscrews are located directly beneath the table and a vertical feed is obtained, eliminating side thrust.

The table, column and base are of cast iron, the table being gibbed to the column on both sides. The column and base are of box section, reinforced, and the base rests on the floor at three points only.

WALLACE BENCH JOINTER

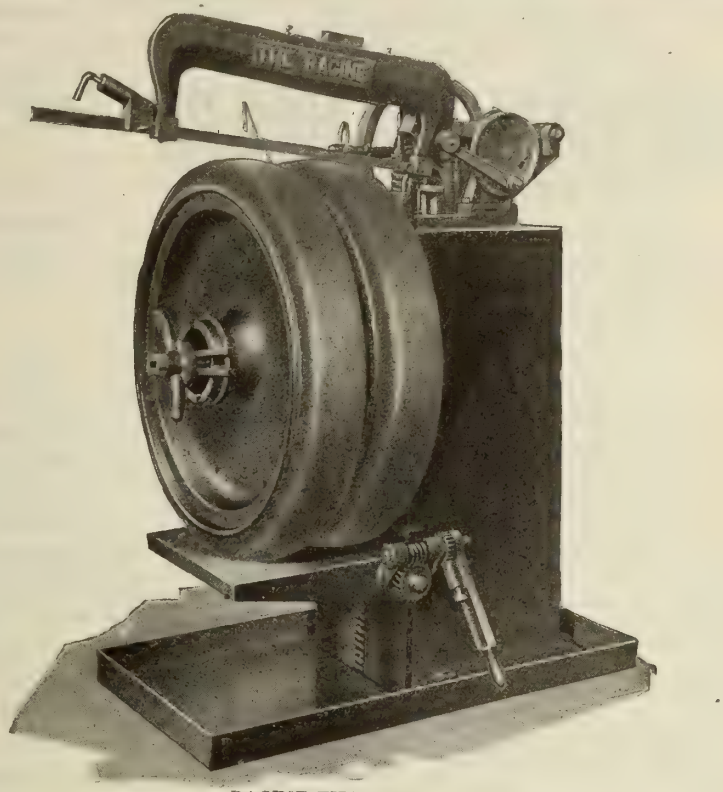
A 6-inch bench jointer which is shown in the accompanying illustration has been developed by J. D. Wallace & Co., 1401-1405 W. Jackson Blvd., Chicago, Ill., for use in working and pattern shops. On account of its smallness and weight, this machine can be readily carried by one man, thus permitting it to be transported to any part of the shop where a machine of this type is required. A feature of the machine is the fence, which is mounted on the motor and slides backward or forward on rods, which allow it to be accurately adjusted. This fence is so designed that only a very small amount of table space is lost when the fence is set for beveling. The motor is connected to the machine in such a manner that the cutter-head can readily be taken out and another head inserted. The tables may be slid away from the cutter-head to permit the use of special heads, or they may be slid forward so as to work with the narrowest possible throat opening. An efficient arrangement of the flap and shutter has been effected by mounting the shutter guard on the cutter-head bearing. The machine is equipped with a motor, lamp cord, and plug for operating from any ordinary lighting circuit.



WALLACE BENCH JOINTER.

RACINE TIRE SAW

The Racine Tool Machine Co., Racine, Wis., has recently developed the hack-saw shown, which is used for removing the steel rims of worn-out truck tires from the wheels. The saw mechanism is mounted on a sturdy base provided with a platform that may be raised or lowered by a ratchet-lever-driven worm, operating a gear in mesh with a rack cut in the base. After the platform is adjusted to the proper height for the wheel being handled, the wheel is locked in place by a bar passing through the shaft hole. The platform may also be provided with a shallow V-shaped top surface to aid in centering and holding the wheel. The saw frame is arranged to hold any size blade up to 24 in. in length by 1 in. in width, and is so arranged that the automatic control mechanism automatically stops the blade when it has finished its cut, parallel to the felloe. The machine can be furnished for either motor or countershaft drive and is provided with a pulley 16 in. in diameter with 4 in. face. It operates at approximately 100 strokes a minute, and will cut a dual tire 17 in. wide from the rim in approximately 10 min. A pump is provided for circulating the cooling liquid during the operation.



RACINE TIRE SAW.

Following are the principal dimensions:

Weight 1,077 lb.; floor space, 24 x 48 in.; distance from top of platform to bottom of blade with platform in lowest position, 44 in.; height of machine from floor to top frame, 5 ft.; blades used, up to 24 in. long and up to 1 in. wide; travel of platform, 14 in.; height of platform above floor when in lowest position, 4 in.; coolant used and circulating pump provided; diameter of drive pulley, 16 in.; face of drive pulley, 4 in.; speed, 100 strokes per minute.

Rub rusty steel with emery paper dipped in turpentine to remove rust. Polish with a fresh piece of emery paper and the result will be satisfactory.

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Oil to the Rescue

GREAT stress is being laid these days on the possibilities of oil as fuel to replace coal. The coal situation is becoming acute in every country in the world, and in Great Britain, where coal has for so long been king, it is felt more than in most places. The recent disastrous strikes, coupled with the constant fall of production due to shorter working hours, has caused widespread alarm among all sections of the population, except perhaps among the striking miners. These are evidently of the same frame of mind as the Irishman who, when being lowered down a well, demanded to be pulled up. He backed up his demand with the statement that if it was not complied with he would cut the rope.

The value of oil has been appreciated for a long time now, but one of the reasons it has not been used more generally for fuel aboard ship has been the lack of suitable fuel oil stations in different parts of the world. This is being rapidly overcome, and if the present boring operations in Great Britain result in the discovery of an adequate supply, the situation will be materially relieved. Oil, whether used as fuel for a steam boiler, or directly in the cylinders of an internal combustion engine, is a much more satisfactory fuel than coal. It is more easily and quickly handled than coal, and its heat value is about one-third greater. Combustion is carried out more efficiently than with coal, and there is an entire absence of smoke. The cruising radius of a steamer fitted with oil burners is considerably more than when coal burning, the crew required is less, and the oil can be carried in ballast tanks instead of occupying space that could otherwise be devoted to profitable cargo.

On shore there are a great number of uses for it. Besides being available for steam-raising purposes, it is the best and most economical medium for supplying heat to metal-working furnaces, for tempering, annealing, enamelling, etc. Mixed with the finer refuse of the coal pit, it makes a colloidal fuel of great value. We may look forward to the next few years for great developments in the use of this fuel, which provides a means of obtaining our power at a much higher rate of efficiency than we have been accustomed to getting with the use of coal. It should not be long before it can be applied safely and economically to the heating of houses, to the great relief of the average citizen of this country of long winters.

Don't See the Danger

HERE is a sample of the material that is being published in regard to prices of food. This does not seem to come in the nature of an explanation as to why conditions were forcing up prices. On the other hand it looks very much like a deliberate notice that on a certain date a mild form of highway robbery was going to be perpetrated:

> Edmonton, Aug. 28—In spite of denials by Montreal and Toronto wholesalers of reports that the price of sugar is to be increased, five cars of sugar were to-day offered Edmonton wholesalers on a basis of 17 cents per pound. The previous highest quotations in this wholesale field was 12 cents per pound. Thus this new quotation for fall stocks shows an increase of five cents per pound. This will represent an increase of at least five cents per pound when it reaches the retailer, and an increase of probably seven or eight cents per pound to the retailer, meaning to the consumer not less than twenty-five cents per pound. A local daily devotes a column editorially to the subject to-day, under the caption of "The Sugar Brigands."

The men who are responsible for this condition of affairs are certainly short-sighted, as any simple ostrich that ever stuck its head in the sand in the presence of danger.

They are not reading the signs of the times, nor are they paying attention to the fact that this is coming to be more and more the day of the common people.

It is almost a lamentable thing to see a man or a body of men still obsessed of the fact that they can go ahead and mulct the people without having to stand up later and tell what they have been doing and why.

Only this week a distinguished Canadian, addressing a large body of representative men, was loudly cheered when he stated that any man or firm that took larger profits during the war than in a normal peace-time year, was a profiteer, and worthy of Governmental attention.

You may call it shrewd business; that sounds well. Others not so kindly disposed may refer to it as selfishness, but the man who is being continually gouged by the system is very apt to refer to it as plain theft and robbery. There are laws to deal with the latter class, and it may soon keep some of the profiteers busy explaining why they should be left out of that category.

Politics No Cure Now

THE political parties at Ottawa are doing their best to try and line up again on old lines at Ottawa. They may deny it, but on both sides there are those who seek to bring to bear on the present situation nothing better than the old prejudices and heat of party affiliations.

They have nothing to offer except the return of one or other of the old-time parties to replace the fusion of forces which has taken place.

There are larger problems facing this country now than there were when the war was on. During the war there was a great dynamic force, driving the people together and ahead; there was the imperative element of win or die.

Now these things have been removed, and instead of the war problem of win or die, we have a tremendous economic and financial problem, with its sink or swim alternatives just as clearly marked as day and night.

The Governments of Canada have never yet been able to get right down to hard pan in the matter of administration. For that reason Government jobs have not attracted the best men. It seems to be the idea that it is a life appointment, and this country has always had scores of holders of little jobs that could be swept aside with no loss except to the little holder of the little job.

It is just a question if the people of Canada realize fully the problems with which they are face to face. There is too much political dust. The politician with his eyes glued on the ballot box and the next election is going to pay first and best heed to those things that are going to help get him elected. In the meantime the real big affairs of the country can go to the devil if they please.

If this country had problems during the war, it has more of them now. If they were big then they are infinitely larger to-day.

It looks as though the old political parties were getting ready to grab a war-sickened country by the neck, and shove a dose of old straight-line politics into its poor system.

In which case the country will continue to be sick and its people disgusted.

The Dangerous Car Driver

IT happened at the corner of one of the busy streets in Toronto a few days ago. He was driving his car at a fair rate of speed, and it looked as though he were an amateur at the job. At the corner as he turned to his left he was encountered by a heavy, and fortunately a slow-moving truck. By some strange turn of fortune he hee-hawed around this obstacle. At the curb there was a nice little runabout pulled up. The driver having missed the big truck, could not resist the driverless runabout. Nice driving and a cool head would have carried the day safely but not so with this plunger.

He sideswiped the runabout, caved in the door and running board, jammed the car generally and made his own bus look as though it had been used for trucking purposes on a sixteen-storey building, and by some mishap had fallen out of the window. This being over the car, engine still going strong and clutch in, made a head-on for the curb at the other side of the road. The hydro poles are strong things, and fortunately they are. They took the force of the smash, and by some wonderful process of brain work it occurred to the driver that the next best thing on his part would be to stop the car.

Had there been many people on the road some would have been struck. The driver had no more control of that car than he had of the high cost of living.

Now, the point is here. That driver was probably no worse than scores of others whom the law allows out on the streets in charge of cars. Had he nothing but a straight road, or simple corners, all would be well. But put him in a corner or a hole, and give him something where he has to think and act quickly, he becomes a mighty dangerous element on the road. He is liable to run into anything that is within radius of the engine-power of his car.

The rapidity with which motor traffic is increasing makes it necessary that something should be done to weed out the near-driver of the car. He may be a fine old chap and have no intention whatever of running down any person, or he may be the smart-aleck. The fact is that he can go ahead and take to the road with his chariot, knowing full well that were he to get into a tight place he would explode and drive wild enough for a three-ring circus.

There are rules, regulations and laws for everything under the sun, but there is nothing in sight yet that puts a halter on the fool driver and causes him to sit safely on the kitchen step while a qualified driver looks after the bus and the welfare of its occupants and the travelling public in general.

Speakin' of Profiteers

THE thing that's takin' lots of time and makin' lots of smoke, is the effort that's being made just now to corner certain folk who have been makin' dollars quick and grabbin' of the cash, while others strive to keep alive on sawdust, hay and hash.

They crooked a finger at some prune who ran a butcher shop; he had been gouging folks at home, he made them pay the shot.

He looked the judge right in the eye and waved his fist about, and opened up his sturdy jaw as though to hoot and shout. But then a tear stole to his eye, his voice was soft as lard, his heart was tender as a stew, his countenance not hard.

"Nay, nay," he said, "I am not he who profiteered, by heck, nor soaked the common horde for fair, nor camped upon their neck." Another tear chased down his face and crawled across his jaw, to think that folks suspected him of comin' 'gainst the law.

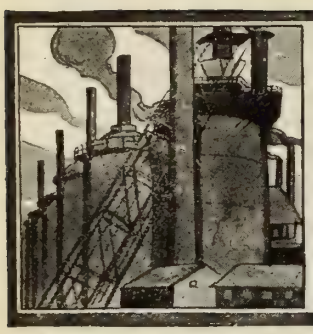
And then they brought a farmer, an honest son of toil, who gouged great holes into the folks, likewise into the soil. Oh, he had bought a joy cart new an' built a new bank barn, and likewise he had carved into the mortgage on his farm. But, bless my soul, he had not made no profits worth the name; his pickin's, so he said, were poor and most uncommon tame.

And so they had a whole procesh to try and find the chap who'd led the profiteerin' biz and staked it on the map. But, good land sakes, he was not there at mornin' nor at night, the chap who'd took the family purse and bled the hang thing white.

I long to see some hardy soul arise and make a bow, and in a voice that's noisy like, far more so than a cow—announce that he's a profiteer, a guzzler and a crab, who'd taken all the things in sight he had a chance to grab!

I would not hiss this chap, oh, no; nor would I heave a brick, nor take my heavy working shoe and aim at him a kick. Nor would I clamor for a chance to smite him on the jaw, nor ask that he be turned unto the 'steenth kind of law.

Far rather would I take my axe, my chisel and my hoe, and then unto some lofty place I'd grab my plans and go, and to this honest, kindly soul who owned up to the graft, I'd raise of granite and of gold a tall and glistening shaft. And on the thing I'd carve a verse, perhaps, in way uncouth, to tell the folks what's yet to come of him who spoke the truth.—ARK.



MARKET DEVELOPMENTS

Labor Trouble Seems To Be More Remote

Independent Mills Seem to Be Quite Emphatic in Claiming That They Will Not Be Tied Up—Dealers Must Have a More Thorough Knowledge of Making of Motor Cars

THE MARKETS AT A GLANCE

UNITED STATES markets should show a tendency to come down to a more settled condition shortly, greatly to the relief of the steel and machine tool industries. As far as the steel situation is concerned, the independents seem to be far more certain than the corporation that their plants will not be tied up. They have assured their agencies in this country that the chances for trouble are becoming more remote each week.

There are some concerns in Canada, especially those building boilers, that have a fine line of business just now. They are buying very heavily, and have orders that run well on into the future. In fact, in referring to one of these concerns a Toronto warehouse stated that, "We have sold more material to them in the last week than in any similar time since we have known them."

There have been no prices changed during the week. There seems to be a desire on the part of many in the trade to leave prices alone as far as possible. The claim is made that further increases simply tend to keep up and increase the agitation that is going on against the cost of materials.

United States points state that the exchange rate is hindering business there, especially anything that looks like export trade, as nations can purchase their needs to much better advantage in other markets where their money is worth more.

The scrap metal market is passing through a peculiar era, for which there seems no good reason, unless it be that there is some manipulation going on in the larger centres. There was a slight break in New York about ten days ago, and so far there has not been a corresponding recovery. Local dealers have not marked down their lists but they state that the figures they are quoting are only nominally correct and may change very suddenly.

MONTREAL REPORTS DEMAND YET FOR THE SECOND-HAND EQUIPMENT

Special to CANADIAN MACHINERY.

MONTREAL, Que., Sept. 4.—While the labor situation in the States appears less acute, there is, nevertheless, an atmosphere of doubt as to what the next few weeks will develop. This uncertainty is reflected in the market here and trading is consequently of a quiet nature. Business continues to drag along as in the last month or so. With little or no change in mill prices dealers continue to quote figures that have prevailed for some time. Early operations and prices will depend, very largely, on the developments of the next few weeks, in which period it is thought that some understanding will be arrived at between the producers and the workmen. Shippers have become interested in the announcement that more cargo space will be available on Atlantic vessels. This has been placed at 50 per cent., an increase of 10 per cent. over what it was expected the Ministry of Shipping would grant to Canadian shippers. The holiday season has had the effect of slowing up business, but sufficient is passing to maintain the interest of manufacturers and dealers. Steel trade has had a quiet week, but indications point to renewed activity early in September. Metals have fallen off a little as a result of the lighter demand. Machinery trading is easier, with second-hand trade becoming lighter. Scraps are moving slowly, but dealers are maintaining firm prices.

Metals Slightly Easier

No material change is reported in the metal situation, and apart from the slight easing of prices, the market is unvaried from that of the past couple of weeks. Demand is, if anything, a little lighter at present, but this condition is generally accepted as being in order at this time of the year. Coppers are down ½ cent, the price quoted being 26½ cents for lake, and 25½ for electro and castings. Tin is steady at 60 cents. Spelter, lead, and antimony are each marked down ¼ cent per lb., the quotations being 9¾ cents for spelter and antimony, and 7¼ cents for lead. Aluminum is quoted at 35 cents, a drop of one cent on the week.

Quiet Week in Machine Tools

There is considerable business being done in second-hand machine tools, but the volume of such sales is gradually assuming a position of less importance. A fair demand is present for new equipment, and this would show some increase if delivery was more certain. Some dealers here have stated that this factor has affected their sales materially. The past week has developed no features of interest and business generally has been below normal.

Scrap Movement Quiet

"The movement in scrap at the present time is of a very conservative character, as we are more or less in the dark as to early developments. The situation in the States, of late, has been a disturbing factor, and the market has consequently been quiet, but little weakness has developed from the lesser demand. Should conditions become more stable there is a possibility that strength will follow. In anticipation of early labor settlements we are holding firm on previous quotations." This statement by a dealer here reflects the general conditions, but coupled with this it should be remembered that August is invariably a quiet period, not only in old materials, but in other lines of industry.

STUDY INDUSTRY TO SELL EFFICIENTLY

Toronto Markets Show Signs of Strength And Business is Reported As Sound

TORONTO.—The holiday has taken, as usual, the keen edge off the business days, according to many of the dealers, who claim that it is almost the middle of the week before they get well under way again. Buying continues to be good in many lines, particularly where the raw materials of manufacture, such as plate, sheets, etc., are concerned.

The scrap metal market is passing through a rather peculiar era, and for no particular or well-defined reason. Those having anything like a large quantity of well-assorted material are simply holding firm and waiting until something more definite develops.

Study the Industry

The methods and ways of doing business are changing, and the machine tool field is no exception to this. The manager of one of the largest Toronto houses sized the situation up as follows this morning: "The Canadian machinery men must study the automobile business if they are going to get the best results from selling to the firms that are in the business and going into it. When a man wants to make cars, his proposition is that he wants and expects the machine tool salesman to get him a plant that he knows will give him the necessary production at the price he is figuring on. Now, in order to do this it is necessary to study and know the business of making cars and their parts. If a certain grinding job cannot be done in the standard equipment, then it may be necessary to specialize and get something that will give quantity production. The same thing can be said of many other operations that are now in many cases considered as being work for standard equipment, but which in reality could be done to better advantage by a special-purpose machine. And right here is where the dealers here often find themselves in trouble. They need a man from the various machine tool works, an engineer, or an expert, who can give expert advice on what his firm can do with these various operations. It is a hard matter for the Canadian dealer always to get this sort of service, but it is a question that must be met."

There are very few dealers in this section of the country that have not been down around the Border Cities during the last few months looking for business. There has been a good lot of selling, especially for the machine tool men with the concerns that are coming over from the United States. One complaint they have is that there is a tendency to do business still "across the line," direct, instead of letting the Canadian representatives of these firms handle their business.

Selling Is Still Brisk

"They bought more this week than in any week since we have known them." That is the way one large warehouse in this city sized up the amount of business that was being taken on by a well-known manufacturing concern. Warehouses in many instances are buying heavily for their own stocks, and find it difficult to keep up with their range. This is especially true with regard to plate, for which there has been a very good demand, and there seems to be no let-up.

Firms that are represented in Canada claim to have no fear of a tie-up of their steel mills. The independents seem to be more certain of this than the corporation mills. They—the independents—state that whatever trouble there has been was local, and adjustment has been made. Of course they realize that it is not well to go the length of making the statement that they will not have a strike, as things all over the world seem to preclude that degree of certainty in referring to any industry or calling.

There is still a desire to take on business in many lines that have been thought to be pretty well sold out and booked up. Concessions are made in queer ways rather than to make a departure from the adopted price schedule. And so it is that the exchange rate provide the latest opening for the concession business. A good many of the mills will now absorb the exchange rate up to three per cent. Some of them held out against this for a while, claiming the prices quoted would be on date of delivery with the exchange paid by the customer on this side of the line. But when one concern or group of them gets away from the beaten path it makes a very good talking point for the buyer who had not heretofore received any concession. Of course many of these little things soon gain circulation in the market, and the demand increases in proportion to the knowledge that concessions are to be had for the insisting. There is also one firm in the copper and brass business that is making this concession on the exchange, but for the most part it applies to plate and sheets, mostly the latter.

Uncertainty in Scrap Metals

There is no saying just at the moment what is likely to happen in the scrap metal market. One does not like to think that there may be a break and indeed there is no reason on the surface why there should be, but for all that there is a feeling of doubt that is putting the scrap metal business on the shelf for the present. The market weakened just about a week or ten days ago, without any warning and for apparently no good cause, apart from manipulation. The starting point of the weakness was in New York, and the situation in those larger centres quickly finds its double in Toronto and Montreal markets. Prices broke there, and there was an immediate tightening up of business. It is not that a half cent off makes such a terrific difference to the market, but it is that this little decline throws a fear into the trading that takes some time to overcome.

Toronto yards are not marking down prices, although they are not keen to do much buying at the values quoted on another page of this week's paper. Unless things show a tendency to come up stronger again the chances are that some of the prices now considered all right will suffer a reduction. For the present, therefore CANADIAN MACHINERY would state that the figures we quote cannot be guaranteed for any length of time. That they are, under the circumstances, nominally correct, is the real situation.

Metals Down a Little

Copper, electro and castings, are a shade off this week. Dealers in copper are not looking for a drop, claiming that if prices do go off it will only be temporary. There is still a very good demand for copper, and that alone is counted upon to keep the prices pretty well up to present levels.

POINTS IN WEEK'S MARKETING NOTES

There is still a considerable amount of uncertainty in the scrap metal markets, and buyers and sellers alike are holding back.

—

Pittsburgh reports that the chances of a strike in the steel trade seem to be growing less. The strike committee will have to call a strike if they wish to convince the steel mills that they are acting for their employees, which claim the steel mills repudiate.

—

In order to make concessions in regard to Canadian business some of the firms are now absorbing the exchange rate up to 3 per cent. At least one copper and brass concern is doing this, while the practice is quite common among the plate and sheet industry.

—

Toronto warehouses are putting some very fine specimens of standard machine tools into stock, the goods having been ordered as far back as three months ago. Deliveries are not improving.

—

Speaking of one well-known Canadian concern, a warehouse representative stated to CANADIAN MACHINERY this week: "They have bought more material in the last week than in any similar time in all the years we have known them."

—

Prices of steel and iron are firm, but there seems to be a growing feeling that there should be no advances announced, as it is in the interests of all concerned that there should be a falling off in the increased cost cry.

EXCHANGE RATES MAKE IT HARD FOR U.S. FIRMS TO DO EXPORT TRADE

Special to CANADIAN MACHINERY.

NEW YORK, Sept. 4.—Labor unrest is having its effect on the machine-tool markets. This has been somewhat marked in the past week, though the outlook is clearer now. The firm attitude of President Wilson on the demands of the railroad shopmen and his insistence that railroad workers on the Pacific Coast return to work have been reflected in a better sentiment. There is not so much fear of a strike in the steel industry now that Samuel Gompers, head of the American Federation of Labor, has had a conference with President Wilson on the subject. Many striking workmen at various plants have returned to work during the past few days, and from every point of view the labor situation looks less disturbing than a week or so ago. The reduction in the cost of living, which the Administration hopes to bring about, will, undoubtedly, have considerable effect in stabilizing industrial conditions.

Despite the lack of any very large buying, a very fair volume of machine-tool business is being done for this season of the year. Some machine-tool builders making machines largely used in the automobile industry are pretty well sold up for several weeks or months ahead. Deliveries on many lines are getting further off. The price situation is also stiffening. Practically nothing is now heard of any price concessions, but quite on the contrary there are more and more predictions that prices will be higher this fall. Some makers of milling machines have made an advance of about 10 per cent., effective at once.

If the exchange situation in European countries would improve, considerable export business would undoubtedly be done by American tool builders, but under present circumstances very little can be accomplished. Japan is the most active foreign buyer, being in a better position than any other large user of American tools to buy here without disadvantage.

There is a fair amount of buying of cranes, but there is keen competition and some slashing of prices on nearly every desirable job. During the war a number of new crane manufacturing companies came into existence, and these are now added to the old plants which were established many years before the war, with the result that there is scarcely enough business for all. It is declared that many crane orders have been taken lately at very close to cost price. The Toledo Bridge & Crane Co., Toledo, Ohio, has received an order from the Pennsylvania Railroad for several cranes for a repair shop at Stark, Ohio, and the Cleveland Crane & Engineering Co., Wickliffe, Ohio, has been awarded an order for about 8 or 10 cranes for the new tube mills of the Youngstown Sheet & Tube Co., Youngstown, Ohio. The Navy Department has awarded to Niles-Bement-Pond Co., New York, an order for five cranes for the Philadelphia Navy Yard.

IT IS NOW UP TO THE STRIKERS TO CARRY OUT THE THREAT TO STRIKE

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., Aug. 30.—Possible labor troubles in the steel industry have been even more the dominant factor in the iron and steel market in the past week. This does not mean by any means that at any time the balance of probability has been that there would be labor troubles. If there were only one chance in 10 or 20 of there being a strike or a voluntary closing of mills (and producers certainly would close their works themselves rather than leave it to the workers to do so) that would be the dominant factor, for the reason that in this dull season there are no other factors or influences of the least importance.

The labor situation, moreover, has had various important ramifications. Its most important is its influence upon prices. Nothing could more thoroughly stabilize prices on their present level than this. On the one hand, with the bare possibility of production being curtailed by labor troubles, no steel manufacturer would think of shading existing prices for the sake of securing an order, for the mills are already fairly well filled with business, and in some lines are crowded, while on the other hand the labor unrest that unquestionably exists, even though it is altogether improbable, there will be any disturbance, is such that any price advancing tendency in the market would be harmful in the extreme. It is the common opinion of nearly all manufacturers, and those who hold the opinion assert it is the opinion of all intelligent manufacturers, that no price advances, even of minor character, are permissible in present circumstances. Price advances would arouse labor to make demands, and would create public antagonism, for the public is now coming to realize that the high cost of living, against which there is so much outcry, is all one thing, made up of many parts, including all wages and prices of all commodities. An advance in any wage rates, or in any commodity, or in any transportation rate, is recognized as affecting the whole structure in which the cost of living is involved.

Thus iron and steel prices may be regarded positively as at a dead level. Recently a few sheet manufacturers started quoting higher prices for their product, but they were very anxious that their names should not get into the trade papers, let alone the daily papers, and now if they do not wish to sell they are much more likely to say simply that they are out of the market than they are to quote a price above the recognized market level.

In some pig iron districts furnaces have been attempting to spread the idea that pig iron prices are higher for next year than the level prevailing for some time past, for this year's deliveries. Assertions have been made that sales have been put through at advances of from 50c to $2 a ton. Generally speaking, such references are undoubtedly incorrect. In occasional instances a buyer of foundry iron may have had occasion to contract for next year in order to cover contracts for the sale of their finished products, but such transactions would be entirely exceptional. Never in the past has the pig iron market advanced that way. When higher prices come, they come first for early delivery, representing in substance a delivery premium, and then if the market is strong enough the higher price gradually extends to the later delivery.

The special committee of the general committee for organizing iron and steel workers, appointed to seek a conference with the iron and steel producers in regard to enforcing the 12 points in the labor platform enunciated July 20, and empowered, in case no conference could be secured, to call a strike, failed to get the conference and thus far has failed to call a strike.

Whether the iron and steel workers have an organization or not is debateable, the manufacturers asserting that the strike vote announced Aug. 20 as 98 per cent. affirmative, did not represent more than 15 per cent. at the outside of the workers. The men soliciting a conference, however, claim they are an organization. In this they have the advantage of the manufacturers, who have no organization, and thus the special committee had to approach Judge Gary, chairman of the Steel Corporation, as the leading man in the trade. When they went to his office Judge Gary sent out word politely declining a personal conference and suggesting that the committee put what it had to say in the form of "a written letter." In writing a letter the committee could not ask Judge Gary, as doubtless it wanted to, to invite all the iron and steel manufacturers to gather for a conference, as Judge Gary would undoubtedly have replied promptly that he was minding his own business and did not care to be the committee's representative in seeking a conference with other manufacturers. The committee, therefore, simply asked for a conference with Judge Gary and Judge Gary replied, refusing, and saying

the Steel Corporation stood for the open shop as against the closed shop and would not discuss business mattters with labor unions. Judge Gary referred to the many things the Steel Corporation had done for its employees, in welfare work of many kinds. The committee replied saying that if these claims as to good treatment were true "even in a minor degree" (and they are absolutely true) the committee would not be seeking a conference. A few days were left and Judge Gary was urged to grant a conference. As he denied that the committee represented the Steel Corporation's employes, they could only prove the point by calling the strike.

The committee then went to Washington, and President Gompers, of the American Federation of Labor, had a conference with President Wilson, who, several days before, had issued a very strong statement, calling for a truce as to all labor demands and during that every citizen co-operate to stop this whole thing. Apparently there was a forlorn hope that the President could be induced to use his influence with the steel manufacturers to get them into conference with the labor leaders, and, obviously, it failed. In bringing the issue before the President the committee burned one of its bridges behind it. It burned another when it wrote to Judge Gary that only a few days were left in which to avert a strike. It burned another, between it and the 12-plank platform enunciated July 20, when it wrote to Judge Gary, "There has not arisen anything between your corporation and your employees, whom we represent, in which the question of 'closed shop' has even been mooted." The fact is that one of those 12 planks was nothing less than a demand for the "check-off," which is the most extreme form of closed shop labor leaders have been able to conceive, and which they never succeeded in establishing, except in some of the union coal mines.

The prevailing view now is that labor demands have just passed their crest and that progress has now commenced towards saner counsels.

MOST FURNACES NOT ANXIOUS TO TAKE ON BUSINESS FOR THE COMING YEAR

The pig iron market still shows strength, with many makers booked up for the present year. 1920 business is not being booked very largely owing to lack of eagerness on the part of furnaces for this business. Basic orders have been placed. Following are reports from U.S. points:

Chicago.—While there is a good general demand, it is not as heavy as in recent weeks. This is chiefly due to labor uncertainty, and makers are not sure how long they can keep their plants running without a strike. The feature of this week's business was the selling of about 30,000 tons basic, in two lots of 10,000 each, and a number of small lots.

Boston.—There have been some sales for 1920 delivery, two orders aggregating 2,000 tons having been sold at $30 furnace for 2.25 to 2.75 silicon. There is no competition from Southern furnaces as far as New England is concerned. About 6,500 tons have been sold during the week.

New York.—There has been a fair volume of business made up of small lots, and generally for this year's delivery. There is but little 1920 business being booked. Export business is very slow, but one lot of 500 tons hematite was booked, and a few tons of foundry iron.

Philadelphia.—Business has been good generally in the pig iron market, bookings being made for both this year and next. 1.75 to 2.25 silicon was sold at $28.50 to $29.50 delivered Philadelphia, 2.25 to 2.75 silicon bringing $1 more for this year delivery, while next year delivery is quoted about $1 higher on all grades.

Buffalo.—There is not much furnace capacity unbooked for this year in this district, and there is not much eagerness on the part of makers to book for next year delivery. Enquiries for about 10,000 tons for first quarter foundry iron are out.

Pittsburgh. — The demand here is chiefly for foundry grade, and one sale of this grade sold for last quarter at 50c per ton over the market rate. Steel making grades are not being called for, but in spite of the limited demand prices in these classes are holding strong.

Cleveland.—Foundries which had completed their purchases for this year are in some cases finding it necessary to come into the market again, their consumption being above expectations. They are after small lots up to 1,000 tons. Furnaces are generally booked up to January 1, and are not looking for 1920 business.

Cincinnati.—Although there is considerable enquiry for next year delivery iron, no quotations have been made on any of these. Higher prices for next year seem to be a foregone conclusion.

St. Louis.—There are numerous enquiries for small tonnages covering both immediate and future shipments, and the market is firm though little actual business has been done.

Birmingham.—Production has increased and several more furnaces are scheduled to blow in during the coming week. At the same time sales have been good and mostly for prompt delivery. An increase of $2 is spoken of for next year delivery.

SOME WEAKNESS IN SCRAP METAL TRADE

With the exception of the New England district, there has been a general weakening of the scrap market. Following are reports from various United States points:

Pittsburgh.—Steel makers are getting more particular about the grade of material delivered to them, with the result that many rejections are being made. Dealers are showing their confidence in future high prices by laying down heavy melting steel at $20.50. No. 1 cupola cast is being bought by dealers at $24.

Boston.—Heavy melting steel has recovered from the decline of last week, and dealers are now being asked $16 for this grade. No. 1 machinery scrap is in good demand, and this grade and stove plate have also stiffened in price. Heavy cast iron scrap was sold at $21.50 delivered.

New York.—The situation in the scrap market is materially better, the trade feeling much less doubt on the score of labor troubles than they have for some time past. Heavy melting is $15.33 to $16 per gross ton New York. Cast scrap and wrought are active.

Philadelphia. — Small business was done in heavy melting during the week. Consumers tried to benefit by the weak market in Pittsburgh by offering $18 to $18.50 delivered for heavy melting steel, but dealers would not sell at this price. Foundry scrap is in good demand.

Buffalo.—Business has been practically at a standstill here, neither dealers nor consumers being willing to do business. All scrap is firm in price, with little selling.

Cleveland.—There have been slight declines in several grades, following a week of stagnation. Heavy melting is down to $20.25 to $20.50. Cast borings $15 to $15.50, and bundled sheets $15.50 to $15.75. Wrought scrap is unchanged.

Chicago.—Dealers are waiting for better prices, and consumers are willing to take the chance of waiting a while, so transactions are practically nil. There is little railroad scrap offering.

Cincinnati.—Business is dull, both dealers and consumers seeming willing to wait. There is not much change in prices, but the situation is weak.

Birmingham.—There are numerous enquiries, but very little activity. There is some inconvenience to the dealers through car shortage, but dealers generally are sitting back and awaiting for an improvement in the market.

OBITUARY

Theodore Cooper, well-known consulting engineer, died at his home in New York at the age of 81 years. Mr. Cooper was identified with the first elevated railroad in New York, and was consulting engineer for the Quebec bridge and the New York Public Library. It was said that had a telegram been received that was sent by Mr. Cooper prior to the collapse of the Quebec bridge in 1907, that accident could have been prevented.

FOREIGN STEEL MAKING LARGE INROADS IN THE BRITISH MARKET

Special to CANADIAN MACHINERY.

SHEFFIELD, ENGLAND.—A most unsatisfactory situation exists at the present time in the iron and steel trades in England because of the recent advance in coal prices and unrest in the coal trade. A sensation was created throughout the country when the Government recently announced an advance of 6s. in the price of coal. This was followed by a serious strike in the South Yorkshire coal field with the result that several steel plants were closed down, while at others output was seriously curtailed. The strike has been settled but unrest still exists.

Owing principally to higher wages, the cost of producing steel has been mounting for some time, and the recent advance in coal has, of course, caused another jump in iron and steel prices. It would almost appear that a climax has been reached, for at present prices the positions of English steel makers is threatened even in the home market, to say nothng of the foreign trade. The situation is interesting to the trade in Canada and the United States for the reason that American mills have been underselling British steel makers in the home market, which incidentally, is causing considerable alarm in England. Some steel men are frankly pessimistic and fear not only competition from the United States in the home markets, but also a serious cut into their export business.

An Acute Position

For some months American material has been coming here, and is causing considerable uneasiness. The unfavorable position of British manufacturers, owing to the fact that America is quoting considerably lower prices is now made more disheartening by the increase in the price of coal. The question of foreign competition will become more acute with the upward tendency in prices as the limit does not appear to have been reached as yet.

There appears to be an opening for Canadian manufacturers in the British mrket under prevailing conditions, for only quite recently a cargo of Canadian steel arrived at Newport, Mon., the price, plus freight, being lower than the home rate. Cheap labor is now a thing of the past in Great Britain, and with it has gone the chief cause for this country's trade supremacy. It remains to be seen if the increase in wages in other countries will affect the situation in England's favor or not.

The export of high-speed tool steels has materially fallen off, and this branch of the steel industry is quiet. There is only a moderate demand for railway steel, but makers of material used in shipbuilding yards and for automobile construction are very busy.

Cutlery are some of the other light steel branches that are very active, and more business is offering on home and foreign accounts than can be accepted. Generally speaking, a large amount of material is required for various purposes, but consumers are holding back with their orders on account of the unsettled conditions prevailing. To use a slang expression, they are waiting to see which way the cat is going to jump. It is generally believed that consumers will be driven more and more into the hands of American manufacturers for supplies, not only for bar iron for rolling and finishing, but for finished products. Even now American bolts and nuts are being imported, a new phase of competition within the last few weeks.

Production Too Low

Little, if any improvement is looked for in the general situation for some considerable time. In the coal trade, as in the iron and steel trade, wages are very much higher than before the war. The rate of production is still far from satisfactory and is generally reported to be anything from 30 to 50 per cent. below the pre-war standard. It is this feature of the situation that is causing so much uneasiness, while in addition, the high prices will retard expansion of trade for both domestic and export account

SECOND-HAND TOOLS BRINGING BIG PRICES IN THE OLD COUNTRY

Special to CANADIAN MACHINERY.

SHEFFIELD, ENGLAND, AUG. 15.—The British Government is selling the equipment at the various National Projectile factories. As might be anticipated some equipment such as shell forging presses, is not in demand, but electric motors and machine tools are selling well, in many cases considerably higher than the original cost.

At a sale recently at a National Projectile factory in Sheffield, 3-phase induction motors sold for £115 and £132 against their cost price of £104 each. A bolt screwing machine, which originally cost £61 15s., realized £100. A number of all geared 16-inch swing, self-acting, sliding, surfacing and screw cutting lathes realized £50 to £60 each. One bolt screwing machine sold for £100 and cost £16 15s. An 18-inch swing all geared head lathe on an 8-foot bed sold for £85; 14-inch stroke double geared self acting slotting machine £305, original cost £245; a 22-inch fixed head drilling machine £60, cost $45 15s.; a planing machine to plane 6-ft. x 3 ft., £380, cost £252; three 9-inch centre double gear screw cutting lathes realized £150, £100 and £50 respectively, and a 7½-inch lathe was bought for £30; a 2 foot 6 inch "Forsdick" radial drilling machine found a buyer at £230, the original cost being £200. A 16-inch stroke swivel head self acting shaping machine was purchased for £145, whilst a number of vertical pneumatic hoists realized from £5 10s. to £8 10s. each.

Prices of new machine tools are holding very firm, but there is little demand. Consumers are now buying much equipment now owing to the unsettled conditions.

AUSTRALIAN TRADE FOR THOSE WHO STUDY FIELD AND GO AFTER BUSINESS

IF the Canadian manufacturers in any and all lines want to secure more of the trade of Australia they will have to make up their minds to look after it more thoroughly than they have ever done before.

That was the opinion of a Canadian business man, who just returned from that country, but who, for various reasons, does not wish to have his name used. "There are developments going on in the steel and iron business there, particularly at the hand of the Broken Hill Company at Newcastle, N.S.W. This company has had a romantic career, and is a wealthy concern. During the war they were careful of their prices. They did not indulge in profiteering, and the chances are that in consequence there may be some favorable tariff arrangements made to assist their future development. In the war period, for instance, you could purchase rails in Australia from that company for less than the freight on them would have been from United States or any other country that was in a position to sell them. Of course, there is a market there for steel. Although the Broken Hill people are making good progress they cannot begin to supply the market. Sheets and bars are the lines most in call just now from what I could observe, although I was not there in the interests of the steel industry.

Must Act Quickly

"There is one thing the Canadian business world should think of," our informant continued, "and that is that there are more mails per day between Hamilton and Toronto than there are between either of these places and Australia. For that reason the people in this country should be very prompt in answering any letters they may happen to receive from Australia. I heard of several cases where this had not been done. In fact, in one instance, I was told of an Australian firm sending letters to several places in Canada and United States asking for certain information about lines in which they were interested. Evidently the United States

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with or without tapping attachment.

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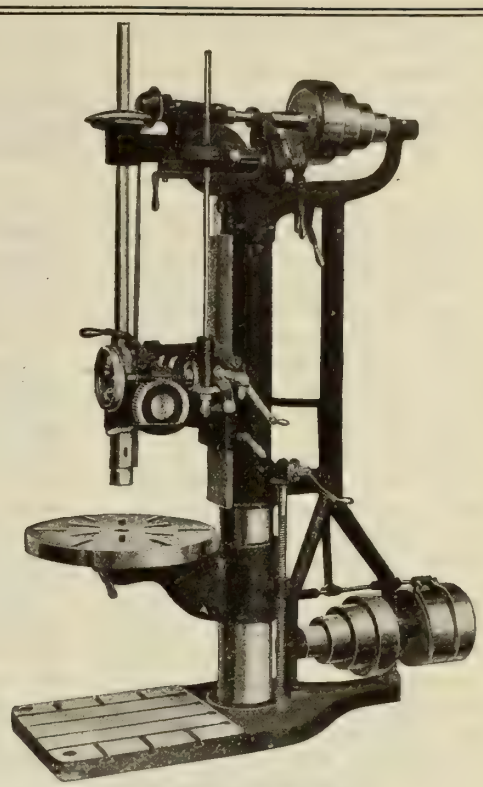

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Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

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There is "Class" to each "MORROW" product; that indefinable something which lifts them out of the ruck.

"Good enough" won't do in "MORROW" manufacture. Everything must be "better than" the average. Each article is built on honor and sold on merit.

As quality is the sole argument to the discerning buyer, we can appeal to him with "MORROW" manufactures.

Remember these "MORROW" products in your next requisition.

"MORROW" Set Screws.
"MORROW" Cap Screws.
"MORROW" Nuts.
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They have the "CLASS."

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firms had answered immediately upon receipt of the letters, while in the case of the Canadian houses they were away behind, and the business had really been placed before they were heard from.

The Selling Policy

"It is not an easy matter for a new line to be placed on the market in Australia. For instance, I remember seeing one very large machinery house in Melbourne, the name of which I cannot recall for the moment. It had a tremendous floor space and splendid warehouse windows for displaying the goods. I made some enquiries about the manner in which such a business was carried on, thinking that it must take a very large amount of money to stock such a place, but I soon found that much of the material there was consignment goods. Of course, that is not done to such an extent now as before the war. But I was given to understand that at that time business was carried on largely in that way. The firm would order a couple of machines from some well-known English company with whom they had good connections. The two ordered would be sent along, and the English firm at the same time would send along an extra two on the chance of their being disposed of. There are large stocks of machine tools and supplies, such as drills, etc, carried in the same way."

According to the gentleman to whom CANADIAN MACHINERY was speaking, there is a very favorable feeling toward Canadian trade in Australia. He seemed to think that there was also a desire to protect the home-made article wherever it showed a tendency to develop. This representative had been there in the interests of a Canadian firm, and was satisfied with the results of the trip. He seemed sure that the best way to get foreign business was to go after it, study the market thoroughly, find out in what ways the goods wanted differed from those being turned out for home consumption, and then set out to supply them. He instanced the way in which certain of the large agricultural implement firms had set out to supply the Australian trade, and how they had succeeded by making the implements to suit the needs of the various soils and practices of the Australian farmer. The Australian, he concluded, were good buyers now, but they were not buying with their eyes shut.

MONTREAL NOTES

The John McDougall Caledonia Iron Works, of Montreal, are now completely closed pending the further action of the liquidators. The entire plant and property is now for sale.

The grey iron foundry, now under construction for the Thos. Davidson Co. of Montreal, is nearing completion. The walls and roof are about finished and in a few weeks it is anticipated that the equipment will be installed and ready for active operations.

Edward A. Robinson Co., Ltd., of 228 Craig Street W., Montreal, railroad and engineers' supplies, expect to open an office in Toronto in the very near future, with H. H. Davis in charge. L. O. Larkin has been engaged to assist Mr. Robinson in the Montreal office.

The Dominion Bridge Co., of Montreal, have just completed the first of two 2,100 h.p. steam turbo-blowers for the Sudbury plant of the British-American Nickel Co. For the past week this unit has been undergoing tests at the plant of the Bridge Company.

Thos. Moore & Son, 224 Lemoine St., Montreal, have secured the exclusive Canadian agency for McKechnie Bros., Ltd., Metal Works, Rotton Park Street, Birmingham, England, manufacturers of extruded brass rods and sections, hot brass and bronze stampings and pressings, non-ferrous ingot metals, and every description of brass and bronze drop forgings.

Robt. McCleery, formerly works manager of the John McDougall Caledonia Iron Works, is now associated with R. W. D'Arcy in the D'Arcy Engineering Co., efficiency engineers and machinists. They have leased a property at 34 St. Ferdinand Street, Montreal, and are now installing the necessary equipment for immediate operations. The temporary offices are at 95 Laporte Ave., Montreal.

Extensive alterations are being carried out on Commissioners Street, adjoining the Montreal Harbor, in the way of tearing up the pavement and making preparations for the relaying of the tramways tracks, which has been necessitated by the added requirements of the Montreal Harbor Commissioners, who are taking over a considerable strip of Commissioners Street for increased railway accommodation.

Press announcements have just been received that the Ministry of Shipping has reduced their requirements for space on cargo vessels. It was their intention to retain 60 per cent. of the cargo space, but this has been changed to 50 per cent. This will increase the shipping facilities for the Canadian exporters and help greatly in improving conditions, which have apparently been none too favorable during the past few months. It is further announced that there is a good possibility that the control of shipping may be discontinued within the next six or eight months.

REVIEWED YEAR'S BUSINESS AS CARRIED ON AT ALGOMA PLANT

Lower net earnings, but in several respects an improved general position, particularly in regard to the steel industry, are shown in the annual report of the Lake Superior Corporation, issued on Saturday. Net earnings for the year ending June 30 last, from operations of subsidiary companies, excluding the Algoma Central & Hudson Bay Railway, were $5,441,574, compared with $6,551,495 the previous year. The balance brought forward from 1918 was $668,292, but this year the balance carried forward by all companies was $1,589,388. The Algoma Steel Corporation, chief of the subsidiaries, with large works at Sault Ste. Marie, had net operations of $5,035,032, compared with $6,001,891 the previous year. The Steel Corporation, however, in addition to paying a dividend of 7 per cent. on preference stock for the year ended June 30, 1915, amounting to $700,000, paid the sum of $350,000 on account of preference dividend for the year ended June 30, 1916. At the same time, it carried forward a balance of $1,433,875, compared with $764.038 the previous year. Steel Corporation's financial position has been improved, as current assets stand at $13,834,842, compared with $11,147,259 the previous year, while current liabilities are but $2,449,790, compared with $3,059,826 in 1918. Total assets of the Steel Corporation show little change at $55,280,830.

Year's Steel Production

Production by the Algoma Steel Corporation as compared with the preceding year was as follows, in tons:

	1917-1918	1918-1919
Coal imported	995,064	889,591
Ore imported	761,082	700,510
Limestone produced	321,485	296,812
Coke	379,040	406,398
Pig iron	314,188	336,657
Steel ingots	499,712	414,932
Steel products	329,438	322,011

Enlargements to Plant

President Wilfred H. Cunningham, in reviewing conditions, says that the change from war to peace conditions naturally resulted in a stoppage of the manufacture of shell steel and steel for munitions purposes generally. "Toward the end of the year," he says, "the mills resumed the rolling of normal products in the shape of steel rails, rail fastenings, merchant bars, shapes, etc. Up to the time of making this report, business has not been plentiful, and for the last few months the mills have been operating at about half capacity." Mr. Cunningham believes that repairs and replacement orders for steel must soon absorb considerable quantities. The long-cherished idea of a structural mill, he says, should now be dealt with, and plans are in preparation for a new universal mill consisting of a 40-inch blooming mill, 36-inch rougher, and three-stand 28-inch combination structural and rail finishing mills. These works, the directors believe, would have sufficient business, and they are vital to the continued success of the Steel Company. A scheme for financing the undertaking will be submitted to stockholders at an early date. In the meantime, the rail mill is being extended to care for such structural steel up to 15-inch beams and panels as may be required by the market.

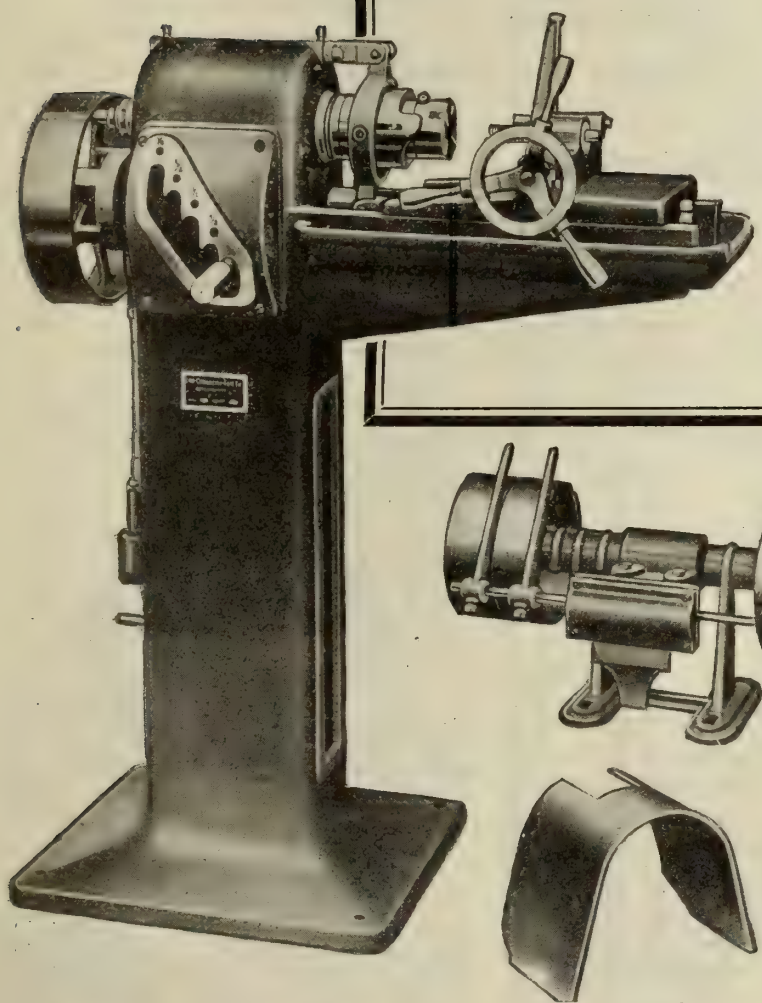
THE GEOMETRIC WAY

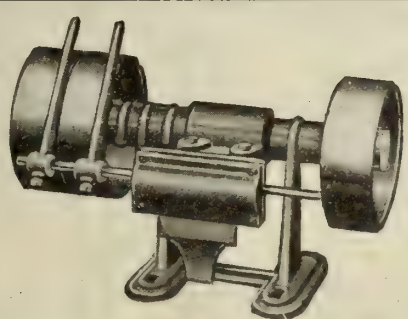
Where quantity and exactness have to be considered, the Geometric Threading Machine is just the way that suits. These machines have been tested and proved over and over again on speed, accuracy and endurance.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut ⅛ to ½ inch, ¼ to ¾ inch, and ¾ to 1½ inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.





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SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

Pittsburgh to Following Points	Per 100 Pounds. C.L.	L.C.L.
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$26 50	$26 25
Electro copper	25 50	26 00
Castings, copper	25 50	25 00
Tin	60 00	58 00
Spelter	9 75	10 00
Lead	7 25	7 00
Antimony	9 75	10 50
Aluminum	35 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$16 00	$13 75
Copper, crucible	19 00	18 00
Copper, heavy	19 00	13 00
Copper wire	19 00	18 00
No. 1 machine composition	17 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	15 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	8 00	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe, wrought	8 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	14 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

Aikenhead's WALSTROM ATTACHMENT

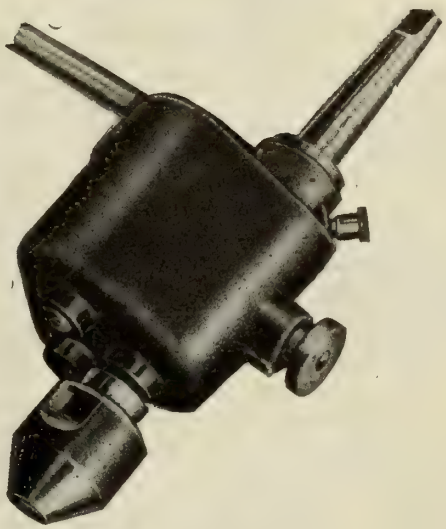
A Tap that will Revolutionize Your Tapping Cost

Taps holes as squarely as they can be drilled, ten times faster than is possible by hand, and **cuts tap breakage to a minimum.**

Its mechanically obtained **OSCILLATING MOVEMENT** closely resembles the action in hand tapping.

Easily attached to any drill press. Takes taps of all sizes up to 1 1-2 inch.

It will pay you to try it. We guarantee satisfaction.



Taps 10 Times Faster

Aikenhead Hardware Co., Limited

17 Temperance Street, Toronto

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus 10 to	40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 50
Premier, 10¾ oz.	....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	19½
Palacine	22½
Machine oil, per gal.	27½
Black oil, per gal.	16
Cylinder oil, Capital	52
Cylinder oil, Acme	39½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	10¼

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

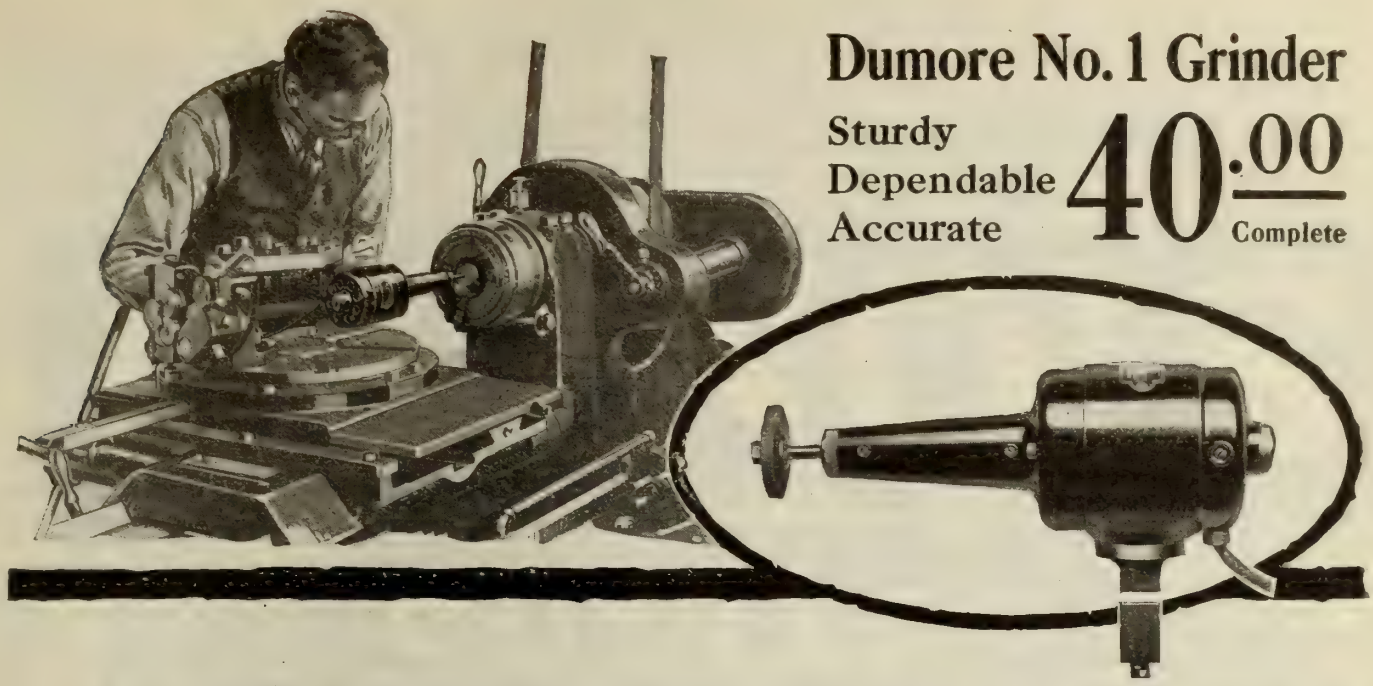
	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium, carbonate	..
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2.25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated



Dumore No. 1 Grinder

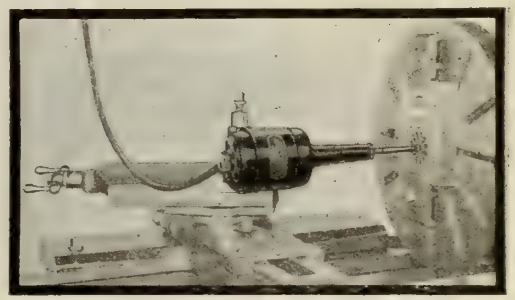
Sturdy
Dependable
Accurate

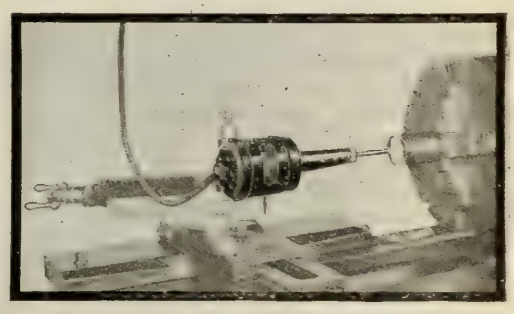
40.00 Complete

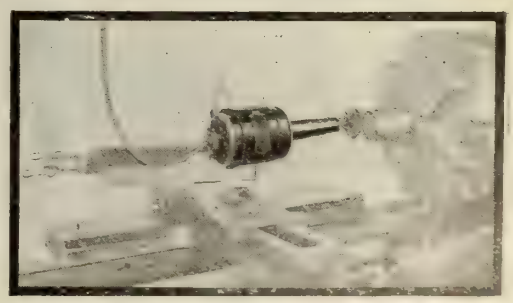
THERE is no doubt of the value of the **Dumore No. 1 Grinder.** No other tool, at or anywhere near its price, can give a greater amount of actual, accurate daily service.

Because jigs, dies, gages, bushings, etc., will always warp during tempering, thousands of mechanics use the **Dumore** grinder to bring these tools to as close limits as .0001″. Such a degree of accuracy is possible solely because the **Dumore** is perfectly balanced throughout and operates at the correct cutting speed.

We have some very interesting literature for men facing grinding problems —write for it.







WISCONSIN ELECTRIC COMPANY
291 SIXTEENTH STREET
RACINE, WIS.

DUMORE HIGH SPEED GRINDERS

DEVELOPMENT OF THE STEEL PLANTS IN AUSTRALIA IN RECENT YEARS

An issue of the Trade & Commerce Bulletin some months back contained the following reference to the steel business in Australia, which may be interesting at this time:

The president of the Engineering Association of New South Wales reviewed the principal engineering developments at the annual meeting of the association held recently and stated: That quietly, but surely, a powerful steel industry was growing up in Australia. Not only was it expected that the Lithgow (100 miles from Sydney) and Newcastle (60 miles from Sydney) steel works would henceforth provide the whole of Australia's requirements of steel rails, but the time was not far distant when export might be possible. Of yellow and white metal alloys, it was interesting to note the development along sound lines of the manufacture of rolled manganese, phosphor, and other bars, and that difficult business had not been undertaken without due recognition of the necessity for maintaining a laboratory for the scientific control of the processes. Considerable improvement was taking place everywhere in the extension and addition of modern foundry equipment, the capacity of which for large iron castings was now practically unlimited. For the more difficult work of steel casting there was also a most noticeable improvement and an increasing number of plants are being laid down. The casting of steel rolling stock wheels is gradually developing to a satisfactory stage and it was generally understood that the establishment of another modern plant on extensive lines was contemplated in the near future at Newcastle. When it is remembered that there are now approximately 20,000 miles of railway in operation in Australia, it would be realized what possibilities there were for the local manufacture of rolling stock material.

A better example of high class workmanship could not be quoted than the manufacture of modern high speed steam engines which are now being successively made. In the manufacture and export of agricultural machinery, harvesters particularly, quite a striking success has been achieved, and a considerable quantity exported to Argentine and elsewhere. The imperative call of the man on the land for a cheap and handy form of power to supplant hand or horse power has given manufacturers of internal combustion engines a great impetus. Before the war perhaps 10 per cent. of the supply only was made locally and 90 per cent. was imported. In ten years' time the percentage will probably be reversed. Oil engines, from one-half horse power of the farm unit type up to semi-diesel marine engines of 150 horsepower are now being made. Ten years ago only 15 per cent. of the centrifugal pumps used were made locally. This figure is now believed to be 50 per cent. Refrigerating plant has for many years been made, but is worth noting that the largest compression so far made here was recently completed by a local firm. In machine tools, woodworking machinery, rail and road tractors and cars, tinmaking machinery, electric motors, capstans, boilers of every class, including water tube, further reminders are given that engineers are broadening their resources. Steam boilers which before the war could be manufactured and sold for approximately £32 to £40 per ton complete, are now costing £70 to £100 per ton, due almost wholly to the fact that boiler plates are only procurable at from £50 to £80 per ton. If a modern steel plate rolling mill had been established locally it could be producing and selling them under present conditions at £14 per ton.

Mr. G. D. Delprat, general manager of the Broken Hill Co., recently came to America on a special mission, thought to be in connection with purchasing additional plant. The manager of the steel works at Newcastle, N.S.W., is Mr. Baker, formerly manager at Sydney, C.B., of the Dominion Steel Corporation.

Coaling vessels, both with bunker and cargo coal, is carried out in the Far East entirely by hand labor. A series of stages are rigged on the vessel's side from the lighter to the bulwarks. From the bulwarks to the hatch a chain of men, women and children are stationed and on the stages the chain is continued. Many of the women carry their infants strapped on their backs. The coal is passed from hand to hand in tiny baskets, and the coal goes down the hatch in an unbroken stream. With four hatches working, a five thousand ton vessel can be loaded in about twenty working hours.

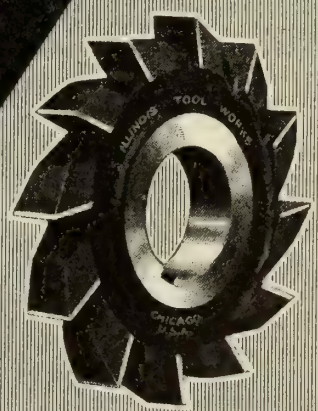
Navigation through the Suez Canal is carried on at night time by means of powerful search lights. The regular liners carry their own, but the tramps are provided with a portable outfit by the Suex Canal authorities. A cage is slung over the boat containing the light and its operator, who directs the light on to the narrow channel ahead. Current is provided by a small high-speed generator, direct-connected to a Brotherhood high-speed engine, the whole outfit weighing only a few hundred pounds. It is placed on deck and a connection made from one of the forward steam winch pipes to supply the steam. The apparatus can be installed and dismounted in about thirty minutes, so no time is lost.

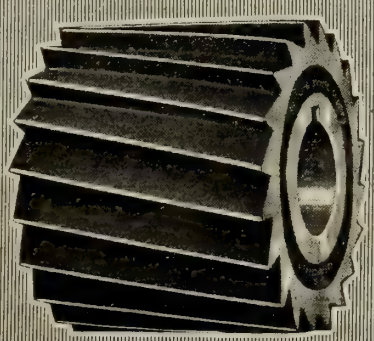
None Better *can be Made*

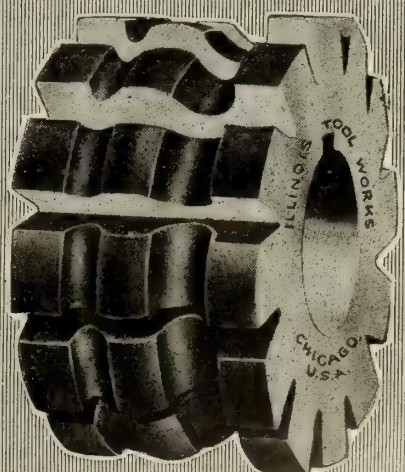
ILLINOIS

CUTTERS

No matter how difficult your cutter requirments may be, it is probable that we have solved similar milling problems for others.







ILLINOIS TOOL WORKS, CHICAGO.

Detroit Store—
Woodward and Warren Aves.

A. C. Towne, Inc.
17 W. Swan St., Buffalo.

S. J. Pfaff
Pioneer Bldg., St. Paul

Rose Tool and Supply Co.
111 Market St., Pittsburgh

Louis G. Henes
75 Fremont St., San Francisco

Title Insurance Building
Los Angeles

Indianapolis Office
616 Fletcher Sav. & Trust Bldg.

New York Office
141-145 West 36th St.

NEW IRON AND STEEL COMPANY

A charter for $8,000,000 was issued on August 13, to the Consolidated Iron and Steel Corporation Ltd., a company of Detroit and Toronto parties engaged in the mining business. The company is essentially Canadian, with head offices at 20 King Street East, Toronto. They own two large deposits of proven iron ore lands and it is their intention to proceed in a large way with their development.

The company has opened a large hematite mine on the C.N.R. in the county of Leeds, 25 miles north of Brockville at Furnace Falls, where they have 1,500 acres. The early settlers erected a smelter at this place 110 years ago and it was operated in a primitive way, the ore being ground out by water wheel. It still retains the name given to the place at that time. This was in the days when Lake Superior and Pennsylvania ores were almost unknown. The city of Brockville has offered inducements to the company to build a pig iron smelter there, and it is being seriously considered as there is a surplus of electric energy at a low rate. As the mine has excellent transportation facilities, ore can be shipped by the St. Lawrence either west to Canadian and United States markets or east to Montreal, Ottawa and European markets.

Their other property, consisting of 2,500 acres, is located at mileage 182 on the Algoma Central Railway. This has been gradually developed since it was discovered in May, 1911. Up to the present time permanent camps have been built and diamond drilling has been carried on from November 1917, to July, 1918, proving up large deposits of ore to a depth of 500 feet. Prominent iron ore engineers reporting on this property estimate the tonnage at from 800,000,000 to one billion tons of ore. The ore is free from titanium and low in phosphorus and sulphur. Work on both properties is now being carried on, thousands of tons already being piled up at the Furnace Falls mine ready for shipment.

It is anticipated that German railway systems will find great difficulty in rebuilding their lines to pre-war standards, and that cheaper construction will have to be used, both on account of scarcity of raw materials and also financial difficulties.

* * *

Stockroom workers are often required to transform decimals to inches and inches to decimals. In the ordinary stock-room this is done by referring to a book or dirty chart, in most cases practically illegible.

In cases where a room is none too light, which is unfortunately the general condition in stock rooms, an electric light is placed behind the board. The stenciled figures are illuminated and made visible to the stockkeeper wherever in the room he happens to be.

Do You Know That

Antimony is said to have been discovered by Basil Valentine, a monk of Germany, in the fifteenth century. It is said that the word itself is derived from the Arabic.

* * *

The county of Cornwall, Wales, has yielded tin for at least 3,000 years, and the mines of Cornwall have been worked for the oxide of tin since the time of the Phoenicians and Greeks.

* * *

Lead was found before the time of Moses and was known to the Israelites and Hebrews. It was anciently used to purify silver.

* * *

Copper was the first metal known to man. The metal in the form of bricks and rings was used as a medium of trade by the Egyptians and Babylonians. It derived its name from the fact that the Greeks and Romans obtained it from the Island of Cyprus.

* * *

The addition of a small amount of bismuth to babbitt increases the antifrictional properties of the alloy. One-tenth of one per cent. has been added to No. 1 babbitt and the resulting alloy has always been of a fine, close, even grain, with remarkable wearing qualities.

* * *

Much has been written about new and marvellous methods of ship salvage. While apparatus naturally has been improved, the methods remain fundamentally the same. These consist of raising by lighters, in which method the reserve buoyancy of a number of lighters is utilized to raise the wreck from the bottom, the rise of the tide furnishing the lifting power; patching the holes in the hull under water, and pumping out, or building a copper dam on the superstructure to create a reserve buoyancy, and expelling the water by compressed air. For floating grounded vessels it is usually necessary to await a high tide, when there will be a greater depth of water than at the time of stranding.

* * *

An item in an American newspaper speaks about the trouble marine insurance men are having through pilfering of cargoes in Continental ports and mentions Genoa specifically. Genoa has always held an inenviable notoriety through the audacity and cunning of the water-front thieves. On one occasion a steamer undergoing repairs had occasion to send a large bronze valve, about 450 pounds in weight, to the shop on shore. A motor truck with this firm's name on it drove down, three men alighted and took the valve away. That was the last seen of it, and it transpired later that the truck had been taken from the front of the shop while its driver was inside. The truck was later found standing 100 yards from where it was stolen.

A writer in "Aeronautics" has an interesting suggestion to make about the landing of aeroplanes. He points out that this is where the greatest difficulty is experienced owing to the great space required to effect a safe descent. His idea is the building of wind tunnels, in which the aeroplane would meet a current of air driven at the same speed as the machine itself, but in an opposite direction. This would make the movement of the machine over the ground nil, and it could then be secured while the air current and the propellor were both gradually brought to rest.

* * *

The Dominion of Canada, since the beginning of the war, borrowed from the Canadian people no less than $1,436,000,000. This amounts to $192 per capita of population.

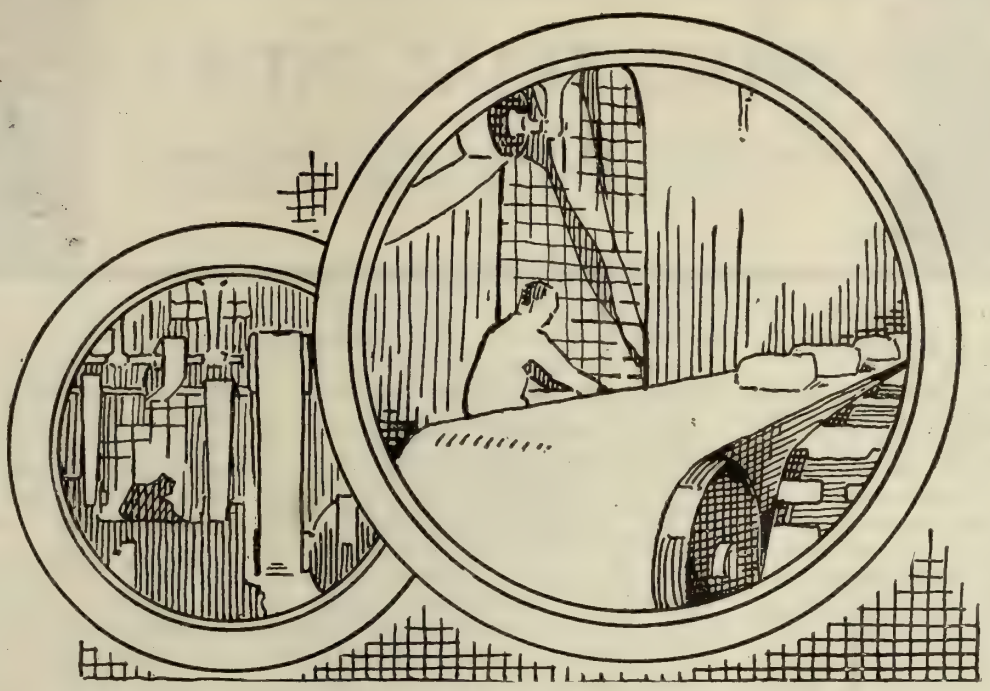
* * *

Tracings may be very readily cleaned and pencil marks removed by the use of benzine, applied with a cotton swab. It may be rubbed freely over the surface without fear of injury to the lines drawn in ink, or even water colors, but pencil marks and dirt will quickly disappear. The benzine evaporates almost immediately, leaving the tracing unharmed. The surface, however, will be somewhat softened, and should be rubbed down with a little powdered talc or chalk before drawing more ink lines.

BOOK REVIEW

Analysis of Babbitt by James Brakes, The Allen Book and Printing Co., Troy, N.Y.

It has been the desire of the author, as stated in his preface, to place before the mining, civil, electrical and mechanical engineer and others who have taken chemical analytical training, a small practical book on the analysis and manufacture of babbitt. The methods have been selected from the many methods in use for their simplicity, neatness and accuracy. At the same time reactions and data have been inserted which will prove interesting to the student in analytical chemistry. One of the most valuable features of the work is an extensive bibliography on books dealing with metallurgical engineering. The various metals met with in the manufacture of babbitt metal and similar alloys are each given a chapter to themselves and their properties, their qualitative, quantitative, volumetric, gravimetric and electrolytic analyses are taken up in detail. Each chapter closes with a bibliography on the metal concerned. Antimony, tin, lead and copper are dealt with. Chapter five takes up the determination of magnesium and bismuth in babbitt, the qualitative analysis of babbitt and gives a bibliography on white metal analysis. Chapter six is devoted to notes on the manufacture of babbitt, examples of calculation, the sampling of babbitt metals and a bibliography of metallurgy. To the works chemist this book of 170 pages will prove an admirable aid where anti-friction metals, etc., are concerned.



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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Victory for Moderation.—The organizer of the International Unions in the West, Mr. R. A. Rigg, has just completed a tour of the West. He states that there is very little sentiment in that district for the principles of the O.B.U. and the unions are practically all lining up with the Internationals.

Estimates Soon Ready.—Sir Adam Beck has assured the citizens of Galt through the mayor, that an estimate of the cost of the proposed Hydro Radial System in this district will be made by the new year. The municipalities will then be able to submit the by-law to the electors.

Building Firms Amalgamate.—The Norcross Brothers Company, of Worcester, Mass, and Anglins, Ltd., of Montreal and Toronto, have amalgamated their interests with the object of creating an organization large enough to handle all the big building that will be carried out in Canada.

Fire Does Small Damage.—The three-storey building of the Gold Medal Furniture Company at Van Horne and Bartlett Avenue, Toronto, was visited by fire which did damage to the extent of $500. The damage was confined to the contents, the building being unhurt.

New Power Company.—A Dominion charter has been obtained for the Wendigo Power Company, which has been capitalized at $1,000,000. The plant of the company will be twenty miles south of Larder Lake, and the head office at Guelph. Water powers on Wendigo Lake and the Blanche River will be developed.

American Army Stores in France.—The property of the American Expeditionary Force now in France, with the exception of the stores required by the American soldiers still in that country, is to be sold to the French Government. The price is said to be $400,000,000, and the method of making payment will be by 10 year gold bonds bearing interest at 5 per cent. from August, 1920.

Ask Delay in Freight Rate Increase.—The Winnipeg Board of Trade, Shippers' Bureau, has sent a wire to the Board of Railway Commissioners, Ottawa, asking for a delay until October 1st or later in the increase granted in express rates. The reason given for the request is that the rates discriminate against the West, and that there are many discrepancies in the schedule.

Strike Breakers Won't Work.—A gang of men brought from Midland to Meaford by the Seaman-Kent Company with the object of breaking the strike of men, refused to work. A scow with 140,000 feet of lumber is waiting to be unloaded, as are a number of Grand Trunk cars. The situation will be aggravated by the lumber in the dry-kilns being exhausted shortly, with no green lumber to take its place.

Largest Airplane Engine.—The Sunbeam Works at Wolverhampton, England, have been recently testing what is said to be the largest airplane engine in the world. The engine is a twelve cylinder one, the cylinders being arranged diagonally. The horsepower expected to be developed is 900 at normal speed, and the weight per horsepower is less than two pounds.

Some Iron Workers Return.—A large Toronto foundry, having offered the moulders 75 cents an hour with an 8-hour day, about twenty men returned to work under these conditions. More will be taken on when production becomes normal. It is understood that a brass-working shop has also made a settlement with its striking employees, but otherwise the situation is as it was.

To Buy Power.—The clerk of the York Township Council has been instructed to write to the Ontario Hydro-Electric Commission, requesting that negotiations be opened to purchase the lines of the Toronto Electric Light within the township. The council is preparing to extend the Hydro through the thickly settled districts, and with only one power company the expense could be lessened considerably.

Wheat Price is Fair.—The general consensus of opinion on the rate fixed by the Wheat Board and approved by the Government is that it is a fair one. The West was under the impression that the rate would be set at $2.25 per bushel, but the award of the Board, $2.15, should be satisfactory. The Government may possibly be a loser at this price, while if a higher price is realized the farmers will receive the benefit of the balance.

Colliery Loses Three Days.—Owing to a dispute over the employment of two men on the bankhead, a colliery of the Sydney Reserve mine has been idle for three days. The disagreement rose over the fact that two men had been employed to push the boxes on and off the scales, and the company thought that one should be sufficient. The men finally resumed work on the understanding that when production was increased sufficiently two men would again be employed.

Making Money From Moss.—The swamp lands in the vicinity of Brockville are to be used as money producers, the medium being the moss that is found in abundance thereon. Three carloads of this moss are being shipped to Rochester, N. Y., for use by nurserymen and florists, who wrap it around the roots of trees that are being shipped, and also in preserving cut flowers. The moss is sold by the cord and brings a good price.

Restrictions Removed.—The British Treasury Department has announced the removal of certain war time restrictions on the export of capital. Hitherto, money could be remitted only for the purpose of paying for merchandise bought abroad. Securities which are held abroad can now be sold on the Stock Exchange provided that they have not been in enemy ownership since the outbreak of the war. Remittances cannot be made abroad for the purchase of any form of property.

Cable Operators Strike.—Something new in the way of strikes has been introduced by the Western operators of the Commercial Cable Company's lines in Canada and the United States. They went out on strike at midnight, the complaint being that they were receiving less money than the company's European operators. They will stay out 48 hours, then return to work for 48 hours, and strike again for 48 hours. This will be continued till their demands are met.

Imperial Trade Opportunities.—The Canadian Trade Commissioner for New Zealand, Mr. William A. Beddoe, has been visiting Sydney, N.S. While there he took occasion to visit the steel plant. In conversation with the officials of the company he stated that there was a good demand for steel products, and this was increasing. The only difficulty in the way was the shortage of ships, and the situation in that respect should improve every month.

Paper Mill For Morristown.—The property owned by the Gillies Brothers at Morristown, directly opposite Brockville, who used the plant as their American

depot, has been sold to representatives of Hearst, the American publisher. It is said that he will erect a mammoth paper mill on the site. Gillies Bros., who are large lumber mill men at Braeside, near Arnprior, formerly conducted a lumber business at Morristown, but closed down when lumber prices rose so high during the war.

The Board of Commerce.—The third member of the newly-formed Board of Commerce has been chosen and appointed in the person of Mr. F. A. Acland, Deputy Minister of Labor. Mr. Acland has been appointed without salary. The appointment, it is understood, is to be temporary, and the Government at a later date, after conference with Judge Robson and Mr. O'Connor, will appoint a permanent member. It is thought that for the first period of the board's activities the experience of Mr. Acland in high cost of living problems, etc., will be of great value.

New Industry for N.B.—The Hardwood Last Block factory, which was spoken of some time ago as about to be located at Mullin's Brook, York County, N.B., is now being built. The site is about four miles from McGiveny Junction on the Canadian National Railway. The interest behind the enterprise is H. Mobbs, of Kettering, England, said to be the largest maker of last blocks in the world. Between one and two hundred persons will be employed to begin with, and the manufacturers have entered into an agreement with the Nashwaak Pulp & Paper Company for 3,000,000 feet of hardwood lumber.

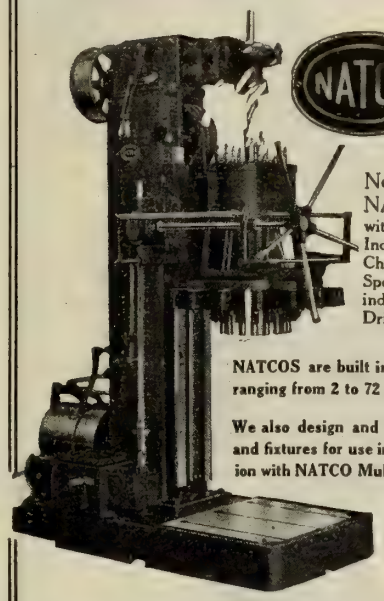
Credit Men Want Probe.—The annual general meeting of Canadian Credit Men's Association, held in Winnipeg under the presidency of Mr. G. N. Jackson, had something to say about increased telegraph rates. They put on record the demand that a thorough and searching investigation should be made by the Railway Board of the telegraph companies' request for higher rates. The alleged discrimination in rates was also mentioned as an object for investigation. The president of the association gave the opinion that in these days of high costs the companies should be pleased if they could make ends meet.

MARINE

London.—The arrival of the Cunard liner "Caronia" in the port of London will be somewhat of an event, the "Caronia" being the largest vessel to enter the port up to date. She is 675 feet long, with a tonnage of 20,000, and will dock in London after landing her Continental passengers in Cherbourg.

Quebec.—The Dussault Company of Levis, which purchased the abandoned wreck of the Canadian Government steamer Montmagny, has floated the vessel after being sunk for four years. The Montmagny was sunk by a collier in thirty feet of water off the Island of Orleans, and three lives were lost.

St. John, N.B.—The War Moncton, a wooden steamer built by Grant & Horne, was launched successfully recently, and is now ready to go on her trial trips, just twelve months after the keel was laid. She is 250 feet long by 43 feet 6 inches beam and 25 feet 6 inches moulded depth, and has a gross tonnage of 2,300 tons. She is a sister ship to the "War Fundy," built at the same yard last year.



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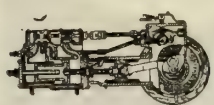
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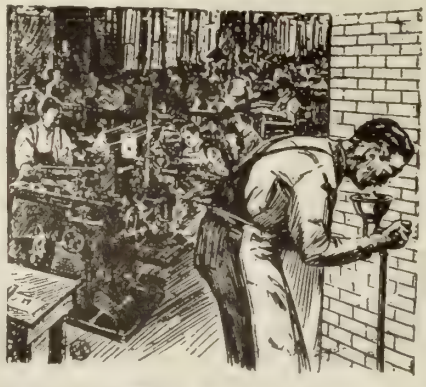


London.—The standard vessels laid down by the British Government have been distributed by Lord Inchcape, chairman of the P. & O. Steamship Company, without any profit to himself or interest to his firm. The amount of tonnage distributed was 1,400,000, contained in 196 ships, and the value of which was $150,000,000.

Sault Ste. Marie.—The steamer Collingwood, drawing 19 ft. 6 in., was compelled to back out of the locks on the Canadian side and go over to the American side before she could get through. The 19 ft. 6 in. was just one inch more than the depth of water that could be put in the locks on the Canadian side. A strong west wind that backed up the water in the river was the cause of this.

Montreal.—There is considerable indignation in Montreal over the action of the Montreal Harbor Commissioners, in increasing wharfage rates without giving the shipping federation or exporters and importers a chance to discuss them. Mr. Robb, the manager of the shipping federation, pointed out that this was an order in council, and how the council could pass such a measure without giving the other side a chance to be heard was more than he could understand.

Brockville.—George C. Sherman, president of the Taggarts Paper Co., and three companions, George W. Mercier, Gus Seymour, and William Lambert, had a narrow escape of drowning when the motor boat they were in blew up. The boat was going along at her usual gait when something happened in the cylinders which caused the whole engine to go up, the boat catching fire as the result of the explosion. The men were rescued with difficulty.

Lauzon. — The Davey Shipbuilding Company of this town have just completed successfully the building of a new bow for the steamer North West. It will be recalled that this vessel was being brought down the lakes in halves last fall, and the bow end was lost in Lake Ontario, together with two men. The stern end was brought on down to Quebec and placed in the Davey dry dock at Lauzon, where the new bow has been made an exact replica of the one that was lost.

Vancouver. — The shipyard of J. Coughlan & Sons, Vancouver, can now boast of its own weekly newspaper. The paper, which contains sixteen sheets, is devoted to live news about the plant and the happenings therein. For the present the paper is known as the J. Coughlan & Sons Plant Publication, but steps are being taken to provide it with a suitable title. One of the means employed to stir the imaginations of the employees is to offer a prize of $10 for the most suitable name. Among the items concerning production is one giving the name of the champion riveter of the yard at the time of publication. For July the best man was E. Peterson.

TENDERS

The Department of Indian Affairs is requesting tenders for the construction of an Indian boarding school at Chapleau, Ont. Tenders will be received up to September 15, and plans and specifications can be obtained from A. D. McNabb, Indian agent, Sault Ste. Marie.

Post Office at Sudbury and North Bay, and J. T. Godfrey, Indian agent, Chapleau.

The Leaside Housing Company are asking for tenders for Leaside houses which will be received up to September 10. Plans and all information can be obtained after September 1 at the office of the Canada Wire and Cable Co., or from William Lyon Somerville, architect, Imperial Bank Building, corner of Yonge and Bloor, Toronto.

BOOK REVIEWS

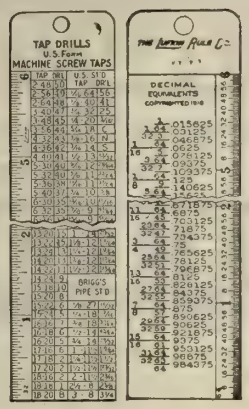
The Canadian Mining Manual for 1918, edited by Reginald E. Hore. The Times Publishing Co., Toronto and Quebec.

This well-known annual has been enlarged considerably over former years and contains much new material of a statistical and mining nature about Canada's mineral wealth. In this new edition is to be found information concerning all minerals and metals produced in Canada, and all metallurgical and mining companies operating in Canada. Two chief objects have been achieved: to present in concise form matter of interest to persons connected with the industry, and to attract attention to the opportunities for the development of Canada's mineral resources.

The volume is exceptionally well illustrated with colored plates, half-tones and line cuts. A large number of mineral specimens are shown in natural size and color, these plates including some of the best reproductions of ore that have ever been printed. In the section of the book devoted to mine products useful information concerning the character, use and occurrence of each mineral treated. The minerals are dealt with in alphabetical order and the amount of space given to them varies. Owing to the great demand recently for information concerning certain minerals and metals special attention is given to war minerals such as magnesite, fluorite, pyrite, molybdenite, etc. A second large section of the book is devoted to mining and metallurgical companies operating in Canada. In each case is given the office address, the location of the property, and the name of the manager. In most cases capitalization, names of directors, officers, nature of operations, recent financial statement and record of production during the last year are given. These companies are treated of in alphabetical order.

Contents

Mineral production in Canada in 1917; Canada's water powers and their relation to the fuel situation; metals and metallurgical research; annual meeting of the Canadian Mining Institute; Alberta coal mines; the gold industry; the magnesite industry; fluorspar mining in Ontario; oil prospecting in Ontario; tungsten ore deposits in Manitoba; the Mataehewan gold area; Molybdenite mining in Quebec; copper mining and refining in British Columbia; mining in Northern Manitoba; mining companies operating in Canada; mining companies listed according to product.



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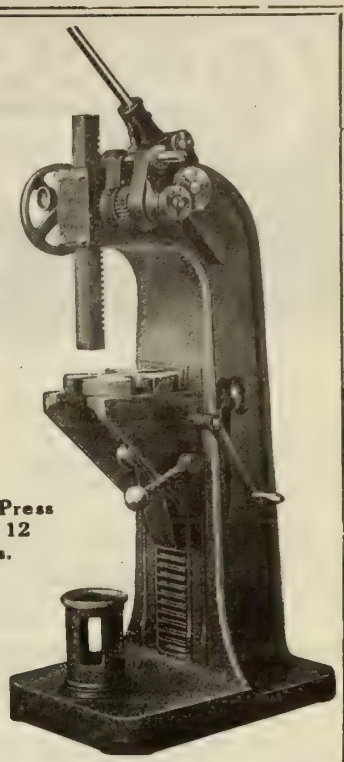

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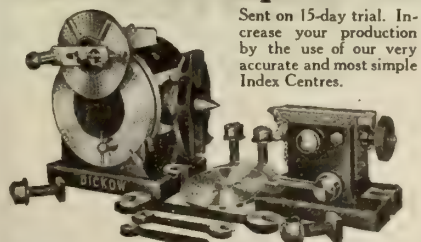

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73,250 lbs...	.750″	¾″
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45,000 lbs...	1,250″	1¼″
26,000 lbs...	1.375″	1⅜″
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1 Power & Mining 5 x 22.

Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

Zenith Coal & Steel Products Limited

402 McGill Building Montreal

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NOW!

You've been going to send in that ad for weeks, so why not mail it now for next week's issue.

Canadian Machinery

43-53 University Ave., Toronto

WANTED

1—"Used" Plate Punch and Shear 36″ gap, capacity ⅞″ hole in ⅞″ plate

—also—

1—"Used" Air Compressor, steam actuated — compound steam—simple air —12″ x 12″ cylinder.

Both machines must be modern in design and in good operating condition. Offers with full details, price and shipping point, will be considered.

I. MATHESON & CO., LTD.

Builders of Machinery

New Glasgow, - Nova Scotia

In the Machinery Hall at the Canadian National Exhibition

We have on exhibit and in operation

Type A & B Briggs Manufacturing Milling Machines.
Steptoe Single Pulley Drive 24″ Shaper.
Bath No. 2 Universal Grinder.
Fitchburg 8 x 36 Cylindrical Grinder.
Conradson Heavy Duty No. 3 Plain Milling Machine, Single Pulley Drive.
Thor Pneumatic and Electric Tools.
Adams Short Cut Lathe.
Lodge & Shipley 24″ Three Step Cone Engine Lathe.
Sliding Head, Back Geared and Sensitive Drills.
Hardinge Bros., Inc. ("Cataract"), No. 7 Turret Tool Post Lathe.
Quick Change Precision Lathe.
R 4 Underdrive Bench outfit, equipped with Nos. 3, 4, and 5 Precision with screw cutting and grinding attachments.
Bench Miller and Drill Press.

Experts from the factories will be on hand to demonstrate machines and answer all enquiries.

You are cordially invited to call at our booth and inspect this machinery.

GARLOCK-WALKER MACHINERY COMPANY, LIMITED

32-34 Front St. West, Toronto

MONTREAL TORONTO WINNIPEG

PARTIAL LIST OF TOOLS

2—60″ Bullard Vertical Boring Mills
1—60″ Niles Vertical Boring Mill
No. 4—B. & S. Plain Miller
1—36″ x 36″ x 8′ Gray Planer, two heads
No. 3—Cincinnati Universal Miller
5—No. 0 Steptoe Hand Millers
13″ x 5′ 6″ New Carroll-Jamieson Quick-Change Lathe
14″ x 6′ New Carroll-Jamieson Quick-Change Lathe
15″ x 6′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
15″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
17″ x 8′ New National Quick-Change Lathe
3—17″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
17″ x 10′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
18″ x 24″ New Rahn Larmon Lathe, D.B.G. Quick-Change
19″ x 10′ New Sidney D.B.G. Quick-Change Lathe, swing 21″
9—19″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 21″
25″ x 14′ New Sidney D.B.C. Quick-Change Lathe, swing 27″
33″ x 14′ Putnam, arranged for Motor Drive
6′ Western Radial Drill
5′ Bickford Single Pulley Drive Radial
100-lb. New Little Giant Hammer
50-lb. New Little Giant Belt Hammer
25-lb. New Little Giant Belt Hammer
30-ton Watson & Stillman Hydraulic Press

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TORONTO IRON WORKS
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Oil Storage, Gasoline Tanks, Air Receivers, Pneumatic Water Supply Tanks, Smoke Stacks, Boiler Breeching, Riveted Steel Pipe, Bins and Hoppers. Heavy and light steel plate construction erected anywhere.

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High Speed Reamers, Cutters and Drills

IN STOCK HERE

Prompt Service

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Machine Shop Supplies

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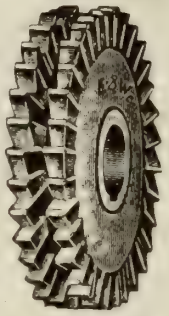
Elliott & Whitehall Machine & Tool Co.

GALT, ONTARIO, CANADA

MILLING CUTTERS AND SMALL TOOLS



We manufacture the following tools, etc.

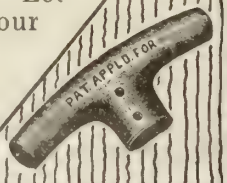
Standard and Special Milling Cutters of all descriptions, Gear Cutters, Hand Reamers, Shell Reamers, Chucking Reamers and Taper Pin Reamers, Lathe Mandrels and Arbors, Metal Stamping Dies, Gauges, Jigs and Fixtures, Etc.

All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.

ASK FOR OUR NEW CATALOGUE No. 10.

TOOLS & STAMPINGS

We have the equipment to make the tools and produce the stamping. Let us quote on your requirements.



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Stamping and Tool Works

1-5 Lancaster St., Hamilton

VICTORIA Special Machinery

DESIGNS PATTERNS

CASTINGS FORGINGS

Send for Catalogue

Victoria Foundry Co., Limited, Ottawa, Canada

WELDING APPARATUS AND . . . **SUPPLIES**

The REGO 100% Efficient Welding Torch

Saves Oxygen Eliminates Flash-Back Better Welding

Write to us for anything and everything you need.

WELDING & SUPPLIES COMPANY

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SPECIAL MACHINERY

Built to Order

Also gauges, punches, jigs, dies, small tools, etc.

Prompt Service.

Moderate cost.

Send Blueprints for estimate.

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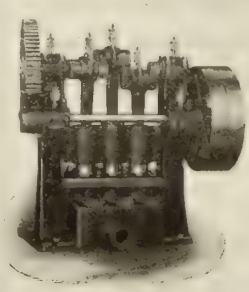


Place a trial order for one of our Pumps and find out the reason that

Smart - Turner Pumps

always bring repeat orders.

THE SMART-TURNER MACHINE CO.

LIMITED

Hamilton, Canada

Don't Keep It--Sell It

If you have a lathe
a drill
a milling machine
a planer
a chain block
a chuck
a motor
a crane
a stock of belting
an engine
a compressor

or any other machine shop equipment for which you really have no further use, why not turn it into *cash?*

Someone may be looking for just the machine you may want to sell. Let us bring you together.

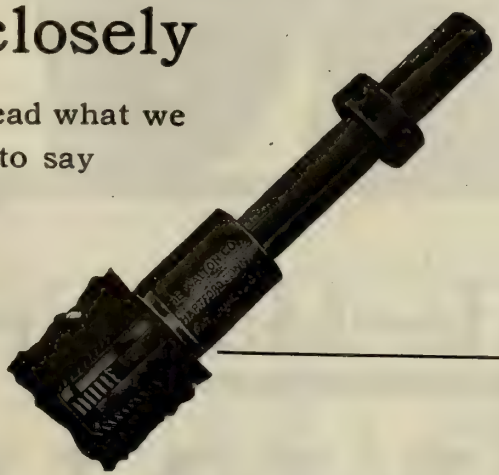
A "classified" ad. in CANADIAN MACHINERY, costing a few cents per issue, has done wonders for others. Why not try it?

Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Avenue TORONTO, ONT.

Look at this again —closely

and read what we have to say below



WHEN a tap breaks off close or below the surface, you'll find the Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.

Oxy-Acetylene Welding and Cutting

This welding repair on broken crank shaft saved an expensive tie-up, at a cost of 50c.

Reduces Repair Costs Saves Time and Money

Oxy-Acetylene Welding is saving hundreds of thousands of dollars annually in Canadian Factories, Mills, Mines, Machine Shops and wherever metal or machinery is used. Broken machinery parts, tools and defective castings are quickly and permanently repaired. Many economies and advantages are derived from welding in construction as well as repairing.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it.

Address Department C—107

Prest-O-Lite Company of Canada, Limited
PREST-O-LITE BUILDING
Corner Elm St. and Centre Ave.
TORONTO
Plants at: Toronto, Ont., Merritton, Ont. Shawinigan Falls, P.Q., St. Boniface, Man.

World's Largest Makers of Dissolved Acetylene

"Gee, that's a beauty--"

There's a Real He-Man Drill

It's a CLEVELAND

THE CLEVELAND TWIST DRILL CO., Cleveland, New York, Chicago

Agents for Europe, CLEVELAND TWIST DRILL CO. (GREAT BRITAIN), Ltd., 36-37 Upper Thames St., London E.C.4.

The Canadian Who Bullied the Bolsheviks!

WHEN war broke out, Colonel "Klondyke" Boyle took across, at his own expense, 200 staunch Yukon volunteers. He was sent to Southern Russia, and in six weeks turned the transport system there from chaos into efficiency. He fed the starving Russian and Roumanian armies. He arranged temporary peace terms between Bolsheviks and Roumanians. Aided by twenty Chinese murderers and a brave Canadian girl, he bluffed the Bolsheviks and Austrians, in a tremendous exploit which won for him the title "Saviour of Roumania," and the personal thanks of the Roumanian royal family.

Read this story of "Klondyke" Boyle, by Arthur Beverley Baxter, in September MACLEAN'S—it starts on page 13.

"Growing Under Gouin"

—tells the amazing story of development of Quebec Province during the past fourteen years —in road-building, finances, industries and education.

"Meet Mr. Habitant"

—What does the rest of Canada know about the Habitant of to-day? Does he talk like Drummond's poems? This article, by Thomas M. Fraser, forcibly depicts the assets Canada has in French-Canadian stability and thrift, and will go far to remove any lingering prejudices which may exist in some minds.

Other Big Features

The Crowning of the King—By J. K. Munro, the pungent, pithy, political pundit.

Nuorteva's Propaganda—By C. H. Cahan, K.C., recently Director of Public Safety.

The White Eagle at Niagara—By Major C. R. Young, late adjutant Polish Army Camp.

The Problem of Our New Canadians—By Nellie McClung.

His Majesty's Well-Beloved—By Baroness Orczy.

Canada's Great National Asset—By D. B. Hanna, president Canadian National Railways.

Teddy Bear—A wonderful, poignant, Robert W. Service poem.

On Leave—A light, frolicsome story by Harry Bailey.

Evil Spirits—Another Bulldog Carney story, by W. A. Fraser.

Ebb and Flow—A new story by C. W. Stephens, who wrote "Man and Wife."

Over 70,000 Canadian Families Buy

MACLEAN'S

"CANADA'S NATIONAL MAGAZINE"

SEPTEMBER ISSUE *Now On Sale At All News Dealers* *20c*

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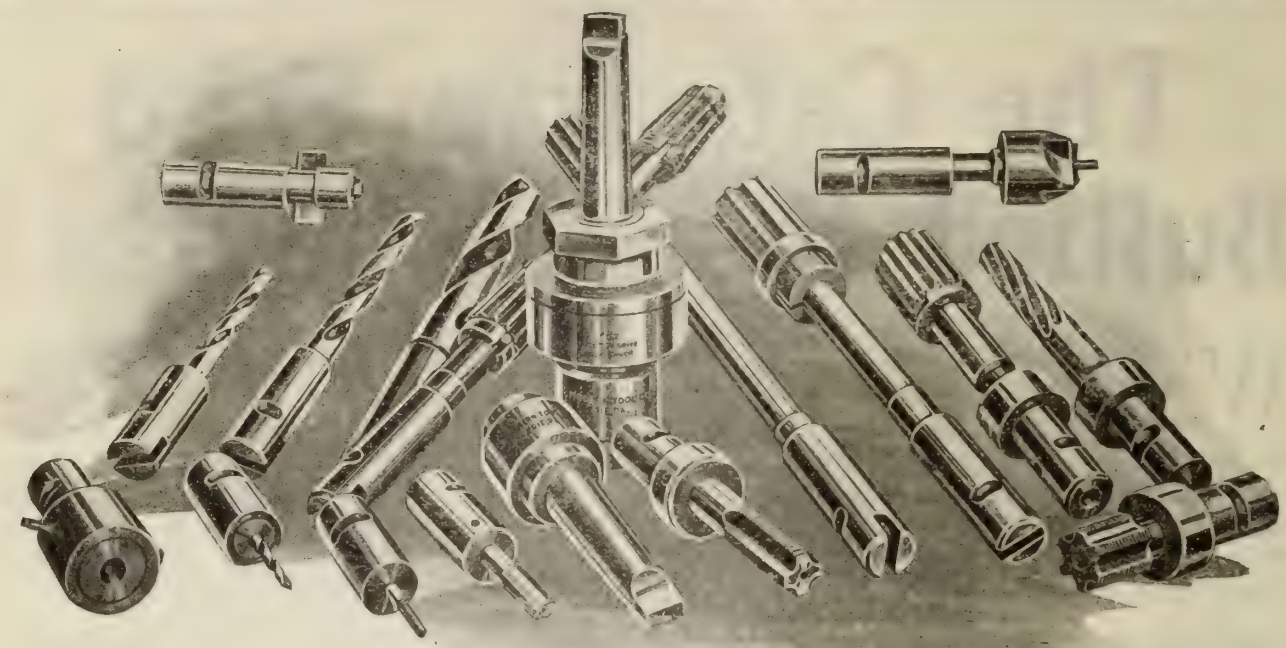

Modern "Magic" Chucks

—Often make unnecessary the purchase of expensive multiples.

Take a look at the picture above. All the tools shown may be used in a magic chuck on drill press or other revolving spindle machine.

The Magic Chuck virtually transforms a single revolving spindle machine into a multiple with as many spindles as you have tools to use. Especially valuable for successive operations which may be performed without resetting the work. For drilling and tapping successive holes of various sizes on one job the Magic Chuck is even a more advantageous tool than a multiple.

The cost is so small that no shop should be without several. You can well afford to equip every revolving spindle machine.

Other Modern Tools

—Modern Plain Grinders
—Modern Universal Grinders
—Modern Internal Grinders
—Modern Chaser Grinders
—Modern Self-Opening Die Heads
—Modern Collapsible Taps
—Modern Tapping Attachments

Reclaiming Broken Tang Drills

One of the collets in the Magic Chuck equipments is for making useful broken drills without necessity of milling keyway or flat spots.

The saving in this use alone will repay the entire initial cost many times.

Send for complete technical bulletin.

MODERN TOOL CO.

MAIN OFFICE AND WORKS: **ERIE, PA.** STATE AND PEACH STREETS

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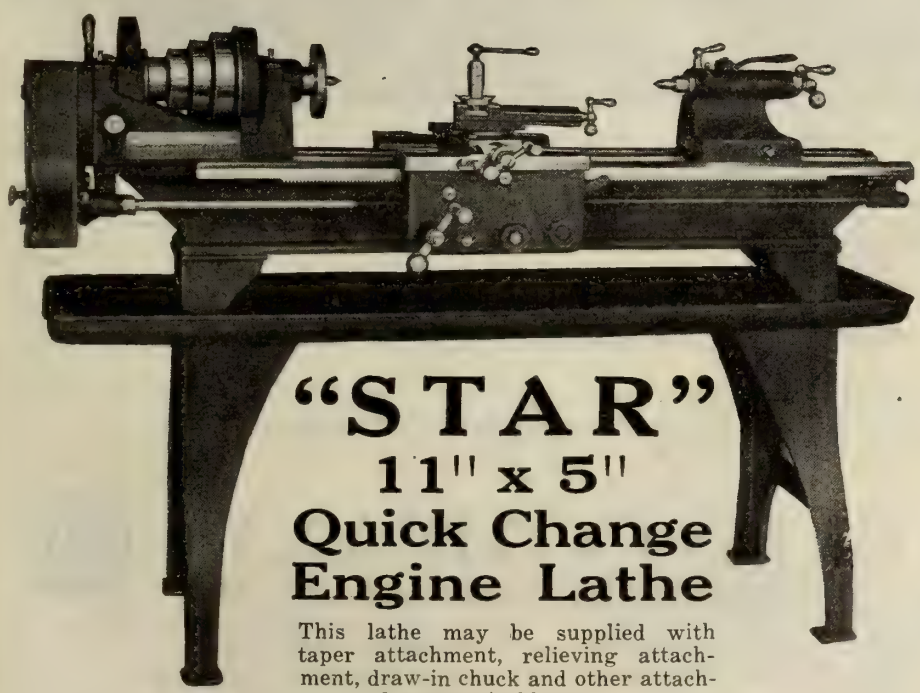
We solicit enquiries for Foundry and Factory supplies, including---

Bar Iron, Mild Steel, Sheet Steel, Black and Galvanized, Carbon and High Speed Steels, Roofing Materials, Pipe and Fittings, also Machine Shop Supplies, such as Files, Drills, Fine Tools, Set and Cap Screws, Etc.

For Small Tool Room Work—



"STAR"
11" x 5" Quick Change Engine Lathe

This lathe may be supplied with taper attachment, relieving attachment, draw-in chuck and other attachments found desirable for tool room work.

The First Choice of All Who Know

Use a small lathe on your light tool room work. "Star Lathes" not only ensure greater accuracy but save power, labor and space.

Instal a "Star" and you'll soon realize that there is much work that can be handled far more cheaply than is now thought possible.

May we send our catalog?

The Seneca Falls Mfg. Company, Inc.
366 West Falls Street
SENECA FALLS, N.Y.

Photographs and data by courtesy of our customer.

And to-day it produces these seamless Taper Drinking Cups at the rate of more than 2100 per hour. Speaks well for "Bliss" Presses, does it not?

This particular "Bliss" No. 3½ Cam Press is being run at about 22 strokes per minute and the operator performs 532 operations per hour, drawing 4 cups at a time.

Certainty of satisfactory service is what the name "Bliss" means to you.

BLISS 1857

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BLISS 1919

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No. 55

VENUS PENCILS

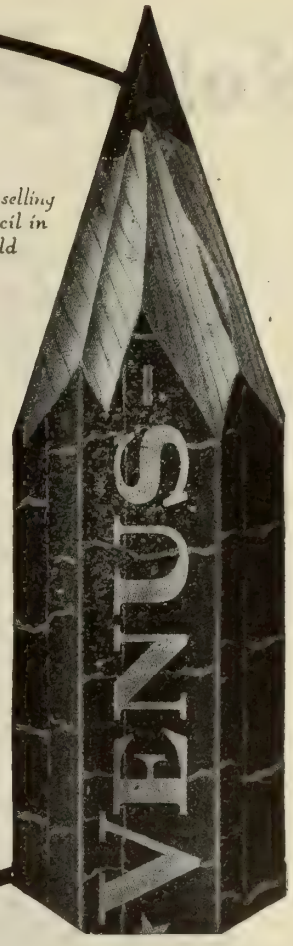
The largest selling quality pencil in the world

BECAUSE of their silky *smoothness* and *uniform* dependability, VENUS PENCILS are in constant use in the offices of engineers throughout the world.

To know the dependable and uniform quality of VENUS pencil in *every* degree, write today for

free samples of the degrees of lead which you prefer.

17 Black Degrees 6B softest to 9H hardest and hard and medium Copying All perfect



American Lead Pencil Co.

238 Fifth Avenue, New York

and Clapton, London Eng.

RICKERT-SHAFER TAPPERS

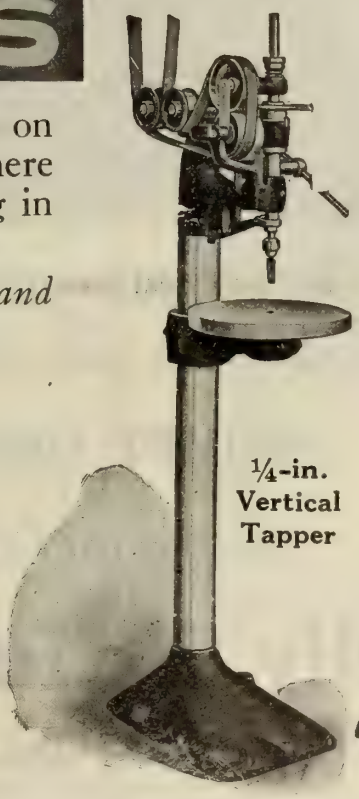
Save Tap Breakage

The *smooth drive* reduces the strain on the taps—they wear longer—and there are fewer delays from taps breaking in the work.

R-S Tappers ensure faster tapping and quicker assembling.

Friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on ⅝-in. work—50 per cent. faster than the usual tapping speed for that size. Uses but 1 h.p.

Write for specifications



¼-in. Vertical Tapper

Column Type Horizontal Tapper

The Rickert-Shafer Co.

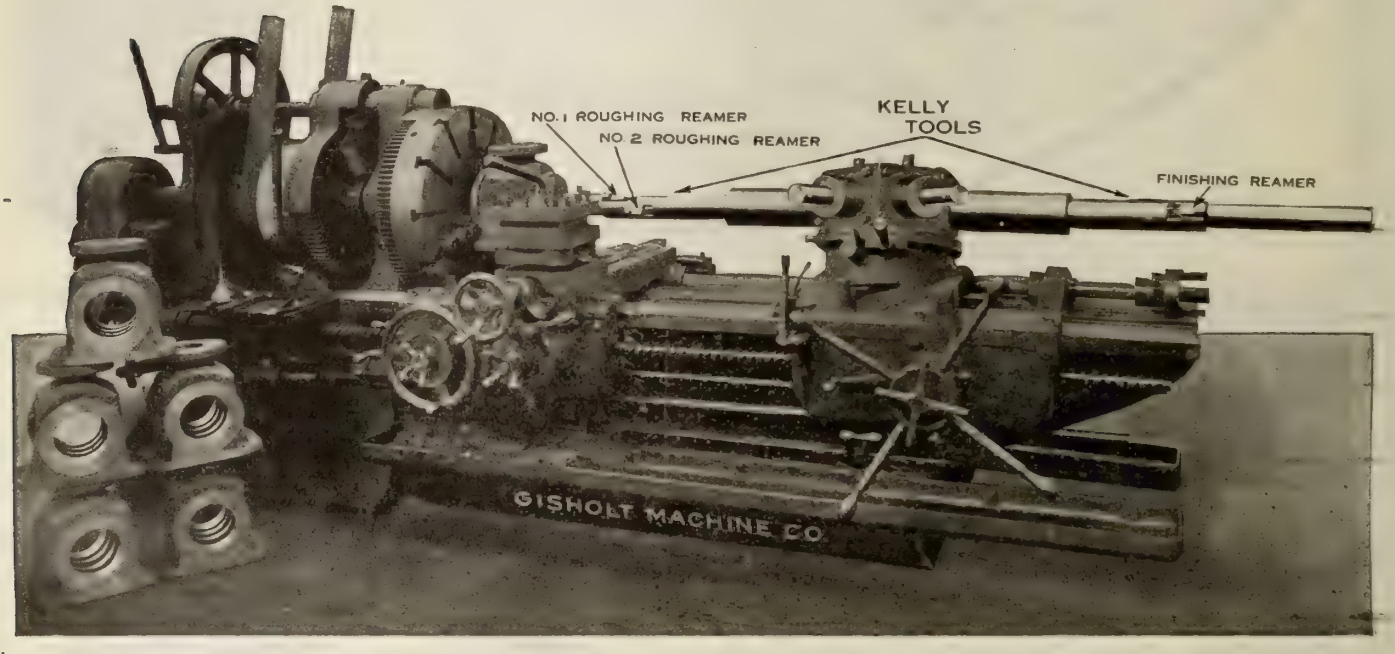
ERIE, PA., U.S.A.

FRED HERBERT, Foreign Agent, Coventry, England.

Kelly PRODUCTION Tools

KELLY tools are shown below in operation upon a 24-in. GISHOLT LATHE. The steam engine valve chests, being machined, are of cast-iron and are rough bored and semi-finished with two reamers in one bar. They are then REAMED with finishing reamers in the other bar. These reamers, being properly piloted, pass over THREE PORTS and give a TRUE, SMOOTH hole to close limits.

The hole is approximately 5½-in. diameter. By inserting a different sized set of reamers IN THE SAME BARS, a much larger sized job of a similar nature is performed.



ADJUSTABLE—REPLACEABLE

High-Speed Steel or Stellite Blades

PROMPT DELIVERIES

Send for our Catalog J-4

The Kelly Reamer Company

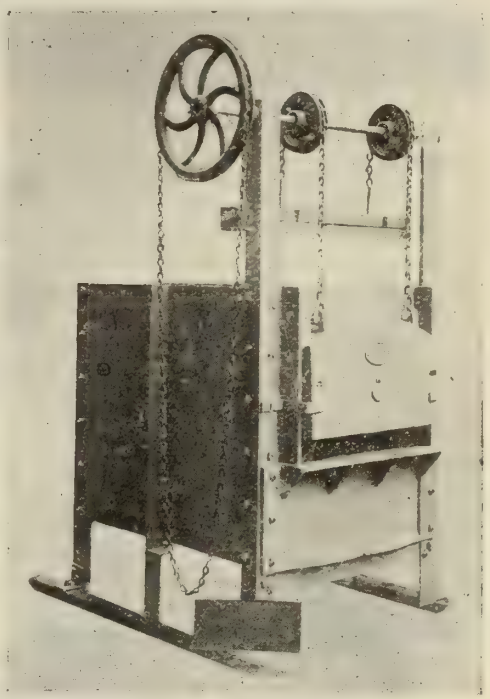
Cleveland, Ohio, U. S. A.

Do These Advantages Appeal

To Your Sense of Economy and Efficiency?

OIL FURNACE
VERSUS
COAL FURNACE

It's economy — requires one-half the space; costs less than half; no chimneys or flues required; instantaneous and perfect control of temperature; higher temperature obtained; no coal ash handlers required; no coal or ash piles; less waste of fuel, because it is shut off instantly; requires much less time to get the required heat. *Can you afford to lose the Advantages of this oil Furnace?*



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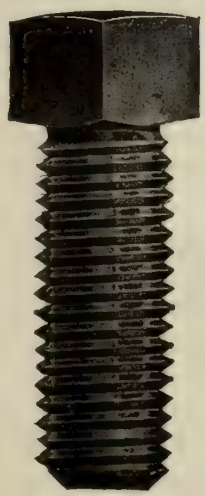
ACCURACY



When you want Cap and Set Screws and Semi-finished or Finished Hexagon Nuts for your rush jobs send your order to us. Prompt service with accurate goods.

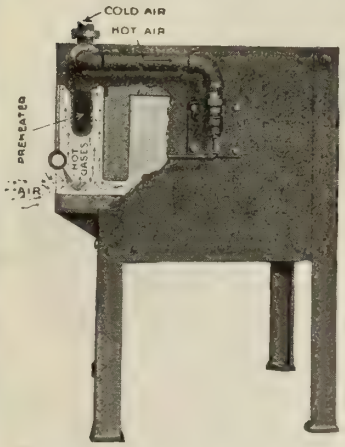
THE
GALT MACHINE SCREW CO.,
LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Merton Company Limited, 49 Common St., Montreal, Que.

Cool Shop This Summer

if you use

ECONOMIZER FORGE



Showing deflection of hot gases, with induced air *toward* the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

Write to-day for catalogue 34-T

Canadian Representative:
R. J. McLEAN
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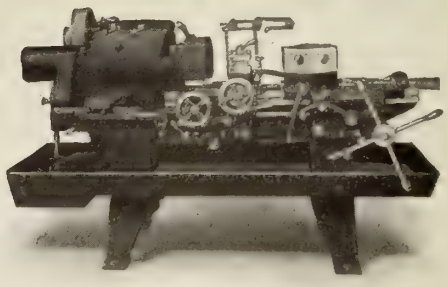
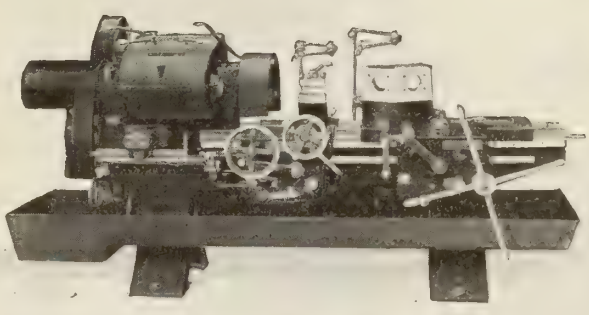
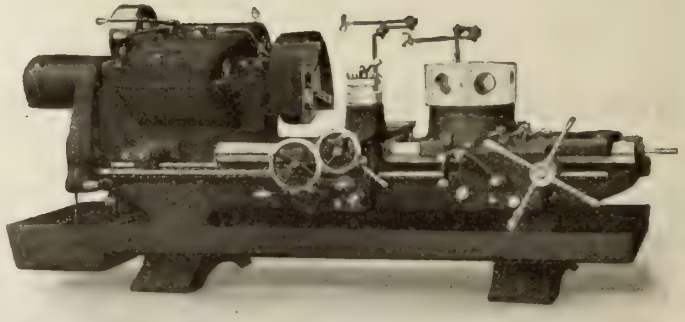
W. S. ROCKWELL CO. INDUSTRIAL ESTABLISHED 1888 FURNACES NEW YORK



1-B Universal Turret Lathe



2-B Universal Turret Lathe



3-B Universal Turret Lathe

HOW ARE YOU EQUIPPED FOR MACHINING CASTINGS AND FORGINGS?

Are you allowing your machining cost to increase with the steadily mounting cost of labor?

Or are you taking advantage of the labor-saving cost reducing possibilities, to be found in the latest developments in machine tools, to keep your manufacturing cost down to the old level?

The Foster Universal Turret Lathes are built for rapid production. They are rigid and powerful. Your heavy forgings and castings can be machined with speed and accuracy on these machines. The cross slide can be facing while the hexagon turret is boring and turning. As many as five to six cutters are often seen working simultaneously.

The control levers for the various units of the machine are centralized. The ease and convenience of manipulation saves the operator time and energy and increases his day's production—and your earnings.

Our production engineers will gladly submit a production estimate covering your work. Send us your blue prints.

Is our catalogue in your file?
If not, write for it to-day.

FOSTER MACHINE COMPANY, ELKHART, IND.

WONDER "Bending Machines"

BEND PIPE COLD

ELIMINATE FRICTION

3 New Models

"Wonder" Pipe and Tube Bending Machines (pat.) electrically operated to bend from 1" to 18".

We also manufacture 10 other sizes

Hand operated to bend from ⅛" to 8".

American Pipe Bending Machine Company

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CONSULTING ENGINEERS on all kinds of welding.

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OXY-ACETYLENE WELDING of heavy cast iron frames, cylinders, gears, water wheels, etc.

STEEL, any kind of **welding** on parts of large or small machines, tanks, digesters, boilers, shafts, brackets, etc.
Can be welded in place when necessary.

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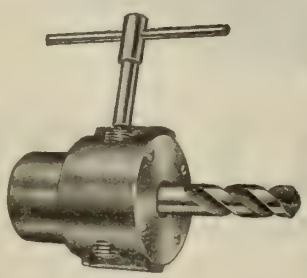
MARINE REPAIRS undertaken by our Marine Welding Tug which is equipped with Electric and Oxy-Acetylene Welding Apparatus with Compressed Air Plant complete.

OXY-ACETYLENE CUTTING of any kind of steel construction.

PORTABLE WELDING APPARTUS of all kinds with skilled operators always available to repair your breakdown at once.

THERMIT WELDING on all classes of work is a special feature of present activities.

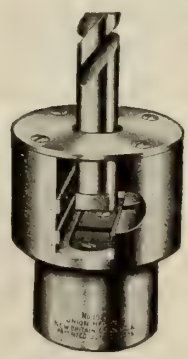
Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, etc.; Electric Welders, Oxy-Acetylene Welders, Boiler Repairs, Lead Burning and Thermit Welding.



UNION

POSITIVE DRIVE DRILL CHUCKS

The Union Drill Chuck is made in seven sizes (0 to 2 inches) with PATENT TRANSVERSE SLOT—so that drills with tenons can be inserted (see illustration). The shank of drill should be squared on two sides to enter the TRANSVERSE SLOT, giving a positive rotation to the drill independently of the jaws, permitting the jaws to centre and align the drill accurately. The drill is held absolutely true and will not slip under the hardest strain. This type of chuck will be found to give the best results on all classes of work from HIGH SPEED drilling to the hard BLACKSMITH and GENERAL REPAIR work.



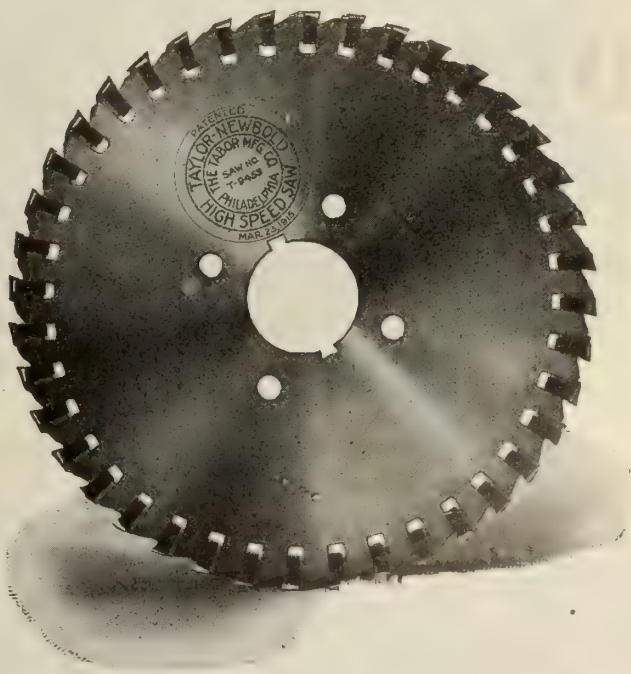
UNION Manufacturing Co.

New Britain, Conn.

New York 26 Cortland St.

Makers of a complete line of chucks

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

IMMEDIATE DELIVERY

MODEL D-1

SPECIFICATIONS:

RANGE—

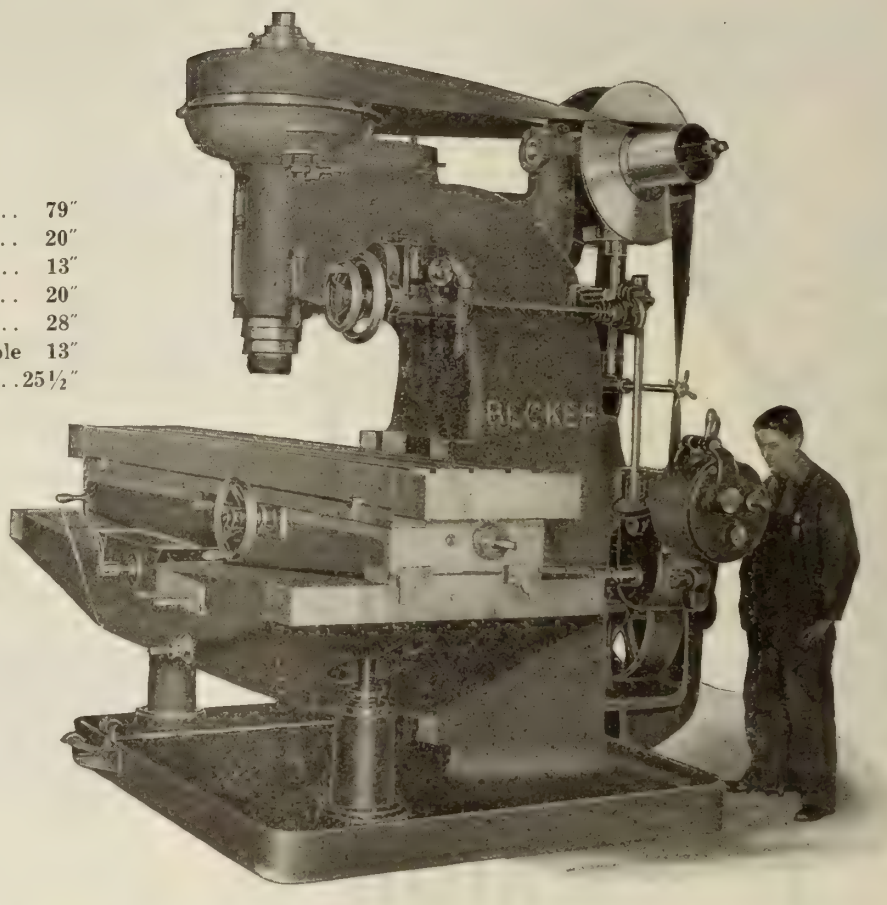
Longitudinal Feed	79″
Vertical Feed (Knee)	20″
Vertical Feed (Spindle)	13″
Cross Feed	20″
Max. Distance, Spindle to Table	28″
Max. Distance, Spindle to Rotary Table	13″
Max. Distance, Spindle to Frame	25½″

TABLE—

Working Surface	96″ x 20″
Overall	110″ x 20″
3 T-slots	⅝″
Length of Carriage	96″

WEIGHT—

Net .....Approx. 18,600 lb.



BECKER BELT DRIVEN MILLERS

THE MACHINE THAT GIVES THE SMOOTH FINISH

Massively constructed to handle work requiring a powerful machine tool, the Model D-1 fills a distinct want in every large plant.

The control is centralized so that te machine can be advantageously operated by one man, yet none of the Becker features have been sacrificed in its design, in fact, these features have been improved along the lines of greatest efficiency.

Note the large range—the rigid design of the knee supported by two perfectly co-ordinated elevating screws—the wide table, and powerful drive. These are some of the salient points of the Model D-1—Write for further information—To-day—NOW.

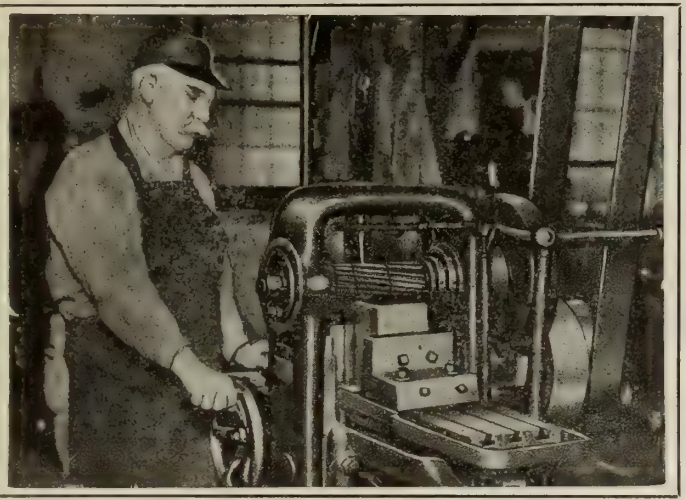
BECKER MILLING MACHINE CO.

HYDE PARK, BOSTON, MASS.

TORONTO: A. R. Williams Machinery Company, Ltd., 64 Front Street West
MONTREAL: Rudel-Belnap Machinery Company, Ltd., 137 McGill Street

BRIGGS MILLER

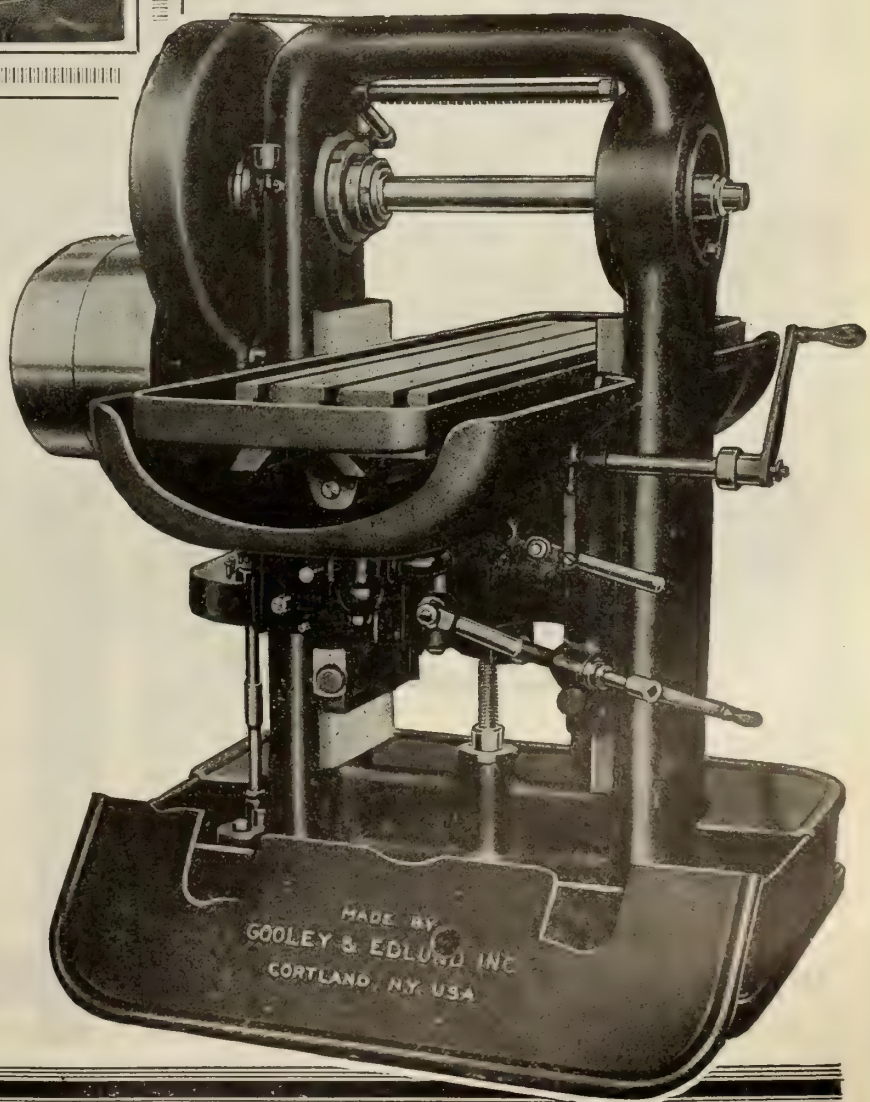
Keeps Five Die Sinkers Going



HERE you see the Briggs Miller Squaring Die Blocks, and it is working so fast it keeps five die sinkers going.

Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work. Unusual rigidity accounts for Briggs' higher efficiency.

Don't you think you could use this tool to advantage in your shop? Write for the details.



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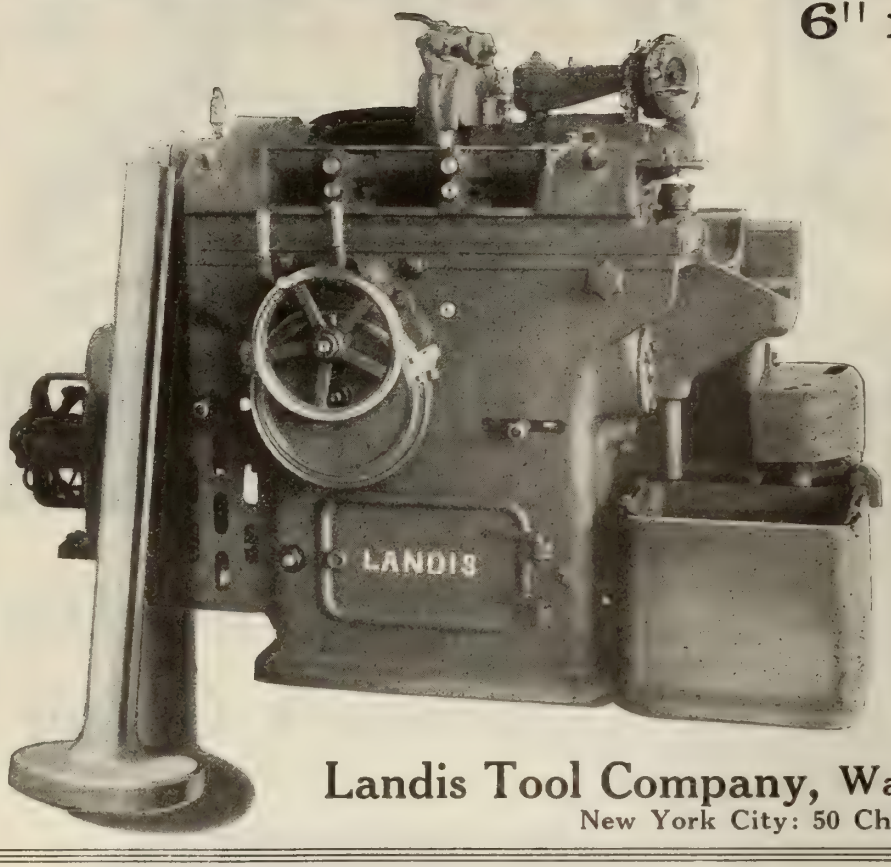
Cortland, N.Y., U.S.A.

Garlock Walker Machinery Co., Ltd.
Toronto, Ont.

Williams & Wilson, Ltd., Montreal

140 Valve Stems per Hour on the "LANDIS" 6" x 18" Grinding Machine



ONE enthusiastic user calls this tool "the biggest little machine on the market." It is a great little producer, compact, sturdy and accurate.

The stems of these valves require finishing within .00025" limits. The Landis does this easily, using a 4-inch face wheel requiring a traverse of only 3/8" to cover the stem and at a speed of 140 valve stems per hour.

Landis Tool Company, Waynesboro, Pennsylvania
New York City: 50 Church Street

Special Equipment
Built to Specification
Steel Plate and Structural Steel Work

Grey Iron Castings

High Quality and Prompt Service Double Sure

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TRADE MARK

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The quick performance and long service of P.H. and IMPERIAL Files amply demonstrate their worth.

Some files are worth more
Others are worth-less.

P.H. AND IMPERIAL Files are worth more because

"They Cut Faster and Wear Longer"

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JOHN MORROW SCREW & NUT COMPANY, LIMITED
INGERSOLL *Sole Distributors* ONTARIO

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World Renowned for High Quality

"Oliver" 26-inch Extra Heavy Duty Engine Lathe

turning face on 24-inch steel disc and drilling 3-inch hole in the centre

The power and rigidity of the "Oliver" will enable you to get the full cutting power of your high speed steel.

WE ALSO MAKE TURRET LATHES, SCREW MACHINES, SPEED LATHES, DIE FILING MACHINES.

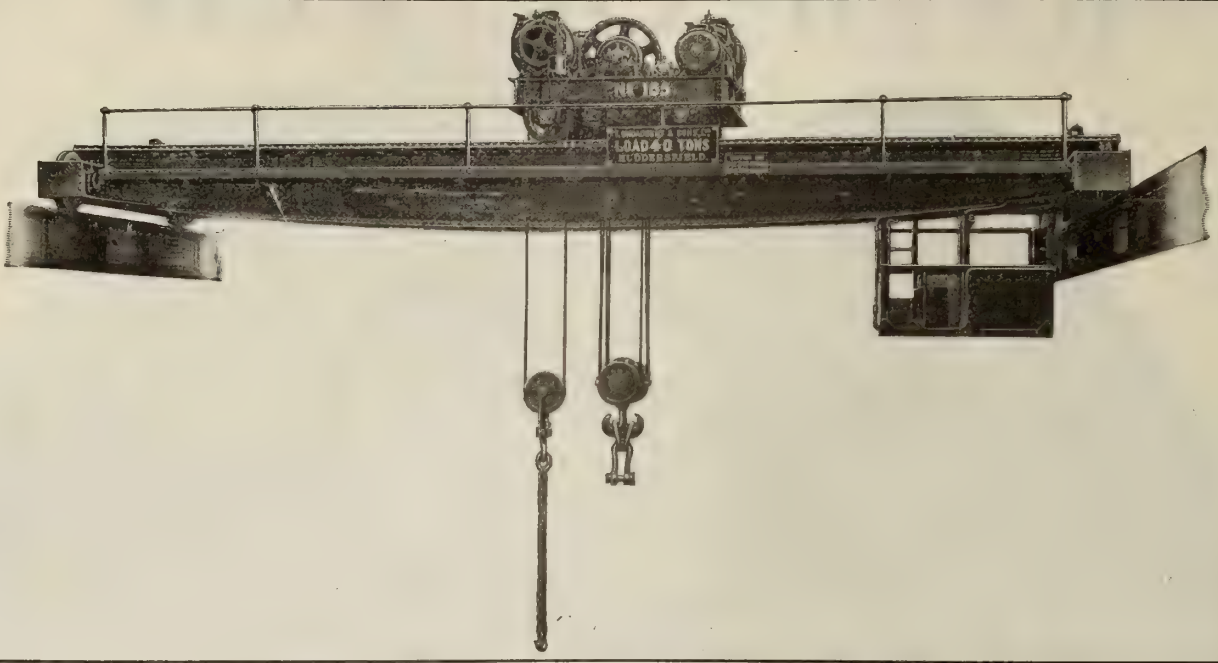
May we send you Descriptive Bulletins?

OLIVER MACHINERY COMPANY

GRAND RAPIDS MICHIGAN, U.S.A.

European Offices: Manchester, England; Paris, France.

ELECTRIC CRANES & CAPSTANS



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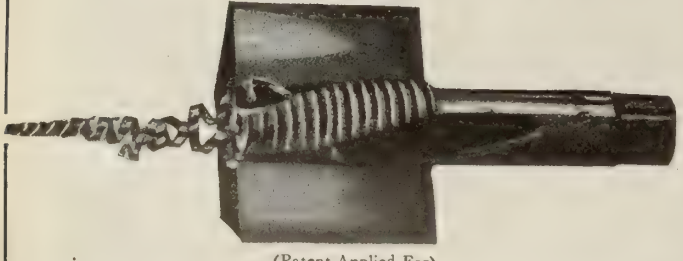

(Patent Applied For)

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makes tapping a pleasure

The Most MODERN,
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The Most ECONOMICAL.

Send for a "SEMPLE" Sample Tap. Made in any thread
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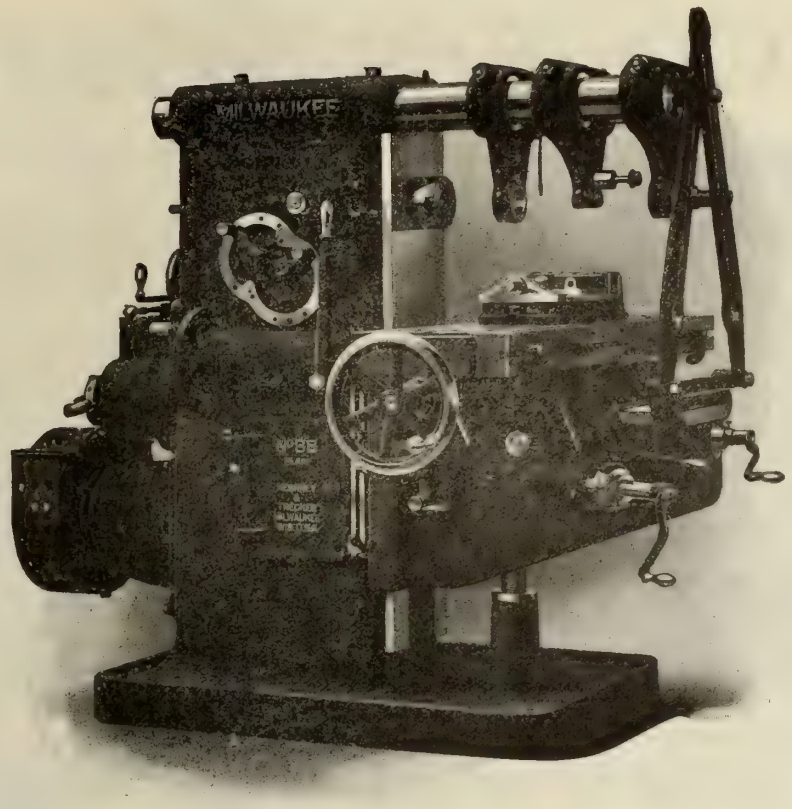


MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

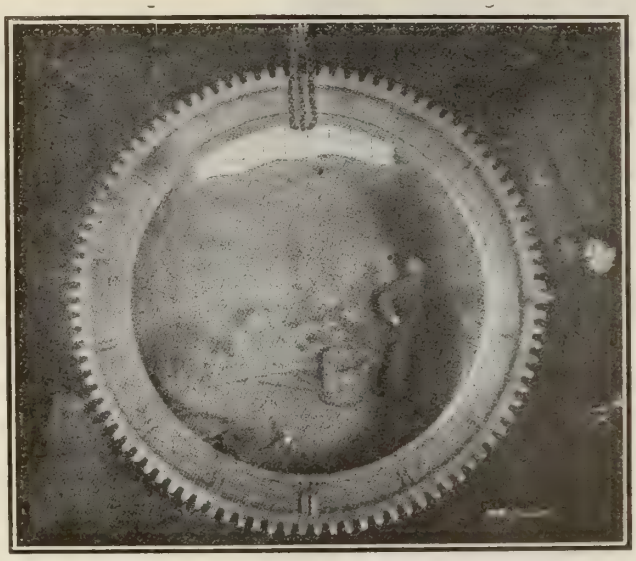
Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

KEARNEY & TRECKER CO.

MILWAUKEE, WIS. U.S.A.

HISCO Steel Castings

In Canadian Industry



Machine Moulded Gears. any size up to 18 ft. diameter. No patterns needed.

The development in manufacturing, in mining, in railroading, in shipping demands dependable equipment.

There is not an industry in Canada to-day where the quality represented by **"HISCO"** Steel Castings is not an absolute essential.

"HISCO" Steel castings have been demanded for special purposes in pulp and paper mills, in textile mills, cement mills, in mining enterprises, in locomotive and car construction, in enterprises big and little.

"HISCO" will be found wherever reliable service is required.

HULL IRON & STEEL FOUNDRIES, LTD.

HULL, CANADA 2

"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.

Marshalltown, Iowa
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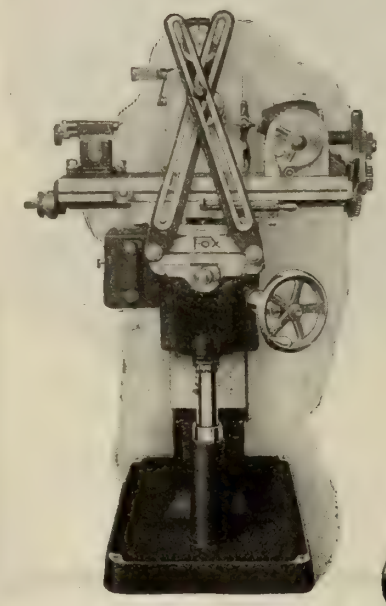
TRADE FOX MARK
REGISTERED

MILLING MACHINES

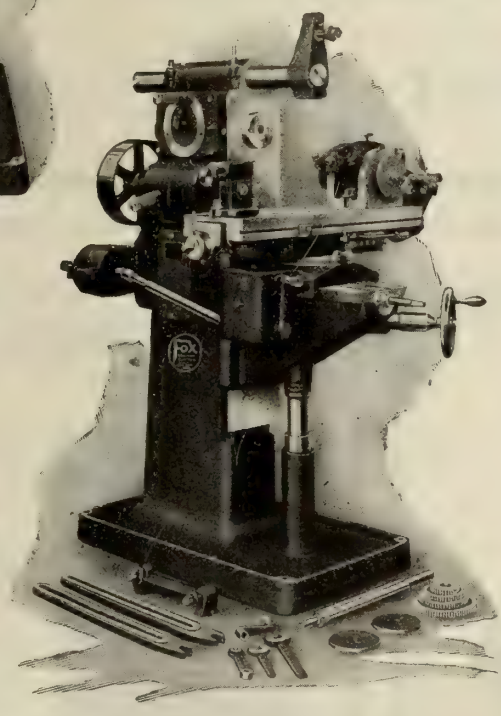
FOR

Rapid Production of Motor Parts



The **demand** for increased production **requires tools** of **great strength** and **durability**; the Fox 2-A Universal Milling Machine illustrated has met this demand, and is being used wherever extreme accuracy and quantity production are required.

The machine has a universal table, spiral cutting attachment, 10″ Dividing Head with 6″ Universal Chuck, making it a machine **especially adapted for Tool Room Work.**



The **United States Government** used this machine in its various **repair shops** for **Aeroplane Motors.**

You should be using this tool to help the production of parts necessary for reconstruction.

Specifications—No. 2-A Miller.

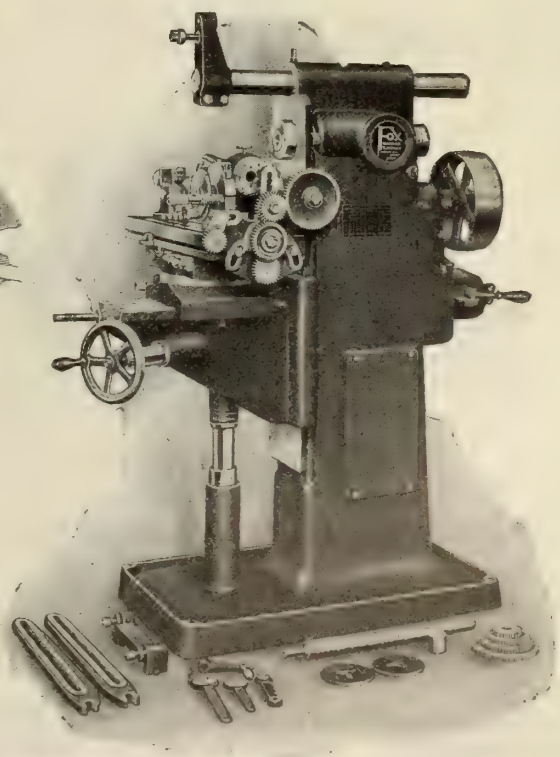
Spindle speeds 12
From 21 to 423 r.p.m.

Table feeds 6
From .317″ to 2.79″ per min.

Table .....8½ x 27″
Long. feed (power) 26″.
Vertical feed (hand) 13″.
Trans. feed (hand) 8½″.

Drive...Single pulley 10 x 3″ running 250 r.p.m.

Gears — Hardened steel.
Weight .....1,500 lbs.



We build this same machine with a plain table, omitting the spiral cutting attachment and Dividing Head.

Our No. 1 type machine has a four-step cone drive, and while being a lighter machine is a "bear" for work. This was proven by **the hundreds of them in the largest munitions plants.**

We also build the Fox Multiple Spindle Drilling Machines.

FOX MACHINE COMPANY
1047 W. Ganson St., Jackson, Michigan, U.S.A.

Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

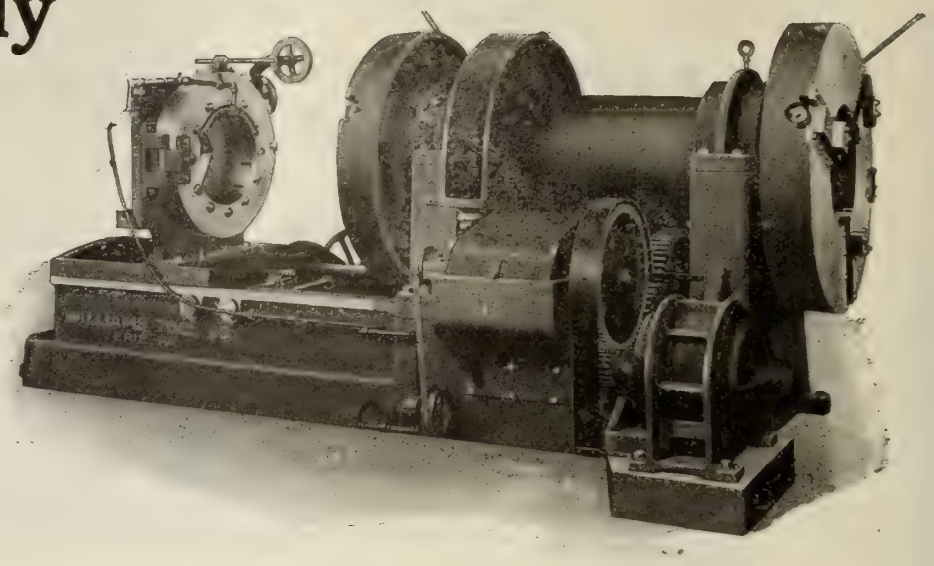
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



Write

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The A. R. Williams Machinery Co., Limited, Toronto, Canada

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Universal Machinery Corp. London - England

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HAVE WORLD WIDE REPUTATION FOR

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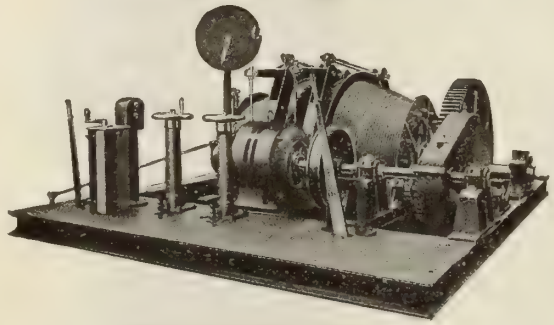

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PROTEXAL CLOTHING

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Made of high-grade, closely woven, especially treated duck material to **resist fire, water or acid**; will outwear overall or other work-cloth.

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are backed by our guarantee. A garment for every industrial need. This clothing is as popular as our

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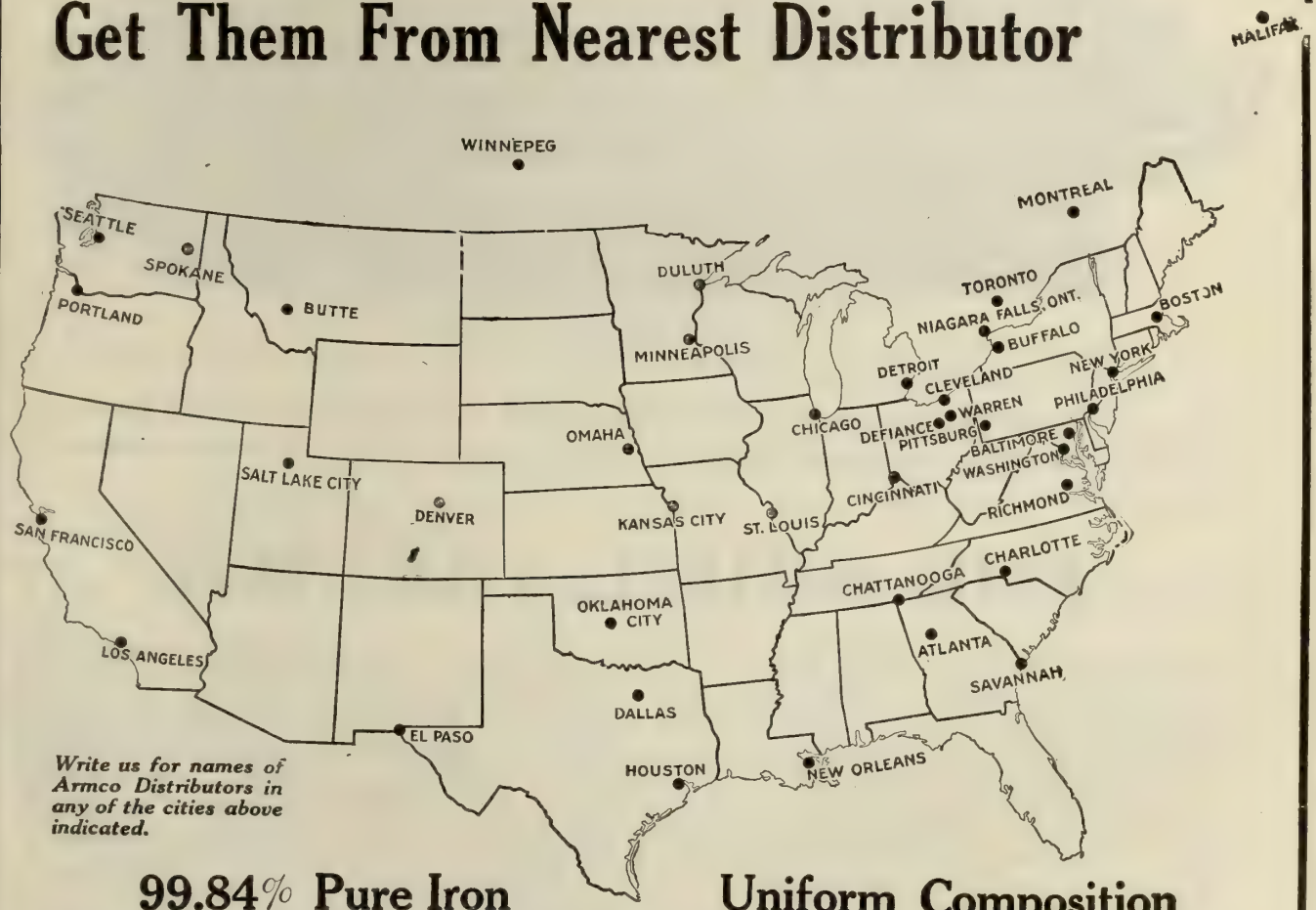
ARMCO IRON WELDING RODS

are steadily increasing in popularity, especially among welders who are building up a reputation for quality of work and reliability. Each new ARMCO enthusiast passes on the word that this strictly American product surpasses in purity and uniformity even the best grades of Norway and Swedish iron. The result is a rapidly growing insistence for ARMCO and our response with the coast-to-coast distribution shown below.

AMERICAN ARMCO INGOT IRON

The trade mark ARMCO carries the assurance that iron bearing that mark is manufactured by the American Rolling Mill Company with the skill, intelligence and fidelity associated with its products, and hence can be depended upon to possess in the highest degree the merit claimed for it.

Get Them From Nearest Distributor



Write us for names of Armco Distributors in any of the cities above indicated.

99.84% Pure Iron

ARMCO IRON Welding Rods have a guaranteed analysis of 99.84 per cent pure iron content (minimum)—a practical purity which insures complete and uniform cohesion and maximum strength of the welded section. Such purity also makes it possible for two kinds of rods of guaranteed ARMCO analysis, one specially treated for electric and the other for oxy-acetylene, to do all the work (and better work) that heretofore has required a wide range of filler compositions.

Uniform Composition

The uniform composition of ARMCO IRON Welding Rods, as determined before drawing by microscopic and chemical analysis of samples from various parts of split ingots, is another assurance of tough welds that will endure the most severe service and reflect credit upon the welder. This uniformity also insures free flowing of the welding material and a joint that can be hammered, forged, and, when necessary, annealed and quenched. Operators produce their best work when they use ARMCO Rods.

Send for our booklet on Armco Iron Welding Rods. It is full of interesting and useful data.

PAGE STEEL & WIRE CO.

Established 1883 as Page Woven Wire Fence Co.

Makers of "Copperweld" Copper Clad Steel Wire; ARMCO Iron Welding Rods and Electrical Wire; Wire Mill Products, Plain and Galvanized; Wire of Special Analysis; Wire Fencing for all Purposes; Factory Gates; Ornamental Iron Fence; Machine Guards; Tool and Stock Room Partitions; Architectural Iron.

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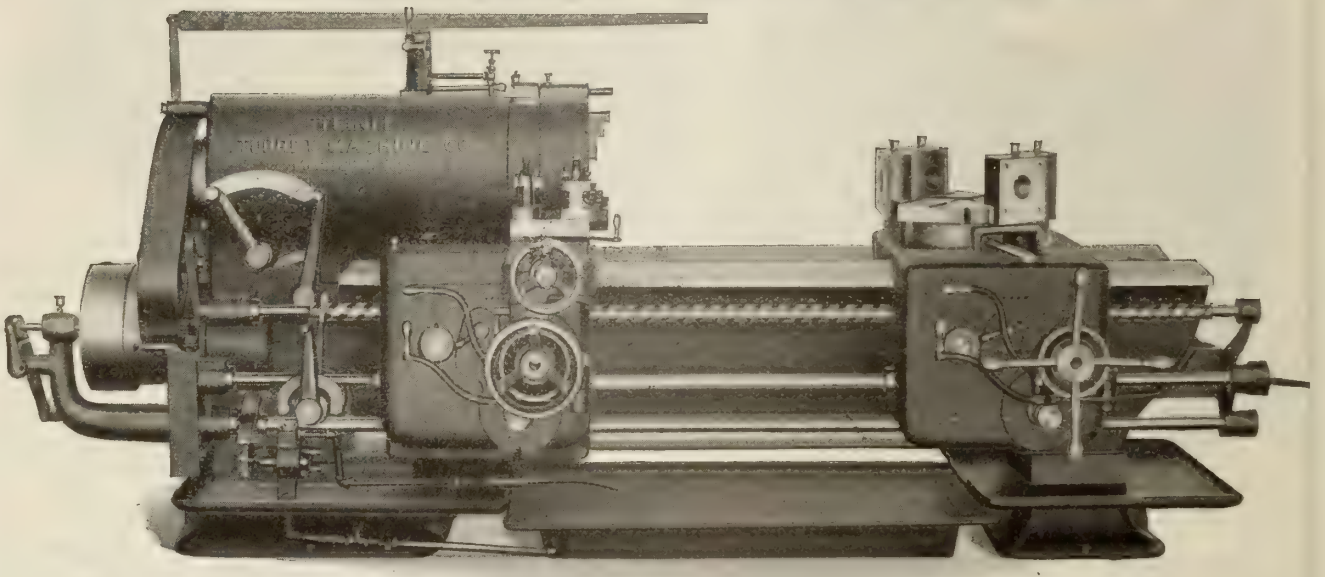
STEINLE



Still another reason why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

THE SIDE CARRIAGE

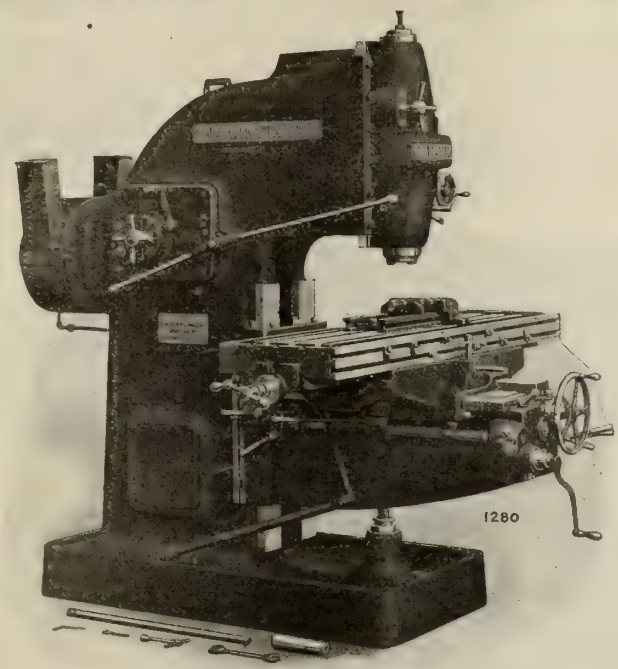
This feature has many advantages over the old style carriage that spans or bridges the ways. It is designed in such a manner that while it can be run past the chuck and permits bringing the turret up close to the work there is no sacrifice of strength or rigidity due to the absence of a bridge across the ways. The side carriage is firmly supported by the massive front way at the top of the bed and secured with a dove-tail gib to a way located at the bottom of the front of the bed. It is thoroughly substantial in design and is equipped with a cross slide having power cross feed, on the top of which slide is mounted a turret block carrying four tool holders. It has power traverse, quick change longitudinal feed, and power cross feed all of which are reversible and controlled from the apron. While this carriage does not span the ways it is so substantially supported that it can be used for most severe service in facing to the centre and similar work such as cutting off heavy bar stock.

All of the advantages of this side carriage feature are not available except where the design of the entire machine has been carried out with a view of utilizing them and in a future issue of this Journal we will describe another feature, the design of which as incorporated in this machine permits of the use of all side carriage advantages.

STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.

The New Cincinnati No. 4 High Power Vertical

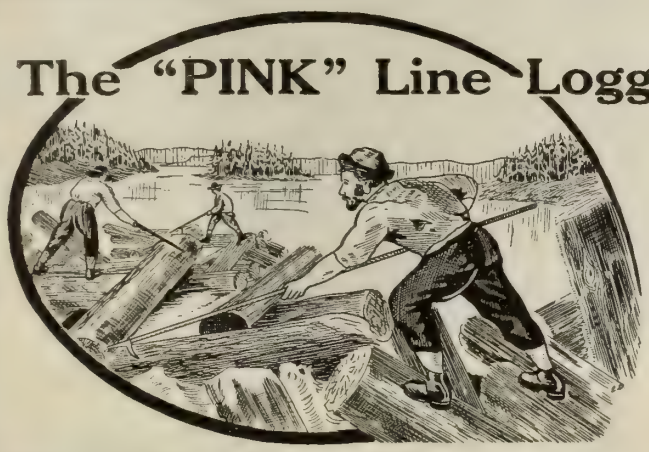


- Intermittent feed, power quick traverse
- Square gibbing with narrow guides
- Feed changes at front of knee
- Safety couplings in feed transmissions
- Individual feed control levers
- Automatic lubrication
- Centralized oiling
- Stream lubrication
- Hardened sliding gears throughout
- Starting lever at front
- Automatic brake
- Cincinnati standard flanged spindle end
- Spindle can run in either direction

Patent Rights Fully Reserved

THE CINCINNATI MILLING MACHINE COMPANY
CINCINNATI, OHIO

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

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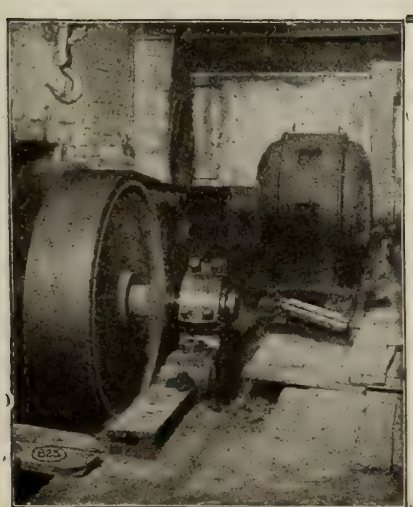
We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited
PEMBROKE, ONT., CANADA



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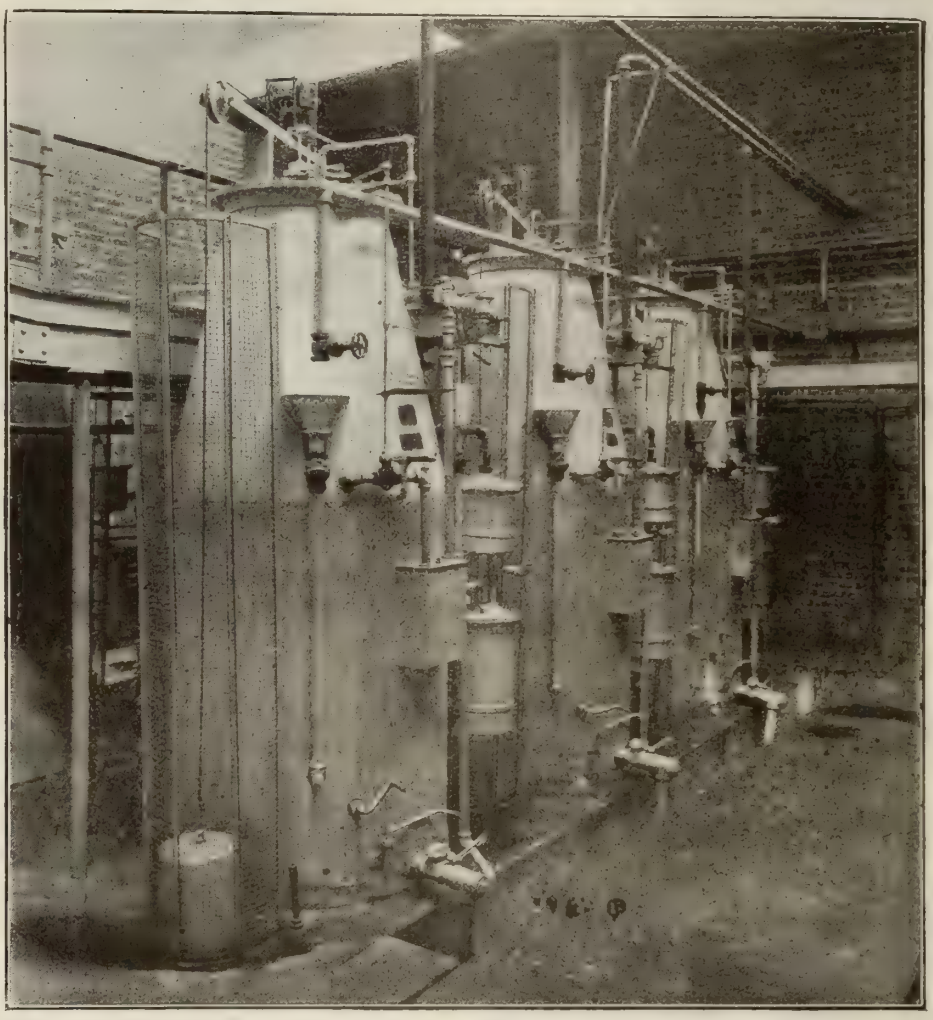
Acetylene is the only efficient gas employed for both cutting and welding of metals. For shop operations and for yard use, with fixed stations, the most economical and satisfactory supply is by generation of acetylene on the premises as it is required, piping the gas under working pressure directly to where it is wanted, avoiding transportation delays, costs, and handling of acetylene tanks, and the necessarily higher cost of the gas. For outside work where portable apparatus is required, the portable acetylene tanks are invaluable.



This illustration shows a bank of three 300-lb. carbide capacity Davis-Bournonville acetylene pressure generators, which is one section of a twelve-generator installation in a metal working plant.

Davis-Bournonville generators are made in several sizes and are frequently installed in batteries of from two to twelve of the largest size. Automatic in operation, and with no additional storage of free acetylene, they provide the highest efficiency in acetylene production. Davis-Bournonville apparatus comprises the widest range of equipment for the production, distribution and application of acetylene, oxygen and hydrogen for welding and cutting.

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Jersey City

WELDING AND CUTTING
DAVIS
APPARATUS
DAVIS-BOURNONVILLE CO.
"MADE IN CANADA"

Los Angeles
Minneapolis
Montreal
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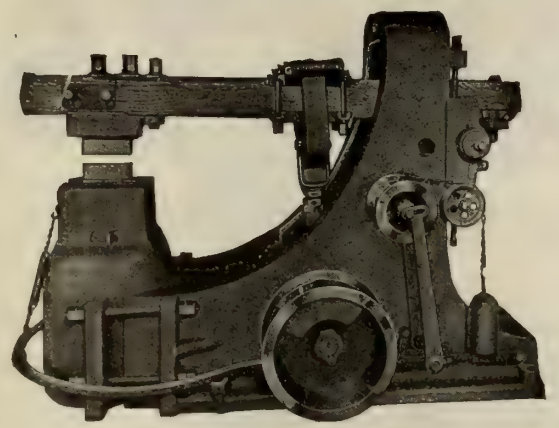
We'll Help You to Blaze a Trail of Efficiency



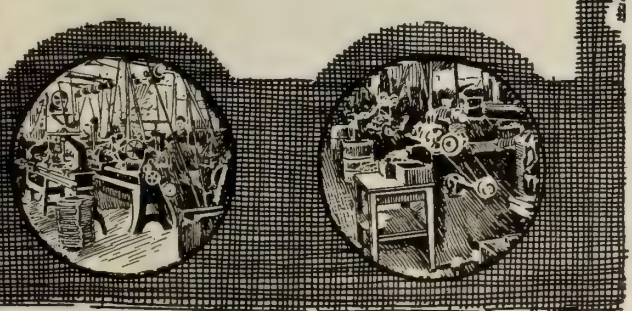
The Rochester Helve Hammer

The Mechanic who works comfortably does the best work in quick time. He gives you WORTH-WHILE results. You can't pry him loose from a superior tool. He brags about it. Give the chap a chance who uses the Helve Hammer. In 9 cases out of 10 he'll say, "The Rochester Helve" for mine. He is the man who knows the 100% Satisfaction Helve. We can't tell you all its distinctive features in this brief advertisement, so we ask you to write for our Helve Hammer Book.

THE WEST TIRE SETTER CO.
ROCHESTER, N.Y., U.S.A.

SPECIAL TOOLS

Automatic Machinery
for all purposes
Punch Press Work
Screw Machine Products
Consult us on your machine problems
Toronto Tool Company
516 Richmond St. West Phone Adel. 1181



Your Money's Worth

Never again will the Canadian Nation and People be the same careless improvident spenders of "ante bellum" days. "EFFICIENCY" and "GET YOUR MONEY'S WORTH" will be the popular motto and the successful machine shop manager must be able to see the advantage of making one pound of High Speed Tool Steel do the same work as ten pounds in forged tools; in other words he must and will

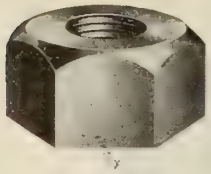
USE ARMSTRONG TOOL HOLDERS

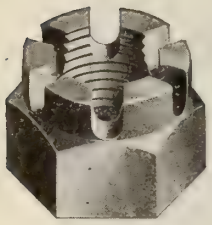
No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men—a good thing to consider from a production standpoint.

Our Catalogue is of handy pocket size and will be mailed to you upon request

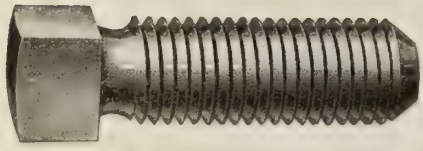
ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.
STRONG STRONG





Screw Machine PRODUCTS

Standards in Stock



NUTS

Plain and Castellated—S.A.E.—Semi-Finished—V.—U.S.S.

SCREWS

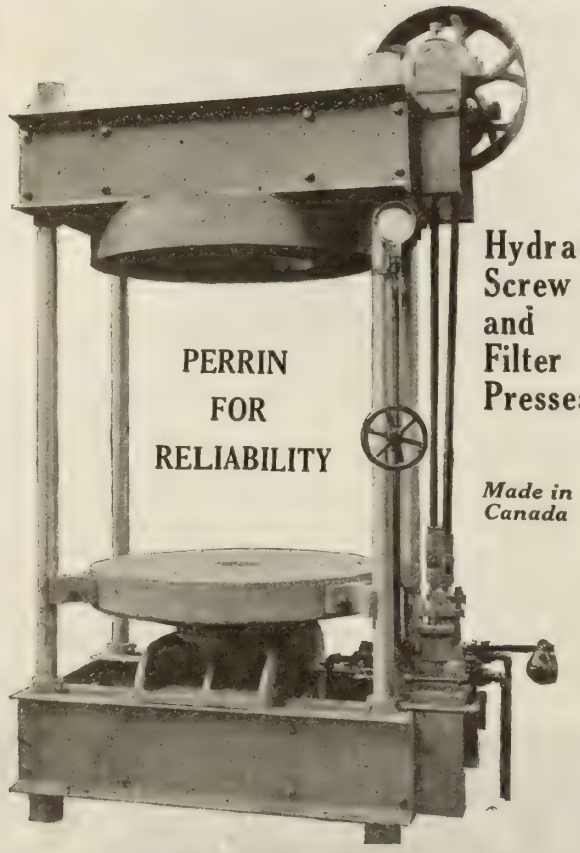
Cap—V.—U.S.S.—S.A.E.—Set—U.S.S.—V.

Special Parts

Made to customers' specifications. Sizes up to 2¼ in. diameter, 10½ in. long.

THE NATIONAL ACME COMPANY

De Courcelles and G.T.R. MONTREAL, P.Q.



PERRIN FOR RELIABILITY

Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED

TORONTO

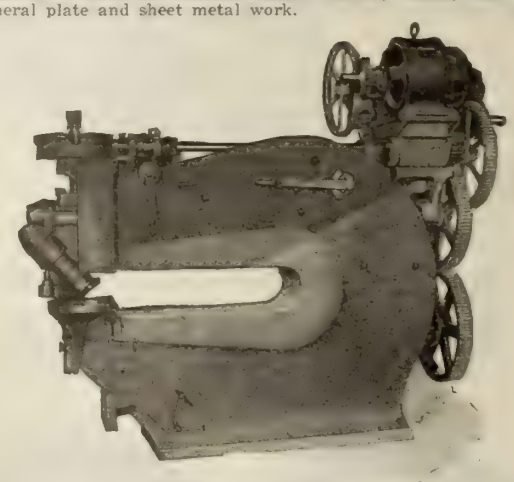
"QUICKWORK"

Registered in U.S. and Foreign Countries.

ROTARY SHEARS

MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

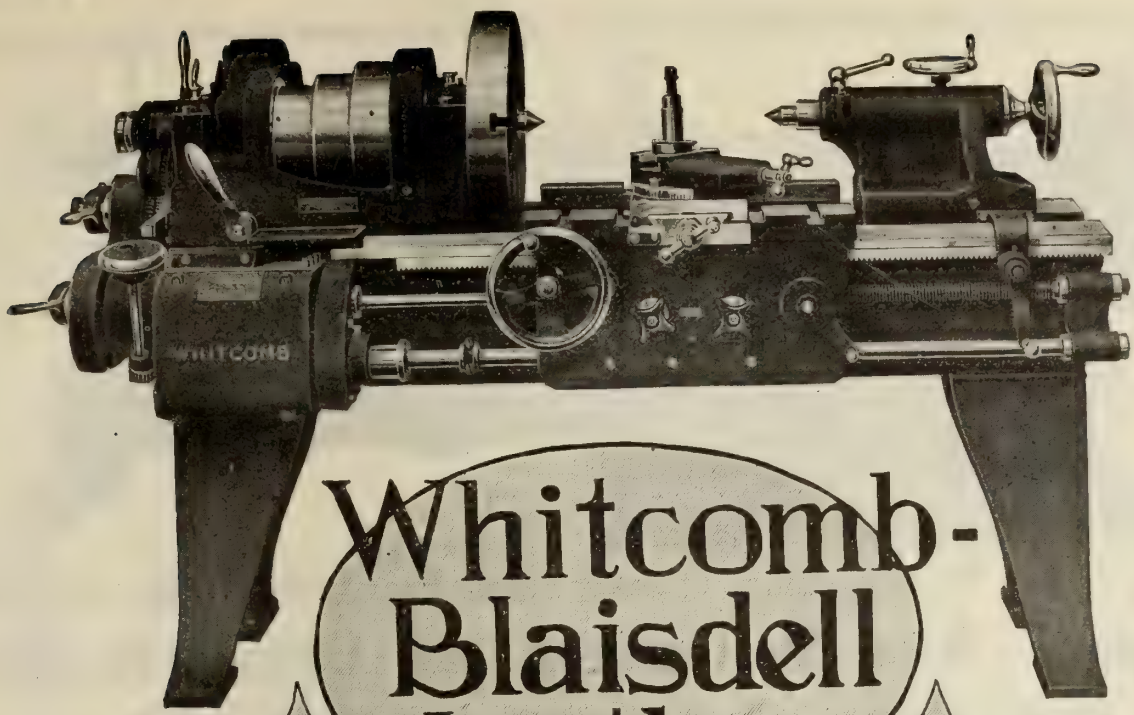
SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing.

Write for Catalogue No. 60.

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.

Cable address: "QUICKWORK."
Codes: W. U. and General.



Whitcomb-Blaisdell Lathes

POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product.

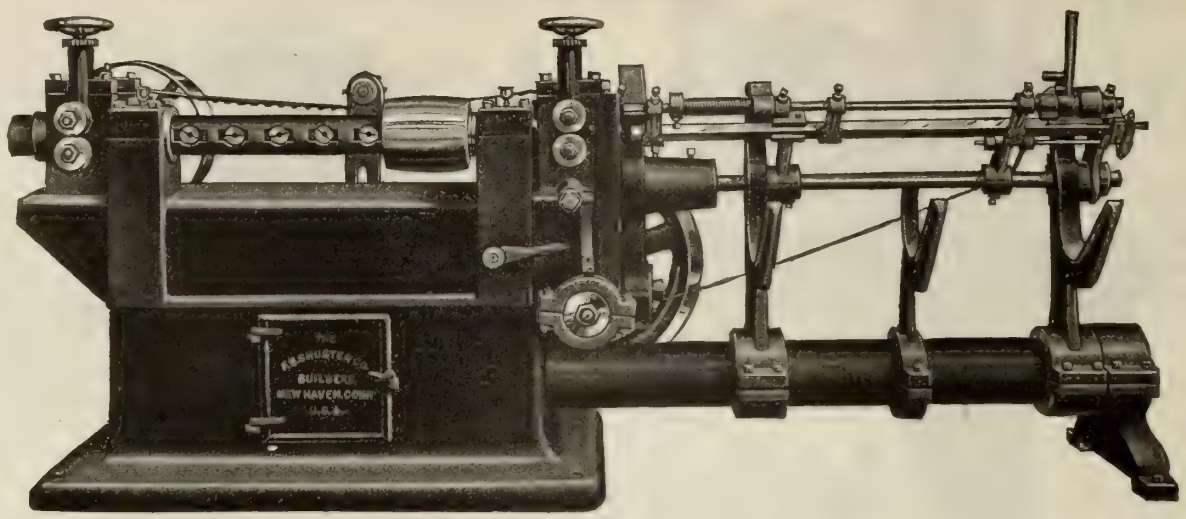
Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes

Lathes

WHITCOMB-BLAISDELL MACHINE TOOL CO.

WORCESTER, MASS.

Planers



Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

Would you like to have us prove that

Peerless HIGH SPEED

Machines do 50 to 100% more work

The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

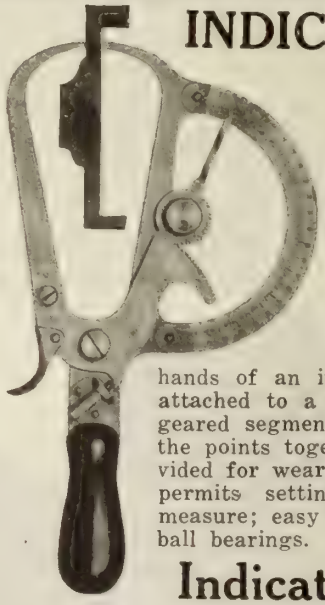
The Balance Lift of the Peerless

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

The Peerless assures you the peak of production at very lowest cost. Write for full details.

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN



INDICATING CALIPERS

This finely made tool, of the simplest construction, incorporating features of outside calipers, rule, magnifier, and indicator, is accurate, easily read and manipulated with one hand. Great saving of time is effected in the hands of an interested user. A hand attached to a pinion is actuated by a geared segment; a coiled spring draws the points together; adjustment is provided for wear of parts; locking device permits setting of tool to required measure; easy movement is effected by ball bearings.

Indicating Calipers

are used by

MACHINISTS, PATTERN, TOOL and MODEL MAKERS.

$8.75 **3"** Graduated in 64th inches, Scale enlarges two times. **2"** Graduated in 100ths inches. Scale enlarges three times.

Write for folder or make inquiries thru local dealer.

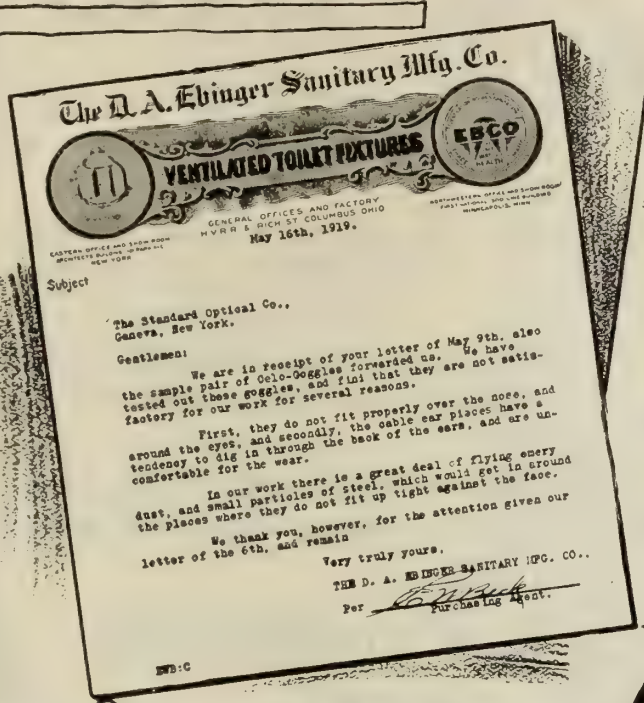
MADE EXCLUSIVELY BY THE

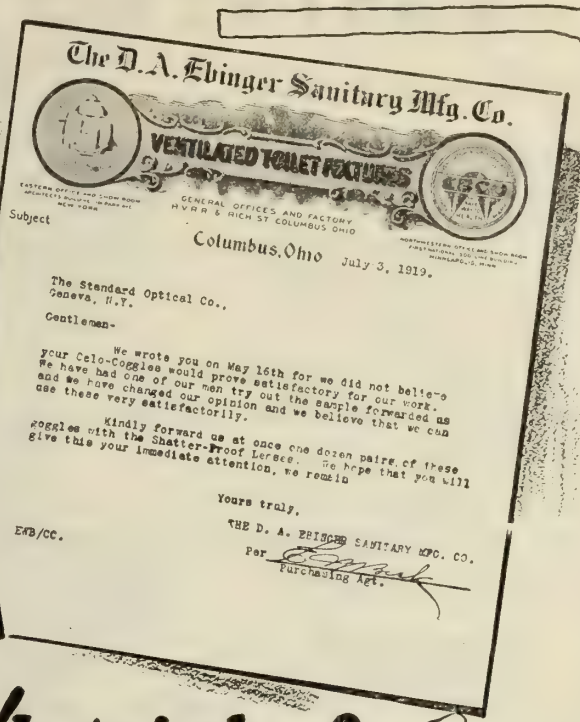
INDICATING CALIPERS CO.

506 East 19th St., New York

Stocked by Exclusive Canadian Agents:
Williams & Wilson Limited, 84 Inspector Street, Montreal, Que.

BEFORE AFTER

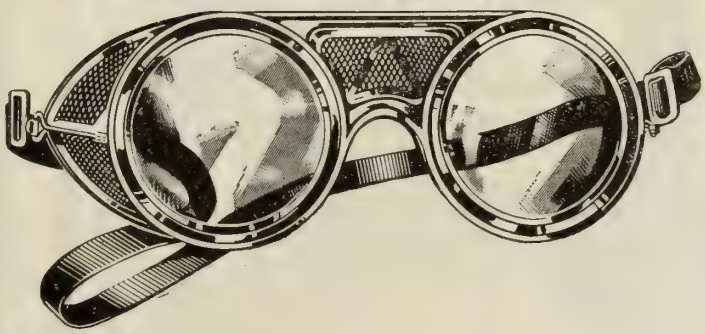

The D. A. Ebinger Sanitary Mfg. Co.
VENTILATED TOILET FIXTURES
EBCO
GENERAL OFFICES AND FACTORY
HYRR & RICH ST COLUMBUS OHIO
May 16th, 1919.
Subject
The Standard Optical Co..
Geneva, New York.
Gentlemen:
We are in receipt of your letter of May 9th, also the sample pair of Celo-Goggles forwarded us. We have tested out these goggles, and find that they are not satisfactory for our work for several reasons.
First, they do not fit properly over the nose, and around the eyes, and secondly, the cable ear pieces have a tendency to dig in through the back of the ears, and are uncomfortable for the wear.
In our work there is a great deal of flying emery dust, and small particles of steel, which would get in around the places where they do not fit up tight against the face.
We thank you, however, for the attention given our letter of the 6th, and remain
Very truly yours,
THE D. A. EBINGER SANITARY MFG. CO..
Per
Purchasing Agent.
EWB:C


The D. A. Ebinger Sanitary Mfg. Co.
VENTILATED TOILET FIXTURES
EBCO
GENERAL OFFICES AND FACTORY
HYRR & RICH ST COLUMBUS OHIO
Subject
Columbus, Ohio July 3, 1919.
The Standard Optical Co.,
Geneva, N.Y.
Gentlemen-
We wrote you on May 16th for we did not believe your Celo-Goggles would prove satisfactory for our work. We have had one of our men try out the sample forwarded us and we have changed our opinion and we believe that we can use these very satisfactorily.
Kindly forward us at once one dozen pairs of these goggles with the Shatter-Proof Lenses. We hope that you will give this your immediate attention, we remain
Yours truly,
THE D. A. EBINGER SANITARY MFG. CO.
Per
Purchasing Agt.
EWB/CC.

a thorough trial of

STOCO SAFETY GOGGLES "CELOGLAS"

SHATTER-PROOF LENS



You try the STOCO Safety Goggle! Give it a **good** trial—don't be content just to look at it. Bend it; twist it; if the lens is a "Celoglas" break it with a hammer and try to force the pieces of glass out of the frame; put it on and see how comfortable it is; look at yourself in a mirror and see how it protects all the way around and **between** the eyes. Then put it in the shop and let the man who is to wear it O.K. it. He will.

Price of STOCO Safety Goggles with regular optical glass lenses (for protection against emery dust, etc.), $115.00 per hundred.

With "Celoglas" Shatter-Proof Lenses (for workers such as chippers who need extra-positive protection) $150.00 per hundred.

A sample of the STOCO Safety Goggle will be sent without charge to any Safety Engineer, Purchasing Agent or Superintendent on receipt of request on letterhead.

STANDARD OPTICAL CO.

GENEVA, N.Y.

TRANSVEYORS
Did It!

Castings by the hundreds — yes, by thousands — all easily, rapidly and efficiently transferable with the Transveyor.

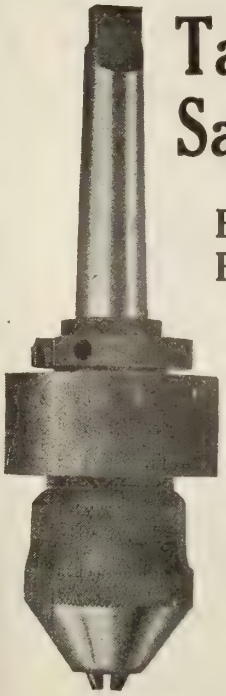
Not on the floor, but on wooden platforms, or on skids made instantly mobile by elevating the Transveyor under the loaded skid—that is Transveyor transfer.

Despatching and storing material the Transveyor Way, promotes system, saves time and labor through the elimination of rehandling; reduces "overhead" cost.

Any business with a floor under it can beneficially apply Transveyors. Our latest machinery bulletin is yours for the asking. To what address shall we send it?

COWAN TRUCK COMPANY
15 Water Street, HOLYOKE, Mass.

Canadian Agent: R. B. SMILEY, 120 Glenholme Ave., Toronto, Ontario, Canada



Tap Chucks that Save Tap Costs

BICKNELL-THOMAS FRICTION CHUCKS

reduce tap breakage to the vanishing point. These chucks will hold the tap to the limit of its endurance, but a sudden strain sufficient to break the tap will cause the grip to loosen instantly. They are particularly adapted for tapping to the bottom of blind holes, for special work and—owing to their compact design—for use on multiple spindle machines.

Made in four sizes—one-eighth to one inch. Straight or Morse taper shanks.

BICKNELL-THOMAS CO.
GREENFIELD, MASS., U.S.A.

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"**—the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

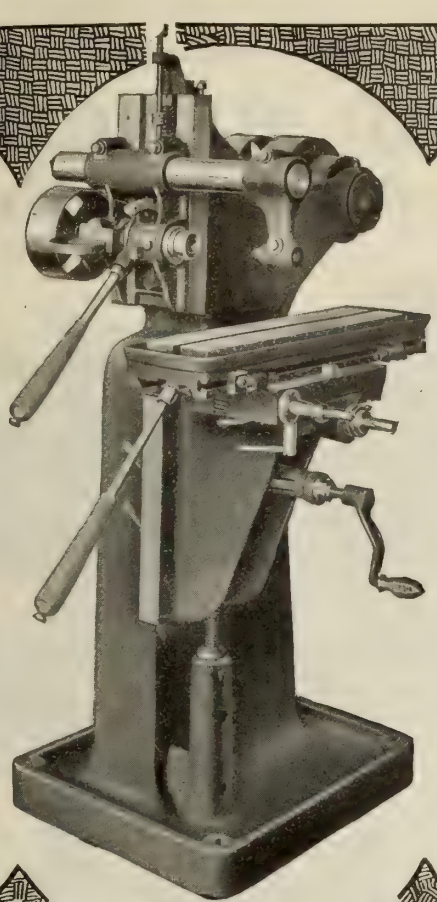
The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

The "BRISTOL" Hand Milling Machine

Extensively used in the manufacture of small parts where accurate duplication is essential. Illustration shows our number 1 Heavy Type Hand Miller.

Specially designed for use on work where heavier machine than standard type is necessary.

BRISTOL



Convenience Assures Big Production

The lever controls make a very convenient method of operation, though crank is furnished for table feed for use when so desired.

Users acknowledge these machines to be exceptional producers, proving in many cases more satisfactory than milling machines of the more expensive type.

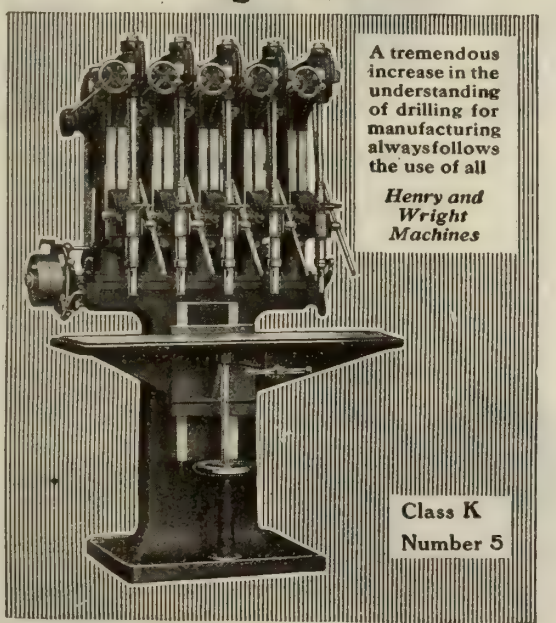
Write for catalogue.

BRISTOL

The Bristol Machine Tool Co. Bristol, Connecticut

HENRY & WRIGHT

Drilling Machines



A tremendous increase in the understanding of drilling for manufacturing always follows the use of all *Henry and Wright Machines*

Class K
Number 5

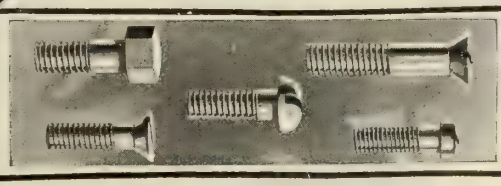
The Henry & Wright Mfg. Co.

Hartford, Conn.

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

Wood Screw Making Machinery

SEND FOR CATALOGUE
Series B6



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

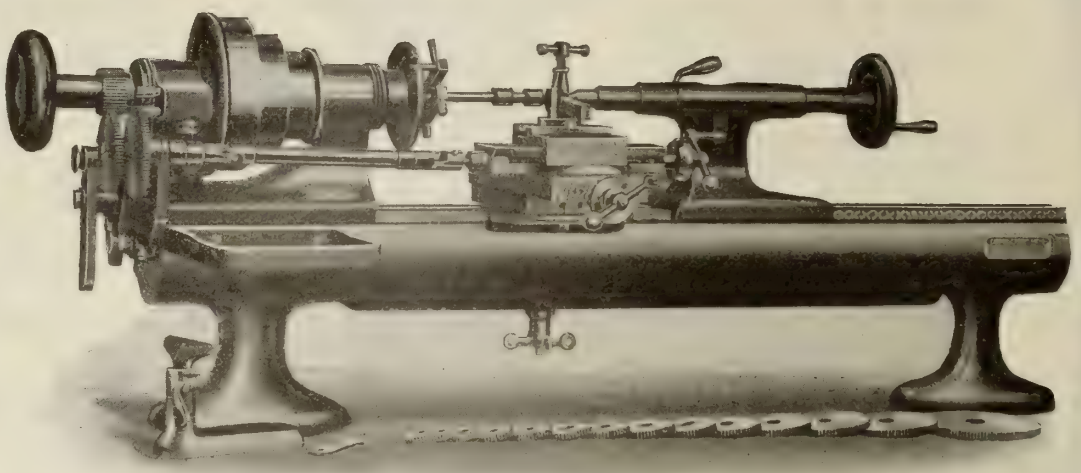
Write or Wire us.

Cable address: "Cook," Hartford, U.S.A.
Codes: Liebers
Western Union

Asa S. Cook Co. Hartford, Conn.

CATARACT BENCH LATHES AND ATTACHMENTS

Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



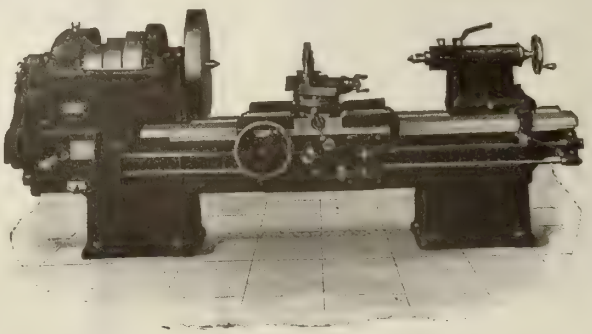
Hardinge Bros., 1770 Bertau Avenue, Chicago, Ill.

ALFRED HERBERT CO., Limited, Coventry, England, are our representatives for United Kingdom, France, Belgium, Russia, Japan, Manchuria, Korea, Formosa, China, Italy.

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.

Photographic Copying
The PHOTOSTAT

(Trade Mark Registered)

"Orders are now delivered three or four days earlier to our customers by making photographic copies of sketches and drawings which are the same in every detail instead of having our draftsmen reproduce the original.

"Practically all orders were previously held up three or four days by our drafting department while copies of the intricate drawings of ordered tools were being made. Now with the Photostat, only 15 or 20 minutes are required to make the three copies, exact duplicates of the original, which the factory needs to turn out the order. By eliminating this needless delay we are able to provide better service for our customers, and attract new prospects because of prompt deliveries."

This cut shows a PHOTOSTAT on which a large drawing has just been copied in less than a minute.

Never Makes a Mistake

It is simple, practical, easy to handle. Requires no expert knowledge. The machine is loaded with a roll of sensitized paper especially manufactured for the purpose.

The original subject is photographed directly upon this paper producing a facsimile copy which is immediately cut off, developed and fixed right in the PHOTOSTAT itself.

The focusing, exposing and developing are all controlled by simple mechanical devices and no glass plate, film or other intermediate negative has to be made.

After fixing, the copy is removed to a tank of running water and rapidly washed free from chemicals. It is then dried and is ready for use. As many copies as desired may be run off in this manner.

By a simple adjustment of the mechanical focusing device the copy may be made at actual size, reduced, or enlarged, within the size limitations of the machine.

Error in copy is impossible because every copy is an absolute facsimile. The operations are all simple, such as a boy or girl can do.

The PHOTOSTAT Copies

Pencil Drawings, Ink Drawings,
Tracings, Reports
Shipping Lists, Data Sheets,
Contracts, Ledger Pages,
Illustrations for Salesmen, Insurance Records,
Sketches, Blue Prints,
Specifications, Maps,
Legal Documents, Graphs,
Cuts and Drawings for Advertising, etc.

Manufactured by the Eastman Kodak Company exclusively for the

COMMERCIAL CAMERA COMPANY

343 STATE STREET, ROCHESTER, N. Y.

CHICAGO NEW YORK CITY PHILADELPHIA PROVIDENCE WASHINGTON

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Alfred Herbert, Ltd., Coventry, England
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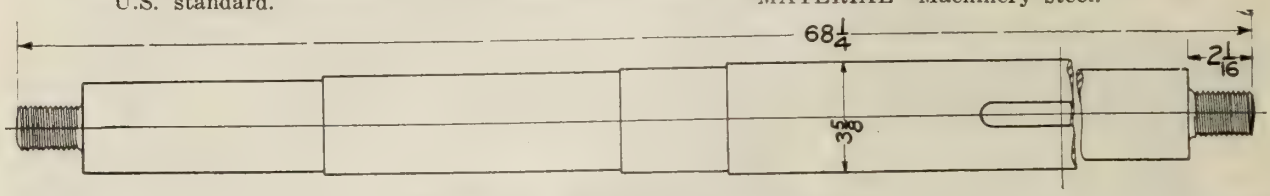
Societa Anonima Italiana Alfred Herbert, Milano, Italy
Graham Broters, Stockholm, Sweden

Smalley-General

THREAD MILLING MACHINES

Will give you a short cut to lower-cost thread milling.
Study the blue print and time study as given below.

MACHINE—Smalley-General Thread Miller No. 2.
THREAD—1½ in. diameter, 2 1-16 length, 6 pitch U.S. standard.
PIECE MILLED—Axle for tractor.
MILLING FEED—4.35 per minute.
MATERIAL—Machinery steel.



Tractor Axle Operation
TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the centre and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

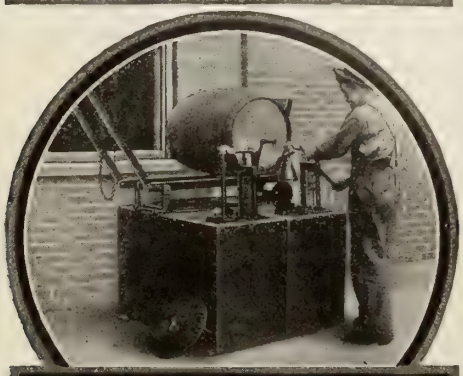
Consult us on every phase of Thread Milling.

We will show you how to cut the costs.

Smalley - General Co., Inc., Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

Tiresome, Expensive, Dangerous, Wasteful—but Unnecessary.



With Bowser Equipment One Man Does the Work with Less Time and Effort —and Without Loss

STOP WASTING LABOR IN HANDLING OILS

Do away with the back-breaking, disagreeable labor in storing and handling oils.

With Bowser Storage Equipment the heavy work is done mechanically—there is no wasted energy—all oils are easily and quickly put into storage by gravity.

Save With BOWSER Systems

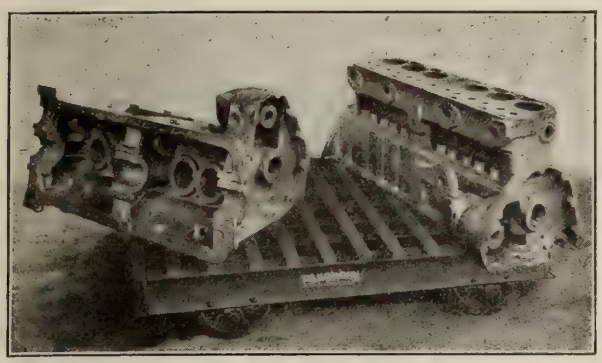
Distribution is done by accurate, rapid self-measuring pumps—no oils are left in shipping containers to dry up, leak and seep away—none is lost through spilling or dripping faucets. Every operation in the use of oils is done in a systematic, safe and saving manner.

Write us for literature, showing why Bowser Systems are a paying investment

S. F. BOWSER CO., Limited
66-68 Frazer Avenue, Toronto, Ont.

LONDON 32 Victoria St. S. W. 1 | PARIS 5 Rue Denis-Poissons | HAVANA Lonja del Comercio 427 | SYDNEY 6 Castlereagh St.

How long would it take to clean this Cylinder by your present methods—and what would be the labor cost alone?



How long would it take to pay for a Sand-Blast Installation from the saving in labor cost if you cleaned it in 3 minutes?

CLEANED IN THREE MINUTES BY

PANGBORN SAND BLASTS

and whether your requirements are the cleaning of Castings, Forgings, Stampings, Sheet, Plate or Structural, or the removal of scale from Heat Treated Parts there's a Pangborn Unit or Combination for every need, large or small, that will make a saving for you — and a more attractive product.

PANGBORN CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS
P. O. 8503

Perfect Riveting

Provided its cost is the lowest possible, riveting so well done that it can't be improved upon, is perfect riveting.

Boys on Grant Riveters accomplish two and three times as much perfect riveting as an equal number of men using ordinary machines.

With the

GRANT
ROTARY
VIBRATING RIVETER

rivets placed close up to the shoulder of the work are as rapidly spun perfectly smooth as are rivets in easy-to-reach spots.

The Grant Mfg. and Machine Company
Holland Ave.
Bridgeport Conn.

Send for "Perfect Riveting"

Let them know it's there

In complimenting us upon the results secured from their advertisement in the classified section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

Canadian Machinery
Classified Advertising Section
143 University Ave., TORONTO

Nichrome Castings for Heat Treatment

Cast "Nichrome" and Ferrous Materials at High Temperatures

There is an excessive reduction in the physical strength of ferrous materials after subjected to high temperatures.

In one set of experiments wrought iron had a tensile strength at 1700°F. of 6300 lbs. per square inch, less than 15% of its normal strength at 70°F. At 1700°F. cast iron had a tensile strength of 7900 lbs. per square inch. That is, it had lost 58% of its normal strength at 70°F.

The tensile strength of cast Nichrome at 1700°F. is 24,500 lbs. per square inch, approximately 210% greater than the tensile strength of cast iron at 1708°F. When cold, Nichrome has a tensile strength of about 45,000 to 50,000 lbs. per square inch.

The durability of cast Nichrome makes the use of Nichrome boxes, pots, tubes and retorts economical for heat treating work and for all operations occuring at high temperatures.

Write for further particulars.

Manufactured under Henderson Patents.

CANADIAN DRIVER-HARRIS CO., Ltd.

WESTERN OFFICE AND DEPOT CHICAGO 20 So. JEFFERSON ST

WALKERVILLE, ONT. CANADA

AMERICAN OFFICE AND WORKS HARRISON, N. J.

BRITISH WORKS MANCHESTER ENGLAND

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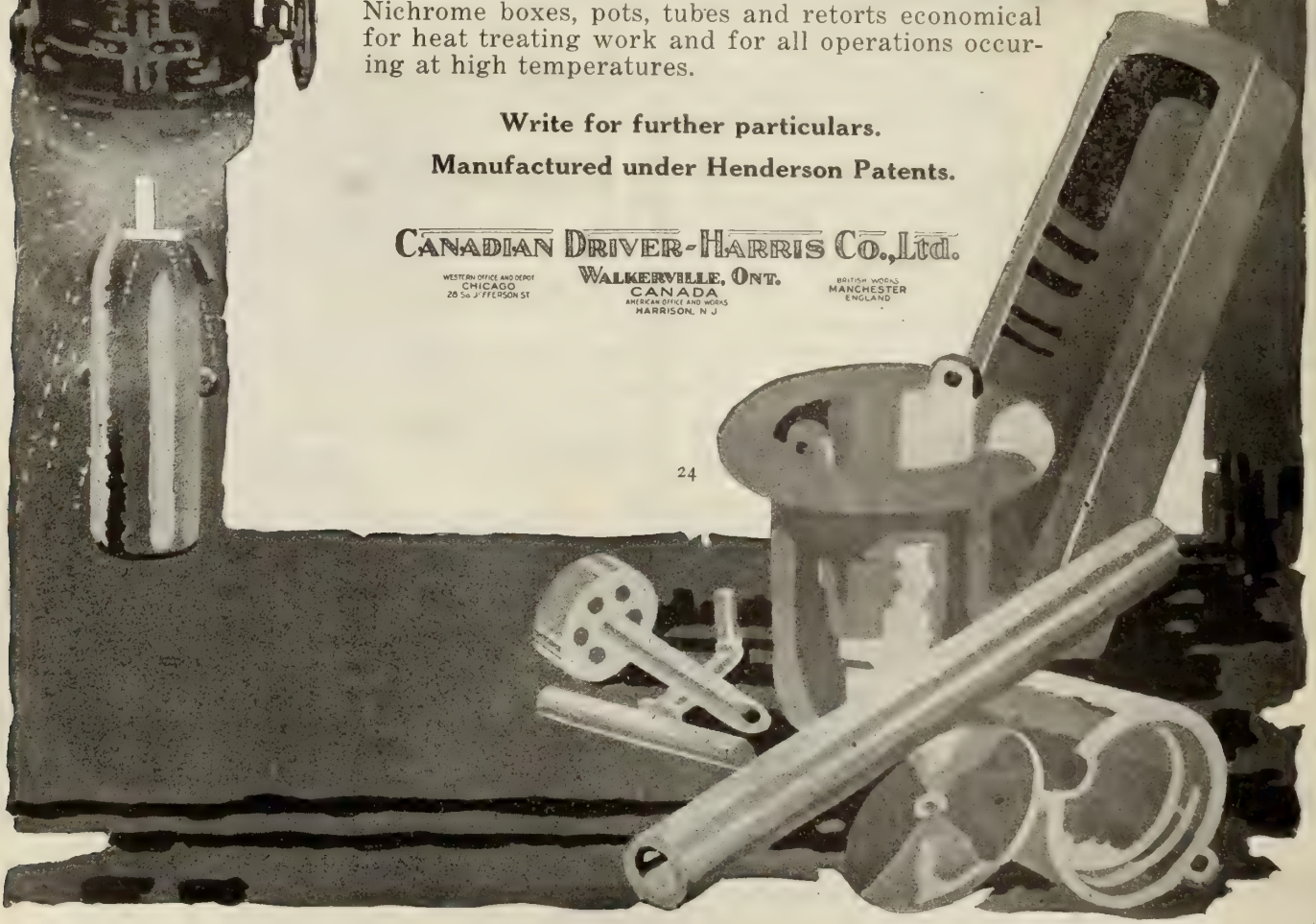
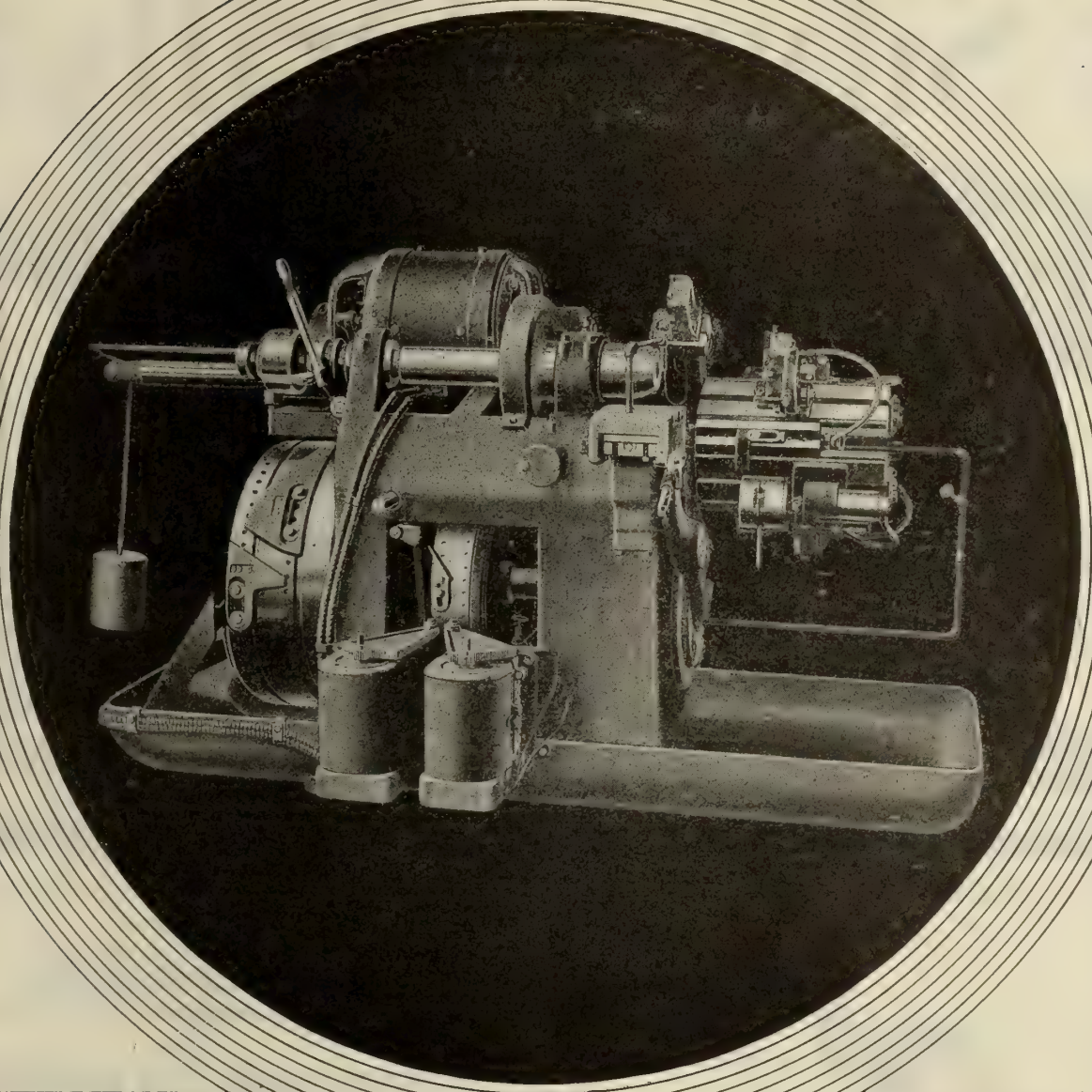




Let's be specific:

A comparison of two different Turret Lathe jobs for accuracy or for output, merely on heresay or opinion has often resulted in a new attitude when the real figures were known.

Gridley Automatic Turret Lathes stand or fall by their specific performance on *your* work in your shop. May we quote you *specifically?*

Capacities 2¼-5".

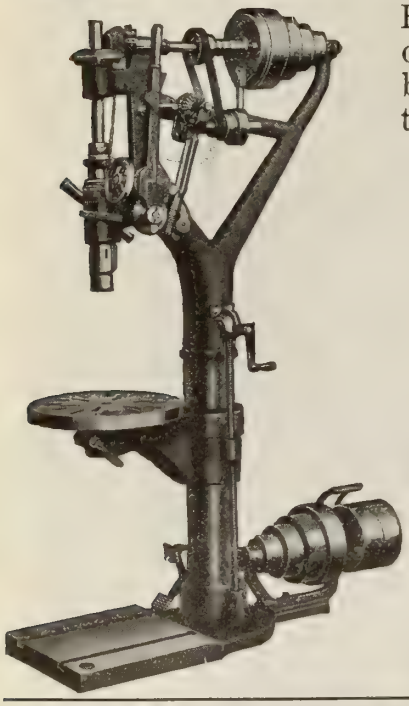
THE NATIONAL ACME COMPANY

AUTOMATIC SCREW MACHINERY AND ITS PRODUCT

CLEVELAND WINDSOR NEW YORK BOSTON CHICAGO DETROIT MONTREAL

Representatives in Principal Foreign Countries

Silver Drills

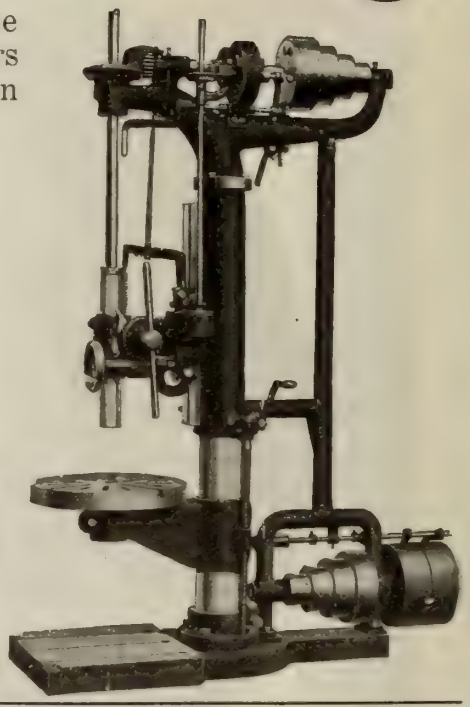


Fast, Strong, Accurate and Dependable drills with an experience of 40 years behind them—they can be depended on to finish the work and do it right.

The 20″ is made in four distinct styles with round or square base and can be furnished singly or in gangs of 2, 3 or 4 spindles.

The 25″ has eight spindle speeds and six positive geared feeds.

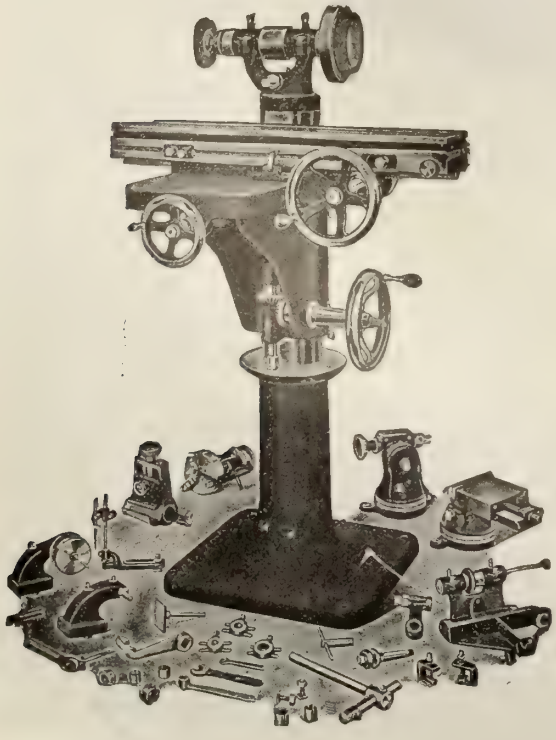
Send for full description and quotations



The Silver Mfg. Co.

290 Broadway

SALEM OHIO



The Greenfield Universal Grinder

For General Tool Room Work

This grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

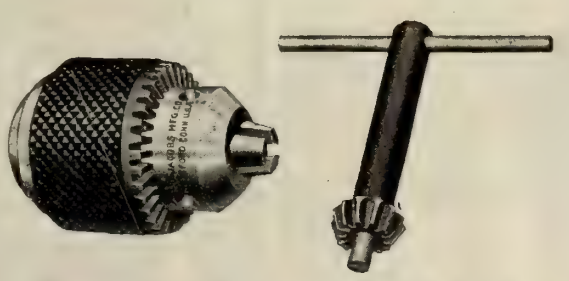
The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,

GREENFIELD, MASS., U.S.A.

Jacobs Chucks

Sixteen years devoted to the unswerving purpose of building service into its products has resulted in a success enabling this Company to be of genuine aid to the manufacturers of America. The leading qualities —efficiency, convenience, accuracy, — which are wrought into the product also characterize the manner of supplying the product.

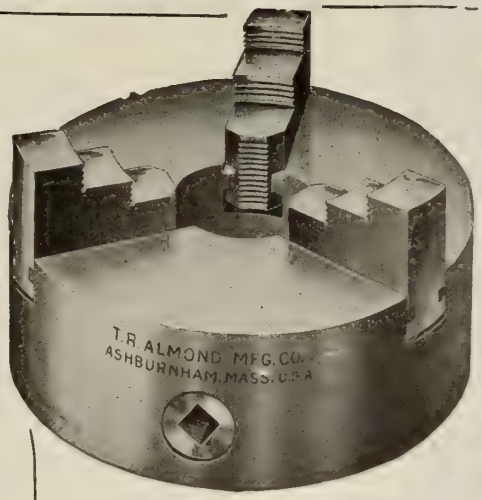


The Jacobs Mfg. Co.

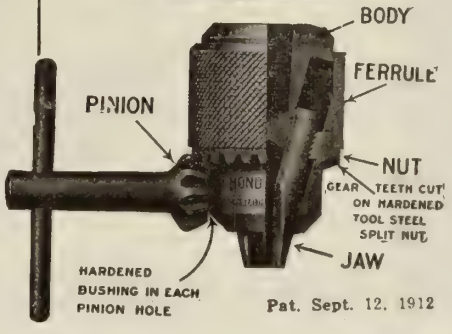
Hartford ~ Connecticut.

ALMOND
CHUCKS & MICROMETERS

Give them a try out. Universal Geared Scroll Chuck—Sizes 5″, 6″, 7½″, 9″ and 12″.



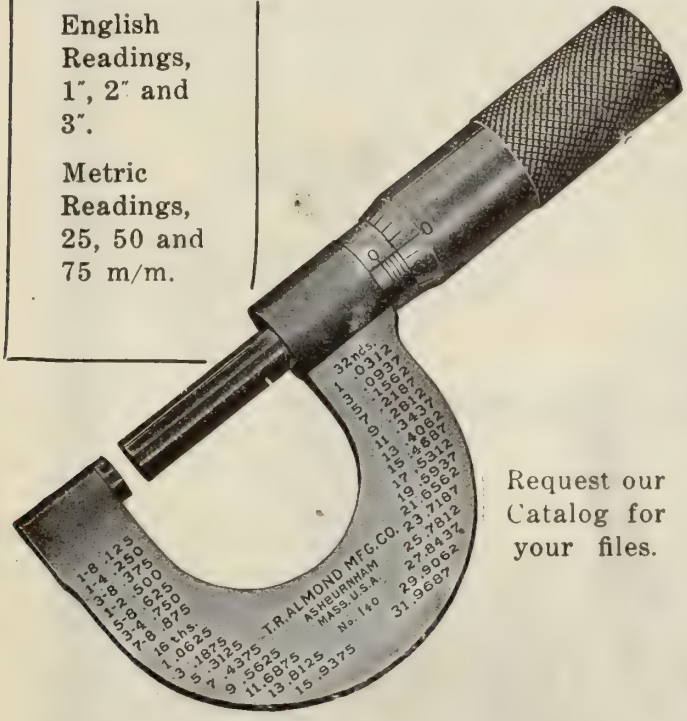
Geared Nut Drill Chucks, in various capacities, 0″ to 1″.



Micrometer Calipers—

English Readings, 1″, 2″ and 3″.

Metric Readings, 25, 50 and 75 m/m.



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T. R. ALMOND MFG. CO.
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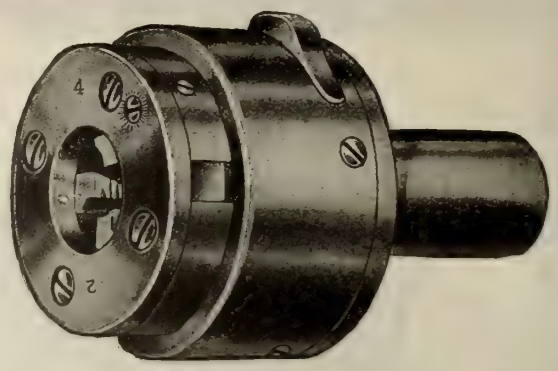


H&G Die Heads

are of small outside diameter compared with the size of work they do.

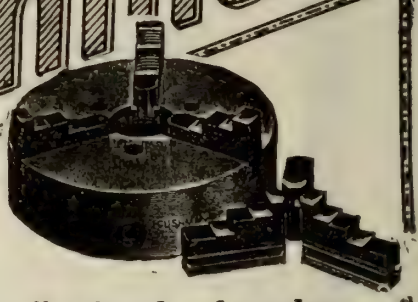
The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16″, 1″, 1¼″ and 1½″.

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

Cushman



The "Cushman" Chuck of to-day is the fruit of nearly sixty years of Chuck building

And right from the start in 1862, they have been known throughout the industry for their high quality Material and Workmanship.

The CUSHMAN Chuck of to-day embodies every up-to-date improvement of a long line of FAMOUS CHUCKS.

Send for our Catalogue showing complete line of Lathe Chucks, Drill Chucks and Portable Face Plate Jaws.

Cushman Chuck, Hartford, Co. Conn

CHUCKS

RAISED!

"Those Chapman Bearings have been such a big saving, Bill, that I guess you are due for a raise for persuading us to put them in."

This was the conversation of one boss to his foreman.

You too will find it to your interest to find out how much Chapmans will save in your plant. Write us stating:

1. **About how many hangers you have,**
2. **Kind of bearings with which they are equipped,**
3. **Horsepower used,**
4. **Kind of power—steam, electric or gas,**
5. **Whether you are or are not carrying an overload, and if so, how much.**

Records taken where plants have changed from babbitted to Chapman Ball Bearings show a 15-40% saving of the total power. They pay for themselves within two years. **In some plants they have saved enough in power, lubrication and attention to pay for themselves in six months.**

Figure out what a saving of 15% would mean in your plant, then sit down now, or tonight at home, and send us the above information. Help yourself by helping your firm.

Send the above information and ask for catalogue 3-B.

CHAPMAN DOUBLE BALL BEARING CO.

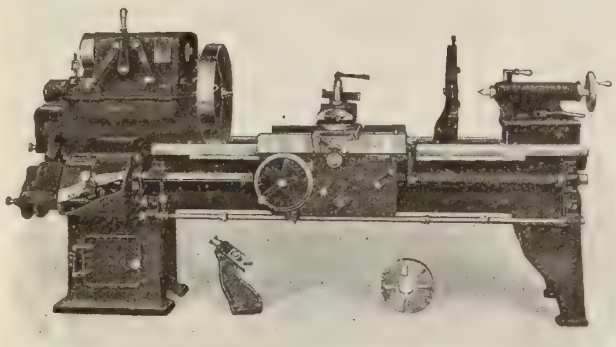
347 Sorauren Ave. TORONTO

BALL BEARINGS Chapman

"YOU PAY FOR THEM WHETHER YOU BUY THEM OR NOT"

Most Powerful Geared Head Made

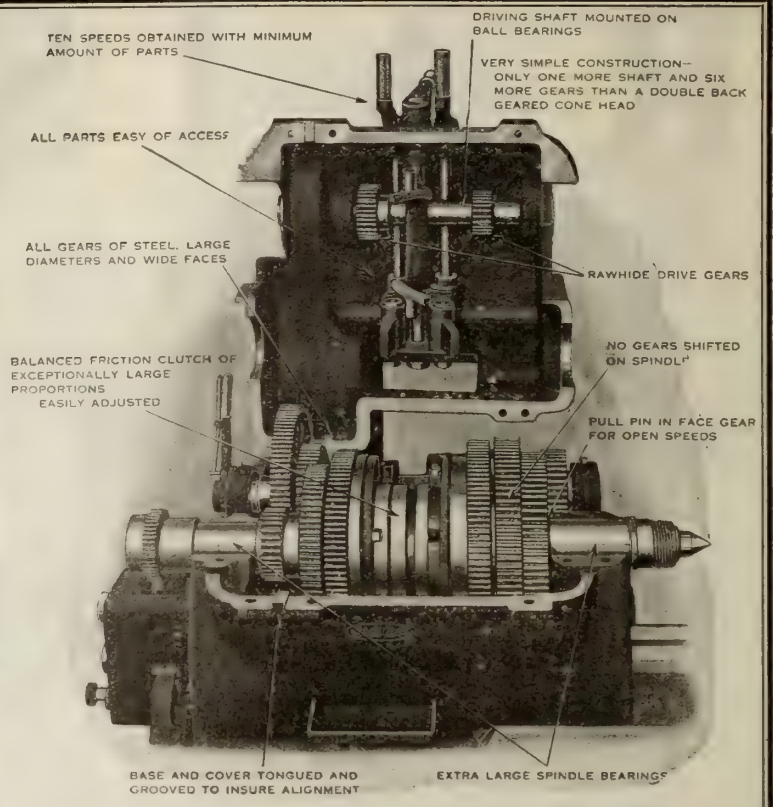
NO OVERHANG, SIMPLE UNIFORM, PROPORTIONATE



CISCO 18" Geared Head Lathe

The Lathe with the Pull
The Lathe of Simplified Accuracy

Made in
14", 16", 18", 20", 24" Engine or Tool Room
Belt or Motor Drive, Plain or Geared Head

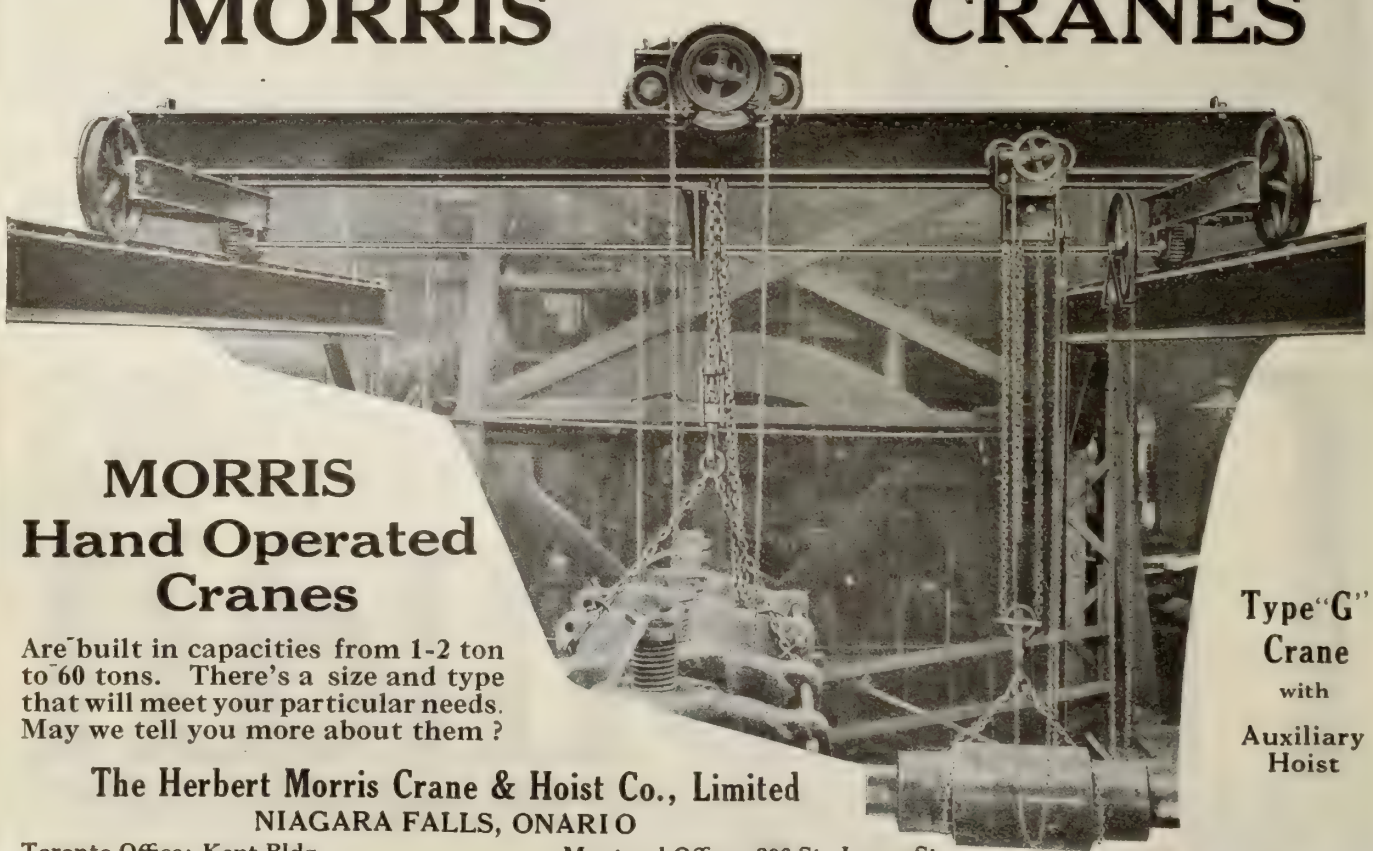


Interior View CISCO Geared Head

The Cisco Machine Tool Company

CINCINNATI, U.S.A.

MORRIS CRANES



MORRIS Hand Operated Cranes

Are built in capacities from 1-2 ton to 60 tons. There's a size and type that will meet your particular needs. May we tell you more about them ?

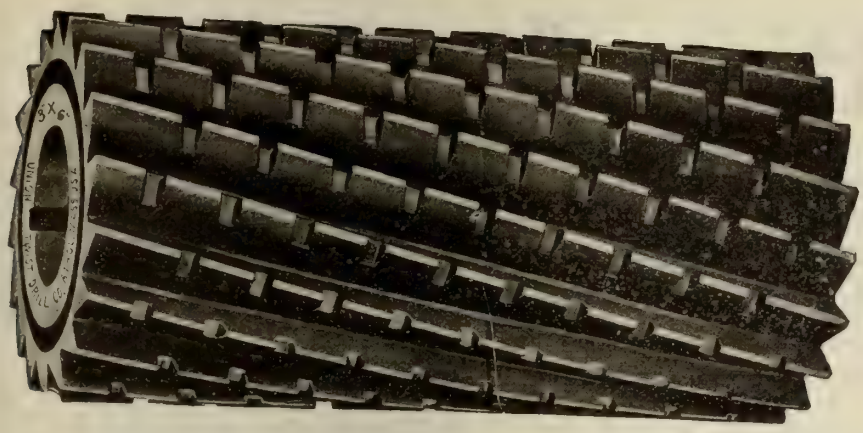
Type "G" Crane with Auxiliary Hoist

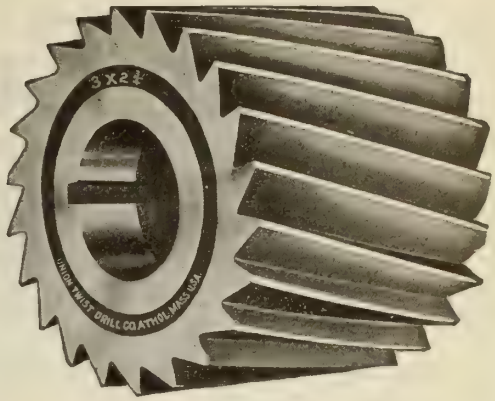
The Herbert Morris Crane & Hoist Co., Limited

NIAGARA FALLS, ONARIO

Toronto Office: Kent Bldg.

Montreal Office; 296 St. James St.





BUTTERFIELD

TWIST DRILLS GEAR AND MILLING CUTTERS

(Carbon and High Speed Steel)

It will pay every manufacturer, who is not acquainted with Butterfield Tools, to measure their quality by the test of long, hard SERVICE.

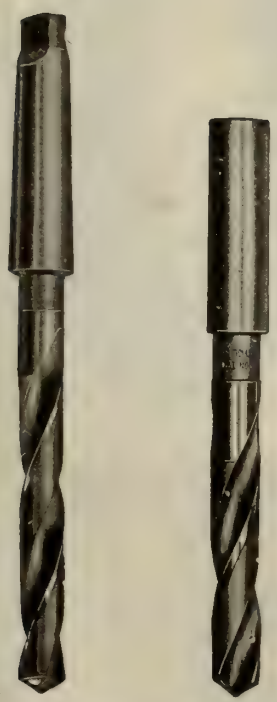
You'll find the Butterfield durability the key to tool economy.

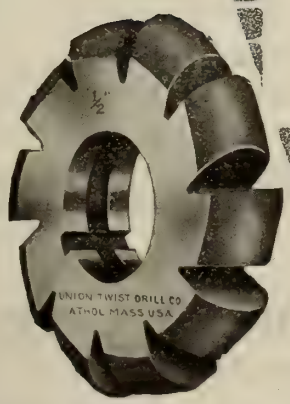
Drop us a line for catalogue.

Butterfield & Company, Inc.

Rock Island, Quebec

Toronto Office :
220 King Street West



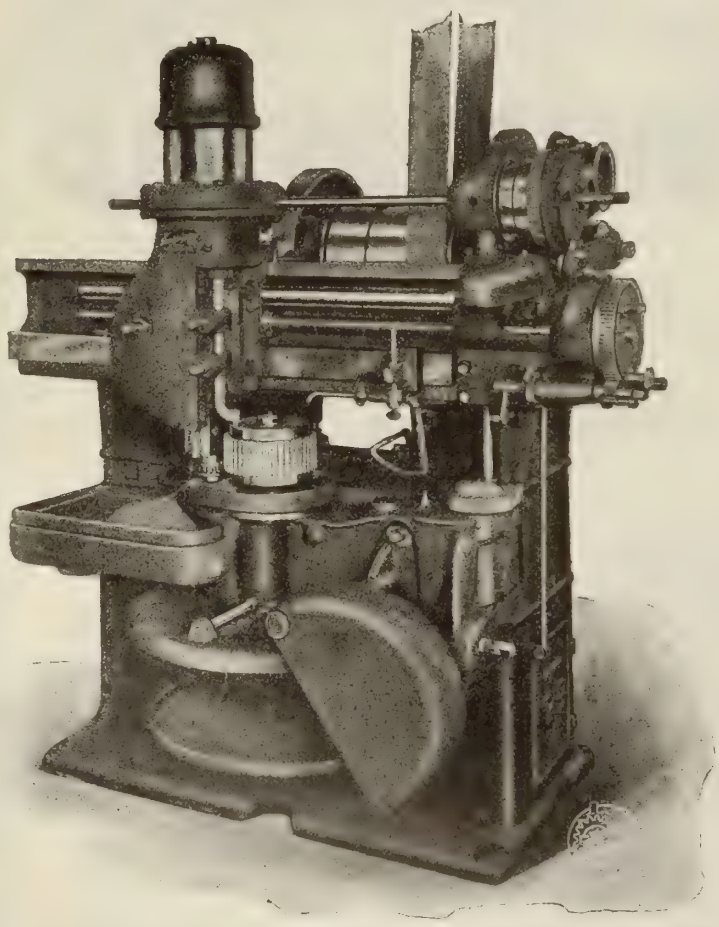


Gear Cutting for Profit

Every business undertaking must in the end stand or fall on its answer to the question "Does it pay?" The gear cutting business is no exception to this rule. The theoretical beauty or mechanical ingenuity of any scheme will not save it. If it is to excell as a business proposition, it must also excell as a profit earner.

Incorporated in the Fellows Gear Shaper are four of the necessary essentials for profitable gear cutting, which we might term: **accuracy, uniformity, output** and **adaptability.**

Accuracy: The Gear Shaper Cutter is an original cutter generated by grinding after hardening. It is not copied from any templet, each cutter being a master tool of great accuracy.



Fellows Spur Gear Shaper, adapted to the cutting of both internal and external gears, as well as being capable of handling a large range of other work.

Uniformity: All Gear Shaper Cutters are alike as far as accuracy is concerned, because all "hand and eye" methods of manufacture are eliminated. The Gear Shaper is so constructed that it uses this accurate cutter to the best possible advantage.

Output: The question of output is inherent in the Gear Shaper process, and is implanted in the design of the machine.

Adaptability: The Gear Shaper will cut external or internal spur gears, shoulder gears, cluster gears, and, in addition, will handle a large range of work that cannot be cut on any other type of gear cutting machine.

The Gear Shaper stands in a class by itself, and excells as a profit earner for large and small users of gears alike. It is just as much at home in the small jobbing shop as it is in the large manufacturing plant, turning out thousands of gears.

Further information regarding the many advantages of this type of machine can be obtained from our general catalogue, "Commercial Gear Cutting," a copy of which we will gladly send to those interested.

FOREIGN AGENTS: Alfred Herbert Ltd., Coventry, England. Societe Anonyme, Alfred Herbert, 47 Boulevard de Magenta, Paris, France. Societa Anonima Italiana, Alfred Herbert, 42 via Cajazzo, Milan, Italy. Alfred Herbert Ltd., 14 Yamashita-cho, Yokohama, Japan. Societe Anonyme, Alfred Herbert, Barcelona, Spain. Societe Anonyme Belge, Alfred Herbert, 36 Rue de Laekin, Brussels, Belgium. A. B. Galco Ltd., Stockholm, Sweden.

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

FRANKLIN DIE-CASTINGS

Machining small parts wastes stock and requires expensive skill.

Die-castings are cheaper, and often better where their use is advisable.

As the originators of die-castings we have probably helped decide, more than any other concern, where die-castings could be used in different and difficult products.

We will help you with any problem you may have.

We are prepared to quote on Die-castings in Aluminum, Lead, Tin and Zinc base alloys.
You may gain knowledge as to die-casting possibilities by sending for our Booklet "C."
A sample part, or a blue print enables us to make report and recommendations to you. Write us.

FRANKLIN MANUFACTURING COMPANY

746 GIFFORD STREET, SYRACUSE, NEW YORK, U.S.A.

Williams' Drop-Forged Clamps

CAST Clamps may cost less, but they are not cheaper—first cost is not the only factor to be considered. No cast clamp can, or does, stand the constant strain of severe usage.

Williams' Clamps are all drop-forged and are then subjected to a refining heat-process which greatly increases their stiffness and strength. They are thoroughly dependable and render superior service under the hardest and most exacting conditions.

Williams' lines of "C" Machinists' and Scrap Clamps provide a wide range of sizes for all clamping service. "There's a Williams' Clamp for every purpose." They are carried by leading dealers and are all fully guaranteed.

A copy of our Machinists' Tools Booklet will be sent on request.

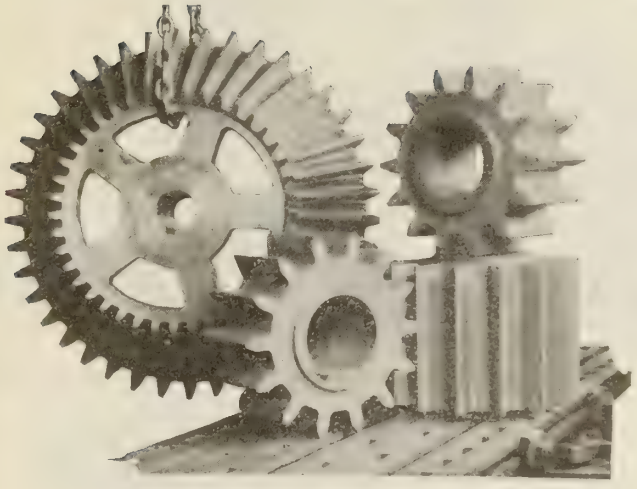
J. H. Williams & Co.

"The Drop-Forging People"

45 Richards Street - - - Brooklyn, New York

The A. G. Low Co., Ltd., 45 Pacific Ave., Saskatoon, Sask., Agents for Manitoba, Saskatchewan, Alberta and British Columbia

Mill Gearing



These Semi-Steel Pinions have tooth thickness 35/100 of circular pitch, to mate with wood mortice tooth gears.

Write to

Hamilton Gear Co., Ltd.

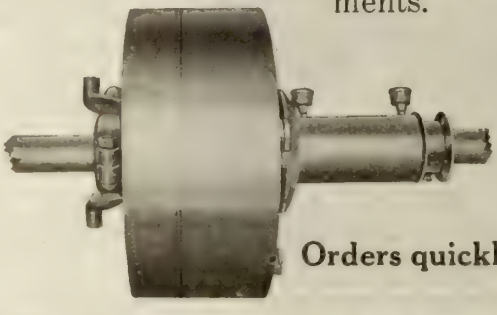
Van Horne St., TORONTO

BERNARD

is the Canadian-made Clutch—reliable, safe and modern.

There Is No Better Friction Clutch

Some cost more **because they are imported.** But, foreign or Canadian-made, no other clutch will give better satisfaction. Let us know your requirements.



Orders quickly filled.

The A. Bernard Industrial Co.

Manufacturers of High Grade Power Transmission Appliances

Office and Works: Fortierville, Quebec, Canada

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VINE STREET PHILADELPHIA, PA.

Spur, Bevel, Spiral, Herringbone and Intermittent

GEARS and PINIONS

Made in all kinds of metals, rawhide and fibre

SOCKET WHEELS
MADE TO ORDER

DISTRIBUTORS OF
DIAMOND CHAINS

For Power Transmission, Machinery and Motor Trucks, Motor-Cycles and Bicycles.

We ship gears to all parts of Canada. Write us when you want good gears, good service, good prices.

Get our Catalogue: "All About Gears."

BEVEL
BEVELS

There's a Famous Five File for Every Kind of Work

And every one is made of high grade steel, and ground and cut for its particular purpose.

Give your men Famous Five Files to work with, and you will get good results.

Also teach them to turn in a file as soon as it becomes dull.

You do not need to be afraid to do this with Famous Five Files, because they will not grow dull quickly.

Specify them when ordering.

They are:

The Scientific Metallic Blasting Abrasive—

ANGULAR GRIT

One ton of ANGULAR GRIT equals carloads of sand. Its angular and irregular cutting points clean raw castings and forgings quicker and better than either sand or shot.

No dust, no sand bins or sand dryers are necessary where ANGULAR GRIT is used.

Trade Mar Reg. U.S. Pat Office

Cuts Sand-Blast Costs

Give ANGULAR GRIT a trial and note the difference between it and shot Globules or sand which you may be using. You'll save much labor and reduce your blasting cost anywhere from 20% to 80%.

Pittsburgh Crushed Steel Co.

Established 1888

PITTSBURGH, PA., U.S.A.

Canadian Representatives:

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Montreal, P.Q.

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Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.

PRESSES and SHEARS
Sheet Metal Working Machinery
THE D. H. STOLL CO., INC.
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Bryant Chucking Grinder Company
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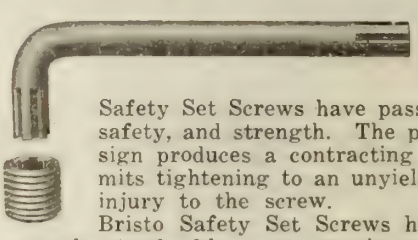
Builders of
Hole, Hole and Face and Deep Hole Grinders

BUILDERS OF MACHINERY
WHAT SET SCREWS DO YOU USE ?



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BRISTO
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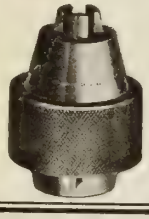
Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.
Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders.
Ask for free samples and Bulletin I-809.
THE BRISTOL CO., Waterbury, Conn.
U. S. A.

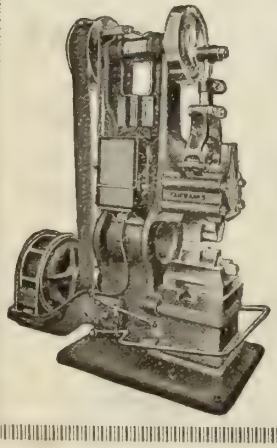
SKINNER
New Model Standard **DRILL CHUCKS** Geared Pattern Positive Drive



In Stock for Immediate Delivery.

The Skinner Chuck Co.
NEW BRITAIN CONN., U.S.A.

STEEL CASTINGS
ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.
PROMPT DELIVERY
Manitoba Steel Foundries, Ltd.
1204 McArthur Building
Winnipeg - - - Manitoba



Fairbanks Hammers
25 to 300 lbs.
Belt or Motor Drive
These Hammers Embody a Design and Workmanship that are unsurpassed.
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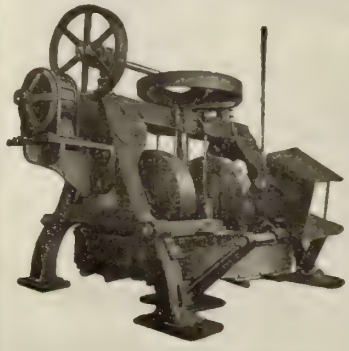
UNITED HAMMER CO.
Oliver Building Boston, Mass.

Canadian Steel Foundries Need Frost Improved Sand Mills



WINNING FEATURES
Heavy Mullers
Unloading Device
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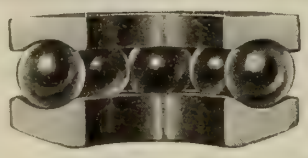

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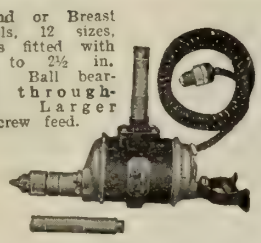

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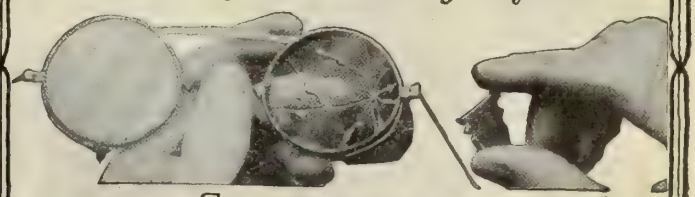

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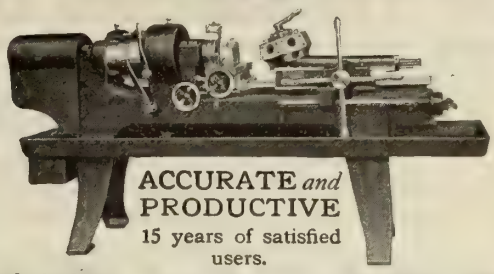
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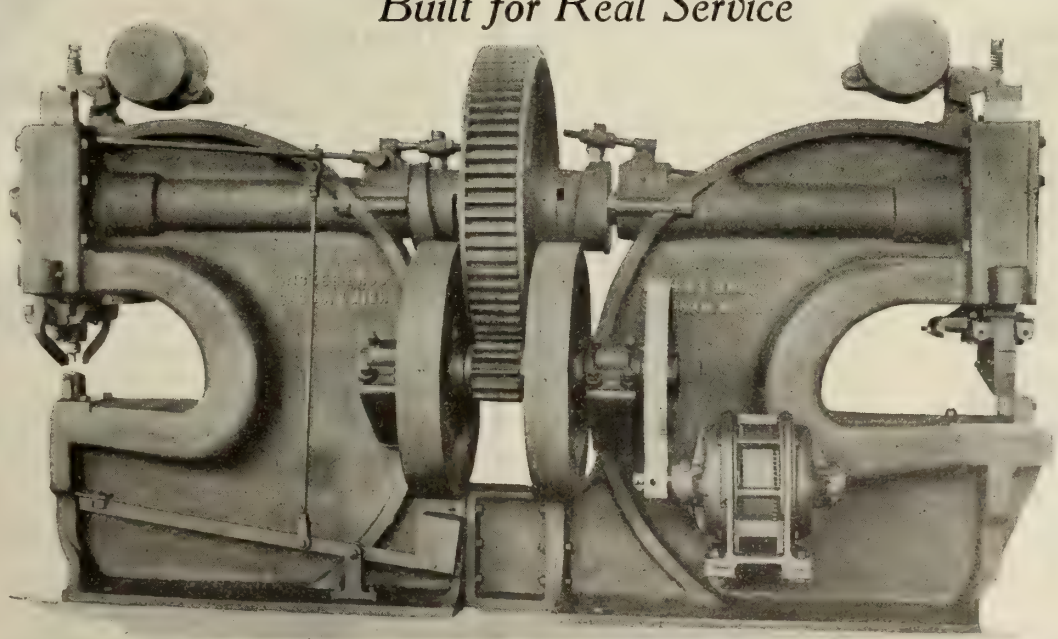
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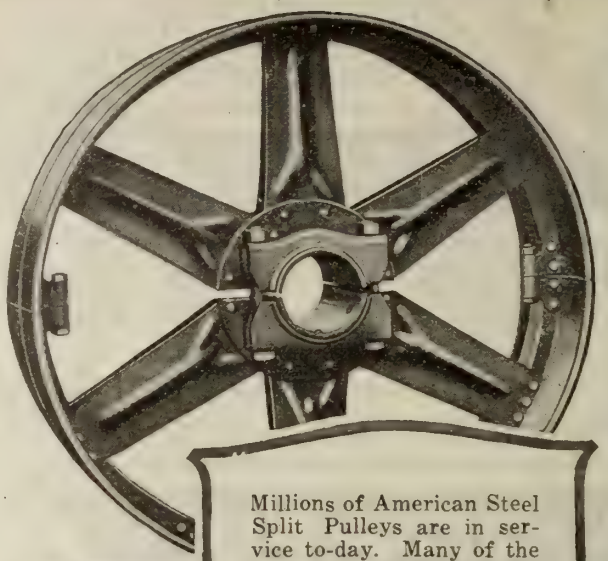

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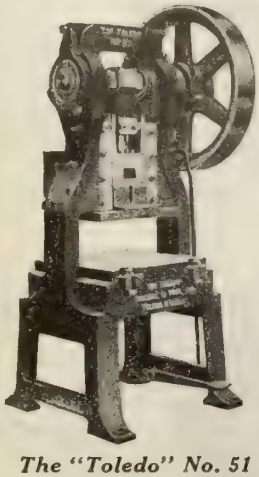

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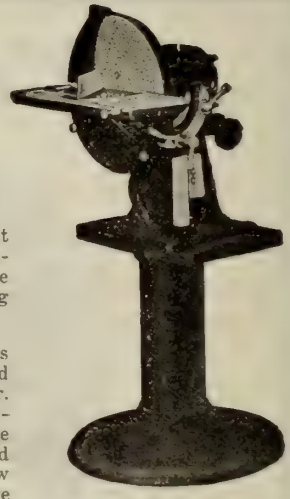

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Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Fellows Bros., Ltd., Chadley Heath, Eng.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Fellows Bros., Ltd., Chadley Heath, Eng.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BOOM, TIMBER
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FORGED
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

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Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

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Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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Bowser & Co., Inc., Fort Wayne, Ind.
Williams & Co., J. H., Brooklyn, N.Y.

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Oakley Chemical Co., New York.

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The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positivte Clutch & Pulley Wks., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Bond Engineering Works, Toronto, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
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Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

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Canada Metal Co., Toronto, Ont.

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Lynd-Farquhar Co., Boston, Mass.

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Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal. Que.
Williams & Wilson, Ltd., Montreal, Que

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Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

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Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
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MacGovern & Co., Montreal, Que.

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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Whitman & Barnes Mfg. Co., Akron, O.

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Almond Mfg. Co., Ashburnham, Mass.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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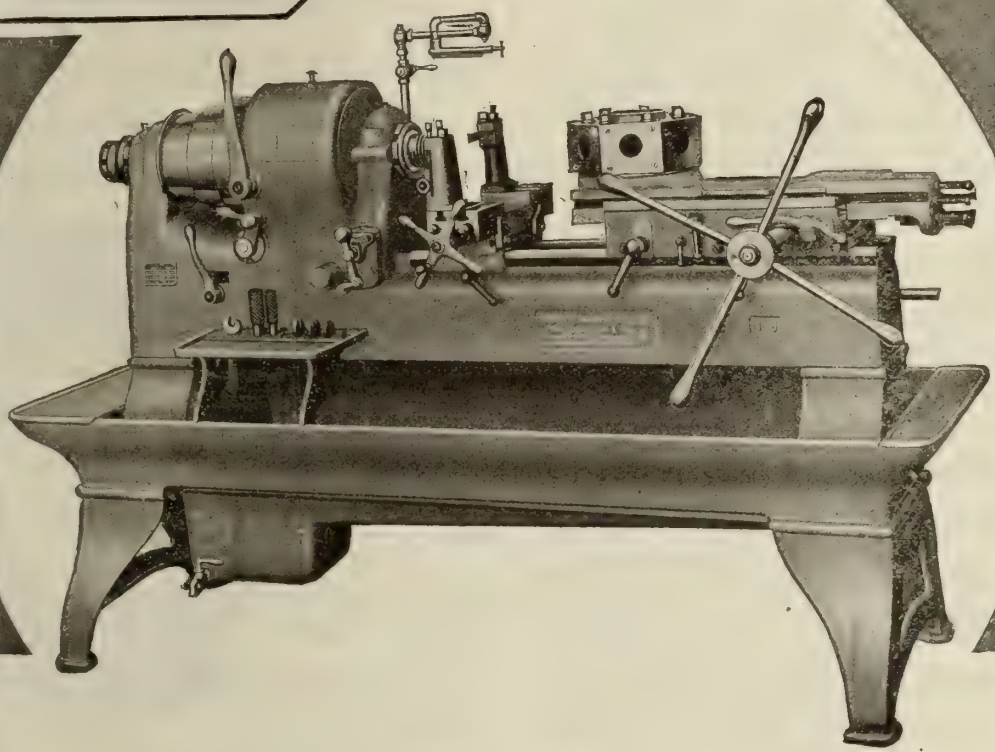
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

Brown & Sharpe
Plain
Screw Machines



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THE No. 6 Plain Screw Machine is one of the most popular machines in the modern shop. It is readily adaptable to the working of cast iron, machine steel or metals of this character.

The rugged design and wide range makes it suitable to a wide variety of work. The convenient location of all operating levers combined with independent feeds and speeds make it a primary support in keeping up production.

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Catalog 21-G features the big points.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
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MacKinnon Steel Co., Sherbrooke, Que.

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Northern Crane Works, Walkerville.

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Canada Found'g & Forgings Ltd., Welland
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Northern Crane Works, Walkerville.
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CUTTER HEADS
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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
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Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Pickert-Shafer Co., Erie, Pa.
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Stoll Co., Inc., D. H., Buffalo, N.Y.
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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Wells Bros. of Canada, Galt, Ont.

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Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
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Pratt & Whitney Co., Dundas, Ont.

DRAWING
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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
Blomquist-Eck Mach. Co., Cleveland, O.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Fry's (London), Ltd., London, Eng.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lund-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

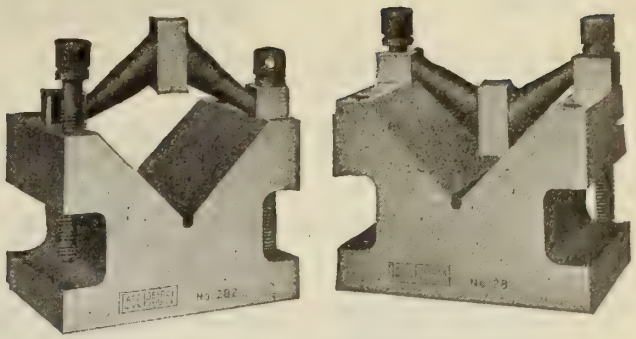
DRILLS, OIL TUBE
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

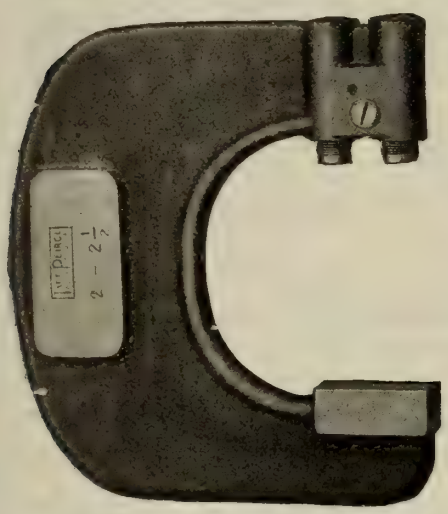
DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.

Standardized Tool-Room Equipment



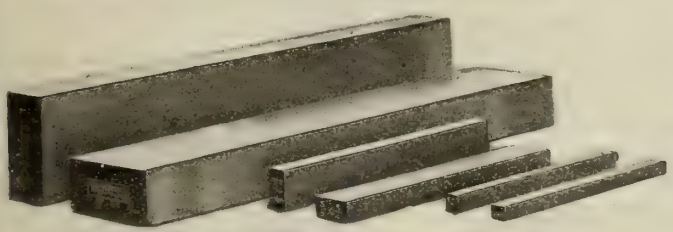
V Blocks—Style 130 –Assembled with Clamps

No modern shop can afford to give valuable time to the production of the miscellaneous tool-room equipment now required for testing and working purposes. Besides diverting real production time, it results in a varied assortment of tools, the duplication of which in the ordinary shop would entail great inconvenience and loss of time.



Adjustable Gage—Style 32

Limit Plug Gage—Style 10



Steel Parallels—Style 150

The Taft-Peirce standardized line of shop and tool-room equipment represents the latest and best design and the highest degree of accuracy. Specials are made to order and duplicate of standard pieces can be promptly shipped. We offer you a service that will put your shop efficiency on a higher plane of excellence than ever before.

Bulletin No. 104-E describes the complete line.

2074

TAFT-PEIRCE

Woonsocket, R.I., U.S.A.

New York: Woolworth Building

Detroit: Majestic Building

Williams & Wilson, Ltd., Montreal and Quebec

Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK

Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK

Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN

See Belting, Chain.

DRIVING TOOLS

The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM

Bowser & Co., Inc., Fort Wayne, Ind.

DRYERS, SAND

Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES

Baird Machine Co., Bridgeport, Conn.

DRUM CONTROLS

Elec. Steel & Metals, Ltd., Welland, Ont.

DUMP CARS

Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER. ARRESTER SYSTEM

Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT

Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS

Can. Blower & Forge Co., Kitchener, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES

Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES

Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACE

Electric Steel & Metals, Ltd., Welland.
General Steel Co., Milwaukee, Wis.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.

Can. Driver-Harris Co., Walkerville, Ont.

ELEVATOR, ENCLOSURES

Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS

Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS

Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY

Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES

Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS

Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS

Wheel Trueing Tool Co., Windsor, Ont.

END MILLS

John Morrow Screw & Nut Co., Ingersoll

ENGINES, STEAM, GAS, GASOLINE

Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL

Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE

Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS

Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS

Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS

Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS

Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRACTORS, TAP

Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS

Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS

Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES

Page Steel & Wire Co., Adrian, Mich.

FANS

Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE

Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY

Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES

Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL

Bowser & Co., S. F., Fort Wayne, Ind.
Can. Wire & Iron Goods, Hamilton, Ont.

FIRST AID CABINETS

Strong, Kennard & Nutt Co., Cleveland.

FIRE BRICKS

Harbison-Walker Refractories Co., of Canada, Montreal, Que.

FIRE EXTINGUISHERS

Strong, Kennard & Nutt Co., Cleveland, O.

FIXTURES

Brown Engineering Corp., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLEXIBLE SHAFT COILING MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

FLAT SPRINGS

The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS

Wickes Bros., Saginaw, Mich.

FORGES, HAND PORTABLE

Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON

Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING

Victoria Foundry Co., Ottawa.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL

Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING

H. Hope & Sons of Can., Ltd., Peterboro.

FOUNTAINS, DRINKING

Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS

Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING

Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS

Bowser & Co., S. F., Inc., Fort Wayne.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING

Bellevue Furnace Co., Detroit, Mich.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST

Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING

Gilbert & Barker Mfg. Co., Springfield.
Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, HIGH SPEED STEEL,

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

Standard Fuel Engr. Co., Detroit, Mich.

FUSE BOXES, STEEL

Dom. Forge & Stamp. Co., Walkerville.

GANG PLANER TOOLS

Armstrong Bros. Tool Co., Chicago.

GASKETS, LEATHER, ETC.

Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

Bowser & Co., S. F., Inc., Fort Wayne.

GAUGES

Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS

Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT

Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD

Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, THREAD

Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE

Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL

C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS

Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST

Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS

Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY

Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE

Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL

Bridgeford Mach. Tool Wks, Rochester.

GEAR BOXES, REDUCTION

Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN

Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM

Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glasco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE

Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto
Jones & Glasco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR

Fellows Gear & Shaper Co., Springfield, V.

GEARS, SPRING

Morse Chain Co., Ithaca, New York.

GEARS, SILENT CHAIN GENERATORS, STEAM TURBO

Can. General Electric Co., Toronto, Ont.

GENERATORS AND CONVERTORS

Can. General Electric Co., Toronto, Ont.

GENERATORS, MOTOR

A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

GERMAN SILVER

Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.

Strong, Kennard & Nutt Co., Cleveland.

GLUE HEATERS

Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY

Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GOVERNOR, WATER WHEEL

Wilson & Co., J. C., Belleville, Ont.

GRAPHITE

Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES

Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal.

GRAVITY CARRIERS

Can. Link-Belt Co., Toronto, Ont.
Jones & Glasco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS

Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE

W. H. Banfield & Son, Toronto.
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH

Wisconsin Electric Co., Inc., Racine, Wis.
Blake & Johnson Co., Waterbury, Conn.
Can. Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal.

GRINDERS, CUTTER

Brown & Sharpe Mfg. Co., Providence, R.I
Cincinnati Milling Mach. Co., Cincinnati.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garvin Machine Co., New York.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.

Thor

CHIPPING HAMMERS

Drilling in concrete with a size D hammer with a hexagon nozzle. Will drill a hole one inch in diameter, at the rate of one inch per minute.

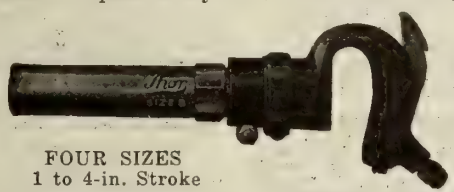
Thor Predominates wherever chippers are used because:

1st. The main valve is large in size and durable, being of the balanced type and having a bearing surface of three square inches.

2nd. Two square inches of the bearing surface retain the lubrication constantly, as no air passes over to blow the oil off.

3rd. The handle is equipped with a self-seating throttle valve, which eliminates all leaks.

4th. The barrel and all working parts are hardened and ground and the hammer is practically free from vibration.



FOUR SIZES
1 to 4-in. Stroke

Riveting Base Plates with size B hammer. Let our service engineer call at your plant and explain the various uses to which these hammers can be adapted, and how to obtain the best results on your particular work.

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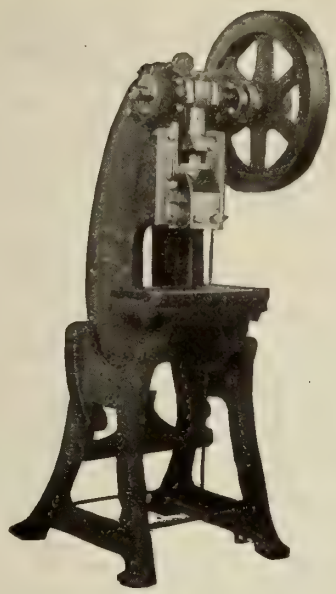

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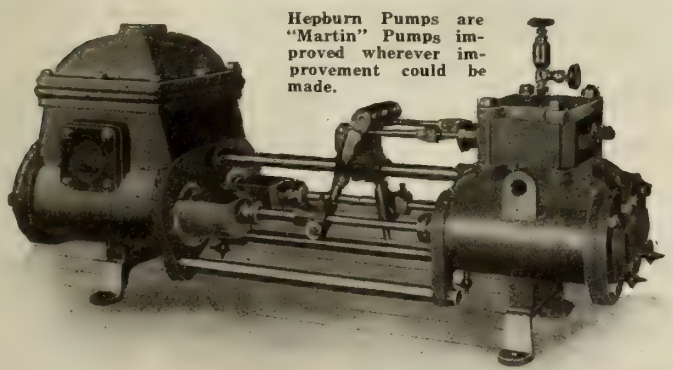

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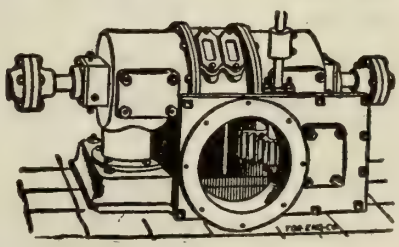

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Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Can. General Electric Co., Toronto.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co., Toronto.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,
Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL
Brown's Copper & Brass Roller Mills, New Toronto, Ont.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Baker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
See Steel.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OPENING DIE HEADS
Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, M.
Perrin, Ltd., William, Toronto.

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland.
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES
See Lathes.

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Wilson & Co., J. C., Belleville, Ont.
Greenleafs, Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
Canada Wire & Iron Goods Co., Hamilton

PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER
Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph.

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.

Electric Furnaces and Equipment

THURY REGULATORS, NEW TYPE

ELECTRODE WINCHES

ELECTRODE HOLDERS

MAGNETIC BREAKS

ROOF COOLER RINGS

HAND CONTROLS

BUSS BARS SYSTEMS

ELECTRIC FURNACES

FOR SMELTING FERRO ALLOYS AND REFINING STEEL

PORTABLE ELECTRIC HOISTS,

MONO RAIL HOISTS,

GENERAL CONSULTING

VOLTA MANUFACTURING CO.

WELLAND, ONTARIO

Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS AND DIES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON RODS, ROUGH TURNED
General Steel Co., Milwaukee, Wis.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Williams & Wilson, Ltd., Montreal, Que.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert. Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Williams & Wilson, Ltd., Montreal, Que.

PRESSED STEEL PARTS
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlass Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Banfield & Son, W. H., Toronto.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Standard Machy. & Supplies, Montreal.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Standard Mach. & Supplies, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL
Bowser & Co., Inc., Toronto, Ont.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, RUBBER CEMENT
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, KEROSENE, OIL, SELF MEASURING
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H., Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Standard Mach. & Supplies, Montreal.
Wells Bros. of Can., Galt, Ont
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
H. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, HAND
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS PIN
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
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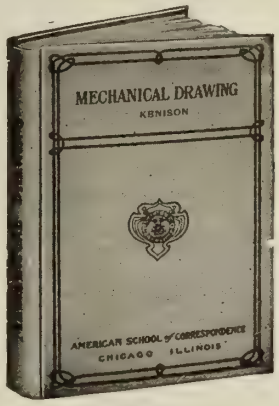

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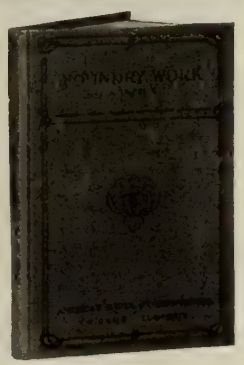

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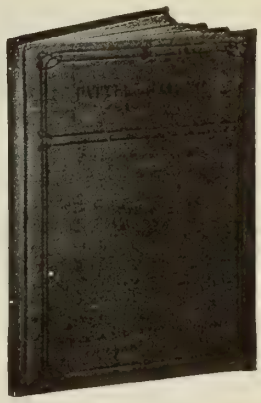

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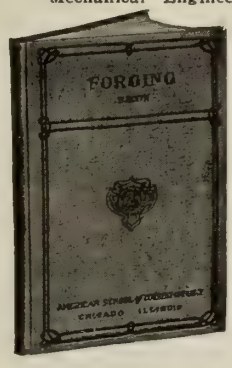

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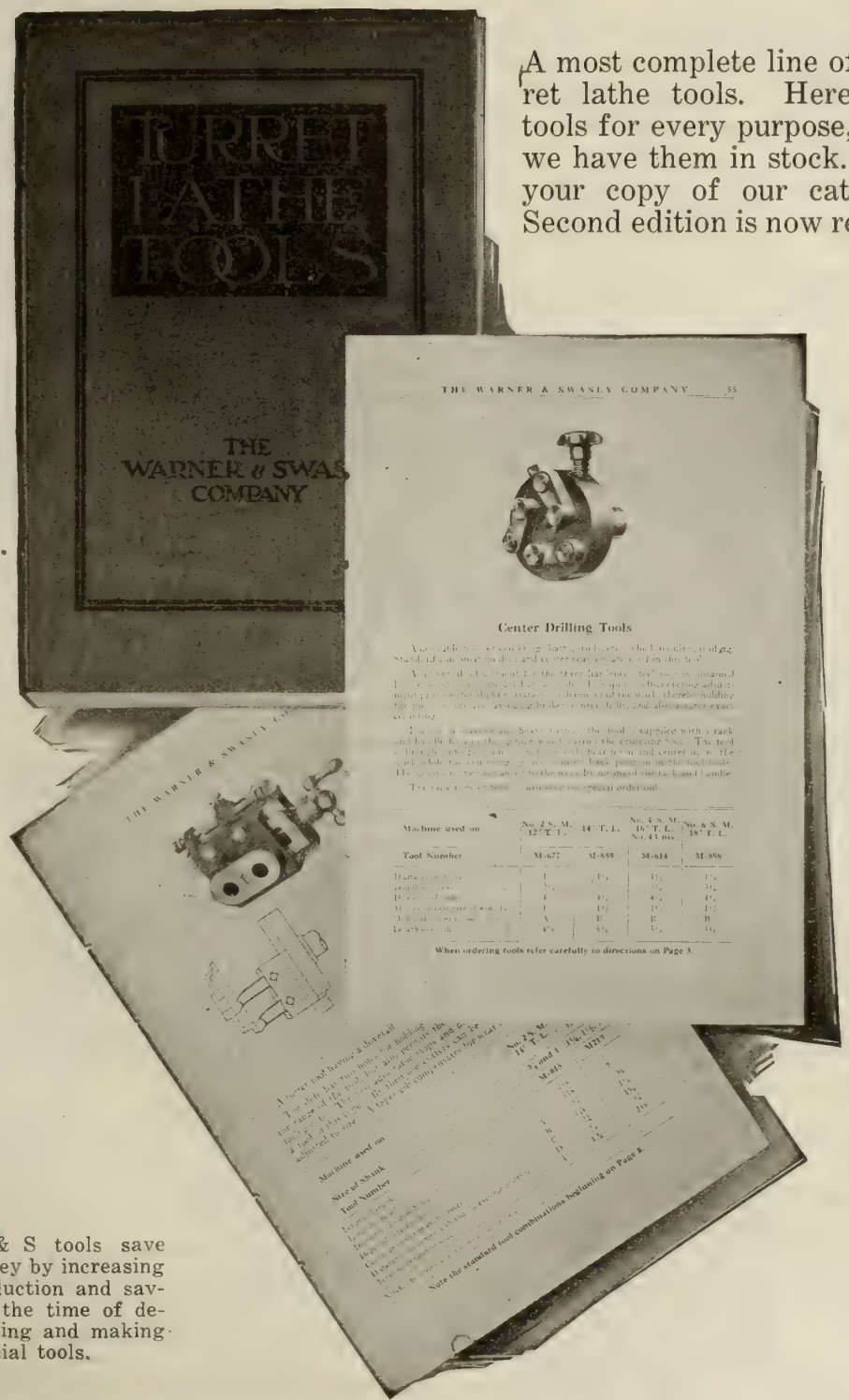

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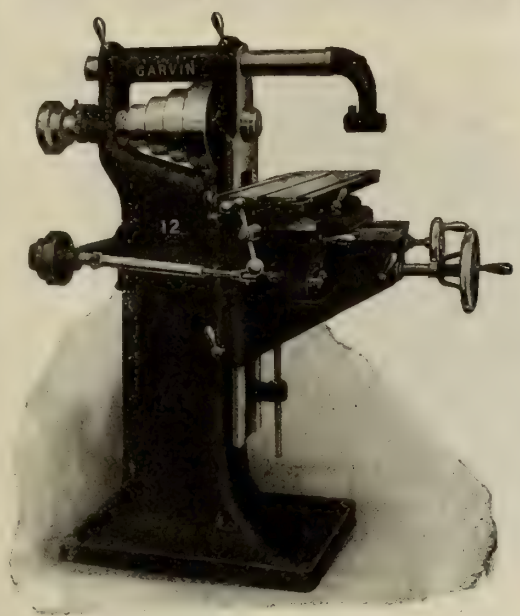

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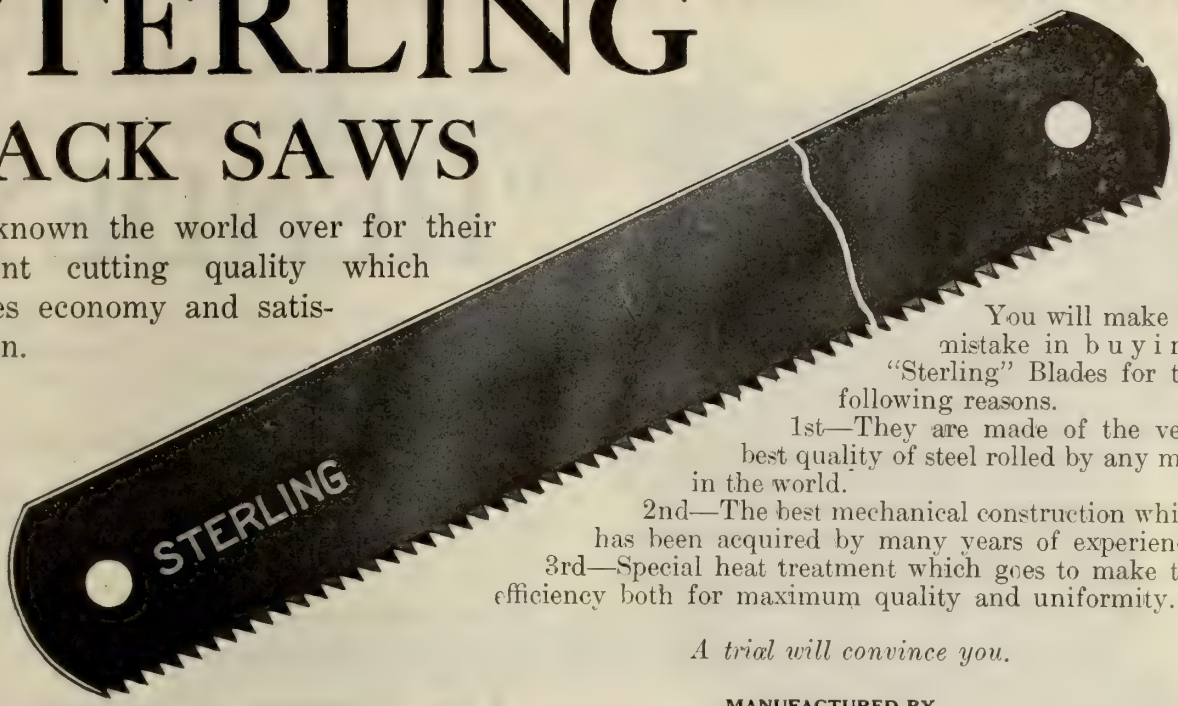

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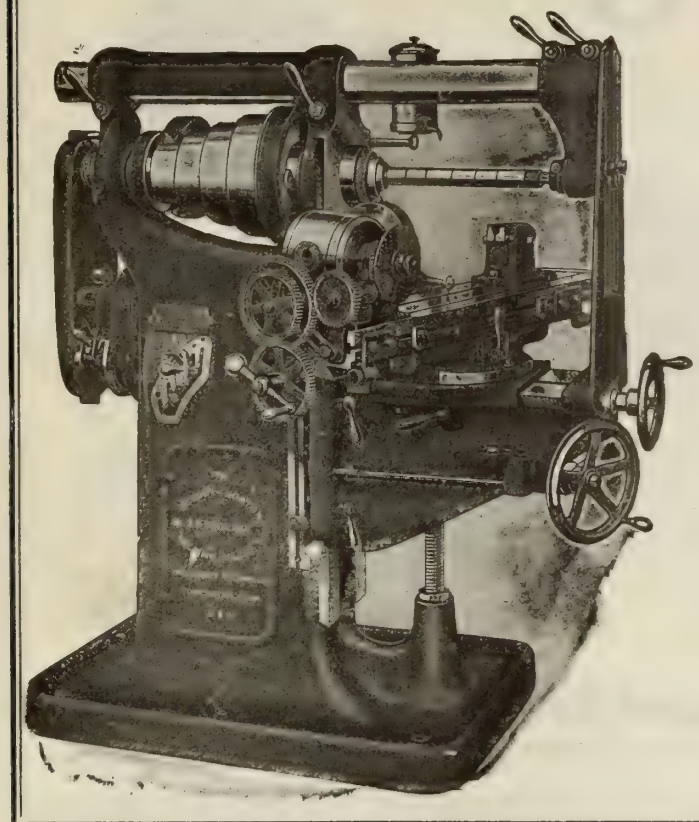

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Hack Saw Blades

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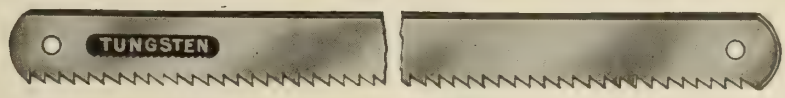

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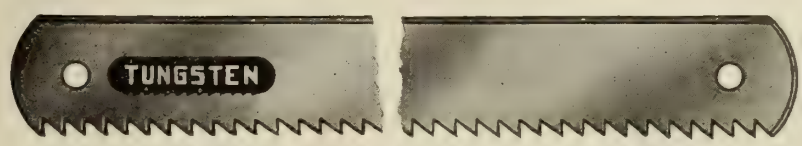

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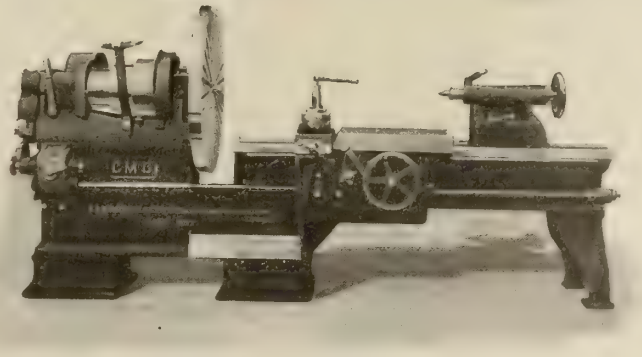

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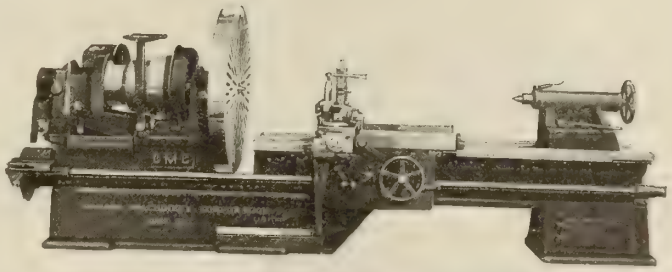

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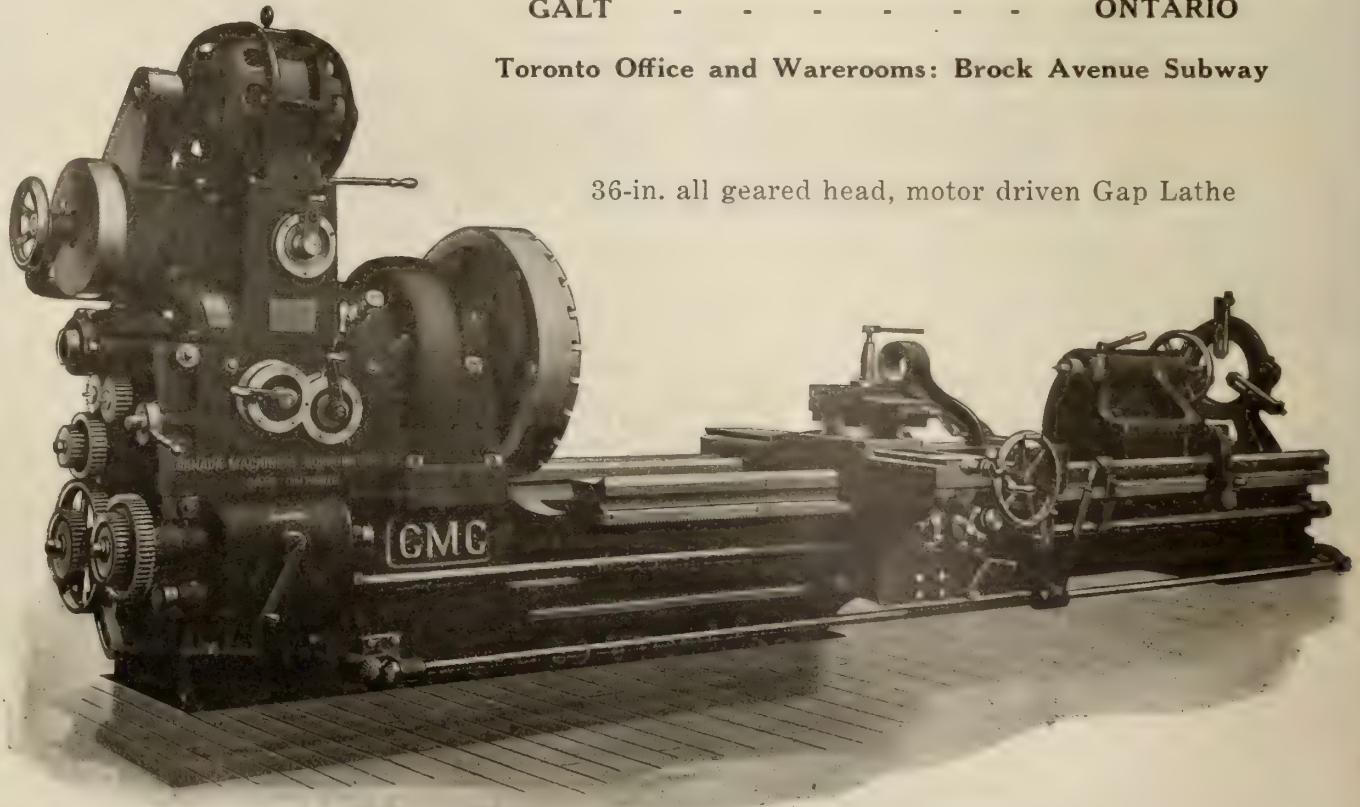

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
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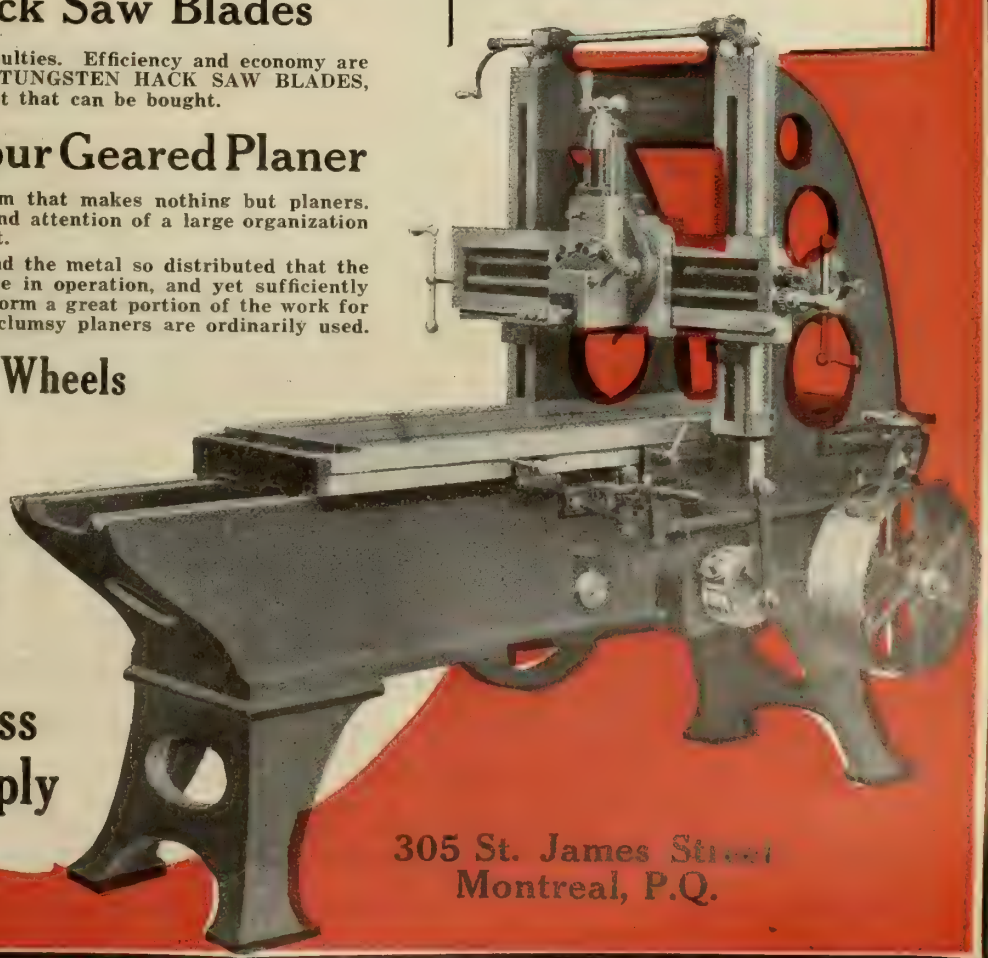

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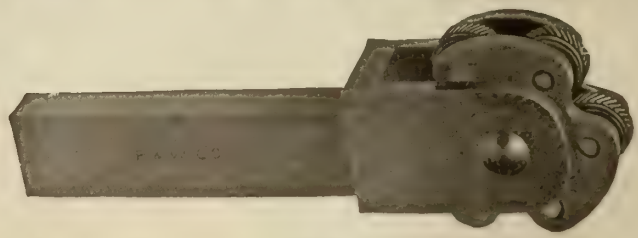
P. & W. Combination Lathe Knurling Tools



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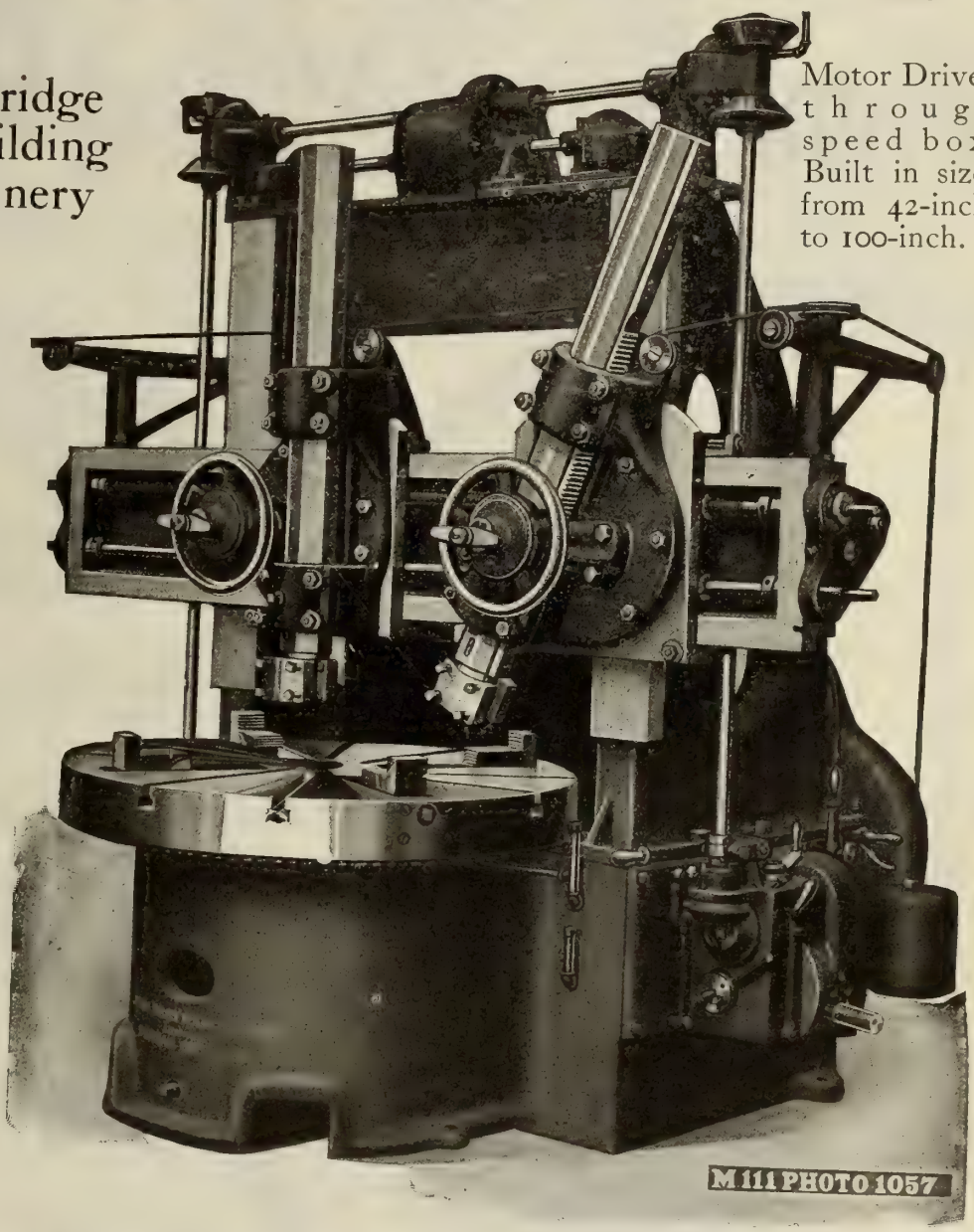

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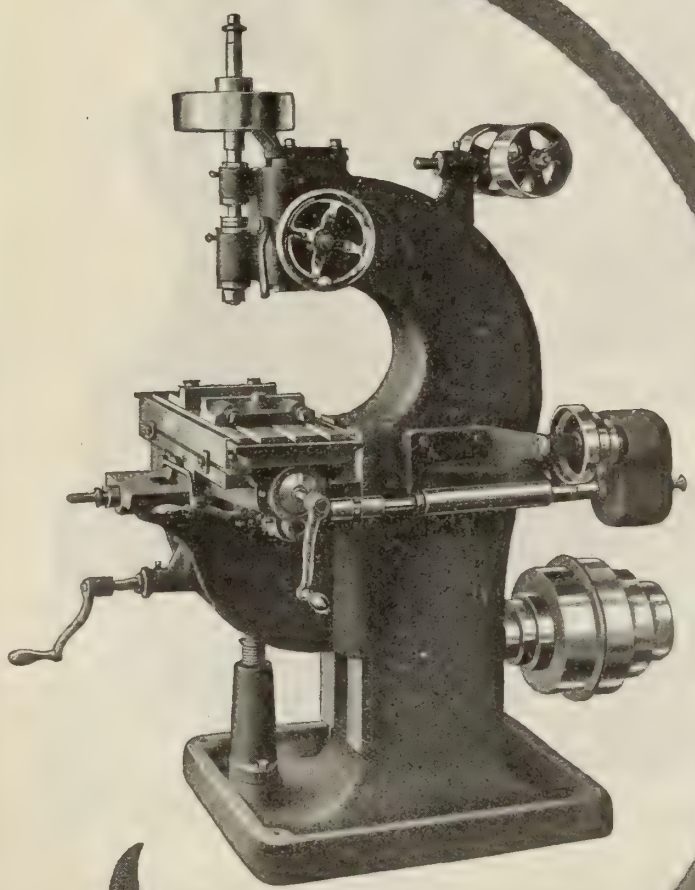
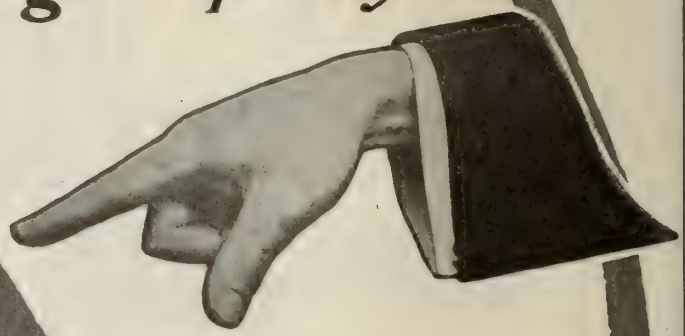
BRISTOL

Bristol Vertical Milling Machine

A Tool of Large Capacity





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SUCCESSORS TO C. G. GARRIGUS MACH. CO.
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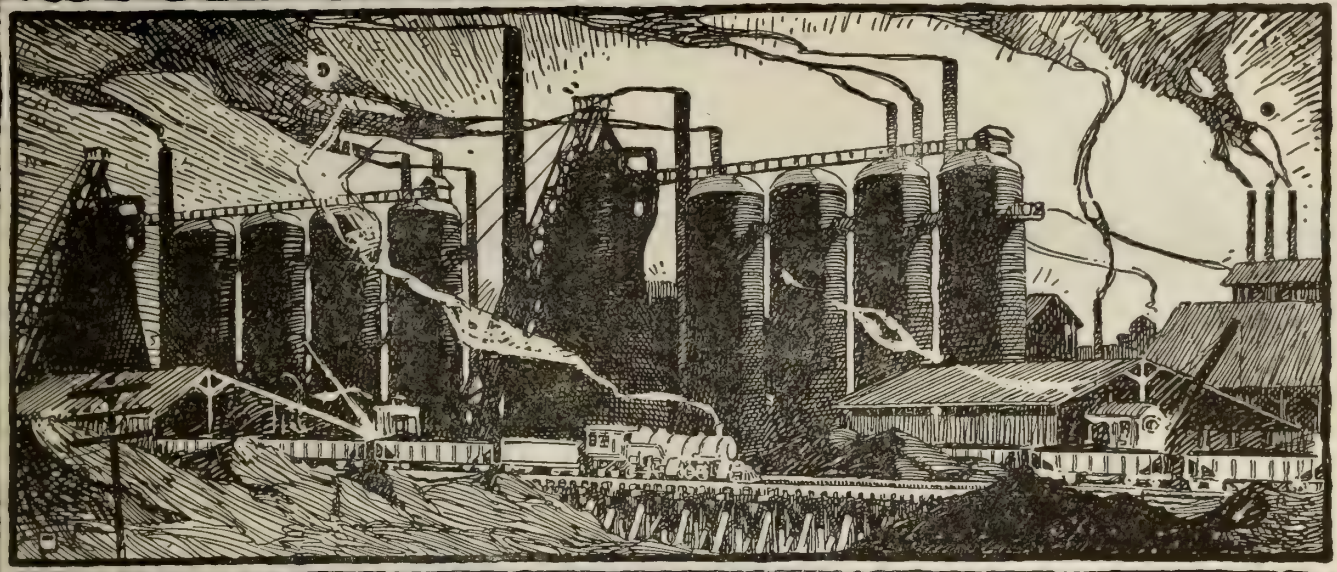

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Webster's definition of "Service" is; "The performance of labor for the benefit of another."

We use these words advisedly—fully understanding their definitions—and realizing the obligation we place upon ourselves by their continued use in connection with our products of Iron and Steel, and our attitude to the people we serve.

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ANGLES—Unequal Leg—
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5 x 3½″—5 x 3″—4½ x 3″
4 x 3½″—4 x 3″—3½ x 3″
3½ x 2½″—3 x 2½″—3 x 2″
2½ x 2″

BEAMS—
15″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

CHANNELS—
15″, 13″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜″
3⅜ x 5⅛ x 3¾ x 7/16″
3 1/16 x 4 x 3 1/16 x ¼″
3⅛ x 4 1/16 x 3⅛ x 5/16″
3 3/16 x 4⅛ x 3 3/16 x ⅜″
2 11/16 x 3 x 2 11/16 x ¼″
2¾ x 3 1/16 x 2¾ x 5/16″

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All sizes from ½″ up to and including 4″.

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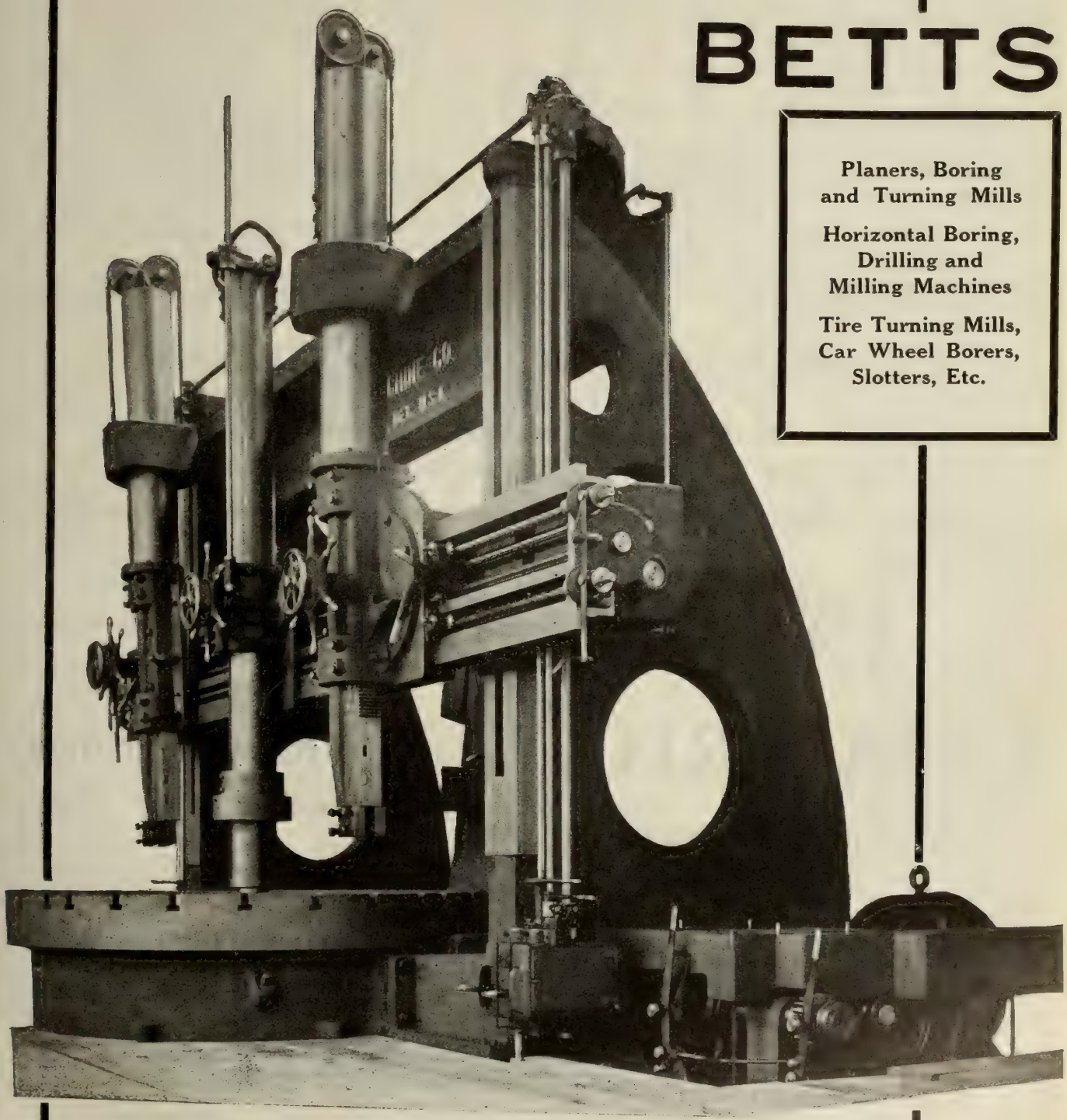

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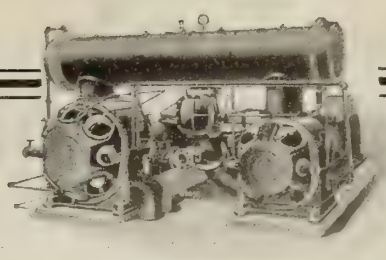

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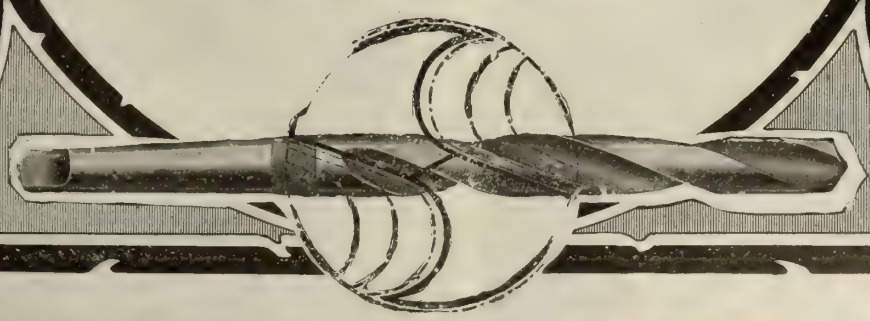

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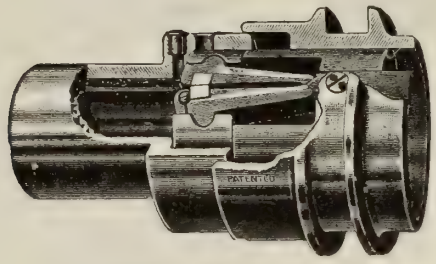
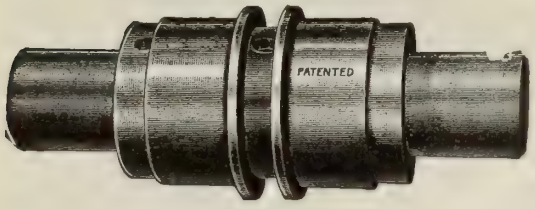


Single Cluuch—Interior—Clutch Disengaged



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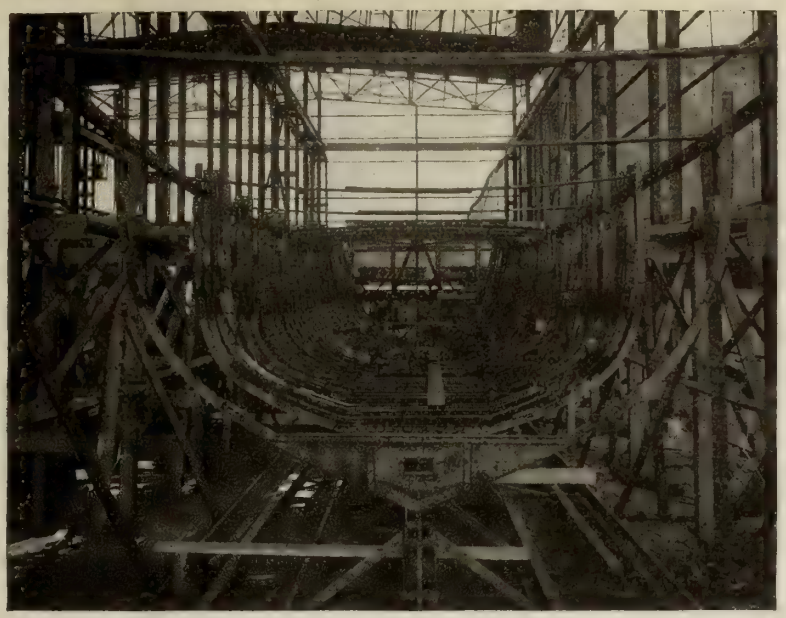

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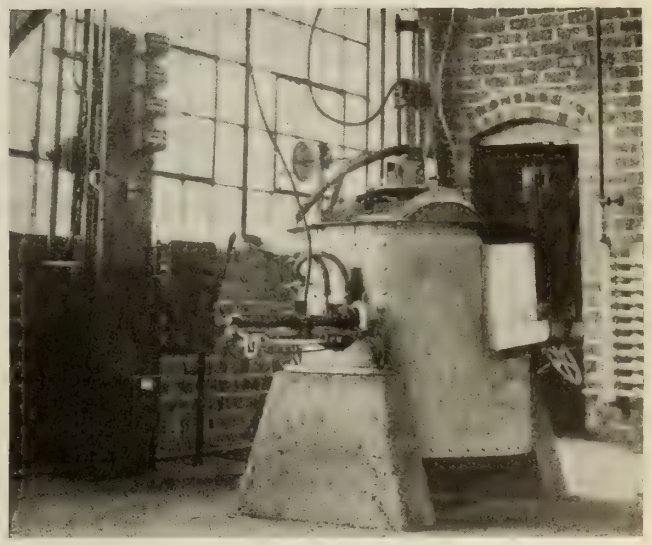

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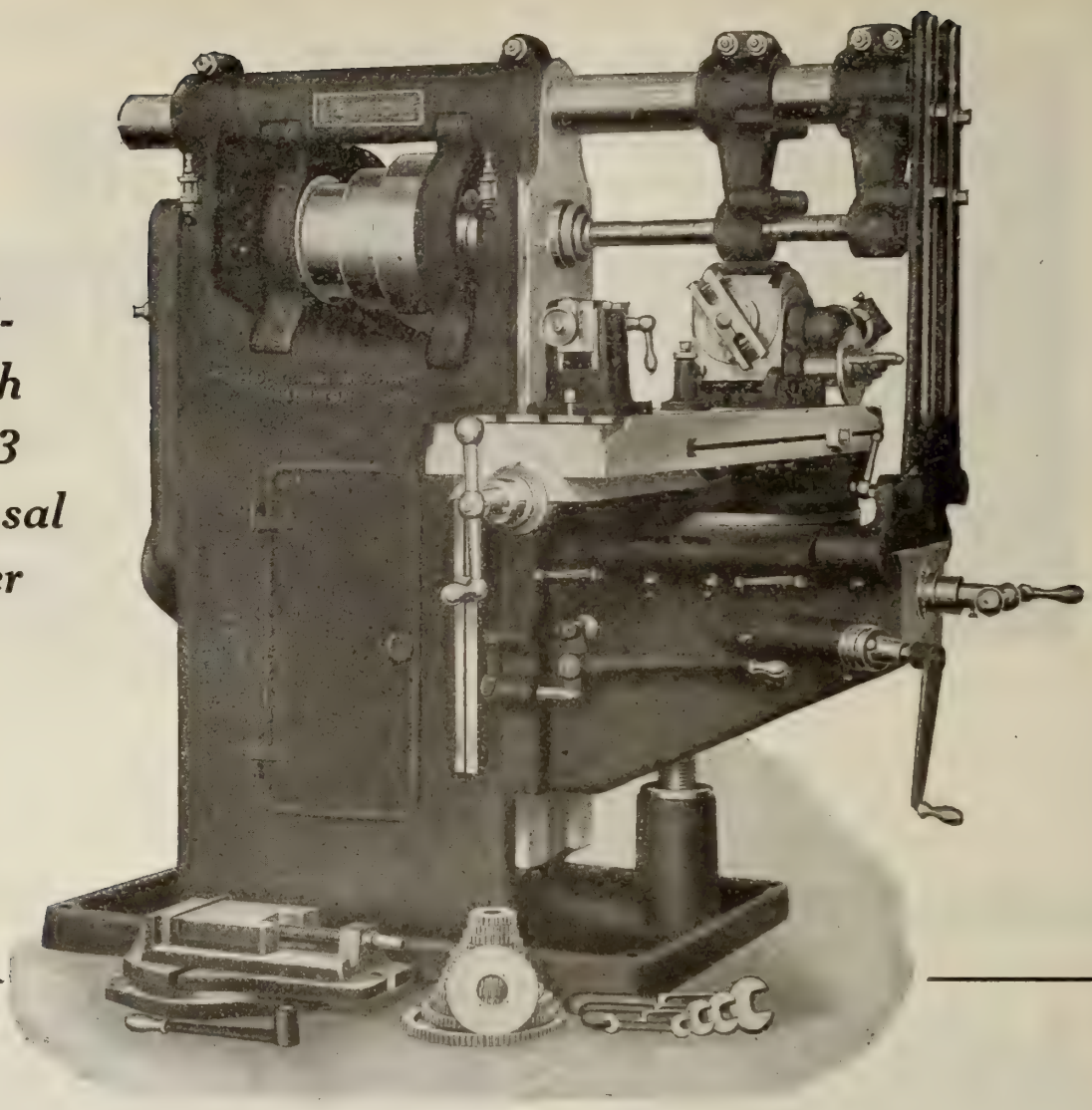

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We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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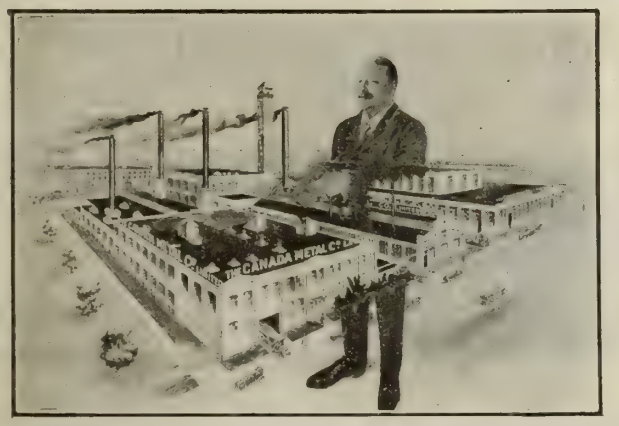
Steel Ingots
by the
HARMET
Liquid Process



IMPERIAL GENUINE BEARING METAL
For High Speed, Heavy Engine Bearings

HARRIS HEAVY PRESSURE
For General Machine Bearings.

ALUMINOID BEARING METAL
For Light Countershaft Work.

THE CANADA METAL COMPANY LIMITED
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TRADE K–T MARK

FOUNDRY
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A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. **We can advise you** and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

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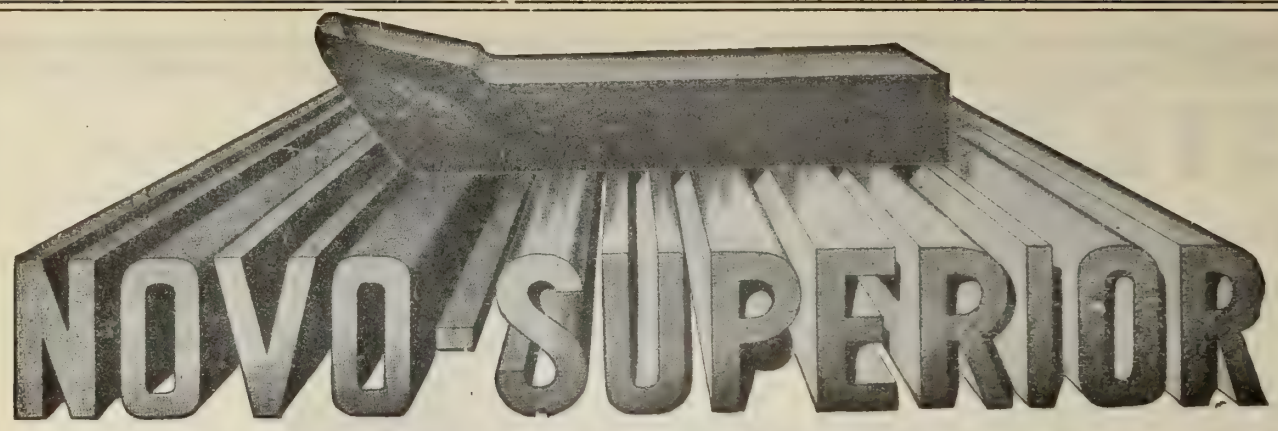
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US



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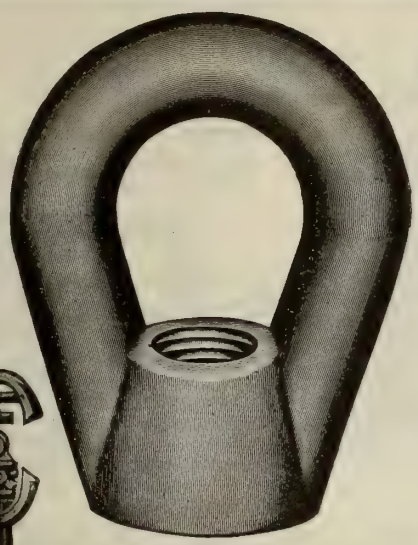

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all sizes

Produced at
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MISCELLANEOUS SHOP TOOLS

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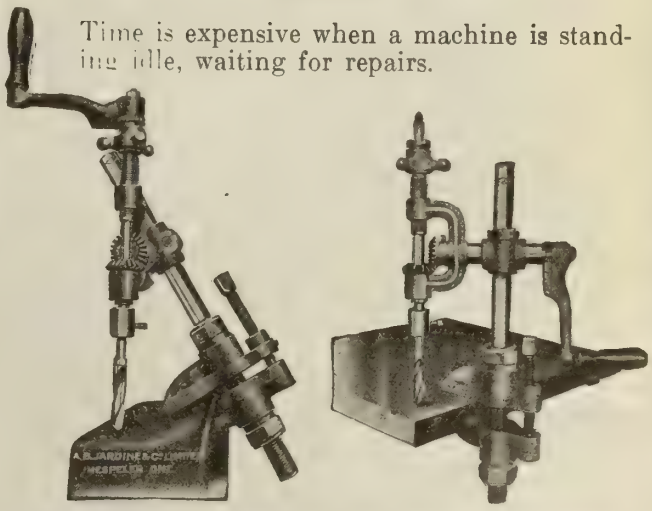
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

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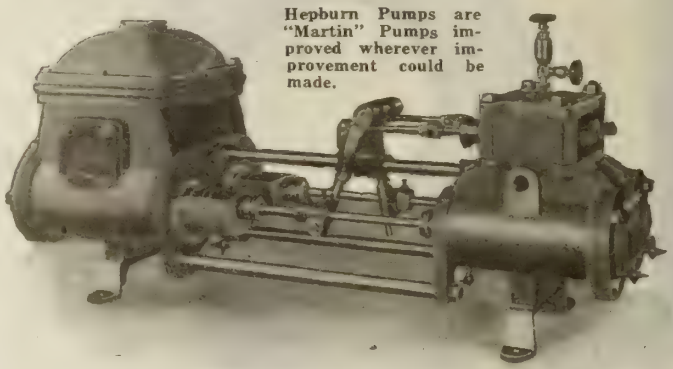

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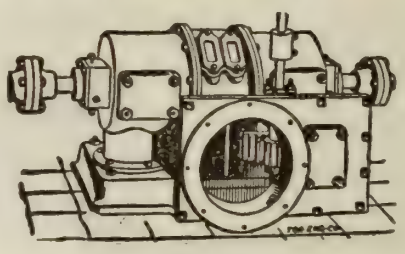

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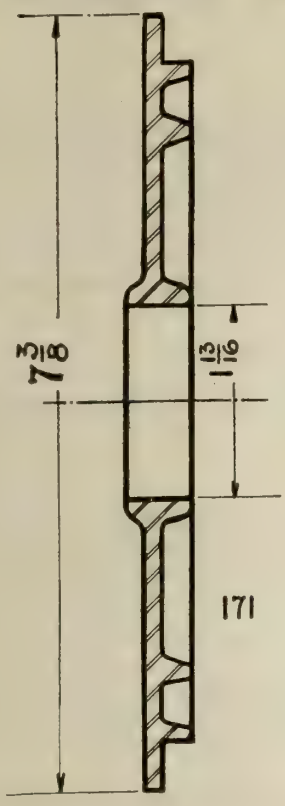

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There **is** a better way and we are glad to give it to you.

The better way is handling this class of work in POTTER & JOHNSTON MANUFACTURING AUTOMATIC where one operator attends to as many as six machines.

Here is a malleable iron end plate 7⅜ in. in diameter with a 1 13/16 hole. It is finished completely on all surfaces in two chuckings and all done automatically.

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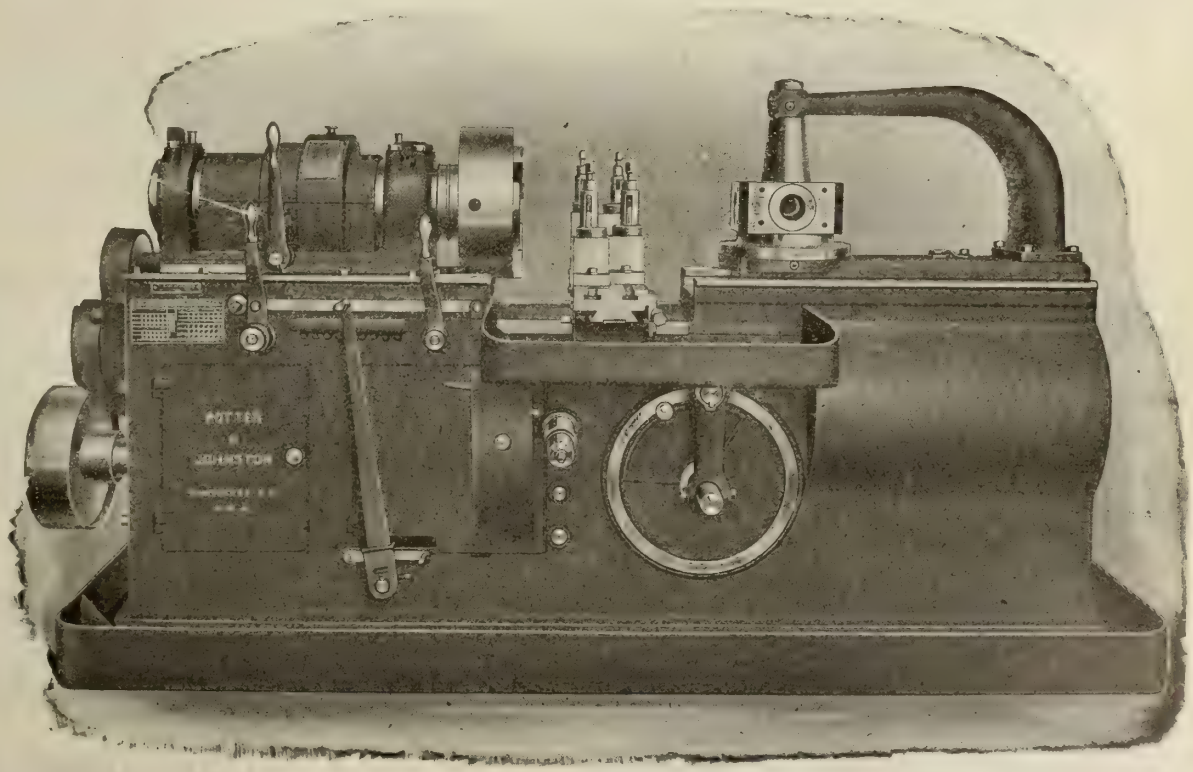

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Engineering Aspects

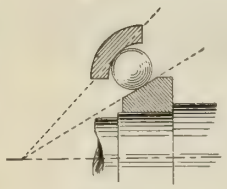


Fig. 1

OF the early history of ball bearings it is necessary to say but little. The fact that a weight could be moved with little effort on balls or rollers was known before the times of Archimedes or the Pyramids, but to find durable rolling members was another matter. As compared with a round bar turning in a wood, bronze, or cast iron sleeve, the high cost of even the simplest anti-friction bearing deterred efforts in that direction till the bicycle came.

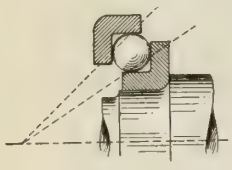


Fig. 2

Of the technical features of early ball bearings, the following were prominent:

1. Adjustability. Intended to avoid costly accuracy in fitting, to facilitate assembling and to compensate for then seemingly inevitable wear.

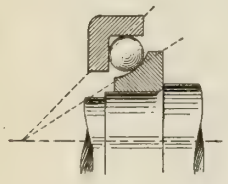


Fig. 3

2. Load Carried, not in the line of contacts, but at an angle thereto. This resulted necessarily from the adjustable feature.

3. Materials. Occasionally tool steel, but more often mild steel, case-hardened.

4. Construction. Accurate according to the standards of the time, but liable to vary one or several thousandths of an inch from true form in both balls and races. No separators used between the balls.

5. Finish. Balls and races ground passably smooth, and left to roll themselves to a true finish if they would.

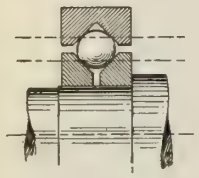
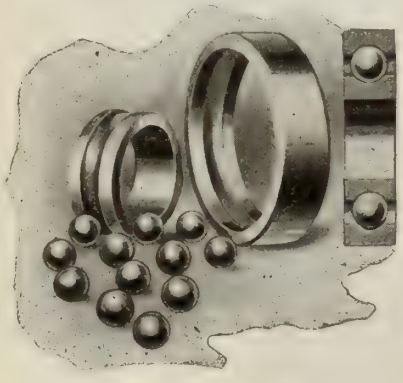


Fig. 4

6. Protection and Lubrication. No special provision made either to exclude dirt or to retain oil.

To the ball bearings expert of to-day these characteristics seem absolutely farcical; yet a dozen years ago no one could have said with authority that they were not as good as any others. Nevertheless, it is easy to-day to point out the defect in each.

MONARCH SERIES CONRAD PATENT



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# of Early Ball Bearings

The rise of the bicycle, and the need for conserving the very limited energy of its human motor, brought forth numerous types of two, three and four point ball bearings, of cup and cone and other types; and for very light service these types did well. Some of them are illustrated in the marginal sketches. All are familiar; all share certain technical features in common; all are to-day distrusted by reason of their failure to endure the heavy loads and high speeds demanded in serious commercial work.

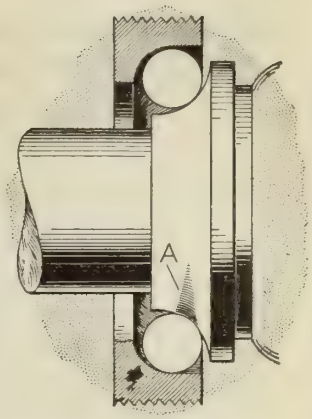

Fig. 5

1. Adjustability. No adjustment which acts alike for worn and unworn portions of a cup or cone, or which shifts the cup or cone at an angle to its line of wear, can compensate correctly. It merely shifts the path of contact, and the then highly localized pressure soon breaks down the new path and makes a bad matter worse. Not even a new bearing should ordinarily be adjustable, for the average user sets it either too loose—which compels one or two balls to take all the load —or too tight, which crushes balls and races.

2. Carrying the Load at an angle to its natural direction augments the pressures sustained by the balls. With a rational design, the line of contacts is as nearly as possible the line of applied pressure.

3. Materials. Unless the ball or race is homogeneous clear through, it will both compress and wear unevenly. Aside from that, the steels of twelve years ago were not good enough for good ball bearings; they were either too soft or too brittle.

4. As the balls and races are but slightly compressible, they will not distribute the load evenly unless formed with extreme accuracy. For balls, one ten-thousandth of an inch is about the limit of permissible variation.

5. Even the highest polish, under the microscope, is a mass of scratches. Only the "high spots" take the load, and if these are not fairly smooth they necessarily wear down. Only a very rough ball wears smoother, however; in general, the end of the first surface is the end of the ball's usefulness.

6. Dirt and Oil. Dirt ruins a ball bearing by grinding away the first polish on which durability largely depends. Oil is necessary, both for minor lubrication and to prevent rust. If dirt is kept out and oil (or grease) is kept in, the lubricant will last for months without being even discolored.

Elementary as these facts seem, it took years of time and a veritable fortune in experimental research to establish them fully, and to point the way to a genuinely durable type of ball bearing. Yet when that was done the results seemed, by comparison with the early failures, almost miraculous.

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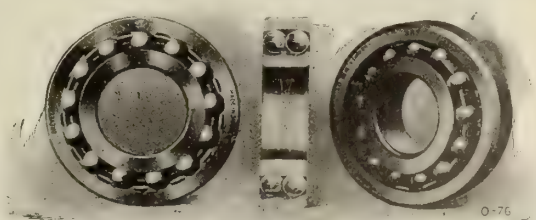

Typical S K F Radial Bearing shown in normal position in cross section and in deflected position

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That Puts Dollars in Your Pockets

Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions in your pocket by the installation of this machine.

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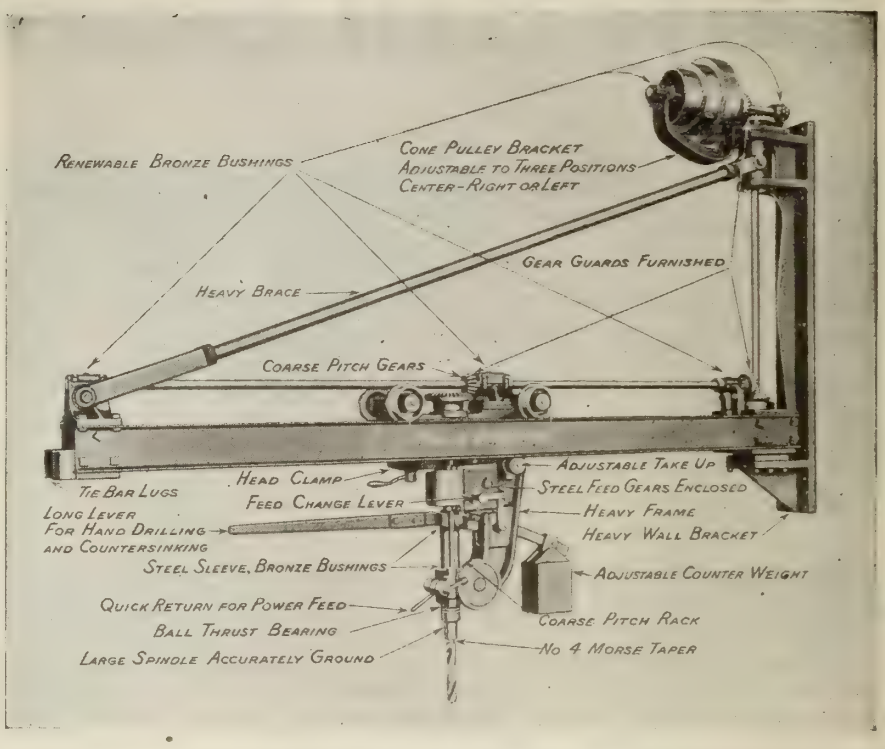
MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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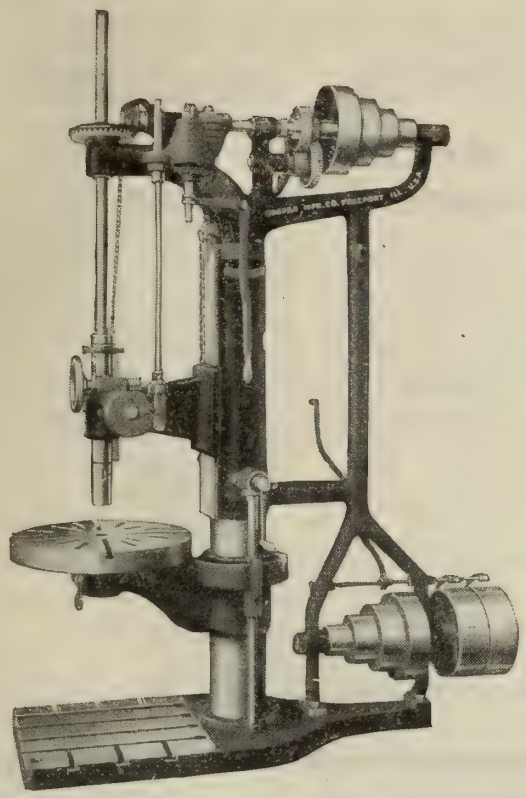
The Driller for Exact Work



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Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

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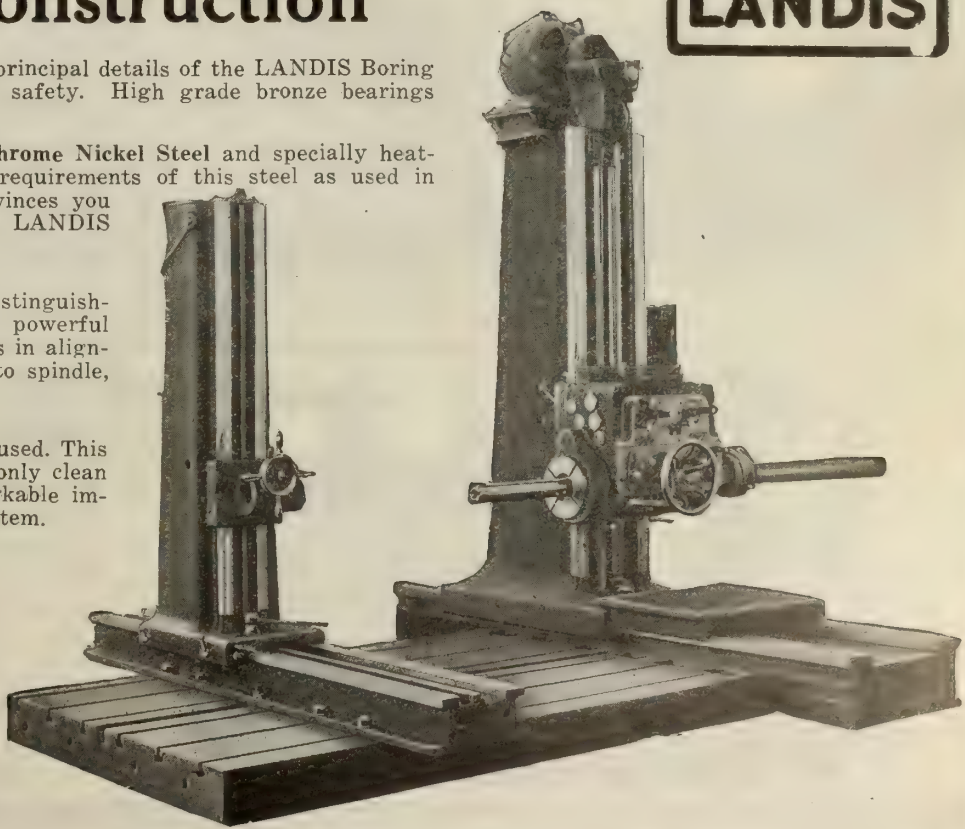
Gears and shafts are made of **Chrome Nickel Steel** and specially heat-treated The extremely severe requirements of this steel as used in gear shifts for automobiles, convinces you of its efficiency and strength in LANDIS gears.

Our concentric screw-feed is a distinguishing LANDIS feature insuring a powerful yet very sensitive feed—is always in alignment and without side pressure to spindle, found in rack and pinions.

The syphon self-oiling system is used. This method of supplying oil permits only clean oil to enter the bearing, a remarkable improvement over the pumping system.



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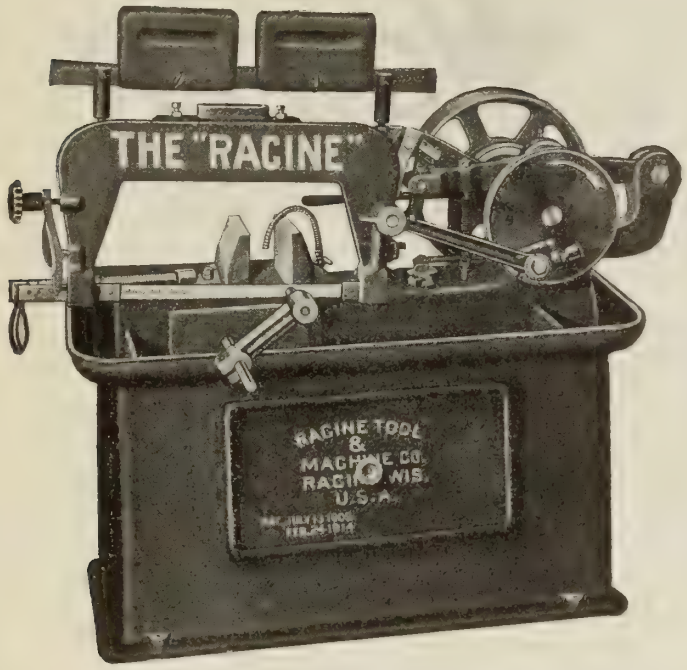

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HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

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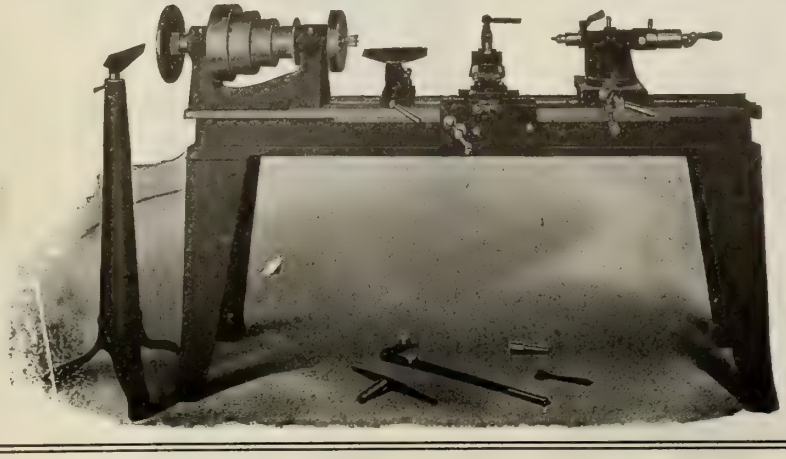

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The World's Greatest Toolmakers
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the chart

Starrett Hack Saw Chart

MATERIAL TO BE CUT	No. of Blade for Hand Frame		No. of Blade for Power Machine			
	All Hard	Flexible or Soft Back	Light Machine	Medium Machine	Heavy Machine	Extra Heavy Machine
Light Angles Channels Tee Iron Ornamental	102	252	115	262		
Heavy Angles Channels Tee Iron	103 112	250	115-B	255		
Light Structural	112-B	250-B	115-B	255	254	256
Heavy Structural	112-B	250-B	114	255-B	254-B	256-B
Steel and Iron Pipe Conduit and Brass Pipe	102	252	116	262	259	
Solid Stock Cold Rolled Machine Steel	103-B 112-B	250 250-B	114	255-B 256-C	254-B 254-C	256-B 256-C
Tool Steel Cast Iron	103 112		114	255	254	256
Brass	103 112		115	262	259	
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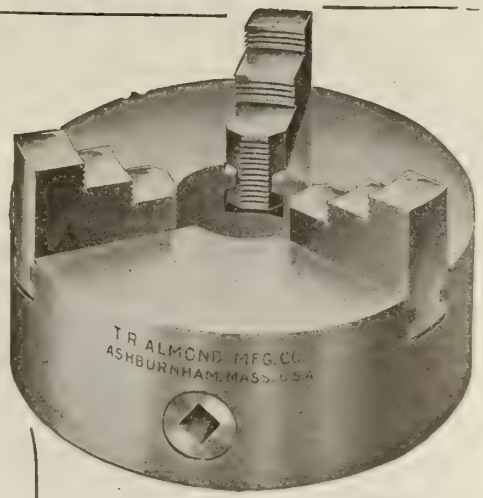
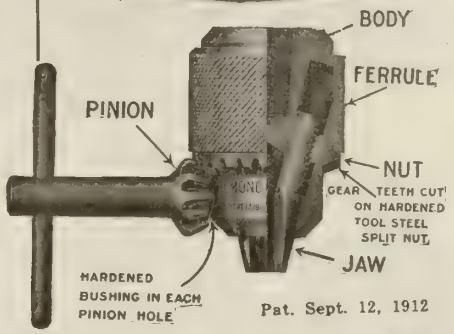


Geared Nut Drill Chucks, in various capacities, 0″ to 1″.



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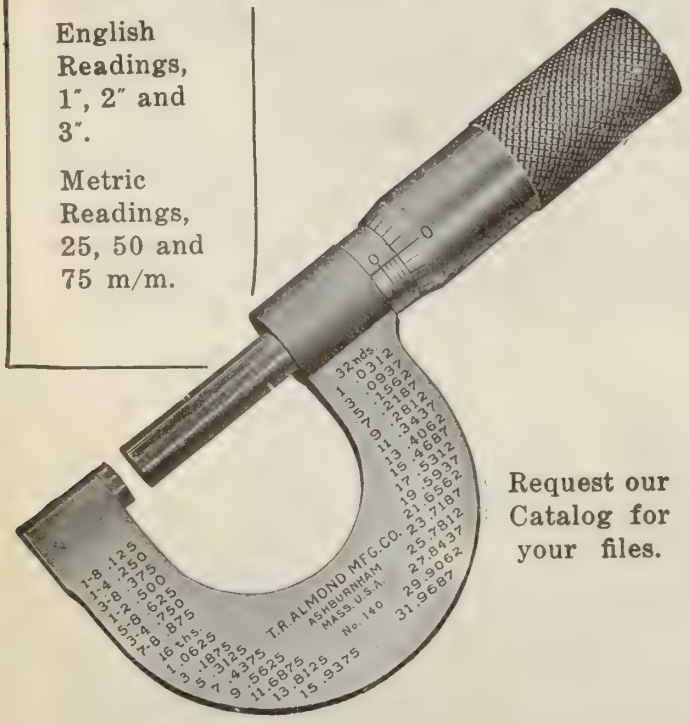

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Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

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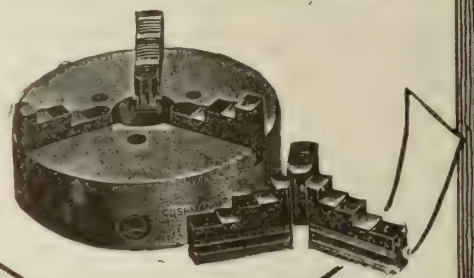
Cushman Chuck Co., Hartford, Conn., U.S.A.

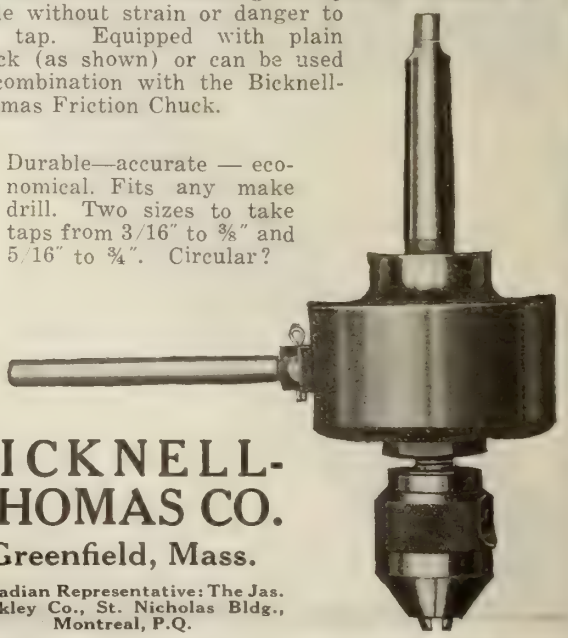


THE BICKNELL-THOMAS TAPPING ATTACHMENT

Speeds the Work—Saves the Taps

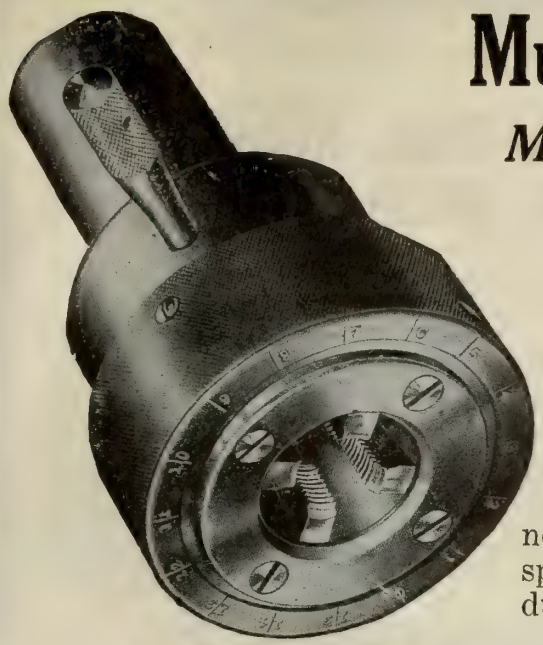
This Tapping Attachment withdraws the tap from the work without reversing the spindle. Reverse is made without strain or danger to the tap. Equipped with plain chuck (as shown) or can be used in combination with the Bicknell-Thomas Friction Chuck.

Durable—accurate — economical. Fits any make drill. Two sizes to take taps from 3/16″ to ⅜″ and 5/16″ to ¾″. Circular?



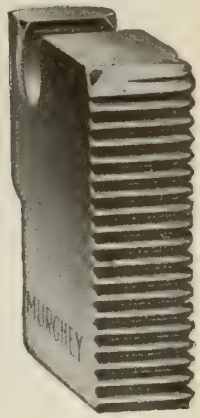
BICKNELL-THOMAS CO.
Greenfield, Mass.

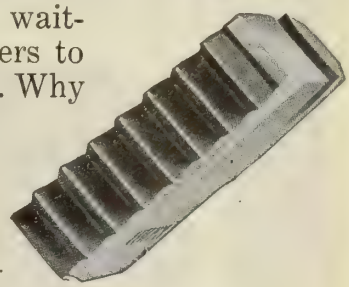
Canadian Representative: The Jas. Buckley Co., St. Nicholas Bldg., Montreal, P.Q.



Murchey Chasers

Mean Quick Deliveries





Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?

Send for a Murchey Tap or Die on approval and give it a trial. You will then secure actual proof of its value to you.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne.
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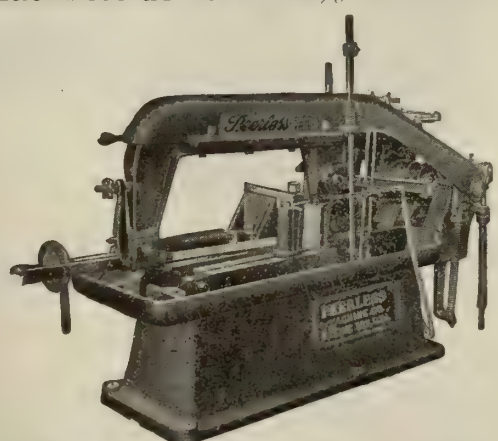
Machines do 50 to 100% more work



The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

The Balance Lift of the Peerless

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

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PEERLESS MACHINE CO.

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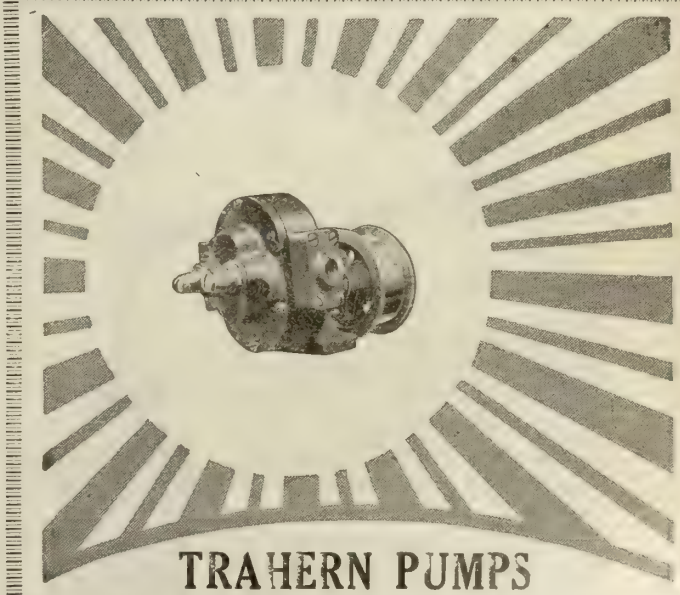

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We positively guarantee that our pumps will deliver all the coolant that can be forced through the discharge opening, according to the size of the pump used, while operating from 300 to 500 R.P.M. A centrifugal pump delivering the same sized stream of lubricant must operate at a speed of at least 1000 R.P.M. This excessive rate of speed necessarily results in a short lived pump.

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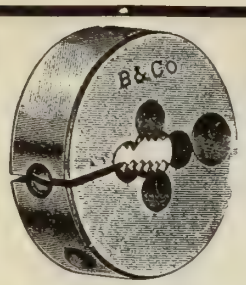

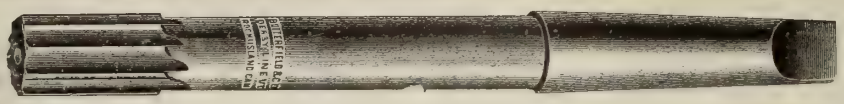

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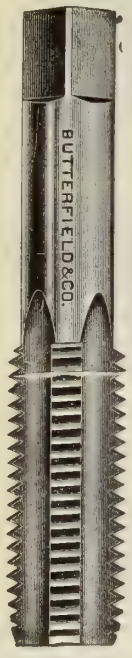

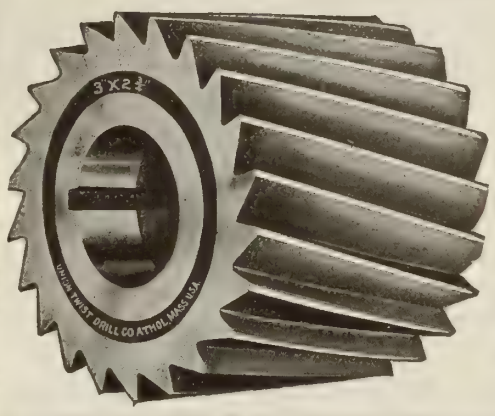

Butterfield quality gives the Maximum returns on your investment.

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Butterfield Quality is the result of 35 years' continuous effort to keep our product distinctly in the lead from the standpoint of efficiency and economy.

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Butterfield & Co.
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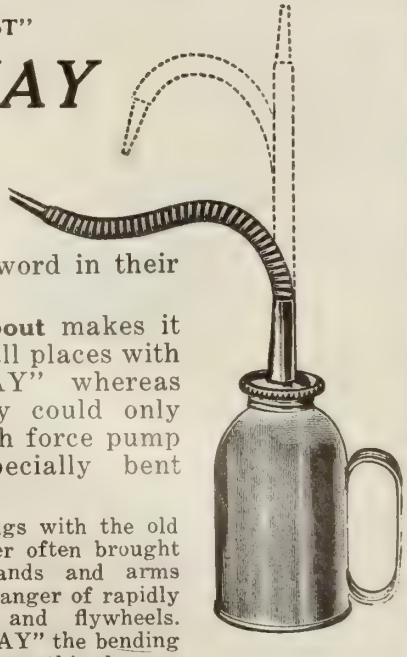
14

"SAFETY FIRST"

ALL-WAY
RAILROAD
OILERS



are the latest word in their line.

The **flexible spout** makes it possible to oil all places with one "ALL-WAY" whereas previously they could only be reached with force pump cans with specially bent spouts.

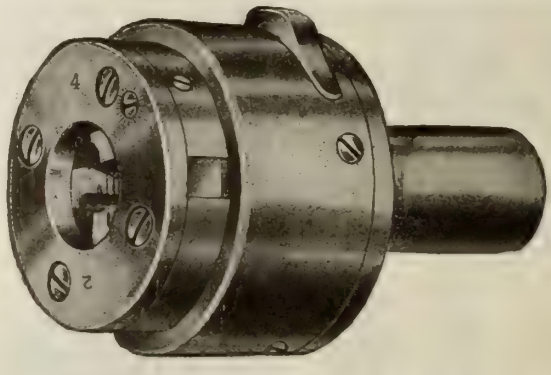
Lubricating bearings with the old straight spout oiler often brought the engineer's hands and arms very close to the danger of rapidly revolving gears and flywheels. With the "ALL-WAY" the bending of the spout removes this danger.

Sizes No. 4, 1 pint—10 in. spout. No. 5, 1 quart—11 in. spout.

Flexible spouts can be furnished for any kind of oiler. If your dealer cannot supply you write us.

We also manufacture the well-known "All-Way" Oil Can—saves you 50% of your oil bill.

THE ALL-WAY OILER MFG. COMPANY
196 KING STREET WEST - TORONTO, ONTARIO



H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

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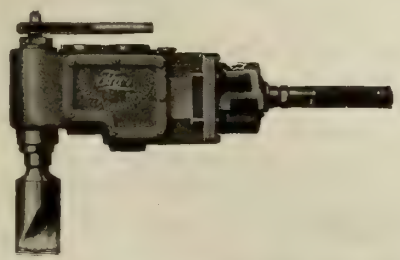
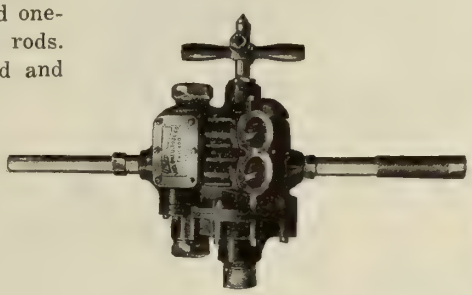
Thor Pneumatic DRILLS and Hammers

There is a Thor Tool made especially for your work. Try it—and watch it save you time and labor and increase your production.

No. 32-L Reversible Compound Piston Air Drill driving ⅜-inch studs in Motor Crank cases.

Thor are the only air drills made in America having Corliss valves, roller bearings, and one-piece pressed Vanadium steel connecting rods. Also equipped with telescopic screw-feed and removable crank chamber plate.





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Twenty years of knowing how built into each Thor Tool you buy.

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Built for Service

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Specifications:

Spindle 2 3/16″ diameter No. 2 or 3 Morse Taper Spindle travel 8½″.
All gears accurately cut and fitted.
Carriage wheels equipped with roller bearings.
14″ x 14″ tight and loose pulleys or single pulley for belt drive to motor, or direct connected to motor.
15 ft. Beam will drill to 13′ 6″ centre.
12 ft. Beam will drill to 10′ 6″ centre.
7 ft. Beam will drill to 5′ 6″ centre.

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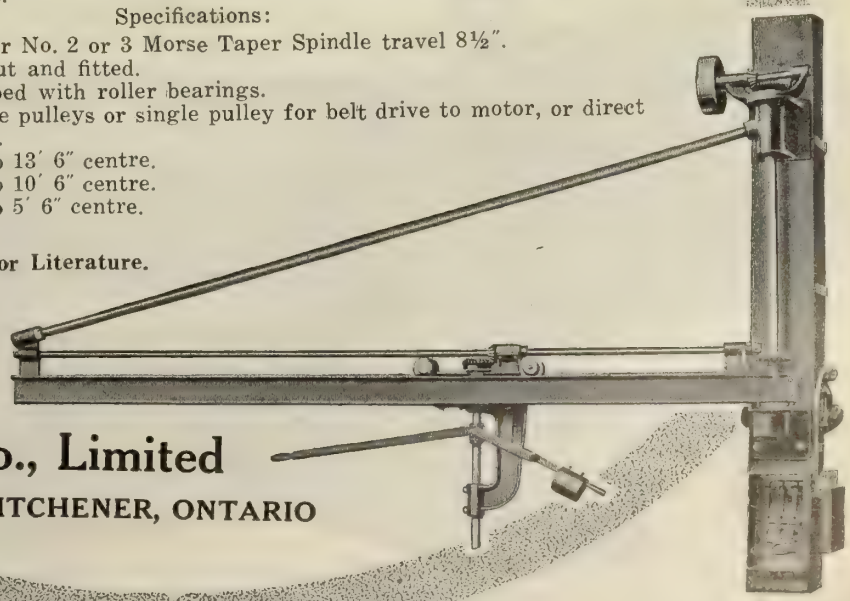

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"WACO" TRADE MARK

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Diamond Special Extra Best Quality Best Warranted Warranted Ordinary
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Rockford Horizontal Boring Machine

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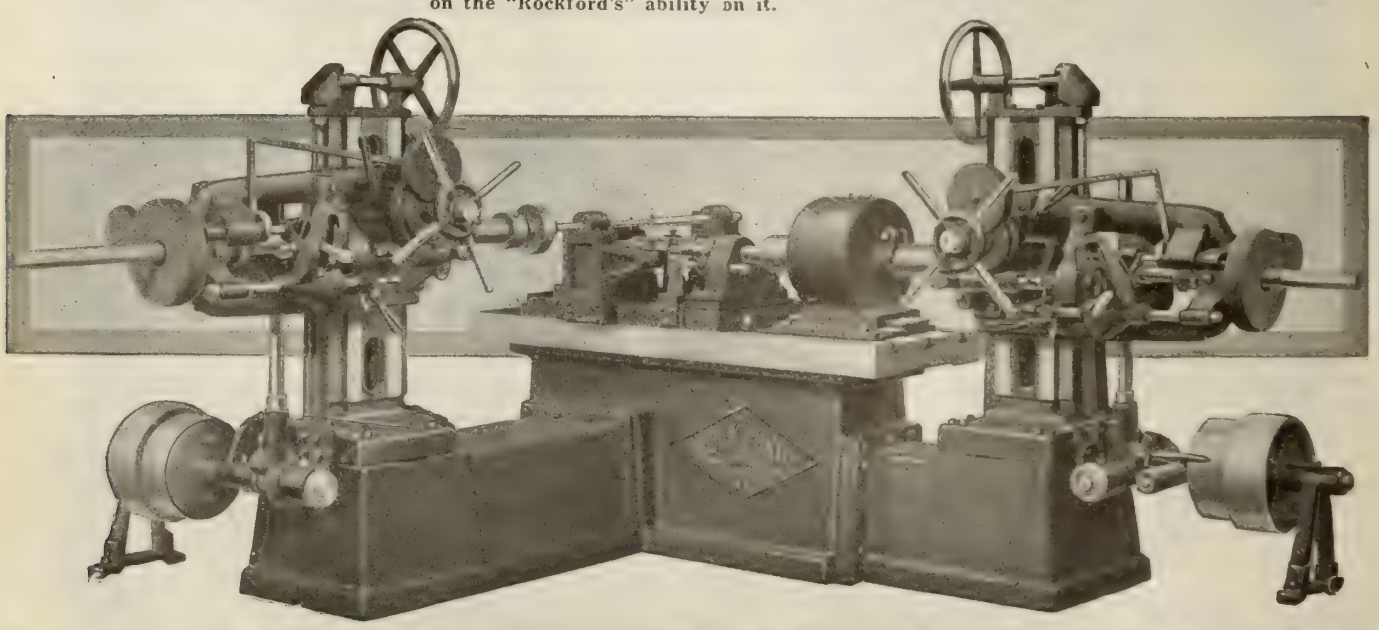
Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



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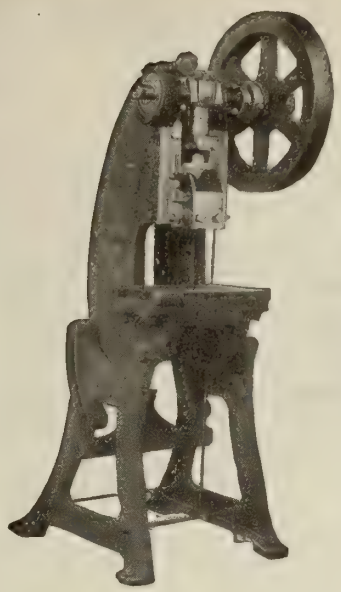

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Special presses are designed where the customer's requirements are unusual.

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Provided its cost is the lowest possible, riveting so well done that it can't be improved upon, is perfect riveting.

Boys on Grant Riveters accomplish two and three times as much perfect riveting as an equal number of men using ordinary machines.

With the

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ROTARY VIBRATING RIVETER

rivets placed close up to the shoulder of the work are as rapidly spun, perfectly smooth as are rivets in easy-to-reach spots.

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Registered in U.S. and Foreign Countries.

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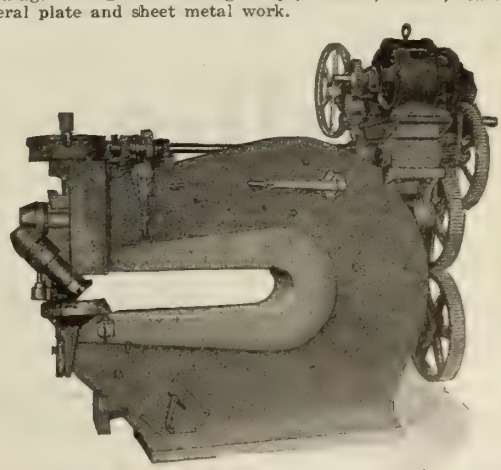
MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



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Eliminates Oxyacetylene Cutting and Plate Planing.

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They are accurately ground and cut for the special kind of work they are intended for, consequently they stay sharp and give good service.

That means better work and contented workmen, because there is no waste of time or energy.

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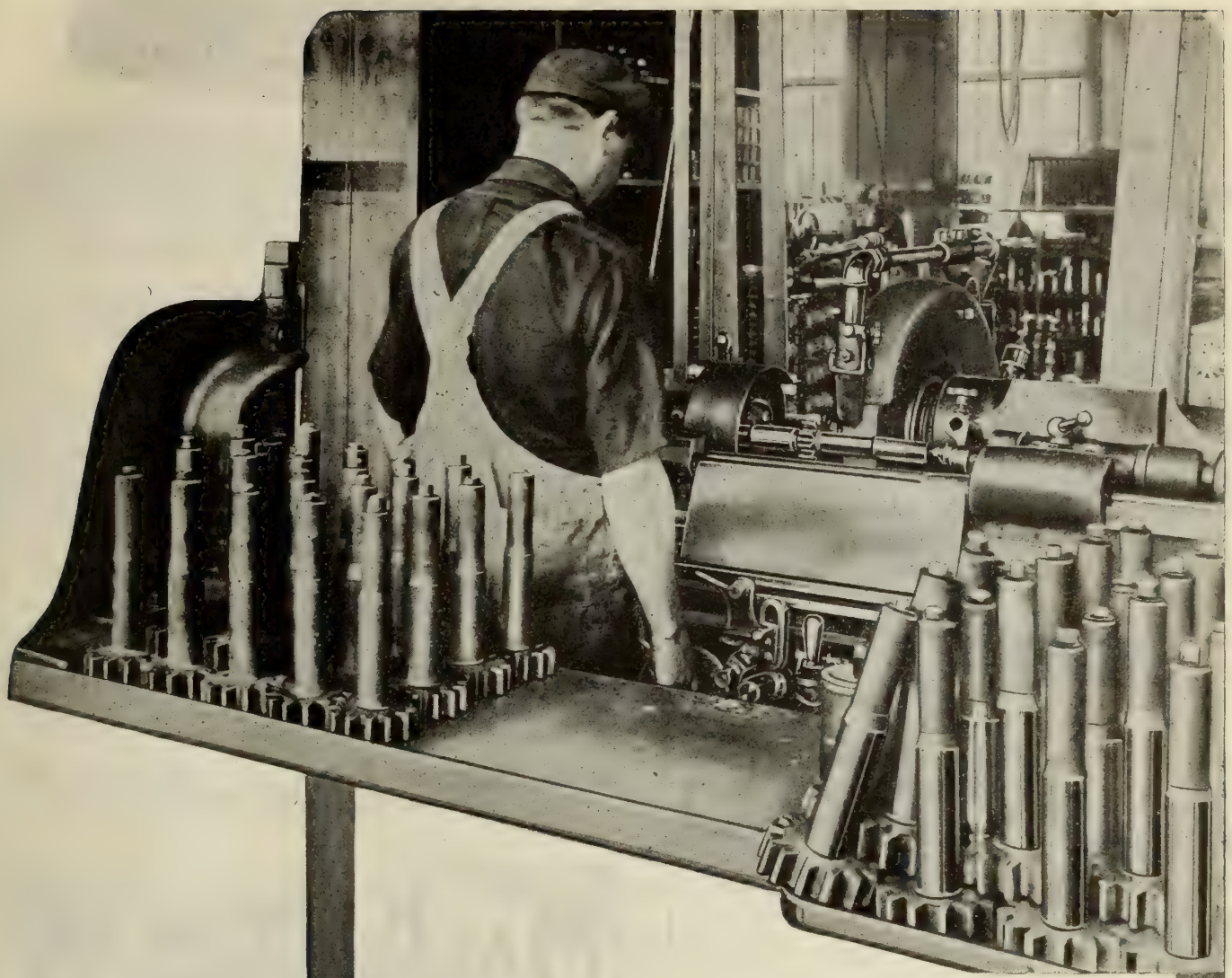

Here's Pinion Shaft Grinding On a Norton

This photograph was made in one of the well-known automobile factories, and shows just how Pinion Shafts for a well-known truck are being produced. In the rough these shafts have a diameter of about 1¼ in.; from .018 in. to .020 in. of stock is removed, the operator being allowed a tolerance of .0015 in. and the output is approximately 200 daily. The machine shown here has been in constant use over 8 years, has required hardly any repairs, and has always given splendid satisfaction.

This is fairly good grinding, but no better than you should obtain. Compare your results and if you are in need of additional information, write to us. We'll be glad to help you.

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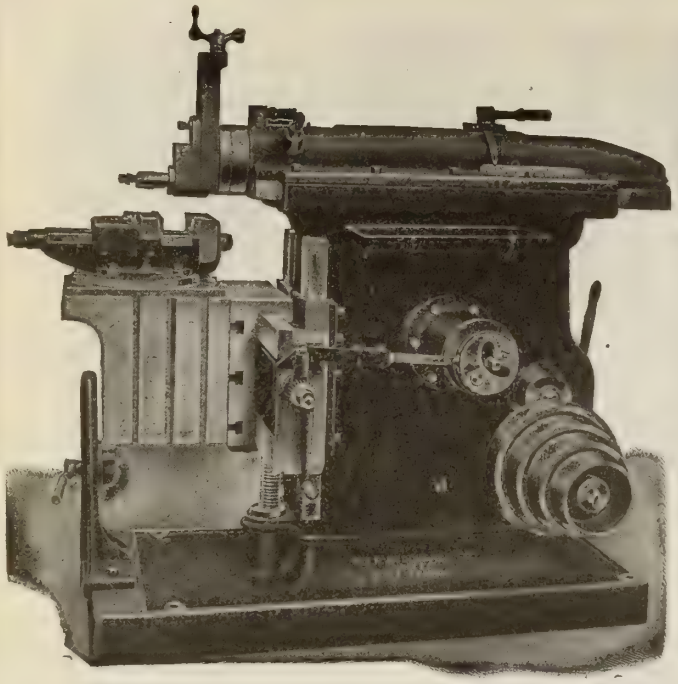

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Let it be a word that comes naturally.

Turn to GISHOLT at Madison when you need bigger production, greater economies.

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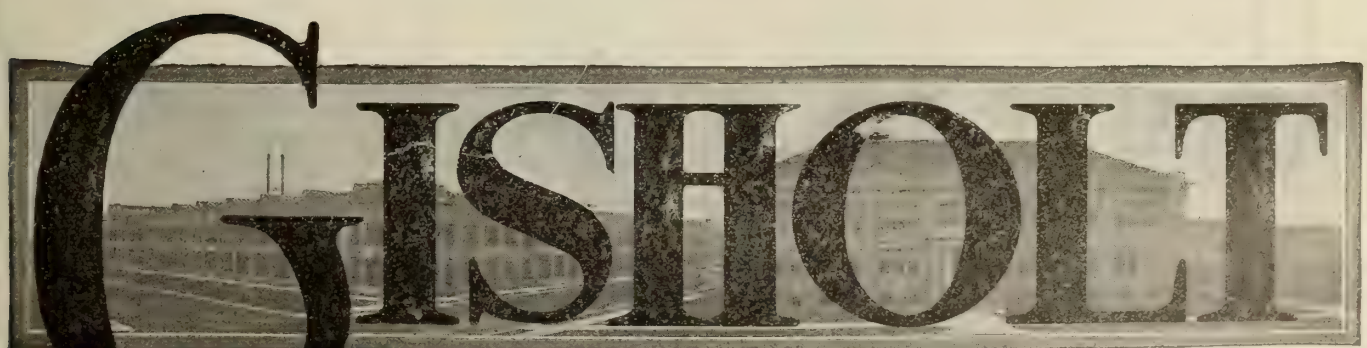

MADISON, WIS., U.S.A.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 10. September 11, 1919

Using Edging Rolls in Breakdown Emergency

Mill Managers as a Rule Aim to Keep Their Production Up to a Maximum. Herein is Described the Use of Edging Rolls as a Help to Quick Shipments

By W. S. STANDIFORD

IN these days of efficiency methods there is nothing more annoying to mill managers than to have a roll break during the rolling of an order for iron or steel bars, which are so essential to the construction of various machines, when a contract between the manufacturer and consumer requires delivery of the bars to the latter at a specified time. The usual method of procedure adopted by mill managers is to order another roll cast at a foundry, and when it arrives, work their roll turners night and day until it is finished, the rolling of the bars being then resumed. The employment of edging rolls in quickly filling orders when breakdowns occur seems to be little known t mill managers, yet the us of such rolls allows of fill ing the order very prompt ly and on time, the onl delay being caused by th roller in the time taken i changing the rolls, whic is very small.

As it is the aim of ever mill manager to keep hi deliveries of bars up t their maximum output, th use of edging rolls to enable quick shipments to be made, not only benefits the rolling mill owners, but passes it along to machine shops and others in different lines who use enormous quantities of iron and steel bars. These rolls are also a very valuable asset to any mill doing jobbing work, to fill orders for bars in large or small quantities, in widths of which there is only a small demand and for which it would not pay to turn a new set of rolls to make the sizes desired. As an example: Suppose that a mill had an order for flat bars of iron 2 1-32 of an inch wide by ⅜ of an inch thick, and had no rolls to make them in. The roller would simply put in the housing rolls that contained a 2⅛ inch pass for making bar iron or steel, also the edging rolls and a set of planishing rolls or "bull heads" as they are termed in rolling mill vernacular. The method of procedure adopted by the roller, is, to first make an iron bar in his flat rolls 2½ inches wide by 7-13 of an inch thick, which is 1-16 of an inch thicker than the desired thickness of the finished bar. Some rollers make the bar ⅛ of an inch thicker so as to fill the edging pass out more.

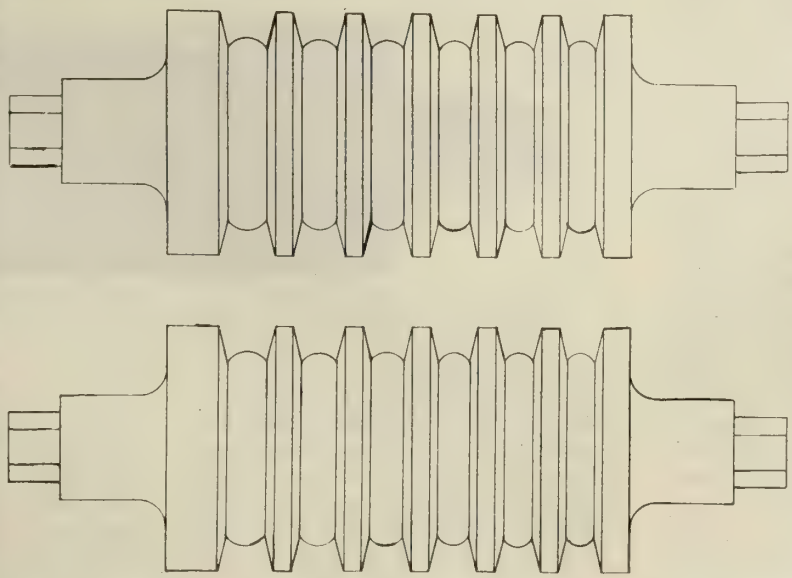


FIG. 1—SHOWS A SET OF EDGING ROLLS FOR EDGING SMALL FLAT BARS ON A GUIDE MILL. THE USE OF THESE ROLLS ENABLES ORDERS FOR IRON AND STEEL BARS TO BE DELIVERED PROMPTLY.

Either system of handling the rolls will make good bars, the advantage being with the 7-16 of an inch one as it does not wear out the edging roll grooves or the surfaces of the planishers too quickly. As the red hot bar comes from the finishing pass in the flat rolls, it is inserted edgewise into the 7-16 inch pass in the edging rolls, the latter having been set so that the distance between the deepest corners in the pass will measure —allowing for shrinkage of the bar when cold—2 1-16 inches. In some cases there will have to be some slight variations made from these sizes, owing to the temperature at which the metal is rolled, speed of the rolls, quality of the metal in the bars made, in most cases they being made out of scrap iron which nowadays contains anything from Norway iron to tool steel. From the edging rolls, the bar next goes to the planishers, which have been set a few thousandths of an inch over ⅜ of an inch.

All of the above conditions have a direct influence on the size of the bar when cold. The best method of using edging rolls is to set them at the estimated height, allowing for the bars' shrinkage when cold, and then run a short hot "trial bar" through them. It can then be seen whether the rolls have to be raised or lowered slightly by means of the housings screws. At any rate, the variation from the sizes given will only amount to a few thousandths of an inch in the raising or lowering of the rolls.

Another use in which edging rolls can be used to advantage is as follows: It is well-known fact among rolling mill managers and superintendents that rolls for making flat bars generally wear out wider at the sides long before the passes by wear and turning of the rolls get so small that they have to be discarded as useless and new ones turned. When this class of rolls are worn so that the passes are 1-16 of an inch wider at the sides and enlarges, so that they make

a fin on the bar at the joints between the tongue roll in a two-high set, these rolls, although making a bar wider than the desired size, can, by the aid of the edgers and planishers, make perfect bars to the exact size desired and thus save money for any company.

It will readily be seen the important part these rolls play in saving money for rolling mill owners, they being of especial value in these days of efficiency in production. Having placed before the readers of this magazine the practical advantages accruing through the use of these rolls, I will now take up the constructional details of edging rolls. The rolls depicted in Fig. 1 are a set for edging small flat bars on a guide mill, and they contain the following passes: ¼, 5-16, ⅜, 7-16, 9-16, and 11-16 inch wide grooves, it being remembered that 1-16 of an inch is allowed for straightening of the sides and planishing to the required thickness of the bars, which for the above passes as 3-16, ¼, 5-16, ⅜, ½ and ⅝ of an inch. The width of the bars made is controlled by the amount of up and down space that the housing screws allow, and also the diameters of the rolls. In regard to the diameters and lengths of the rolls, there seems to be no standard lengths, each mill owner having his own ideas in regard to it.

The rolls in this set are 20 inches long (not including necks and wobblers) and 10 inches in diameter. Some rolls have duplicate passes of the various sizes in order to make the rolls last longer without dressing. Others contain the usual number of grooves and have a blank space for the insertion of other sizes of passes. In some cases the blank space is used for planishing purposes. But the latter is not an economical one for the reason that the planishing surfaces get roughened by use long before the edging passes need dressing in the lathe. It is essential in roll dressing to take the same amount of metal off of all passes so as to keep their proportions the same as when they were first turned. By this it is not meant that the rolls should be the same in diameter as when they were first made—as by wear and turning they are continually getting smaller. What is meant is, that the diameters in the bottom of each pass have the same proportionate depth to the diameters of the collars or barrel of the rolls when they were new. In dressing rolls, if 1-32 of an inch were taken off of the surface and passes of the top roll, the same amount should be removed from the bottom one—or if the rolls are three high, from all of them. The top roll of the edging set (which are most always two-high) should be ⅛ of an inch larger in diameter than the bottom one, the faster peripheral speed of the top roll then throws the bar down and away from the pass, delivering it straight, thus destroying the tendency of the bar to fly upwards, pass over the top of the top roll and meet the other part of the oncoming bar, which, in the case of iron being made, becomes welded to it. This is technically called "a collar," and it forms one of the most exasperating and costly delays which a mill can have, frequently the sudden stop resulting in the engine breaking down or the journals of the wobblers of the rolls being twisted off.

On the other hand, should a top roll be 1 inch larger in diameter than the bottom one, a "backlash" will result owing to the peripheral speed of the surface of the top roll being much greater than that of the bottom one. This results in flat bars having a corrugated shape, they also being uneven in gauge. Backlash is also very hard on the rolls and machinery, it frequently causing damage. In all cases, especially in the designing of rolls for making thin shapes and sections such as angles having an unequal length of side, the position of the pass has to be carefully placed in the rolls if bars without bent and torn edges are to be secured. Rolls for making large round bars do not require the top roll to be larger than the bottom one, the force of gravity ensuring that the bar delivers in a straight line. By referring to the edging roll photograph depicted in Fig. 1, it will be noticed that the bottoms of the passes are rounded. This is done so that the finished bar will have straight sides, as otherwise the bull heads bulge the centre portions of the sides out. By having the narrow sides of each bar concave as they leave the edging groove they straighten up nicely in going through the planishers. In order to make the photograph show the convexity of the bottom of the edging passes clearly, the curves are shown purposely exaggerated, as in actual practice, for the sizes of the grooves under discussion, they would be nearly straight; a roundness of only eight 1-1,000ths of an inch being required between the corners and the highest part in the centre of each pass. In designing edging grooves for making flat bars of iron or steel of one inch and over in thickness it is the usual practice to allow more convexity of surface in each different size of groove.

The collars of the passes of the small edging rolls shown in the illustration have a taper of 6 degrees and a depth of ⅜ of an inch, all being equal in depth. Many roll designers and roll turners will disapprove of having all of the edging grooves of a uniform depth; the usual practice in this respect being to make the smaller ones such as the ¼ inch passes shallower than the ⅝ of an inch and smaller ones. From an efficiency standpoint, the writer as a practical roll designer has found out by experience, that it pays to make them all of equal depth, as the roller can work with greater speed and efficiency. An example to illustrate this point will be given. Suppose that a roller has to make flat iron bars 1¼ inches wide by ¼ of an inch thick, and that rolls containing a 1⅜ inch wide pass are to be used to make the 1¼ inch bars. It frequently happens that the roller during his day's work has orders calling for bars of the same width, but varying in thickness. Now, by turning all of the passes to the same depth the roller has only to set his rolls for the one pass, and the other ones will have the same widths if the roll turning has been accurately done. The roller will thus be enabled to get the work out far more quickly than if he has to stop and lower or raise his rolls, using trial bars in each case to get his sizes for bars having the same width, but differing in thickness.

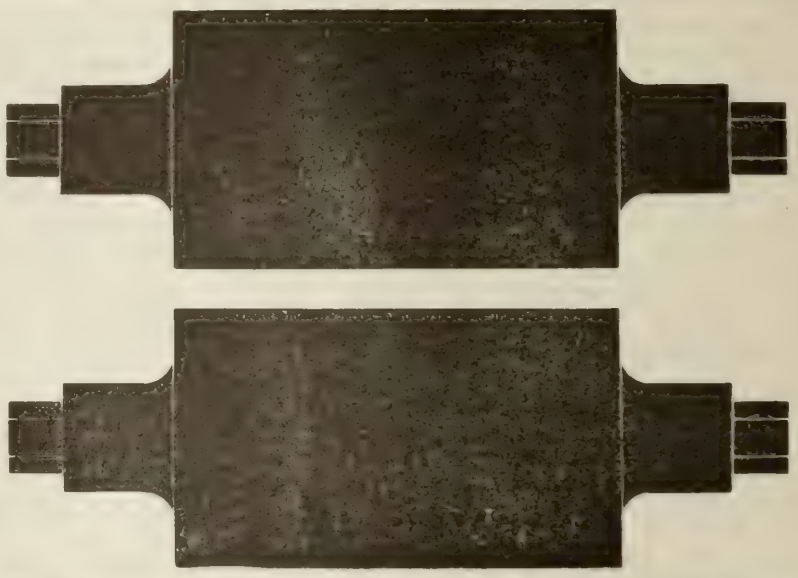


FIG. 2--DEPICTS THE PLANISHING ROLLS FOR STRAIGHTENING THE SIDES OF THE BARS AND ALSO FOR SMOOTHING THE TOP SURFACES. THE USE OF BOTH SETS OF ROLLS SAVES MONEY FOR MILL OWNERS.

It is the practice of up-to-date mill managers to so group their orders that the roller, when working on different thicknesses of bars, will have no more changing of rolls than is absolutely necessary, as the time consumed in changing and adjusting the rolls to make various widths of iron or steel bars delays production and costs money. The planishers or bull heads shown in Fig. 2 are generally made out of chilled cast iron as this metal has long-wearing qualities. Whenever possible it is best to have a set of bull heads having as long a body length as can be gotten into the housings, sets of rolls with lengths of 18 or 20 inches, lasting long before needing dressing in the lathe. In using these rolls, when one portion gets rough

the roller shifts over to a smooth part, hence the advisability of using rolls having a long body length, as it will be quite a while before they require dressing.

The use of chilled iron for planishing rolls has one drawback as contrasted with those made out of ordinary hard cast iron, and that is, whenever a jam occurs with a bar in chilled iron rolls, the metal is compressed, forming what is technically termed a "burnt spot," which vary in depth from 1-32 to ⅛ of an inch. Turning out a burnt spot is one of the most exasperating and tedious pieces of work that a roll turner has to contend with. This is due to the fact that chilled cast iron is very nearly as hard as the tool used to turn it, and when the metal is compressed it is rendered as hard as the metal in the tool. The result being that when the tool touches the burnt spot it slides over it, the edge of the tool breaking out at the same time, thus necessitating regrinding. The method adopted by the roll turner in turning out burnt spots is to resharpen the tool and take a light cut until he nears the hard spot, then he takes a very heavy cut so as to get under it and lift it out. The tool is then reground and the process repeated until it is turned out. The surface of the roll is then trued up with another tool. The roll turner, in doing this work, actually spends more time grinding the tool than is spent in the turning as the burnt spot shatters the edge each time it is used. It is hardly necessary to state that the workman does not stand in front of the lathe while cutting or breaking out these spots, as pieces of the spot and tool fly out with considerable force.

In handling of the edging and planishing rolls, the roller has to use judgment, if one set of rolls are smooth and the other is rough. Thus, if the finishing flat roll passes are smooth and the edgers and planishers are rough, the finished bars will have a rough appearance. If the finishing flat roll passes are rough before the bars go into the edgers and planishers, the edging and planishing rolls being smooth, then the finished bar will be smooth. Should both the flat rolls and the planishers be smooth, while the edging rolls grooves are rough, then the finished bars would have smooth tops and bottoms and rough sides, as the edging rolls control this part of the bars. The foregoing shows that the roller continually has to use judgment in handling the rolls, as he can spoil the appearance of the best metal ever made by not attending to details.

Will Wait a While.—The threatened strike of railway shopmen in the United States has been held over for a time, according to a decision reached by the executive council of the American Federation of Labor. The wage increase offered by President Wilson was declared inadequate by a vote of 325,000 to 25,000, but the men agreed to leave action to the International officers. The executive decided not to put the vote in operation till the result of the Government's efforts to decrease the cost of living becomes apparent.

COST OF CUTTING TOOLS

From Machine Tool Review

IT is remarkable that any false ideas should prevail as to multiple tool machines being disadvantageous on the ground that cost of cutting tools used on them is higher than those used on single operation machine tools. This idea is not widely entertained, but is persistently revived, sometimes by capable men, who perhaps have not had time to reason it out thoroughly. The idea crops out in arguments in which comparisons are made between two classes of machines. In the course of these disputes items of cost, such as capital, tools, floor space, etc., are isolated for comparison as involved in the two methods. If the summing up of the totals of the items is neglected no useful conclusion can be reached. There is no sin or virtue, or profit or loss, in using more or less cost in one of these items. The point is which is the least costly method of doing a given quantity of work. Even on these broad lines it should first be considered whether the work really is equally good by either method. In fact, possible cost is not the sole consideration, although it is so important.

Assuming, however, that the two methods are equal in all things except cost of production, it is necessary to analyze cost under classified headings. We must expect, then, that as the methods are different the cost headings will differ and cannot be compared in classes one against the other. It is only the totals that tell. For example, in cutting tools. If old plant is used carbon steel tools may do as well as high speed steel in cases where the cheaper steel will cut as much as the machine will drive. But that will not be a general rule. In cases where it is true the tools will be less expensive but the cutting will be more expensive. If we leave out cost of steel and its relation to quantity of cutting, and consider only the time spent in sharpening to keep the tool fit for its work, it will not matter which type of machine it is on. If one tool is continuously cutting on a centre lathe as against, say, six tools on a multiple machine, then we may be asked to assume that each tool on the multiple machine cuts on an average only one-sixth part of the working day. That will not affect its "wear and tear" expense in the end. If other conditions are equal the tool on a single operation machine will be sharpened six times as often as on the multiple machine, but that is solely because we assume it to do six times as much work per day. If we allow that asumption, which we would not on its merits, it only means that by using single tool machines there will be less capital fixed in tool steel. If we consider capital, in comparing two methods of production, we must consider the total capital required to produce a given output and in relation to the wages cost of the output. These are old arguments, but still often misunderstood. In splitting up items of cost for separate comparison we may evade any real problem there is if we neglect to assemble the detail losses and gains, compare the totals, and show on which side the balance of advantage lies. The single machine method might be taunted with using six times the quantity of belts, countershafts, floor space, etc. Those would all be equally, or unequally, relevant, but no one of them would solve the problem.

It may be said generally that the multiple machine method leads to increased expenditure on cutting tools. A better stock of tools is kept, better skill and attention is given to dressing them, and concurrently with the increase of knowledge obtained finer and more costly tool materials are preferred. But all this results in lowering the total cost of production. If a six-tool machine is standing idle because one tool has failed the effect is to make a bad manager despair while a good manager applies his talents to overcoming the difficulty. The competent man it not going to give up good machines because he has bad tools. The fact, however, behind all this is that even where multiple machines are not used it would pay to give far better attention to and spend more money on the cutting tools.

DRIVING CHAIN MANUFACTURE

The leading British manufacturers of driving chains have resolved to form a permanent association of their interests in order to develop the trade on lines that will fully satisfy home requirements and enable them to compete abroad. The associated firms are the Alfred Appleby Chain Co., Ltd., Birmingham; Brampton Bros., Ltd., Birmingham; the Coventry Chain Co., Ltd., Coventry, and Hans Renold, Ltd., Manchester. These firms will work together in improving the quality of driving chains and gear, in promptly meeting the demands for quantities and in supplying technical and other information. They will also be able, by co-operation, to bring more efficient service to bear in securing to this country a proper share of foreign trade. Some of the immediate work in hand is: (1) To standardize chains, wheels, and chain wheel cutters; (2) To simplify matters by eliminating any redundant sizes which create expense and difficulty to the user without serving any useful purpose; (3) To provide for a large and rapid output so that new schemes can be carried out with the least delay; and (4) To systematize and develop technical knowledge both for manufacturing purposes and for use in applying chain drives. It is not many years since the conveyor chain and the bicycle chain were the only driving chains very widely used. With the development of exact manufacture much wider applications were tried, and the new difficulties which arose were dealt with in a way that created a separate and flourishing branch of manufacturing engineering. The association aims at retaining the position and extending it.

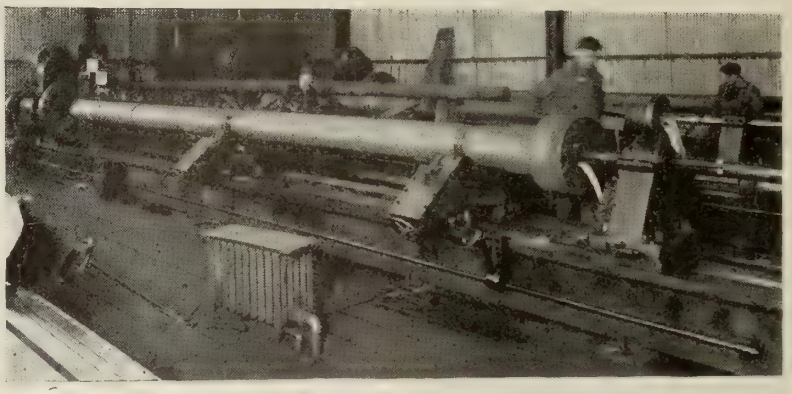
Goodyear Building at Regina. — A three-storey building will be erected by the McKay Construction Company, contractors, for the Goodyear Tire Co. The building will be used as offices and warehouses, and is estimated to cost $75,000.

Various Operations On Propeller Shafts

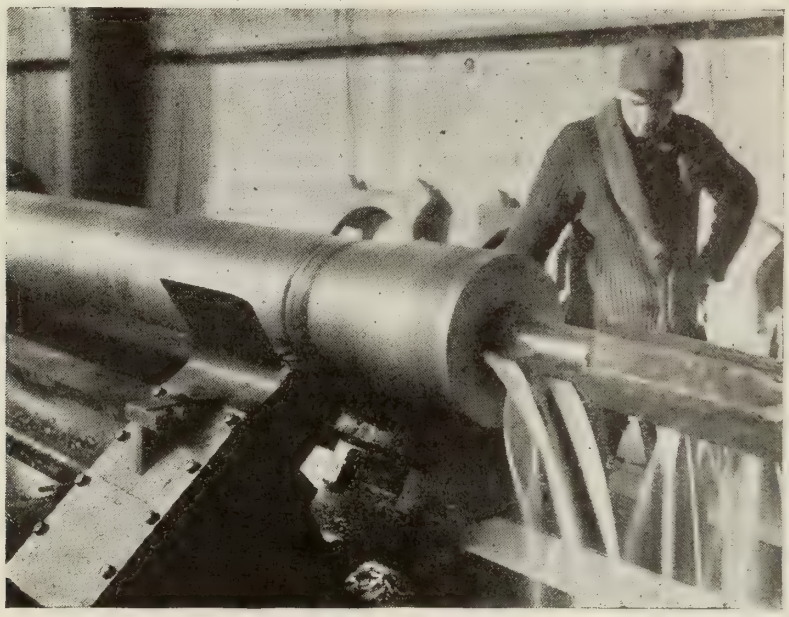
These Views Illustrate Interesting Work on Marine Shafts, Bored Out, Etc., on Special Large Hollow Boring Lathes. These Pictures Were Taken at the Plant of the Pollak Steel Company

By FRANK C. PERKINS

THE accompanying illustrations show the Pollak Steel Plant equipment at Cincinnati, Ohio, where steel axles and forgings are provided for locomotive and marine service. The equipment of the hammer shop for forging locomotive side rods and other parts is equipped with modern hammers, and in the press shop may be found several one thousand ton steam hydraulic presses with a battery of furnaces in the background. These presses are served by two overhead travelling cranes with special electrical turning devices. The large marine propeller shafts from the press are forged and delivered to the machine shop to be hollow bored and rough turned. The 72 ft. hollow boring lathe bores a large hole through the solid of a marine propeller shaft.



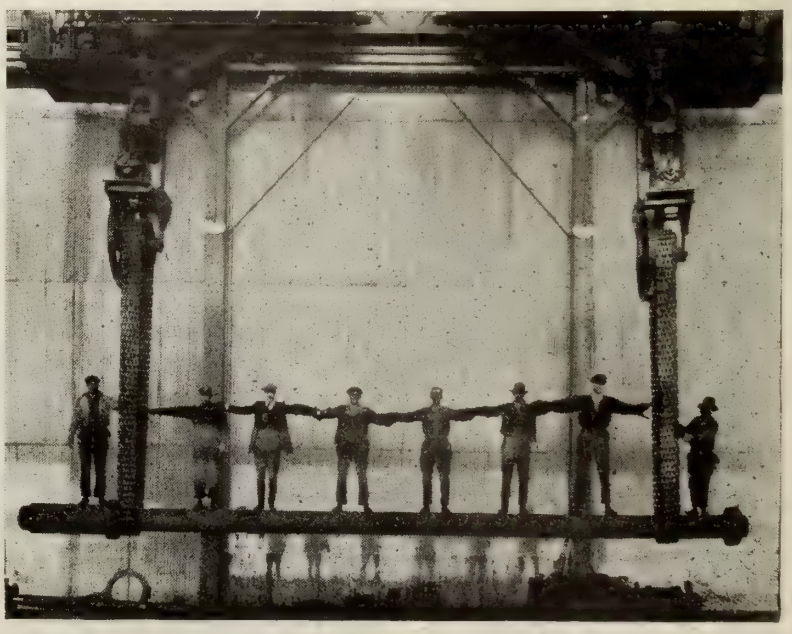
BATTERY OF LARGE HOLLOW BORING LATHES AT WORK, BORING LONG MARINE SHAFTS.



72" HOLLOW BORING LATHE BORING HOLE THROUGH SOLID MARINE PROPELLER SHAFT.

In the heat treating department there is a battery of vertical furnaces with large quenching tank to the right. To the right there is a battery of large car type annealing furnaces. All these furnaces are equipped with electrical devices for determining the heat temperatures, which is very important in the heat treating of steel. All the furnaces are controlled from a central station, which makes it possible to have uniform heat throughout. The large shaft is lowered into the furnace to be heated and then quenched in the quenching tank to the right. One of the most modern cooling systems is operated in connection with the oil quenching tanks. To obtain the highest efficiency in heat treating of steel the quenching fluid should be kept at a constant temperature. The quenching fluid is, therefore, circulated through a series of coils located under water in a 150,000 gallon reservoir. This department is equipped with cranes and conveyors, and is capable of taking care of forgings of every description of from one to one hundred thousand pounds. The marine propeller shafts of great length are bored in a battery of large hollow boring lathes.

The work of the Pollak Steel Company dates back to the year 1865. The fifty-four years of practical experience together with constant application and concentration has done much toward the betterment of forged products of all kinds, such as steam and electric car and locomotive axles. In this plant are produced hollow bored special heat treated locomotive axles, as well as crank pins, connecting rods, cam shafts and side rods, also all kinds of forgings for railroads, marine forgings of every shape and description, forgings for every line of industry, sugar mills, machine tool builders, automobiles, tractors and machinery builders. The plant is equipped to handle anything in the forging line from one to one hundred thousand pounds.



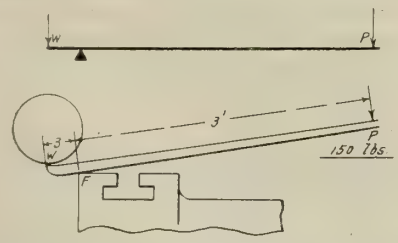
FINISHED MARINE PROPELLER SHAFT AND CRANE SERVICE AT POLLAK STEEL PLANT, CINCINNATI, OHIO.

Shop Arithmetic, Levers in Shop Practice

Eleventh of a Series in Practical Mathematics For the Mechanic and Those Learning the Machinist Trade—Leverage as Applied to Every-Day Shop Practice Forms the Present Lesson

By J. H. RODGERS

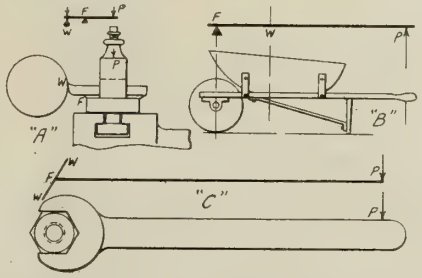
IN our last lesson the instruction dealt with a few practical applications of the simple lever. We will now consider, further, this subject of leverage as applied to every-day shop practice. A very common sight that one might see in the average machine shop is the use of a "tommy" bar for straightening shafting in the lathe. When a shaft is found out of true it is frequently the custom to use the bar and peen, and remove the kink while the shaft is held between the lathe centres—not the best practice we will admit, but if proper attention is given to details, light shafting may be effectively straightened by this method. Probably the way generally adopted is shown in the sketch below, where the shaft is revolved on the centres and the high side determined by the use of chalk. The lathe is stopped, turned by hand until the high spot is at the bottom, or point A, so that the point of the bar will be on the chalk mark, the heel B (fulcrum) resting on the edge of a tool or on the corner of the tool-post rest. The various factors can then be determined as shown in the skeleton sketch.



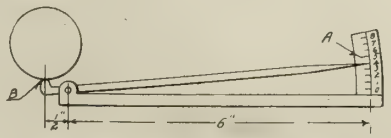
With a lever, as shown above, the resistance (weight) due to bending the shaft would be equal to the force applied at P (150 lbs.) multiplied by the length of the power arm (3 feet), divided by the length of the weight arm (3 inches), or:

$$\text{Resistance } W = \frac{150 \times 3 \times 12}{3} = 1800 \text{ lbs}$$

A few practical illustrations of the simple lever are here given; "A" shows a lathe tool in position, and emphasizes the importance of minimum overhang, to insure rigidity and prevent chatter. This rule holds good wherever cutting tools are used. "B" shows a loaded wheelbarrow and demonstrates the advantages of concentrating the load as near the wheel as conditions will permit. The weight, however, should be so placed that the power applied on the machine will be a lifting one, as better control is possible. "C" shows the lever when tightening a nut with a spanner. The solution in each case is calculated on the supposition that the force is applied in a perpendicular direction to that of the lever. In using a wrench, however, this condition will not always exist, but greatest efficiency is obtained when such is the case. When using a wrench on a nut it will be seen that the sides bear on the corners of the nut so that the resistance or weight arm will equal the radius of a circle, having the corner distance as the diameter.

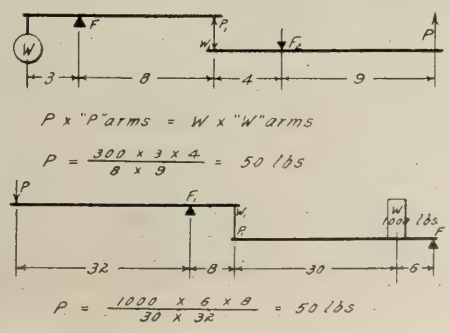


A little study and observation will enable anyone to analyze and simplify almost any mechanical application of the simple lever. The principle is not confined to the equalization of forces as levers are often used to obtain an increased or decreased motion of travel. An example of this kind is shown in the indicator below, the pointer showing a relative movement to that of the contact point, the value of such movement being determined by the corresponding lengths of the lever arms. Suppose that the graduations on the arc A of the indicator are divisions of 1-10 of an inch, and the variation between high and low, when testing a shaft, is found to be 3-10 of an inch; what is the eccentricity of the shaft or the movement of the contact point B, the lever lengths being as shown?

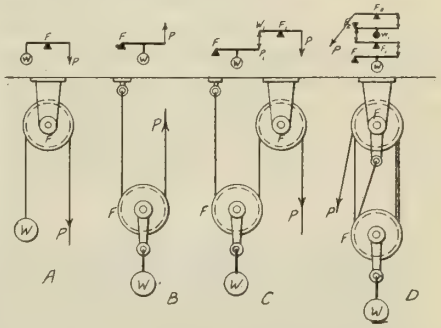


The eccentricity would then be .025, and to bring the shaft or disc central it would require to be moved .025 divided by 2, or .0125 of an inch.

It is not always possible, however, to obtain the results desired by the use of a simple lever, and very frequently it is necessary to combine two or more simple levers into what is termed a compound lever; the principle, nevertheless, remains unaltered. A skeleton drawing of two compound levers is here shown.

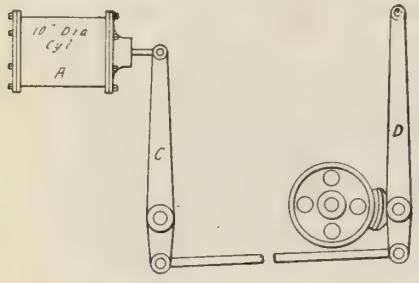


Apart from the levers generally used in weighing scales, the simple application as shown above will seldom be seen in practice. In almost every nook and corner of a machine shop a modified form of the lever may be found. Everyone is more or less familiar with the ordinary pulley, and it is here that we see the most common transformation of the lever, the action being continuous. While this may be rightly placed in the section devoted to pulleys, and will be treated more fully under such heading, a few illustrations will be given here so as to make clear to the student, the direct relation that the pulley or gear bears to the common lever. Below are shown several sketches of block and tackle, together with the skeleton lever upon which the pulley action is based.

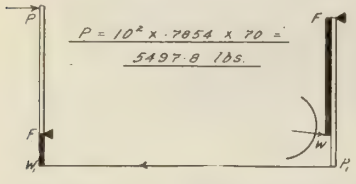


At A we see a single fixed block and pulley, over which the rope passes, the power, P, suspending the weight, W. It will immediately be seen that the force applied must equal the weight supported, as the lever arm in each case is exactly the same length, being the radius of the pulley. At B is shown another style of single block, but with a movable pulley; in this instance the power arm is equal to the diameter of the pulley, while the weight arm equals the radius, therefore, the weight lifted would be twice that of the power applied. A practical application of this particular style of block, however, is not often met with, and to make it more suitable for ordinary work, a modification like that shown at C is adopted, where a combination of a fixed and movable gives the result shown at B, but with the pull at F exerted in a downward direction. This, and the sketch at D, illustrates quite clearly the different factors of the compound lever. The mechanical advantage of the multiple block and tackle is exemplified in the skeleton sketch of the leverage at B. It will be noted that the only advantage derived by the fixed pulley is to

change the direction of the pull and facilitates the continuous movement of the cable in raising or lowering the weight. The skeleton sketch shows the fulcrum of the fixed pulley in the centre of the lever, while the fulcrum of the movable pulley is located at the extreme end, showing a combined application of the first and second class levers. It will be noted that the link connecting the second and third lever is suspended from the fulcrum F^2, but it must be understood that this fulcrum is on the movable pulley and, therefore, the upward movement represents the power at this point. The same condition applies at the fulcrum F_1. These examples have been given to show the relationship of the lever to the pulley. Practical problems will be given under the section devoted to wheels and pulleys.



In the above sketch of an airbrake mechanism, what pressure would be exerted at the brakeshoes B, if the air enters the cylinder A, at a pressure of 70 lbs. per sq. in.? To show more clearly the various factors entering into the solution the skeleton sketch below is given, the power arms represented by double lines, and the weight arms by heavy black lines.



The pressure exerted against the upper end of the brake lever C, is equal to the area of the piston, in sq. in., times the initial air pressure, or:

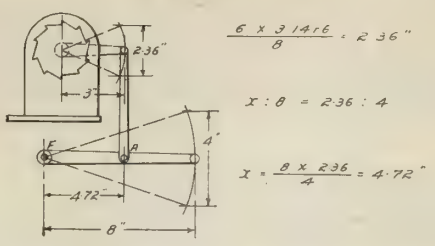
$$x = \frac{5497.8 \times 28 \times 26}{6 \times 20} = 33351 \text{ lbs.} = 16.6 \text{ tons.}$$

It has been shown in a former lesson that the force applied multiplied by the force arms, will equal the weight multiplied by the weight arms. Therefore, the pressure exerted by the brakeshoe against the wheel will be:

$$10^2 \times .7854 \times 70 = 5497.8 \text{ lbs}$$

In fitting a counter to a punch press, that has a stroke of 4 inches, it is found necessary to use an auxiliary lever to reduce the movement. This additional lever was 8 inches long, and it was desired to find the point of connection A, so as to give the proper travel to the lever on the counter.

With a 10-tooth ratchet on the counter it is necessary to have a movement



so that the pawl will just take one tooth at each stroke of the press. To provide a little over-travel and yet not enough to take two teeth, a movement of ⅛ of a revolution was deemed ample for the purpose. The travel of the outer end of the primary lever would then be approximately ⅛ of the circumference of a 6 inch circle, or 2.36 inches. The point A can then be found by proportion, and as shown above would be 4.72 inches from the fulcrum F, of the auxiliary lever.

AN ECONOMIC WAY TO HANDLE SHIPMENTS OF LONG IRON RODS

IN an installation of a Shaw Electric crane at the plant of Bayonne Bolt & Nut Co., of Bayonne, N.J., there is an important illustration of the manner in which one problem of handling material was solved by the application of a few small strands of wire.

This company receive quantities of bar stock-iron rods about twenty feet in length, and ranging in diameter from ¼ in. upward. This raw material comes in gondola cars on the company's private switches.

The unloading and stacking of the rods by hand was, however, a slow process. The rods had to be lifted, one at a time, from the cars and carried to various parts of the yard. From the flexible and yielding nature of the material the placing of a shipment was necessarily slow, and of course, expensive.

In seeking a better way to do the work an electric crane and magnet naturally suggested themselves, but the nature of the material to be handled again interposed an obstacle. With the rods lying loosely in the bottom of the car a hoisting magnet could not pick up a clean load. Some rods would hang and swing. To obviate this, the expedient of having the consigners wire the rods together in bundles of approximately a dozen, the size varying with the diameter, was adopted. With the rods in bundles the profitable use of an electric crane and a magnet became feasible and the apparatus was installed by the Shaw Electric Crane Company of New York.

With the bar stock in bundles the magnet makes a clean lift, not merely of one bundle, but of bundles up to its lifting capacity.

They are raised out of the car and piled practically at one operation. With the crane and magnet the company can now accomplish in a few minutes, work which under the old method took a gang of freight handlers hours to do. There is, besides the saving in labor, a gain in the speed of handling raw material.

Furthermore, the use of the crane permits the piling of rods to a greater height than would have been economically possible by hand work.

HOPE TO "WEIGH LIGHT"

Prof. W. W. Campbell of the Lick Observatory explains the problem of "weighing light" in his "Solar Eclipse Notes" in the Publications of the Astronomical Society of the Pacific, issued at San Francisco. Two British expeditions and at least one American expedition that went out to observe the total eclipse of the sun on May 29, expected to make their main business that of getting data to help solve the problem of weighing light. Prof. Campbell says:

"According to certain hypotheses, light radiations possess mass and are subject to gravitational disturbance. If the hypotheses in one form or another represent the truth, then rays of light proceeding from stars which are seen very nearly in the direction of the sun should be deflected from their straight-line courses, as these rays pass close to the sun and through the sun's gravitational field.

"If a ray of light coming from a star to the eclipse observer just grazes the edge of the sun but without touching the sun, it should be bent from its course in amount 0".87, according to one hypothesis, in twice this amount on another hypothesis, or not at all on a still different hypothesis. The eclipse of May 29 found the sun very favorably situated for the solution of this problem in the northern part of the Hyades cluster. A good number of stars in the photographic field, with the eclipsed sun in the centre, may be rectified with an exposure of ten seconds or less. Many eclipses will come and go before another will be so favorable in this regard."

At this writing we have no news from either the American or the British expeditions. Much other interesting scientific data may be expected when results of the eclipse observations are made known.

Government Labor Statistics.—The Alberta coal mines are calling for about 1,100 men. Returned soldiers are being asked for, and as there are many of these now in the West, incidental to the harvest, it is hoped that they will be available after the harvest for the mines. During August the Saskatchewan Labor Bureau placed 8,536 men out of 8,761 applying for work. There were out of this number, 1,264 Saskatchewan farmers who have suffered crop failure, the balance being mostly harvesters from Eastern Canada.

Harvesters for Railway Building.—The extensive railway construction going on in the Fort William district calls for a large number of men, and these are being procured from the ranks of the returning harvesters. It is estimated that at least 500 men will be drawn from this source and the railways are extending their cheap transportation for this purpose.

Transferring Your Product Efficiently

The Illustrations and Text Matter Describe How Users of Jeffery Equipment Overcame Their Haulage Problems. Perhaps You Can to Advantage Utilize Similar Methods in Your Plant

By J. H. MOORE, Associate Editor Canadian Machinery

THE problem of hauling your product from department to department is one well worthy of consideration, and the field that the electric storage battery locomotive occupies in this regard is already too well known to need comment.

Where the plant is of any real proportions an electric locomotive becomes almost a necessity if one wishes economical handling, and the purpose of this article is to present more in illustrated form than anything the advantages of such a system.

Before going on to describe these various photographs, let us first consider how one plant saved $60.00 daily by using locomotives.

The Park Falls Lumber Co. save 16 men and 18 horses each day by the use of Jeffery locomotives. This, they figure, saves them at least $60.00 every day. In some cases the track is as long as 1 mile, and a total mileage of 4 miles stretches throughout their yards.

Numerous other examples of saving could be quoted, but the one example will do in this case.

As everyone will agree, labor is scarce, making it necessary to increase the output per man. There is no doubt but what one man and a locomotive will do the work of many men, quicker, cheaper, and with less trouble and supervision.

FIG. 1—5-TON STORAGE BATTERY WITH CANOPY.

Referring to Fig. 1 we see a 5-ton locomotive equipped with canopy. It is capable of hauling 240-ton miles on level tracks on a single charge. If the battery is boosted at double normal rate for one hour in the middle of the day, it will be able to do 300-ton miles. A locomotive of this weight and battery capacity is very serviceable in climates where severe snows, storms, and low

FIG. 4—CONTRAST THE SPACE BETWEEN LOCOMOTIVE AND WAGON AND TEAM.

temperature are encountered and where haulage conditions become severe.

Fig. 2 illustrates an installation of a 5-ton Jeffery storage battery locomotive, used by the Oil Well Supply Co. of Oil City, Pa., to transfer various classes of material about their plant.

One cannot help but save money and time with such a system. It might be well to mention that these locomotives work on a track gauge of 20 inches.

The Columbia Plate Glass Co. finds this system of locomotive haulage to work to advantage, and Fig. 3 shows one such installation.

The space occupied by the industrial locomotive is also a big feature, for looking at Fig. 4 we cannot help but see that the locomotive and its train of cars do not take up as much width as the wagon and team of horses. When looking at this photo it is well to remember that the locomotive and its cars are nearest the camera, which further emphasizes the point already spoken of.

Last, but not least, we will consider Fig. 5. Here we see a view of the Seaman Sleeth Co., Allegheny, Pa., who, as can be noticed, handle considerable large castings. A Jeffery storage battery provides the hauling in this plant and results in considerable saving.

In conclusion we might say that when looking over your hauling problem, remember that the field which the industrial locomotive covers is well worthy of consideration.

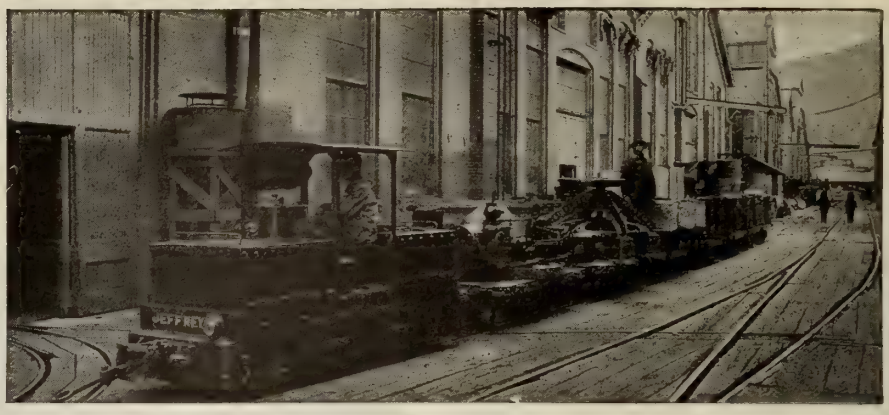


FIG. 2—A TYPICAL JEFFERY INSTALLATION.

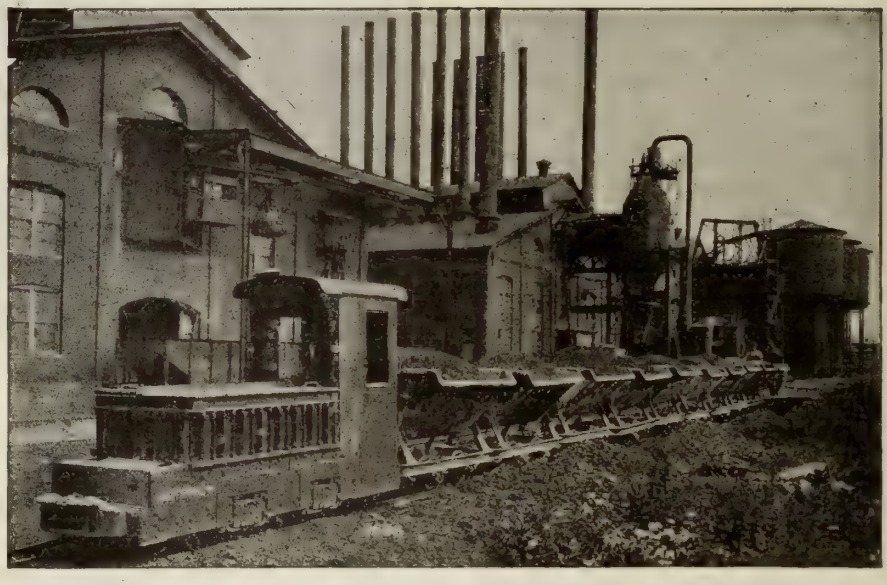


FIG. 3—AN INSTALLATION AT THE COLUMBIA PLATE GLASS CO.

FIG. 5—HOW THE SEAMAN-SLEETH CO., ALLEGHENY, PA., HAUL THEIR HEAVY CASTINGS.

DRAFTING COURSE RE-OPENS

CANADIAN MACHINERY Drafting Course reopens in the Sept. 18th issue. This will be welcome news to our many students who have been following up these studies, and now that the evenings are becoming much cooler, there is no reason why every reader interested cannot buckle down to work again, and send in his drawing plates.

When we commenced this course we hoped for considerable interest on the part of our readers, but the resulting interest shown has far exceeded our most sanguine expectations.

Students from one coast to the other are following up this course, and sending in their plates. We started to count our plates by tens, but soon hope to count them by the hundreds, as interest in these studies has grown by leaps and bounds.

You may perhaps have overlooked the possibilities of this course, and so far may not have started in to follow it up. Naturally you would not care to jump in at Part 8 without a knowledge of what came previous to this. But this fact need not deter you from entering, for we have prepared reprints of our former seven parts specially to help out such readers who did not grasp the former opportunity.

These reprints are absolutely free, and may be had for the asking.

We wish to impress readers of CANADIAN MACHINERY with the fact that our aim and object is service. This course is but **one form of our service, and originated by us.**

A course of such a nature as we are giving would cost you considerable money through any other channel, so why pay out big money for something you can secure for almost nothing?

If you are already a student make up your mind to plunge in afresh on the 18th, or if you belong to the class who have not yet started, write us for a set of reprints and get busy on this course right at the start.

We offer three prizes for the three best plates received on each part of the course, this being another feature which appeals to the reader.

We have yet to announce some prize winners on remaining plates. This will be done in our Sept 18th issue, so watch and see if your name is up in the honor roll.

WELDING AND CUTTING

The Judgment of the Oxy-Acetylene Process

The Views of the Technical Engineer on the Above Subject. Briefly, the Judgment Arrived at is That the Oxy-Acetylene Process is an Engineering Success, and a Fine Commercial Asset

By ALFRED S. KINSEY, Member A.S.M.E.

THE mechanical success of a mechanical process may depend on two factors, its utility as determined by the manufacturer, its efficiency as judged by the technical engineer. No one knows better than does the owner of the metal working plant or the superintendent of the repair shop how great the need has been for quicker and more thorough methods of manufacture and ways of making repairs, and few have looked forward with greater interest than has the mechanical engineer to the coming of safer and more efficient mechanical devices and processes. One has been the stimulus of the inventor, the other the surety of the manufacturing world.

The technical engineer's position in this progressive age requires no evaluation, his critical scientific attitude no defense. His is the problem of casting beyond the superficiality to the durability of things, from the flimsy to the substantial. Unquestionably this has produced in the engineer a conservatism, a habit of close enquiry which make for safety and success. The manufacturing world, therefore, still seeks the judgment of such a mind, and the technical engineer's endorsement is often final. It may be of interest, therefore, to learn what he thinks of such a modern process as that of oxy-acetylene welding.

Up to the advent of autogeneous welding the engineer had only his experience with the forge weld upon which to base his calculations and judgment. In a way this proved somewhat unfortunate for the new method of welding, as the forge weld had nearly lost its value as a dependable means of joining materials. Imagine two pieces of steel being brought to a soft, plastic condition in a forge fire charged with sulphur from the fuel, an excess of oxygen from the indifferently operated bellows or fan blower, the cinders and refuse of the fuel and one can readily realize the cause of weak forge welds. Such welds never were reckoned to have a tensile efficiency of more than about 50 per cent., and many observations of welds which had failed showed crystallization and even entrapped cylinders. Navy yards and many other large shops had practically abandoned the forge weld, preferring the expensive substitute of machining a job out of the solid when it was possible to do so. Serious failures of forge welds were too common. The author recalls many of these, and particularly one regarding which he assisted in a suit for damages where a hoisting hook on a city pier had parted at the weld, causing the death of a father of a family of small children. There was a demand for a safer and more efficient way to weld steel and wrought iron.

Then, too, in those earlier days, the only metals which could be welded were wrought iron and steel. There was no way to weld cast iron and the non-ferrous metals like copper, brass and aluminum. The mechanical engineer, of all men, realized these limitations. He knew that the time was ripe for a new method of welding materials.

Then came autogeneous welding and cutting by the oxy-hydrogen process, soon to be superceded by oxy-acetylene, thanks to the electric furnace's efficient method of producing calcium carbide, and making acetylene a commercial possibility. From that time, practically only about fifteen years ago, metal workers, manufacturers, engineers, nearly the whole industrial world, have eagerly watched the progress of the oxy-acetylene process.

The mechanical engineer recognized at once that there were certain fundamental principles involved in oxy-acetylene welding which were new to shop practice such as:

First, that autogeneous welding was accomplished by fusion instead of plasticity. The old method required that the metal be heated merely to a soft, pasty condition and then hammered or pressed together, while the new way was to melt the metal and flow the two ends into one mass. By the former method there would not be a thorough mingling of the grains of the metal, because it was only plastic, and besides there was every opportunity for such a weld to receive gas and fuel impurities from the forge fire. By the new process there could be nearly perfect rearrangement of the grains due to the liquid condition of the metal. The mechanical engineer recognized at once, however, that while the fusion of castings for welding would be consistent with the method of their formation, that is, that both the original metal and the weld itself would be in the cast condition, this would not be true in the case of the welding of rolled or forged wrought iron or steel. There the two pieces of rolled or forged metal would be joined by a cast weld, the former being fine grained and strong, the latter of coarse grains and reduced tensile strength. This was not a new situation to the engineer. The benefits derived from hammer refining the grains of steel are well known. An ordinary machinist hammer, therefore, proved to be the cure of this trouble, and it may be of interest to relate that in some experiments performed during the past year by the author for the Air Reduction Co., of New York, at the shops of the Baltimore & Ohio Railroad, at Marinsburg, West Virginia, and at Brunswick, Md., some worn railroad frogs which were built up by the oxy-acetylene process, and allowed to cool directly from the liquid to the solid condition, lasted only a few weeks in service but when a progressive method of building up and hammering was resorted to some of the frogs lasted over nine months in continuous severe service.

Second, that as fusion was the chief requisite of a good weld, the new process might be used to join other metals than wrought iron and steel. This opened up wonderful possibilities, new indeed to welders, for cast iron and the non-ferrous metals had not yet been welded. Would it be possible for the new welders to learn the marked differences of characteristics of steel, cast iron, copper, brass, aluminum? We

*Professor of Shop Practice, Stevens Institute of Technology, Advisory Engineer Air Reduction Company, 120 Broadway, N.Y.

have but to call to mind the work being done in the welding of iron castings alone to get an answer and to form an idea of the possibilities and value of the oxy-acetylene process for the welding of cast iron. The author recently had to do with the oxy-acetylene welding of three broken cast iron cylinders of freight locomotives, which cost $515 to weld and put in good working order, but would have cost $3,600 to replace by new cylinders if oxy-acetylene welding had not been available, leaving out of consideration the long delay in getting the locomotives back in service by the old method of making repairs as compared with the few days' lay up for welding.

Third, that the gases used in an oxy-acetylene torch operated by inexperienced welders might easily be made to lower the value of the weld. Many of the first oxyacetylene welds were badly crystallized. The engineer knew this and waited for developments. The first designs of torches were much to blame for this condition, but the inexperience of the welder was more so. It is not unusual now to find oxy-acetylene welds so homogeneous as to make it practically impossible to see any difference between the original material and its weld.

Fourth, that unusual problems of expansion and contraction must be reckoned with in the job welded by oxy-acetylene. No one would attempt to dispute this. The cautiousness of the engineer in this regard may well be understood. It has required an experimental experience to master these difficulties, but they do not stand in our way now.

Fifth.—That the heating of the oxy-acetylene weld was accomplished by the powerful quick-acting flame instead of a slow forge fire. It was readily seen that a trained eye would be required to bring about good results from the working of the metal in the molten conditions. What would happen if the metal were overheated? What if the original metal were not thoroughly melted when the molten rod was dropped upon it? A man must know more than a blacksmith about hot metals to be an oxy-acetylene welder. Could such men be gotten and could their skill be relied upon? We know the encouraging answer to these questions now, but they recall to some at least the time of not so long ago when the mechanical engineer struggled with his welders to teach them the difference between molten metal and burnt metal. We venture to say that it will be much easier to make good oxy-acetylene welders from now on than it has been heretofore.

In this connection it may be of interest to describe the results of some work performed by the author, as an effort to help win the war. At that time, as you know, there was a great need of the use of the oxy-acetylene welding and cutting of metals. Trained welders were scarce and many men were being pressed in the work without proper knowledge of the way it should be performed. At the request of those in charge of these men it became our privilege to form a night school for oxy-acetylene welders at the Twenty-Third Street Y.M.C.A., New York. The course consisted of lectures on the metallurgy and general principles of the work, followed by the actual use of the welding and cutting torches on special jobs in the shop. We took in men who were working on war orders in the shipyard and other large shops, and also other men who would learn to be welders and take positions in the shops doing war work. Over 200 men were trained the first year, about 75 per cent. of whom proved to be successful welders so far as we have been able to follow them up. It was easy to see why these men were failing in their daily labors with the torch, and their rapid advancement after a few evenings of instruction clearly proved the importance of a special training in the subject. As a more marked illustration of the value of such a training, however, we may mention an experiment in this same evening school of a special class selected from the non-essential industries. The men had been earning a livelihood as furniture salesmen, laundrymen, hat dyers, printers, bookkeepers, waiters, plasterers, signalmen, art students, saloonkeepers, etc. Seventeen out of the twenty in the class became good welders, and went to work in shipyards and shop with a zeal that was surprisingly new to them.

To continue this subject a bit further it will be apropos to call attention to the attitude of the technical engineer toward the teaching of the oxy-acetylene processes in the engineering colleges. Some of these institutions were not slow to grasp the importance of the subject. The Stevens Institute of Technology was probably the first college to take up the work. The author has lectured for about ten years on the subject as head of the department of shop practice in that institution, and some time ago we added a course of jobs to be welded by the oxy-acetylene torch which every student at Stevens has been required to take. We have heard of other engineering colleges who have introduced such a course, and we understand that Harvard's new engineering school is about to include oxy-acetylene welding in the instruction of its shop department.

In college and abroad in the world of engineering construction and repairs the technical engineer has been giving careful thought to the possibilities and advantages of oxy-acetylene welding. He has encouraged its trial in shop, foundry, and manufacturing plant. He has studied its evolution from the rough joint of doubtful value to the homogeneous weld of nearly 100 per cent. efficiency. If he has been conservative in his judgment it was because he knew better than others of the undeveloped parts of the new field being entered by the welder; if he has appeared to be slow to accept the process for the most important high-pressure and high-tension work it is because he has waited to prove that the new welder could measure up to his increased responsibility. One thing he will not do, he will not forget the inherent crudeness of the work, nor the varying personal errors of the best workmen and expect impractical refinements. A small fraction of sulphuretted hydrogen and phosphoretted hydrogen in the acetylene or a little difference in the purity of oxygen will not disturb his acquired confidence in the possibilities of a good weld by the new process. He has learned to appreciate the difference between a 50 per cent. plastic weld and a 90 per cent. fusion weld.

The author has discussed oxy-acetylene welding with many of the leading technical engineers of the country, men who are in responsible charge of immense engineering plants. Five years ago almost all of these men would have advised a delayed acceptance and further study of the advantages of the process. To-day they do not hesitate. Their minds are made up. From study and experience they speak, and because of the nature of the heat supply, which can easily be made a non-oxidizing reducing flame, because of the effect of the process on the physical efficiency of the actual weld, because of the portability of the welding apparatus, and because of the economy of the process their judgment is that the oxy-acetylene process of welding metals is an engineering success and a fine commercial asset.

AIRPLANE DEVELOPMENTS

The following statement of the National Advisory Committee for Aeronautics shows the development in airplanes which has been made since 1903. The first man-carrying airplane flights were made in December, 1903, with the Wright Bros. engine, developing 12 h.p. and weighing 152 lb., or 12.7 lb. per h.p. In 1910, the average horsepower for aeronautic engines had increased to 54, and the weight had decreased to 5.7 lb. per h.p. After another 7 years, in 1917, the average power output had advanced to 243 h.p., and the weight had decreased to 2.8 lb. per h.p.

In March, 1918, the Liberty motor developed 432 h.p. for a weight of 808 lb., or 1.86 lb., per h.p. At present, the Liberty motor is developing a maximum of 450 h.p. for a weight of 825 lb., or 1.83 lb. per h.p.

The average consumption of fuel decreased from about 0.8 lb. per h.p. in 1903 to 0.55 lb. in 1918, and for the Liberty engine to 0.50 lb. The present consumption is about 0.46 lb. per hr.

For one horsepower of energy expended $500 worth of textiles is produced, $300 worth of iron or steel, $1700 worth of printing. In the textile industries, where the cost is not exceptional, the cost per horsepower is calculated to $20 or $30, indicating a power cost of 5 per cent. of the total cost of production. Development of a river of electrical energy is suggested stretching from New England to the Southern States, and the transformation of coal to power in the mining fields, instead of transporting it over the railroads to factories far and near.

DEVELOPMENTS IN SHOP EQUIPMENT

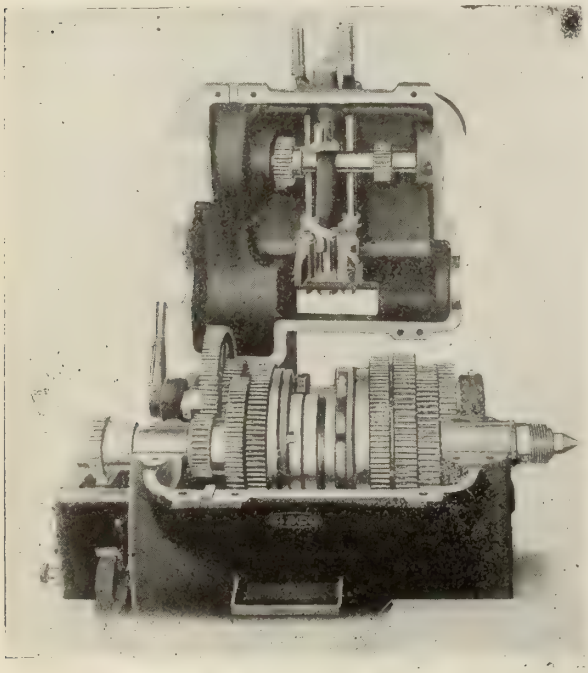
GEARED HEAD LATHES

Lathes with geared heads for either belt or motor drive are announced by the Cisco Machine Tool Co., Cincinnati. The geared head on the belt-driven machine has a double friction countershaft, one friction running 300 r.p.m. and the other 130 r.p.m. The 300 r.p.m. friction has control of 10 spindle speeds, 300 and 200 with back gears out, 214, 146, 116, 78, 54, 36, 29, and 19 with back gears in.

The 130 r.p.m. friction has control of 10 spindle speeds, 130, and 88 with back gears out and 93, 63, 50, 34, 23, 15, 12 and 8.5 with back gears in. There are four levers, including the back gear lever, required for these changes. One handle controls the friction on the spindle and two handles control the shifting of four back gears on the eccentric shaft. A pull pin in the face gear is used to run straight from the spindle when the back gears are out. The eccentric shaft lever or back gear lever meshes back gears with spindle gears. On the spindle are a friction and six gears, on the back shaft four gears, on the drive shaft two gears, all gears and spindles being of 0.40 to 0.45 carbon steel. Except the drive shaft gears, which are rawhide, all geared heads have ball bearings.

In applying the motor to the geared head a plate is placed on the top of the regular geared head with a bracket on the plate for an intermediate stud. On the intermediate stud is a rawhide intermediate gear. A pinion is placed on the motor and a gear on the drive shaft, both pinion and gear being made of steel. The gears are covered and the spindle speeds are 220 and 150 r.p.m. with back gears out and 158, 107, 86, 58, 40, 27, 21 and 14 with back gears in.

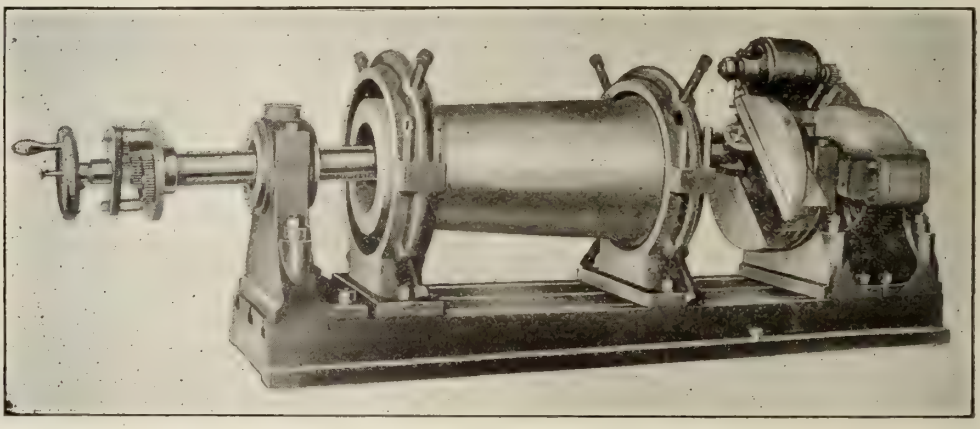
The lathes are made in four sizes, 14, 16, 18 and 24 in. For motor drive, these lathes require a 2½, 3, 5 and 7½-h.p. motor respectively. The manufacturer specifies a General Electric motor at 1,700 r.p.m. for direct current or a Westinghouse motor at 1,800 r.p.m.



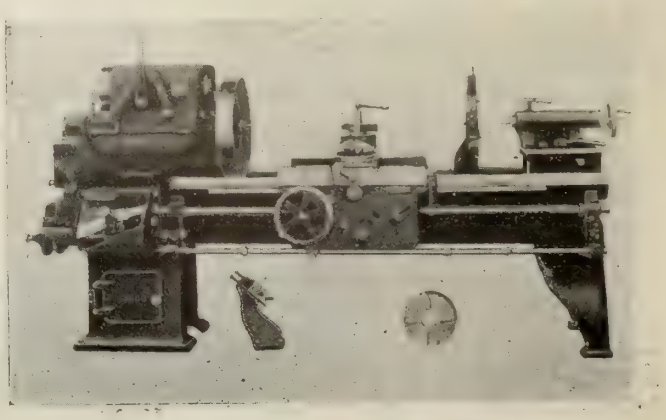
INSIDE VIEW OF GEARED HEAD.

PEDRICK TAPER BORING MACHINE

A horizontal taper hole boring machine, which is suitable for boring any taper that is ordinarily used in machine work, has been designed and built by the Pedrick Tool & Machine Co., 3639 N. Lawrence St., Philadelphia, Pa., and is here illustrated and described. The machine is simply and rigidly constructed. The boring-bar and driving mechanism are supported by three pedestals which are mounted on a bed-plate. The boring-bar is connected to a sliding block on the faceplate by means of a strongly constructed hinge joint. The degree of taper to which the work is to be bored is determined by the distance that this sliding block is moved away from the centre of the faceplate; thus it is obvious that when the sliding block is located in the centre of the faceplate, the machine is adapted for straight boring operations. The boring-bar is supported



GENERAL VIEW OF THE BORING MACHINE.

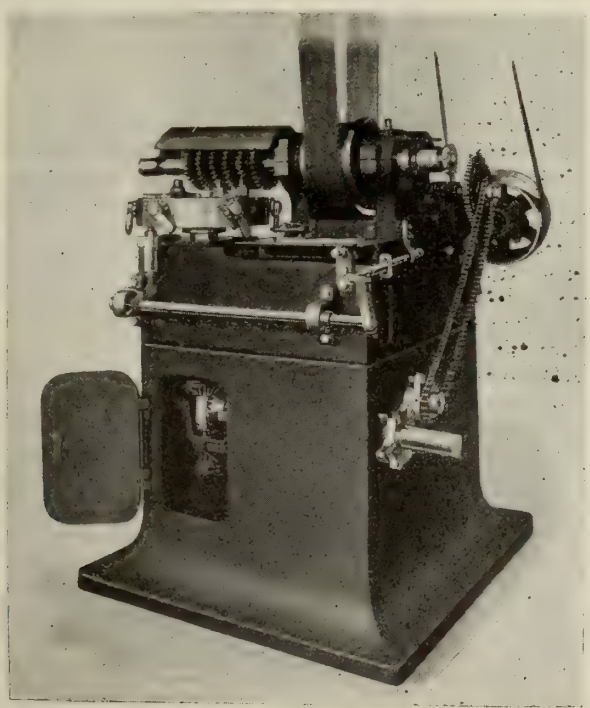


GENERAL VIEW OF THE LATHE.

in a pedestal at the rear end of the bed by a bearing which has been designed to permit the necessary oscillation or orbital movement of the boring-bar. The feed-screw which traverses the cutter-head along the boring-bar is imbedded in a grove in the boring-bar. The feeding mechanism located at the rear end of the boring-bar controls this feed-screw by means of a constant automatic movement which is changeable to permit the taking of roughing and finishing cuts. The work is supported on two steadyrests which are also mounted on the bedplate. The bedplate is 28 inches wide by 96 inches long; and the boring-bar is 3 inches in diameter. The cylinder, which is shown on the mounted machine, was bored a distance of 30 inches, the bore being 12 inches in diameter at one end and 9 inches in diameter at the other end. The machine may be equipped for either belt or motor drive.

SEMI-AUTOMATIC MILLER

The F. C. Sanford Manufacturing Co., 2060 Fairfield Ave., Bridgeport, Conn., has developed a semi-automatic milling machine for the milling of valve heads, lock nuts, or work of a like nature. This machine has a sliding head which carries the arbor, which in turn carries a gang of six side-cutting mills. The table consists of a chuck having six sets of jaws. To operate the machine the operator places the work in the first set of jaws.



GENERAL VIEW OF THE MACHINE

At the end of the reverse stroke, the chuck or table turns one-sixth of a circle and automatically locks. The head advances and No. 1 hub is faced on two sides by cutters No. 1 and No. 2. On the second stroke the table has made another one-sixth of a full turn and the second two sides of No. 1 hub are milled by cutters No. 3 and No. 4, as well as the first two sides of hub No. 2. With the third stroke, the table has made its full half turn and the last two sides of hub No. 1 are completed, the second two sides of hub No. 2 and the first two sides of hub No. 3.

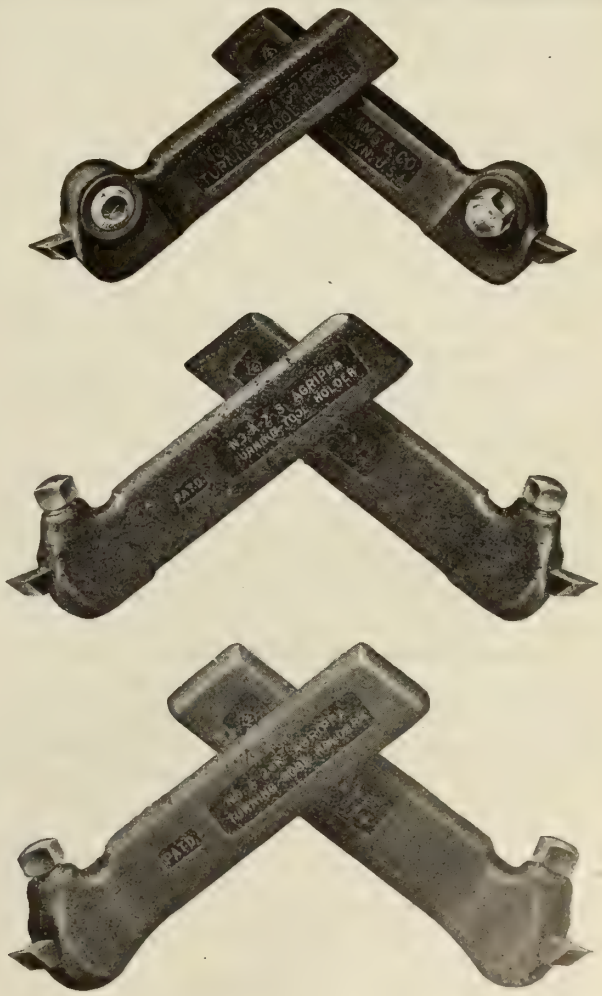
"AGRIPPA" TURNING TOOLS

J H. WILLIAMS Co., manufacturers of dropforgings and drop-forged tools with plants at Brooklyn and Buffalo, N. Y., have added a line of Set Screw Pattern Turning-Tools with right and left-hand offset and straight shanks, to their present well-known "Agrippa" Tool Holders. These latter already include a full line in a wide range of sizes for all regular machining operations: Turning, boring, planing, threading, knurling, cutting-off and side work. Several of these styles, among them turning-tools, are fitted with a cutter-fastening device in the shape of a cam (see cut) instead of the conventional set screw. The plans are furnished either of the hex head or headless type.

The nose of the holders, or shanks of both cam and set screw turning tools is broached to accurate size in special machines and provides an absolutely rigid seat for the cutter, a fundamental requirement in tool-holder efficiency.

For those who purchase cutters made of a steel rolled to the variation in size common to usual mill practice, the makers recommend turning tools of the cam-fastening pattern as giving the greatest economy, strength and economy. It is rapid and positive—the greater the pressure the tighter the lock. But the gradual rise of the cam, while providing great power, obviously limits its range of contact; consequently, where the size of steel used in cutters which are not ground to bearing size, as in turning-tools, varies beyond established limits, the markets offer this new line of Set Screw Pattern Turning Tools at the same price as for corresponding sizes of the Cam Pattern Holder.

The screws, made of a fine grade of alloy steel, are accurately machined and carefully heat-treated and hardened. They are unusually tough and strong and



beveled to permit their convenient use in close quarters. The tools are all drop-forged from a strong, tough grade of carefully selected steel and are submitted after forging, to a special heat-treatment or refining process which develops not only resistance to all wears but also the great strength necessary to overcome the pushing thrust imposed upon the cutters. The cutter-holding channel is carefully

give the maximum efficiency obtainable from this type of cutter-fastening.

"Agrippa" Cutters, made from high speed bar steel are cut to the "diamond point" form or bevel. They thus provide for the most common requirements with a minimum of grinding for either right or left-hand usage; also the full extent of economical service that distinguishes this superior line of tool holders.

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Making War on Accidents

THE farms of Ontario have more accidents than its factories.

The accidents in United States are more serious and numerous than its casualty list in the war.

That latter statement can easily be substantiated by figures taken from the nineteen months during which United States was a participant in the war.

In that period 50,150 Americans died in battle, or as a result of wounds received in action. During that same period in America, approximately 126,000 men, women and children lost their lives in accidents. Of this number two-thirds were killed in accidents outside of industrial plants.

The Census Bureau of the United States Department of Commerce keeps a close record of accidents, and it is worth while knowing just how people do get mangled and killed. Taking as a basis a group of 100,000 people, here are some of the things that have a fairly high average:—

Falls: 14.8 per 100,000, or a total in the last year for which figures are available, of 11,114.

Railroad accidents: 11.5, or 8,649 in the year under review.

Others follow in this order:—

Burns: 9.1, or in a year, 6,830.

Auto accidents: 8.9, or 6,724.

Drownings: 7.4, or in all, 5,550.

Machinery accidents caused 2,112 deaths, or 2.8 per 100,000, and this rate compared with other years, is considered high.

It is gratifying to know that real progress is being made by some firms in cutting down the number of accidents in their shops. For instance, R. G. Adair, safety engineer of the American Rolling Mill Company, at Middleton, Ohio, has been able to make a worth-while report for the first five months of the present year.

This report shows a reduction of 91.9 per cent. in the total compensation paid by the company during the period mentioned, a reduction of 46 per cent. in the total number of lost time accidents and a reduction of 51 per cent. in the total days lost as the result of accidents.

Perhaps the most striking item in the tabulation is that showing a total outlay for compensation of accidents amounting to $1.71 for the month of May, 1919, in a plant employing 3,500 men. The decrease in accidents shown in Mr. Adair's report is all the more significant in view of the fact that the 1918 figures, which are used as a basis of comparison, show a relatively low accident experience.

In the five months of 1918, compensation amounted to $20,638.22, against $1,340.26 this year, making a reduction of 91.9 per cent.

Total lost time, accidents in 1918 (5 months) 210, against 83 this year.

Total days lost in 1918, 2,523, against 868 this year.

The business of making the shop a safer place to work has made big strides in Canada. The Western mining field was for some years a leader in the business of killing men. There are rows of little black crosses dotting the foothills of the Rockies that tell their own story all too well.

But we are passing the stage where the big chance or the little chance is left open. Of course there is always the fool-killer around the premises. It seems well-nigh impossible to weed him out. A fresh batch is always on the incoming freight.

It's a great work, though, making conditions such that a man is less likely to lose a limb or his life while out making a living.

The Trade and Technical Papers

THE position and business of the trade paper is coming to be more and more recognized by those who have occasion to dig beneath the surface in any particular line, and get down to real facts.

The trade press does not appeal to the mob. It is not a political organ, nor is its purpose merely to entertain. Its mission is to present information along specific lines, to publish the views of men who have succeeded, to give methods and schemes for doing mechanical things the best and most efficient way, to make a mechanic a better mechanic or a salesman a better salesman. In reality the trade paper is the medium through which the man who wants help can get it.

In the Ohio State University Department of Electrical Engineering there is a course in industrial lighting. The literature sent out by the University has the following in regard to the assistance the University authorities are getting from the trade press. Referring to the rapidity with which accepted theories and practices are being scrapped to make room for new ideas, the University letter says:

"One result of this rapid development is that the best available textbooks are to a large extent out-of-date before they are off the press. We are, therefore, confining the work of the course mostly to these letters and to that most up-to-date form of technical literature, the trade publications. We are fortunate in the large amount of good material that is available in the lighting field."

In other words, the trade press is regarded by the Ohio State University as being of more importance than all the textbooks that are coming off the press, because it can keep up to the minute, while a textbook has to stand for certain stated beliefs, even while the procession passes along and leaves those beliefs old and without a following. Again, the University authorities can have

no ulterior motive in stating their views on the matter. They are out to secure all the information they can along certain modern problems. They want to bring to bear on their problems every bit of worth-while knowledge they can secure, and their tried experience has been that they find this material in the trade press.

That is exactly the work CANADIAN MACHINERY is trying to do. If there are new ideas being brought out, new machinery, new devices, it is our business to get them for our readers. If our readers know of new things or better things or more efficient methods than are now practised, we want to hear of them.

The trade and technical paper is the friend of the man who wants to go farther up, and the men who have succeeded in going farther up are the best friends and most constant readers of the trade and technical papers.

Ingenuity Displayed By Native Races

THE possession of a wonderful mechanical sense by more or less primitive races is referred to in an interesting manner by an editorial writer in *The Practical Engineer*, a British publication. Where native labor is employed on engineering works, cases arise where it is wise on the part of the supervising engineer to leave the overcoming of certain difficulties to the solution arrived at by the native mind. Interesting instances of the successful application of this policy are mentioned. There is the case of a dam in Egypt, which was giving trouble through leakage, though the exact spot where the weakness existed was not apparent. A native Egyptian employed on the job conceived the idea of coloring the water on the high side of the dam in order to detect the spot where the leakage appeared on the low side.

The engineering feat we hear of so frequently now of placing the centre span of a bridge by floating it on lighters to its place, and then raising it, was not unknown to the Chinese. In fact it is claimed that it was a Chinese who first utilized the buoyancy of lighters and the help of a tidal stream to place girders in this fashion.

Transporting a Lancashire boiler where there were no roads was encompassed by slinging it bodily on bamboo poles, and manning the poles with enough coolies to carry the weight. Naturally labor was cheap where this method was employed.

Transporting a vertical boiler up a hillside was done by the Chinese headman by means of what we would call parbuckling. The boiler was laid on its side and ropes were passed around it, one end of the rope being made fast to convenient trees, the other end being taken round the barrel of a winch. The winch being started winding in the rope, the boiler naturally rolled up.

This does not seem to us to be nearly so good an instance as the next one, which showed really excellent mechanical thought. This case was of a nine-ton flywheel, which had to be taken to the summit of a hill. Obviously such a wheel was too heavy to take any chances of rolling it up, as one slip would have meant disaster. The Chinese headman was told to get it up, and then left to his own devices. He immediately proceeded to drive strong stakes into the hillside at long intervals, leaving them about three feet above the surface. He then secured some screwed pipe, and screwed a flange on each end of a piece just long enough to fit over the stake. To the top flange he fitted long bars to act as capstan bars. The wheel was then raised by levers, and rollers fitted under it as it lay on its flat. The rope was attached, and the loose end passed around the improvised winch on the stake. Enough men were then placed on the capstan bars, and the order given to heave away. The men walked round and the flywheel came up the hill. When it had reached the stake it was chocked up, the rope let go, and the winch was taken bodily to the next stake. The distance apart of the stakes was limited by the length of the rope available. This was about as safe and quick a way as could have been devised by any one under the conditions prevailing, and was thought out and adopted by a man who had never heard of the principles of mechanics.

On Regulatin' Prices

IT is a joyful thing, for sure, to read in these here times of how they're treatin' profiteers to jail terms and to fines, and makin' them loose up a spell and drop their ponderous wad, and get right out to earn their bread by gougin' up the sod.

With pure delight I scan them things, I read 'em line on line, while chills of pleasure and of joy they camp upon my spine.

Ah, well, it's time some move was made to shove us folks ahead, and push away the clouds that hang and bump upon our head; it's time they made our dollar sprout like some sweet-smelling vine, for it has shrunk to most like two nickels and a dime.

I wish them men would give to me a seat upon the board that's goin' to boot the prices down and scatter out the horde. I'd like to hear 'em call me out: "Old top, come have a seat, and use your brain to regulate the price of hay and meat."

I'd wiggle my big ears, I would, and hear the widder's cry about the price of liver a-campin' far too high, and then I'd set at once to work upon my new board seat to see that folks like me and you could get enough to eat.

I'd say to them what carve the cows, the rooster and the swine, that pounds of pork chops hence shall sell for just one single dime. A luscious T-bone steak I'd mark with paint and letters bold, and tell 'em that for fifteen cents that there thing should be sold.

I'd go unto the grocery store and say: "You grocery man, just yank the prices you've struck upon each prune and fig and can, and take 'em quick from out of here; forget your glorious days, and I shall teach you, yes, by gum, to walk in humble ways."

I'd take the hands of time quite rough and wind 'em back a spell before I'd give them grocery men the high sign for to sell. The good old days, the grand old days I'd bring back with a bound, when butter dished up in a boat at 20 cents a pound.

I'd travel up and down the street, I'd visit every place, and buyers would be cheerin' me, a smile hung on their face.

And for my friends what like to smoke I'd surely do a turn, rememberin' cabbage leaves and truck and all things that would burn. The cheers would rise up like a cloud, they'd come from near and far, as I led back to life once more a good five-cent cigar.—ARK.

THIS country's big chance now is to get down to the business of production. Labor trouble is righting itself, and Canada should be in a position to go in and supply the demands of nations that must purchase immediately.

It is difficult to harden a long, thin piece of steel without considerable warping. This is due to the cooling of different parts at different times, producing internal strains. If the red-hot piece is allowed to slide into the liquid on a chute held at an angle of about 45°, it will strike the water, end foremost, and cut into it at once. This gives better results than dropping it directly from the tongs, as the latter allow it to tilt, which will keep it from cutting in sharply and delay the contact of the liquid with some parts of the surface, thus causing warping. The chute may be a piece of scrap iron or tin, about 2 ft. long, bent up on two sides as shown.

MARKET DEVELOPMENTS

Machine Tools May Go To Higher Mark

Makers Expected Reductions in Labor and Material Following the War, But They Did Not Come—Preference For British Goods in Many Places, But There is Difficulty in Getting Deliveries

THERE is business in this country for British firms, providing they can supply the material, and meet any reasonable demand for delivery. In many cases it is a fact that the price is not the determining factor. One dealer this week stated that his house was constantly coming in contact with firms that expressed a preference for British-made goods. He instanced a case where equipment is required for a ship. Here a wait of as long as six months would not be objected to provided delivery could be definitely promised. Dealers who have been handling British lines, however, report very little improvement in the matter of securing the material they want. Any improvement that can be made on the part of the British firms, it is safe to say, will meet with a quick response in this country.

The future of machine tools is just a little uncertain regarding the important matter of prices. Following the war many makers, anticipating a drop in wages and the price of raw material, made a reduction of their prices. The reduction did not come in wages and material, and the makers are growing weary waiting for signs of this taking place, although they do not wish to put prices up. New York advices state that there will be increases in many lines of machine tools that will bring them back to where they were in war days.

Canadian bar mills are well booked with business just now, in fact it is likely that when they go out after business again it will be at an increased rate.

The scrap metal market is doing a fair amount of business, and that is about all that can be said for it. Shipping that is being done by the larger dealers to points outside Canada is on contract only, and new business is not being taken on. Prices show no change, and there is some dullness hanging over the whole market.

MORE STABILITY NEEDED TO BRING MONTREAL MARKET BACK TO NORMAL

Special to CANADIAN MACHINERY.

MONTREAL, Que., September 11.—Trade conditions are still influenced by many factors that tend to extend the period of uncertainty through which we have been passing during the past season. Local labor disturbances are not of a character to seriously affect conditions, but the activity in the district reflects the unsettlement that prevails in other places. Strikes and unrest in the States have been indirectly responsible for the dullness that has prevailed in many Canadian centres, and while this is not pronounced there is every reason to believe that industrial activity would be on a larger scale if normal conditions were more uniform. Transatlantic freight traffic has been seriously handicapped through continued strikes in many of the British dockyards, resulting in delays that have been reflected on this side. Passenger sailings have been interfered with, and in consequence mail has frequently been carried by cargo steamers. The situation is improving, however, and shipping companies are generally in a position to accept all freight offered for European ports. Plenty of space is available to South American ports. Business activity is of a normal character at present but trading is invariably based on present requirements, as conditions are not conducive to the covering of future needs. Steel business is steady but sales do not indicate any large development of a specific character. The non-ferrous metal situation is quiet with normal demand. Machine tool requirement is largely for single tools, but distribution is quite extensive. Second-hand demand has shown a falling off. Scrap continues listless with the market firm.

Activity on a Pre-War Basis

"While there has been no outstanding development in the steel situation as affecting local conditions, the volume of trade is of a normal character, and compares favorably with pre-war movement," remarked a dealer to CANADIAN MACHINERY. "The present requirements of the trade would signify that the greater percentage of material demand is of a general nature and more in the way of general maintenance than the development of new activities." The feeling that industrial unrest is still a factor in the iron and steel market is still prevalent, and dealers are inclined to suppose that this will continue to be an influence in fall trading. The present movement for conciliation between capital and labor in the States is looked forward to with interest as early future conditions hinge on a satisfactory settlement of this momentous problem. However, it may be said with some assurance, that the possibility of actual strife in the steel industry is less likely now that the President has taken a hand in the matter, but time alone can show what the outcome will be. The local movement of iron and steel commodities is principally in small lots, and no particular class predominates. No price changes are reported but those prevailing are firm in character.

Metals Steady and Firm

Normal business marks the trading in metals and in face of the quiet activity of the past week the market has been devoid of feature. The requirement of the consumer is light and only immediate or near future needs are considered. Quotations in most cases are firm, with the exception of aluminum, which shows a stronger tone, but the price is still unchanged. Antimony is going better, and prices have been marked up to 10

cents per pound. This is an advance of ¼ cent over last week.

Machinery Movement Steady

Dealers continue to report a fair volume of business in light orders, this demand emphasizing the wider distribution of general trade requirements, this being a very encouraging factor in the transition period of readjustment. It is interesting to note that the balance of trade is gradually swinging around in favor of new tools, the inquiry for used equipment being less pronounced. The movement of second-hand machinery, however, is still a profitable factor of current business. Whether the difficulties associated with labor or the general changed conditions is the influencing factor, there is evidence that recent inquiry would indicate that the demand for labor-saving machines is steadily increasing. Where manufacturing is carried on on a large scale this feature is becoming emphasized. Supply demand is keeping up and prices on the average are well maintained.

Strength in Cast Scrap

The old material situation differs very little from that which has prevailed for the past several weeks. Trading is comparatively quiet and no pronounced activity is reported in any particular line. While business is not moving in any large volume the interest is sufficient to sustain the firmness in the market. There is still an uncertain atmosphere surrounding conditions in the States and this is reflected in local scrap circles. Cast iron scrap is most active and the demand is for considerable volume but well distributed. Small iron foundries are quite busy and their requirements are of a steady character. Machine cast iron has advanced $3 during the past week and local dealers are quoting $23 per ton. Stove plate shows a similar advance, the price quoted being $17 per ton. Strength has developed in wrought iron pipe, the quotation of $10 being an advance of $2 per ton. Old metal prices are holding firm on a steady but light demand. Aluminum is quoted up 3 cents, the price being 21 cents per pound.

POINTS IN WEEK'S MARKETING NOTES

New York reports that machine tool makers may announce an increase that will bring them back to war prices. After the war prices went down, anticipating a drop in wages and labor. These did not come, and makers are going to revert to war values.

—

Sale of small tools is rather dull this week.

—

Dealers report a strong preference for British-made goods, a willingness being expressed in some instances to wait for long deliveries.

—

Pittsburgh says that the chances of a strike in the steel business are becoming more remote for the present at least.

—

An advance has been made in bars by some of the makers amounting to about $2 per ton.

—

Scrap metal market is unchanged in price, and dealers are shipping only on contract.

—

For the first time in some months one Toronto warehouse has received a specification calling for acid plate.

FEELING FAVORABLE TO BRITISH TRADE

But Trouble is in Getting the Supplies Through at Present Time

TORONTO.—Weeks have been much the same lately, nothing has happened during the past few days to break the sameness. There is still a fairly good volume of business moving, and some very large contracts are being worked on just now. Warehouses have, in several cases, been asked to get ready to take care of fairly heavy specifications. If they materialize it is certain that the shops taking the work on will be well employed for the remainder of the season.

Machine Tool Prices

Although no general announcement has been made of an increase, there is a feeling in machine tool circles that a rise is likely to come in the very near future. Deliveries are not as good as they were some time ago, in fact it is a notable thing that each successive month makes delivery dates a little less satisfactory on several lines.

Again, it is pointed out that the prices of some of the machines were put down after the war by the makers, on the assumption that the prices of labor and material would soon drop. These latter things have not taken place, with the result that prices of many lines of machine tools are likely to be placed back almost at the point where they were during the period of the war, when a person had almost to have a Government order and a Government shot-gun in order to secure any of the much-wanted machine tools. It must be said that there is a tendency in many circles to keep the prices down, it being felt that further increases now will not help matters. There are times when intimation of a price increase will help to close up a lot of business that has been lying around. There is a case in point right now, where notice was given that a machine used largely in the publishing business was going to be increased in price. The selling price as a general thing has been around $2,700, and the proposed increase was going to be around the ten per cent. mark. The result seems to have been that every prospect in sight was closed with, and the firm is now swamped with the business that resulted. That is generally the way of the market, but in the machine tool field just now, salesmen find it harder to get any more for machine tools than the present lists call for.

Want Old Country Material

One large warehouse reports that it finds a strong desire to secure Old Country material in many cases.

This house reported that it ought to be easy for a British house to come in here and do business, as there are many cases where specifications ask for these lines. Dealers who have been handling British lines, in some cases exclusively, report that it is a serious matter for them to get shipments through, regardless of whether the price is too high or not. There are certain lines of steel, cutlery, etc., on which it is impossible to secure deliveries. From reports that these agencies have in this country improvement is slow in Britain, and they can see no reason for expecting anything like a real improvement in the near future.

Asking For Tenders

Some boiler work may be placed in Canada for shipment to Egypt. The specifications for this call for acid plate. This is about the first time in months that the firms asked for figures on the business have been asked to supply this particular kind of plate, as practically all the plate business is straight basic. There are not many mills where the acid process plate is turned out, and the price charged for it will be about $1.50 per hundred above the basic.

Reference was made in the markets of last week in regard to business for steel for a bridge in an Ontario city, and as far as can be learned that business has not been placed. One dealer took it at 3.10 laid down in Peterborough, and apparently depended on being able to place the business at one of the Ontario mills at a price that would allow him a profit at the 3.10. One mill replied with a 3.23 price in Peterborough, while the nearest another of those able to handle the business would come was 3.13. Just what the holder of the contract is going to do with the business remains to be seen.

There is a feeling of more confidence in the steel market, as there seems to be no likelihood of a strike at the mills for the present at least. A week or so ago the Canadian selling agents of some of the U.S. mills seemed to be certain that there would be trouble. Some of the warehouses here were none too well fixed for material, and prospects of a strike, or of a holdup of material were not pleasing. Warehouses in several cases are buying heavily at present, preferring to get their stock in good shape while they can do so, and before there is any tie-up of the transportation system. It cannot be said that they are looking for increased prices, although bars do look as though they would not stay long at present figures, one Canadian mill al-

ready having announced an increase of $2 per ton.

The Supply Market

There has not been a very brisk selling of small tools during the last week. Nearly all the dealers in this district report that trading was a little off color, and they are at a loss to give any good reason for it. It may be that the fair had interfered largely with business or that the holiday season has not been fully concluded. Business in certain of the establishments that are running to capacity, such as the automobile shops, is good, and buying is satisfactory.

Metals in Demand

The metal situation (non-ferrous) is reported satisfactory. There was just a little doubt as to the course of copper a few days ago, it being held that it was at its peak and was likely to recede. The trade here is not disturbed, electric being quoted at 26c. There is a good demand for the other metals as well, with prices unchanged.

Scrap Market Quiet

Business is fairly good in the scrap metal market, and this is about all that can be said for it. The larger dealers are shipping to the United States market, but only on contract, and no new business is being taken on for the present. It looked last week as though some reductions might be made in certain lines, as there was an apparent weakness in the lists, but this has not taken place. Rather have some places made slight increases.

Copper continues to be fairly strong. There is quite an amount of copper turnings yet in this country, the property of the U.S. Ordnance Department. A certain part of this has been disposed of, but sales have not been made against the entire holdings. As far as the shell steel scrap is concerned, the market has been cleared out, as all that the U.S. Government had stored here has been sold or removed, while that of the British Government has in a large measure been shipped back to Britain.

NOT LIKELY THAT THERE WILL BE ANY STRIKE IN STEEL MILLS AT PRESENT

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., Sept. 11.—The labor situation in the iron and steel industry is greatly improved. The universal opinion among manufacturers is that a general strike, such as was threatened, is out of the question. There may be sporadic outbreaks, as there have been in the past three months, but there may even be less of that than there was.

At no time was the balance of probability that there would be a strike. At Youngstown it was thought at one time to be "50-50," but Youngstown is the worst place in the country in that respect. It was there that the riots occurred at the beginning of 1916. Now the chances, taking the industry as a whole, are practically insignificant. Of course, no prediction can be made for any length of time, for there may be new developments eventually, but as to this particular strike that the labor agitators have been endeavoring to foment, it would have occurred before this if it was going to occur at all.

There was quite a complication of events, as detailed in last report, with the strike committee seeking to arrange a conference with Judge Gary and threatening strike if the conference were not arranged, at the same time that Samuel Gompers, President of the American Federation of Labor, with his more moderate views, returned to this country, and President Wilson issued his appeal that there be a truce in labor disputes.

The outcome was that the strike committee did not call any strike. Why they did not nobody but the labor people knows. It may have been through realization that calling a strike would not produce a strike, or through Mr. Gompers refusing on general grounds to sanction a strike, or through the issuance of the President's appeal showing that a strike would be ill-timed.

After the hand seemed to be played out the strike committee continued throwing down cards. They secured, under the headship of Mr. Gompers, an interview with President Wilson, seeking to have him endeavor to get Judge Gary into a conference, and then last Friday they sent a long telegram to the President at St. Louis, urging him to arrange a conference, and saying they had great difficulty in restaining their men at various points from striking. All along the Washington press correspondents have had the wrong view of this thing, and they seem to have taken seriously the agitators' bluff that they were having trouble keeping the men from striking. Everywhere else in the country the sun shines through the bluff, which is considered a cheap joke.

It may be taken that the whole matter rests for a time, or at least until after the conference, early in October, that the President has called, to be participated in by 15 men selected by manufacturing and financial interests, 15 labor leaders, and 15 men to be selected by the President himself. The object is to devise a solution for the whole labor matter, so that strikes and lockouts will be relegated, like wars, to the barbaric past. Naturally enough, however, one is inclined to be cynical. There have been great conferences before in Washington, aimed at accomplishing various things. However, the chief trouble is "unrest," time is passing and time has been expected to decrease the unrest.

Production

Production of pig iron at the beginning of September was at the rate of about 34,400,000 gross tons a year, against average rates of 32,650,000 tons in August, and 28,950,000 tons in July. The low point in production was at about the middle of May, since when there has been a constant increase to date. Capacity is about 44,000,000 tons a year, based on what the furnaces actually produced in 1916, working under 1916 conditions, with allowance for new furnaces completed. On that basis production now is at 78 per cent. of capacity, which would indicate 22 per cent. capacity idle. All the idle capacity, however, could not operate if they had a market for their product at present prices, because with wage rates so very high now the furnaces that employ much more labor per ton of iron produced than the generality of furnaces are at a much greater disadvantage than formerly. There was a time when the greater labor employment was more or less balanced by the much smaller capital investment, but the great advance in wages, with decreased labor efficiency, has altogether altered the balance. This might apply to something like 10 per cent. of the capacity, so that there remains a considerable volume of idle capacity that could come in if the orders were available. Such orders are not available, however, since buying now is on a limited scale. Consumers of foundry grades of iron are fairly well covered by contracts to the end of the year. Some of them are buying in a moderate way, finding that their wants are greater than anticipated when they contracted, or having concluded to end the year with a normal stock, when formerly they had counted on having practically no stock. Some sales into next year at advanced prices are reported, but the tonnages are small. There is little demand, and producers prefer to wait until they have a better line on their costs.

Steel Market Quiet

The steel market is quiet, there being only a very limited demand, as to new purchases, while on the other hand the mills have little to offer, being fairly well sold up to the end of the year. If the works that are in operation were producing normal tonnages there would be a good bit of steel available, but at nearly all plants tonnages are unsatisfactory, by reason of slackness on the part of labor. While 90 to 95 per cent. of the productive capacity is in operation, the tonnage output is 80 to 85 per cent., estimating capacities on the basis of what the mills were able to turn out in 1916, when manufacturing conditions were favorable.

Occasionally reports are circulated that this producer or that has advanced one price or another. Such advances, if actually made, are not suggestive of any general advance to come, for the leading producers are strongly opposed to advancing steel prices. On the other hand there is no prospect of any decline while conditions are as they are to-day.

Export Business

Export inquiry for blast furnace and steel mill products is about the same as formerly, which means that it is about

as good as could be expected in view of unsettlement throughout the world and the very unfavorable exchange rates on New York that prevail in several countries. Italian exchange is at a level that makes it the same as if exchange were at par and prices here were 88 per cent. higher than they are. Exchange in France is nearly as bad, and while London exchange on New York is much less distance from par, it is unfavorable enough to cause business to be held back. With a better exchange situation the export demand would be still heavier, but the exchange situation has not begun to improve, and it may get still worse.

MATERIAL AND WAGES FAILED TO COME DOWN AS TOOLMAKERS ANTICIPATED

Special to CANADIAN MACHINERY.

NEW YORK, Sept. 11—There has been a lull in machine-tool buying in the East during the past weeks, but the sales results of July and August have been quite satisfactory to a majority of American machine-tool builders. Deliveries have been extended on some lines to October and November, and despite present quietness the situation looks more promising to machine-tool builders and dealers than it has at any time this year. Some solution of the European exchange situation must eventually be found, and when this improvement comes there is bound to be a considerable demand from Europe for American machine tools. A good deal of this busines will come here because adequate financing probably cannot be arranged in any other country. The suggestion of Judge Gary, chairman of the United States Steel Corporation, in a speech at Boston that the dollar be made the basis of international exchange has been the subject of considerable comment in financial and business circles, and doubtless this or some other way will be found to restore the present unbalanced position of the money markets.

Higher prices for machine tools are expected to be announced soon by quite a number of makers. These advances will probably take effect by Sept. 15, and not later than Oct. 1, and will cover several important lines if not all. Machinery manufacturers throughout the United States have agreed that owing to the high cost of labor it will be necesary to make a general advance of from 10 to 20 per cent. This will bring many prices back to the level which prevailed during the war. The cost of machine tools under present labor conditions is from 60 to 80 per cent. labor and from 20 to 40 per cent. material. In many instances, manufacturers reduced their prices at the end of the war in the belief that labor costs would come down at least 25 per cent. This has not happened, but quite on the contrary labor costs have been steadily advancing and hours of work have been shortened in many foundries and machine shops.

The Government is now offering large lots of machine tools for sale through its various district offices, and this fact may be in some degree responsible for the falling off in demand for new tools.

PRODUCERS OF PIG IRON HOLDING IN SOME CASES FOR HIGH 1920 PRICE

BUYING of 1920 iron is meeting with difficulties. This is due to the attitude of producers, who. in many cases are refusing to make any quotations on next year iron. Some business has been closed in the East. Following are reports from U.S. points:

Philadelphia. — Producers are withdrawing from the market, or putting the price of their product on a basis that practically forbids buying. Ferro-silicon from Jackson County is unobtainable on account of labor troubles, and high silicon from Virginia is being used as a substitute. There is little buying. Sales include 500 tons Bessemer by an eastern maker, and 500 tons copper-bearing, low phosphorus at $35 furnace.

Boston.—There has been about 6,000 tons of iron placed during the week for 1920 delivery, but it has been divided among a comparatively few furnaces in small lots. Furnaces which were quoting from first half delivery have withdrawn and will now quote only on last half this year. 2.25 to 2.75 silicon for first half sold at $31.90 delivered. Same quality for last quarter $29 Buffalo.

New York.—Sales amounting to between 15,000 to 20,000 tons for first quarter 1920 have been made during the week. Prices ran from $1 to $2 higher than those for this year. Most of the business was in small lots running not over 1,000 tons. Many furnaces are withdrawing from the market for next year delivery. There is a good export inquiry, but little business is being placed.

Pittsburgh.—There is little transpiring in the market here this week, in fact this is about as quiet a week as has been seen this year. This has had some effect on prices, and 2,000 tons of No. 2 foundry sold at $26.75. Valley furnace is about 50 cents lower than recent quotations. An inquiry for 1,000 tons Bessemer is noted.

Buffalo.—The situation here is affected by the difficulty of obtaining ore. This is thought by furnace men to be only a temporary condition, but furnaces are refusing to quote on 1920 iron while this state exists. A stack that has been down since November last has been blown in.

Cleveland.—The placing of orders to fill up shortages caused by melters underestimating their requirements has caused the moving of a few small tonnages. New business is very slight, producers not wishing to quote for delivery next year, and melters holding back their inquiries till furnace men are ready to offer a price.

Chicago.—Demand holds fairly well here, a good number of melters having to come into the market to make up their requirements. Most of the furnaces are sold out, or nearly so, to the end of the year. Silicon differentials have been increased about $1 on each grade, but the basic grade remains the same. Silveries are in good demand.

Cincinnati.—Enquiries for first quarter delivery are fairly numerous, but producers are not willing to quote on these deliveries. Some malleable has been sold for 1920 delivery at an advance of $2. Car shortage is still causing inconvenience.

St. Louis.—Prices here continue firm, with a good demand for prompt shipment and over last quarter. The $27.75 schedule price with regular silicon differentials is being adhered to by some makers, but cases of shading on the differentials are not unknown. Inquiry for 1920 is represented by requests for 250 tons Southern iron for first quarter.

Birmingham.—Production in the South is increasing, and the market is stiffening too. There are about 26 furnaces now in blast. Fourth quarter delivery is the basis of most of the business being done. There is some inquiry for 1920, but no business being booked.

TRADING REPORTED VERY DULL IN "SCRAP"

THE scrap metal market seems to have struck a period of dull trading. Prices remain firm but are more or less nominal. Following are reports from various U.S. points:

Pittsburgh.—The market is in a dormant state, practically no trading being done. Dealers are not pressing sales and prices remain as they were. Government sales of shell steel have reflected conditions recently, 10,000 tons being sold at $20 to $21 delivered. Pennsylvania road is offering 20,000 tons, including 4,000 gross tons No. 1 steel rails.

Boston.—A quiet market prevails with some grades in fair demand. No. 1 machinery, turnings and borings are among these. Heavy melting steel has brought $16.50 to $17.50 from dealers. On Bessemer screw stock offered by the Government as high as $31 per gross ton was bid. Cotton ties for rebaling have sold up to $14 place of shipment.

New York.—Prices are not very clearly defined in a weak market. Stove plate and heavy melting are off about $1. A lot of 15,000 tons shell forgings were sold this week.

Philadelphia.—A much more confident feeling is evident in the market, due to

Continued on page 292

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	.....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$26 50	$26 25
Electro copper	25 50	26 00
Castings, copper	25 50	25 00
Tin	60 00	58 00
Spelter	9 75	10 00
Lead	7 25	7 00
Antimony	10 00	10 50
Aluminum	35 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld		
⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74
Standard Lapweld		
2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$16 00	$13 75
Copper, crucible	19 00	18 00
Copper, heavy	19 00	13 00
Copper wire	19 00	18 00
No. 1 machine composition	17 00	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	15 00	14 75
Yellow brass turnings	10 00	9 00
Light brass	8 00	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	21 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	23 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	17 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 50
Premier, 10¾ oz.	....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	3 25
Polishing wheels, bull-neck	2 00
Emery in kegs, American	07
Pumice, ground	3½ to 05
Emery glue	28 to 30
Tripoli composition	06 to 09
Crocus composition	08 to 10
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.06

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11
Dark colored	09
Mixed colored	10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.06
Acid, nitric	.14
Acid, sulphuric	.06
Ammonia, aqua	.15
Ammonium, carbonate	..
Ammonium, chloride	.55
Ammonium hydrosulphuret	.30
Ammonium sulphate	.15
Arsenic, white	.27
Copper, carbonate, annhy	.50
Copper, sulphate	.22
Cobalt, sulphate	.20
Iron perchloride	.40
Lead acetate	.25
Nickel ammonium sulphate	.25
Nickel carbonate	.32
Nickel sulphate	.35
Potassium carbonate	.75
Potassium sulphide (substitute)	2.25
Silver chloride (per oz.)	1.45
Silver nitrate (per oz.)	1.20
Sodium bisulphite	.15
Sodium carbonate crystals	.05
Sodium cyanide, 127-130%	.40
Sodium hydrate	.22
Sodium hyposulphite per 100 lbs.	6.00
Sodium phosphate	.18
Tin chloride	.80
Zinc chloride, C.P.	.80
Zinc sulphate	.15

Prices per lb. unless otherwise stated

THE SCRAP MARKET

Continued from page 289

the idea that labor troubles are finally settled. Machine shop turnings have brought $15, on a lot of around 5,000 tons. Stove plate was sold at $21 delivered.

Buffalo.—Sales have been few, but prices are holding firm. Mills are using up stock from their reserve, and if the labor situation was clearer buying would become free again.

Cleveland.—As users pretty well stocked up on the recent buying movement, there is little strength to the market just now. Dealers believe that the depression will soon be over and the more favorable outlook for the labor situation inclines to optimism.

Chicago.—The market here has succumbed to adverse influences and has become comatose. The combination of holidays and threatened strike proved too much for business that was weak already. The only railroad offering is 2,200 tons by the Chicago and Northwestern.

Cincinnati.—The tendency is towards weakness, and especially in heavy melting. Cast borings are off about 50 cents a ton. Prices on other grades do not represent real quotations.

Birmingham. — Although consumers are offering better prices for heavy melting they are still $3 below the dealers' demand. No. 1 cast is in good demand and a little more life is apparent generally. Prices are stiffening on most grades.

MONTREAL NOTES OF THE WEEK

The Montreal officials and staff of the Canadian Export Paper Company, to the number of about fifty, spent a pleasant holiday on Labor Day at Grand Mere, Quebec, as the guests of the Laurentide Company, Limited.

* * *

Montreal citizens are again confronted with an advance in tram fares, the most recent demand on the people going into effect on the 15th of the month. The basis of the new rates will be a 7 cent cash fare, or 4 tickets for 25 cents.

* * *

Jenkins Bros., Montreal, have recently obtained a large order for valves from Cuba. It has been learned that considerable business in this connection is developing from South America and the West Indies. Plenty of shipping space is available for export in this direction.

* * *

Clarence I. de Sola, the Belgian Council in Montreal, has been honored with the Belgian knighthood by King Albert, being created Chevalier of the Order of Leopold in recognition of his valuable services to Belgium during the war. This title is the highest in the power of the Belgian monarch to bestow.

* * *

The municipal authorities of Sydney, N.S., have drafted a resolution for presentation at Ottawa, asking that a Royal Commission be appointed at once to probe the situation surrounding the closing down of the steel plant. The city is desirous of knowing when the works will be reopened, as many of the skilled workers are leaving the city.

* * *

Owing to the delays in sailings of passenger and mail steamers, caused by the labor troubles in British ports, the Canadian and British Governments are utilizing fast freighters for the transmission of mails. Recent fogs have held up some passenger boats as long as 50 hours, lengthening the journey from port to port to about 9 days, the time taken by a fast cargo vessel.

* * *

A record for quick loading of a cargo vessel has just been made at the port of Montreal, when the McLean-Kennedy freighter S. S. Alston was completely loaded with 7,000 tons of general cargo in 2½ days. It is generally conceded that Montreal port clears vessels two days quicker than New York or Philadelphia, but this recent loading is an outstanding achievement for vessel loading.

* * *

From a statement recently made by an official of the Canadian Pacific Ocean Service, there is every reason to believe that there is plenty of space available for the export of Canadian products. As a matter of fact, many shipping firms are looking for cargoes, and it would appear that the cry of exporters of lack of shipping space, due to the requirements of the Ministry of Shipping, is not warranted.

* * *

The Fraser, Brace Shipyards are deepening the basin in which they have recently been constructing wooden vessels for the Imperial Munitions Board and the French Government, and intend to make the present location into a permanent dry dock for the repairs and building of lake vessels. It is likewise possible that a plant will be erected for the construction of steel vessels for lake service; negotiations are now on for work of this character.

* * *

Announcement has been made that the plans and specifications for the new dry dock for Louisburg harbor have recently been completed and that they are now before the Federal Government for approval. When this has been given it is expected that work will be commenced at the earliest possible moment. About 800 men will be employed in the construction of the work. English capital is largely interested in the development.

* * *

The Montreal General Tool Company are now manufacturing the "Victory" water heating system, and they have constructed a system at the factory for demonstration purposes. They will carry on this new development in conjunction with their line of Talbot boilers, which are oil-fired. They have already obtained a large contract for installation in a new church to be erected in Notre Dame de Grace. This will be the first installation of its kind in Canada the fuel being crude oil.

* * *

W. A. Downing has accepted a position as sales manager with the Cutter and Wood Supply Company, of Boston, Mass. For the past three and a half years Mr. Downing has been associated with the Geo. F. Foss Machinery and Supply Co., of Montreal, in the joint capacity of manager of the small tool department and general advertising. Prior to his connection with the Foss organization he specialized in small tool equipment, acting in various capacities with many of the leading American can manufacturers.

* * *

A. G. Clark, who has been accountant for the Geo. F. Foss Machinery and Supply Co. for the past five years, will succeed W. A. Downing as manager of the small tool department.

* * *

A remarkable and commendable record for rehabilitation has been made by the Canadian Pacific Railway, as official reports up until the end of August show that this company has more returned men now employed than left the company for service overseas. The total number of men reported as joining the army was 10,538, and of this number over 1,000 have died, nearly 2,000 were wounded, and 5,024 have been re-employed. In addition to this 5,543 soldiers have been given employment who were not previously working with this company. This makes a total of returned men now working with the C.P.R. of 10,567. The policy of the company has been to re-engage the men in positions equally as good as the ones they left, and wherever possible the men are taken back to the same jobs that they had prior to enlisting, or others of a similar character.

Organization of Traders.—The Canadian Association of British Manufacturers and their representatives held their first meeting at the King Edward Hotel, Toronto, within the last few days. The membership is composed of between 300 and 400 British firms at present, but a drive will shortly be made to secure additional members. The meeting was presided over by John Wilson, who said in his address that in the opinion of some of the more optimistic members, the association was likely to become as influential as the Canadian Manufacturers' Association.

Industry for Sarnia.—The Loughead Machine Shop here has been purchased by the Seagrave, Ltd., manufacturers of motor trucks and firefighting apparatus. The new concern, which has several establishments in the U.S. and Canada, will be capitalized at $200,000, one quarter of which will be open to local investors.

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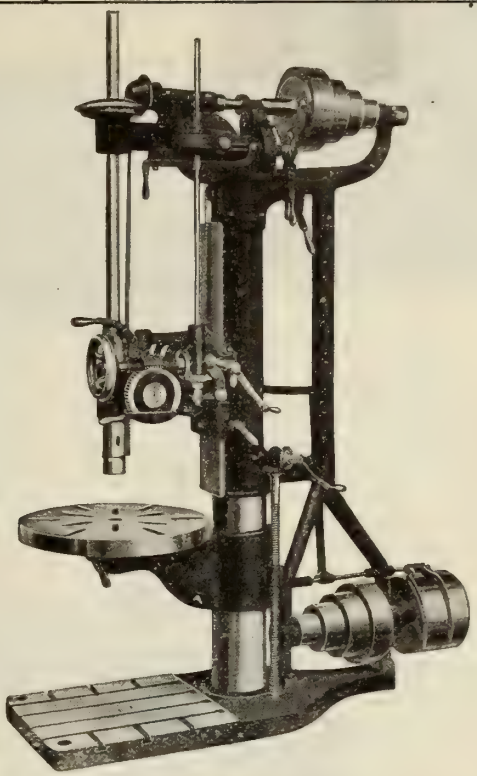

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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES

TRADE GOSSIP

New Brantford Factory.—A building for the purpose of manufacturing small motors and electric fans will be put up in Brantford by the Robbins & Meyers Co., of Springfield, Ohio.

Wants Information.—J. L. Perry, lumberman, of Westchester, Nova Scotia, wants to secure catalogues and literature from Canadian firms dealing in mill or woodworking machinery.

Oil Fire at Halifax.—The stills of the Imperial Oil Company at Woodside, opposite Halifax, were visited by fire, but fortunately it was extinguished by the company's own fire-fighting force before much damage was done. The company have a very large plant at Woodside, covering many acres of ground.

Motor Fuel for France.—Germany has to supply France with 30,000 tons of benzol annually under the Peace Treaty. The Government committee on petroleum proposes that this benzol shall be mixed with alcohol in the proportion of half and half, making a cheap national fuel suitable for car, truck or tractor.

Sugar for Canada.—There are four of the Canadian Government merchant fleet at present loading or on their way to this country with sugar. The total amount to be brought in during September will be 12,400 tons. The total for the season will be 32,000 tons. Almost all of this sugar is brought from Cuba.

Choice of Buildings.—The ratepayers of London will vote in January next on the question of spending $700,000 on an enlarged City Hall or build a $250,000 office building on the site of the temporary City Hall. The Mayor favors the office building, as, he says, the present day trend is towards municipal buildings for purely utilitarian purposes.

Up in the Air.—Through a strike of firemen operating the light, heat and power plant of the fifty-storey Metropolitan Life Insurance building, the occupants were cut off from communication with the ground except by means of the stairs. This lasted for about an hour, when a crew of strike-breakers were secured to take care of the 5 o'clock exodus.

Profitable Year for Municipal Line.—The auditors employed on the London & Port Stanley Railway have nearly completed their work, and it is understood that the result of the year's working will prove eminently satisfactory. This line, which is looked on as a kind of model for the proposed Hydro Radial lines, is keenly observed by the whole province.

Big Deal in Oil Stock.—The Commonwealth Petroleum Corporation, a newly-formed New York syndicate, has acquired the interests of Andrew Weir, now Lord Inverforth. Lord Inverforth was one of the largest shareholders in the Union Oil Company of California. The number of shares held by him was 37,500, which the Commonwealth Corporation bought at the rate of $160 per share, a total price of $6,000,000.

To Urge 36 Hours a Week.—The delegates of the Trades and Labor Council of Vancouver, recently organized by the international unions, are about to attend the conference of employers and employees at Ottawa. Their platform will consist of a demand for a 36-hour week, recognition of labor unions and collective bargaining, and the establishment by the various provinces, and not by the Dominion, of a minimum wage.

Britain and Canadian Cheese.—The British Ministry of Food has cabled the Canadian Government, stating that the Food Controller in Britain has definitely decided not to purchase the balance of this season's cheese after 20,000 tons have been secured. Any Canadian cheese imported into Britain after that will be governed by the maximum importers' selling price, as fixed by the British Government, which is at present 28c per pound.

The Victor Tool Co., Waynesboro, Pa., have recently made connections with the J. R. Stone Tool & Supply Company, 997 Woodward Ave., Detroit, Michigan, appointing them exclusive agents for the State of Michigan. They will handle the entire line of self-opening die heads, collapsible and adjustable taps, reamer holders and nut facing machines, and will carry a stock of these tools in their Detroit office in order to serve the trade promptly.

Labor Bodies Federate.—The labor interests in Brantford got together and held a meeting at which it was decided that the metal trades council, the Independent Labor party, and the various trade unions in the city will co-operate for political and other purposes. The Grand Army of Canada and the Great War Veterans were invited to affiliate with the labor men, and in the event of their constitutions preventing this, the invitation was extended to individual members of these bodies.

New Contracts.—A contract has just been concluded by the Department of Marine with the Collingwood Shipbuilding Co. for the construction of two ships of 3,750 tons each for the Canadian commercial fleet. The price is $180 per ton. Four similar ships were built by this company in war time, and the price then was $205 per ton. A contract has also been concluded with the Dominion Shipbuilding Co., of Toronto, for two ships of 3,500 tons each at the same price, $180 per ton. The above are the only contracts arranged for at present.

Drop of Nickel Output—The mineral production record of Ontario shows a decrease since the signing of the armistice. In the first half of this year the production of nickel matte dropped to 7,072 tons, as compared with 21,393 tons in 1918. The shrinkage of prices brought the value of the output down from $12,385,950 in the first half of 1918, to $3,535,915 for the first of 1919. A decrease was also noted in copper matte and silver, the latter being due to smaller output. The estimated value of all minerals was $18,759,000, as compared to $31,574,000 in the first half of 1918.

Vanadium Steel Co.—The "Financial Review" of August 30 says: The most active issue on the N. Y. Curb during the week has been the Vanadium Steel Company of America. This company has secured through purchase the mines and other physical properties of the American Vanadium Company. J. Leonard Replogle, Charles M. Schwab and Allan A. Ryan & Company, were the actual purchasers. The board of directors will comprise the above and T. Coleman du Pont and Harry Payne Whitney. Capital stock is 280,000 shares of no par value. This corporation controls about 95 per cent. of all vanadium produced. The Ford Motor Company is one of its largest customers. Mr. du Pont is interested in the General Motors Company and A. A. Ryan & Company, in the Stutz Company. The shares are quoted around $39.

MARINE

Port Colborne.—The tug Alert, which was sunk and turned bottom upward recently near Port Robinson in about 25 feet of water, was successfully raised by the Lebeau Wrecking Company and taken to Port Dalhousie for repairs.

St. John, N.B.—The St. John Dry Dock and Shipbuilding Company have purchased the dredge "Leaconfield." This vessel was formerly owned by E. O. Leahay and will be employed by the dry-

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Have overcome all the expense and annoyance of tapping screw threads with a solid tap.

Anyone doing thread tapping knows what backing out a solid tap each time means. It usually means low production, poor threads, and worn out taps.

The mechanism of the Geometric Taps takes care of adjustment to correct diameter each time a thread is tapped, it collapses the chasers automatically, leaving a thread clean cut and perfect.

The chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

The manufacturers of the Geometric line of Collapsing Taps and Self-opening Die Heads are justly proud of the distinction which is theirs:—

The Originators
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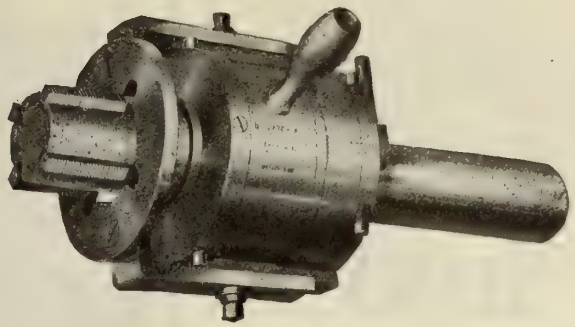
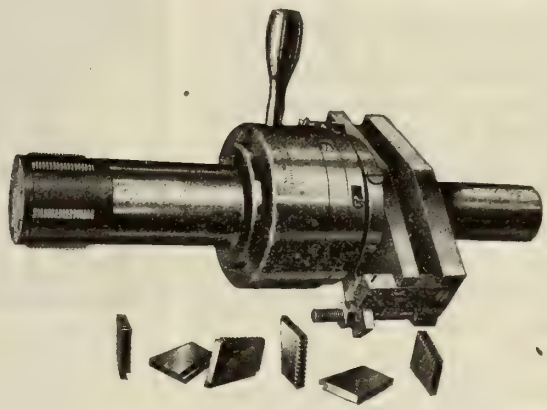
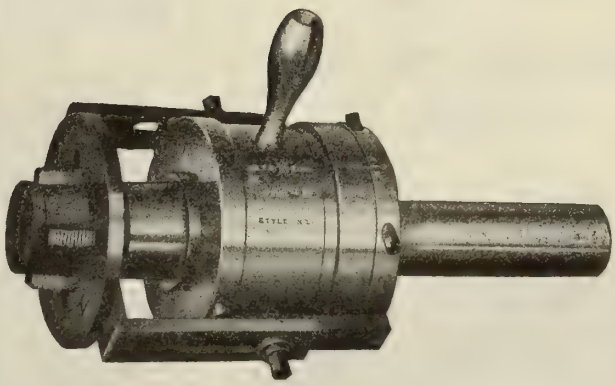
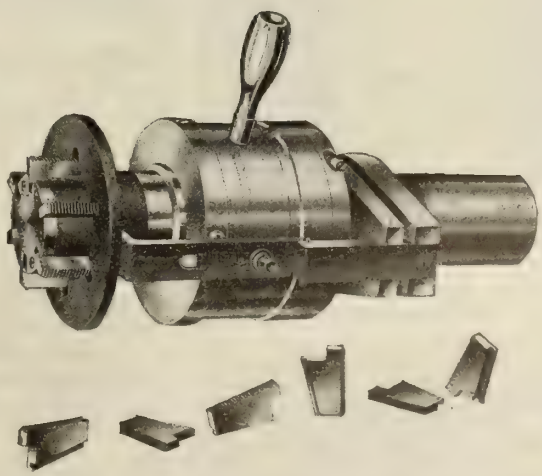
Largest and Best Known Manufacturers
of
Automatic Threading Tools

For cutting all classes of screw threads, internal and external, of any diameter and form.









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Wanted representing agents and merchants to sell and represent firm manufacturing Milling Cutters, Twist Drills, Reamers, Lathe Tools, Planer Tools, High Speed Steel and Alloy Tools, and Merchants' Tools. Good terms and discounts for selling or representing offered. Apply Lawton Bros., Woodseats Engineering Works, Sheffield, England. c13m

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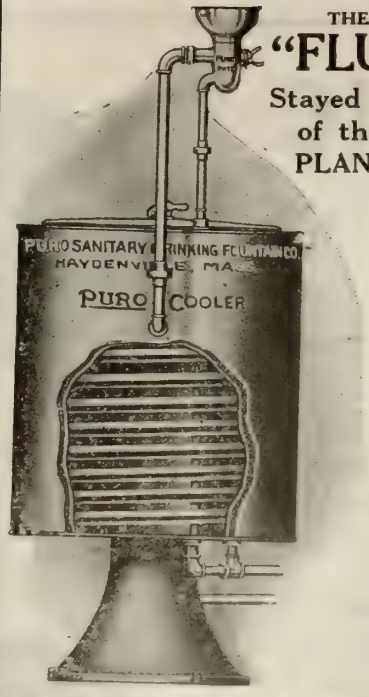

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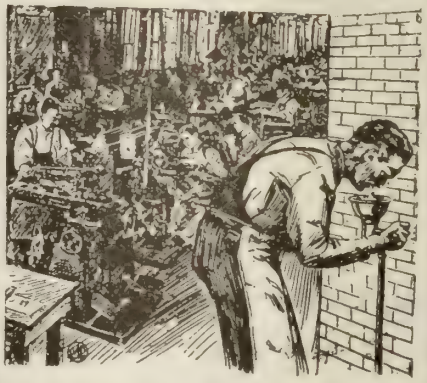

dock company on excavation work in connection with their operations.

Toronto. — The Canadian Government now has fourteen vessels carrying Canadian produce and manufactured articles all over the globe, and before the winter is over expects to have thirty-one vessels in commission. The operating policy of these vessels is to make them supplemental to private tonnage, and not a competitive one.

St. Catharines.—The "Dalhousie City" was unable to make her usual trip to Toronto from Port Dalhousie owing to propeller trouble. The dry dock at Port Dalhousie was engaged, preventing her being put in there for examination. Failing the necessary repairs being carried out expeditiously another steamer will be engaged to carry on the run.

SYDNEY, N.S.—A new drydock for the harbor of Louisbourg will be started by the beginning of 1920. The dock will cost $5,000,000 and the capital interested will be mostly English. Plans and specifications have been placed before the Federal Government, and the signing of a subsidy contract is all that is necessary, previous to work being commenced.

London.—The firm of Harland & Wolff are still expanding. They have now acquired two more yards on the Clyde, those of D. & W. Henderson Ltd., and A. & J. Inglis. They recently acquired the yard of Caird & Company, and are said to be interested in other Clyde yards. They are now strongly entrenched in Liverpool, Southampton, on the Clyde, and at their original works at Belfast.

New York.—Captain W. Hays, of the famous "Olympic," is coming to the States to enjoy a vacation on a New Jersey farm. Capt. Hays wears the Distinguished Service Medal for the services he performed in his gallant ship. She transported 250,000 troops, bagged five German submarines, and travelled 350,000 miles without convoy and without accident.

Ogdensburg.—The crew of the steamer "Toltec," of Buffalo, were landed at Ogdensburg by the Canadian Government steamer "Alert." The "Toltec," which was a wooden vessel, was on a voyage from Montreal to Buffalo in ballast, when fire broke out in the engine room. It spread so rapidly that nothing could be done to suppress it, and the vessel was beached near Prescott. The "Toltec" was owned by the O'Hagen Co., of Detroit.

Montreal.—The "Lake Fibre," built at Toledo, is now in Montreal loading a cargo of Canadian food products for Glasgow, Liverpool and London. The "Lake Fibre" is under the control of the United States Shipping Board and is one of the smallest of the ocean-going boats built on the lakes. She is of 1,588 tons net register, and her deadweight capacity is only 2,500 tons. She is fitted with oil-fuel and her winches are driven by gasoline engines.

Improvements at Water Front — The Toronto Harbor Commission have under consideration the construction of improving the harbor facilities in front of the Exhibition grounds. The idea is to construct a retaining wall at which ferry boats could land passengers from the city, and embark returning visitors for transportation to the city. The chief engineer will present a report shortly on the probable cost of the undertaking.

Montreal.—That there is plenty of cargo space available for shipments going to England is the statement of shipping company's officials. According to these gentlemen shipowners are looking for cargoes, and they are at a loss to find any explanation for the cry that has been going up about lack of space. The British Ministry of Shipping has cabled Canadian offices that they expect to be

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Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.
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Including
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Handy and Durable

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Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

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DRAW CUT SHAPERS
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satisfied with 50 per cent. space instead of the 60 per cent. they have been using.

Halifax.—Work at the Halifax shipyards is being carried on vigorously. The office and stores building are completed as far as the exterior work is concerned,. The concrete retaining wall is being rapidly completed and the bridge over the railroad tracks to give access to the dock and shipyard is now floored and the sidewalks put in. A flight of steps will lead from this bridge to the north ferry. The steamer ferry "Scotia" is in the dry dock receiving an additional fifteen feet to her deck.

Kingston.—The "Cabotia," which went ashore on the Main Ducks, about 500 yards from the lighthouse, is in about 12 feet of water and resting on rock. She is a total wreck, being full of water, and her stern opened up very badly. The Donnelly Wrecking Co.'s steamer Cornwall hastened to her assistance when she first went ashore, but owing to the high seas could not get alongside of her for some hours. She then took off the captain and crew and such equipment as could be readily handled. The cargo will be salved as soon as arrangements are made with the underwriters.

PERSONALS

Byron F. Stowell, for many years connected with the Hendee Mfg. Co., of Springfield, Mass., as master mechanic and mechanical engineer, is now associated with the Napier Saw Works, Inc., of Springfield, Mass., as mechanical engineer.

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STEEL SALESMAN—EXPERIENCED IN HIGH grade steel specialties including Tool Steel and Alloyed Steels. Man who knows the game and trade, and has the experience and confidence in himself to make a real position for himself. State age, experience and salary in first letter. Address Box No. 629, Canadian Machinery. (c11m)

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1—16″ Shaper.
1—20″ Shaper.
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1—No. 1½ Cincinnati Universal Miller.
1—No. 2 Ford-Smith Miller.
2—20″ Drills.
1—22″ x 10′ Engine Lathe.
1—24″ x 10′ Engine Lathe.
1—24″ x 40″ x 20′ Gap Lathe.
1—10,000-lb. Olsen Testing Machine.

Charles P. Archibald & Co.
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BRASS ROD For Sale

At a Very Attractive Price

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Round Brass Rod

Mill lengths of the following sizes:—		Diameter
30,000 lbs...	.250″	¼″
24,500 lbs...	.533″	Abt. .17/32″
62,500 lbs...	.625″	⅝″
73,250 lbs...	.750″	¾″
27,500 lbs...	.9375″	15/16″
46,750 lbs...	1.000″	1″
45,000 lbs...	1,250″	1¼″
26,000 lbs...	1.375″	1⅜″
39,000 lbs...	2.000″	2″

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1—"Used" Plate Punch and Shear 36″ gap, capacity ⅞″ hole in ⅞″ plate
—also—
1—"Used" Air Compressor, steam actuated — compound steam—simple air —12″ x 12″ cylinder.

Both machines must be modern in design and in good operating condition. Offers with full details, price and shipping point, will be considered.

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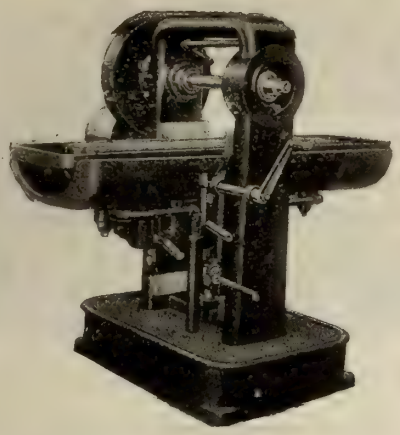

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BREAKING PRODUCTION RECORDS

In the **Weston-Mott Co.**, Flint, Mich., Gooley & Edlund finished 2,500 parts in 10 hours. Cutting depth of 15/16" in 6 cuts. Allowable error being only .005".

National Twist Drill Co. vouches for **Briggs Millers,** using 10 to 12 cutter blanks at a time, ¾" face, 2¼" diameter, 20 teeth to the blank, one production averages 50 to 55 blanks in 10 hours.

This is easy for the Briggs. Its rigid, bridge-like arbor support enables it to drive any cutter through the metal at top speed.

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GENERATOR K.W.	Make	R.P.M.	ENGINE Cylinder Dimensions	Make
7	General Electric	550	5 x 4½ in.	Gen. Electric
7½	Fairbanks-Morse	350	8 x 10 in.	Fairbanks-Morse
10		525	5½ x 5 in.	
15	Western Electric	800		Fuller Co.
25	United Electric	325	8 x 10 in.	Robb-Armstrong
30	Westinghouse	350	9 x 15 x 9 in.	Westinghouse
50	Bullock	275	125 H.P.	Phoenix
50	General Electric	275	12 x 12 in.	Payne
52	Bullock	300	13 x 12 in.	Armington-Sims
62½	Westinghouse			Robb-Armstrong
75	Westinghouse	750		Robb-Armstrong
150	Crocker-Wheeler	225	18 x 17 in.	Harrisburg-Fleming
150		425	225 H.P.	Belliss & Morcom
200	Western Electric		16 x 24 x 24 in.	Robb Engin'g

220/250 VOLTS:

60	Thompson-Ryan	275	13 x 12 in. McEwen
62½	Westinghouse	275	9 x 15 x 12 in Ide
75	Allis-Chalmers-Bullock	275	11-18 x 11 in. Shepherd
75	Crocker-Wheeler	275	Fleming-Harrisburg
75	Bullock	275	13 x 14 in. Robb-Armstrong
130	Crocker-Wheeler	225	Buffalo Twin
150	Fort Wayne	165	16 x 24 in. Diesel
150	Can. Gen. Electric	230	17 x 16 in. Leonard
160	Bullock	160	16 x 24 in. Diesel
175	Thompson-Ryan	200	19 x 20 in. McEwen
200	Gen. Electric	150	20 x 24 in. McIntosh-Hemphill
250	Westinghouse	200	Phoenix
570	Fort Wayne	90	22-38 x 48 in. Bates
850	Westinghouse	80-90	26½ x 44¾ in. Allis-Chalmers

500/550 VOLTS:

300	Thompson-Ryan	150	24 x 22 in. McEwen
500	Westinghouse	90	30 x 48 in. Cooper-Corliss

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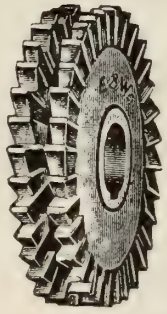

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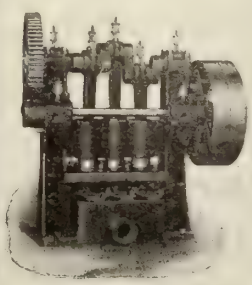

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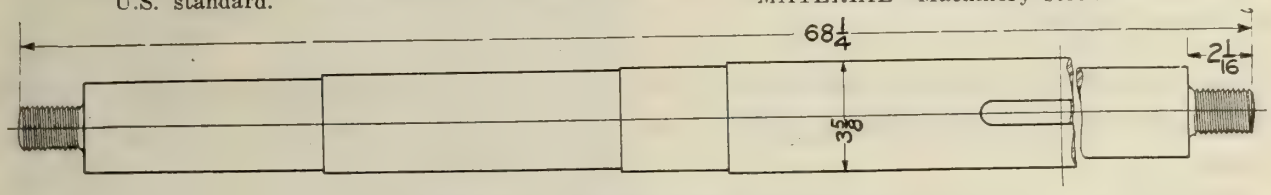
Will give you a short cut to lower-cost thread milling.
Study the blue print and time study as given below.

MACHINE—Smalley-General Thread Miller No. 2.
THREAD—1½ in. diameter, 2 1-16 length, 6 pitch U.S. standard.

PIECE MILLED—Axle for tractor.
MILLING FEED—4.35 per minute.
MATERIAL—Machinery steel.



Tractor Axle Operation
TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the centre and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

Consult us on every phase of Thread Milling.

We will show you how to cut the costs.

Smalley - General Co., Inc., Bay City, Michigan

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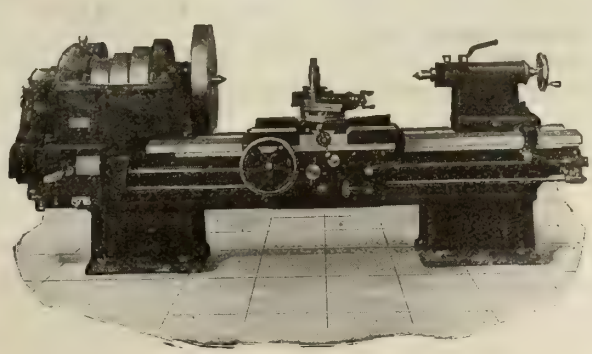
Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

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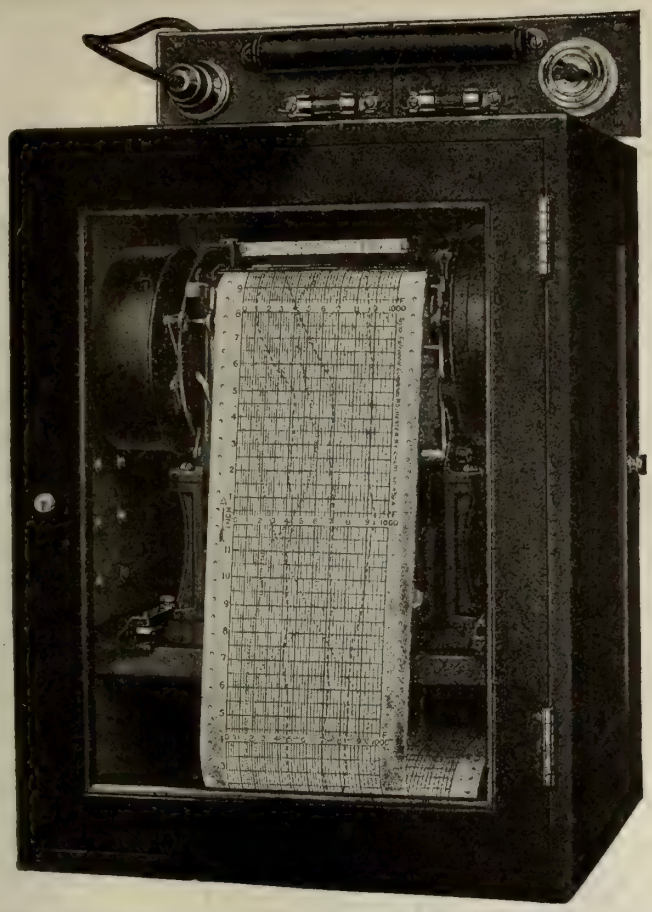

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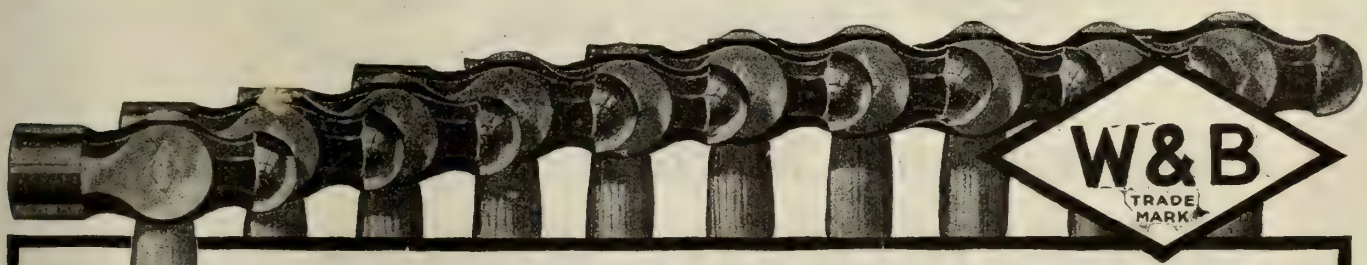

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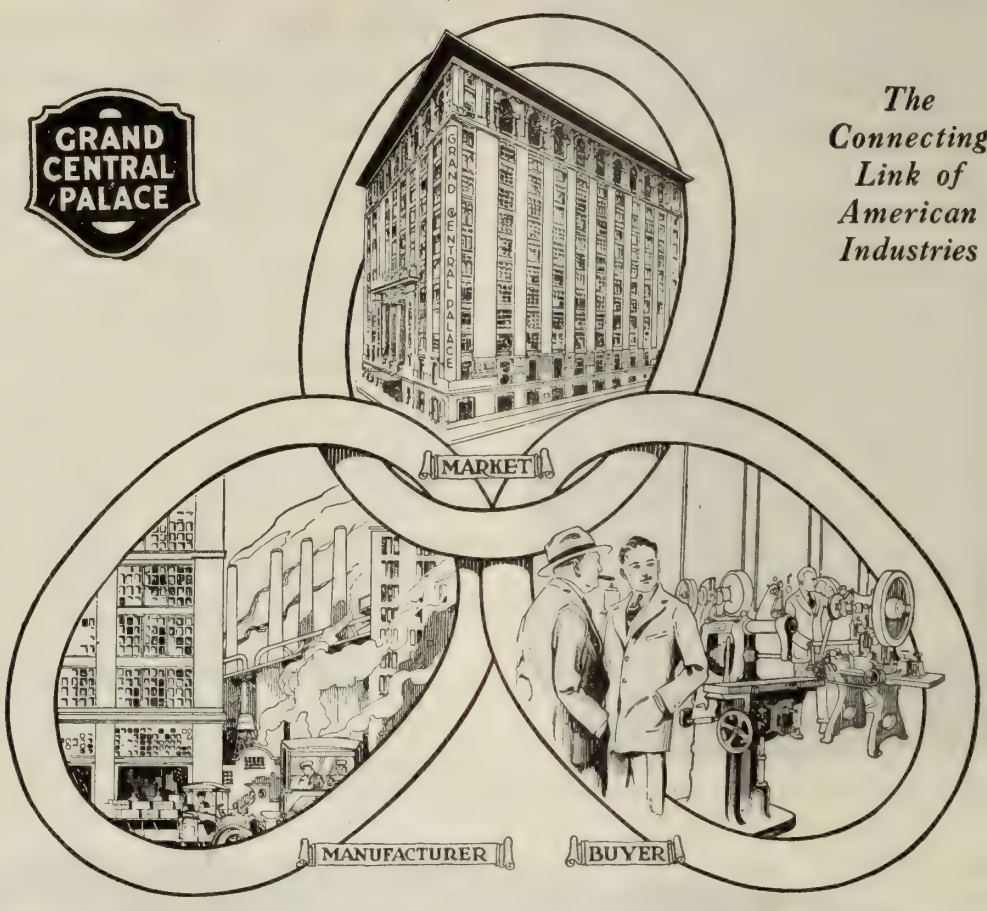

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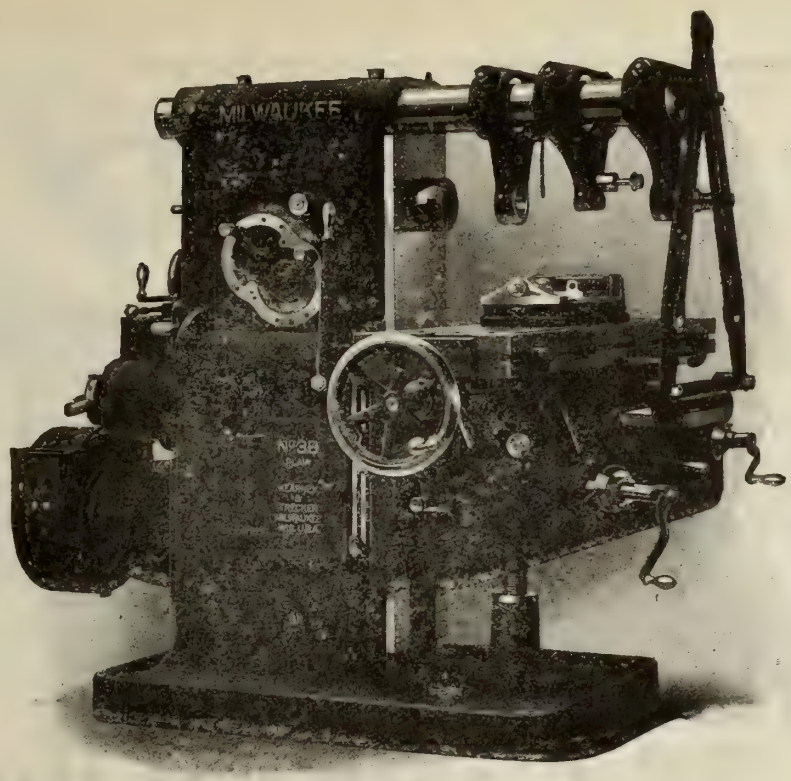

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Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

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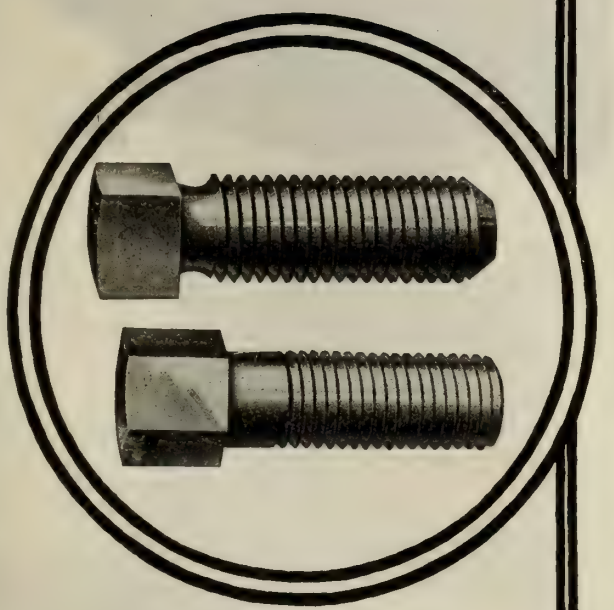

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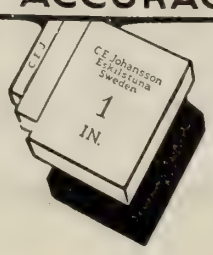

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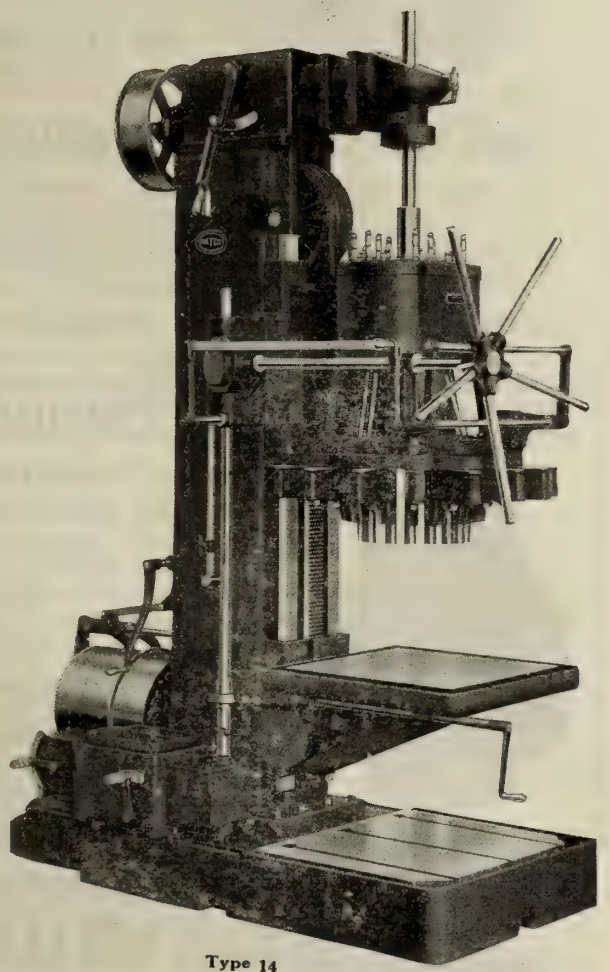
NATCO

Multi-Drillers

Multi-Tappers



Type 14

The Multi-Driller That Individualizes The Drill

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NATCOS are built in 11 sizes ranging from 2 to 72 spindles

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The National Automatic Tool Co.

Richmond, Indiana

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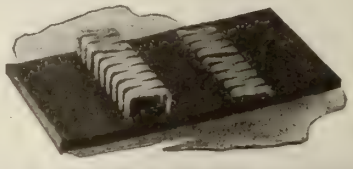

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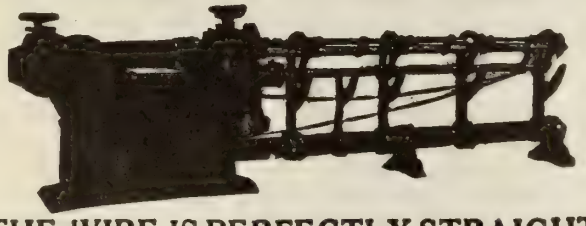

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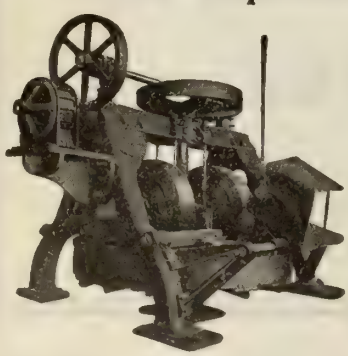

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Unloading Device
Motor or Belt Drive
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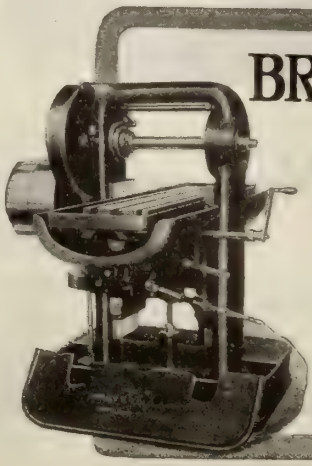

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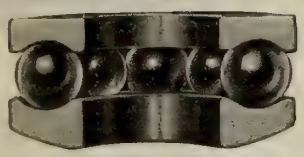

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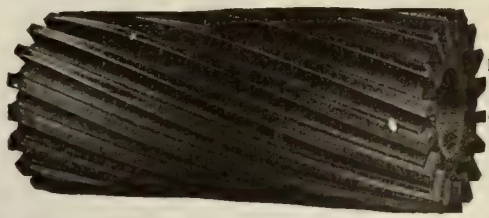

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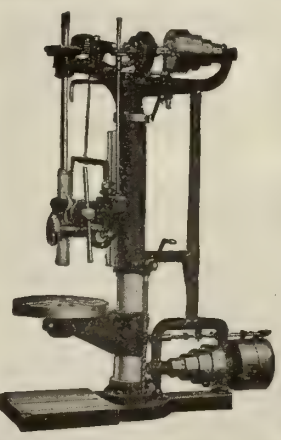

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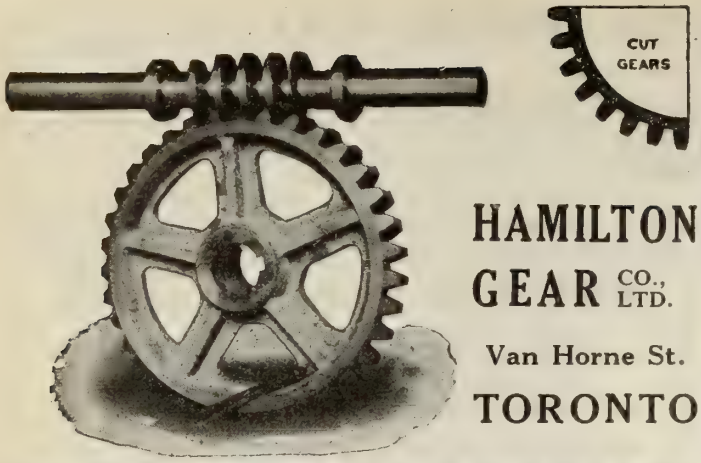

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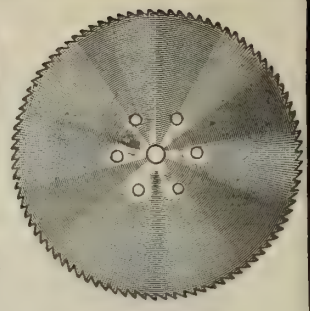

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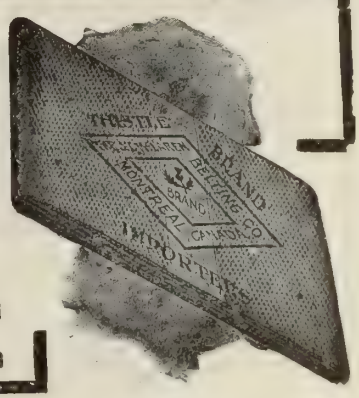

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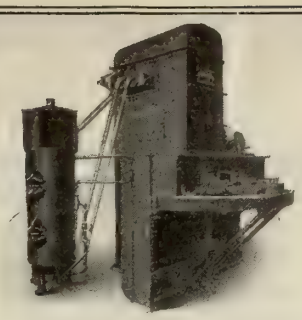

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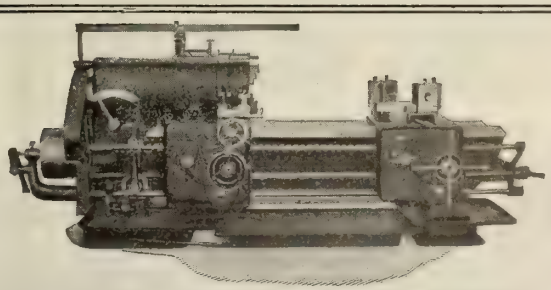

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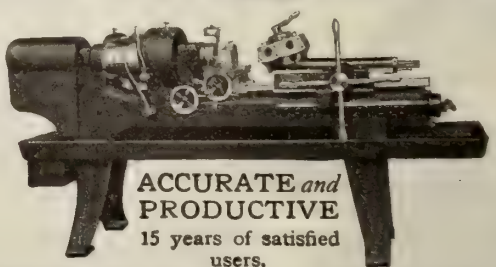

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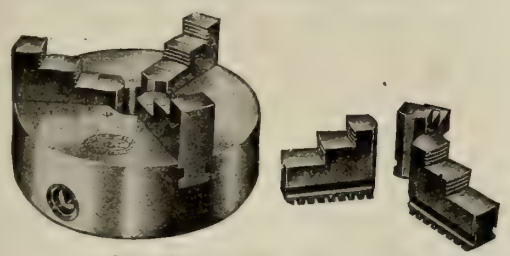

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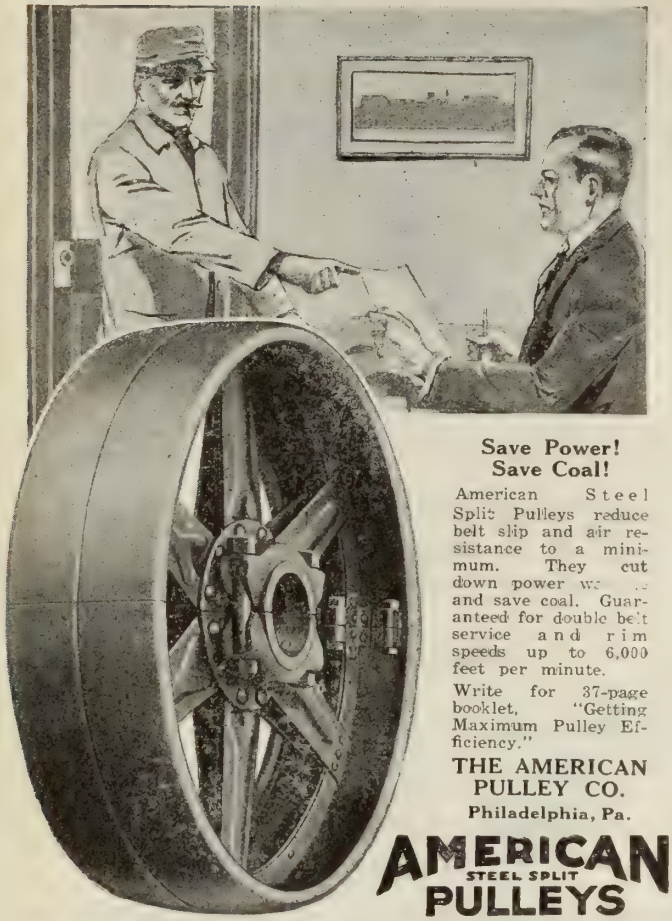

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Whether the machines be of the bench or floor type they should be of heavy construction and anchored rigidly to the bench floor. This is to prevent vibration—a source of wheel waste.

Keep the bearings properly taken up so that no undue vibration comes from loose boxes.

Remember, vibration means waste of abrasive.

2.—WHEEL SPEED

The correct speed for wheels used in the forge shop is between 5000 and 6000 surface feet per minute. If possible, the R.P.M. of the grinding machine spindle should be increased as the wheel wears down, so that this speed is maintained as nearly as possible.

Slow speed make wheels act softer and hence wear faster.

Slow speeds cause wheels to get out of truth quickly—hence, out of balance. Often the wheel is accused of having hard and soft spots, when in reality it is not kept in truth.

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Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Limited, Montreal.

BAND SAWS
Oliver Machy. Co., Grand Rapids, Mich.

BALL BEARINGS
Canadian Fairbanks-Morse Co., Montreal
Can. S K F Co., Toronto, Ont.
Chapman Double Ball Bearing Company, Toronto
The Gray Ball Bearing Co., Ltd., Toronto
Morrow Screw & Nut Co., John, Ingersoll
Rochester Ball Bearing Co., Rochester.
Williams & Wilson, Ltd., Montreal, Que

BALLS, STEEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Chapman Double Ball Bearing Co., Toronto
Boker & Co., Inc., Montreal, Que.
Gray Ball Bearing Co., Ltd., Toronto.
Rochester Ball Bearing Co., Rochester.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Limited, Montreal

BALLS, BURNISHING
Gray Ball Bearing Co. Ltd., Toronto.

BAROMETERS
Taylor Instrument Co., Rochester, N.Y.

BARRELS, SAND-BLAST
Pangborn Corp., Hagerstown, Md.

BARRELS, STEEL SHOP
Baird Machine Co., Bridgeport, Conn.
Cleveland Wire Spring Co., Cleveland.

BARRELS, TUMBLING
Baird Machine Co., Bridgeport, Conn.
Katie Foundry, Galt, Ont.
Northern Crane Works, Walkerville, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BASE FACING MACHINES
Victoria Foundry Co., Ottawa, Ont.

BARS, BORING
Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie

BEADING MACHINES
Quickwork Co., St. Marys, Ohio.

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
G. F. Foss Mchy. & Sply. Co., Montreal.
Graton & Knight Mfg., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids

BELTING, BALATA
Federal Engineering Co., Toronto, Ont.

BELTING, RUBBER
Can. Consolidated Rubber Co., Montreal.

BELTING, CHAIN
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Montreal.
Baxter & Co., Ltd., J. R., Montreal.
Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Graton & Knight Mfg., Worcester, Mass.
Jones & Glassco, Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
John Tullis & Son, Glasgow, Scotland.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto

BENDING ROLLS, PLUTE & AUGH
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Garlock-Walker Mach. Co., Toronto.
Williams & Wilson, Ltd., Montreal.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto.
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
William Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLANKING
Hy. Hope & Sons of Can., Ltd., Peterboro

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

BLOCK, CHAIN AND ROPE
Fellows Bros., Ltd., Chadley Heath, Eng.

BLOCKS, CARGO
Fellows Bros., Ltd., Chadley Heath, Eng.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.
Wickes Bros., Saginaw, Mich.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield. Mass

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield. Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BOILER BREECHINGS
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., B., Hespeler.
Landis Machine Co., W esboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Oliver Mach. Co., Grand Rapids, Mich.

Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Fellows Bros., Ltd., Chadley Heath, Eng.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Fellows Bros., Ltd., Chadley Heath, Eng.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BOOM, TIMBER
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FORGED
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., Inc., Fort Wayne, Ind.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positivte Clutch & Pulley Wks., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Bond Engineering Works, Toronto, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal. Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Banfield, W. H., & Sons, Toronto.
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson- Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

Williams' "Vulcan"
Drop-Forged Safety Lathe Dogs

WHEREVER Lathes are used it is conceded that, no matter how good the machine tool may be, poor equipment makes its satisfactory operation difficult, if not impossible.

Why employ inferior equipment?—the best tools are always the cheapest in the end.

Williams' "Vulcan" Drop-Forged Lathe Dogs are absolutely safe and dependable. Their design, material and workmanship are the result of nearly half a century of constant effort to produce the best and only the best. Bent and Straight Tail—one or two screws, 16 sizes, 3/8 to 6 inches maximum capacities.

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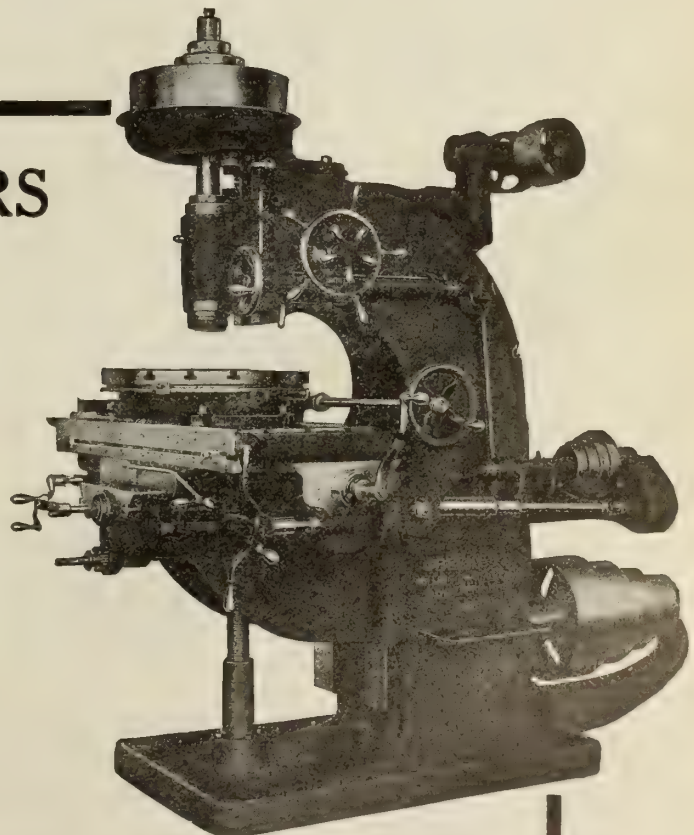

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Northern Crane Works, Walkerville.

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CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

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Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
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Swedish Crucible Steel Co., Windsor.

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Ford-Smith Machine Co., Hamilton, Ont.
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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

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General Steel Co., Milwaukee, Wis.

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Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Pittsburgh Steel Stamp Co., Pittsburgh.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Banfield, W. H., & Son, Toronto.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Montreal.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

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Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

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Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

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Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Oliver Mach. Co., Grand Rapids, Mich.

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Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
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Windsor Mach. & Tool Co., Windsor.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

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Swedish Steel & Importing Co., Montreal.

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Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRAWING
Henry Hope & Sons, Ltd., Peterboro, Ont.

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Wheel Trueing Tool Co., Windsor, Ont.
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W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
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Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

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Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
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Canadian Fairbanks-Morse Co., Montreal.
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Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal.

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Aurora Tool Works, Aurora, Ind.
Blomquist-Eck Mach. Co., Cleveland, O.
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Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Fry's (London), Ltd., London, Eng.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
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Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

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Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

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Cleveland Twist Drill Co., Cleveland.
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Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

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Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
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Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
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Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

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Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

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Garlock-Walker Machinery Co., Toronto.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

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Cleveland Pneumatic Tool Co., Toronto.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
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DRIVES, CHAIN

See Belting, Chain.

DRIVING TOOLS

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DRY CLEANING SYSTEM

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MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

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ELECTRIC FURNACE

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General Steel Co., Milwaukee, Wis.

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Canada Wire & Iron Goods Co., Hamilton

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Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Wheel Trueing Tool Co., Windsor, Ont.

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MacGovern & Co., Montreal, Que.

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A. R. Williams Machy. Co., Toronto.
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Pritchard-Andrews Co., Ottawa.

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Canadian Fairbanks-Morse Co., Montreal.

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Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

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Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

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Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN

Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES

Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
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Simonds Mfg. Co., Fitchburg, Mass.
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Wilkinson & Kompass, Hamilton, Ont.

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Crescent Machine Co., Ltd., Montreal.
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Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

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FLAT SPRINGS

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FLANGING CLAMPS

Wickes Bros., Saginaw, Mich.

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FLUMES

William Hamilton Co., Peterboro, Ont.

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Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

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Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL

Armstrong-Whitworth of Can., Montreal.
Can. Found. & Forgings, Ltd., Welland.
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FRICTION SURFACE BELTING

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Brown & Sharpe Mfg. Co., Providence, R.I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Toronto Iron Works, Ltd., Toronto.

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Standard Fuel Engr. Co., Detroit, Mich.

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GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

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GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

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Wells Bros. of Can., Galt, Ont.

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Garvin Machine Co., New York.
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Pratt & Whitney Co., Hartford, Conn.
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Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Taylor Instrument Co., Rochester, N.Y.

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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS

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Fellows Gear & Shaper Co., Springfield, V.
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D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL

Bridgeford Mach. Tool Wks, Rochester.

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GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

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Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
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Jones & Glasco, Montreal.
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Jones & Glasco, Montreal.
Philadelphia Gear Works, Philadelphia.
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Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
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Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
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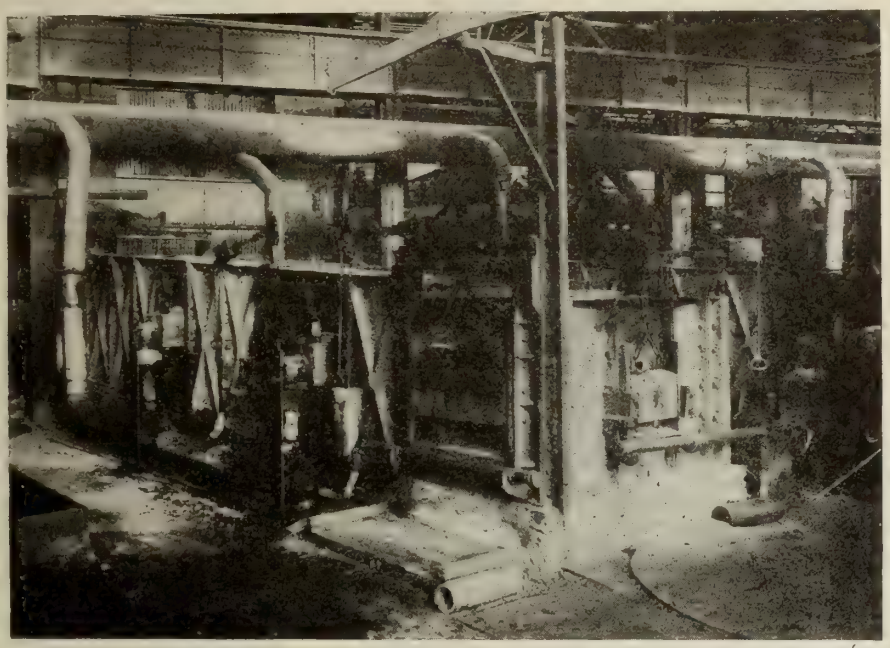

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Modern Tool Co., Erie, Pa.
Norton Grinding Co., Worcester, Mass.
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Wisconsin Electric Co., Inc., Racine, Wis.
Foss Mchy. & S'ply. Co., G. F., Montreal.
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Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
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Page Steel & Wire Co., Adrian, Mich.
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Ford-Smith Machine Co., Hamilton, Ont.
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Marshall, Son & Bunney, Toronto.
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Plewes, Ltd., Winnipeg, Man.
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Rice Lewis & Son, Toronto, Ont.
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Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

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Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
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Wilkinson & Kompass, Hamilton, Ont.
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Jardine & Co., A. B., Hespeler, Ont.
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Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

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Homer & Wilson, Hamilton, Ont.
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Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

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LAMPS, ARC, INCANDESCENT
Can. General Electric Co., Toronto, Ont.

LAMPS, TUNGSTEN AND NITRO
Can. General Electric Co., Toronto, Ont.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

LATHES, CHUCKING
Acme Machine Tool Co., Cincinnati, Ohio
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal.

LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS
Armstrong Bros. Tool Co., Chicago.
Curtis & Curtis Co., Bridgeport, Conn.
Hendey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

LATHES, AUTOMATIC AND SEMI-AUTOMATIC
Gisholt Machine Co., Madison, Wis.
Wood Turret Machine Co., Brazil, Ind.

LATHES, AXLE
Bridgeford Mach. Tool Works, Rochester.

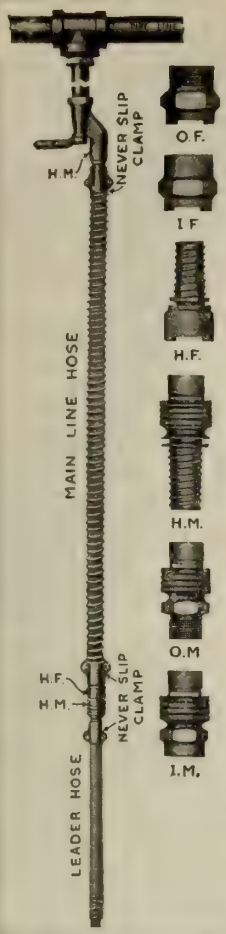
LATHES, BORING
Bridgeford Mach. Tool Works, Rochester.
Lodge & Shipley, Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, PRECISION, BENCH
W. F. & John Barnes Co., Rockford.
J. G. Blount & Co., Everett, Mass.
Canadian Fairbanks-Morse Co., Montreal.
Geo. F. Foss Machy. & Supply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Hardinge Bros., Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, BRASS
Acme Machine Tool Co., Cincinnati, Ohio.
Hardinge Bros., Chicago, Ill.
Lodge & Shipley, Cincinnati, O.
Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, ENGINE
Acme Machine Tool Co., Cincinnati, Ohio.
John Bertram & Sons Co., Dundas.
Bridgeford Mach. Tool Wks., Rochester.
Canada Mach'y Corp., Galt, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cisco Machine Tool Co., Cincinnati, Ohio.
Wickes Bros., Saginaw, Mich.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis

CLEVELAND HOSE SPECIALTIES



Bowes Automatic Air Hose Couplings

Standard Equipment Everywhere

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE O.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.
STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ¼-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

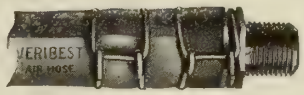
Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-in.

The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.

CLECO GROOVED HOSE NIPPLE



Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-pinion Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Use Annealed Wire No. 14

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Bulletin 34A, 41 and 43.

CLEVELAND PNEUMATIC TOOL CO. OF CANADA LTD., 84 Chestnut St., TORONTO

A. R. WILLIAMS MACHINERY CO., TORONTO, 337 Craig St., W., MONTREAL. WILLIAMS & WILSON, MONTREAL

Let them know it's there

In complimenting us upon the results secured from their advertisement in the classified section, one advertiser said:

> "Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."

If you have any old or used equipment for sale, let people know it's there. Your message in Canadian Machinery will be placed before the probable buyers of such equipment.

Canadian Machinery

Classified Advertising Section

143 University Ave., TORONTO

DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.

BRISTOL, CONN

Kennedy & Sons, Wm., Owen Sound, Ont.
R. McDougall Co., Galt.
Miles-Bement-Pond Co., New York.
Smalley-General Co., Inc., Bay City, Mich.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Standard Machy. & Supplies, Montreal.
Sidney Tool Co., Sidney, Ohio.
Walcott Lathe Co., Jackson, Mich.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Worcester Lathe Co., Worcester, Mass.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, POLISHING
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SCREW CUTTING
Bertram & Sons Co., John, Dundas, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & S'ply Co., G. F., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Wickes Bros., Saginaw, Mich.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, TOOL ROOM
Cisco Machine & Tool Co., Cincinnati, O.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

LEAD BURNING
St. Lawrence Welding Co., Montreal.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton.
Dennis Wire & Iron Works, London, Ont.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser & Co., S. F., Inc., Fort Wayne.

LUBRICATORS
Trahern Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINERY, CORNER AND BENDING
Peck, Stow & Wilcox, Southington, Conn.

MACHINERY DEALERS
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Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Standard Machy. & Supplies, Montreal.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY GUARDS (See Guards)

MACHINISTS' TOOLS
Brown & Sharpe Mfg. Co., Providence, R.I.

MANDRELS
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Pritchard-Andrews Co. of Can., Ottawa.
Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Perrin, Wm. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MASKS, WELDING, SMOKE, FUME, GAS, ETC.
Strong, Kennard & Nutt Co., Cleveland.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser & Co., S. F., Inc., Fort Wayne.

MEASURING TAPES AND RULES
Chesterman & Co., Jas., Sheffield, Eng.

METALLURGISTS
See Chemists.

METAL SAWS
See Saws.

METAL SAWS, POWER
Hoefer Mfg. Co., Freeport, Ill.

METALS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser & Co., Inc., S. F., Toronto, Ont.

MICROMETERS
Almond Mfg. Co., Ashburnham, Mass.
Taylor, J. A. M., 31a Stair Bldg., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLS, BRACE AND TUBE
Elec. Steel & Metals, Welland, Ont.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee, Wis.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co. Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Elec. Steel & Metals, Welland, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MODEL WORK
Windsor Mach. & Tool Co., Windsor, Ont.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Can. General Electric Co., Toronto.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co., Toronto.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY.
Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL
Brown's Copper & Brass Roller Mills, New Toronto, Ont.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAIL MACHINERY
Sleeper & Hartley, Inc., Worcester, Mass.

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Boker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
See Steel.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser & Co., Inc., S. F., Toronto, Ont.

OPENING DIE HEADS
Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

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Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.
Graton & Knight Mfg. Co., Worcester, M.
Perrin, Ltd., William, Toronto.

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland.
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES
See Lathes.

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Wilson & Co., J. C., Belleville, Ont.
Greenleafs, Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

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William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
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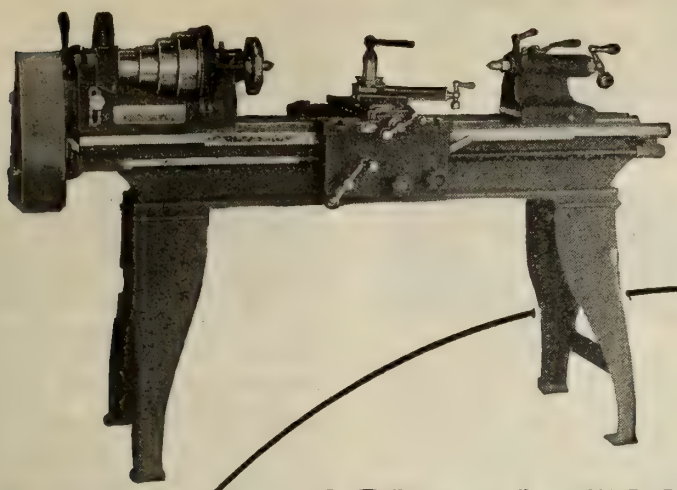
PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER
Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph

PIPE CUTTING AND THREADING MACHINES
Butterfield & Co., Rock Island, Que.



STAR LATHES

STAR TRADE MARK REGISTERED

13" x 6" ENGINE LATHE—

AN EXCELLENT TOOL FOR GARAGE WORK

It is a very satisfactory lathe for garage service because of its simplicity, the various attachments available and exceptional wearing qualities.

"Star" Lathes are economical. They do the work of larger and costly machines at a much lower cost and with greater accuracy.

May we send descriptive circular?

THE SENECA FALLS MFG. COMPANY, INC.

366 W. Falls St., SENECA FALLS, N.Y.

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8. hole.

EMERY FLOUR AND WASHED FLOUR

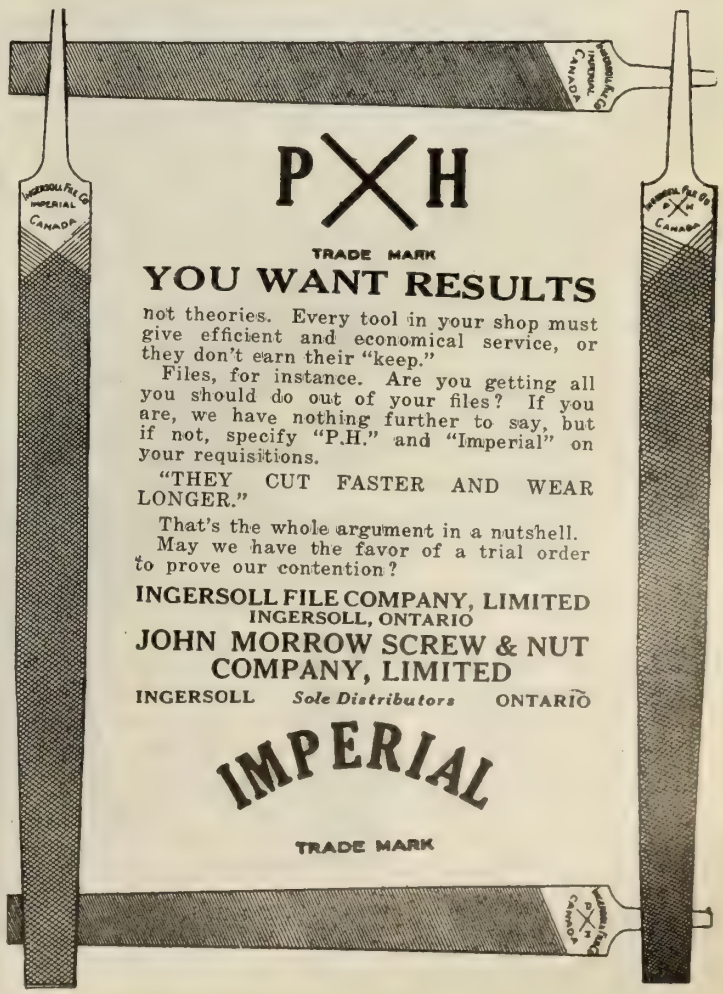
EMERY, GLASS, FLINT, GARNET, CORUNDUM, CARBORUNDUM — PAPER AND CLOTH — IN SHEETS, ROLLS, DISCS, BANDS, STRIPS and TAPES, &c.

John Oakey & Sons

LIMITED

WELLINGTON MILLS

LONDON, S. E. 1., ENGLAND



P⨯H

TRADE MARK

YOU WANT RESULTS

not theories. Every tool in your shop must give efficient and economical service, or they don't earn their "keep."

Files, for instance. Are you getting all you should do out of your files? If you are, we have nothing further to say, but if not, specify "P.H." and "Imperial" on your requisitions.

"THEY CUT FASTER AND WEAR LONGER."

That's the whole argument in a nutshell.

May we have the favor of a trial order to prove our contention?

INGERSOLL FILE COMPANY, LIMITED
INGERSOLL, ONTARIO

JOHN MORROW SCREW & NUT COMPANY, LIMITED
INGERSOLL *Sole Distributors* ONTARIO

IMPERIAL

TRADE MARK

Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS AND DIES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON RODS, ROUGH TURNED
General Steel Co., Milwaukee, Wis.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Williams & Wilson, Ltd., Montreal, Que.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert.
Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Williams & Wilson, Ltd., Montreal, Que.

PRESSED STEEL PARTS
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlass Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Banfield & Son, W. H., Toronto.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Standard Machy. & Supplies, Montreal.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Standard Mach. & Supplies, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL, SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL
Bowser & Co., Inc., S. F., Toronto.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL
Bowser & Co., Inc., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, KEROSENE, OIL, SELF MEASURING
Bowser & Co., Inc., S. F., Fort Wayne.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
W. H. Banfield & Sons, Toronto.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H. Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS, ADJUSTABLE
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Standard Mach. & Supplies, Montreal.
Wells Bros. of Can., Galt, Ont
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
J. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, HAND
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, PIN
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland.

RIVETS.
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

RODS, ROPE AND SPRING
General Steel Co., Milwaukee.
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROLLS AND TABLES
Elec. Steel & Metals, Welland, Ont.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

WRIGHT HOISTS

Canadian Representatives :

A. R. Williams Machinery Co., Ltd.

Toronto, St. John, Winnipeg, Vancouver

Williams & Wilson, Ltd

84 Inspector St., Montreal

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

RUBBER MILL DRIVES
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md
Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Milwaukee Shaper Co., Milwaukee, Wis.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
The Quickwork Co., St Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio

SHEET METAL ROLLING MACHINES
Peck, Stow & Wilcox Co., Southington.

SHEETS, NICKEL, RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHEARS, PLATE CUTTING, SLITTING
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL MACHINERY
Peck, Stow & Wilcox Co., Southington, C.

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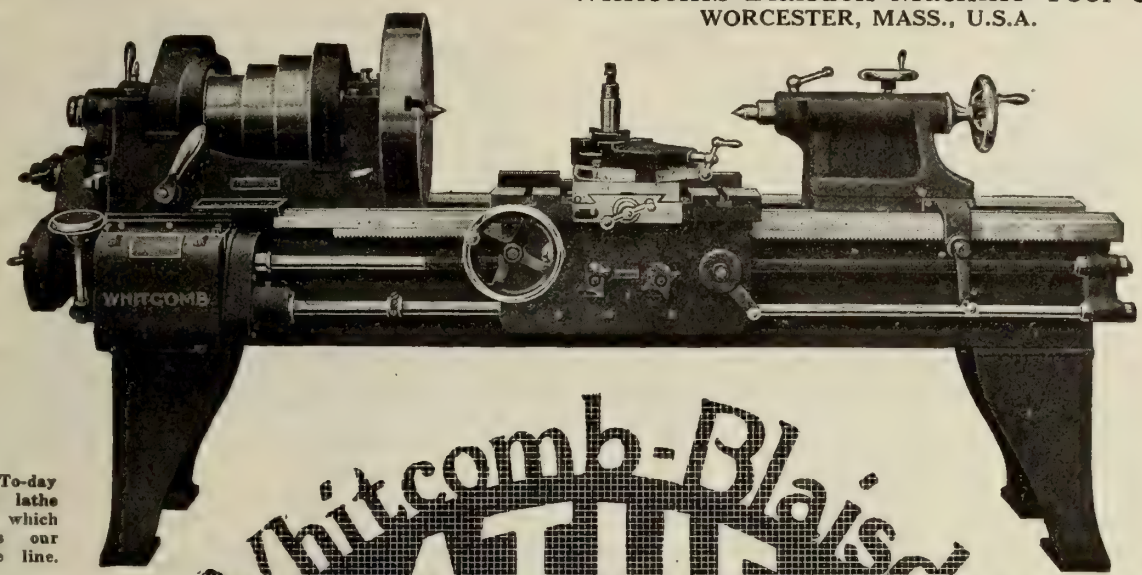

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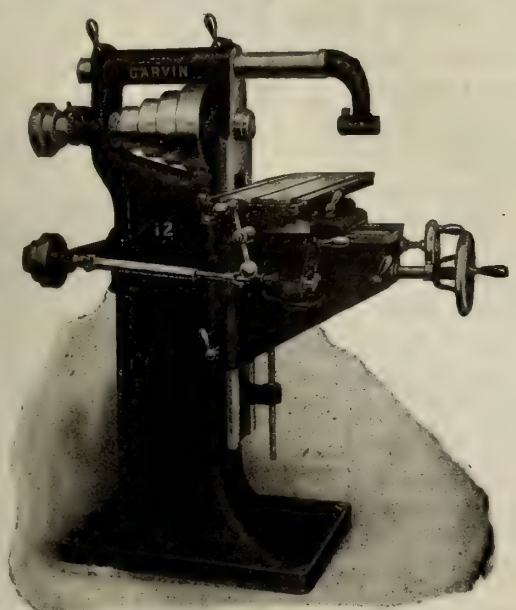

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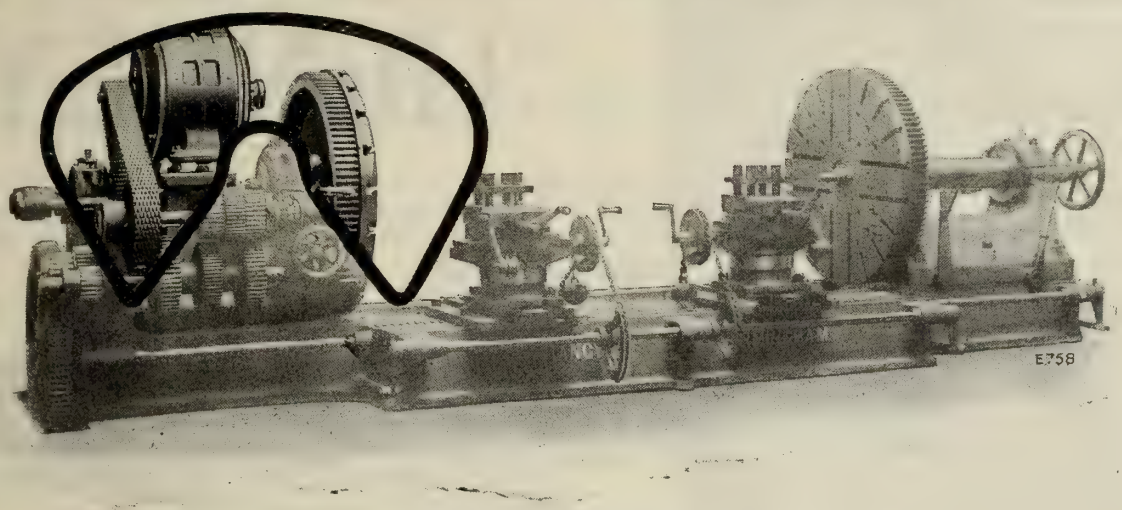

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Vol. XXII.

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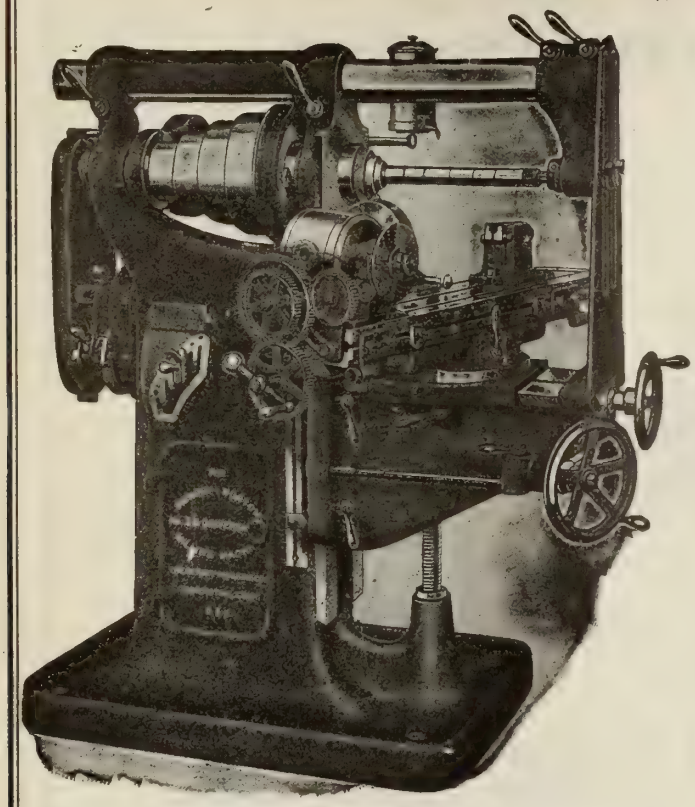

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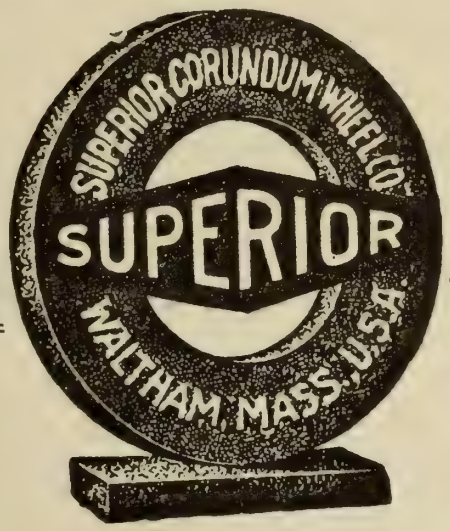

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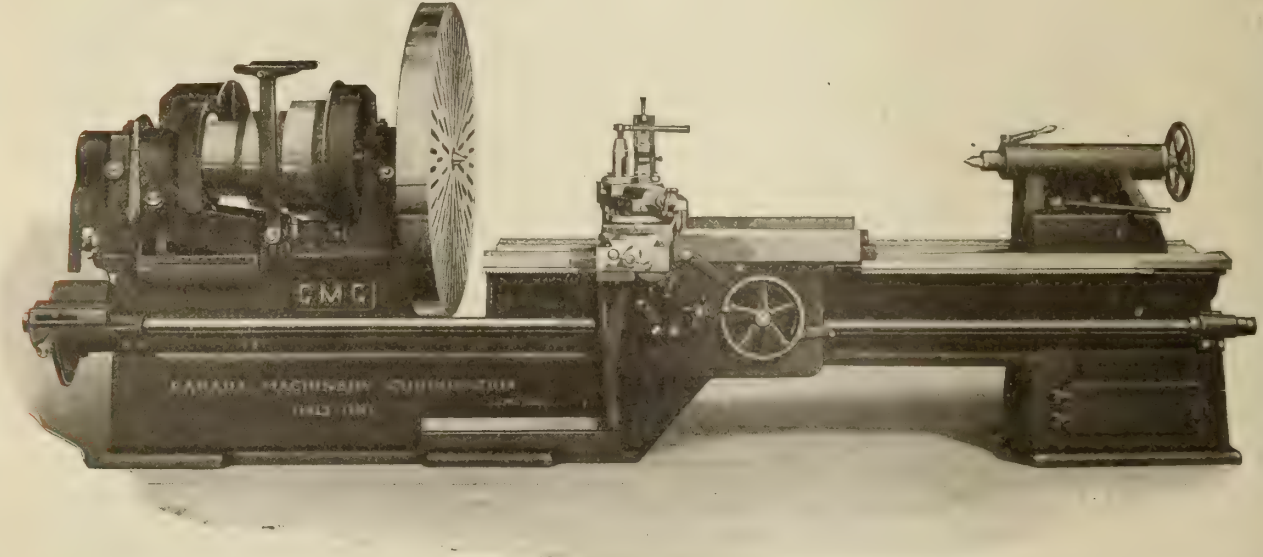

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A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

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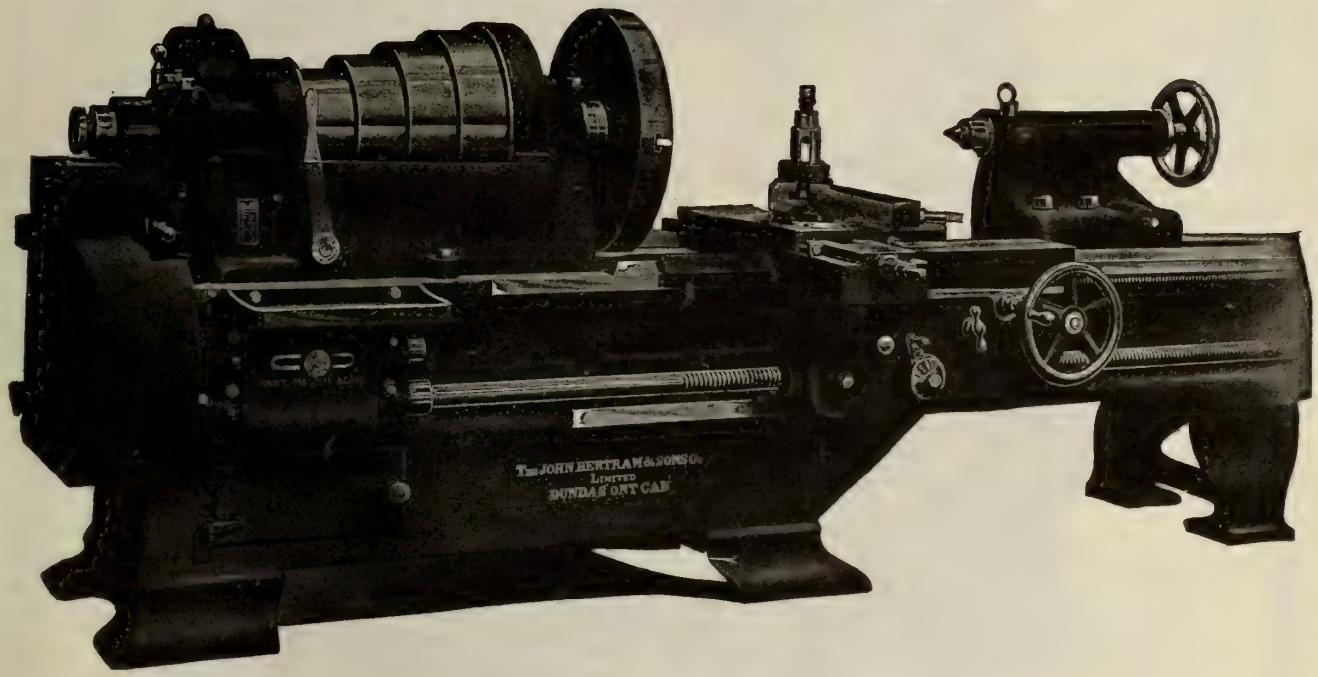

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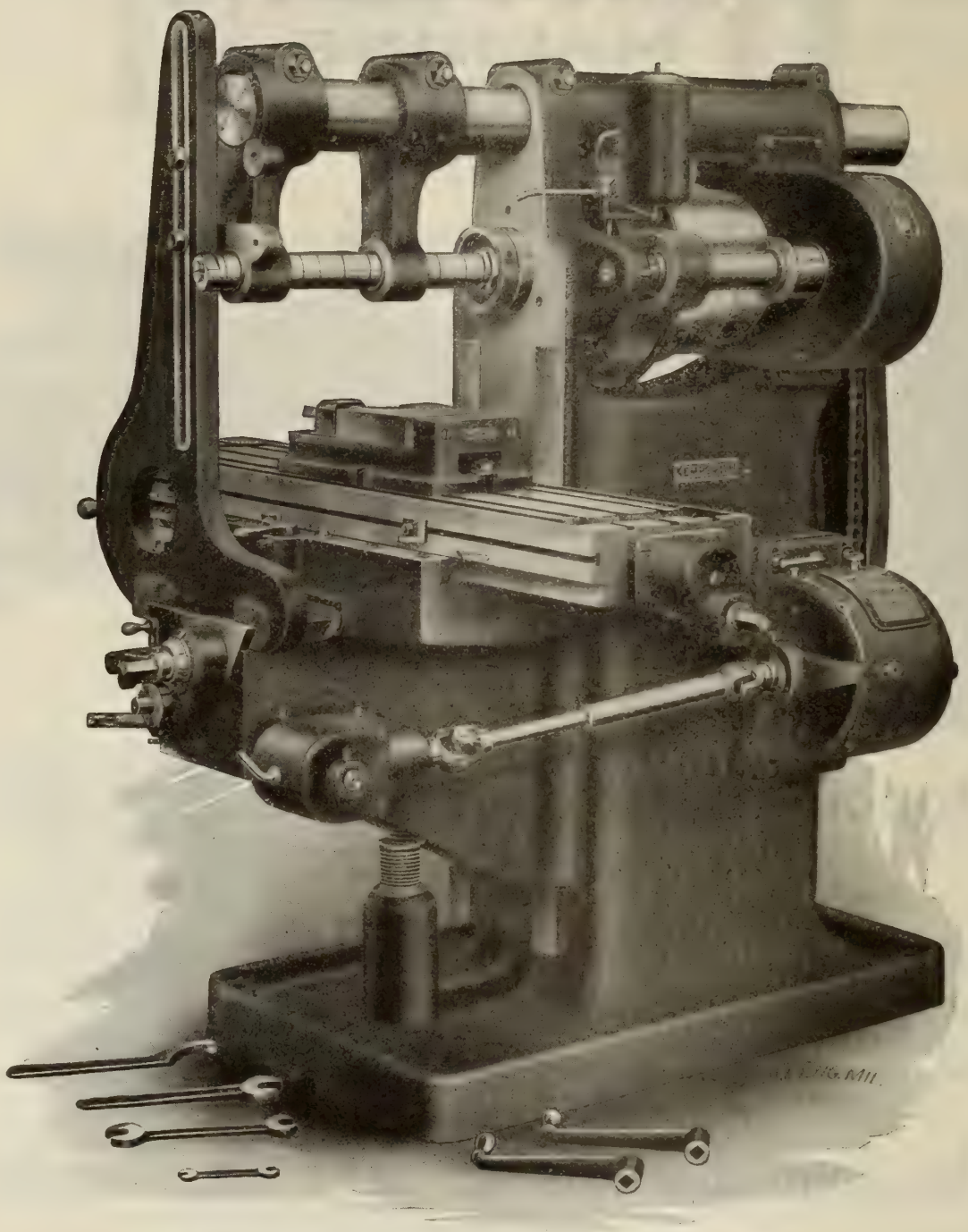

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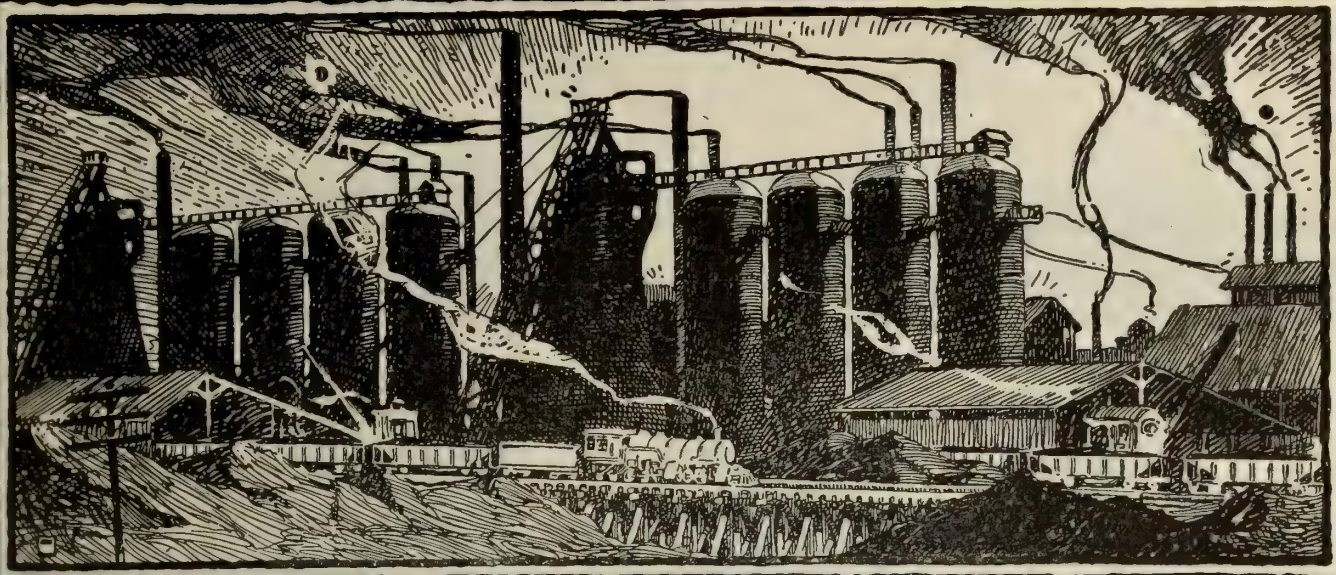

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15", 12", 10", 8", 6", 5", 4", 3".

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3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3¾ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
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Your enquiries and business will be appreciated.

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SAULT STE. MARIE, ONTARIO

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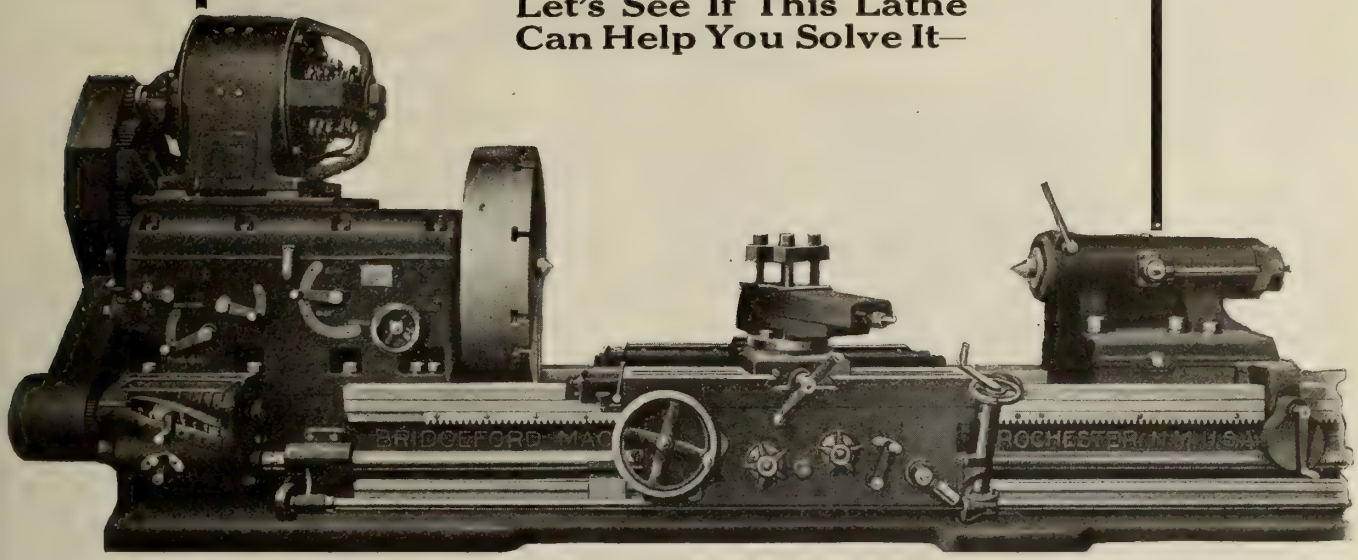
Let's See If This Lathe Can Help You Solve It—



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There's a Bridgeford Geared Head Engine Lathe—with swing from 26 in. to 72 in.—to do your hard jobs.

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Illustration shows a Wilt Twist Drill in active service at the new shops of the Canadian National Railway, Leaside, Ontario.

Wilt Quality improves production and cuts drilling costs to a minimum.

This is no theory, no untested statement, but an established fact backed by many of the largest manufacturers throughout Canada. For steady, reliable output of work that is satisfactory from the standpoint both of quantity and quality there is no better choice than WILT products.

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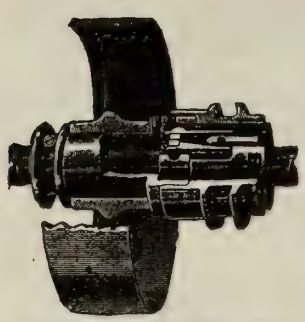

Standard Single Clutch with Pulley Mounted on Hub —Clutch Engaged.

MANUFACTURERS who are particular about keeping an established reputation equip all their machines with Johnson clutches. They recognize that superiority must be consistent in order to count. And Johnson clutches assure them of uniformly good service wherever they are installed.

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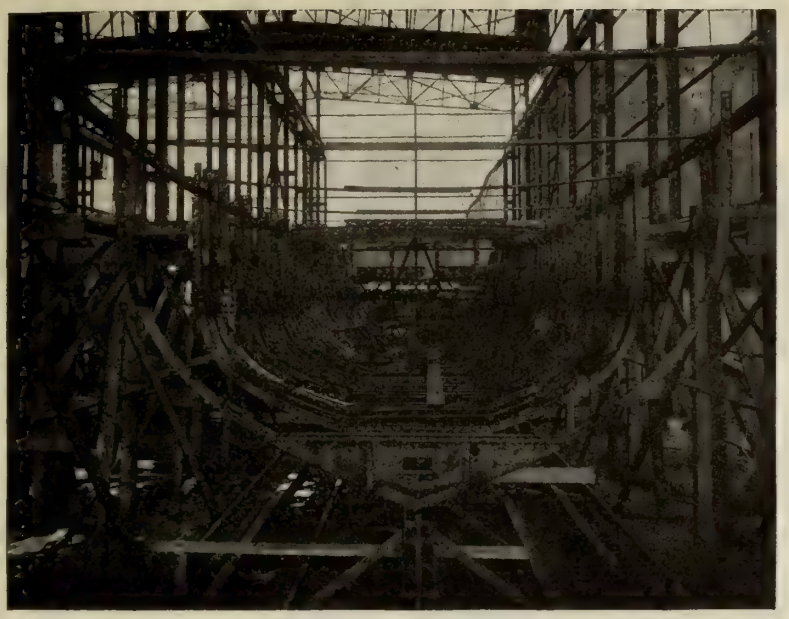

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Ford-Smith Grinders

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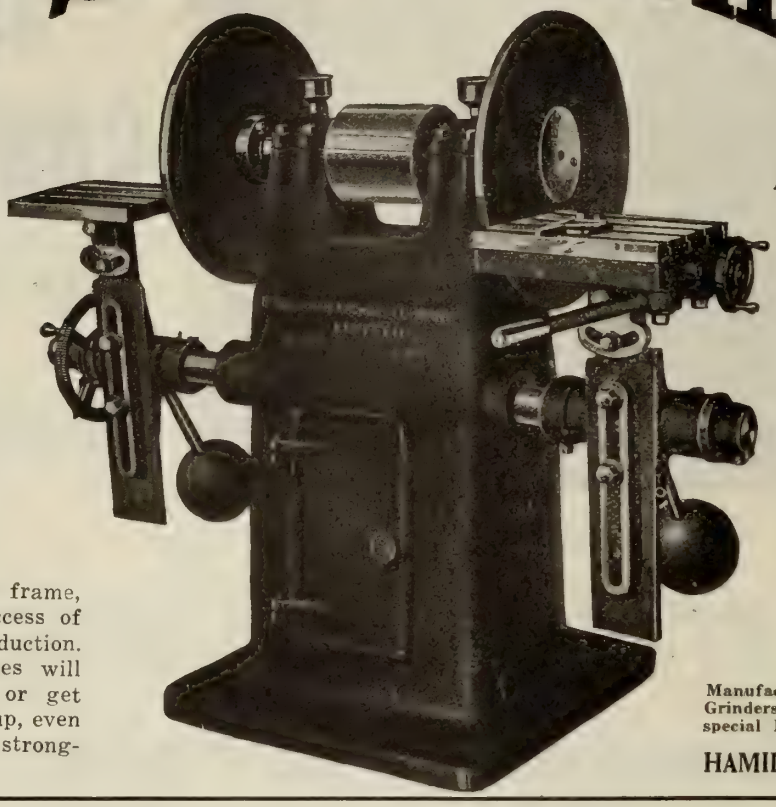

The Disc Wheel Grinder (or Ring Wheel Grinder) is indispensable where economical finishing or roughing work is desired.
The abrasive materials on the Disc Circle are to be considered as extra-high-speed cutting tools. This backed by ample belt power, and a heavy rigid frame, is the secret of the success of this method of metal reduction. These improved Machines will not slow down, glaze, or get dull, when correctly set up, even when the work is forced strongly against them.

Illustration shows our 20-in. "Manufacturing" Disc Grinder.

May we send you catalogue, covering full line?

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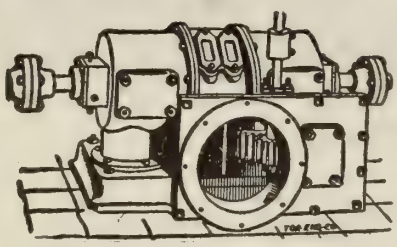

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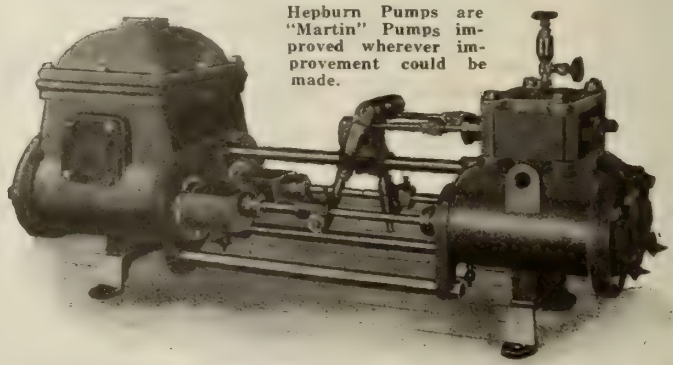
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

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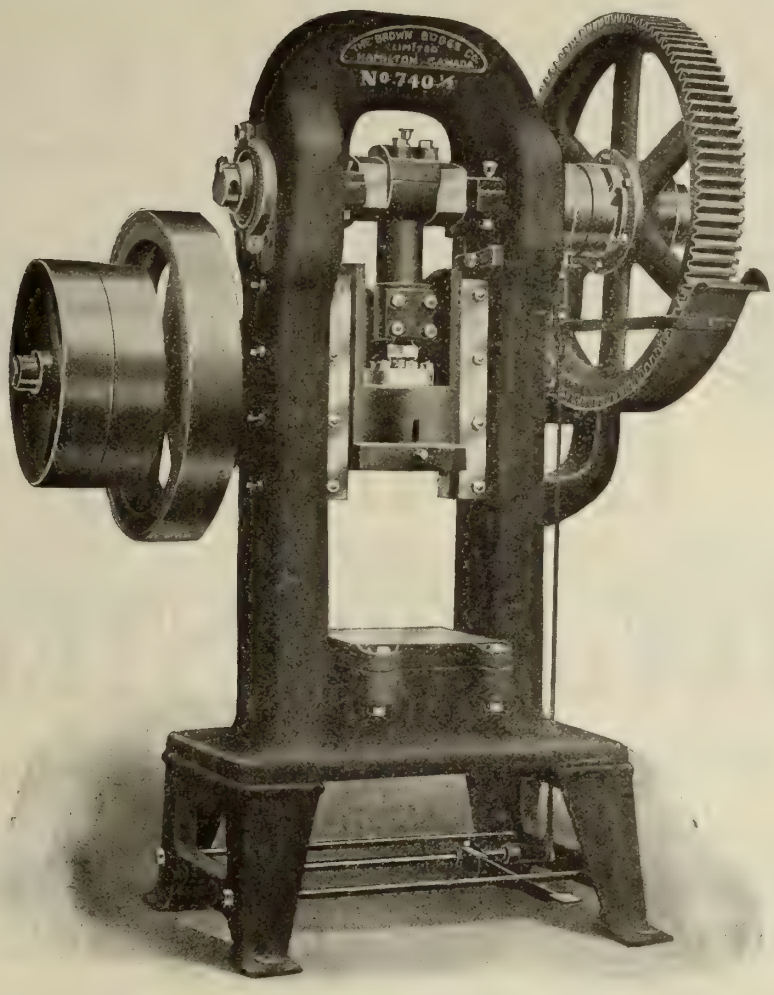

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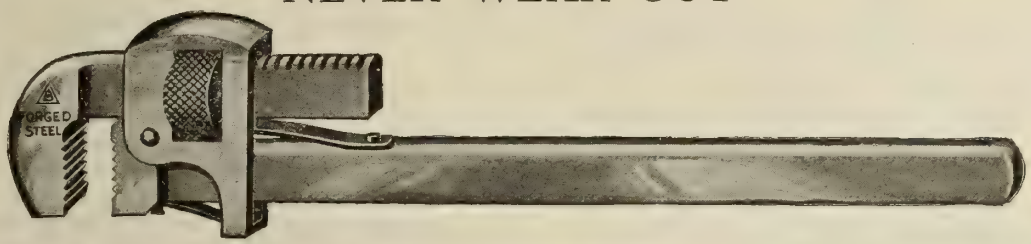

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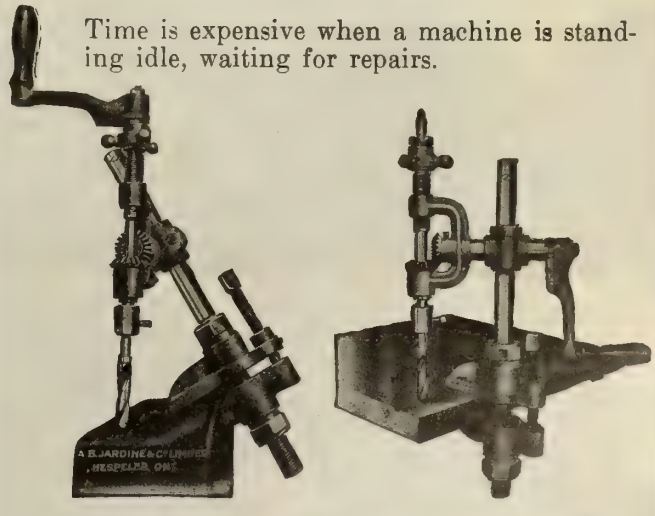
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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In three qualities
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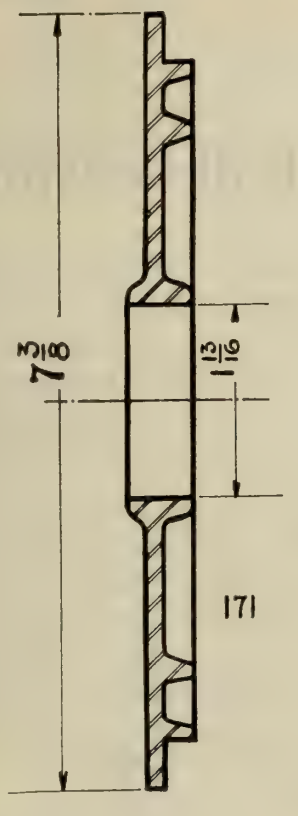

To Manufacturers of Electric Lighting And Starting Equipment

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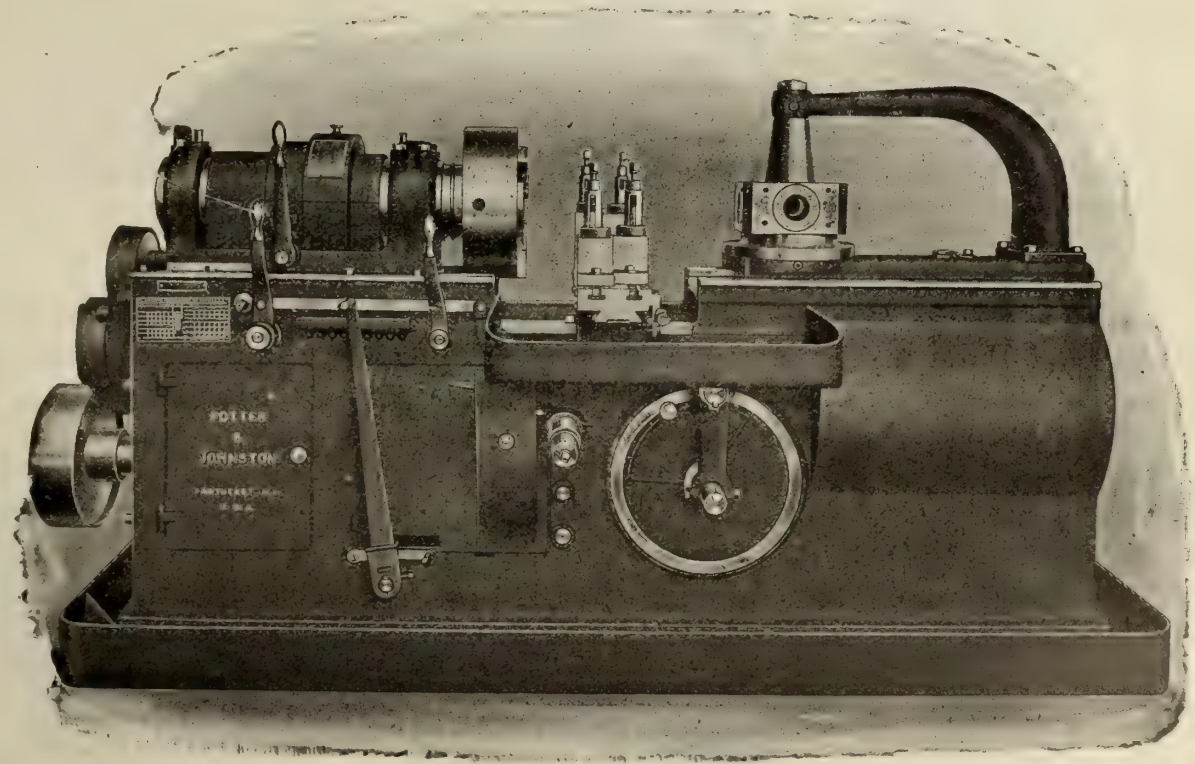
There **is** a better way and we are glad to give it to you.

The better way is handling this class of work in POTTER & JOHNSTON MANUFACTURING AUTOMATIC where one operator attends to as many as six machines.

Here is a malleable iron end plate 7⅜ in. in diameter with a 1 13/16 hole. It is finished completely on all surfaces in two chuckings and all done automatically.

Send us your blueprints or samples.



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Lat

No. 2.

Of a Series of Technical Talks on Ball Bearings

THE upper drawing is an excellent example of an all SKF Ball Bearing lathe head. The drawing, which is a cross section through the headstock of a single purpose lathe, shows the method of mounting the ball bearings. The large radial bearing is locked against a shoulder on the spindle by means of a nut, thus keeping it in position. The housing has two felt washers on the outer end and one on the inner end to prevent chips and dirt from getting into the bearing, and the lubricant from getting out. The cone pulleys are carried on two SKF Radial Bearings held in position by means of a short and long sleeve, and a lock nut. The housing at the right hand of the headstock contains a radial bearing for carrying the spindle and a thrust bearing for taking the entire end thrust on the spindle. It will be noted that the radial bearing is locked against a shoulder on the spindle by a nut. One ring of the thrust bearing is mounted against a shoulder on the spindle while the other, which has a spherical seat and is self-aligning, engages with a steel washer let into the end cap. The back gears are also carried on radial ball bearings.

The smaller drawing on the left hand shows a somewhat similar application to the one described above. It will be noted that in both cases the outer races of all the radial bearings are free to "float;" only the inner races being fixed. The right hand drawing is interesting principally because it shows the mounting of a double thrust bearing in a duplex engine lathe. Note the mounting of the inner race of the radial bearing; the three sleeves and the middle ring of the thrust bearing. These are all locked together rigidly, while the outer race of the radial bearing "floats."

The bottom figure shows an interesting application on a heavy duty spindle. The two radial bearings at the work end of spindle provide great rigidity and eliminate chatter. The cone pulleys are carried on two radial bearings, the larger bearing being held tight against a shoulder on spindle by the long sleeve, at the other end of which is another radial bearing. Both bearings are protected by felt washers. In the housing at the end are two bearings, a radial and a double thrust, the latter taking the entire thrust on the spindle. Sleeves are provided for transmitting the thrust to the thrust bearing and they also lock the bearings securely in position. Lubrication is provided for by means of the grease cups.

CANADIAN SKF COMPANY, LIMITED

Eastern Sales Office:
412 St. James St. West
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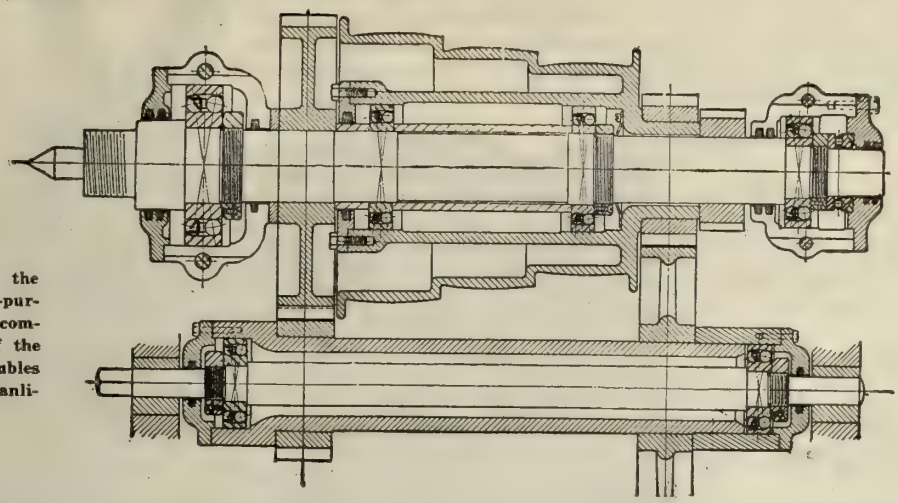
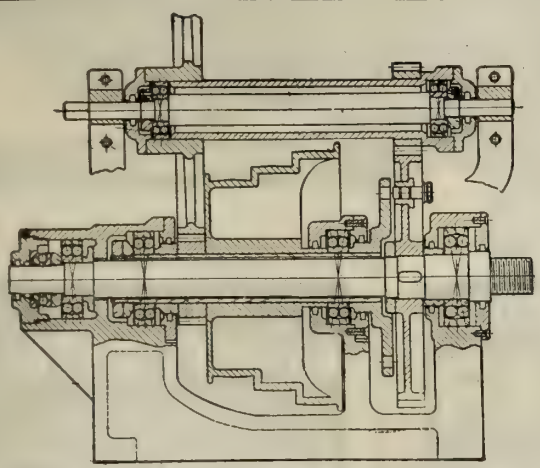
Toronto, Ont.

hes

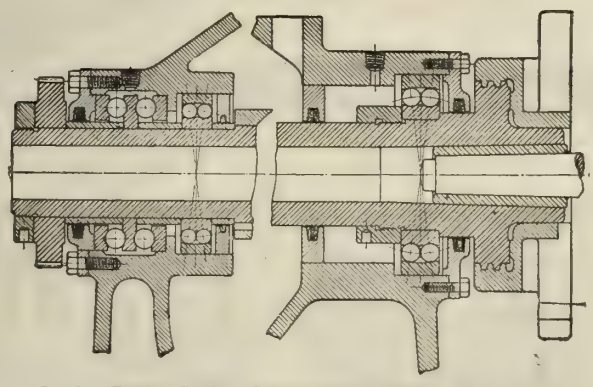
Other S K F mounting suggestions will appear later. We suggest that you clip this page for your file or card index system. Reprints will be furnished if desired. If you are not already receiving them, send us your name and we will put you on our mailing list.



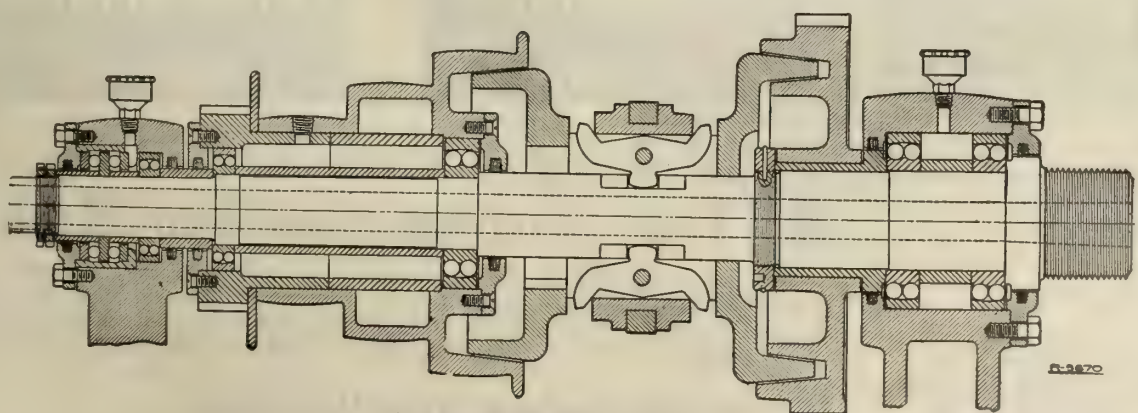
Cross-section through the head-stock of a single-purpose lathe. Note the compactness and rigidity of the design. Lubrication troubles are eliminated and cleanliness assured.



Medium duty lathe, minimum distance between bearing centers assures rigid spindle.



Duplex Engine Lathe—double thrust bearing allows heavy roughing cuts.



A successful heavy duty spindle.
Four rows of balls at work end of spindle provide maximum rigidity and eliminate chatter.

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Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

-And I Always Thought That Was A Good Tractor-

Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't been for that defective part, defective because it was improperly heat-treated.

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You Cannot Afford to Take Such Chances

GILBERT & BARKER Heat-Treating Furnaces

insure uniform high quality of produce because they are designed right and built right. The combustion in a G. & B. Furnace is 100% efficient, temperature control is one of the big features, the heat is uniform **always**, the result is a finished product of maximum tensile strength which will stand up under the hardest usage.

The operating cost of G. & B. Furnaces is extremely low.

Send for Bulletin 24. Let our Engineers suggest the furnace that is best suited to your requirements.

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Gilbert & Barker Mfg. Co.

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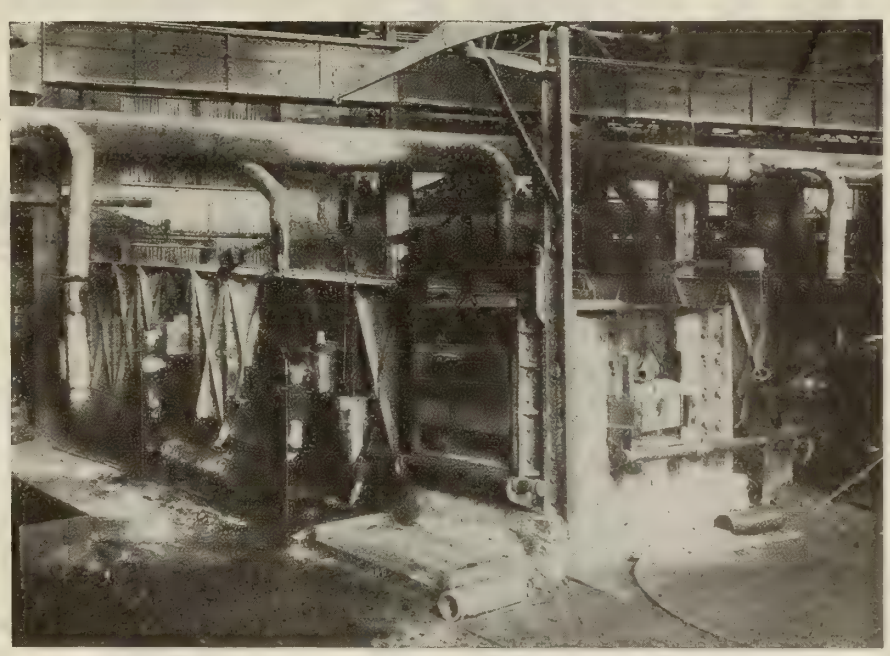
Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

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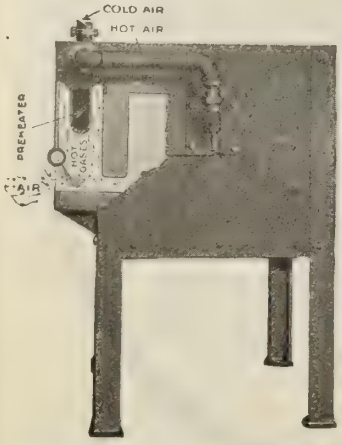
Cool Shop This Summer

if you use

ECONOMIZER FORGE



Showing deflection of hot gases, with induced air *toward* the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

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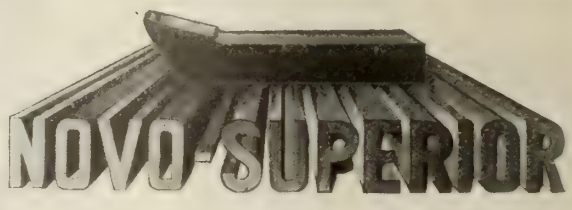

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We are now building over 100 types and sizes of gas and oil-burning industrial furnaces.

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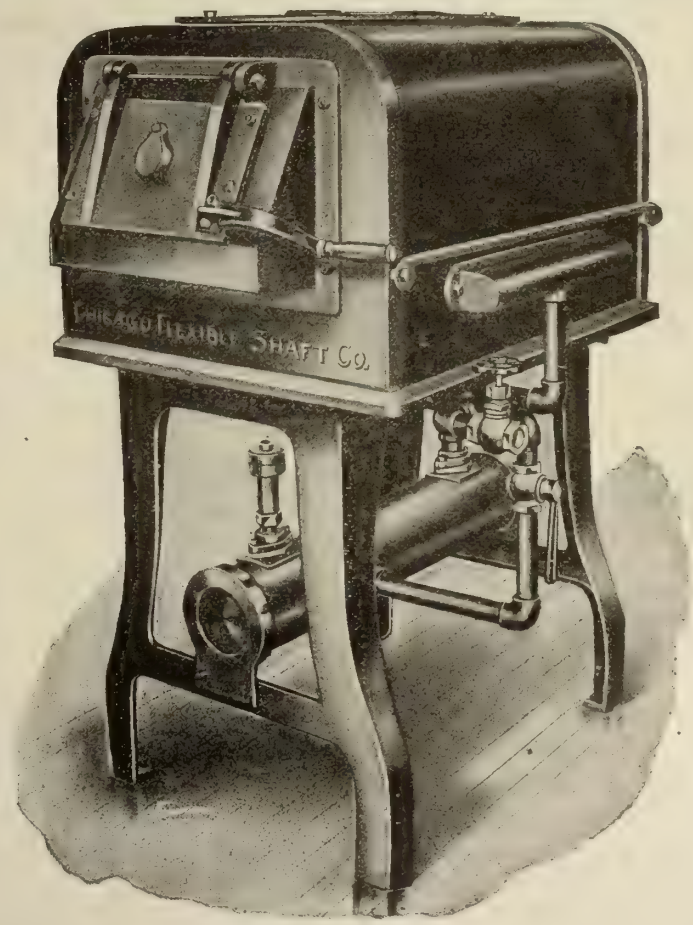

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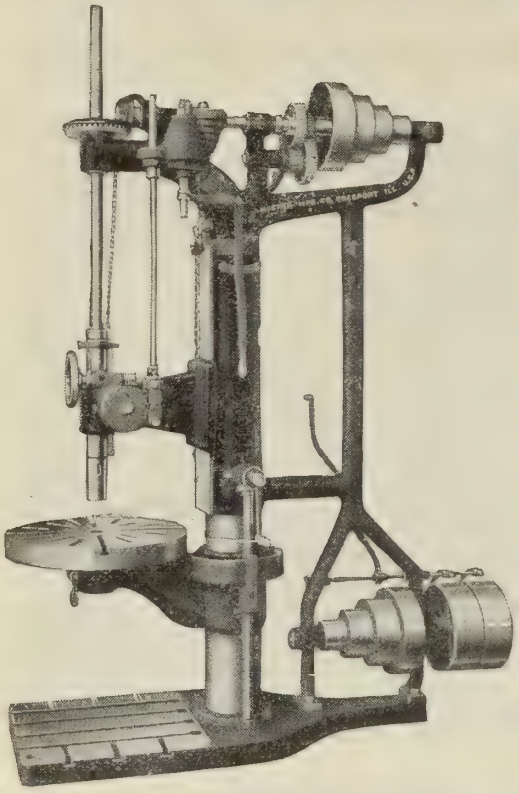

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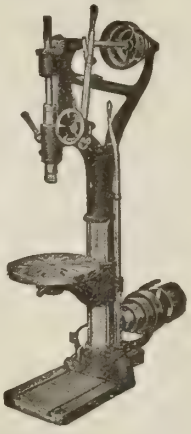

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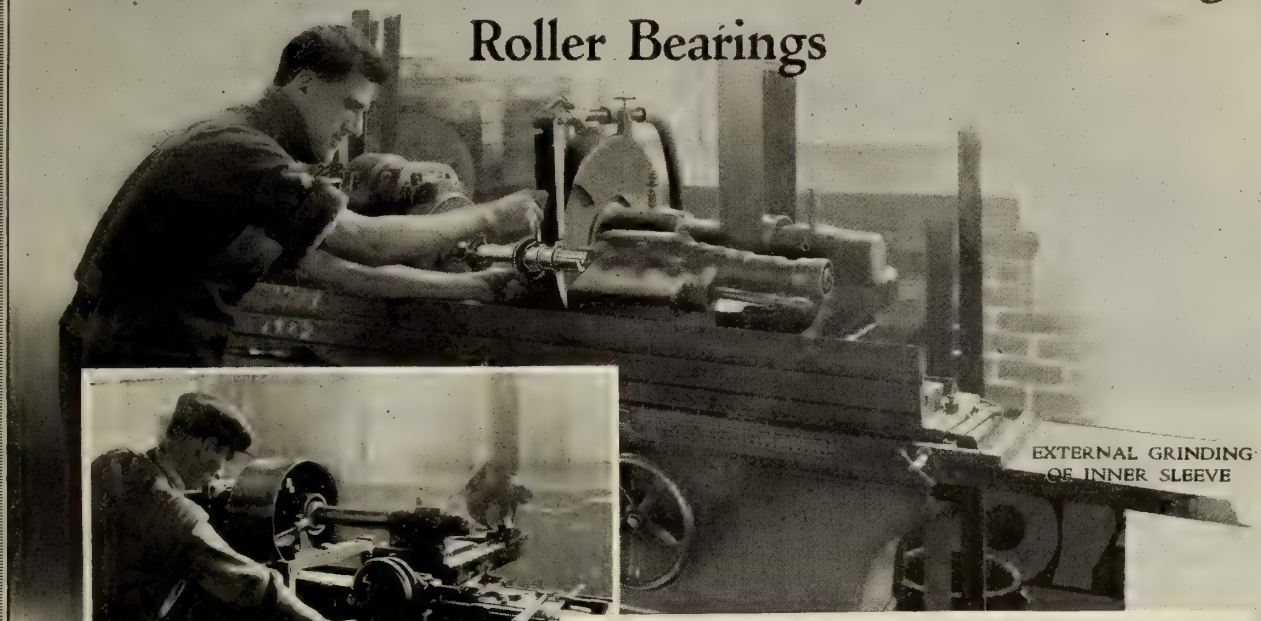
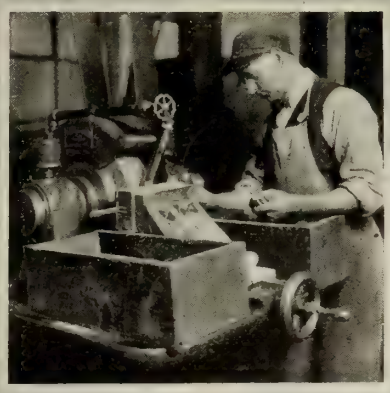
The Part that Aloxite Wheels Play in the Making Roller Bearings

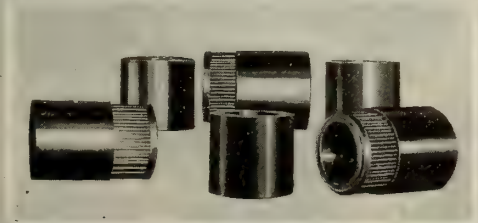


EXTERNAL GRINDING OF INNER SLEEVE

INTERNAL GRINDING OUTER SLEEVE



GRINDING ROLLS



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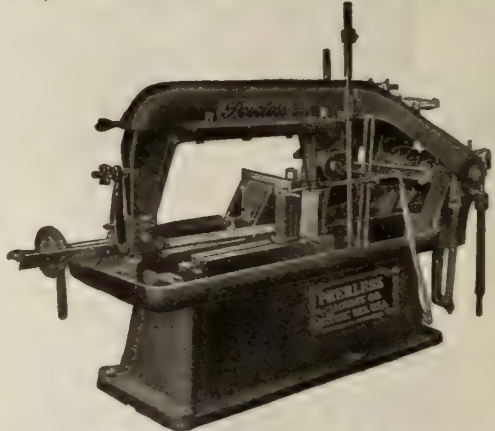

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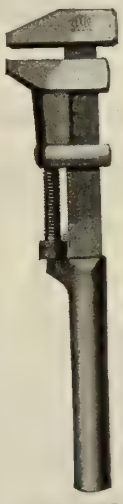
This solid handle Pexto Wrench is made of three strong, simplified parts with heavy wooden riveted handles. The head, bar and handle frame are all forged in one piece from high quality steel, next is the sliding jaw, and third the screw.



PEXTO
Solid Steel Wrench

Like its solid handle partner this wrench is made of three simple parts—the head, bar and handle are all forged in one piece from high quality steel. This Pexto Wrench is built for heavy duty.

PEXTO
Pipe Wrench

This Pexto Wrench carries out the highest ideals of Pipe Wrench design. The hardened jaws of steel grip like a vise, yet they are easily tightened or released. When you get a pipe wrench be sure it's Pexto-made.

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TOOLS FOR USE ABOUT THE HOME AND FARM FOR THE MECHANIC IN EVERY TRADE

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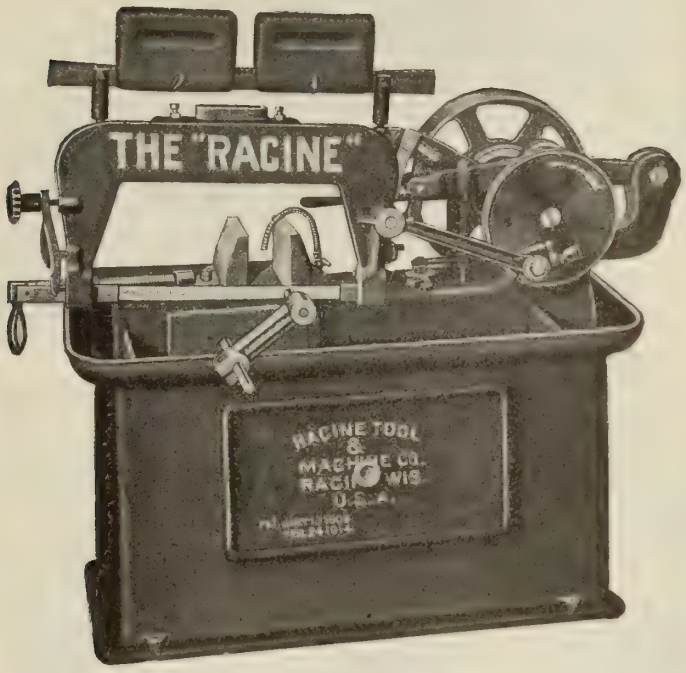

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Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

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HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
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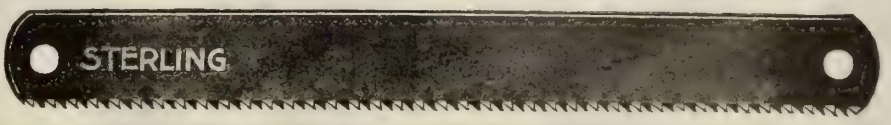
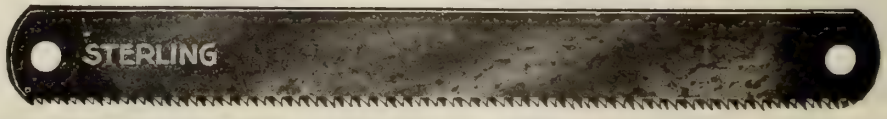


Guarantee satisfaction. A trial will convince you of their superiority.

Insist on securing the "STERLING" Brand.



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The apprentice says:

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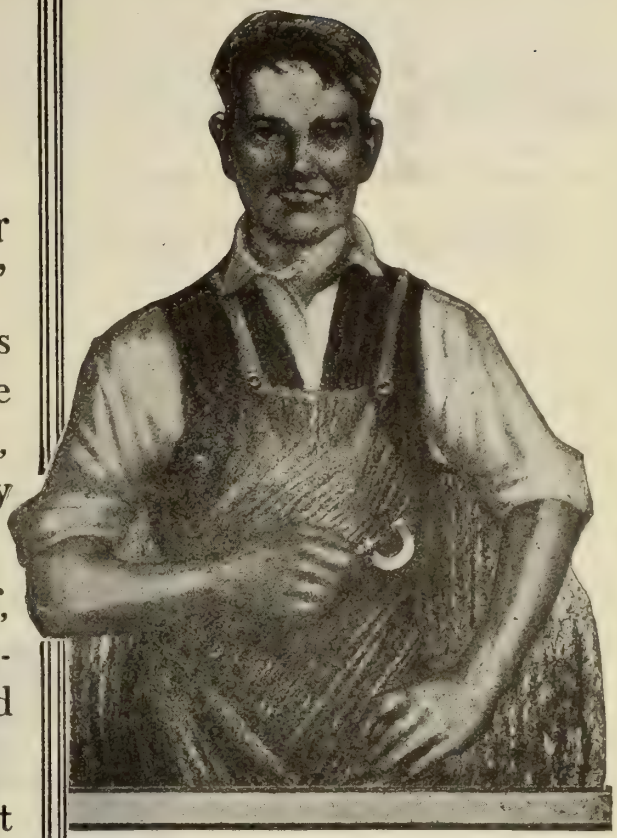
"There's something about 'em that the fellows like. Yeh! They're accurate and they're convenient, but I guess the fact that the men who make 'em are pretty good mechanics themselves, has something to do with it.

"What? Sure I'm getting me a set of Starrett Tools—I need 'em every day. Yes, I got me one of those seventy-five cent Starrett Apprentice Books, too. It saves me asking the foreman a question every five minutes. Now, when I want to know how to do something, I can look in the book and study it out myself."



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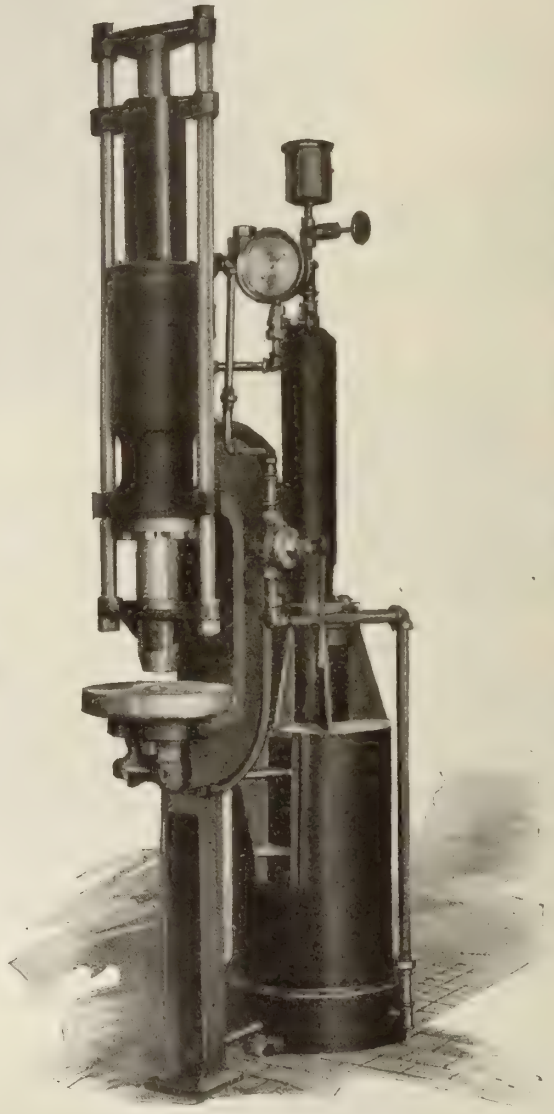
DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

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High Speed Hydraulic and Hydro-Pneumatic Machinery

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For all ordinary shop grinding wheels specify "Diamo-Carbo"—the perfect diamond substitute.

For large, coarse, hard wheels ask for the "Desmond-Huntingdon."

Sherman Corrugated, 2 sizes
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Magazine
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No. 69A

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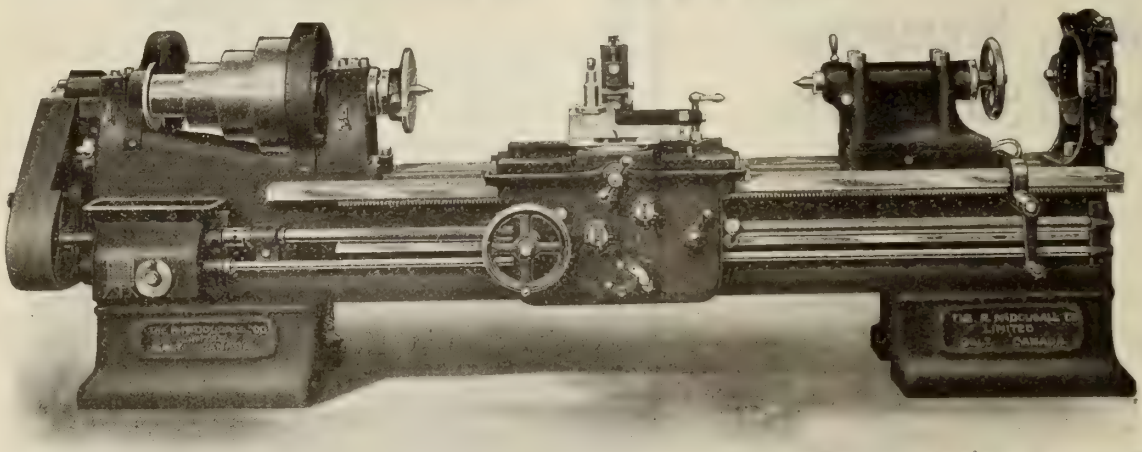

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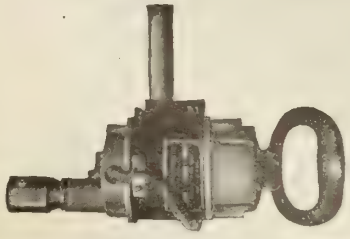

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All motors wound for 110 or 220 volts.

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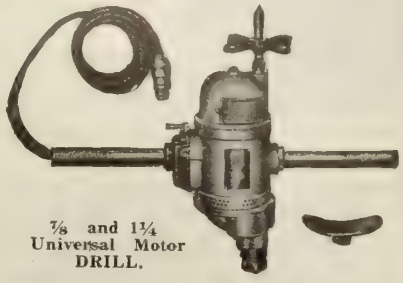

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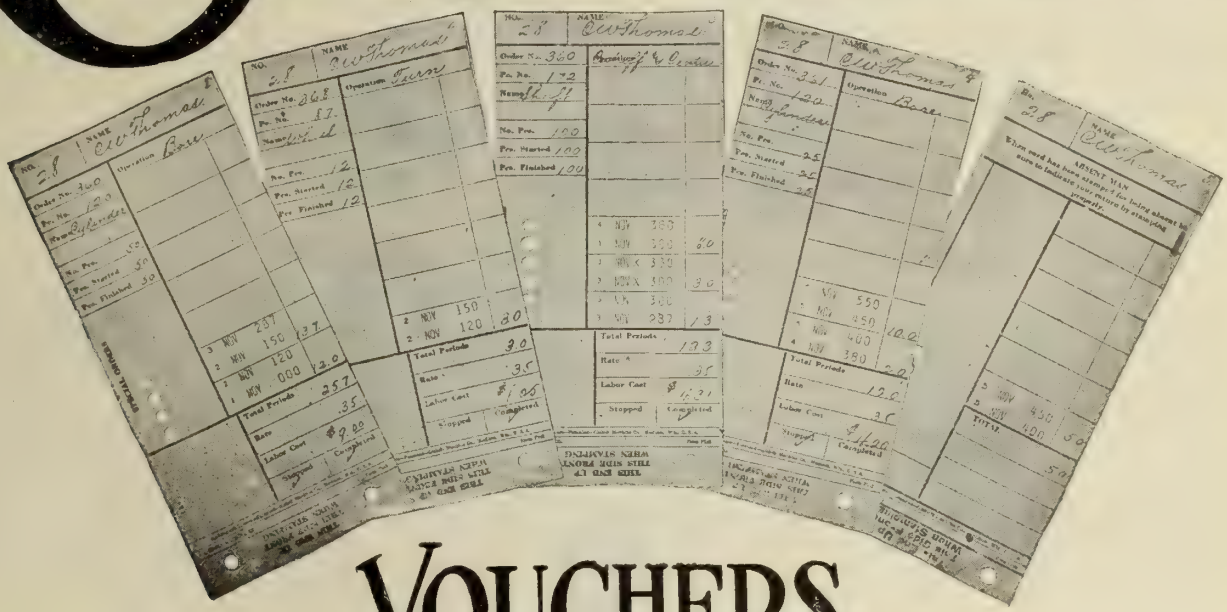
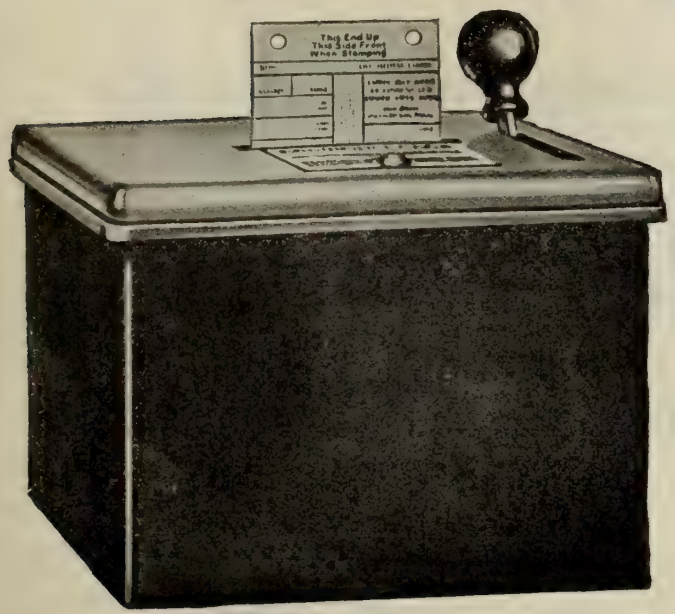


VOUCHERS OF PERFORMANCE



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A Periodograph controlled factory is started right toward better management, increased production and simplified, economic cost accounting.

Every department benefits, from shop to accounting; every man is aided to do his work better, from workman to general manager and owner.

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Dick's Original Balata,
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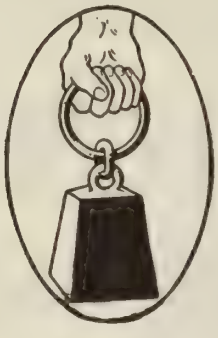
Each considered the best of its particular kind. One of the three will solve absolutely every belting problem.



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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 11. September 18, 1919

Tractor Ploughing Machine of Unique Design

Foodstuffs Are an Absolute Necessity. The Question of Land Cultivation Is Something Worthy of Careful Consideration, and Any Machine Which Reduces Labor Is a Step in the Right Direction.

By J. H. RODGERS, Associate Editor Canadian Machinery

PRODUCTION of foodstuffs in sufficient quantities to satisfy the universal requirements of man and beast, is one of the vital problems of civilization. In normal times, when plenty of labor is available, the question of land cultivation is not surrounded with the difficulties that are only too evident in a time of world crisis, when large numbers of men and women are taken from the productive industries and placed in others where the product turned out is for destruction only. In times like these, and the present is an outstanding example, the strength of a nation depends on its ability to develop, to the utmost, the resources of the country. Cultivation of the land is the fundamental factor of the food problem, and the solution is the extension of the acreage of a food bearing character. Any device that will assist in greater production is essentially beneficial to mankind. With the population of a country tending more and more to crowded districts, it is becoming increasingly difficult to get men on the land in sufficient numbers to maintain the balance for food purposes; therefore, labor saving devices of any description are of the utmost importance.

The accompanying photos and drawings illustrate a novel type of power plough recently designed and constructed by L. A. Desy, civil and mechanical engineer of Montreal, Quebec. Viewed from the near distance it has the appearance of a queer sort of biplane about to take the air, or a mammoth bird with its wings outspread. On closer observation, however, the idea of a flying machine is readily dispelled, as one can immediately see by the construction that the machine is intended for ploughing the ground, and not flying above it. The exact method of operation, at first glance, would be somewhat a puzzle to the uninitiated, but the mechanical mind would at once see and understand the principle upon which it worked, but would be also impressed with the ingenuity of the design and the unique advantages such a machine would have in the cultivation of extensive prairie areas.

Preliminary trials have been successfully carried out by the machine on a farm close to Montreal, and some conception of the work accomplished may be gathered from the photos herewith.

One of the outstanding advantages that is incorporated in this power plough is the fact that a plurality of ploughs can be carried by the tractor, the entire mechanism of the machine being operated by the tractor motor located on the front end of the framework. Another feature of economic interest is the light construction of the various parts, thus assuring high efficiency and low operating costs. Still another factor of interest is the saving of time and labor required to run the plough.

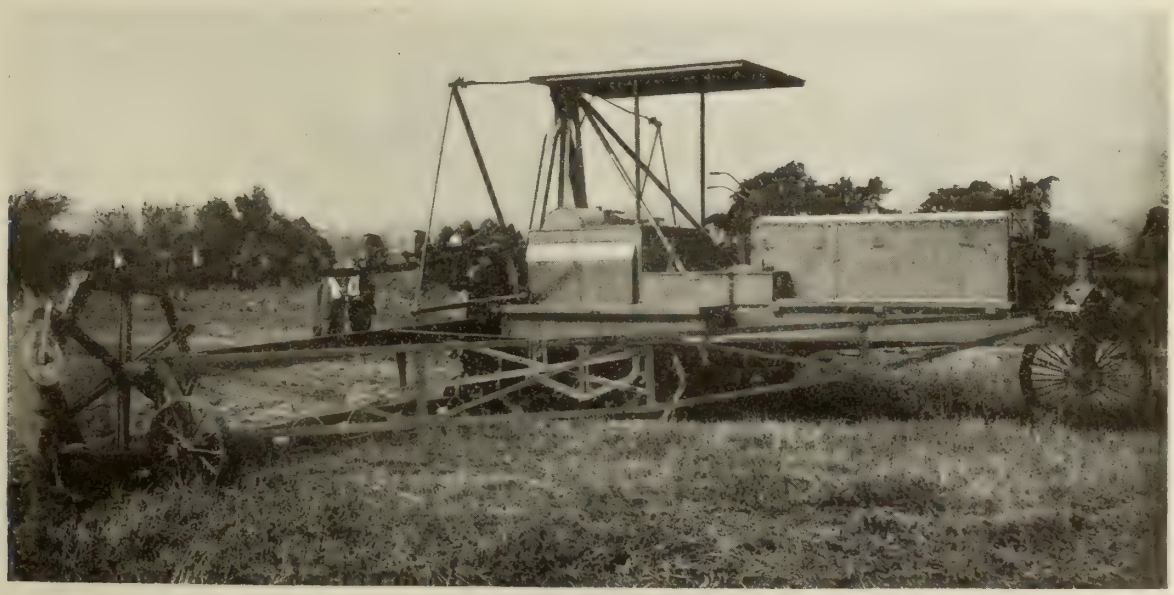


FIG. 1—SIDE VIEW OF THE PLOW SHOWING CATERPILLAR AND FRAME CONSTRUCTION.

FIG. 3—REAR VIEW OF THE PLOW IN OPERATION.

A One-Man Plant

The arrangement of the plough frame and the operating lever is such that the control of the entire machine can be easily manipulated by one experienced man, although it is intended that the engineer in charge will have the aid of an assistant.

That a better idea of the construction and operation may be had, the following brief description is given. The frame of the machine proper is made of light steel channels and angle irons, and steel castings, the latter being largely made on the box pattern, to give strength with ligtness. The line drawings shown herewith are to scale, but accuracy of detail in general assemblies has been dispensed with, the various views being sufficiently clear for descriptive purposes.

In the different views the same parts are indicated by the same reference letters and figures. It will be seen that the power from the engine A is transmitted through the drive shaft B, and the different gears and clutches, to the various shafts for operating purposes. The main shaft C carries the friction discs D.D, and the sliding gears E that provide two different speeds for the caterpillar tractors. These gears may also be located in a neutral position so that elevation of the plough frames, or the lateral movement of the plough shears, may be obtained independent of the advance movement of the tractor.

The forward motion of the machine is obtained by engaging the gears E with either gear F or G, which are keyed to

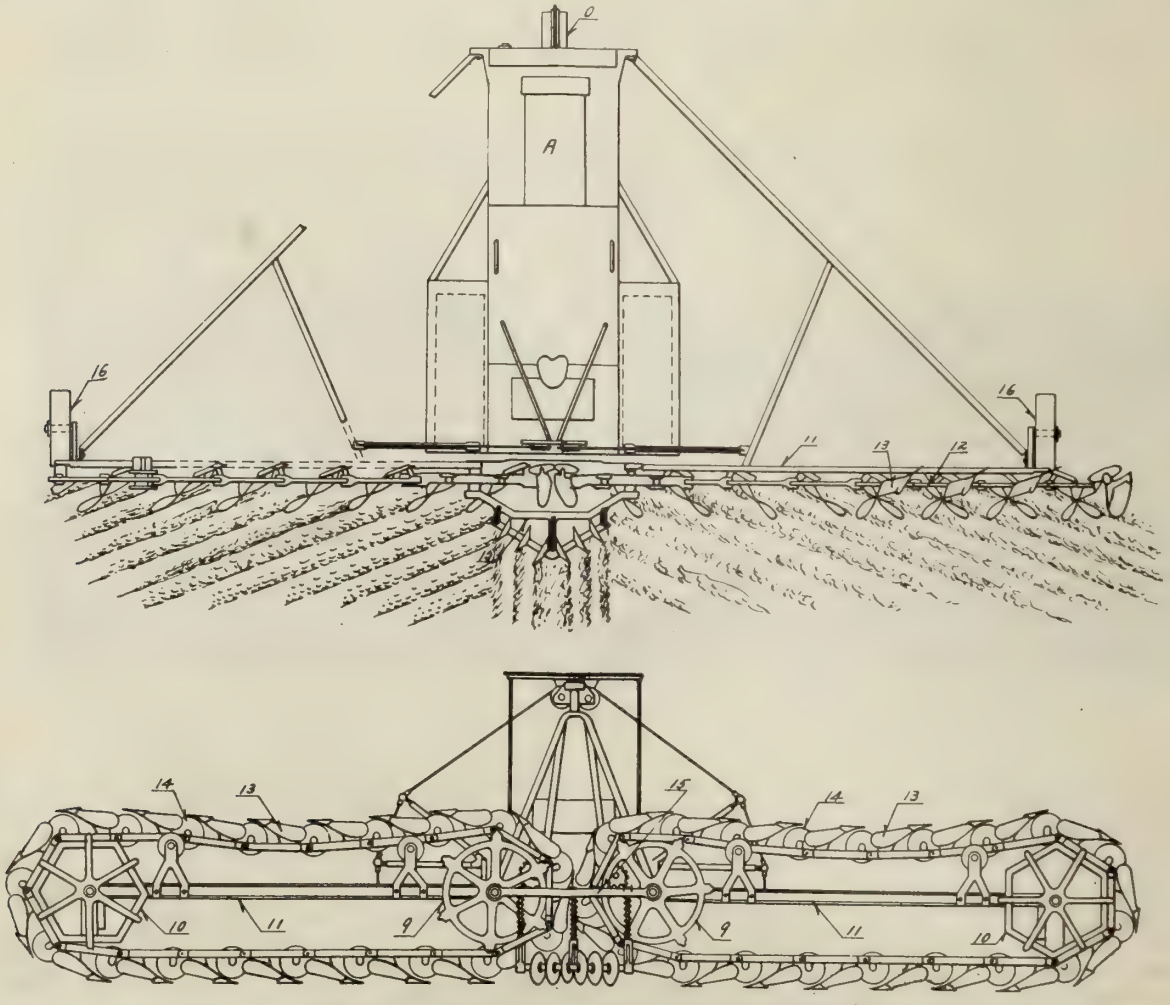


FIG. 2—PLAN AND REAR VIEW OF THE MACHINE.

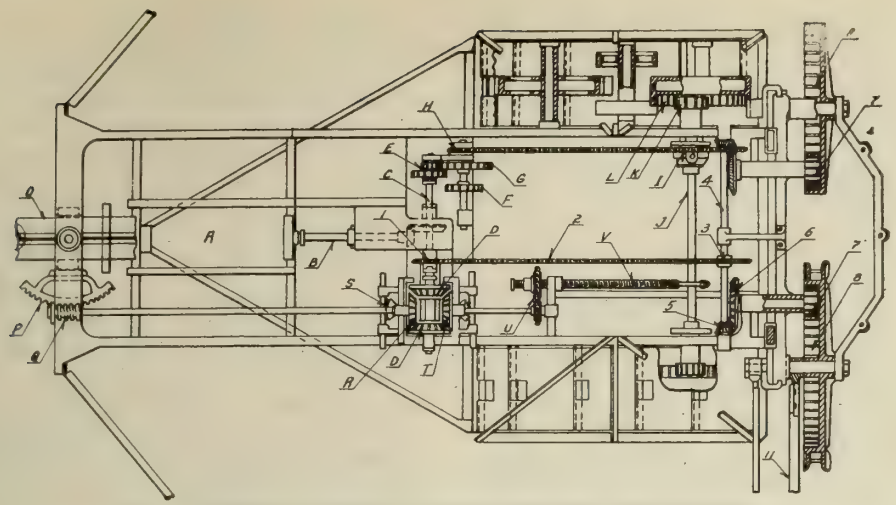


FIG. 4—GENERAL VIEW OF THE OPERATING MECHANISM.

the small countershaft, the small sprocket H being secured at the outer end. By means of a Baldwin chain the power is transmitted to the large sprocket I, that is fastened to the shaft J, that carries the pinion K, K, which in turn mesh with the large gears L, L, on the internal periphery of the hexagon sprocket M, that engages in slots at the joints of the caterpillar treads. These latter are made of sheet steel and wood centres. Small idlers, N, are used to support the centre of the treads. A guide wheel, O, is pivoted at the front of the machine for steering and turning purposes. On the vertical axis is the quadrant P, meshing with the worm Q, driven by the shaft shown, and disc R, this being engaged with the discs D, D, by means of a lever at the front of the operator, which operates the rack and quadrant S, and a cam enclosed in the housing of the shaft bracket.

Raising or lowering of the plough frames (both of which act in unison), is obtained by the movement of another lever in front of the driver's seat. These various control levers can be clearly seen in the illustrations. By engaging the disc T, which is accomplished similar to the forward one, the power is transmitted through the chain drive U, to the long threaded shaft V. To the rear end

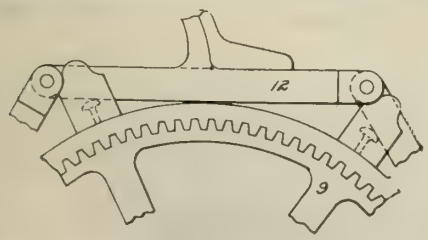


FIG. 6—DETAIL VIEW OF DRIVING SUPPORTS

of this shaft is secured two cables (one for each arm), that pass over pulleys located at the rear of the machine frame. The outer end of this cable is fastened to the upper end of a triangular frame W, one of these being located at either side of the machine. From the outer end of each triangle the plough frame is suspended when raising or lowering it into position, and at such a point that the weight of the frame, ploughs and supporting links, are practically balanced. The frames lift vertically for about one foot and then the outer ends are raised still further while the inner ends remain stationary.

Operating Plough Shears

The unique feature of the machine, however, is arrangement of the plough shears and the method of operation. The principle is somewhat similar to the cutting of a spiral on the milling machine. Here again the initial drive commences at the main shaft C, starting with the sprocket I, the chain 2 driving the sprocket 3 and the shaft 4, each end of the latter carrying the small bevel pinion 5, engaging with the large bevel gears 6, to provide a right angle drive. The pinion 7, on the rear end of the shaft, engages with the internal gear 8, which is integral with the large sprocket 9. A similar but lighter sprocket 10, is carried on the outer end of each frame 11. Over these sprockets travels an endless series of nineteen hollow cast steel links 12, each one of which carries a plough shear 13. Forged plough points are provided for each. A swivel bracket and small stub shaft are also provided on the forward end of each link, for mounting a disc-furrower 14. This disc may be placed at the desired angle with the plough shear.

The plough "chain" is driven by means of lugs on the outer periphery of the central or driving sprockets 9, these lugs being of the forged variety to guide the chain in its passage round the sprockets. The sprockets on either side are staggered so that interference of the plough shears will not take place. Owing to the method of operation, a portion of the ground in the centre cannot be ploughed by the revolving process. To provided for this a large hollow cast steel brace 15, is secured at the rear, between the large sprockets. Hanging from this support are three small brackets that carry two small shafts set at an angle, on which are six disc ploughs. This hanging support is provided with adjustable tension springs as shown. It might be well to mention that the pinion that drives the large sprockets 9, 9,

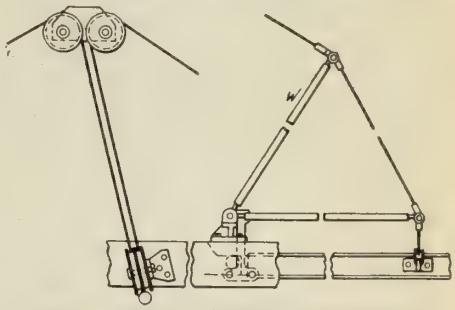


FIG. 7—DETAIL VIEW OF ELEVATING MECHANISM.

is located sufficiently above the centre to permit the elevation of the plough frames the required distance from their lowest position. Several enlarged parts of different details are shown in Figs.

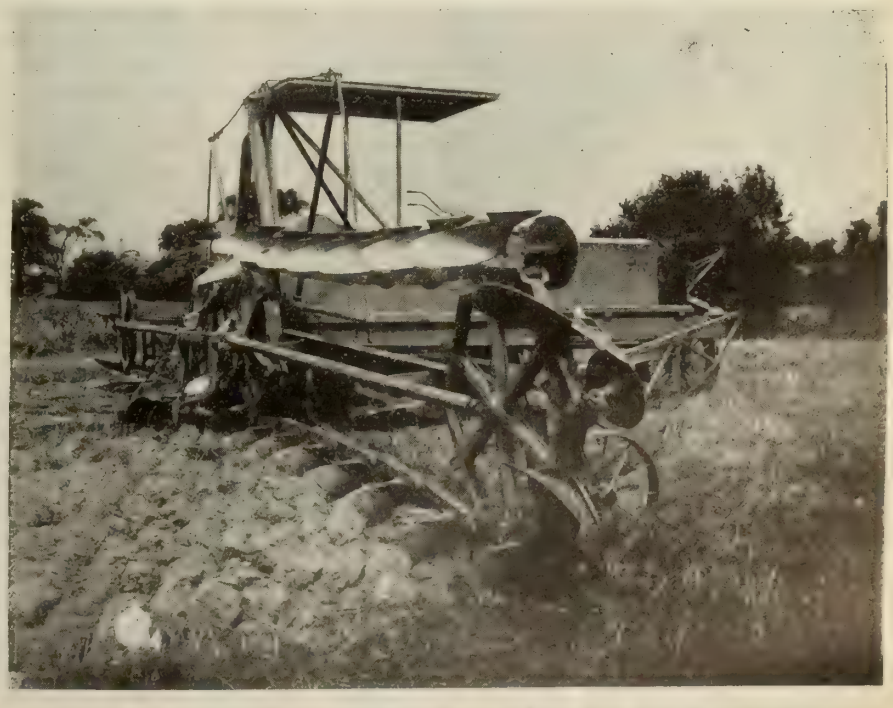


FIG. 5—CLOSE UP REAR VIEW OF THE PLOW SHOWING THE DETAILS OF THE PLOW FRAMES AND FURROWS.

6, 7, 8, that give a clearer idea of the construction.

A guide wheel, 16, is provided at the outer end of the plough arms, suitably supported from brackets that are se-

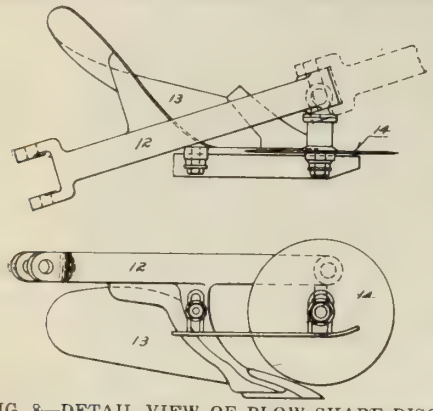


FIG. 8—DETAIL VIEW OF PLOW SHARE DISC AND CHAIN LINK.

cured to the central channel irons. A further brace, composed of a pipe of ample dimensions, extends the full length of each arm, and acts as a stiffening member. It will likewise be noted in Figs. 1 and 2, the light tension member, made of angle iron, that extends from the front portion of the frame to the outer end of the plough arms. On the cut, showing the side view of the machine, can be seen the guiding points, located at the top of the front wheel shaft. This indicator provides an easy method for the operator to tell at a glance the relative position of the steering wheel, and aids him in maintaining a straight course on each and every trip.

In coming to the end of a field the plough arms are elevated, and by operating the steering wheel in conjunction with the caterpillar tractors, the machine can be swung around in its own length, so as to bring the plough in the proper position for the return trip. If desired, the entire machine can be backed up to the very end of the field and ploughing started, thus leaving little or no waste land. The field, after ploughing, will have a herring-bone effect, owing to the angular movement of the plough shears, as the combined forward travel of the tractor and the lateral movement of the plough chain, give a furrow that lies at an angle of about 20 degrees with the field travel of the machine, the furrows being approximately nine inches in width.

The entire machine with all necessary equipment has an approximate weight of about eight tons, and it is estimated that upwards of 10 acres can be ploughed in less than 10 hours. The test, however, was made on land that had not been ploughed in three years, and as this machine is primarily intended for Western farming, where extensive cultivation is continually carried on, the estimated amount of work that may be performed may be materially increased.

DRAUGHTSMEN'S ASSOCIATION

IT is not, perhaps, generally known that there is in Canada an organized Draughtsmen's Association with headquarters in Toronto.

This society was organized on May 16, and on the second and fourth Friday of each month hold regular meetings in the Sons of England Hall at 6.30 p.m.

We understand that the main objects of this association are to promote the economical and intellectual welfare of the class to encourage intercourse between all draughtsmen, to facilitate the acquirement and interchange of professional knowledge among the members, also to bring about a better understanding between employers and employees, and to procure the means of securing employment and supplying help. The president of the association is Mr. Geo. H. Rix, of the Canadian National Railways; the secretary is Mr. Arthur E. Fetherstonhaugh, architect, 224 Kingswood Road, Toronto, to whom all communications should be addressed.

There has recently appeared on the streets of London an ingenious little vehicle which is popularly called the Tankateen. It is a three-wheeled vehicle, taking its general design partly from the conventional motorcycle and partly from the small automobile. It has a three-horse-power motor, which is ample to carry the load imposed by this miniature car. All in all, the Tankateen is an inexpensive vehicle to buy and to maintain, yet it meets the demands of those who prefer something less strenuous than the motorcycle.

A metal lighter than any yet known, and as strong as or stronger than steel, has for years been the dream of many, and every now and then rumors are circulated to the effect that at last it has been discovered. The advantages which such a metal would have, especially for aircraft, are obvious, but unfortunately it is generally found on investigation that there is a "snag" somewhere. The latest report to be circulated relates to a new magnesium alloy, said to have been discovered by a metal company of Montreal, Canada. The new alloy, it is stated, is only two-thirds the weight of aluminum and is "as strong as steel." It is said to be especially suitable for pistons and connecting rods of aero and motor car engines. It is to be hoped that some of the qualities attributed to the new alloy may, on closer examination, be substantiated.

Silicon exhibits the highest known thermo-electric power. It is a curious fact that silicon is either strongly electro-positive with respect to copper or electro-negative, according to the method of preparation, and by combining the positive and negative varieties thus obtained, we can construct a thermo-electric couple displaying the enormous differences of potential of 1,000 microvolts per degree centigrade. The small quantities of impurities, such as iron, which are always found in silicon, diminish the thermo-electric power without, however, changing its sign. By crystallizing the silicon in aluminum to purify it, we obtain a strongly positive product; by crystallizing it in silver or in tin, in each of which it is less soluble, we arrive eventually at an electro-negative product.

Experiments with Germanium demonstrate that this body presents the highest thermo-electric power next to silicon. These two substances also resemble each other in other respects, in particular, in their remarkable power of rectification with respect to the Hertzian oscillations.

FIG. 9—REAR VIEW OF THE PLOW WITH THE PLOW FRAMES ELEVATED TO ALLOW THE MACHINE TO TURN FOR THE NEXT TRIP.

Canadian Machinery Drafting Course Review

Now That the Summer Is Over, There Is No Reason Why We Cannot Once More Settle Down to Work on This Course. For the Benefit of New Readers We Make This Lesson One of General Review.

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE entering on the actual review lesson we will relate for the benefit of the readers how the idea of the course originated.

The writer, himself a slave of the board, suggested that the readers of CANADIAN MACHINERY should be given, through the medium of our columns, a series of lessons on the art of mechanical drawing.

The suggestion was immediately adopted, although such a proposition was entirely new and had never before been attempted in the form in which we now proposed tackling it, namely, to have the students send their work in for judging, and award to the three best efforts sent in each lesson a suitable prize.

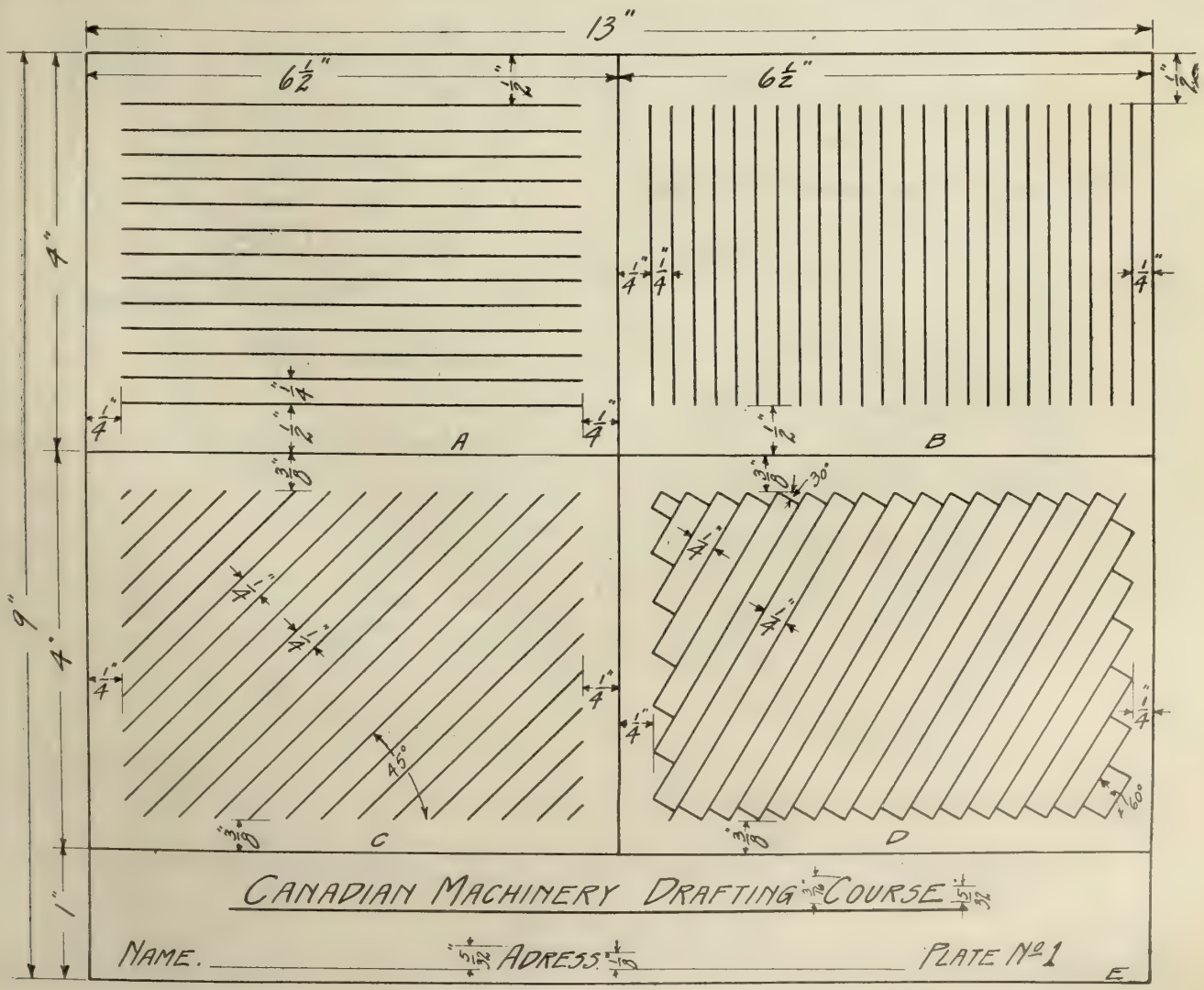
The idea took hold from the very start and the readers of CANADIAN MACHINERY were wise enough to realize that they had here an opportunity to secure a series of study lessons at practically no cost, which if secured through any other channel, would entail a considerable outlay.

Naturally, this is a source of considerable gratification to us, seeing that we have gone to considerable expense in preparing this series. So great, in fact, has been the demand for back copies of the course, that we have been obliged to issue reprints in order to comply with these requests.

Each part has been reprinted separately so that our readers may secure any part desired simply for the asking.

To those who have not yet started the course we can only say: "There is no time like the present." If you require them, we will send you the seven parts already published without any charge whatever.

As evidence of the universal interest taken in this series, we have only to mention that we have plates coming in from all over the country. We have received them from points situated from coast to coast in Canada, and even Uncle Sam's domain is interested in our attempt at providing the apprentice and tradesman with a practical study of mechanical drawing. The states of Connecticut and Illinois have so far been represented. The Grand Trunk Railway Co. have a splendid system of training for their apprentices, and they have seen fit to adopt these lessons as a help to their students. We have already enrolled over one hundred of these boys on our list. We have no doubt that other firms will also see the advantage of interesting their apprentices in the series. The apprentice of to-day is the tradesman of to-morrow, and the add-



ed education which the apprentice is bound to assimilate will eventually come back in some form or other to the manufacturer himself as well as help the student to increase his earning power.

So a word to the wise. If you are already a student stick to the work you have taken up and follow these lessons faithfully. If you are not a student, be one NOW. We have not yet gone very far in these studies, and by securing reprints you will soon catch up—or, if you prefer, start right in at this point and follow on.

Having given this short resume of the history of our course, we will now start in on the review lesson proper.

At the commencement of our lessons we promised to touch only on the essential points of our subject, and as far as possible we have followed out this province.

Review of Part 1

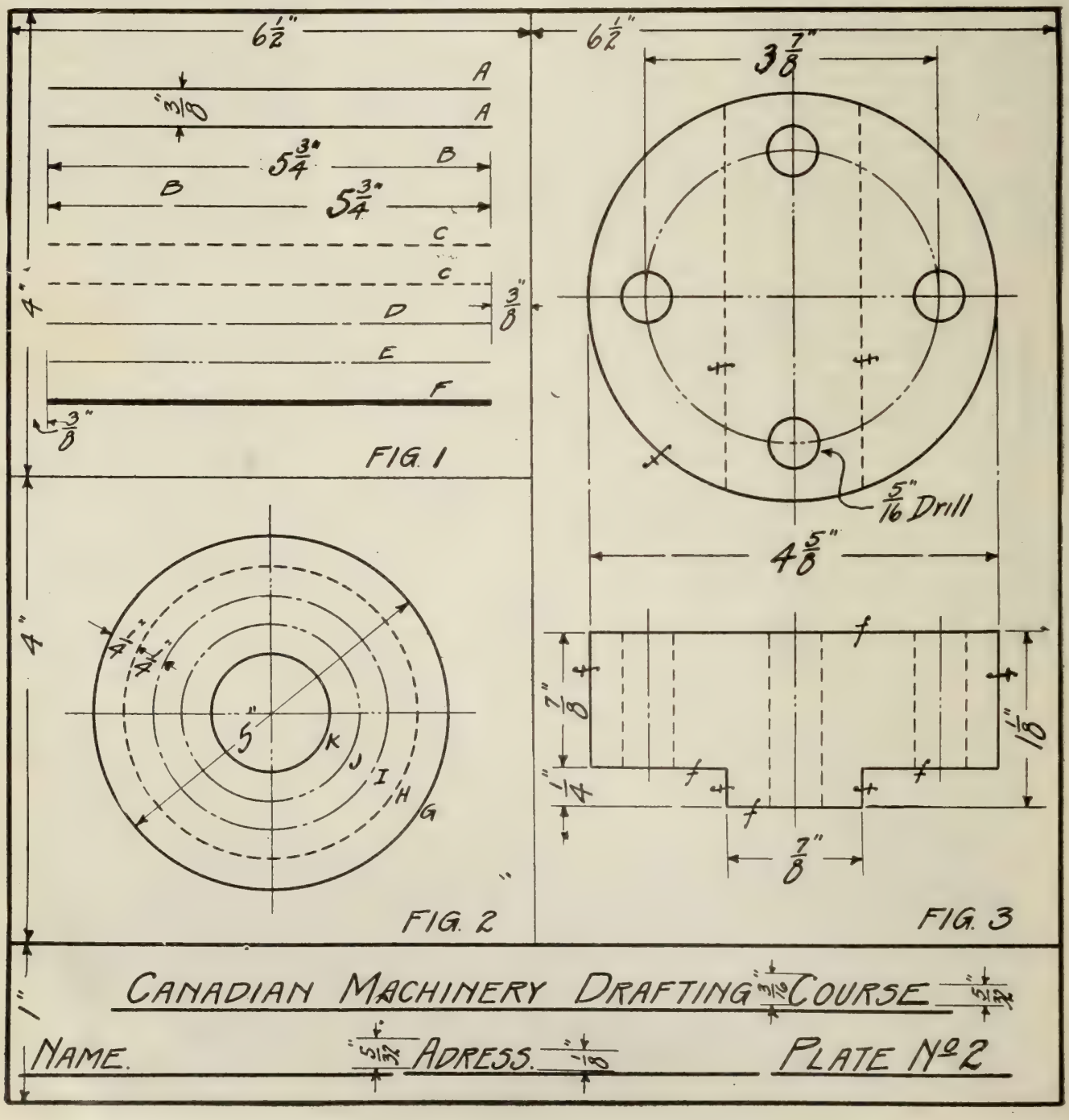
In Part 1 we defined mechanical drawing as the method of showing graphically the intricate details of machinery. We said that it was, so to speak, the language by which the draftsman speaks to the workman. We impressed upon the reader the necessity of making a neat drawing, for a careful draftsman never made a poor drawing.

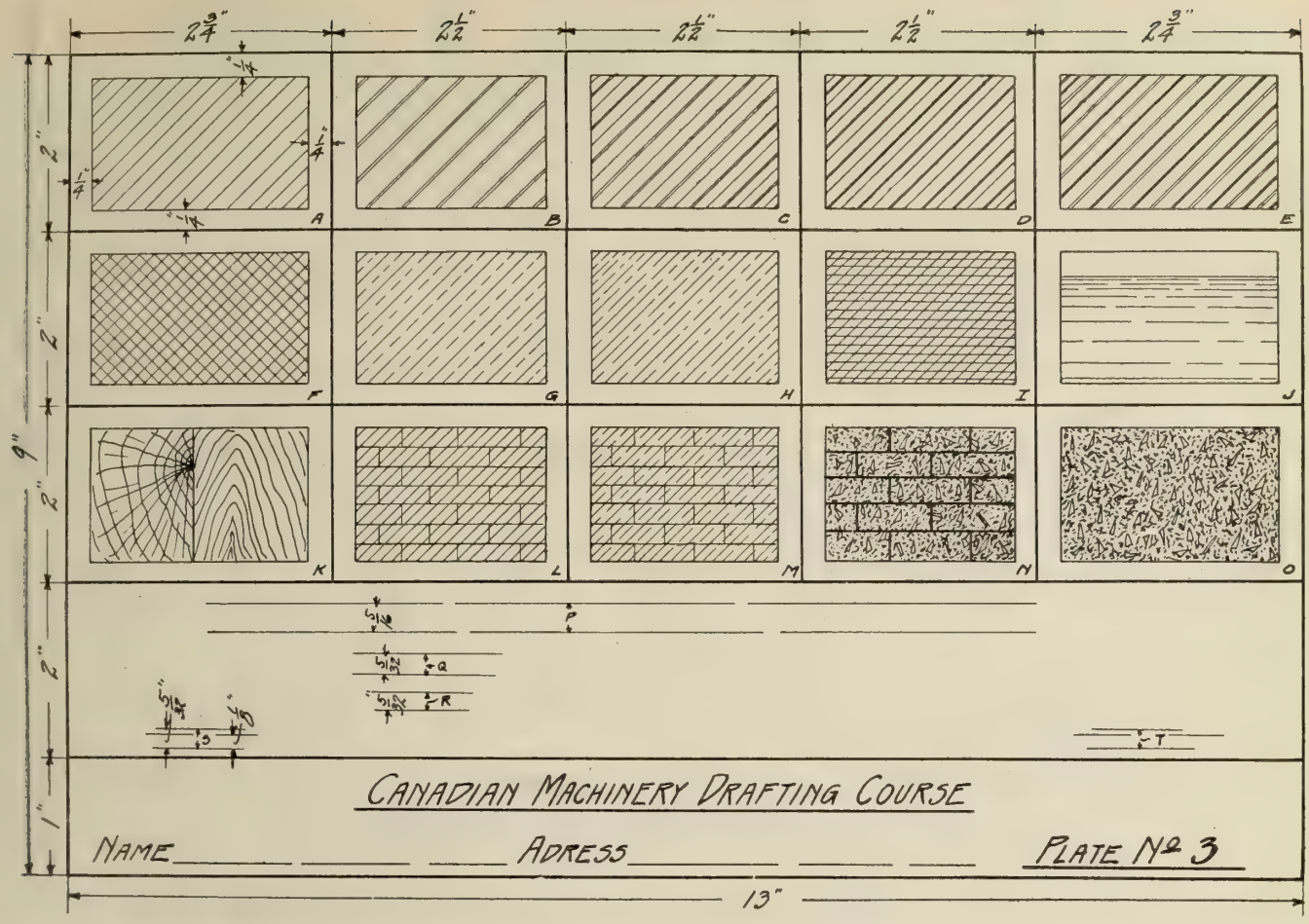
We touched on the question of paper, and mentioned that a grade of cold pressed drawing paper would effectually serve our purpose. The subject of sharpening the drawing pencil was discussed and illustrated, a chisel point being designated as the proper point to be used. The drawing board, T-square, triangles, etc., were all discussed, and their uses were fully explained. To conclude Part 1 we instructed the student to prepare Plate No. 1, which we reproduce in the present lesson, for our new readers' benefit. We will, in fact, show all these former plates, so that new readers who do not wish to study all the former parts in reprint form, can at a glance see the ground we have already covered. It would be a splendid plan for these new students to draw up these former seven plates for practice. Practice, we are told, makes perfect.

Of course, it is unnecessary to send in these plates from 1 to 7, but commencing with our next lesson on plate No. 8 we hope to see your work.

Review of Part 2

In Part 2 we went still further into the use of the drawing instruments, including the scale, French curve protractor, and regular typical set of instruments. We also discussed some triangle problems, and the fact that lines dif-

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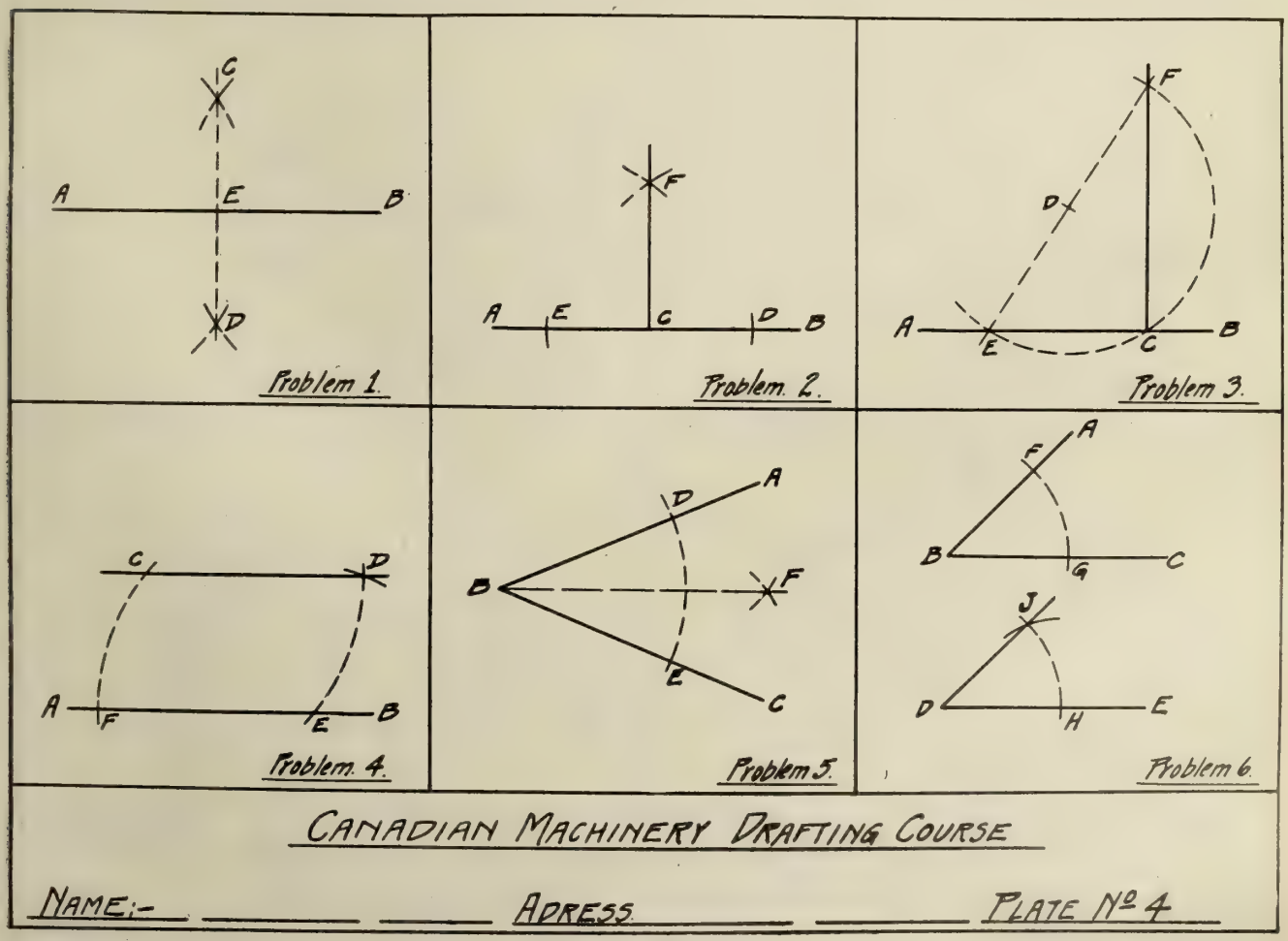
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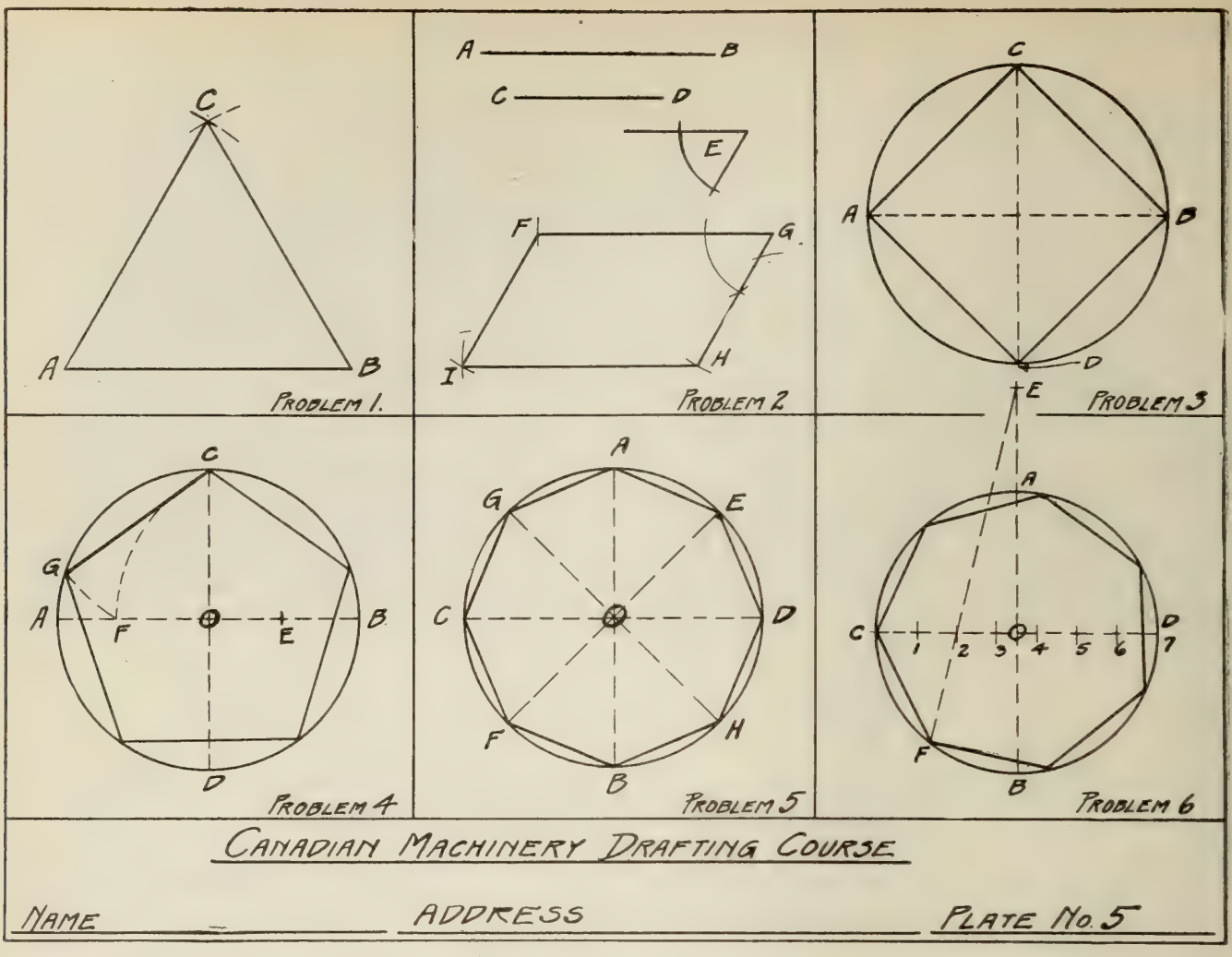
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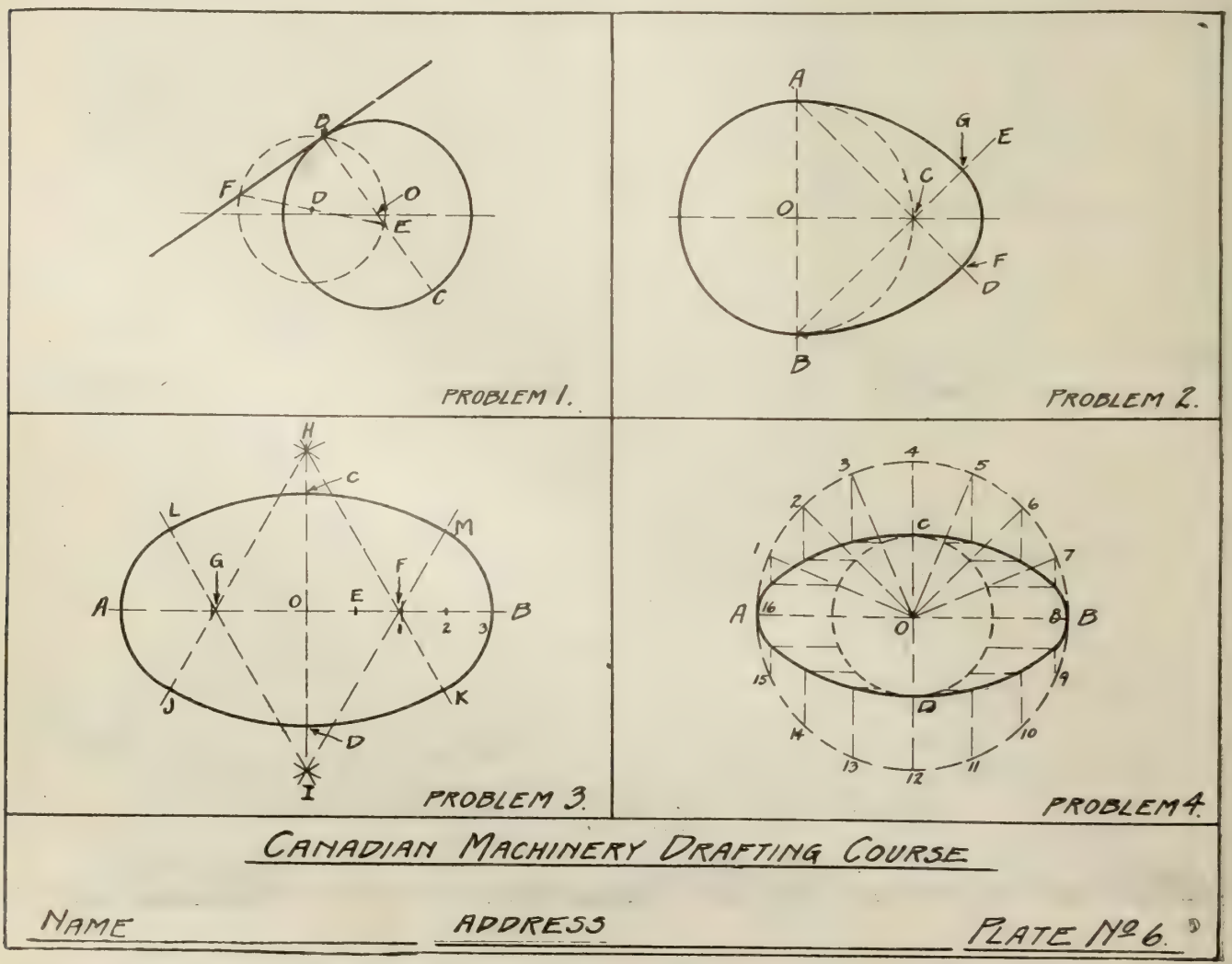
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PLATE No. 6.

fered in style and representation. We referred to the full line, the dimension line, the dotted or hidden line, and the construction line. We also took up the question of finish marks and their proper function.

We then reproduced Plate No. 2, and requested that this plate be inked in with a good brand of India ink. Higgins' ink was suggested as being about ideal for this purpose. Plate No. 2 is also given in this lesson, and is well worth drawing up.

Review of Part 3

In Part 3 we started with a friendly warning to the student in general. "Do not yield to the inclination for speed only, but be content to travel the road carefully and at a natural gait" was our suggestion. We issue this warning not to quell any impatience which might arise in the student when he saw Plate No. 3, and read the lesson of the same number, for the complete portion was devoted to lettering and section lining. We felt that students might say: "Oh, what's the use of all this"—but you cannot make a neat drawing without neat lettering, therefore, lettering is essential, and to know by looking at a sectional view the materials represented you must first know how the various materials are represented. We see, therefore, that not only is lettering necessary, but section lining must also be a part of the study, from which it will be seen that we were touching on the essential points only. New readers cannot do better than secure a reprint of this portion, for it is impossible in a review of this nature to give all details. Plate No. 3 illustrates how the work embodied in this part was finally arranged. The lettering below this plate read as follows: "CANADIAN MACHINERY" (in block letters), then followed "CANADIAN MACHINERY has a motto well worth while. To make their paper better this week than last week, advancing all the while. The price is $3.00 per year. Let us have your subscription now." By this means, we gave students practice in their lettering, and at the same time, impressed on them the fact that CANADIAN MACHINERY was honestly endeavoring to please its readers.

Review of Part 4

On starting Part No. 4, we urged upon readers the necessity of securing a good groundwork in geometrical drawing.

We promised, however, that only three plates on this subject would be dealt with, and that only the most important and practical geometrical problems would be considered. We then went into geometrical definitions from a point right up by stages to the questions of angles. We next gave instructions for Plate No. 4, which is shown in this review lesson and is well worth following up.

Review of Part 5

In Part 5 we went still further into the subject of geometrical terms and their meaning, leaving the angles and going into surfaces and plane figures. The various polygons were taken in turn, triangles of all kinds the parallelogram, the rectangle, the square, the rhombus, and the trapezoid. From this we went on to plate No. 5, which we have reproduced.

Review of Part 6

In the third and last portion of geometrical drawing, namely, Part 6, we entered upon the subject of circles and solids. All the various definitions were gone into. The diameter, radius, tangent, chord, secant, area, segment, sector, inscribed angle, concentric circles and eccentric circles were all discussed. The measurement of angles was also investigated.

The cylinder, cone, sphere and ellipse were later explained.

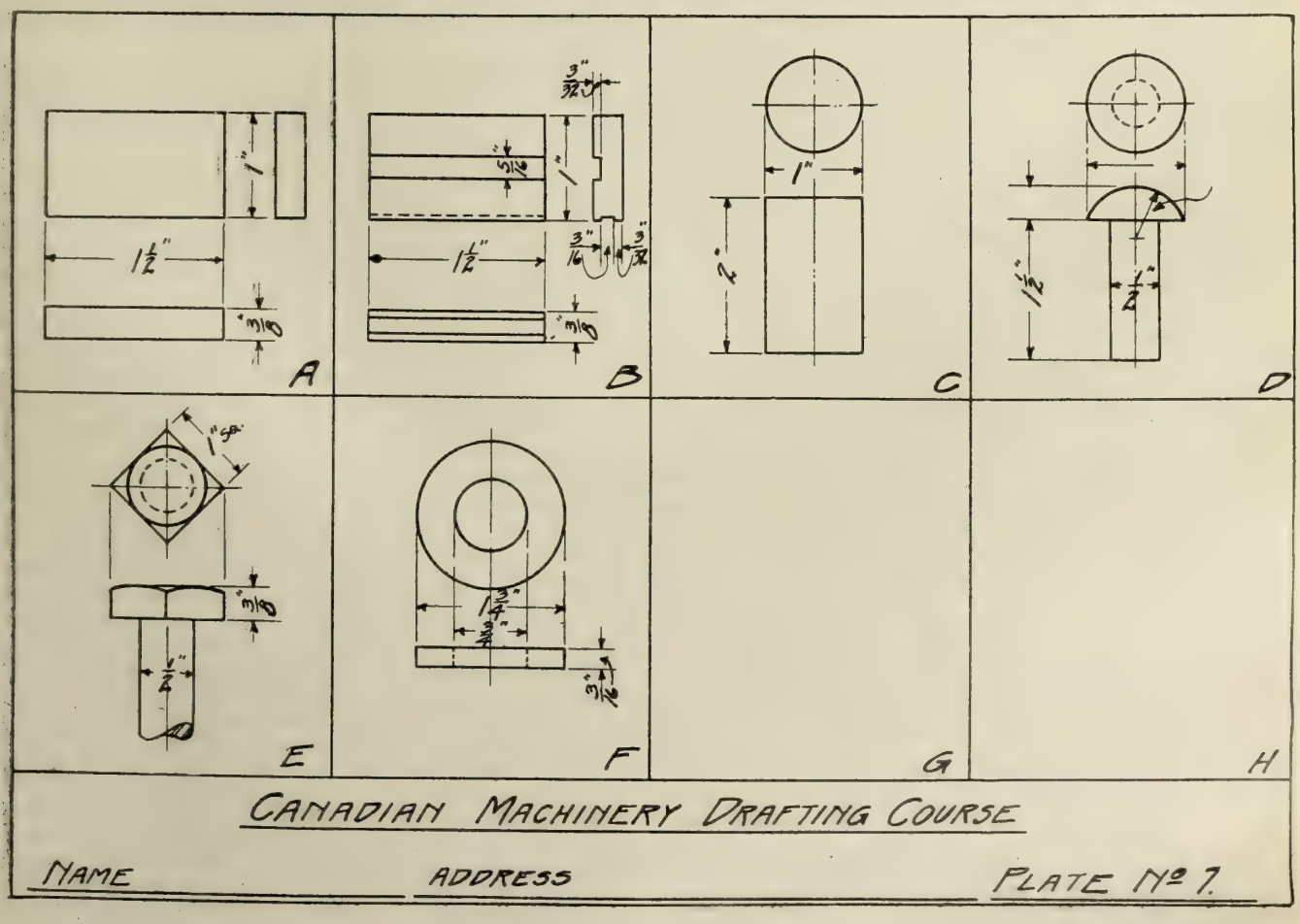
We then went on to Plate No. 6, which will be again found in this lesson.

Review of Part 5

We entered a new field in this part, namely, the subject of orthographic projection. In order to make the same interesting to the student in general, we used (as far as possible) objects with which the student was familiar. A clamp, was first shown as it would appear to the eye, then as it would be drawn mechanically. We next showed an angle plate as it would appear to the eye, and we again placed before readers the mechanical drawing of this piece.

We next portrayed a chart of eight pieces, as these pieces looked to the eye, each piece being familiar to the apprentice of the drawing office, or shop, and on Plate No. 7 we placed, mechanically,

(Continued on page 303)



Some Chatter from the Pneumatic Drill Motor

By JOHN O. HOPE

I AM the Hill Drill Motor, and following the route of my predecessors, I was one day shipped in company with some of my respective brothers to a large plant in N. H. I felt assured that I was pretty badly wanted at this destination, for I had heard that there had been some hold up, in jockeying with the requisition and invoice papers in connection with my delivery, which was every day delaying and also making a great deal of hard feeling with reference to a large machinery contract which was promised under certain contract date delivery.

We were taking some pride in assuming that our motor family, including myself, were so chiefly concerned, and were to be so much depended upon to help out on this most important contract.

On arrival at my destination in N. H. I was duly passed through the receiving office, then taken out of my travelling costume, so to speak, and put on a tool rack in the stores, where after a very brief rest, I was taken from this department and brought into a large machine plant.

The familiar mechanical working sounds which greeted my ears on entering this plant made me feel that I had found a home somewhat similar in most respects to the one I had previously graduated from.

I was straightway introduced and handed to my friend Driller (as I shall call him), an easy going, none too particular, so you could notice it individual, who was told to take great care of me, with a reminder from his foreman, that he did not want to hear any more complaint about (That Old Motor), as such stuff would not be swallowed in the near future, or for some time to come.

My friend Driller, who was now to be my very intimate friend or enemy in the days to come, stood me up on end and pivoted me around on my handle end with a few expressive grunts, which at this present time gave me no cue to determine whether they were grunts of satisfaction or disapproval. Other casual observances of my exterior being concluded, he accidentally let me slip from his hand which brought my body in hard contact with the cement floor, which accident gave me a bodily twinge that made me feel that a few repeated occurrences of this nature would make me fall into a decline (not as yet indicated).

My friend Driller, as I will still call him, picked me up apologetically and murmured something about the paint, which I presume was my exterior finish or coat of respectability which all the pneumatic motor family possesses.

He now swung me up on his shoulder and made a casual remark to another Driller brother, who was pulling a poor dilapidated looking cousin of mine across the floor towards him by the air conveyance known as the pneumatic or motor hose, that he would have to take me to the Motor Trouble Man and see that I was O.K. in my lubricated parts.

The repair man looked me over and expressed his opinion that my home people had probably attended to this most important need before I was shipped, but to make doubly sure he proceeded to pour a liberal amount of their oily substance into my working parts, remarking that it would do me no harm.

This measure of thoughtfulness gave me an uneasy feeling, that I was very much physicked, and that there would be a resultant observance in connection with this in the very near future.

My still best intentioned friend Driller now picked me up once more and brought me to the scene of labor, where he and myself were to thresh out our life's difference in the interest of the N. H. plant's demand.

He now procured a length of pneumatic hose, and connected one end, which had a very indifferent thread connection, to my throat, which when coupled to the main air line connection left me ready for service; meanwhile, I heard him remark that the hose was not up to much, and that some of those wise guys would be around presently to give him what for, and make him believe that he was using up all the air in the plant, and from my distant location I could judge by the sound of escape air that our initial start off would not be altogether amicable.

My thoughtless friend the Driller, as I will now have to designate him, proceeded to open up the main air valve, which caused an accumulation of dirty brown water to rush down my throat and enter into my lungs, which completely choked me up, and being in an oil-doctored condition, as before mentioned, it took some time to get this dose out of my system, which when attended to, made me experience a feeling of being washy and very dirty in my vital organs, and with acute signs of indigestion if any more of the same proceedings was to be renewed.

My now distrusted Driller proceeded to insert a machine drill into my main connection provided for this purpose and not feeling quite satisfied that he had made the drill secure enough into me, which was of tapered shank variety, he, to my astonishment, picked up a hand hammer and gave the drill a sharp blow on the extreme point, which gave my inside an unpleasant jolt and he then seemed concerned only to notice that he had not damaged the cutting edge of the drill, and to murmur a blessing on himself that he did not get the sliver of steel in his eye which he was industriously picking out of his hand with a pin.

I was now placed in a very favorable position which I could see at a glance was going to enable me to demonstrate my superiority by drilling a straight depth hole of 6-in. thickness of metal.

When the air was released to start me on my anticipated labor, I could tell right away quick that my poor friend the hose was in a very sickly condition and was not capable of delivering the proportionate amount of air to my lungs that I could feel was necessary to make me produce the goods.

My now cranky friend the Driller passed not a few unsavory remarks about my anatomy in general and at the same time released the drilling pressure on me to such an extent that I fairly ran mad, so to speak, but making very slow progress in getting through the 6-in. deep hole which I was drilling.

Eventually, by spasmodic stopping and starting pressures exerted on me at an uneven application of the feed screw situated on my top-knot we managed to struggle through this particular job, which when concluded I was unceremoniously banged down on the floor.

Oh, if I could only have made my cranky friend the Driller understand, that to have fixed up poor friend hose would have been a blessing, and that giving me the full power and pressure of air, which was my principal and essential need, I then could have kept right on running at a normal speed which would have controlled me by a steady feed, relative to constant cutting, which would have let me perform a quick service and saved a couple of thousand cubic feet of free air which was racking my inside by the uneven work which I was asked to perform.

I will now have to start in and lose any or all respect that I might have entertained for my meanwhile friend Driller, for now that he was obliged to change the drill for a smaller size, he deliberately took a hand hammer and, after having taken a cautious look around (probably

with respect to my new condition and slight momentary compassion for me) he hit me several sharp blows on the part surrounding the entrance to where present drill was driven into my body previously described, and when this did not release the drill he deliberately placed the sharp edge of a cold chisel on the drill as close to my body as he possibly could and gave a couple of good, hard blows which made an indent in the drill shank, another in the chisel and produced a great, heart-breaking drag to my inside works.

The balance of this day's work was a constant repetition of the above-mentioned performance, and at quitting time I was bundled into a cupboard amongst a miscellaneous assortment of old fittings, etc., where I was perforce obliged to gobble any or all of the dirt and dust that came in my way.

On the following morning I was not at all surprised when my enemy the Driller, as I must now designate him, lugged me out and started me on my day's labor, and for several days at a time, never giving me a thought that I was perishing for a good lubricant bath to oil my working parts, and you would have sat up to take notice of the way he hauled me around in the days that followed.

My fate was similar to that which I have seen handed out to most of my family connections. It is then you could understand that after being in the repair doctor's hands several times for bad external sprains and internal seizures that the life had fairly been dragged out of me and I could not help but think that the only consideration that probably saves and manages to keep our family reputation up is due to the fact that not all Drillers are our enemies and that we can still rub shoulders with a great number of our good friend Drillers who know the treatment we deserve.

ECONOMIES AND COUNTING

By F. E. MERRIMAM

ONE of the greatest differences between ancient and modern methods of manufacturing is the greatly increased use of machinery at the present time. In olden times machines were few, frequently inefficient and always expensive. By contrast, labor was plentiful, cheap and could quickly become reasonably efficient. In fact the manufacturing methods of the various nations of the world now differ along much the same lines. The progress of industry has been marked by a reversal of these conditions, which is continually becoming more complete.

One of the most common operations in any factory is that of counting goods in at all stages of completion, as well as purchased material. This is such an everyday, commonplace operation that not infrequently its expense is unnoticed and the means of reducing it quite neglected. Undoubtedly, if the total cost of counting goods in any factory were accurately determined, the management would be tremendously surprised. The largest factories, of course, carry the greatest expense, yet even the smallest have a considerable bill. It is a strange commentary that frequently an exceedingly small factory office will boast an adding machine, while its much larger factory has no better method of computing its output than the "One, two, three, four" method. Quite reliable if the counter can keep his mind on it and is not disturbed; but subject to many and often indeterminate errors. It has also the disadvantage of not possessing much capacity for increasing the quantity of goods handled.

Obviously the answer to the counting problem is a quick and accurate mechanical device. There are such machines on the market which fulfil these requirements, as well as that of reasonable durability and a low maintenance expense. To the average manufacturer who does not have a vast quantity of goods to be counted, such an apparatus seems too expensive to consider; since but little known time may now be spent in counting and obviously the machine under such conditions will be idle a considerable part of the time. Here, however, is where a serious mistake may be made, for not much labor need be saved to pay splendid returns on the investment, notwithstanding the idle machine time.

An actual case will illustrate the fact that the saving in time may be very small, the machine idle most of the time and yet quickly pay for itself. A screw machine department had one man at twenty cents per hour counting screws, bolts and other small parts, and his errors were known to be sufficient to require a checking count by the manufacturing or stores department next receiving the goods. Three hours per day were spent in counting and recounting this one department's output. The expense was 20 cents per hour, or about $180.00 per year, on a 300 working day basis. A suitable machine for the work could be purchased for $125.00 and the investment then figured out as follows: A saving in the counting time of 75 per cent. easily resulted which amounted to $135.00 per year—an excellent investment, though the machine would be in use only a little over two hours per day. However, the saving was more than this, since the accuracy of the machine made a recount unnecessary, thus saving half the original time plus 75 per cent. of the balance. The real saving therefore was not $135.00 per year, but $157.00. This was surely a return sufficiently great to satisfy most investors. The idle time of the machine was remedied to a considerable extent for another department could use the machine to an equal or even greater advantage, thus adding greatly to the value of the machine.

A very important fact in this connection is that this saving was available and possible even though so little time was spent in counting as three hours per day, and once a trial was made further uses for the machine were quickly found. Obviously, a concern may do far less counting than the one mentioned and still be able to afford a counting machine. In fact, the usual yearly inventory alone considered, there are many instances where the machine, if used only during inventory, would still be worth its cost in time saved, not to mention the increased accuracy and consequent enhanced value of the inventory. Stock records are kept accurate only by an occasional verification of the goods on hand. For this purpose the counting machine is invaluable, greatly lightening the task, as well as increasing its reliability.

All manufacturers have some counting to do, and it is an expense well worth an investigation in all cases, for the cost of such an investigation is practically nothing and the remedy not expensive.

DRAFTING COURSE

Continued from page 301

these pieces as they would appear in shop practice. The last two portions were left vacant on this plate for the student to complete himself. We did this to make sure that the reader had followed out our instructions and understood the principle involved.

This brings us to the point where we stopped for the summer months.

From this viewpoint we will in our next lesson proceed on to further heights as the poet would say.

To use our own everyday language, and not paying attention to poetical flow, let us decide to plug along and get there, and we can only do this by earnest study. In our next plate we will discuss another, and our last plate on projections.

Having completed our study of these basic underlying principles, we will as soon as possible get onto the actual mechanical drawing, building up of a machine tool, piece by piece, later making an assembly of the complete arrangement.

We would strongly advocate that new readers write us for the seven reprints we have prepared, so that they can study in detail the work which has gone before. To our old students who so splendidly stuck to their guns during the former lessons, let us say: Polish and clean up your instruments, dust off that drawing board, and get ready for the next lesson on the subject. By way of a send-off, we will announce the prize winners on Plate No. 6 and 7 in our next issue, so watch for your name.

DEVELOPMENTS IN SHOP EQUIPMENT

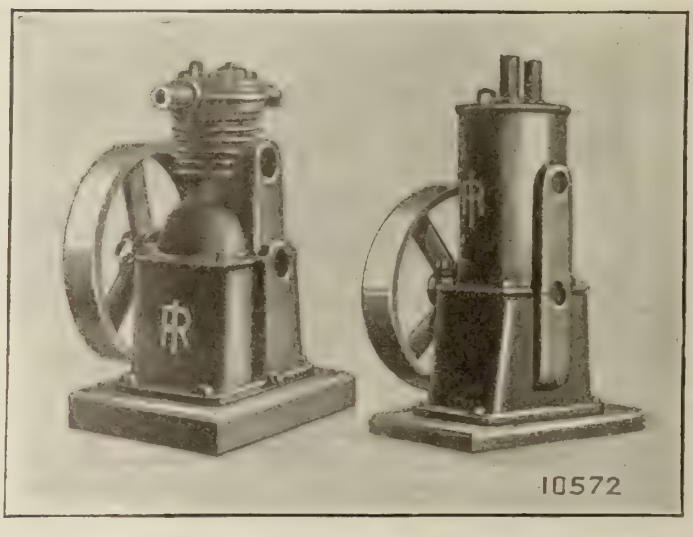
A NEW LINE OF SMALL AIR COMPRESSORS

Capacities Range from 3 to 45 Cubic Feet

THE Ingersoll-Rand Co., 11 Broadway, New York, have placed on the market a line of small air compressors, developed during the war, and known as the "Imperial Fourteen" compressors.

These machines were designed to meet exacting efficiency tests, and have been carefully watched. During a year's service they have proved themselves to be simple, efficient, reliable and economical little machines to operate.

They are made in four sizes, with capacity ranges of from 3 to 45 cubic feet per minute, at 100 pounds pressure to the square inch. Owing to the high grade materials used in their construction and the liberal factor of safety allowed in their design, these little compressors can, however, be used for pressure requirements of up to 200 pounds per square inch, the horse power required being, of course, slightly increased.



THE SMALLER TYPE WITH VANES CAST ON CYLINDER.

Single Stage Single Acting Type

They are single acting machines of the single stage, vertical type, built for belt drive.

Where they are to be driven from a line shaft, tight and loose pulleys are furnished. Where the use of an independent motor is contemplated, they are usually furnished as a unit with motor, endless belt and swinging arm short belt attachment, mounted on a hardwood base plate.

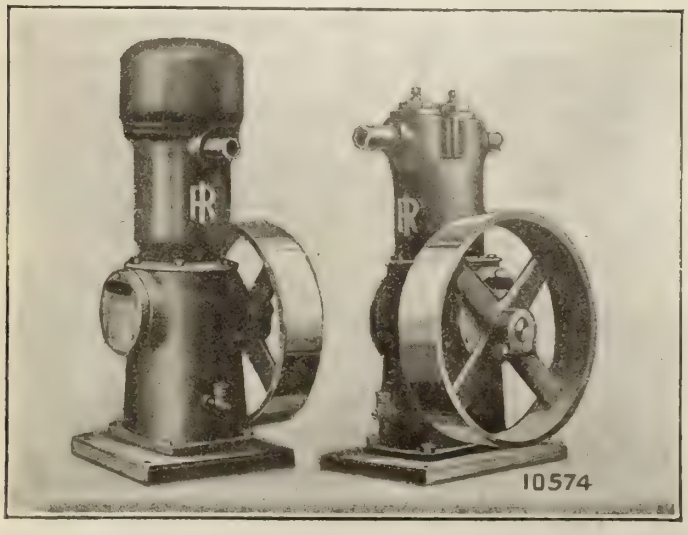
The machines have been so carefully balanced as to permit satisfactory and efficient operation if bolted to any ordinary solid flooring, but where the installation is to be of a permanent nature the use of a concrete foundation is recommended.

Methods of Cooling

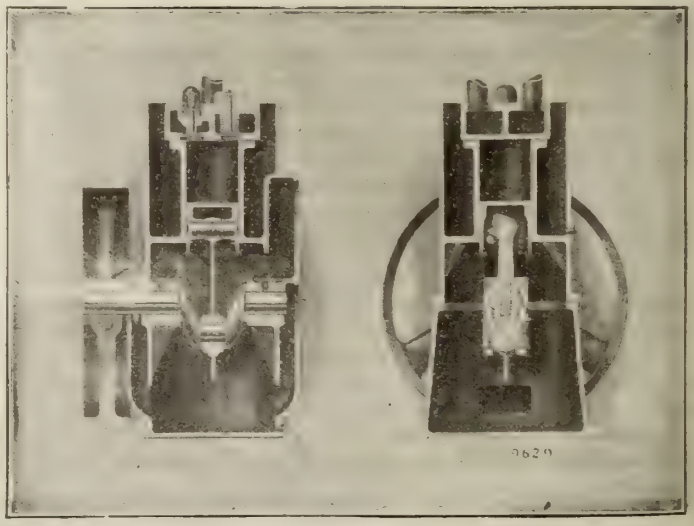
The smallest size is built with deep vanes, or ribs, cast on the cylinder, for use where the service requirements are of an intermittent nature, and with water-cooled cylinder, of the reservoir jacket type, for continuous operation.

The larger machines are supplied with the reservoir jacket system of cooling only, with the exception of the largest sized machine, which may be had equipped with a closed water jacket for direct connection to pressure system if desired.

The reservoir jacket design affords an unusually ample supply of cooling water, which acts on both the walls and head of the cylinder. A single filling of the reservoir is usually sufficient for a run of ten hours.



GENERAL VIEW OF COMPRESSOR.



SECTIONAL VIEW.

In many features of design these new compressors closely resemble the modern automobile engine. There is a similarity in the drop forged connecting rod and crankshaft, the die cast reversible white metal bearings, the automatic splash lubrication system, and the general ruggedness and simplicity of construction which characterizes machines intended for operation at high efficiency under all sorts of operating conditions.

These little machines are well adapted for the use of stone cutters, industrial plants, garages, power plant and printing establishments operating monotype machines, which require a little air at low cost all the time.

They are distributed in Canada by the Canadian Ingersoll-Rand Co., Ltd., Montreal, Que.

UNIVERSAL TOOL-HOLDER

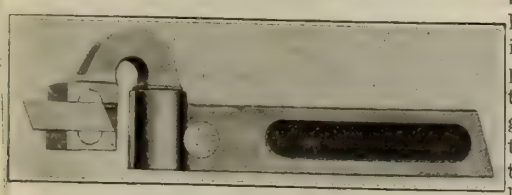
The Universal Tool-Holder Co., 1565 E. 17th Street, Cleveland, Ohio, has recently developed an adjustable spring-head tool-holder which is suitable for

THE TOOL IN ACTUAL OPERATION.

light production and tool work on steel, brass and bronze. It is especially useful for the performance of cutting-off operations, thread-cutting jobs and similar work, as the tool possesses the same utility as the goose-neck type of tool. The clamp holds 5/16-inch round, 5/16-inch square, and 3/32- by 7/16-inch flat bits.

ANOTHER VIEW OF TOOL AT WORK.

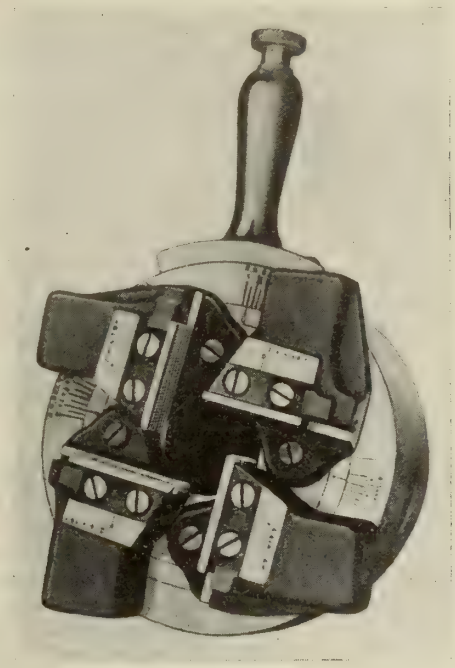
The bit or tool can be placed on the right or left-hand side of the clamp without removing or inverting this clamp. A spring clamp insures that the bit or tool will be in proper alignment. The head of the holder may be adjusted up to 90 degrees, either to the right or left. The shank and spring clamp are forged from nickel steel, and all the parts are tempered, polished, and tested by gauges. The tension of the spring is sufficient to permit the cutting of threads from 7 to 40 per inch. The various illustrations throughout show these holders at work.



VIEW OF HOLDER.

LANDIS AUTOMATIC DIE HEAD

The Landis Machine Company, Waynesboro, Pa., has placed upon the market a new style of automatic screw-cutting die head which is different in design from other heads of this type



GENERAL VIEW OF THE DIE.

in that the chasers are supported on the face of the head. This permits of easy access to the chasers when it is necessary to remove them for grinding or changing from one diameter to another. It is made of steel to insure of long life of hard service. The head is opened automatically by opening the forward motion of the carriage, and is closed by hand. It is locked by the operating handle which contains a latch having a tongue milled on the lower end. This tongue is milled off centre, thereby permitting of roughing and finishing cuts. To adjust the head for either roughing or finishing cuts merely requires a half turn of the latch to suitable graduations.

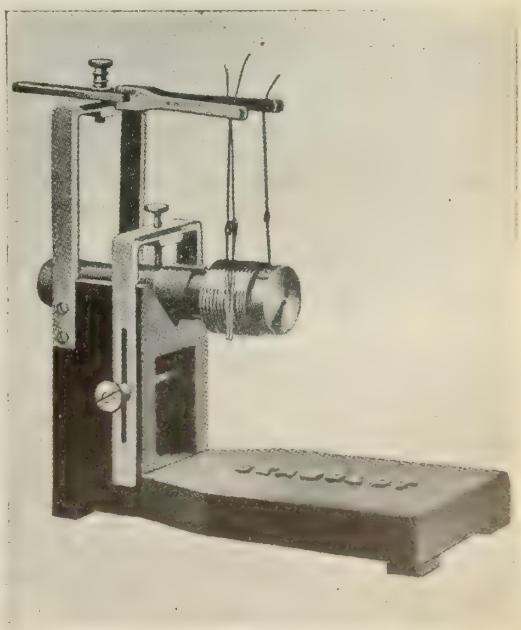
The head is graduated for all sizes of bolts and pipe, both right and left-hand within its range. It is adjusted to size by means of a screw which engages the head body. Since the operating, adjusting and closing rings remain in a fixed position when the head is closed, the rotating of the head body within these rings gives the diameters within the range of the head. To set the head for left-hand threading, the screw which locks the latch pin is removed and the latch pin is rotated to the left-hand graduation. The locking screw is then replaced and the left-hand holders are put in place.

This head is applicable to practicably all makes of screw machines and turret lathes which have sufficient space to swing heads of these diameters. The heads will be furnished with standard shanks, or special shanks will be furnished provided they will not be larger than the standard shanks. Where special shanks of dimensions greater than standard shanks are required a bushing can be used. This automatic die head employs the regular Landis chasers.

THREAD MEASURING WIRES

The measuring wires illustrated herewith are manufactured by the B. Seaboldt Corporation, 25 West Broadway, New York. The accuracy with which these wires are made and the manufacturing facilities of the makers were of material assistance in the standardization and measurement of screw threads during the period of the war. The Bureau of Standards, Washington, alone purchased several hundred sets of wires under the stipulation that they must all be within .00001 in. of the various given dimensions. In the accurate measurement of thread dimensions the three-wire system obviates the use of optical projection apparatus. Maximum, minimum and pitch wires enable thread angles to be measured to very close limits. With these devices the unskilled mechanic is enabled to make measurements with the skill of the expert tool maker.

The illustration shows the fixture used in the measuring of gauges, and by its use all the difficulties of trying to hold by the five members, gauges, wires and micrometer are obviated.



GENERAL VIEW OF THE FIXTURE.

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Will Industrial Conference Fail?

WHEN the Industrial Conference opened at Ottawa this week there was a good attendance. Representatives were there from the ranks of labor and from the manufacturers' side as well.

If that conference is going to get very far—and we hope it does—there has got to be something put into it that has been lacking so far.

The delegates from the labor side sat well bunched on one side of the house, while on the other side there filed in the representatives of the employers.

As long as these parties feel that it is necessary or desirable for them to have an aisle as a boundary between them in such a meeting, just so long will their meeting be as barren of results as the Sahara desert is of wheat and oats.

Coming as it does at a time when the whole nation is looking for something better than strikes and lockouts, that conference has a chance to do the big and the decent thing, and one of the biggest jobs they can turn to is kicking down the barrier that exists between the shop and the office.

Even when they were off work to attend the meeting of the Industrial Conference at Ottawa these two factions took the barrier along with them and stuck it up in the aisle.

CANADIAN MACHINERY knows of manufacturers who get close to their men, and they don't have labor troubles. The men have the regard for their employer that would brand a move against him as a wound in the house of a friend. In such cases the barrier has been removed.

The things that make up the barrier between men and employers are suspicion, lack of knowledge of real facts, and selfishness. Neither side has any monopoly on these things.

That Ottawa meeting of employers and employees should put the boots to the aisle between the two bodies. It would be worth while if the employers' representatives there got to know the representatives of the workers in the shops, even if nothing more were done.

The thing that is needed to build up satisfactory working conditions in this country cannot be put down on paper. It cannot be drawn up and agreed to in black and white. It has been demonstrated time and time again that agreements cannot make the conditions that we need. If agreements and conferences could do it, then it would have been an accomplished fact long ago.

What is needed is real genuine kindness, a departure from that miserable "pound of flesh" idea; a departure from the notion that men can run their factory on the card index system and tag their employees the same as they would tool steel or iron bars.

That Ottawa gathering needs warmth more than a bombardment of well-balanced words; capital and labor have been filled to the neck a thousand times with addresses and arguments and threats, but neither capital nor labor have been filled to the neck with a desire to put heart and soul and kindness and feeling into the daily grind.

Some of those interested in the Ottawa gathering may be hopeful for a good result. But the good result will not come unless the employers come to the point where they look upon the men in their shop as something more than an opportunity to make money, and unless the men are willing to realize and admit that the man in the office has great big problems that at times are enough to crush and break him.

There are enough agencies at work to drive the wedge in deeper between the employer and his men, but kindness, courtesy and love will do more to bridge that gap than all the other combined agencies that the world has tried in vain.

The Pickling Season

ABOUT this season of the year the woman of the house, she crooks her foremost finger toward her lawful wedded spouse, and says, "John Henry, run across unto the grocery store, for I have mapped for you, my dear, a most exactin' chore. I want tomatoes by the peck, I want green peppers, too; I want some onions, pepper, spice, to toss into the stew."

"And while you're at it, get some cloves, some whole and get some ground, that in the cellar shelves this year some victuals may be found"

Ah, yes, it is a goodly thing to pickle and to can, to line the ribs and please the taste of every hungry man; to have both catsup on the meat and pickles on the side, to give to liver and to stew a free and easy ride.

But it's a wise and prudent man who in these picklin' days doth know enough to turn his path into some distant ways.

Yes, wisdom oozes from that chap who, when this spell is on, can plan to pack his carpet bag and for the time be gone; for he is wise beyond his years, from dome unto his feet, who flees when wife campaigns upon the onion and the beet.

For if he lingers 'round the house he simply has to stand and watch friend wife mount up the stairs and then with stealthy hand, remove the razor of his choice—it makes the blood run thin—to see this instrument engage the silver onion skin.

They take his shaving mug as well, and from it cast the soap. John Henry views this latest move, and from his heart goes hope — there ain't no chance for him with ease to make a kick and win, to save the tools and riggin' for the scrapin' of his chin.

Oh, there's kettles settin' on the stove, there's bottles here and there; there's jars and sealers on the floor, likewise the cellar stair.

Yes, let the women have their fling with pickles and with spice, and build up mixtures strange to smear on liver and on rice, but let the man with wisdom teeth, with judgment cell done brown, rear up some pressin' business stuff to take 'im out of town.—ARK.

"Jackey" Fisher and Oil Engine Development

By T. H. FENNER, Editor Marine Engineering

WHATEVER one may think of Baron Fisher of Kelverstone's revelations, credit must be given him for wielding a trenchant pen. There is also little question that the policy of cencentrating the fighting strength of the Royal Navy in the North Sea was an absolutely correct one, though it called forth some very bitter criticism when first adopted. Much of this emanated from holders of sinecure positions in the dockyards scattered over the Empire in remote spots. The civilian population of the dockyard towns also lost a great deal of easy money when these bases were reduced to a skeleton establishment. Men who had been drawing pay from naval dockyards in Bermuda, Halifax, Esquimalt, etc., in return for spending a few leisurely hours daily in these places, were faced with the necessity of going to work in earnest. The presence of the staff, and the frequent calls of the vessels on the station meant good business for the local tradespeople. There was, of course, much criticism from disinterested people all over the Empire, many of whom thought the calling home of the fleets from the outer marches of the seas would diminish the prestige of Great Britain among the nations. Events have proved that Fisher was absolutely right, and the presence of the Grand Fleet in the North Sea on Aug. 4, 1914, was one of the deciding factors in the ultimate victory.

However, when he speaks about the British attitude on the oil engine there is room for serious difference with him. In his vigorous language, he formulates the statement that "This British nation is going to make the same —— mess over the internal combustion engine, which is just as imperative for commerce as for war. Every nation except ourselves is pushing ahead with this engine."

This is far from being the truth. It is true that for the duration of the war British engineers were too fully occupied in absolutely necessary war work to devote much energy to commercial work. Notwithstanding this, oil engines in Great Britain have been brought to a state of efficiency second to none.

There are a large number of firms building marine oil engines, both under license and of all-British design. Distinct types and designs have been evolved, and at least one invention has been brought forward that marks a considerable advance over anything yet achieved. We allude to the Still engine, of which numerous descriptions have been published lately. Some of the largest engineering firms in Great Britain have gone in whole-heartedly for the manufacture of both marine and stationary engines. Among these are the well-known names of Vickers, Cammell, Laird & Co., Beardmore's, Doxford's, Robey's, etc. The smaller class of marine motor for fishing and pleasure boats has for many years upheld the reputation of British builders all over the world. In engines for motor cars and aeroplanes Britain is behind no other nation. The name of Rolls-Royce stands for the highest efficiency in this direction. Coming back to the use of oil engines in commercial vessels, the largest and highest powered oil engined ships afloat are under the British flag, built on the Clyde. The "Glenapp," of 10,000 tons deadweight, and 6,400 B.H.P., has not yet been surpassed. Evidently Lord Fisher has not looked as closely into this question as he might have done, when he says, "We have no big ship so fitted, or even thought of."

There is a distinct field for the marine oil engine, but as far as can be seen at present it does not lend itself to the propulsion of high powered war vessels. As a motor for cargo vessels, of moderate speeds, it would seem to be the ideal. The advantages it has are of economy in fuel due to its high efficieney as a heat engine, economy of space, reduction of engine room crew, largely increased cruising radius. This latter effects economies by eliminating stops at coaling ports, with their attendant expense of pilotage, dues, and long delays. Against these advantages conservative ship owners have considered the almost perfect reliability of the old triple expansion steam engine, which carried their vessels on voyages running into years with safety and immunity from breakdowns. The marine oil engine, being in the development stage, was susceptible to breakdowns, especially such serious ones as broken crankshafts, which caused owners to look askance at it. However, those early difficulties are fast disappearing, and we now see firms like the Glen Line going in for oil engined fleets.

Where the oil engine's real limitation appears is in the size of the units which are practically possible. In the vessel referred to, the "Glenapp," the 6,400 horsepower is divided into two units of eight cylinders each. The horsepower developed in each cylinder is thus about 400, which is as large a unit as has been considered possible. Owing to the high compression pressures used and the pressure on bearing surfaces entailed, the making of larger units is hardly feasible. However, were it possible to make engines developing 1,000 horsepower per cylinder, consider what would be required for a battle cruiser developing 100,000 horsepower. That would mean 100 cylinders, with their necessary air compressors, air vessels, etc. Speaking at a recent discussion on the Still engine, Sir Charles Parsons made the interesting statement that to obtain the maximum power for a large cruiser the design would call for 150 cylinders on four shafts.

The writer is an admirer of "Jacky" Fisher, who unites the qualities of the old-time sailor with the breadth of vision of the engineer. However, he cannot subscribe to the great sailor's opinion that Great Britain is going to be hopelessly left in the oil engine developments of the future.

THE Ontario Safety League are out with a bulletin which says a man should not spit on the floor at home or in the shop. Well, if a man can't spit on the floor of his own parlor then things are coming to a funny stage.

* * *

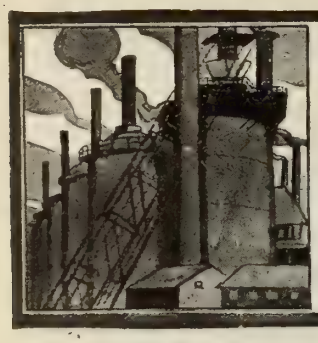
A SPEAKER at the Ottawa Industrial Conference said it helped not at all to give a man a 20 per cent. wage increase while he at the same time faced a 40 per cent. increase in the cost of living. To be sure, most of us would get out and holler for a 40 per cent. increase in wages, with living costs stationary or shrinking.

* * *

MEMBERS of the Dominion Government are working hard to qualify for a sessional indemnity of $2,500 each. They have got to get in 30 days, by hook or by crook. And so the country, up to its neck in debt, faces the beautiful spectacle of a House held in session, with, at times, speakers blazing away to 16 of the 230 members, hoping and praying that they can stick it out long enough to pocket the $2,500. How can Ottawa expect the rest of the country to take big matters seriously with a cluster of time-servers assassinating enough time to legally put them on the sessional pay roll?

* * *

THE explosion in the elevator at Port Colborne seems to have been due to the fact that blowing dust out of wheat makes it lighter. Being lighter, there is a loss of money. Therefore, the dust must stay. Dollars and dust win out against lighter grain and safety. The coroner's jury whitewashing all and sundry is a poor compliment to the intelligence of the community. It is certainly the bounden duty of some official of the Government to explain why they are afraid to order the dust blown out of wheat.



MARKET DEVELOPMENTS

New Developments in Many Ontario Cities

And Dealers Are Out for Orders—Strike in U. S. Steel Industry Seems More Certain—How It Will Affect Conditions in Canada —Plates Would Be Most Affected.

THE talk of a strike in the United States steel industry continues to increase, and if there is no good opening found for rescinding the strike order it looks as though September 22 would mark the beginning of another labor war. The Canadian industrial world is interested, particularly in the matter of plates and tubes. There are large tonnages of plate coming across the border now, particularly for boiler and tank contracts. Plate is something that is not stocked extensively, as each job has its own specifications and sizes quite apart from standards, and each is sent to the mills for rolling to size. Some of the large Canadian boiler shops have a splendid amount of work on hand, and it would be a serious matter were they not able to send their plate specifications to the mills for quick action. However, it has yet to be demonstrated that it is possible to shut off the rolling capacity by a strike. The situation in sheets, bars, shapes, etc., is better, Canadian mills having a splendid capacity for handling this material.

Machine tool dealers are finding plenty to work on in the new industrial developments that are taking place in several of the centres of Ontario just now. Several orders for new equipment have been placed by firms that are locating branches in this country.

Some idea of the size of the shops that are locating in this country can be gathered from a New York advice which states that General Motors, now building at Walkerville, will spend between two and three millions for the necessary equipment.

BRITISH AND AMERICAN FIRMS HAVE THEIR EYES ON MONTREAL SITES

Special to CANADIAN MACHINERY.

MONTREAL, Sept. 18.—The steady trend of business is undisturbed by feature developments, but industrial activity is still affected by the attitude of labor. However, the situation in this respect has been less acute of late, owing to the conferences that have been arranged by the Canadian and American Governments for discussion of the points involved between the employers and the employees. The result of the meeting now in progress at Ottawa is awaited with much interest, and there appears to be a hidden tension throughout trade circles regarding the outcome. Future conditions in industry hinge on the outcome of these conferences, and early resumption of deferred activities will depend on some satisfactory solution to the problems now confronting the country. A condition that is gradually becoming more pronounced is the interest, and in some cases the activity, that is being displayed by British and American firms, in establishing agencies and manufacturing branches in Canada. British interests in particular are feeling out the possibilities and considerable property has been acquired in this district for contemplated development in the near future. One drawback at the present time appears to be the difficulty that is experienced in getting material in from the States. One firm here, manufacturing gas engines, has been unable to secure promised shipments of parts, and no satisfactory reason can be given for the delay. Unsettled conditions are presumed to be the cause. The confidence that has been shown in steel circles during the past week, over the better outlook that prevails at the steel producing points, is still a factor of present trading, but the atmosphere is still more or less of a hazy character, and this will still affect the spirit of the market until it is definitely known what will untimately result from the negotiations now in progress. Local trading is of the quiet kind, but not excessively so. The general situation reflects the unrest that is gradually fading.

Firmness in Metals

With metals moving steadily, but in light volume the market is devoid of feature. There is no heavy demand from any quarter and dealers report little change. Spelter has become easier after the temporary strength of the past week or so; this was anticipated here and prices are not changed. The market in antimony is less active, but the strength is maintained.

Lighter Movement in Tools

While the demand for machinery just now is below normal the interest is maintained by the abnormal conditions that prevail in every line of activity. Dealers to-day, when quoting on tools, are required to take many things into consideration that were not present in pre-war times, or even while the war was on. The uncertainty of delivery, the demands of labor, the possibility of strikes, the changing rate of exchange, etc., all combine to place the dealer in a position where definite quotation is next to impossible. If a customer is quoted a price on a certain machine, and delay arises before an order is placed, there is frequently some explanation required to convince the purchaser that the first price does not hold. In this way the difficulties that are incidental to making sales, are of a character to keep the dealer busy, even though the actual turnover is of a small scale. Dealers here report light sales, but apparently are disposed to believe that better buying may develop a little later in the year. Inquiry for supplies is a little quieter just now, but the light demand is comparatively steady.

Prices Easier, But Market Firm

The movement of scraps at the present time is of a limited character, as the current demand is comparatively light, and the existing conditions are such as

to influence buyers to act in a conservative manner. Despite the quiet tone of the market the dealers are optimistic on early conditions, and they believe that the situation will develop strength shortly. The bulk of the business at present is being done in machinery scraps, as considerable demand is continually coming in from the smaller iron foundries. The volume, however, is seldom large, as the general policy is to cover only for a short time ahead. The industrial conference now on at Ottawa will hold the attention of the trade interests, as much depends on the outcome between the representatives gathered at these meetings. Local quotations show a slight easing of prices, but apart from this the market is very firm. Copper and brass scraps are quoted down from ½ to one cent per lb. Light copper is quoted at 15 cents, and crucible and heavy is bringing 18 cents per lb. Yellow brass, on a decline of one cent, is quoted at 9 cents per lb. Aluminum scrap is selling locally at 18 cents. Dealers here have reduced the quotation on machine cast scrap and the price of $20.00 shows a decline on the week of $3.00 per ton. Stove plate is also lower, havin gdeclined from $17 to $15 per ton.

NEW DEVELOPMENTS ARE SATISFACTORY

Machine Tool Dealers State That a Buying Movement is Well Under Way

TORONTO. — Developments that are taking place in a number of the industrial centres of Ontario are interesting the machine tool dealers in no small way. New lines are being developed, and new equipment is being called for, several very nice orders having been placed within the last few days.

Talk of a strike in the steel mills of United States still continues to interest the warehouse and shop trade in this country. Reports still appear contradictory regarding the real size of the strike menace.

In the Steel Market

A slight change in the majority of quotations from warehouses has been put down this week, whereby small shapes are the same as iron and steel bars. For some time past many of the warehouses have been quoting a slightly higher figure for small shapes than for bars, the former being at 4.50 and the latter at 4.25. Now there has been an arrangement made whereby the quotation of 4.25 will cover them all. Small shapes take in many lines of ornamental iron work, angles, T shapes or channels, and material for fire escapes, elevators, etc. In fact there is not a machine shop of any size in the country which does not use the material that comes under the classification of "small shapes."

Dealers here realize that plate is the weak spot in the market. Delivery dates are still well ahead in some cases, but there can be no denying the fact that a good sized mill order from Canada would bring the 2.65 price down, the distance down perhaps depending on the size of the tonnage and the attitude of the buyer as to whether there was any urgency in the order. A New York despatch referring to plate says:

A rather definite break has taken place in plates. Some of the larger mills have evidently decided not to leave all the more attractive inquiries to mills which have been taking domestic as well as export business at 2.50c., Pittsburgh, and while 2.65c. is still the quotation with leading makers, large offerings may be covered with no great difficulty at the lower figure.

In the Event of a Strike

The plate situation is where the pinch would come to this country in the event of a strike. The size and quantity of plate that can be rolled on this side of the line is extremely limited as yet. Firms handling big marine work, or boiler and engine contracts are dependent entirely on U.S. for their plate supplies, and they have been sending in some very large tonnage during the past few months. Should there be a cutting off or a serious curtailment of the output it would be a serious matter for several of the plants on this side, that at present have business on hand that should run them well on through the winter months. Plate is something that cannot be stocked for a wide range of work, as orders for each individual job are usually forwarded to the mills.

Whether or not Canadian business has been getting the 2.50 treatment at the U. S. mills is not known, but it is known for a fact that although 2.65 has been the accredited price, that a better figure has been secured on several tonnages.

The Machinery Market

That some of the largest makers of good machine tools on the continent have sent out notices cancelling all stock orders is an indication of the trade that is in sight in this line. For instance, if a man in Toronto has a real sale for a machine he sends it in, and if there happened to be others nearing completion that were for stock in some other territory, the "real sale" would have preference, and the stock machine delivery sale would simply be shoved on into the future by an extra month or so. The latest move discourages firms from putting machines in stock, as the delivery dates are very indefinite.

There is a nice lot of business coming in from a wide range just now. There are three or four cities in the industrial section of Ontario that are attracting quite a bit of attention just now. Developments that are taking place at Brantford, Kitchener, Hamilton, Windsor district, and other centres are keeping machine tool salesmen on the move to see that nothing is getting away from them.

The sale of small tools is better this week than for some time past. City orders have been very satisfactory, and considerable out-of-town business is coming along, all helping to round out some very nice bookings. Prices remain stationary, although there is a tendency on the part of some of the firms to keep on cutting lists and prices. One of the dealers, referring to this tendency, said that they knew what the stock cost them, and they knew what they had to sell for, and apart from that new lists and discounts are secondary.

Plating Supply Markets

Firms handling plating chemicals report that they have some trouble in publishing a price list, or in correcting such tables as are published in this paper. Here is the way one manager put it to CANADIAN MACHINERY this week: "We give you a price for our lines, based on a reasonable sized order, when along comes some chap with a thimbleful order, and wants to get the best prices, claiming that the paper quotes a lower price than he paid. It is true in a sence. The published price generally is

POINTS IN WEEK'S MARKETING NOTES

New York reports that General Motors at Walkerville are buying between two and three million dollars' worth of equipment.

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Pittsburgh refuses to admit entirely that the strike is going to come in the steel trade, but there is an absence of the note of certainty that the mills used a few weeks ago.

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There is not very much export business being done by the makers of machine tools at present.

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Machine tool makers in the United States have in some cases sent out notices cancelling stock orders, and giving preference to any bona fide sales. This shoves on the delivery date of stock machines almost indefinitely.

—

Dealers in plating supplies report business brisk, and with the coming into operation again of more shops that have been closed by strikes, they see even more hooking in sight.

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Steel plate is the one weak spot in the market, and it is known that orders have been placed as low as 2.50, although the price quoted is 2.65. Strike talk may change the concessions that are being made for good tonnages.

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A strike in U. S. mills would be bad business for Canadian shops using much plate and tubes. For bars, sheets, etc., Canadian mills are well equipped to attend to the business.

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Developments that are taking place in several of the industrial centres of Ontario are providing good material for the machine tool salesmen.

a very good figure because it represents the sale as it would be in an average piece of business. So the prices that are quoted elsewhere should be taken in this way. It will be noticed that prices quoted are by the pound unless otherwise stated. So it means that a person coming into the market with a good order would possibly get a better price than that named in the list.

The tendency of prices for plating material is upward for the reason that production has been seriously curtailed. There has been a good volume of business moving for some time, and the trade reckons that when foundries and other shops where plating is done get over their strike fevers and start handling the usual volume of business there will be a great deal more to be handled. Although nothing has been done this week the tendency is for a higher price in polishing wheels, felt and bull-neck.

GENERAL MOTORS ARE BUYING HEAVILY FOR WALKERVILLE PLANT

Special to CANADIAN MACHINERY.

NEW YORK, September 18.—The machine tool requirements of the General Motors Corporation for its Walkerville, Ont., plant constitute the most important activity in the machine tool markets. Purchases will total, it is stated, $2,000,000 to $3,000,000, and most of the orders will be placed at Detroit and Cleveland.

The General Motors Corporation is also buying quite extensively for its tractor plant at Janesville, Wis.

In New England and in the Chicago, Cleveland and Detroit districts the demand for new equipment is in very fair volume. Elsewhere in the country, and particularly in the New York territory, it is relatively quiet. Labor troubles are generally credited for the lull in the Eastern States outside of New England.

Many machine tool builders have a good back-log of orders, and deliveries are being extended on some lines. Prices show a continued upward trend, and the present schedule is about on a par with prices which prevailed during the war, and in a few instances higher. Some makers of drills have advanced uprights about 15 per cent., and radials 10 per cent. Buyers now seem to realize fully that machine tool prices cannot remain stationary while labor costs are advancing and sellers meet with comparatively little argument on the price question.

Little Export Business

Export trade is almost at a standstill. Japan is still buying, but nothing is being done of any importance with European countries. The largest export order placed in some time was awarded last week by the Standard Oil Co., of New Jersey, for about 50 tools to be shipped to the oil fields of Rumania. Other equipment, consisting principally of plate-shop and structural shop machines, are yet to be purchased.

The E. W. Bliss Co., Brooklyn, has purchased the plant of the Consolidated Press Co. at Hastings, Mich., and will buy considerable new equipment to increase its capacity.

The American Locomotive Co., New York, has bought fifteen overhead cranes ranging from 10 to 30 tons capacity for three of its plants. Three of the cranes are for the Montreal works.

NEW YORK CITY TO HAVE A GREAT MACHINERY EXHIBIT THIS FALL

CONSIDERABLE progress is being made with the International Macinery Exposition—the permanent display which is to open in Grand Central Palace, New York, on October 15.

The exposition will include exhibits of manufacturers and selling agencies of engines, lathes, milling machinery, planers, drills, screw cutters, presses (hand and power), boring, can-making, wood-turning machines and others of similar nature, prime movers, machine tools, presses, lathes, milling machines, belts, drills, radials, gear shapers, chucks, turrets, bearings, grinders, taps, welders, slotters, screw cutters, borers, can-making, wood-turning, saw-making, tack-making, and other automatic machines of various types—in short, every modern machine used in making machinery. Many of these, both large and small, will be shown in actual operation.

The new enterprise enjoys phenomenal backing. The Nemours Trading Corporation, of which Alfred I. du Pont is president, owns and controls the Merchants' and Manufacturers' Exchange of New York, which operates the Palace. It has branches in all of the leading cities of the world, consisting of 19 branch offices and 3,000 foreign selling agencies.

The exposition will fill a long-felt want in its own particular field. The development of both foreign and domestic trade to which the venture looks forward unquestionably will be remarkable during the next few years, and in this development the Merchants' and Manufacturers' Exchange in general, and the Machinery Exposition in particular, will be big factors.

Already the fame of the enterprise is spreading throughout the world, and newspapers and trade papers in many foreign countries have commented upon it most favorably. It is practically assured that Grand Central Palace is destined to become a mecca for buyers both domestic and foreign.

One great talking point of the Merchants' and Manufacturers' Exchange is that buyers going to the Palace who are interested especially in one line of goods in one exchange, will also take advantage of the opportunity to visit the other expositions and exchanges in the building at the same time, with the result that they will find other things of interest in addition to what they went especially to see.

When one stops to consider what this will mean to the man who is in the market for equipment or supplies, its advantages are obvious. In one great salesroom will be found the products of the leading manufacturers side by side. Visitors will attend for similar purposes and the interchange of ideas and experience thus afforded will result in more accurate buying—better business for all concerned.

NEW LIST FOR COLD ROLLED AND DRAWN

A new price list has been issued by the United States mills and adopted by the Canadian mills for cold rolled, cold drawn, turned and polished steel, and as there is apt to be confusion in the minds of buyers when the new list comes out with such radical changes, an explanation of this list may be a help to our readers.

Ever since cold-drawn steel appeared on the market, it has been sold on the basis of a list price for the various sizes and shapes, with a discount which varied according to the market, therefore all quotations were made in the form of a discount. The new list now takes the same form as the hot-rolled steel, or iron bars, namely, a base price with extra for size and shape. It is only necessary for the buyer to know the base price and to add the extra for the particular size or sizes he may be ordering. The base price applies to all material covered by the new price list, that is, the same price base, is applicable to rounds, squares, hexagons and flats, or other shapes. It is not necessary to remember the list price of each individual size and take the discount from it, but all that is required is to remember the extra that the different sizes take over the base price.

Agency for B.C.—C. W. Sherman, president of the Dominion Foundries and Stee, of Hamilton, went West earlier in the month, and while in Vancouver decided to establish an agency there for shipbuilders' and railway supplies. Most of the business is at present in American hands, but the discount on Canadian funds makes the time opportune for securing a portion of this business. Shipbuilders on the Pacific Coast have been large users of American dyes and castings.

THE STRIKE LOOMS AS POSSIBILITY IN THE U.S. STEEL SITUATION

Special to CANADIAN MACHINERY.

PITTSBURGH, PA., SEPT. 16.—In last report the statement was made that the labor situation in the iron and steel industry was "greatly improved" and that "the universal opinion among manufacturers is that a general strike, such as was threatened, is out of the question." Since those opinions were expressed the "strike committee" of six, representing the 24 unions that have been attempting to organize the iron and steel industry, have called a strike for Monday, September 22. The calling of a strike came as a great surprise, but it would occasion no great surprise were the strike order rescinded, and this may be done if the committee find a good or easy way out.

Of course, there is a matter of "mob psychology" involved. It is not certain what a mass of men will do. They may be stampeded. There are various pieces of information, and various actions of the strike committee, all pointing strongly to the idea that the committee has been bluffing, first in hopes of securing the censent of Judge Gary to hold a conference with them, and next, when that failed utterly, in hopes of securing intervention by President Wilson. It is a common opinion that President Wilson became impatient of organized labor more than a month ago, but even if that were not the case, his announcement of a general conference of labor, to be held October 6, obviously precludes his taking a hand at this time. If the strike committee wants his assistance all it needs to do is to await the results of the conference.

Evidently that is precisely what the strike committee did not want to do. It had worked the men up to a certain pitch of excitement, and the excitement would die out if it were not continually fed. Whatever chances a strike call had of being effective would decrease day by day. The first threat was to call a strike the Saturday night before Labor Day, to occur the day after Labor Day, making a time interval of two and a half days. The strike call now actually issued involves an interval of 11½ days. It is presumed that the much longer time is set in hopes that something can occur meanwhile whereby the strike committee can "save their faces" and call off the strike call.

At a few plants large numbers of the common workmen, particularly the foreign born, were "organized," while at many plants there was no success at all. The process of organizing the ignorant foreign-born workmen was very simple. The organizers said in substance: "We are going to control employment at this plant in future. You can join now for $3 and save your job. Afterwards the initiation is going to be $25." It is understood that when the $3 was paid the organizer got $2 and $1 went into the treasury to pay general expenses, including the printing of membership certificates. Thus it is possible that there will be actual strikers as some plants and nothing at all at others. Another possibility is that there will be practically no strikes and another is that the strike call will be recalled.

The incident has had little effect upon the iron and steel market, which pursues the even tenor of its way, with no great amount of activity as to open market sales because the mills are comfortably sold up. As a rule they have been indisposed for several weeks past to accept orders except from regular customers. There is only a moderate volume of new inquiry in the market, but with so much business being turned down the inquiries have to go the rounds and thus the apparent volume of business offered is magnified .

Steel Production

Steel production in August was at the rate of a shade under 80 per cent. of estimated capacity, against 73 per cent. in July and about 50 per cent. at the middle of May, showing a remarkably sharp recovery, but the rate of last January or February has not yet been attained. These percentages are based upon an estimated capacity of 49,000,000 of steel ingots a year, which is a conservative estimate, and the monthly reports of the American Iron and Steel Institute. The August report showed that 2,746,081 gross tons of steel ingots were produced in the month by 30 companies which in 1918 made 84.03 per cent. of the total of steel ingots produced by the industry.

It is very important, as throwing light upon the general situation, to note that while the actual production in August was about 80 per cent. of capacity, the capacity actually idle in the month was not 20 per cent. There was very little actual idleness. The common interpretation of this apparent discrepancy is that the works in operation did not produce the tonnage of which they are normally capable because labor is not at normal efficiency. This is a common complaint and covers not only men who are paid by the day or hour, but also men who are paid by the ton. The tonnage men, it appears, receive such high rates per ton that in many cases they do not bother to turn out the last ton of which they are capable.

Steel Corporation Tonnage

The Steel Corporation had in August a third very good month in the matter of booking business, chiefly of the contract variety. For six months, December to May inclusive, the corporation's unfilled obligations fell off quite steadily, and by an average of about 640,000 tons a month. Then the situation was suddenly reversed. While May showed a decrease of 518,375 tons in the unfilled obligations on books, June showed an increase of 610,545 tons. July followed with an increase of 685,806 tons, and last week's report showed an August increase of 530,442 tons. While the August increase was less than the June increase the actual bookings were larger, shipments in August having been about 175,000 tons greater than those of June. The Steel Corporation now has on books a total of unfilled obligations equal to six months of shipments at the present rate. The business is not equally distributed among the various department, but there is much less divergence than usual. The contract obligations of the corporation are not all specified against by the buyers, but the proportion is unusually high, probably considerably more than 50 per cent. of the total obligations being in actual orders of specifications, either on mill books for rolling or in shape for entering.

Pig Iron Prospects

Steel products being absolutely pegged at present prices, since in present circumstances mills regard advances as quite undesirable, and there is no possibility of declines, there is much more interest in pig iron prices, for there are possibilties there of fluctuations. Some of the furnaces are anxious to get the market up, and in fact, on foundry iron a number of districts record actual advances over the March 21 schedule. Many furnaces, on the other hand, are opposed as a matter of general policy to there being advances. There is likewise, a divergence of feeling among consumers. Some have been fearful that there would be advances for next year's deliveries, perhaps large advances, and in order to protect themselves they have bought, even paying slightly advanced prices. Such buyers have been much in the minority. Other buyers are looking for declines rather than advances. Others, and probably the majority, are neutral, preferring to take no action and being willing, if prices do advance, to pay the advanced price when the time comes. Western Pennsylvania and valley furnaces generally are maintaining former prices, those of March 21. Some small tonnages, for this year's delivery, have been sold at slight advances in the case of foundry iron, but not in the case of other grades.

The firm of Hamilton & Hansell, Inc., 13 Park Row, N.Y., have made the following announcement with regard to a change in the firm's name. They will be known from now on as the American Transmarine Company, Inc., and will carry on business as importers and exporters and international merchants. The followings firms will be associated with them:—Transmarine Company, Stockholm; Transmarine Company, Ltd., London; Holmberg, Beech & Co., Rio de Janeiro; Brazilian Transmarine Company, Santos; Compania Commercial Traco Sociedad Anonima, Buenos Aires; Javasche Transmarine Handel Maatschappij, Batavia; Transmarine Co.. de Cuba; A. B. Handel & Industri, Petrograd; American Transmarine Company, Inc., San Fransisco.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	.....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$26 50	$26 25
Electro copper	25 50	26 00
Castings, copper	25 50	25 00
Tin	60 00	58 00
Spelter	9 75	10 00
Lead	7 25	7 00
Antimony	10 00	10 50
Aluminum	35 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

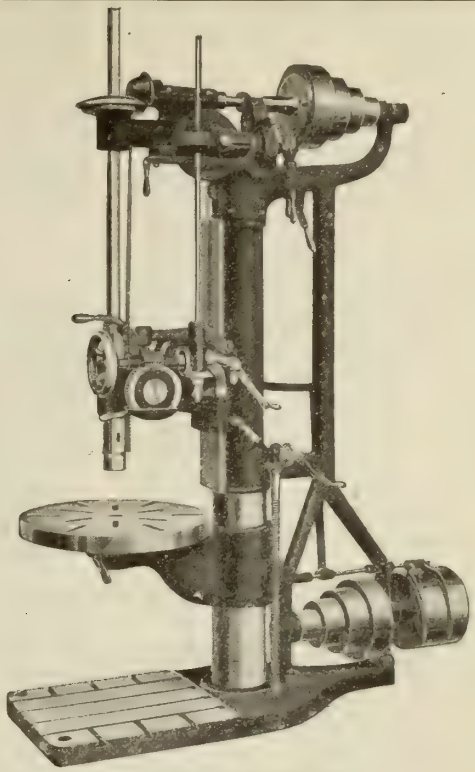
A Complete Line 8 in. to 50 in. Swing.
with or without tapping attachment.

BARNES

Upright Drills
Horizontal Drills
Gang Drills

Accuracy—Strength
Convenience of Operation

Carried in Stock by



26 in. Slid. Head Type

THE A.R. WILLIAMS MACHINERY CO., Ltd. 64 FRONT ST. WEST TORONTO

MONTREAL ST. JOHN, N.B. WINNIPEG VANCOUVER HALIFAX BUFFALO, N.Y.

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited
Steel Foundry Division, Lachine Canal
Head Office: 187 Delisle St. MONTREAL
Phone Victoria 1492

MORROW SCREWS MORROW
DRILLS FILES
MORROW NUTS MORROW

We have been obliged to erect another addition to our Plant No. 3, used exclusively for the manufacture of Twist Drills. The demands upon us for Morrow Drills made this necessary. The new building is three story—up-to-the-minute, reinforced concrete—a real daylight factory—where a large force of happy, clever, expert Canadians make **for you MORROW TWIST DRILLS**, the better kind—**more holes with less regrinding**—we can now fill orders promptly. When ordering from jobbers insist on Morrows — (we guarantee each tool).

John Morrow Screw & Nut Company, Limited
Ingersoll - Canada

"Ingersoll Files Cut Faster and Wear Longer"

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 50
Premier, 10¾ oz.	....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08½**
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

Geometric Production

Installing a Geometric Die Head, or other Geometric equipment, has increased production materially in many plants where an increased output was a vital consideration.

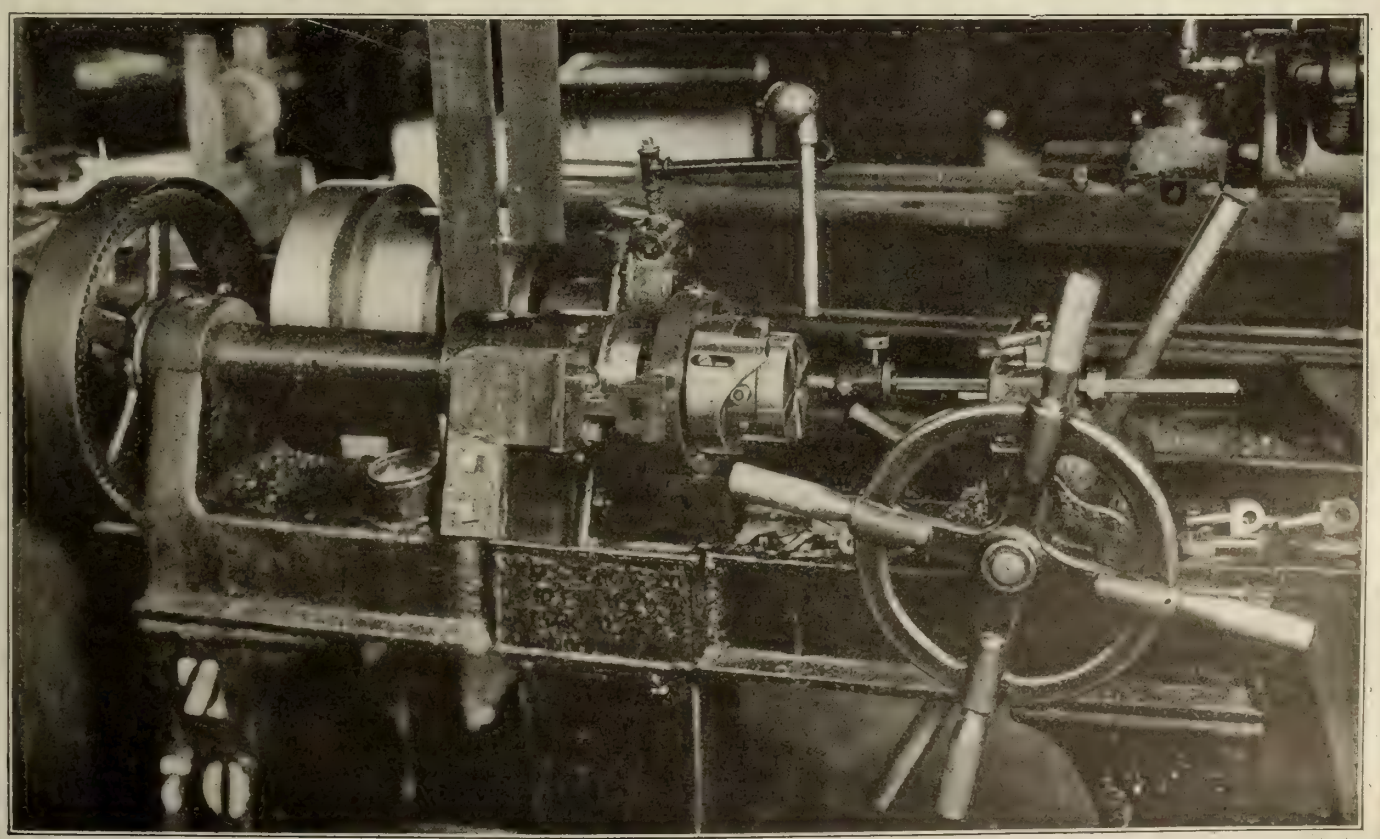
Below is an illustrated instance where a Geometric Die Head (threading machine type) was applied to an old bolt cutter and the production increased six times over what was being done with a solid die head.

Before taking it for granted that you are getting the best possible production on screw threaded parts, let us know what the work is, and we may be able to boost production for you.

The Geometric Tool Company, New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.



CANADIAN FIRM COMING CLOSER TO OLD COUNTRY SHIPBUILDING COST

Special to CANADIAN MACHINERY.

OTTAWA, September 18.—The Government is pushing on with its shipbuilding programme, and the tendency seems to be towards an improvement in the prices. They have now before them for consideration the construction of four more two-deck poop bridge and forecastle ships of twelve knots and 8,400 tons each, and the price quoted is the most favorable yet received, being about $170 per ton. The quotation is from Vickers of Montreal.

There is now only about ten per cent. difference between the quotations from Vickers and the most of building in Great Britain for standard ships, with the advantage that our standard is higher than theirs for similar ships, quotation received from the Old Country being about $166 per ton. Taking into consideration the fact that wages at Vickers in Montreal have gone up about 11 per cent., and hours reduced about 6 per cent., showing a nominal loss in production of from 3 to 6 per cent. it would appear that the Canadian builders are getting their work down pretty fine.

Australia has a very ambitious shipbuilding plan under way, and appear to be building very low, but reports are somewhat conflicting. According to official figures furnished our Canadian Department of Marine, the prices there in May ranged from $140 to $165 per ton. Since the beginning of the war the Australian Government has spent over fifty million dollars on their commercial fleet. The programme includes fourteen steel vessels, shelter deck type, 331 feet B.P., 48 feet wide by 33 feet 7 inches deep, moulded to shelter deck, from 5,500 to 6,000 tons deadweight. They are about the same as the Canadian 5,000-ton boats. The cost of these figures work out at about $141 per ton. Costs of later ships seem to have been considerably higher, but the Government there is going on with its shipping operations regardless of criticism, of which there seems to have been a good deal there as there has been in Canada of our Government programme. At present forty steamers are being operated by the Commonwealth Government, and it has also been directing the course of about nineteen ex-enemy steamers. Only ten per cent. of the men employed in shipbuilding had had any previous experience, and the Government of the Commonwealth believe that with increased experience they can reduce their costs.

There are no figures available as to the exact rates paid men engaged in shipbuilding in Australia, but the presumption is that they are considerably lower than here, although they seem to have advanced considerably since the estimate of $140 per ton for construction as above mentioned was made. Their platers, for example, average about fifty dollars per week, while ours are said to average nearly double that sum.

WANT TO KNOW WHY SYDNEY STEEL PLANT HAS BEEN CLOSED

Sydney, N.S.—The appointment of a royal commission to investigate the closing down of the plant of the Dominion Iron and Steel Company here is to be requested of the Federal Government by the city council.

The following resolution presented by Alderman A. J. McDonald, Ward 5, was adopted at Thursday evening's session of the council and is to be forwarded to Ottawa at once.

"Whereas numbers of the employees of the Dominion Iron and Steel Company have been deprived of employment because of the shutting down of portions of the plant.

"And whereas no satisfactory statement has been made by the Dominion Iron and Steel Company as to the time when operations will be resumed.

"And whereas even a temporary suspension means a hardship to many of our citizens.

"And whereas the said Dominion Iron anl Steel Company has been the recipient of municipal, local and federal concessions.

"Be it therefore resolved, that the City Council memorialize the Dominion Government requesting the said Government to appoint a royal commission to ascertain why there has been a cessation of operations by the company.

"And further be it resolved that the importance of immediate action on the part of the Government be urged in the interests of the workingmen and business interests of the city."

Recommending the adoption of the resolution, Ald. McDonald pointed out that unless immediate action were taken by the council for investigation of local working conditions, the working problem would become a serious one.

"The closing down of the plant," he said, "has been the cause of an exodus of hundreds of our best native-born citizens to other provinces. Cape Breton is an isolated part of Canada, and once our people leave for the West and for the States their return is not probable.

"Resumption of operations at the steel plant will bring, after a time, a flow of foreign labor of an undesirable class into the community, a class which is a danger and a drawback to the interests of the city."

Alderman McDonald was given full support in his views by other members of the council and the resolution presented by him was unanimously adopted.

MONTREAL NOTES

Owing to an appeal made by the citizens of Montreal, the action of the Tramways Company in advancing the rates has been deferred, pending the decision of the Railway Commission.

The Gates Refractories, Ltd., of Montreal East, are just completing a 60-ton kiln for the making of fire brick. It is expected that two others of similar capacity will be in operation before the close of the year.

If present plans materialize the Nova Scotia Steel and Coal Company will construct a by-product plant for the production of coke at an approximate cost of $2,000,000. An additional blast furnace will probably be included in the new developments.

A. G. Clark, of the Geo. F. Foss Machinery and Supply Co., Montreal, has been appointed to the position of advertising manager, not manager of the small tool department as stated in last week's issue. Mr. Clark will still continue to act as the firm's accountant.

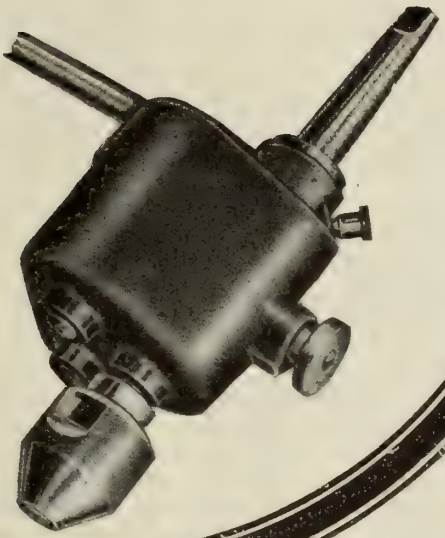
The Oil Engine Works of Canada, Ltd., 29 Prince Street, Montreal, are now manufacturing the Hvid Thermoil engines. For the present their activities will be concentrated on the 6 and 8 h.p. sizes, but eventually this will be enlarged to meet every requirement of the trade. M. L. G. Vincent is the managing director.

Paul Mercier, consulting engineer for the City of Montreal, has resigned. Mr. Mercier joined the city staff in May, 1914, as deputy chief engineer, and when the late Geo. Janin went overseas with an engineering unit in the fall of the same year, he acted as engineer-in-chief until January, 1916, when on the death of Mr. Janin he was duly appointed to the first position. His reorganization of the Public Works Department was responsible for a saving of over 50 per cent. in the operating expenses during his term of office. In May, 1918, he was appointed director of public works, under a new scheme adopted by the Administering Commission. In November, 1918, he was given the position of consulting engineer.

Walter Lambert, M.I.N.A., who has been serving in the capacity of assistant to director of steel shipbuilding in Canada for the past two and a half years, will shortly re-establish the activities that he was engaged in prior to his appointment to the Government position. The work of the Imperial Munition Board will soon be terminated and Mr. Lambert will re-open an office to carry on the business of naval architect and marine surveyor, in which he was actively engaged prior to May, 1917. In his position of assistant to director of steel shipbuilding he has been responsible for the construction of all steel vessels built in Canada to the order of the Imperial Munitions Board, and likewise for the hulls of all wooden steamships built in Eastern Canada. In addition to his previous activities of naval architect and marine surveyor, he will carry on the business of ship broker.

Want To Be Shown?

TAPS TEN TIMES FASTER



For the benefit of shops that are unfamiliar with the great advantages of

Aikenhead's WALSTROM ATTACHMENT

we will ship one to any responsible firm on

10 DAYS FREE TRIAL

Should you at the end of this period, not find it an invaluable asset to quick and economical production return it and we'll promptly refund your money without question.

Taps holes ten times faster than is possible by hand, and **cuts tap breakage to a minimum.**

Its mechanically obtained **OSCILLATING MOVEMENT** closely resembles the action in hand tapping.

Easily attached to any drill press. Takes taps of all sizes up to 1½ inch.

AIKENHEAD HARDWARE COMPANY, LIMITED

17 TEMPERANCE STREET, TORONTO

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Finished Shop.—In St. Thomas the M.C.R. have just completed new shops of very fine construction.

Put in Furnaces.—The Volta Manufacturing Company, Welland, have installed an electric furnace for the Walker Metal Products Co., Walkerville.

Grant to New Industry—The property owners of Cobourg have voted in favor of a by-law to grant the Douglas Packing Company $5,000 towards securing an adequate supply of water for their new plant. The plant consists of five new buildings erected on the site of the old steel works.

Japs Have Trouble:—T. Hiroto, managing director of Ocean Transport Co. of Kobe, Japan, announced in San Francisco that owing to excessive costs of ship construction in Japan, and the inability of Mikado's builders to accept and turn out orders, Japanese are planning to come to San Francisco to have additional tonnage constructed.

Another Grain Explosion.—A nest of grain elevators in Kansas City had an explosion followed by fire recently. The cause of the explosion was attributed to spontaneous combustion of grain dust. The walls and top of the elevator were wrecked by the explosion, and one man was found 350 feet away. About 20 men were injured more or less seriously by the accident.

Coal Mine Re-Opens.—The Dominion Coal Company has opened the New Victoria Mine at Sydney, N.S. This mine was closed down as far back as 1902, and was re-opened in 1913, but was closed down again at the outbreak of war in 1914. At the time it was closed down in 1902 the mine had a capacity of 1,800 tons per day and employed about 400 men.

Employment Good in Stratford.—The Government employment bureau of Stratford has been in operation six months. During that time the bureau has secured employment for 529 men and women. and at the present time there are only four men on the list unemployed. The 529 does not include those who have been passed to the vocational part of the bureau.

Did He Double?—One story going the rounds in connection with the starting of a steel company at Goderich is as follows: A Toronto man went in and signed a lease on a store for a five-year term. The same afternoon he sold out for twice the sum he had paid. We have no good authority for the story, but stranger things have happened.

Fire in Chatham.—The spring department of the Dowsley Spring and Axle Works was totally destroyed by fire recently. The spring department occupied a separate building, and it is said that the dipping of a red-hot spring into an oil tank in the ordinary process of tempering started the blaze. A west wind was blowing and the flames spread rapidly. The damage amounts to about $50,000.

The Federal Board for Vocational Education, Washington, D.C., have issued Bulletin No. 31 on "Training Courses in Safety and Hygiene in the Building Trades. This publication is a well-illustrated volume of 125 pages and is replete with useful and practical information relative to safeguarding from industrial accidents in the building trades. The material which has been incorporated in this work embraces a great majority of the accident hazards in the building trades.

Ottawa Employment Statistics.—According to reports from the Employment Service of Canada at Ottawa, there is no serious unemployment in the Dominion. The Government employment officers all over the country were placing on an average of 10,000 workers per week, and during the harvesting rush this number was increased to 12,000. The total number of applications from March 1 to August 23, was 190,455. During the same period 201,785 positions were offered by employers, and 139,492 persons were placed in positions. The service moved 15,000 workers to the West for the harvest, and made it unnecessary to import labor for this purpose.

Strike on the Welland.—The workers on the Welland Canal went on strike last week, thus fulfilling their threat. The trouble is over the non-payment of time and a half for overtime, as was agreed to at the recent settlement with the contractors. At that time, the agreement was that the men would receive the same payment as the Hydro canal men were receiving. The working day was set for eight hours, and work over that length of time was to be paid for at the rate of time and a half. Some of the men found that they did not make enough when working only eight hours, and asked the contractors to let them work ten hours. The contractors say that as they did not ask the men to work, they should not be asked to pay overtime rates for the extra time.

PERSONALS

George Clarke, brother of S. L. Clarke, Perfect Machine Co., Galt, has been secured as superintendent of the Perfect plant. He was formerly with the Kingston Locomotive Works as pattern maker and designer, and has had recent experience with large concerns in United States.

The death is announced from Trenton, of Robert Weddell, the prominent harbor contractor. Mr. Weddell was well-known in Toronto, and was the contractor for the Western entrance to Toronto harbor. He also was successful in bringing in the intake pipe after the Works Department had made several unsuccessful attempts. He was a personal friend of Mayor Church and George Wright of the Walker House. He leaves a son.

Mr. Ignace Schilowsky, consulting engineer with the Youroveta Home and Foreign Trading Co., 165 Broadway, New York, has been spending some days in this district. Appointed by the first provisional government following the revolution in Russia in 1917, Mr. Schilowsky came to America with the Russian ambassador. Of course the present Government in Russia does not recognize any of these appointments, and so it is that the Russian legation of that time is now interesting itself in preparing for the development of mineral deposits in Russia as soon as conditions there will permit. "Before the war," stated Mr. Schilowsky, in discussing Russian mineral wealth, "the country was supplying much of its own copper, using up-to-date methods, although financed by foreign capital. Iron ore in Southern Russia is also found very near to large deposits of suitable coking coal. The development of these deposits was undertaken largely by French and Belgian capital." The new developments will take place in Siberia, where there is potential wealth. The Irtysh Corporation, financed by English people, has already done much here, and will proceed again as soon as the people in control there decide in which direction they are going. During his stay in this country Mr. Schilowsky has visited the Shawinigan plant, Montreal, asbestos mines in Quebec, Ottawa, Sudbury, Toronto and Niagara, being especially interested in water power development and the various methods that are used in treating metals in this country.

"Limits of .0001 are Easily Maintained with DUMORE Grinders"

IN selecting a grinding tool for your shop, consider the merits in the light of two all-important mechanical principles—**speed** and **balance.** The fact that small emery wheels will not cut properly unless driven at high speeds has been established beyond question. But with high speeds there must be perfect running balance **(dynamic).** Accuracy can be obtained only when chatter, taper and bell-mouth are eliminated.

The **DUMORE** grinder is mechanically perfect because these two great principles are incorporated in its construction. Speeds ranging from 10,000 to 50,000 R. P. M., combined with dynamic balance, insure accuracy to .0001. Then, too, the **DUMORE** is portable—easily carried to all parts of the shop and quickly set up ready for work. Its constant use and endorsement by thousands of mechanics is highest proof of its value.

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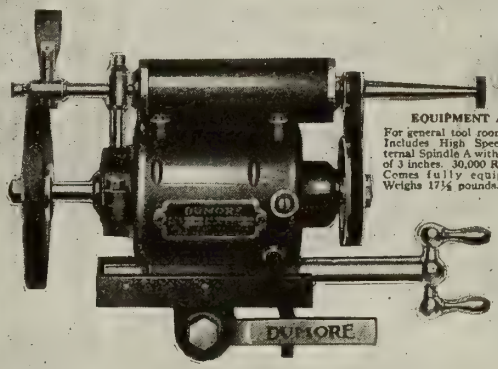
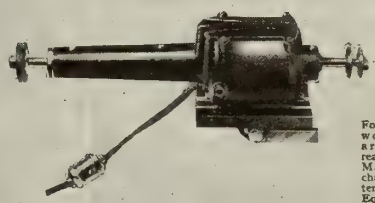
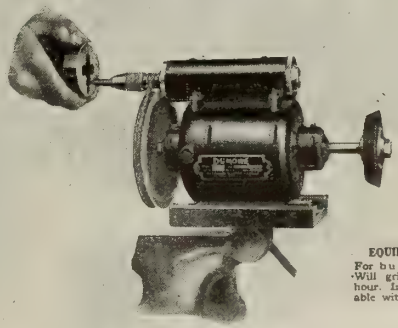


EQUIPMENT A
For general tool room use. Includes High Speed Internal Spindle A with reach of 3 inches. 30,000 R.P.M. Comes fully equipped. Weighs 17½ pounds.



EQUIPMENT B
For deep internal work. Extension arm has 10-inch reach. 10,000 R.P.M. Arm interchangeable with internal spindle on Equipment A.



EQUIPMENT C
For button dies. Will grind 20 an hour. Interchangeable with A and B.

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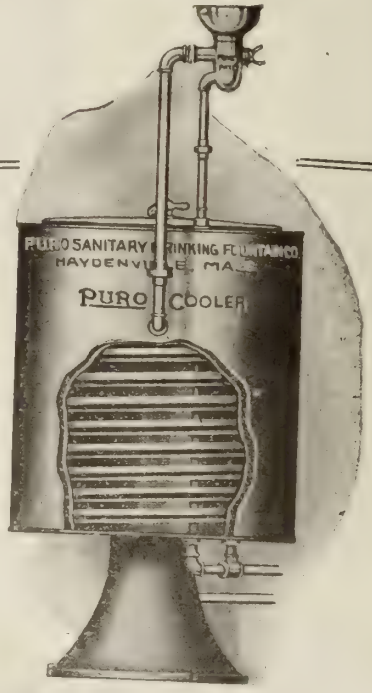

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TENDERS

It is understood that in the near future the authorities of the port of St. John, N.B., will call for tenders for extension of the grain conveyor system to berths 14 and 15.

The Municipal Council of Chatham are asking for tenders for the construction of a concrete bridge known as Lepines Bridge. Plans and specifications can be obtained at the secretary-treasurer's office, St. Philip d'Arg., and tenders must be in before September 15.

Tenders are called for by the Montreal Harbor Commissioners, and will be received up to September 16 for cribwork construction timber, shipbuilding timber and railway ties. Information can be obtained from F. W. Cowie, chief engineer, or M. P. Fennel, secretary.

The Department of Public Works will receive tenders up till September 17 for the reconstruction of the eastern breakwater at Quaco County, St. John, N.B. Plans and specifications can be obtained at the office of the district engineers at St. John, N.B.; Halifax, N.S., and the post office, St. Martins, N.B.

The Township of York is calling for tenders for tarvia pavements and concrete sidewalks on several streets in the township. The tenders will be received up to September 13, and plans and specifications can be obtained from the engineer, Frank Barber, 40 Jarvis Street, Toronto.

The Department of Public Works ask for tenders for building a concrete reservoir for the Ontario Hospital, Hamilton, and for a nurses' home at Kingston. Tenders must be in by September 15th. Plans and specifications may be obtained at the office of the Bursar at either of these institutions, or at the office of the Department, Ottawa.

The Department of Railways and Canals are asking for the construction of Bobcaygeon section of the Trent Canal, tenders to be delivered by September 29. Plans and specifications can be obtained from the Superintendent Engineer, Trent Canal, Peterborough, and from the Department, Ottawa.

Tenders for the dredge cutting and embankment, reinforced concrete, etc., and furnishing and installing a submerged centrifugal pump for the Big March Drainage System, Pelee Island, Ont., will be received up till Sept. 18, 1919. Plans and specifications can be seen at the office of Alex. Baird, C.E., at the town of Leamington.

The town of Hanley, Sask., want tenders which will be received up till Sept. 24th, 1919, for the supply of the following machinery One internal combustion engine, generator, exciter, switchboard, transformers, meters. The supply and delivery of poles, erection of pole lines, and erection of power house. Plans and specifications can be obtained from the consulting engineers, Murphy & Underwood, Saskatoon, and the Secretary-Treasurer, Hanley, Sask.

The Poplar Island Shipyard, New Westminster, is being sold up, and tenders on the plant and equipment are being called for. This includes electrical, steam and air machinery of the usual type used in the shipbuilding work. The time limit for receiving tenders will be Sept. 13, and full particulars can be obtained from Arthur H. Edwards, Vancouver, for the Imperial Munition Board.

The Department of Militia and Defence want tenders for the purchase of material in the one-storey frame building erected on the west side of Park School, St. David's Street, Toronto. Building consists of a dining room 40 by 108 feet, two small kitchens, and connecting passages. Tenderers will have one month in which to remove the buildings and clear the site. Tenders will be received up to September 30 addressed to the Commanding Officer, Royal Canadian Engineers, Military District No. 2, 149 College Street, Toronto.

INCORPORATIONS

F. F. Fry Ltd., have been incorporated under the Ontario Companies Act, to carry on a general contracting and engineering business. The capital will be $40,000 in 400 shares of $100 each, the head office being in Toronto.

The National Metal and Waste Ltd. has been incorporated to carry on a general business as dealers in old materials. The capital stock is $40,000 divided into 400 shares of $100 each, and head office in Woodstock.

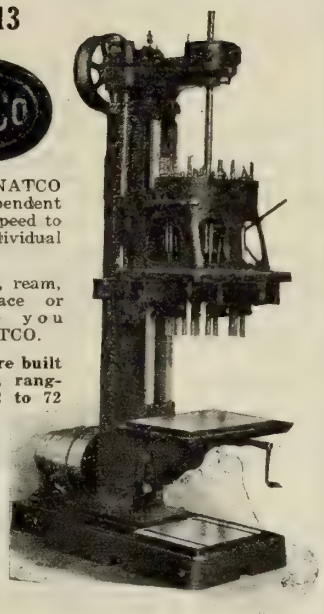
The Merritton Clay Products Co., Ltd., has been incorporated to carry on business as manufacturers of terra cotta, brick, tile, etc. The capital is $50,000 in 5,000 shares of $10 each, the head office being in Toronto.

The Belt Grip Pulley Company of Canada, Ltd., has been incorporated to carry on business as manufacturers of all kinds of pulleys and wheels. The capital stock is $200,000, divided into 20,000 shares of $10 each, the head office being in Toronto.

The Electric Furnace Co., Alliance, Ohio, have issued in pamphlet form a paper recently read by T. F. Bailey before the American Institute of Chemical Engineers at Boston, Mass., on the subject of "Resistance Type Electric Furnaces for Melting Non-Ferrous Metals." This paper is of much interest to those having to do with melting of metals in the non-ferrous foundry, and gives an indication as to the success of the electric furnace in this field.

No. 13

NATCO



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NATCOS are built in 11 sizes, ranging from 2 to 72 spindles.

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drills.

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Seamless Brass and Copper Tubes
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Also a complete line of Mechanical Cold Drawn Seamless Steel Tubing.
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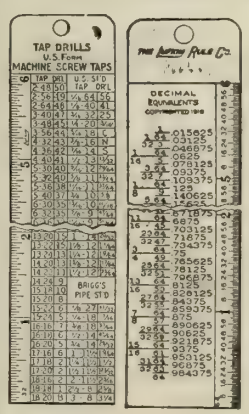

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39,000 lbs...	2.000″	2″

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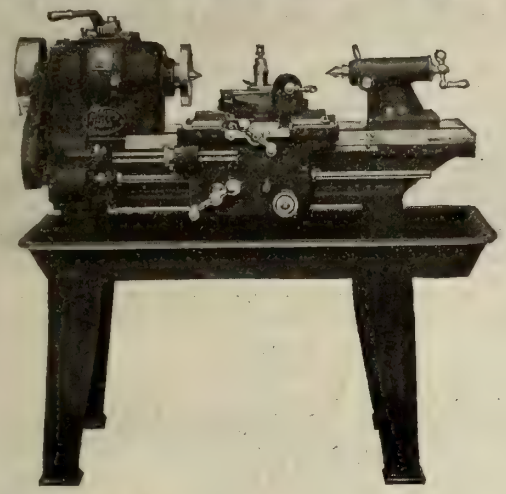

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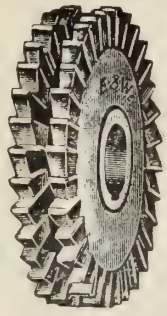

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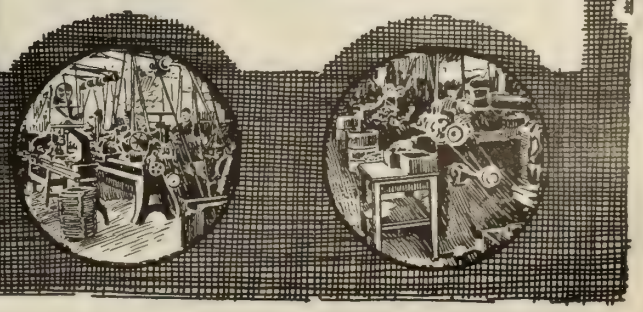

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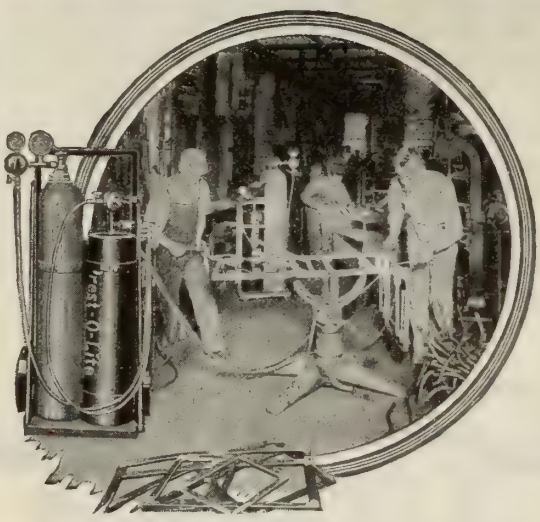

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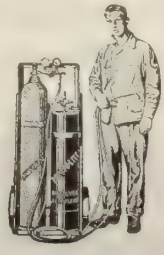
employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow-pipe, automatic regulators and gauges, and all necessary equipment, adaptable for oxy-acetylene cutting by the addition of special cutting blow-pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it.

Address Department C—107



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World's Largest Makers of Dissolved Acetylene

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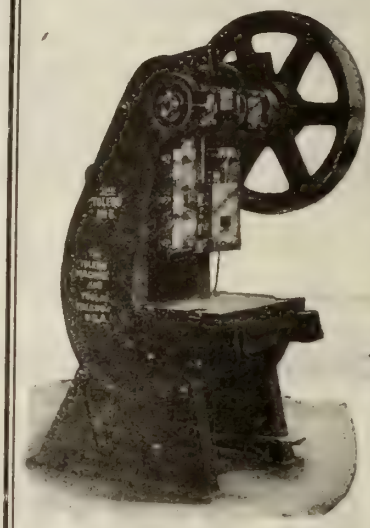


The "Toledo" No. 6, 20 sizes, weighing from 350 to 15,000 lb.

are Continuous Profit Producers

You can prove this to your own satisfaction through other users because they are everywhere, heavy, well-balanced construction — extra long and wide slides—positive inclining attachment operated by handwheel and screw adjustment. Adapted to the widest range of blank cutting, forming, perforating, drawing, shaping and combination die work.

The Toledo Machine & Tool Co.

Toledo, Ohio

Representatives:—Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Via XX Settembre 12, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.

War Record Not Made Public

The "Whitney" Special Quality "Type M" Chains

made a great showing during the war years 1916-7 and 1918.

Our tests and demonstrations were made on prominent 8-cylinder motors in service on a large number of cars in the State of Connecticut.

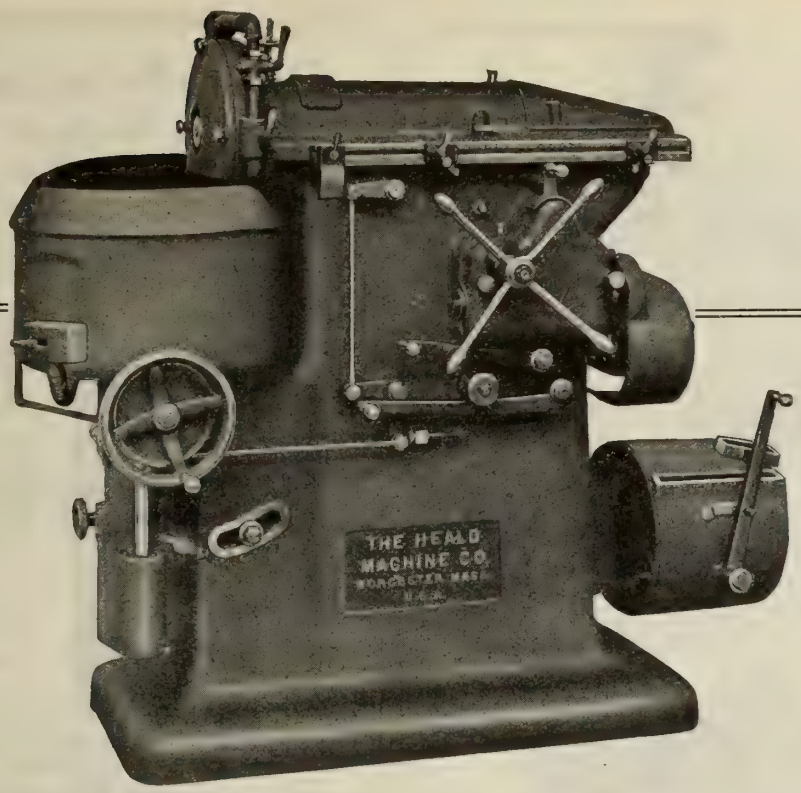
During this long period not a single "Whitney" Chain or Sprocket had to be replaced and the condition of every Drive has been pronounced remarkable.

One Drive recently examined had given over 35,000 miles' service and both Chains and Sprockets were in such perfect condition that they appeared good for more than double that record (Sprockets having no adjustment).

The links of this SPECIAL CHAIN have finished faces and reamed holes, and the smooth faces do not damage the Sprocket teeth.

Our war contracts were such that we did not announce this SPECIAL CHAIN until after the conflict was over.

THE WHITNEY MFG. CO.,
Hartford, Connecticut



BUILT IN TWO SIZES 8" and 12"

The New Surface Grinder you have been looking for.

The new HEALD No. 20 and No. 22 MACHINE is a simple, productive and accurate rotary surface grinder. That the new machines meet the first requirements can be seen from the photograph above.

In regard to production and finish, experiments have proven these new machines have no equal in the field to-day.

The WHEEL SLIDE is a massive casting having a flat and "V" way insuring continued alignment. Bearing surfaces are large and well protected. Spindle belt operates with a downward pull; an important factor in rigidity.

The chrome nickel WHEEL SPINDLE is mounted in large bearings, all adjustments of which are made at grinding wheel end through an opening in top of slide.

The MAIN DRIVE UNIT receives power from the main line by tight and loose pulleys, transmitting it directly by belt to main speed box, wheel spindle and pump.

MAIN SPEED BOX, situated on the rear of machine, furnishes power to wheel slide by a 3-step cone, and operates the chuck, which has three speeds, through a bank of gears. Wheel slide and chuck are independent of each other, permitting a large latitude in speeds and feeds.

Chuck spindle is driven by spiral gears, one of which is mounted directly on the spindle. Spindle itself is mounted in a sleeve which has vertical adjustment. Upper portion rests in a taper bearing, lower end being equipped with ball bearings —wear is automatically taken up. All control levers and adjustments are within easy reach of operator.

Complete water apparatus is furnished with each machine; built in two sizes, 8" and 12", with Heald Magnetic Chucks are regular equipment. Motor drive if desired.

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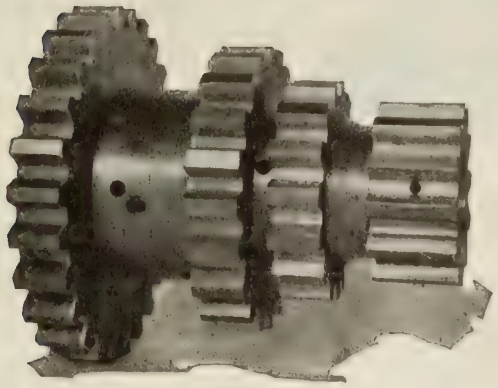

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Made of high-grade, closely woven, especially treated duck material to **resist fire, water or acid**; will outwear overall or other work-cloth.

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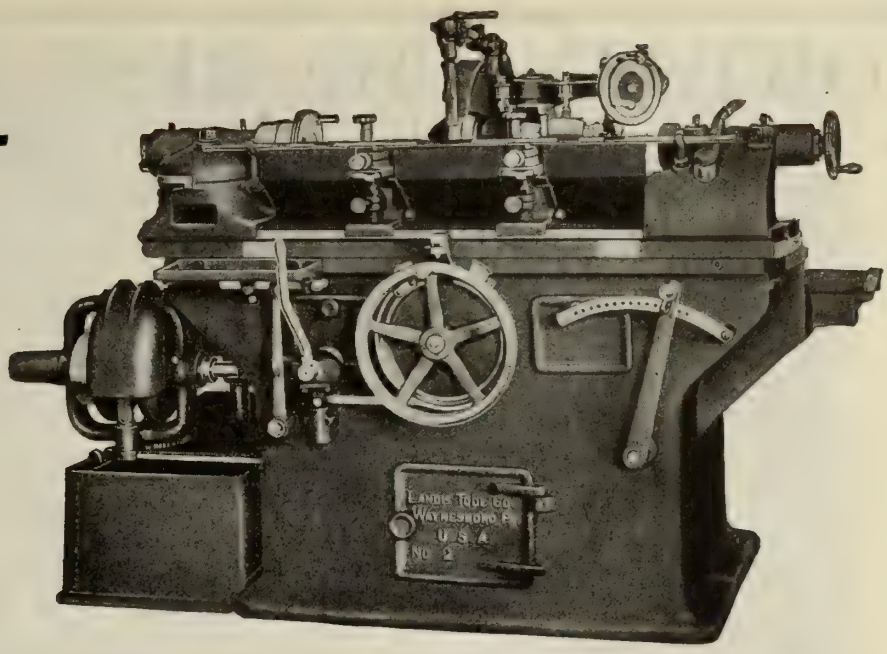
Real Producers



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Read this comment from one of our customers:
"We find these machines particularly well adapted to this class of work. Rigidity, as in all grinding operations, is particularly vital in the grinding of a ball bearing race way. We have found these machines entirely satisfactory in that respect."
On the particular job referred to, Landis "Universals" are grinding the holes of inner ball bearing race ways. The hole is 2.1653 inches in diameter. Number of bearings finished in nine hours, 170. Grinding time, 2 minutes. Total time, including chucking and handling, 3.18 minutes. Landis Universals make good either in tool room or shop.

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"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

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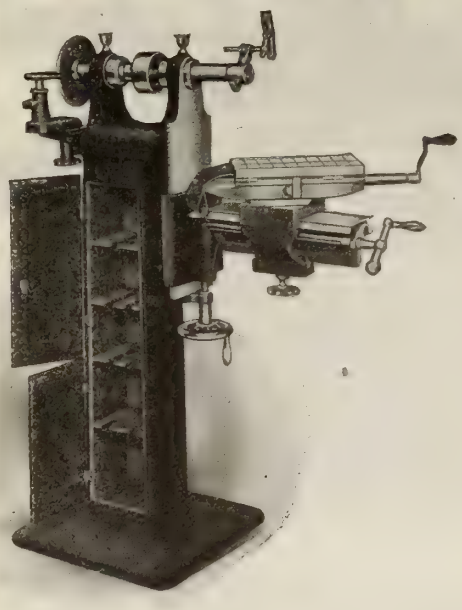

GARVIN No. 3, Universal Cutter and Surface Grinder
Use Code—Banish

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple **Light Running** **Accurate**

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

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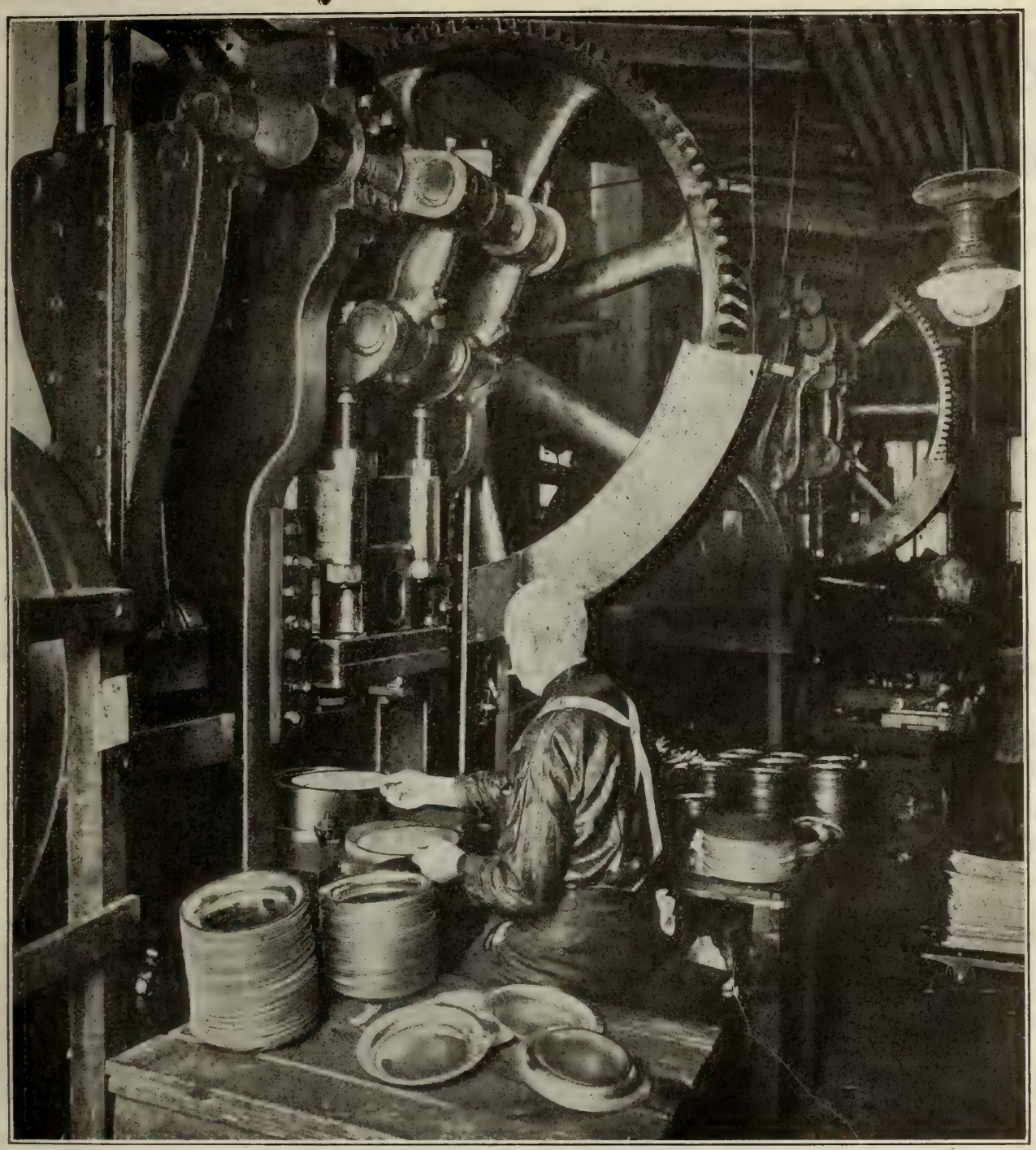

BACK IN 1893

we began to sell "BLISS" Presses to what is now the R eliance Metal Spinning & Stamping Co., Brooklyn, N.Y. (then S. Sterneau & Co.) The business has averaged t he purchase of a "BLISS" machine a year since. "What do you make on these Presses?" was asked. "Every hing," was the answer—indicative of the wide utility of "BLISS" Toggle Drawing Presses.

BLISS 1857

E. W. BLISS COMPANY

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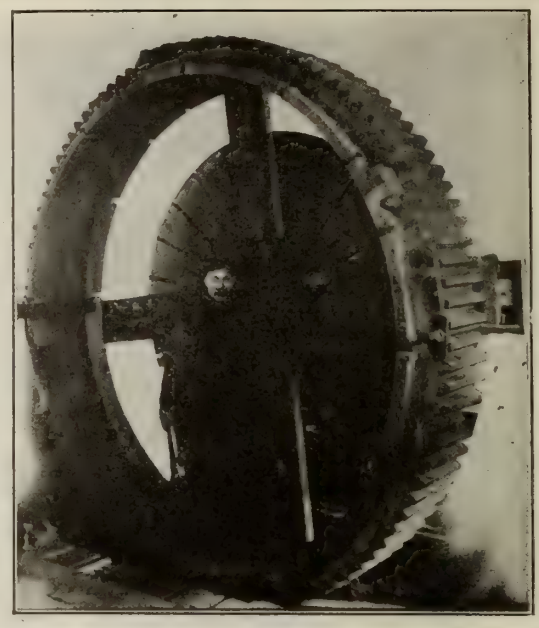
Economy A Big Factor In "HISCO" Moulded Gears



In the installation of new machinery in the working out of new processes—you may require gears or sets of gears, and no matter what the diameter, the Hesco process relieves you of the necessity of having patterns made—entailing considerable cost and delay.

"HISCO" machine moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high lumber and wages, and when time is a factor—is something to be considered.

The "HISCO" plant is equipped to produce machine moulded gears up to 18 feet in diameter without patterns—and remember, very often the pattern has cost more than the gears.

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HOYT METALS

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BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
Annual sales over $5,000,000.

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SPUR
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Or

Gear Cutting from your blanks.

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IT IS IMPORTANT

when advertising that as many prospective buyers as possible read what you are selling. We advise you to use **Canadian Machinery.**

The Canadian Who Bullied the Bolsheviks!

WHEN war broke out, Colonel "Klondyke" Boyle took across, at his own expense, 200 staunch Yukon volunteers. He was sent to Southern Russia, and in six weeks turned the transport system there from chaos into efficiency. He fed the starving Russian and Roumanian armies. He arranged temporary peace terms between Bolsheviks and Roumanians. Aided by twenty Chinese murderers and a brave Canadian girl, he bluffed the Bolsheviks and Austrians, in a tremendous exploit which won for him the title "Saviour of Roumania," and the personal thanks of the Roumanian royal family.

Read this story of "Klondyke" Boyle, by Arthur Beverley Baxter, in September MACLEAN'S—it starts on page 13.

"Growing Under Gouin"

—tells the amazing story of development of Quebec Province during the past fourteen years —in road-building, finances, industries and education.

"Meet Mr. Habitant"

—What does the rest of Canada know about the Habitant of to-day? Does he talk like Drummond's poems? This article, by Thomas M. Fraser, forcibly depicts the assets Canada has in French-Canadian stability and thrift, and will go far to remove any lingering prejudices which may exist in some minds.

Other Big Features

The Crowning of the King—By J. K. Munro, the pungent, pithy, political pundit.

Nuorteva's Propaganda—By C. H. Cahan, K.C., recently Director of Public Safety.

The White Eagle at Niagara—By Major C. R. Young, late adjutant Polish Army Camp.

The Problem of Our New Canadians—By Nellie McClung.

His Majesty's Well-Beloved—By Baroness Orczy.

Canada's Great National Asset—By D. B. Hanna, president Canadian National Railways.

Teddy Bear—A wonderful, poignant, Robert W. Service poem.

On Leave—A light, frolicsome story by Harry Bailey.

Evil Spirits—Another Bulldog Carney story, by W. A. Fraser.

Ebb and Flow—A new story by C. W. Stephens, who wrote "Man and Wife."

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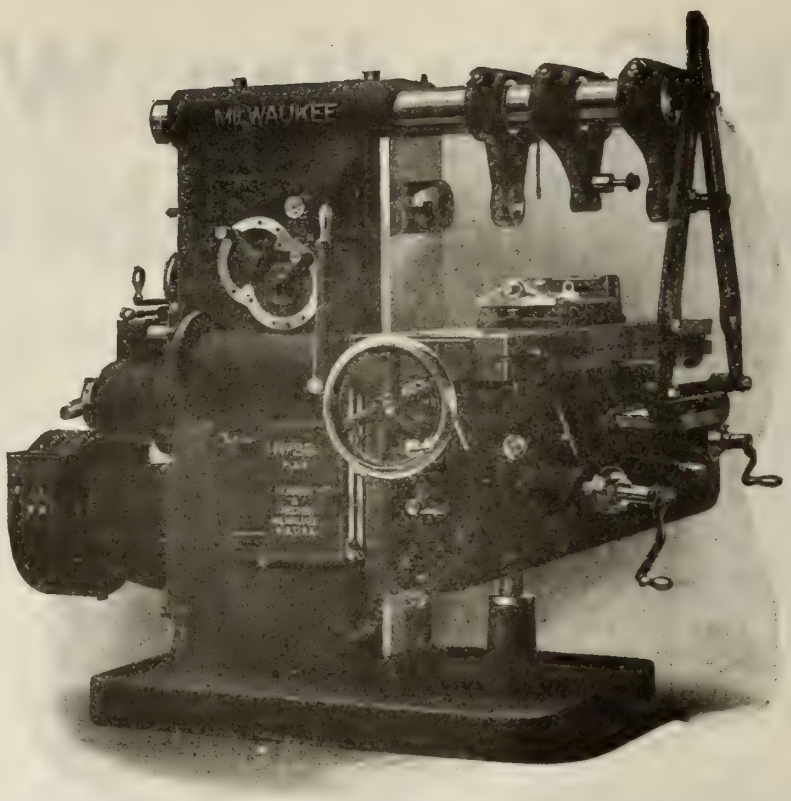


MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

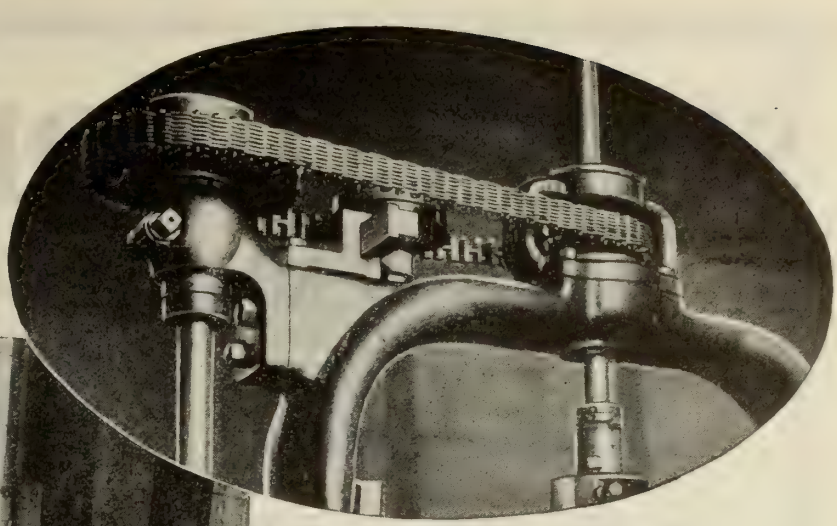
Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

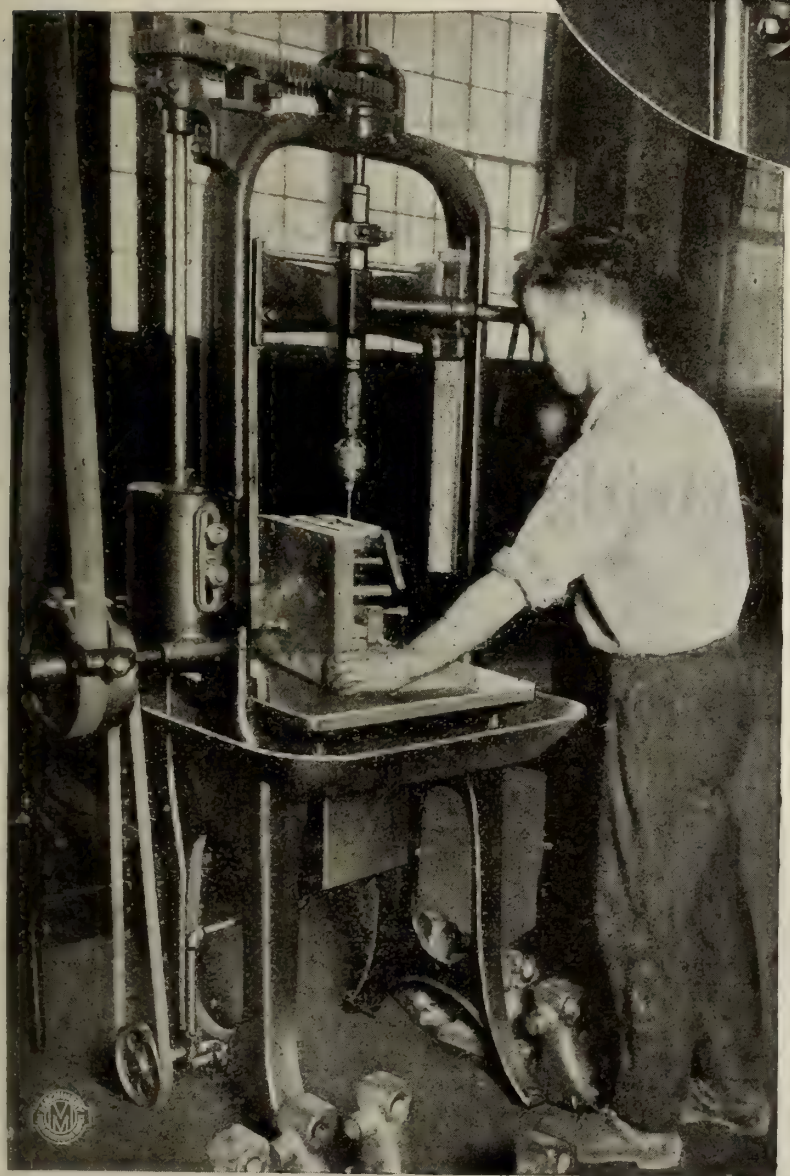
Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

KEARNEY & TRECKER CO.

MILWAUKEE, WIS. U.S.A.

The Drive for High Speed or Heavy Service





Gearing in this capacity would be noisy and would depreciate rapidly. Belting would necessitate a large idler and the power loss would be prohibitive. Chain is the answer to a problem of this kind—Morse Chain.

There are Reasons Why This New Drilling Machine is Driven by Morse Silent Chain

This new drill is a product of the Edlund Machinery Co., of Cortland, N.Y., and is designed for heavy duty drilling at high speeds.

As may be seen, a vertical drive shaft parallel to the drill spindle extends upward from the feed change box to the top of the machine.

From this point a 1" Morse Silent Chain transmits power to the vertical shaft which drives the drill spindle. The sprocket on the drive shaft has 37 teeth, that on the drill spindle 25.

With the drive pulley running at 500 R.P.M., four spindle speeds are obtained —380, 660, 950 and 1215 R.P.M.

MORSE CHAIN CO., LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD **ITHACA, N. Y.**

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60 Rivets in a Minute

Faster if the work can be fed faster. But at least 60 every minute. And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

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handle any rivet up to ¼-in. shank.
If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.
The Grant Book called "Perfect Riveting" tells how to give an extra appearance of quality to your product. For your copy

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SHATTER-PROOF LENS
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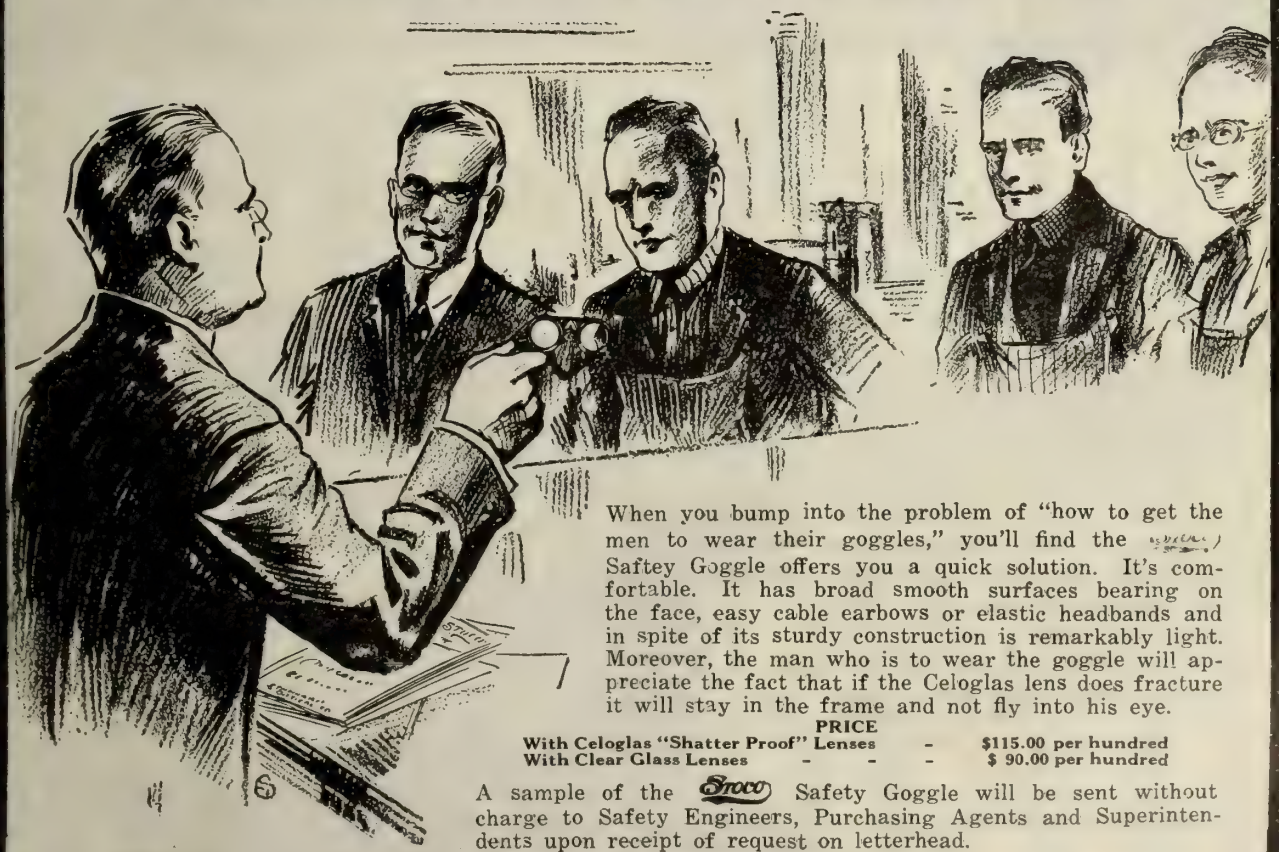

When you bump into the problem of "how to get the men to wear their goggles," you'll find the Stoco Saftey Goggle offers you a quick solution. It's comfortable. It has broad smooth surfaces bearing on the face, easy cable earbows or elastic headbands and in spite of its sturdy construction is remarkably light. Moreover, the man who is to wear the goggle will appreciate the fact that if the Celoglas lens does fracture it will stay in the frame and not fly into his eye.

PRICE	
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A sample of the Stoco Safety Goggle will be sent without charge to Safety Engineers, Purchasing Agents and Superintendents upon receipt of request on letterhead.

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SCREW MACHINE PRODUCT

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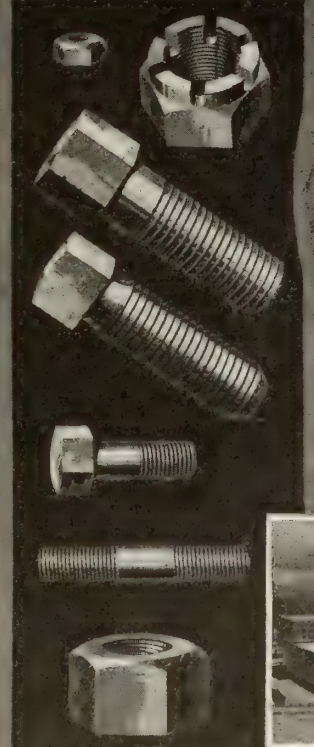

NUTS—
Plain—S.A.E.
Castellated—S.A.E.
Semi-finished—V—U.S.S.

SCREWS—
Cap—V—U.S.S.—S.A.E.
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SPECIALS—made to customers' specifications up to 2¼" diameter, 10½" long.

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ALL-ROUND machines for high grade work, they are equipped with special labor-saving attachments that add to their convenience and enable the operator to "speed up" without endangering accuracy.

ILLUSTRATION SHOWS

a Whitcomb-Blaisdell Planer machining the head post of a Universal Boring Machine—a machine with a nation-wide reputation for accuracy.

May we send you our catalogue giving full particulars?

Whitcomb-Blaisdell Machine Tool Co.

WORCESTER, MASS.
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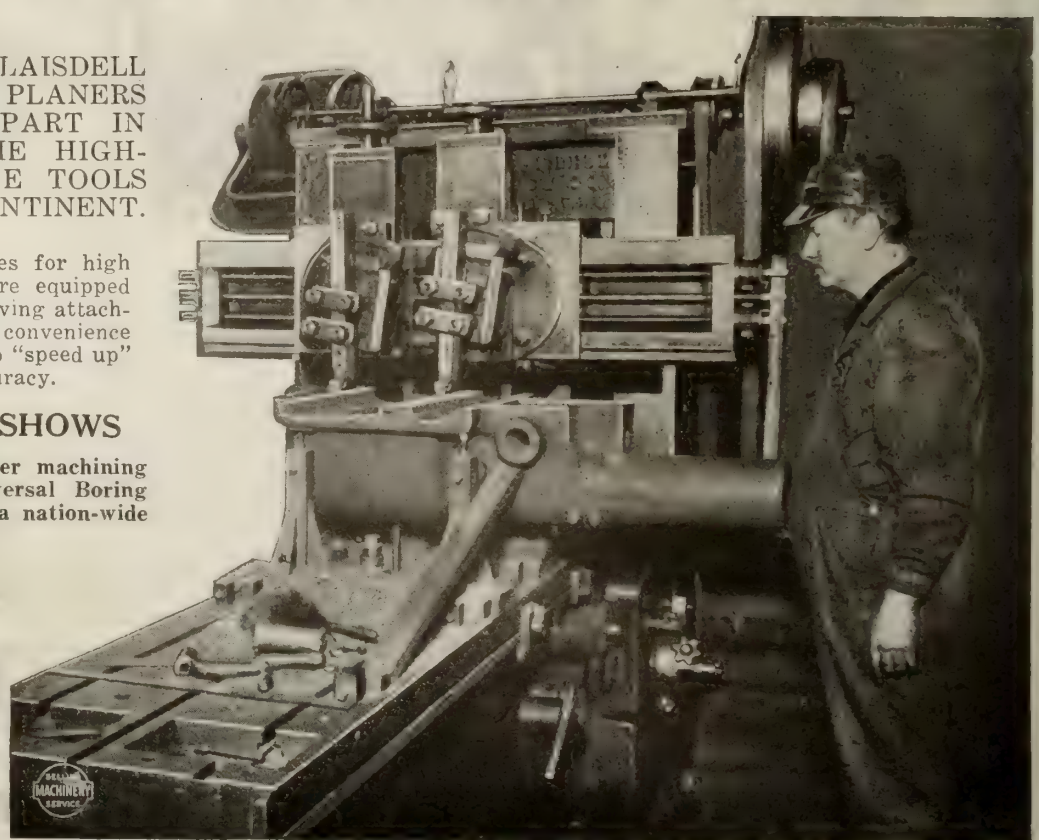

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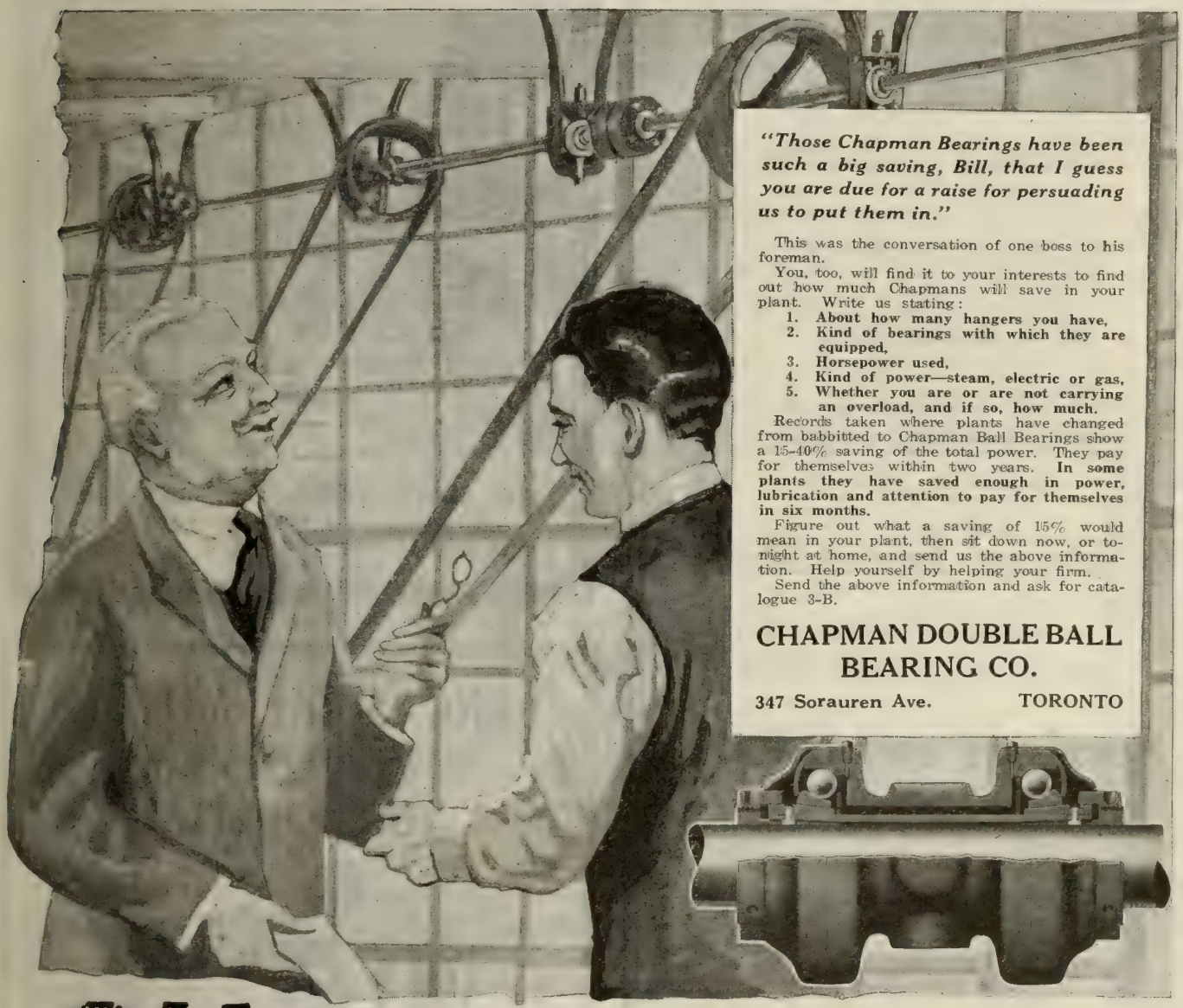

"Those Chapman Bearings have been such a big saving, Bill, that I guess you are due for a raise for persuading us to put them in."

This was the conversation of one boss to his foreman.

You, too, will find it to your interests to find out how much Chapmans will save in your plant. Write us stating:

1. **About how many hangers you have,**
2. **Kind of bearings with which they are equipped,**
3. **Horsepower used,**
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5. **Whether you are or are not carrying an overload, and if so, how much.**

Records taken where plants have changed from babbitted to Chapman Ball Bearings show a 15-40% saving of the total power. They pay for themselves within two years. **In some plants they have saved enough in power, lubrication and attention to pay for themselves in six months.**

Figure out what a saving of 15% would mean in your plant, then sit down now, or tonight at home, and send us the above information. Help yourself by helping your firm.

Send the above information and ask for catalogue 3-B.

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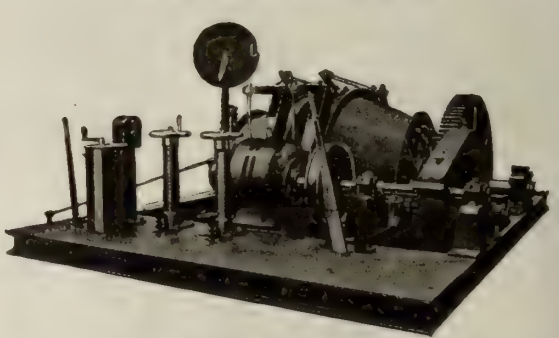

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Specialists in Motor Manufacture and Application

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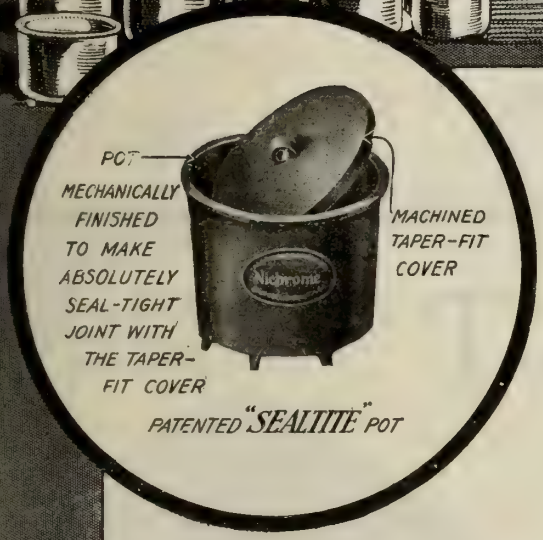

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for Heat Treatment

Speaking of the efficacy of carbon monoxide in the cementation and case-hardening of steel, the noted Italian physicist, Dr. F. Giolitti, says:

"At all the temperatures used in cementation practice, carbon monoxide carburizes iron exclusively through its specific action as a gas."

With the machined gas sealing cover, furnished with the "Sealtite"pot as shown in the figure, no fire-clay is required for sealing the cover, and the heat treatment penetration shows a large percentage increase over that of iron and steel pots and requires less time.

Write for further particulars.

26

Manufactured under Henderson patents.

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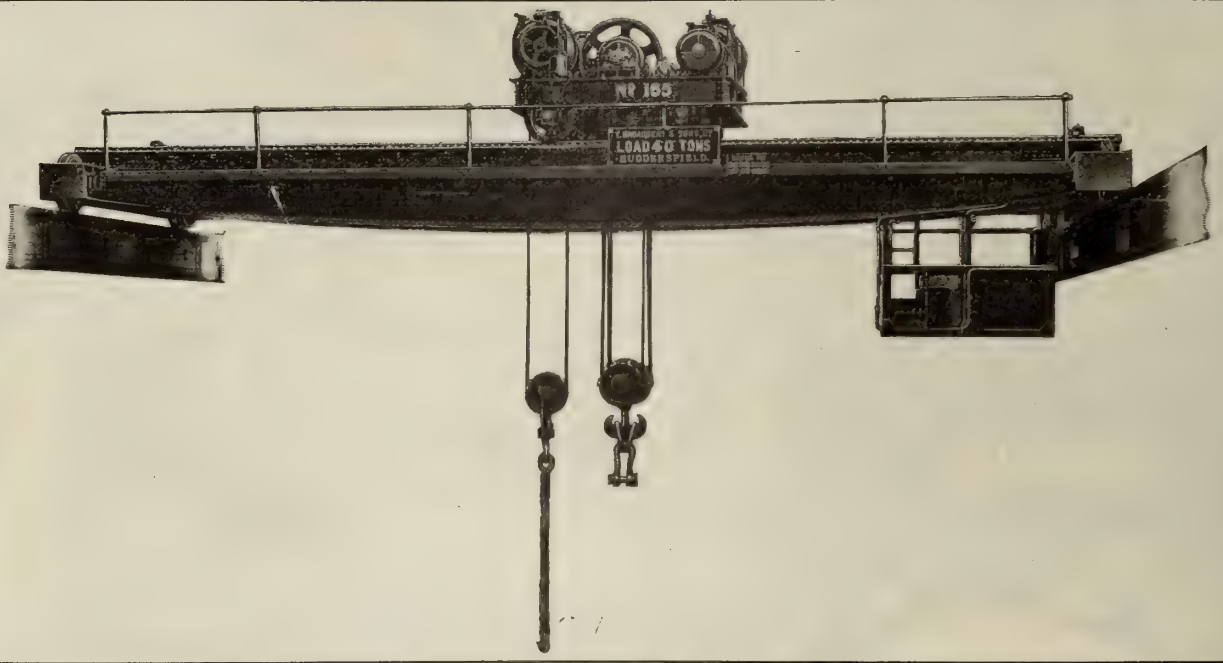

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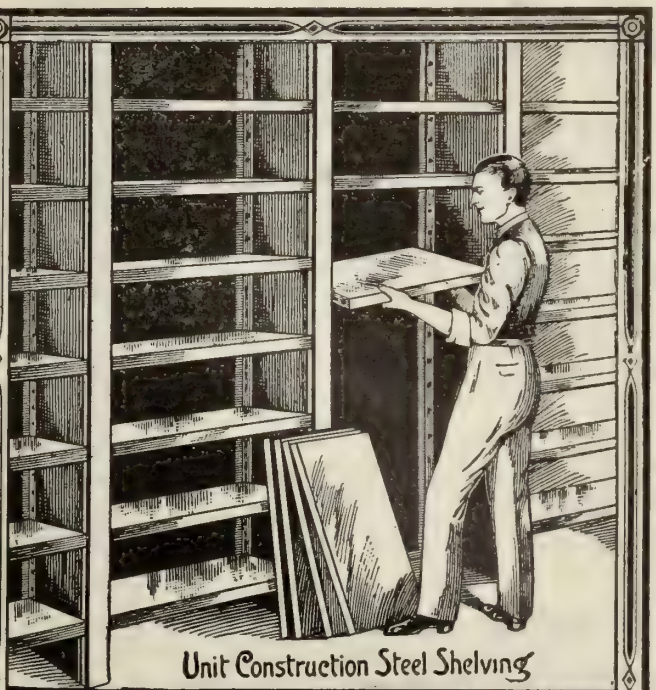

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MADE IN CANADA

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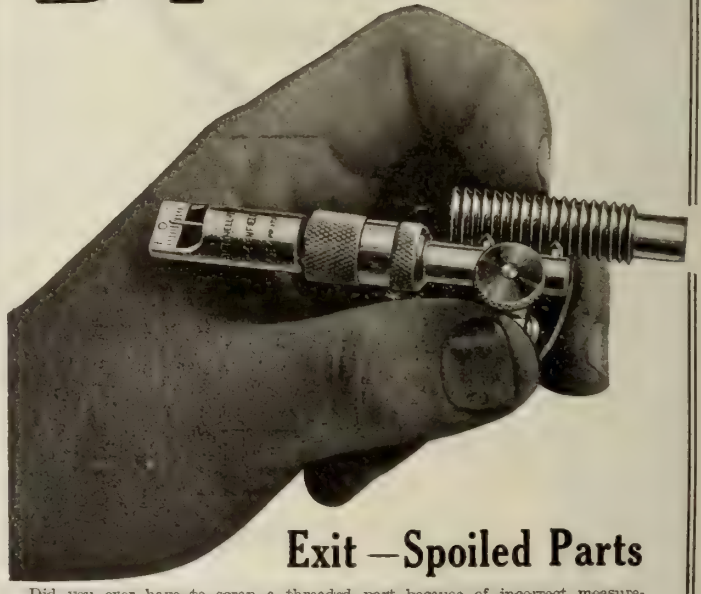
B-T THREAD LEAD INDICATOR



Exit—Spoiled Parts

Did you ever have to scrap a threaded part because of incorrect measurement in lead? Were you ever forced, during a rush job, to thread a part over again, because it didn't fit as it should?

B-T THREAD INDICATORS

enable you to get the right thread lead instantly and maintain a constant check upon it. They will detect errors of one thousandth of an inch—can be used for testing odd and even pitches, as well as internal and external threads.

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116 MILES OF THREAD

without removing the CHASERS" from a NAMCO DIE

"Figure It Out for Yourself"

"The set of ½"—13 Chasers mailed to you is from a No. 3 NAMCO Revolving Type Die Head." *Without removing from the Head* they have cut 240,000 Cap Screws—length of thread 1½". "Figure it out for yourself."

The above information, furnished by a user, is not the result of a test run. Nor is it claimed that this unusual performance establishes a record for NAMCO Die Heads, because with a new set of chasers, they turn out accurate work and will continue to do so indefinitely.

Your experience with threading tools will tell you that *without* the fundamentals of correct design, precise workmanship and good chasers, such performance as this with an Opening Die Head is hardly possible.

The same principles of sound construction have proved that Namco Dies, operated under widely varied conditions, will give all in accuracy and length of service that can be expected from first class threading tools. In many other cases, such as the above, they are giving more. "Figure it out for yourself."

Built in Revolving and Non-Revolving Types—for every threading requirement. Catalog?

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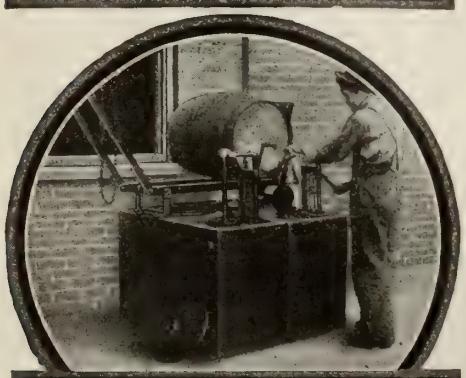

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Do away with the back-breaking, disagreeable labor in storing and handling oils.

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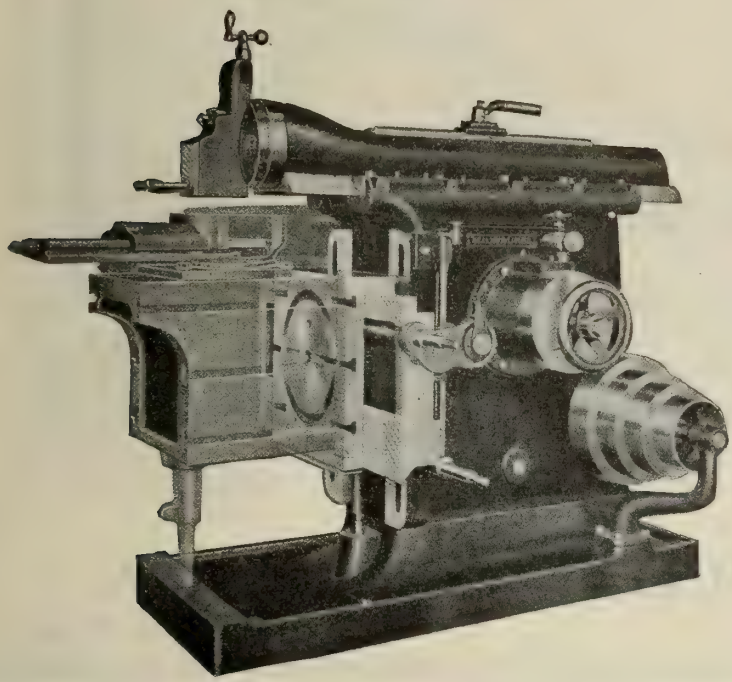

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Built in three sizes: 16 inch, 20 inch and 24 inch.

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The Canadian Disc Sander is 90% Dustless

Think what a godsend that is to the pattern shop! Hundreds of prominent concerns are profiting immensely by using these sanders.

Two types of Canadian sanders are built—the Disc Sander and the Oscillating Spindle Sander.

Both machines are equipped with New Departure ball bearings and General Electric motor. The table in each case can be tilted by a hand adjustment, 45 degrees down or 15 degrees up. Power is obtained by plugging into a lamp socket. Canadian Sanders are extraordinarily well built and are guaranteed against all defects.

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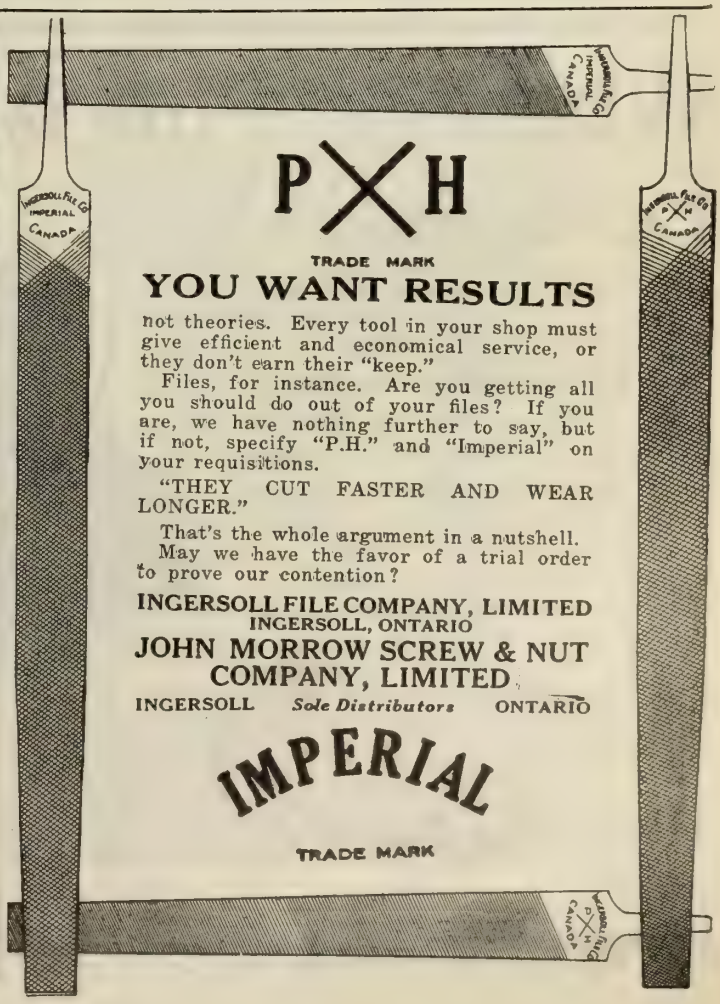

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"THEY CUT FASTER AND WEAR LONGER."

That's the whole argument in a nutshell. May we have the favor of a trial order to prove our contention?

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That Puts Dollars in Your Pockets

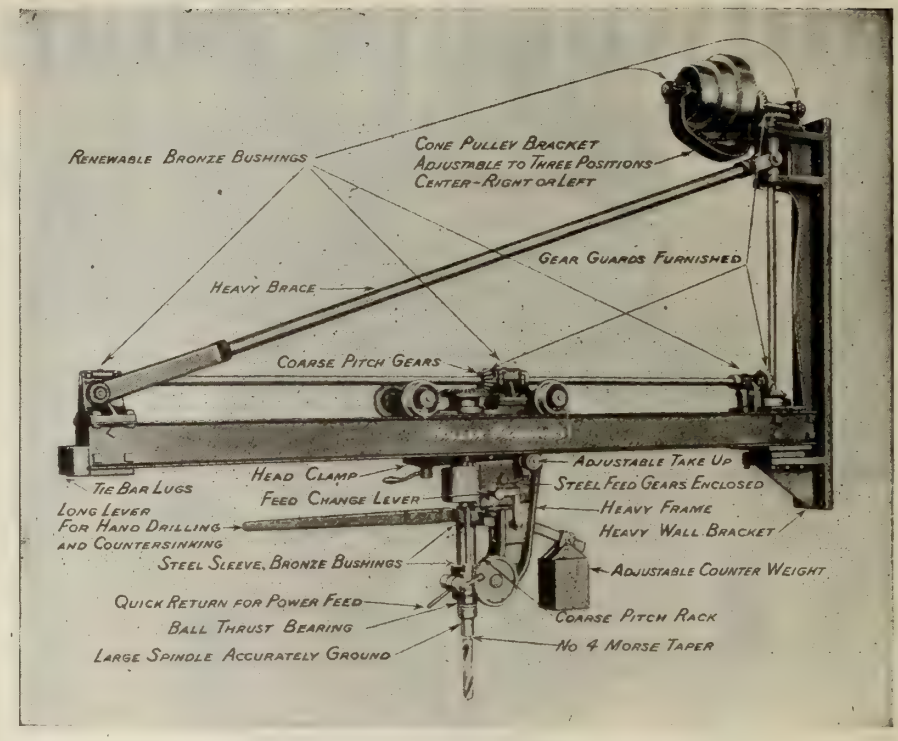
Here's a real machine tool in the wall radial drilling line for your consideration. Listen to this—the machine is made of high grade materials throughout, and the workmanship is beyond criticism. It is designed with the particular idea of maximum production, at a minimum operating expense. Entire control within easy reach makes the operators "boosters" for these machines. You can keep the dollars that may be slipping away on your wall radial drilling propositions in your pocket by the installation of this machine.

Send for Detailed Bulletin

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

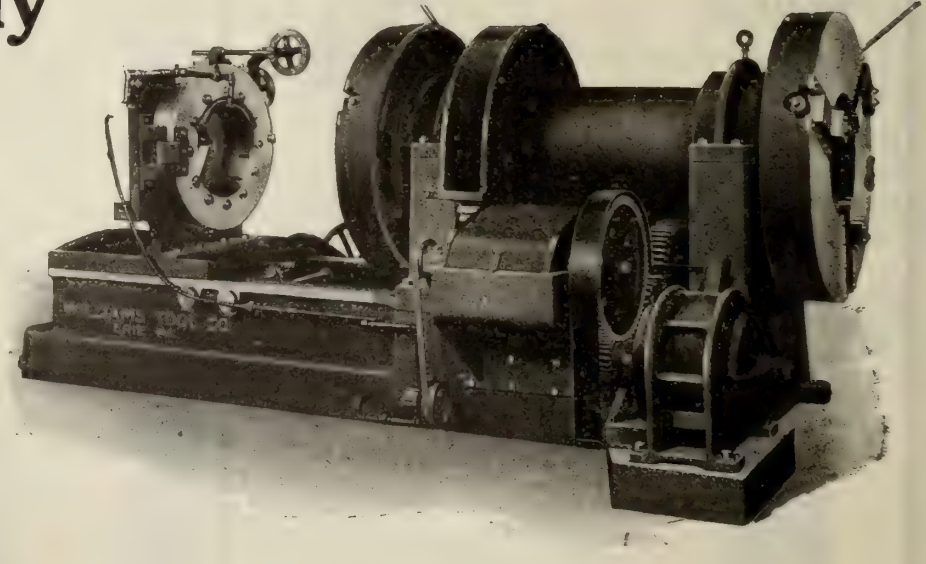
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



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The Lathe with the Pull

The Lathe of Simplified Accuracy

14 Inch Any Length Belt Driven
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Most powerful, simplest operated, most economical lathe made; no intricate parts, no chart required to operate, no overhang. Carefully made of best material that can be bought.

A LATHE THAT WILL DO YOUR WORK QUICKLY AND WELL. A LATHE THAT WILL PROVE A MONEY-MAKER TO YOU.

Made in Engine and Tool Room Sizes

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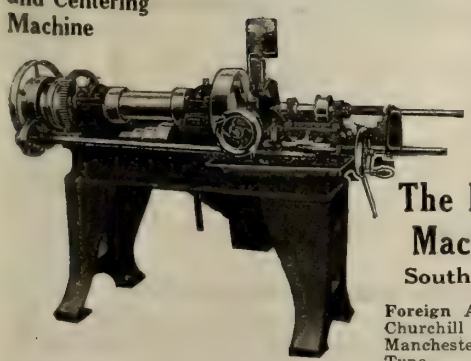
CINCINNATI, U.S.A.

Makers of 14", 16", 18", 20", 24" Belt, Motor Drive and Geared Head Lathes.

One Cuts Up
Another Cuts Down
and
They Both Cut
At Once

Hurlbut, Rogers Cutting-off and Centering Machine



Here's Real Economy

This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools—one cutting up and the other cutting down; each holding the work against the other. What is the result?—**the production is doubled and the cost is cut in half.** Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

Let us hear from you and we will give you the full story of its ability.

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Made in Canada

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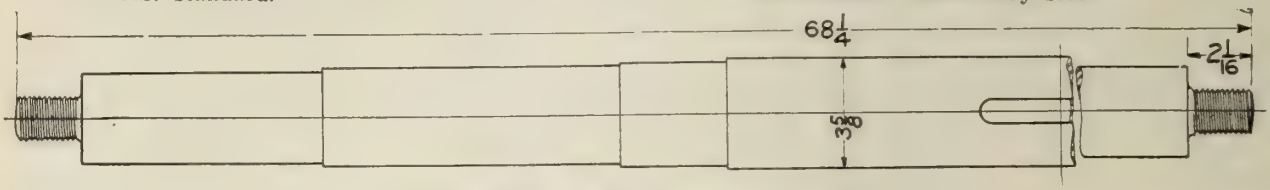
THREAD MILLING MACHINES

Will give you a short cut to lower-cost thread milling.
Study the blue print and time study as given below.

MACHINE—Smalley-General Thread Miller No. 2.
THREAD—1½ in. diameter, 2 1-16 length, 6 pitch U.S. standard.

PIECE MILLED—Axle for tractor.
MILLING FEED—4.35 per minute.
MATERIAL—Machinery steel.



Tractor Axle Operation
TIME STUDY

5 minutes 37 seconds floor to floor milling both threads. Each thread milled in 65 seconds. Balance of time handling. Barker 3-jaw chuck used which had 12 in. unsupported overhang turn main spindle bearing to thread.

NOTE.—These parts were chucked through the rear end of main spindle. This was an awkward operation because the pieces were larger in the centre and the type of chuck would not let them through. A collet chuck with false collets would have permitted faster chucking.

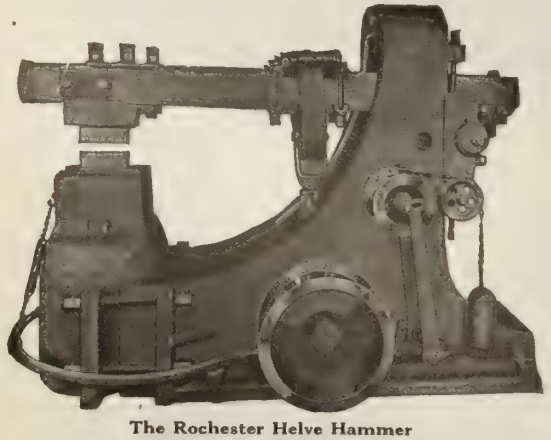
Consult us on every phase of Thread Milling.

We will show you how to cut the costs.

Smalley - General Co., Inc., Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

We'll Help You to Blaze a Trail of Efficiency

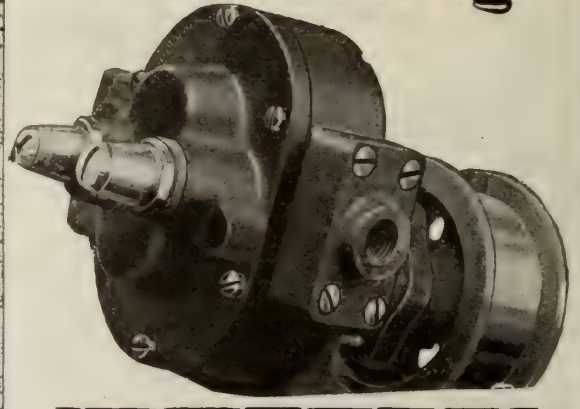


The Rochester Helve Hammer

The Mechanic who works comfortably does the best work in quick time. He gives you WORTH-WHILE results. You can't pry him loose from a superior tool. He brags about it. Give the chap a chance who uses the Helve Hammer. In 9 cases out of 10 he'll say, "The Rochester Helve" for mine. He is the man who knows the 100% Satisfaction Helve. We can't tell you all its distinctive features in this brief advertisement, so we ask you to write for our Helve Hammer Book.

THE WEST TIRE SETTER CO.
ROCHESTER, N.Y., U.S.A.

TRAHERN PUMPS
Lubricating



For efficient service and long life. They are built to stand the gaff—hard, continuous use, free from trouble. While running at 500 R.P.M. they will deliver 16½ gals. of coolant per minute or just a drop at will of operator.

Free even flow—no pulsation. Operate in either direction and against pressure.

Write to-day for Cat. 44 and prices.

TRAHERN PUMP COMPANY
Rockford, Illinois

SUCH attachments as draw in chuck, taper attachment, milling and gear cutting attachment, thread chasing dial, which may be obtained for this lathe, enable it to handle a wide range of work in an accurate and satisfactory manner.

The "Star" is so accurate and so rigid that it is repeatedly replacing heavier and more costly equipment.

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A tool particularly well adapted for model work, experimental laboratory and fine scientific work as well as for the individual in his own shop.

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Springs *for* Every Use

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Tell us the purpose for which the spring is intended, and our experts will gladly co-operate to see that you get the design best suited to the purpose.

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Hole, Hole and Face and Deep Hole Grinders

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Learn how you can secure and maintain uniform operating conditions in your power plant. Learn how to furnish positive proof instead of mere assertions by reading our new Catalog No. I-1001.
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BRISTOL'S
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are unique in their extreme simplicity of construction. The continuous night and day records obtained with these recorders show the actual pressure maintained throughout the twenty-four hours.
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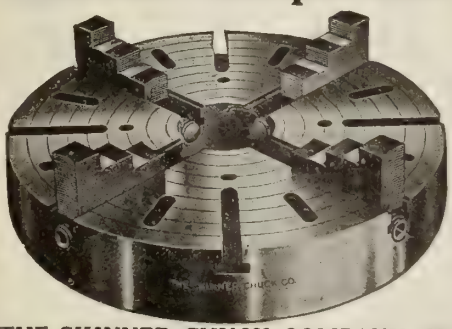
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IRON OR STEEL BODY
The last word in chuck construction.
Wide jaws; hardened steel thrust bearings; adjusting screws of large diameter, threaded full length; jaws ground after hardening, etc.
Write us to-day for prices.
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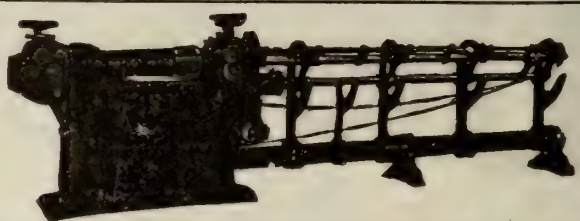
THE WIRE IS PERFECTLY STRAIGHT
and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.
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Formerly John Adt & Son. Established 1866.
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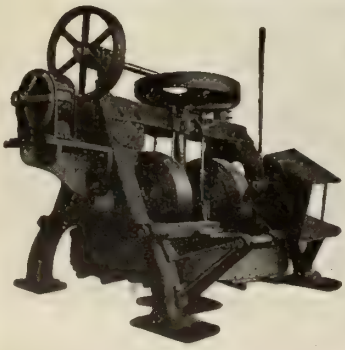
Canadian Steel Foundries Need Frost Improved Sand Mills

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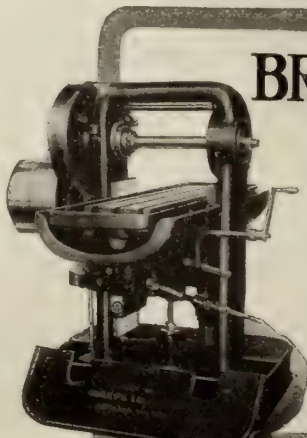
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We should like to show how "Briggs" adaptability and convenience can better output and lower costs for you. Get in touch with us.
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A big, powerful, well proportioned lathe that will stand up under the heaviest service.

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Boring Tool.

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Make One Pound of High Speed Steel go as far as Ten Pounds in Forged Lathe Tools.

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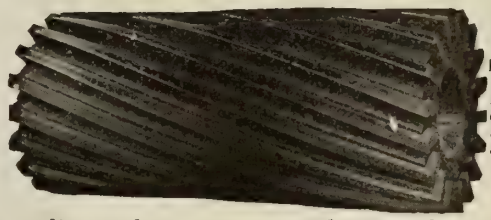

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Powerful

Inserted Helical Blades of High Speed Steel

Will outlive and out-cut any other on the market

4-in. Diameter for General Use.

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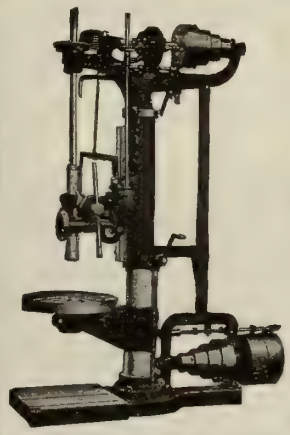
Catalog No. 6.

Greenfield Machine Co.

Greenfield, Mass., U.S.A.



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Write for full description of our 20" and 25" sizes.

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For the Die Maker, Repair Shop, Pattern Maker or Garage; will perform more than 90% of the jobs that come up.

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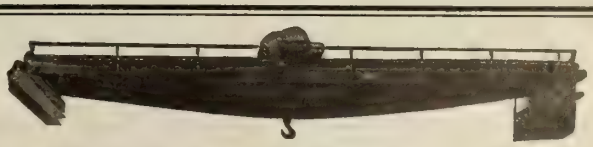

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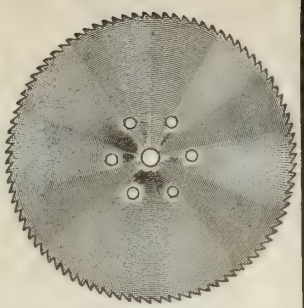

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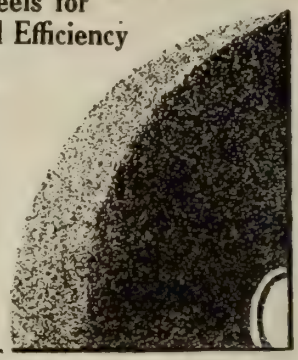

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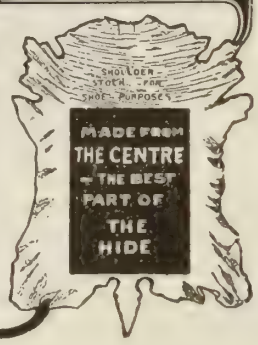

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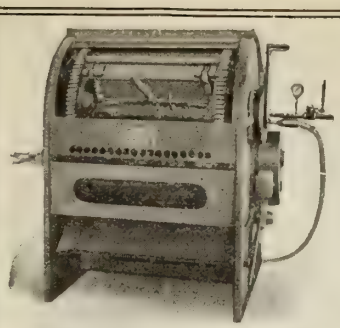

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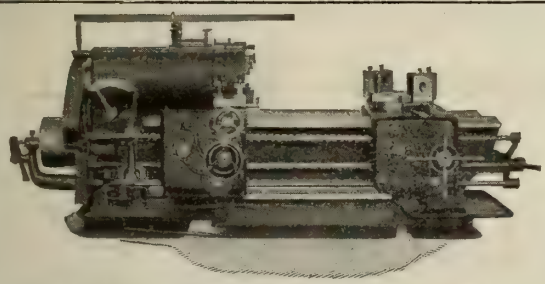

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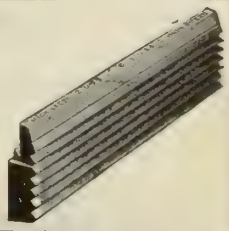

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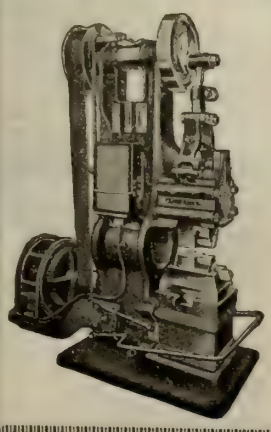

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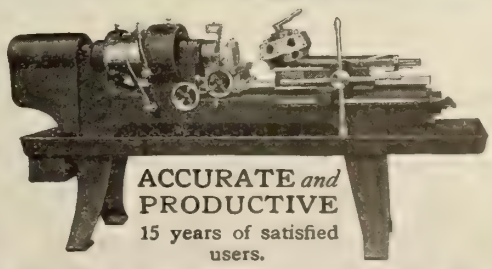

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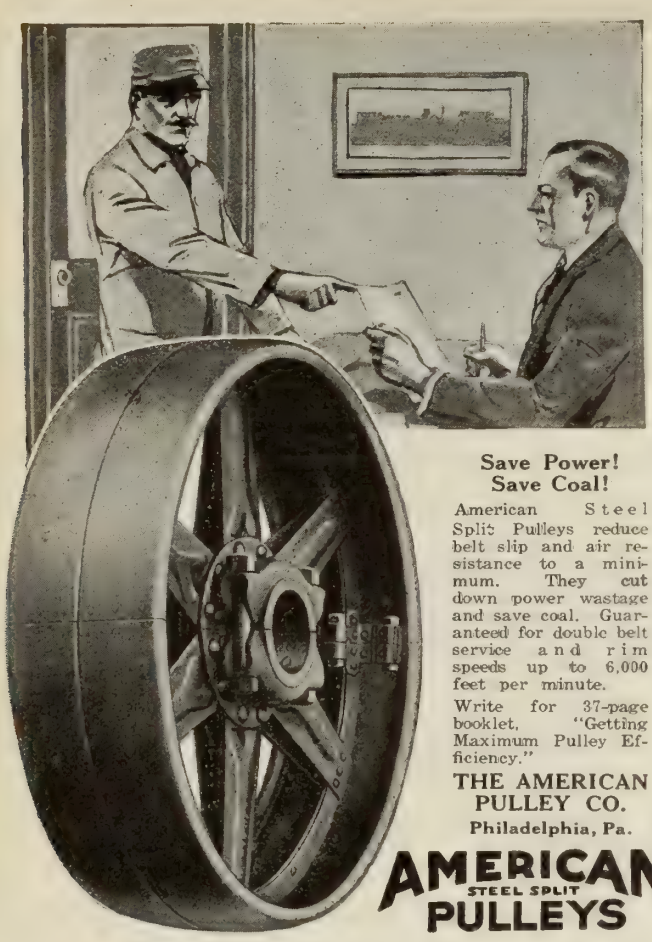

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BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS. SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE. ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS. BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glasseo, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co, J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Fellows Bros., Ltd., Chadley Heath, Eng.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Fellows Bros., Ltd., Chadley Heath, Eng.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BOOM, TIMBER
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FORGED
Fellows Bros., Ltd., Chadley Heath, Eng.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser & Co., Inc., Fort Wayne, Ind.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS. WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES. CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES. FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Positivte Clutch & Pulley Wks., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Bond Engineering Works, Toronto, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.
Sleeper & Hartley, Inc., Worcester, Mass.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can, Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston,
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal. Que.
Williams & Wilson, Ltd., Montreal. Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Banfield, W. H., & Sons, Toronto.
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blancke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

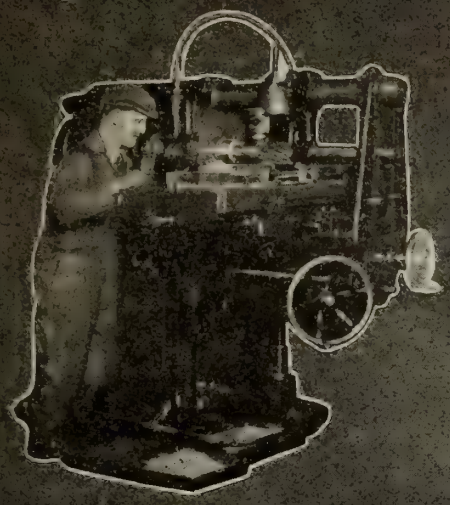
COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

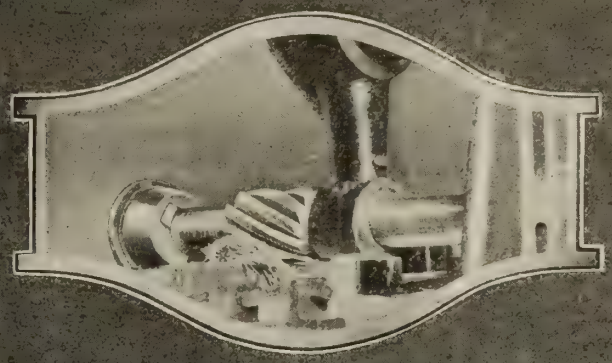
COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville





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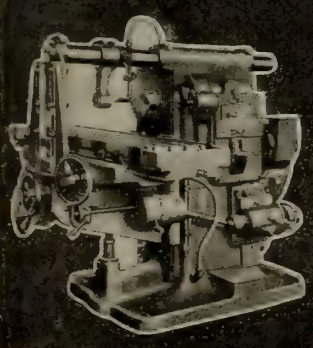
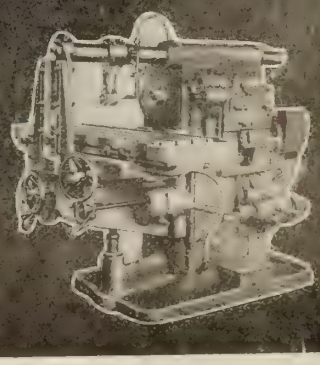
Brown & Sharpe Mfg. Co.
Providence, R. I., U.S.A.



Brown & Sharpe Heavy Service Milling Machines



CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANES, TRAVELLING AND JIB
Fellows Bros., Ltd., Chadley Heath, Eng.

CRANK SHAFTS
Canada Found's & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHED STEEL
Pittsburgh Crushed Steel Co., Pittsburgh

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser & Co., S. F., Inc., Fort Wayne, Ind.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Standard Machy. & Supplies, Montreal.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser & Co., Inc., Fort Wayne, Ind.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Anderson & Co., of Can., Geo., Montreal
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa
Pittsburgh Steel Stamp Co., Pittsburgh.

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Banfield, W. H., & Son, Toronto.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Montreal.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Windsor Mach. & Tool Co., Windsor.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRAWING
Henry Hope & Sons, Ltd., Peterboro, Ont.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
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Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
Blomquist-Eck Mach. Co., Cleveland, O.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Fry's (London), Ltd., London, Eng.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
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Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

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Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
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Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

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Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
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Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

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Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
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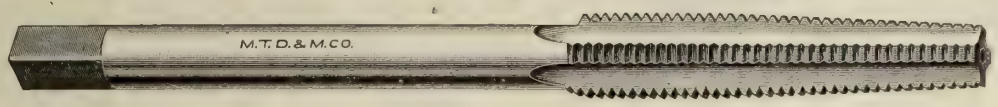
"MORSE"



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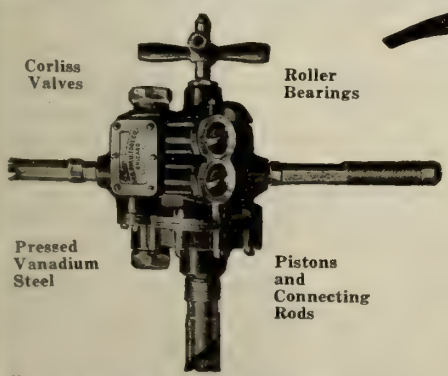

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Roller Bearings

Pressed Vanadium Steel

Pistons and Connecting Rods

Four cylinder type, two on each side. Semi-Corliss valve close to each pair of cylinders gives greater efficiency and power, saves clearance losses and allows air to enter cylinder at full pressure of the pipe line.

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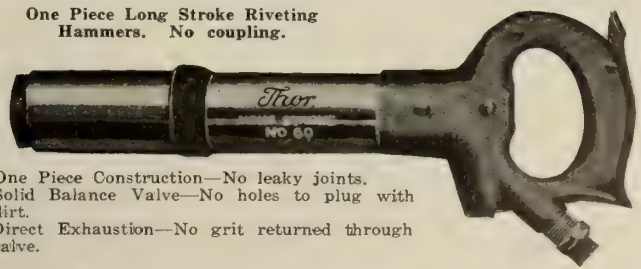
One Piece Long Stroke Riveting Hammers. No coupling.



One Piece Construction—No leaky joints.
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Four sizes, 1″ to 4″ stroke. The barrel and all wearing parts are hardened and ground, making the Thor Chipper practically free from vibration.

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Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

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See Belting, Chain.

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Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Wheel Trueing Tool Co., Windsor, Ont.

END MILLS

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Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS

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ESCUTCHEON PINS

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Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

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Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
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FIRE EXTINGUISHERS

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Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Steel Co. of Canada, Ltd., St. Catharines.
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Blancke Co., L. C., New York City.
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Williams & Co., J. H., Brooklyn, N.Y.

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Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING

Gilbert & Barker Mfg. Co., Springfield.
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FURNACES, HIGH SPEED STEEL,

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

Standard Fuel Engr. Co., Detroit, Mich.

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GASOLINE TANKS

Bowser & Co., S. F., Inc., Fort Wayne.

GASOLINE PUMPS, SELF-MEASURING

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Brown & Sharpe Mfg. Co., Providence, R.I.

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Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

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Greenfield Tap & Die Corp., Greenfield.
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Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST

Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS

Fellows Gear & Shaper Co., Springfield, V.

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Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Bridgeford Mach. Tool Wks, Rochester

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GEARS, COMPENSATING

Morse Chain Co., Ithaca, New York.

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Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
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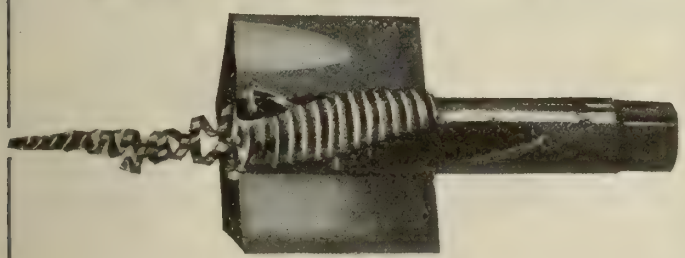

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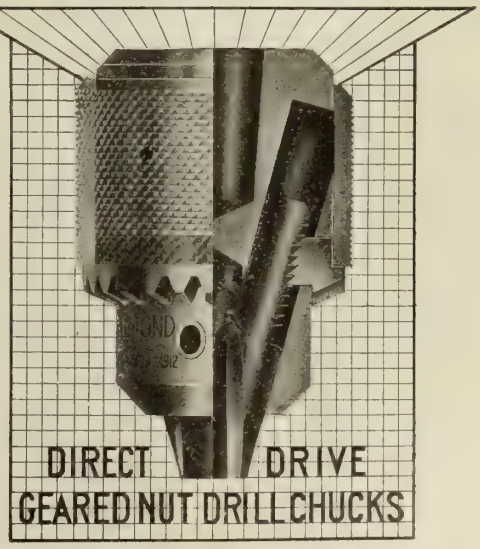

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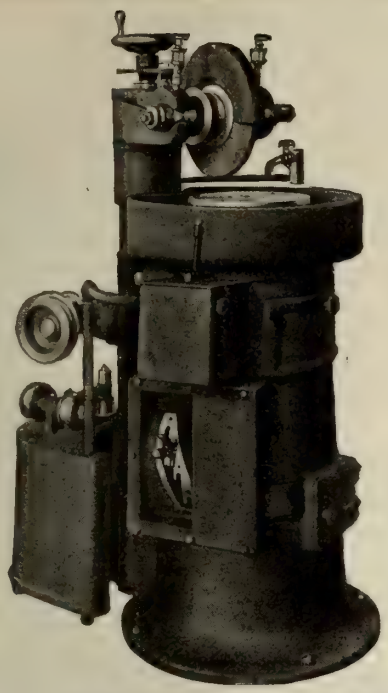

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Bristol 12-inch Rotary Precision Surface Grinder

Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

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Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

Grinds within .0004 in. of absolute Accuracy

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and read what we have to say below

WHEN a tap breaks off close or below the surface, you'll find the Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.

Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.

We wanted something original— this is what we got

BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

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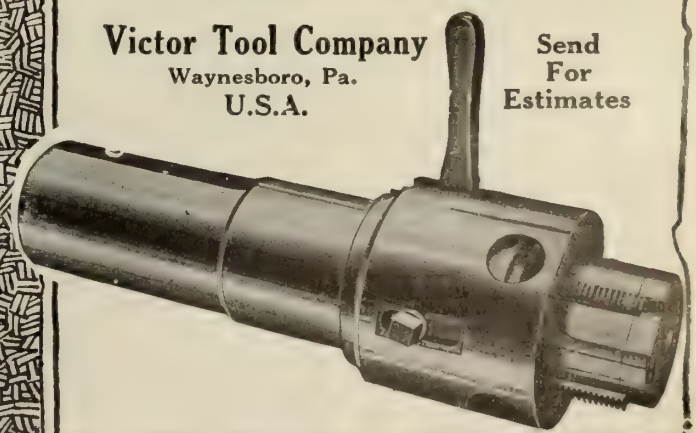

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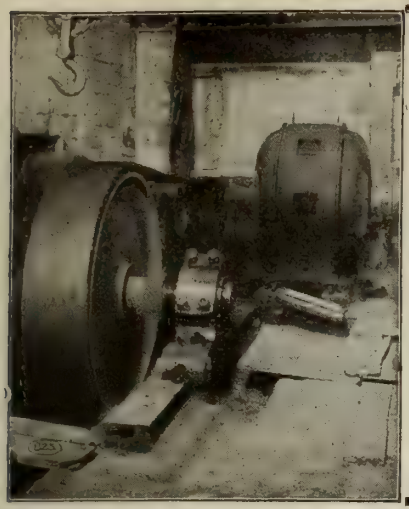

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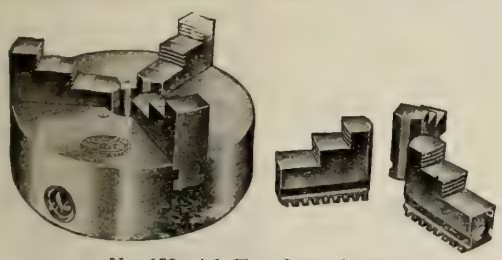

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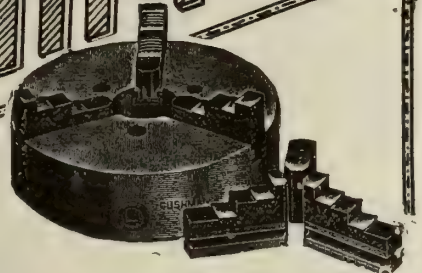

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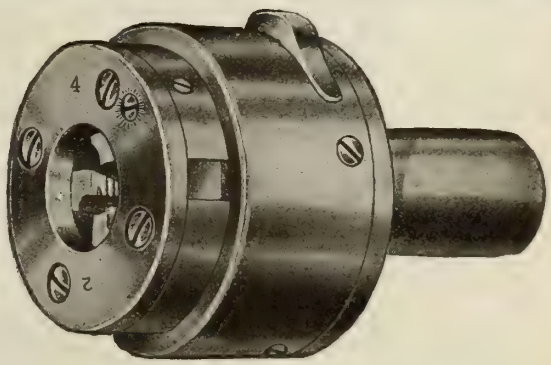

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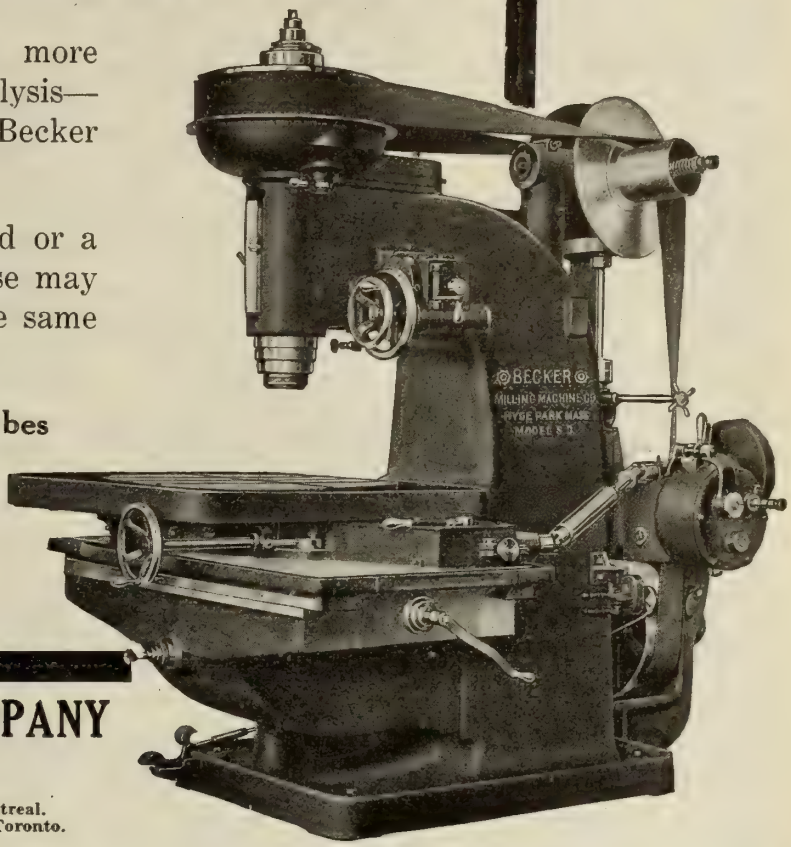

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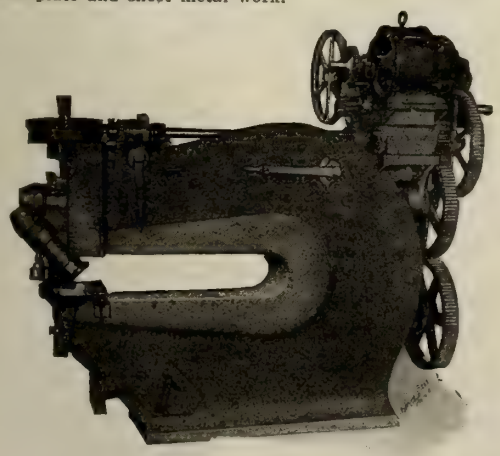

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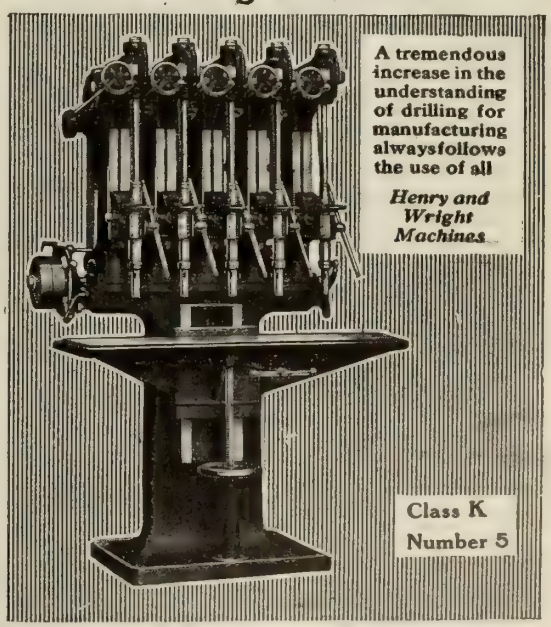

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Page Steel & Wire Co., Adrian, Mich.
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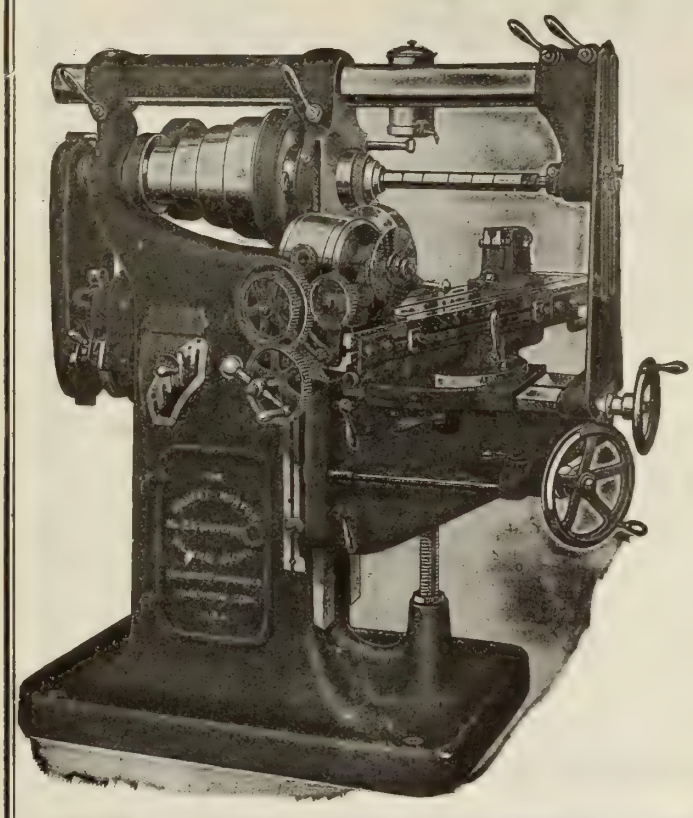

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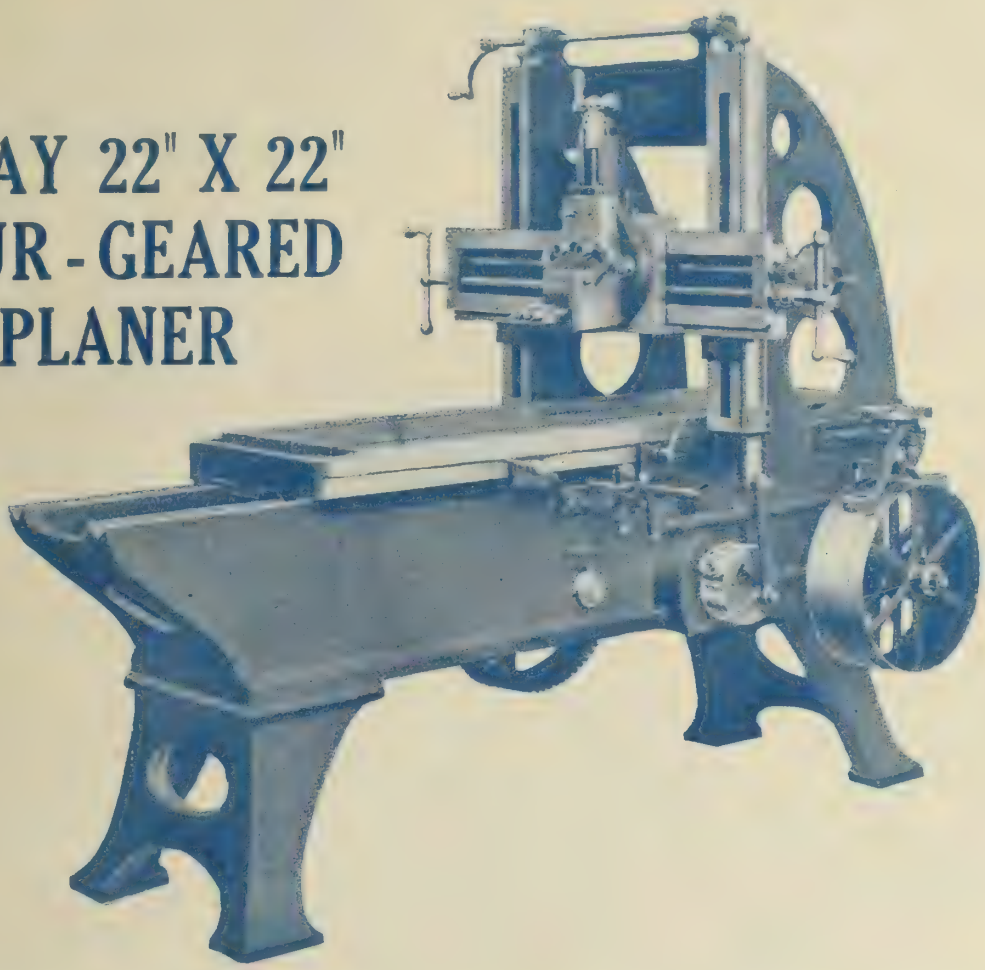

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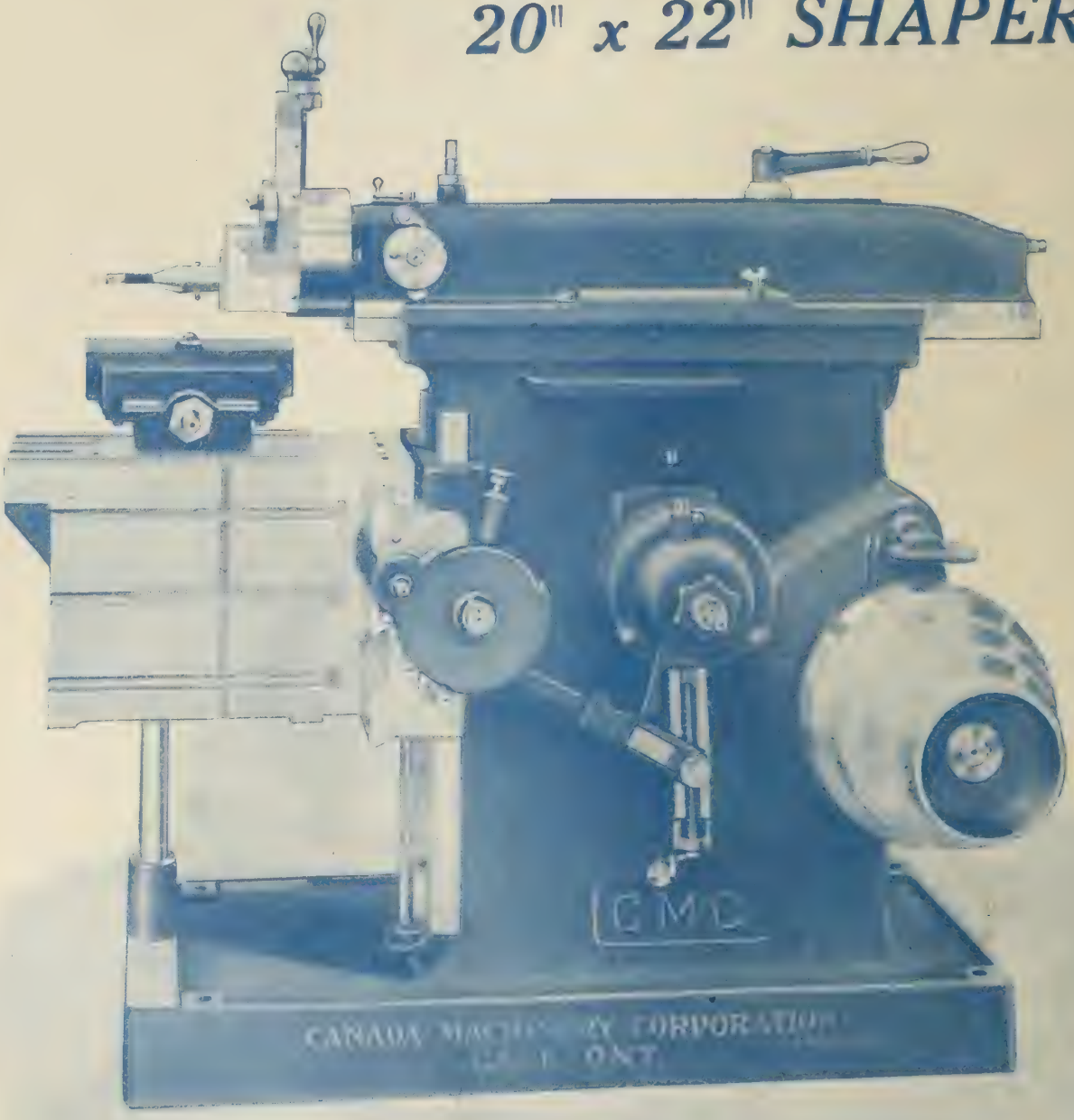

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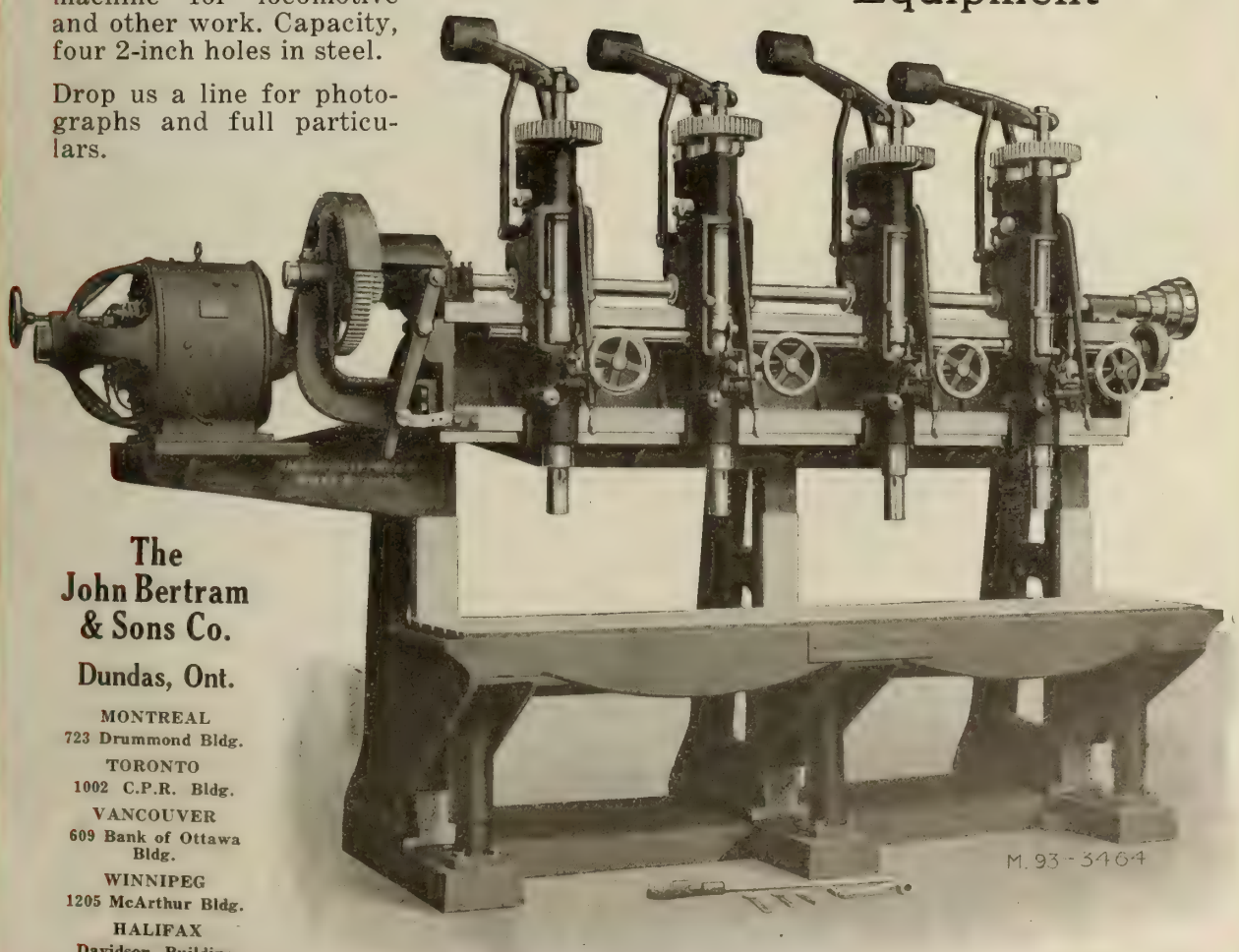

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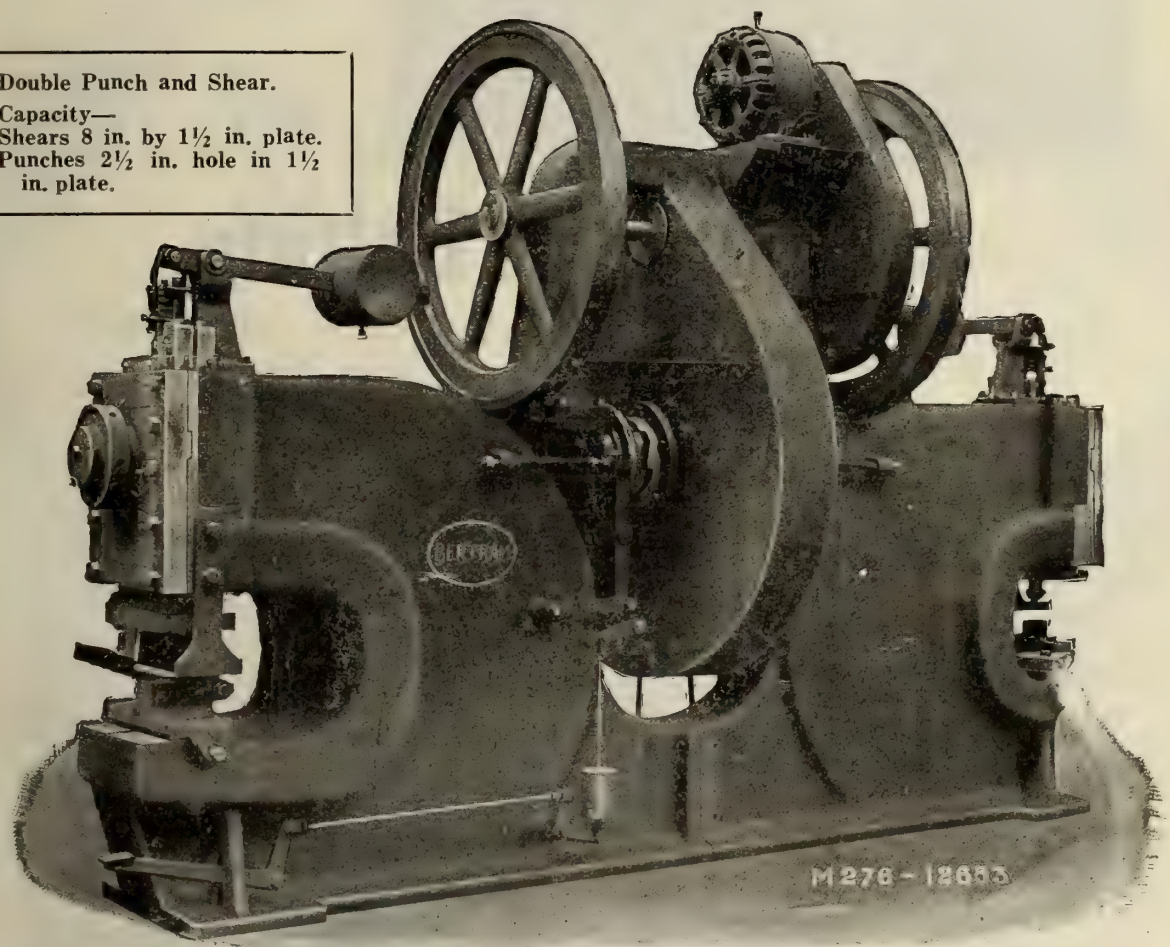

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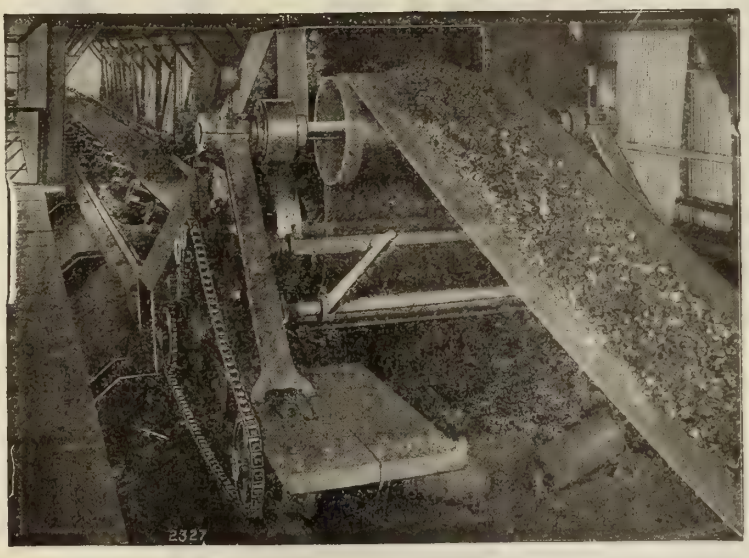

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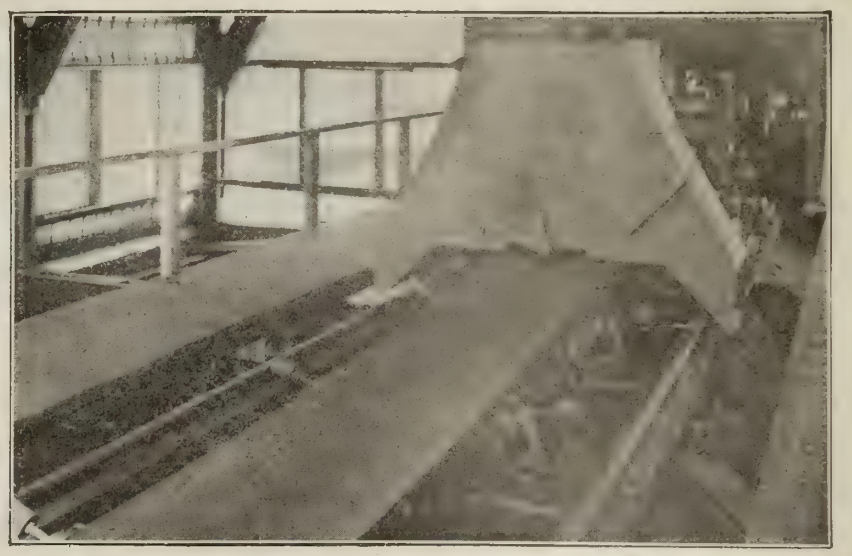

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5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

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15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
2 11/16 x 3 x 2 11/16 x ¼"
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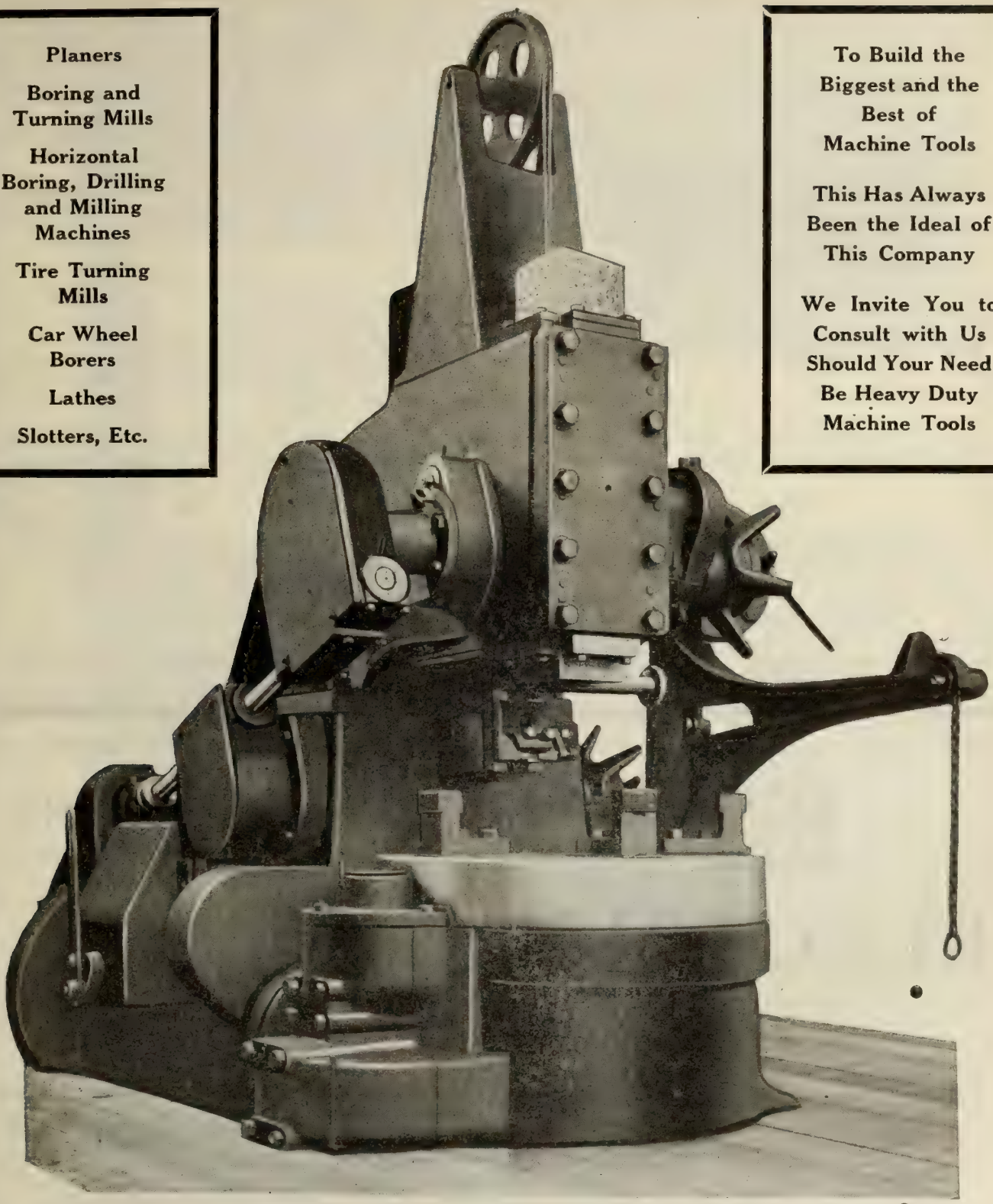

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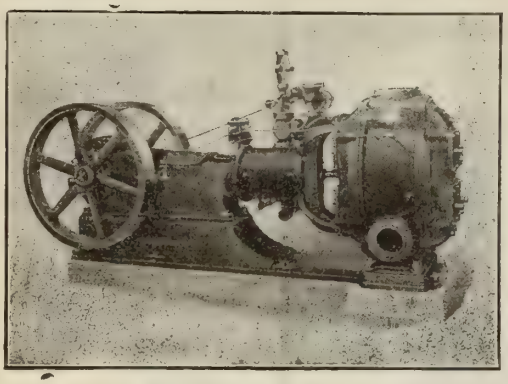

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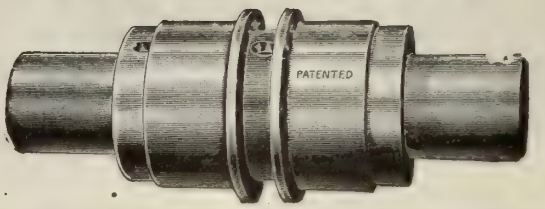

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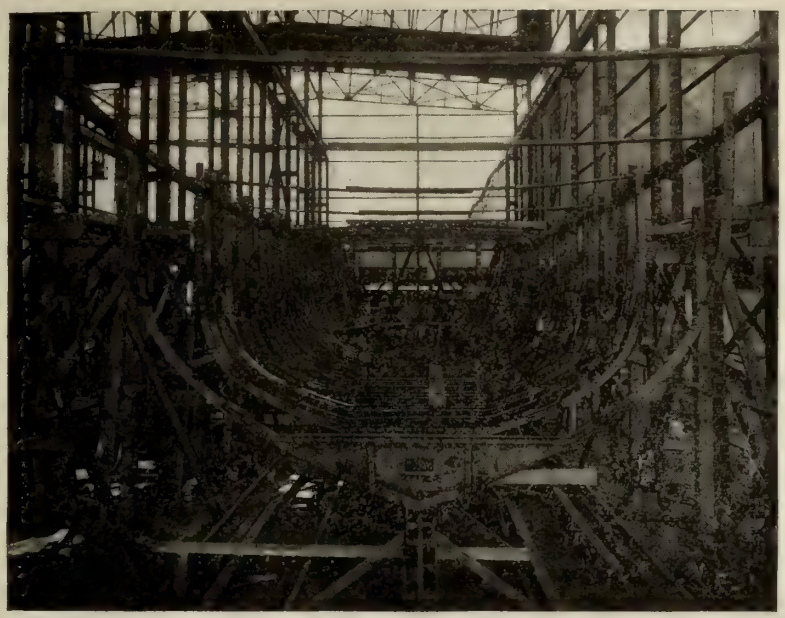

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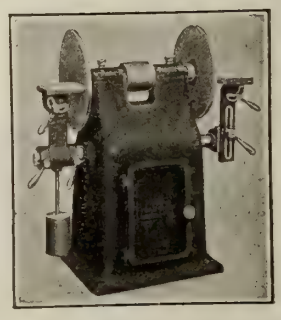

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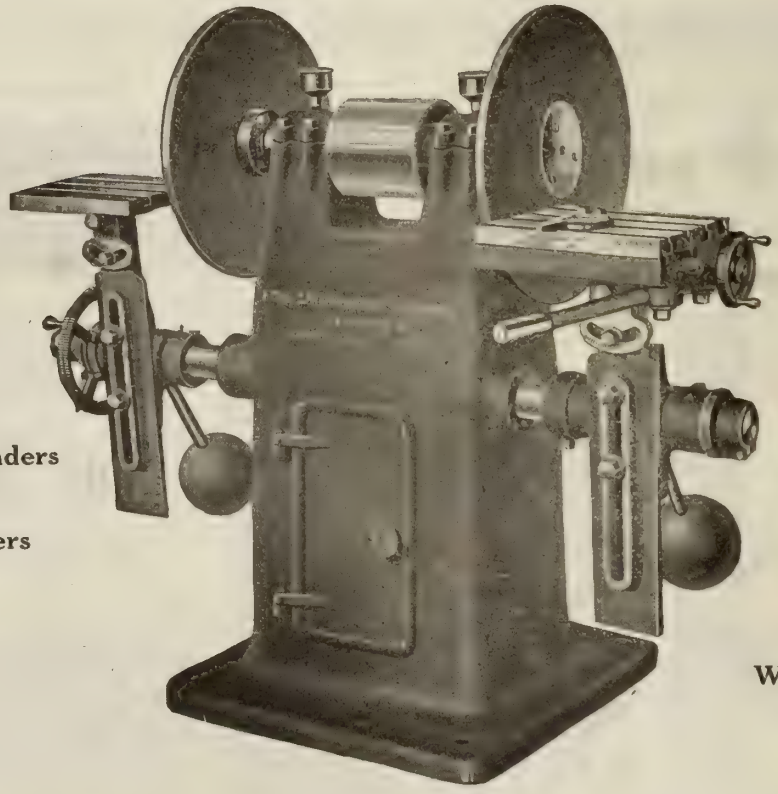

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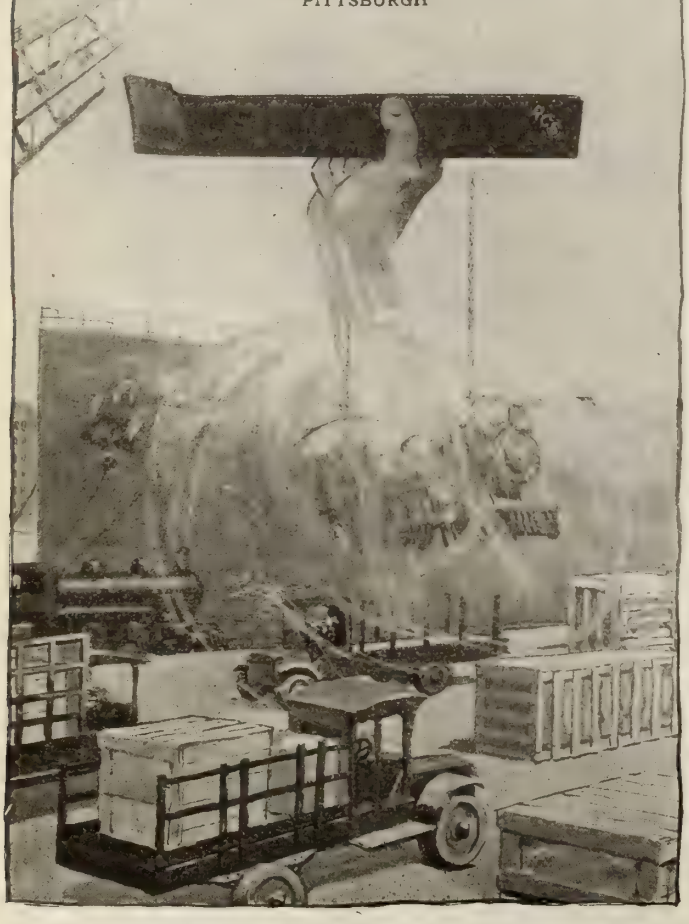

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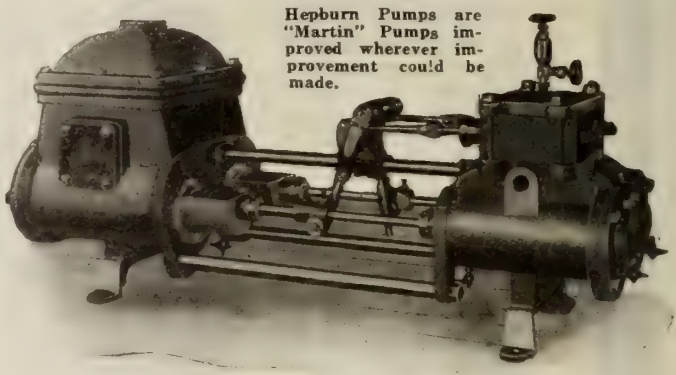

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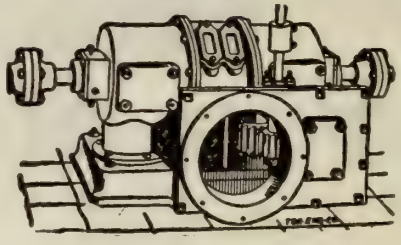

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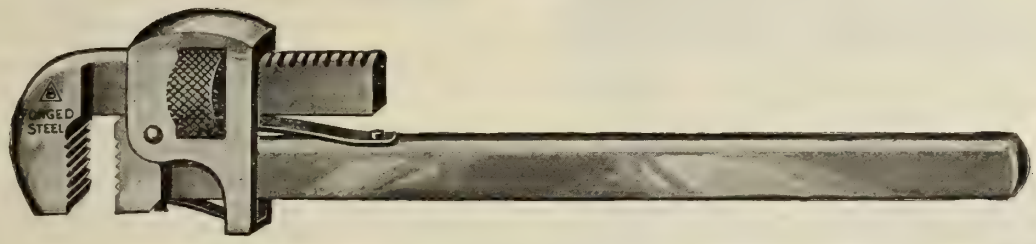

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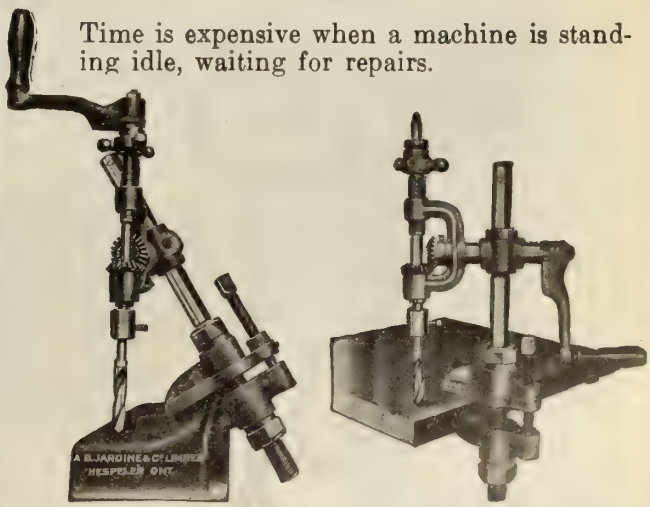

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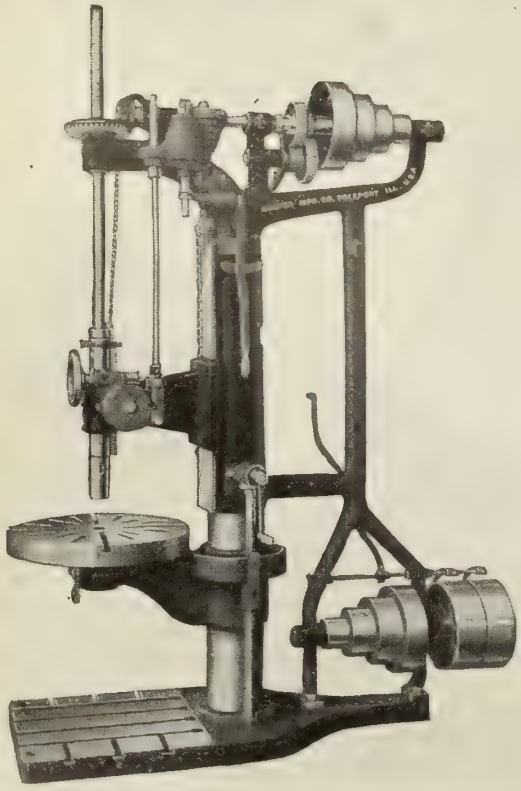

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The finished work is never returned under the cutter, thus avoiding all marks or scratches on the milled surface.

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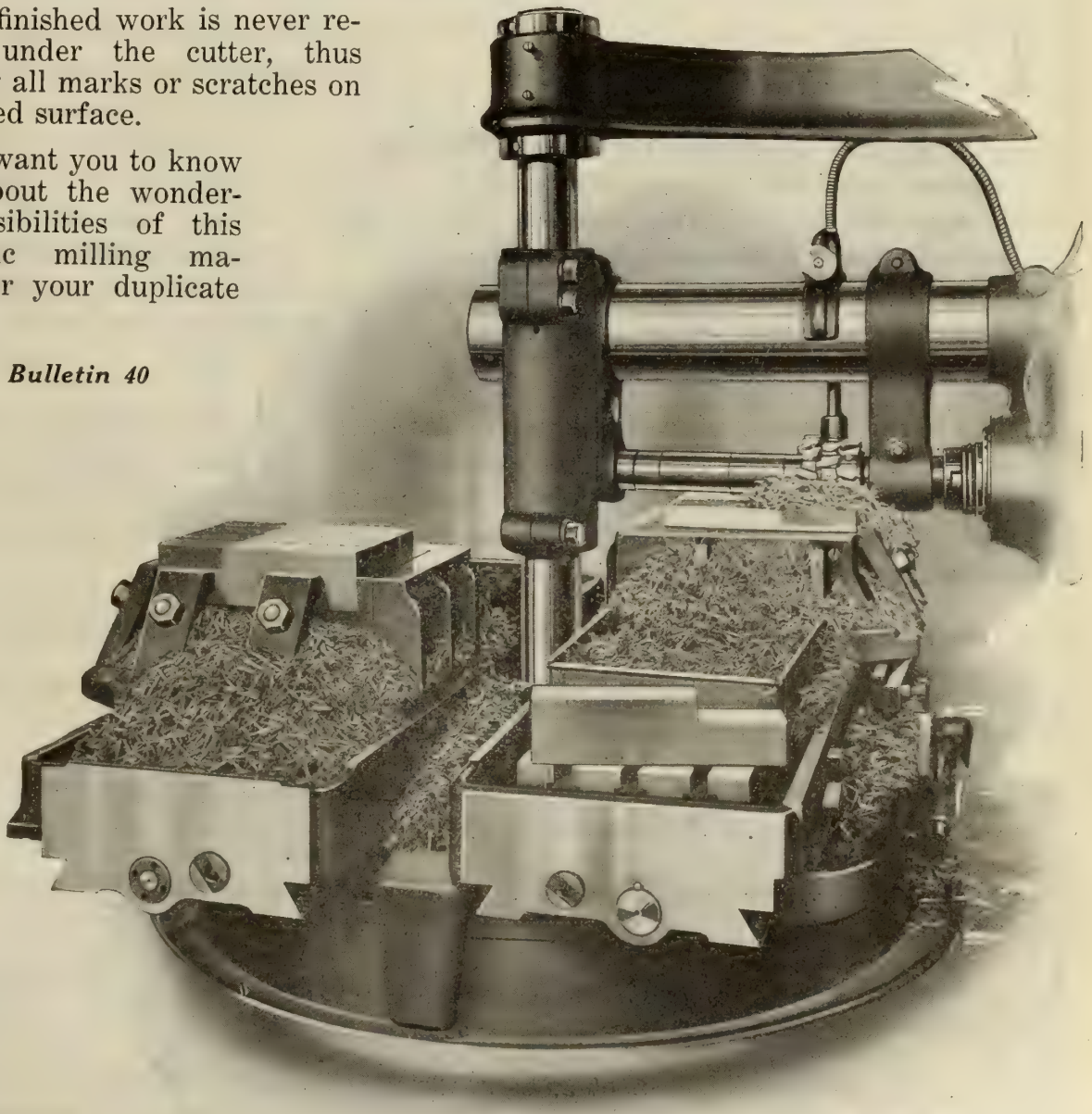

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Electric

No. 3

Of a Series of Technical Talks on Ball Bearings

THE upper diagram opposite shows the comparative space occupied by plain bearings and SKF Bearings, and demonstrates the compactness of an SKF Ball Bearing motor. Babbitt Bearings are usually designed with the box length two and one-half to three times the diameter of the shaft which they support. Contrasted with this, the length of SKF Ball Bearings along the shaft usually is not over one-third of the shaft diameter. Surrounding the ball bearings is a lubricant chamber, which at its outside limits is one-half to one-third shorter along the shaft than the plain bearing for the same motor, with the results that the overall length of motors can be reduced 10 per cent. to 20 per cent. by the employment of SKF Ball Bearings.

Owing to the elimination of friction and consequently of wear the use of SKF Ball Bearings, prevents the armature dropping on the pole pieces, for after long service these bearings show no measurable wear and the original air gaps are, therefore, maintained. Air gap clearances can thus be reduced—an important consideration in induction motors, resulting in higher efficiency.

For the successful employment of SKF Ball Bearings, five general rules apply:

(1) Use judgment in the selection of bearing size. If in doubt as to the proper bearings to use, consult our Engineering Department.

(2) Use care in mounting bearings. Keep them free from dust, metal chips, etc., before sealing them in the bearing heads.

(3) Provide properly machined seats for the bearings on the shafts, and in the bearing housings.

(4) Provide around the bearings, lubricant chambers of such capacity and design that they will retain the lubricant.

(5) Use a lubricant which is chemically neutral, SKF Grease recommended. Do not destroy the highly polished surfaces of the balls and ball races by the use of an inferior grade of lubricant.

CANADIAN SKF COMPANY, LIMITED

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Motors

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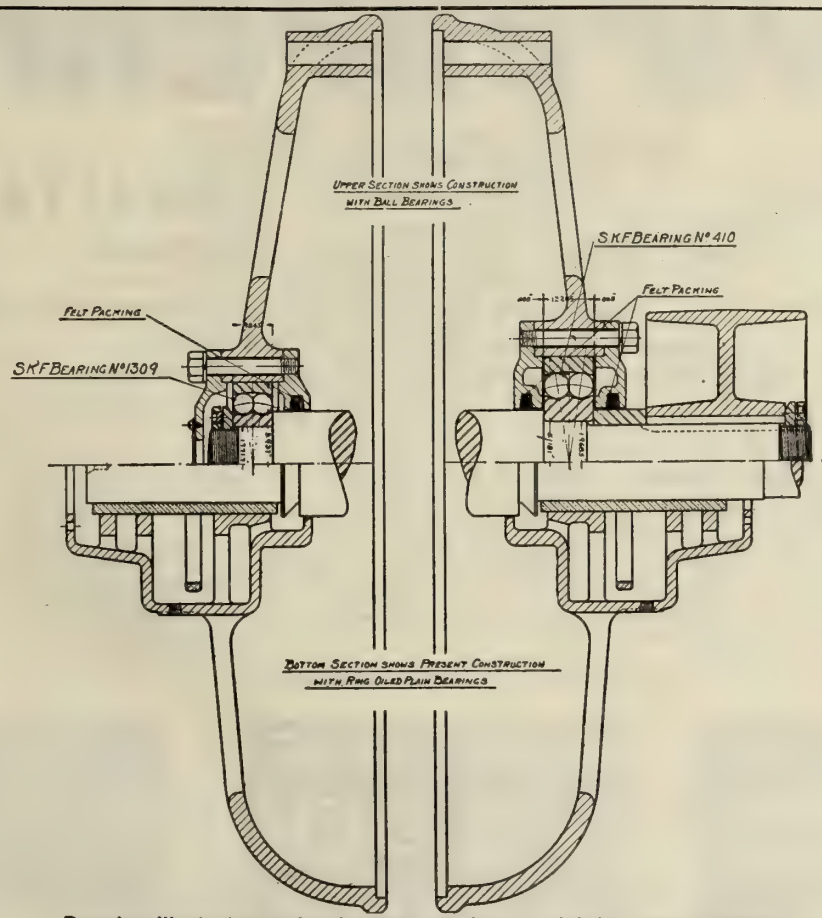
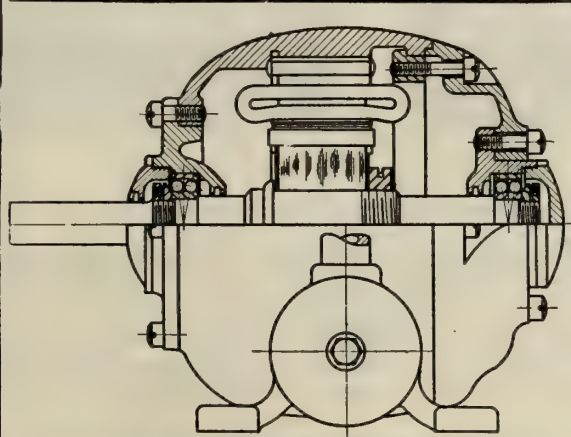
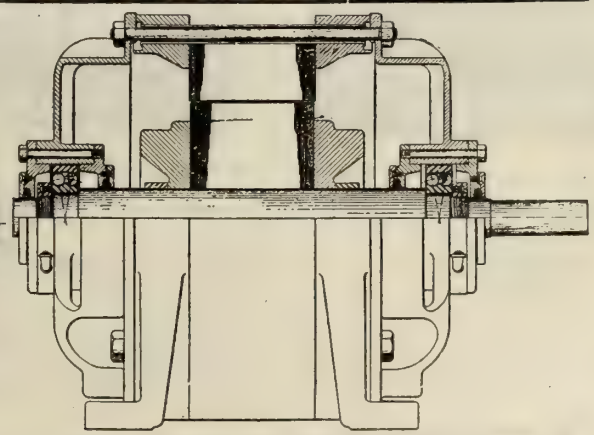


Drawing illustrates saving in space by the use of SKF Ball Bearings. Greater rigidity and freedom from vibration. Overall length of motor reduced 20 per cent.



Construction shown makes possible the removal of armature by simply taking out cap screws in bearing housings. The bearings remain on the shaft, and are not exposed to dirt.



Drawing showing the simple method needed to apply SKF Ball Bearings. No trouble from oil leakage. No change in air gap.

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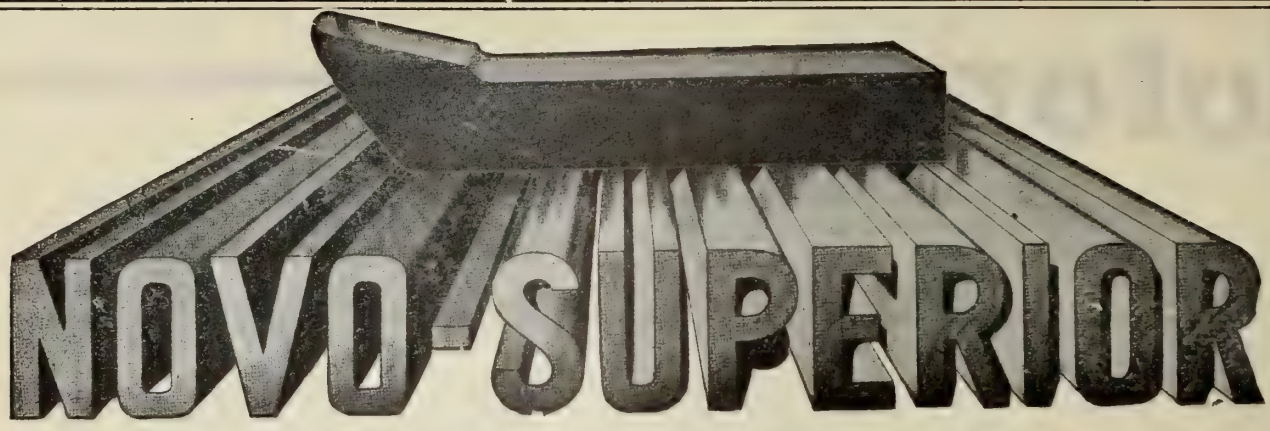

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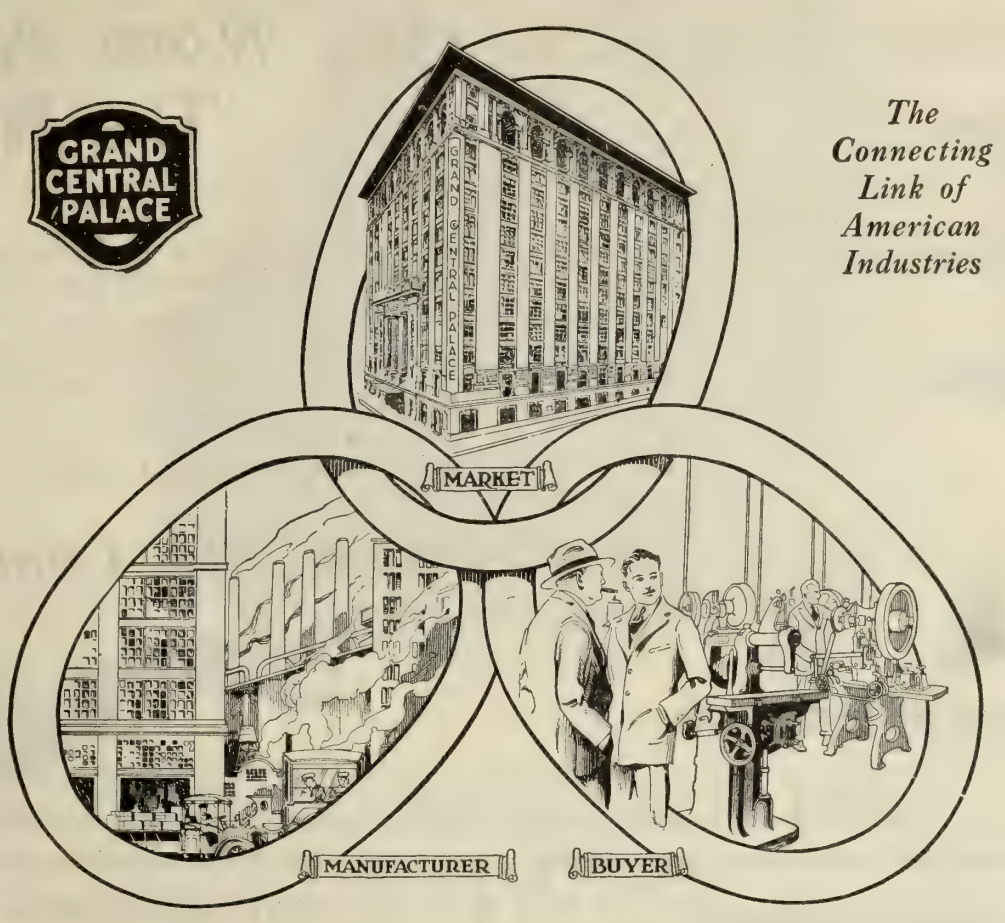

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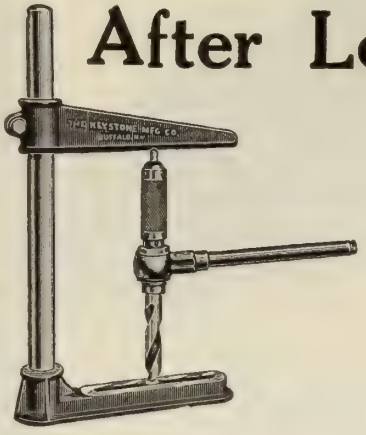

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We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

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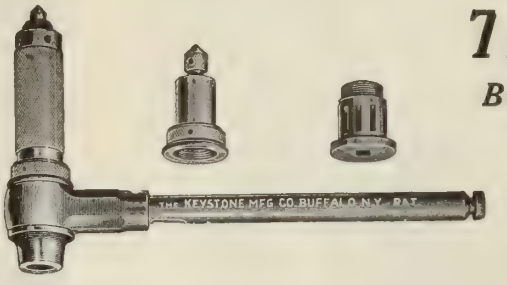

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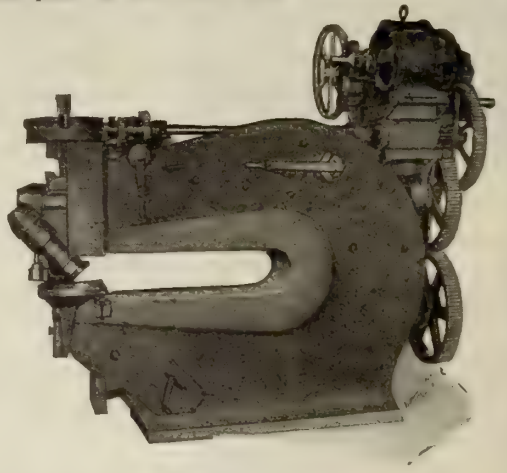

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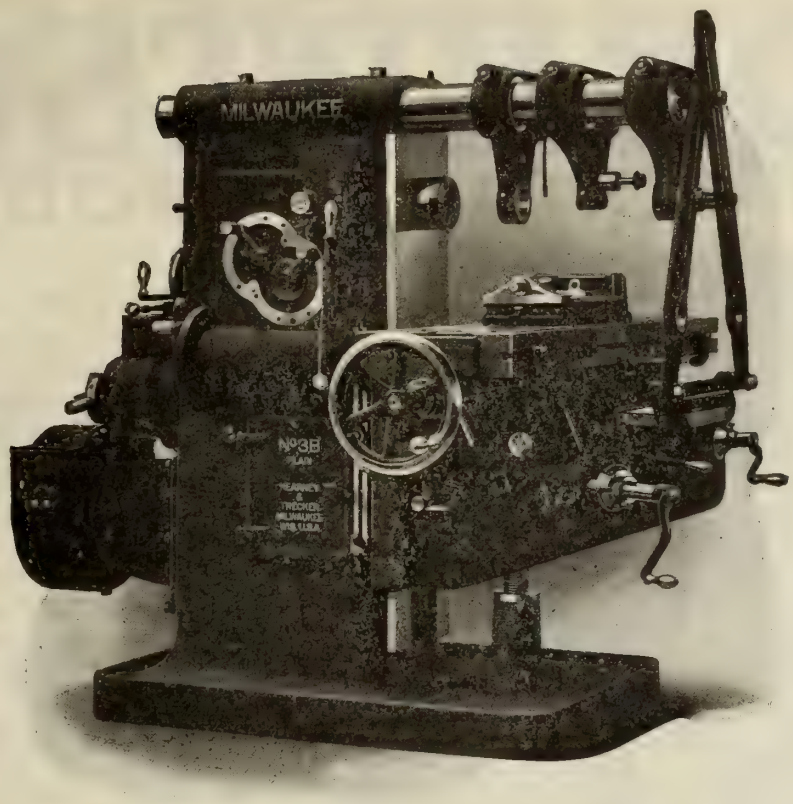

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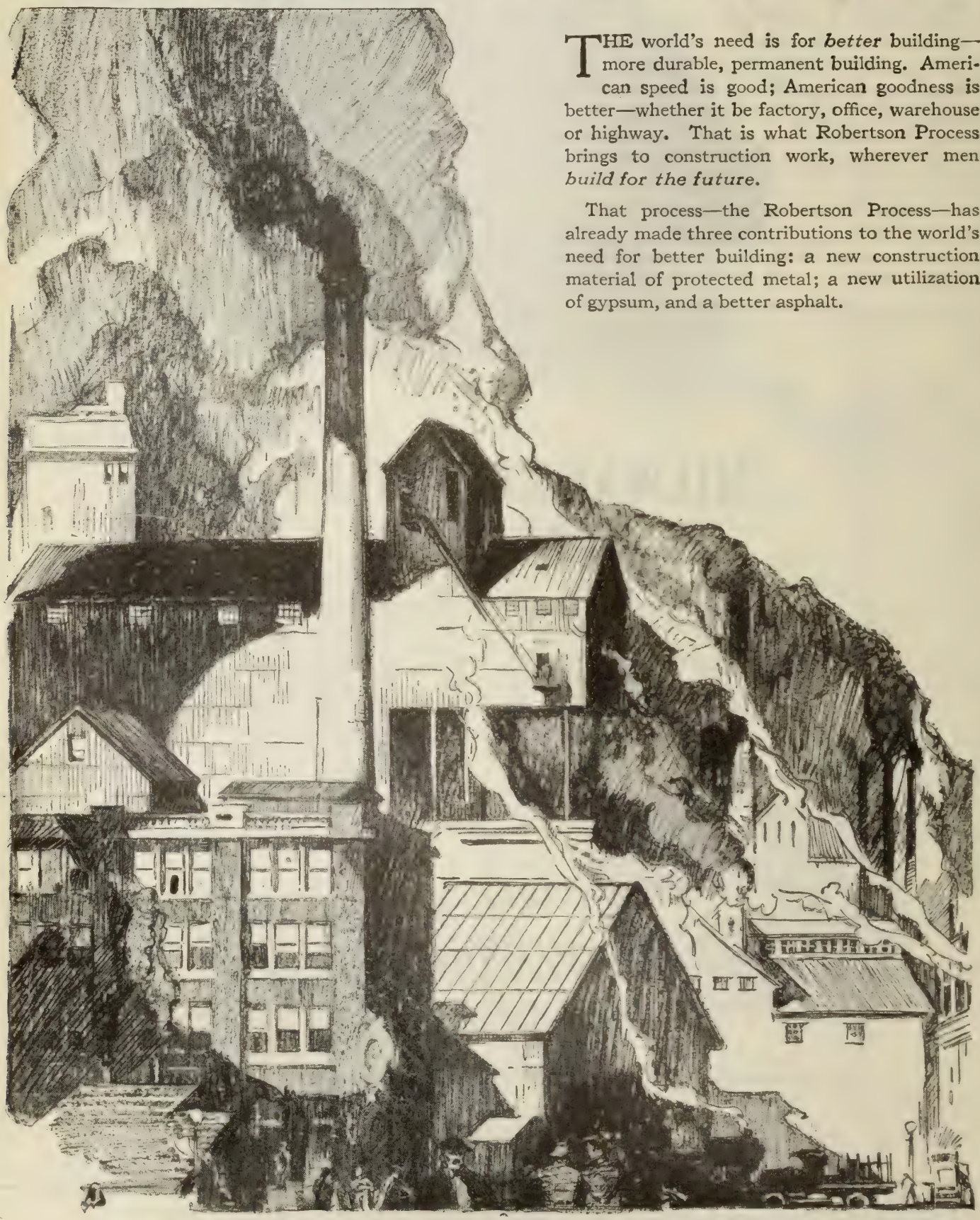

THE world's need is for *better* building—more durable, permanent building. American speed is good; American goodness is better—whether it be factory, office, warehouse or highway. That is what Robertson Process brings to construction work, wherever men *build for the future.*

That process—the Robertson Process—has already made three contributions to the world's need for better building: a new construction material of protected metal; a new utilization of gypsum, and a better asphalt.

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This is another basic building material which has assumed greater world-wide usefulness through the application of Robertson Process. By a new method of refining it has been found possible to produce asphalt of a heretofore unknown quality and with greater economy.

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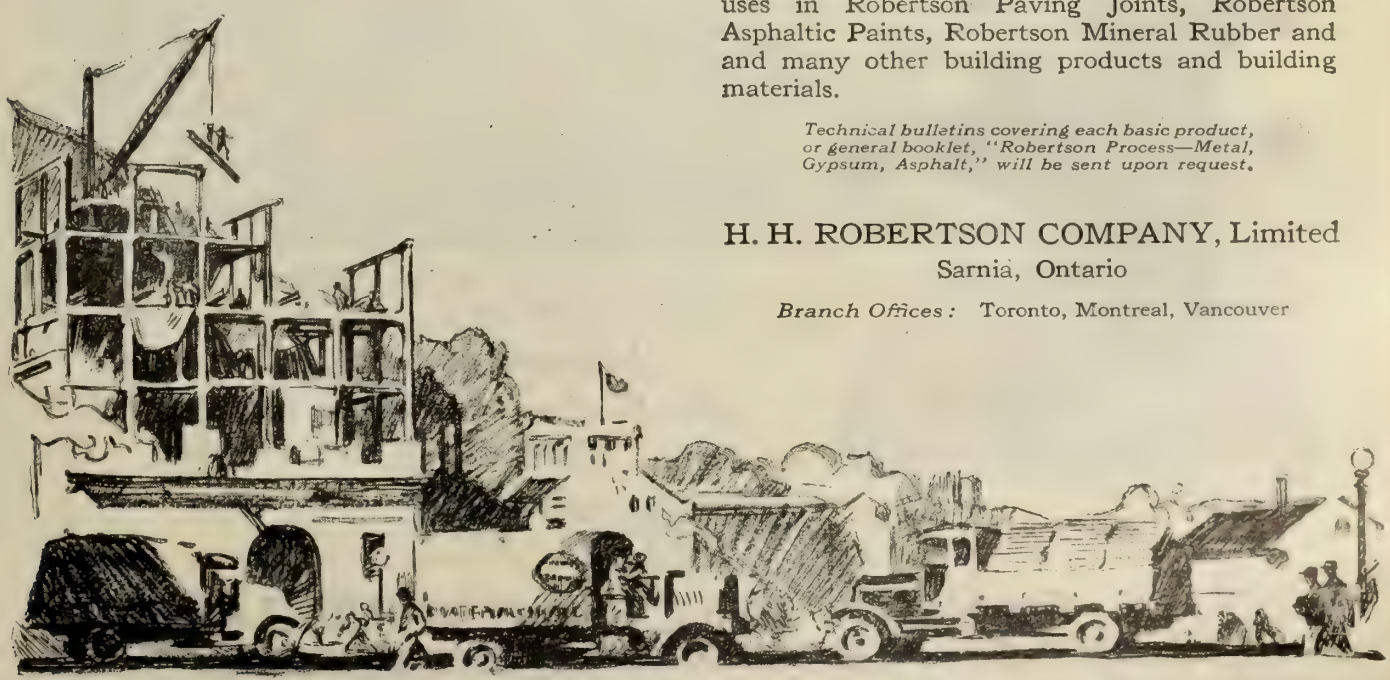
Sarnia, Ontario

Branch Offices: Toronto, Montreal, Vancouver



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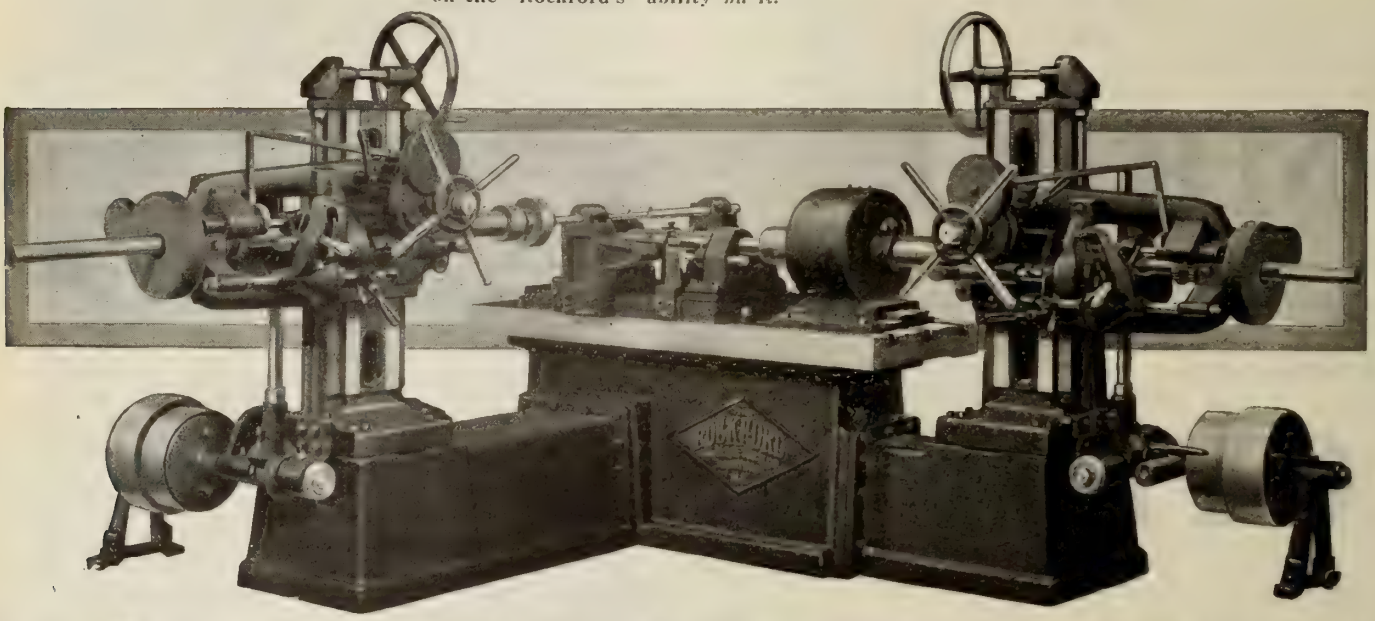

The Rockford Drilling Machine Co., Rockford, Ill.

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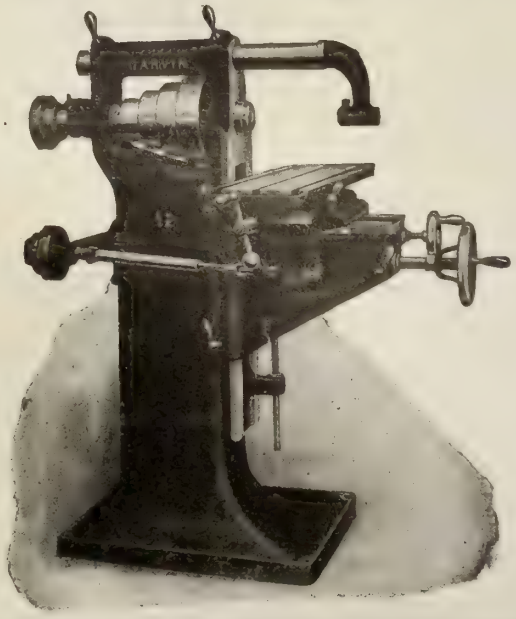

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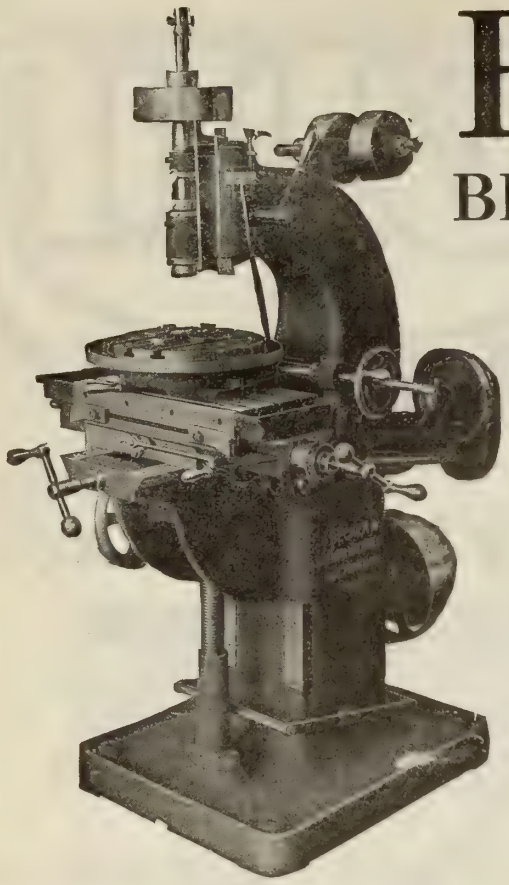

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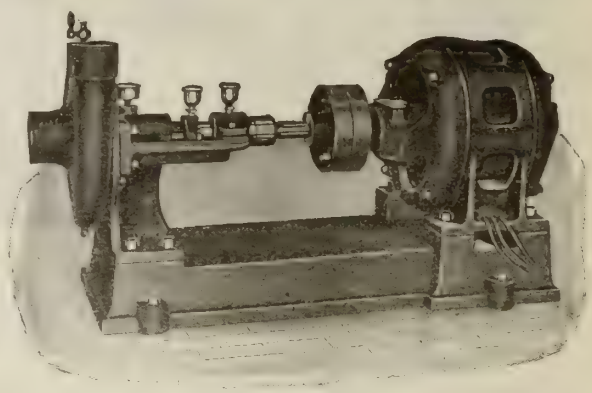

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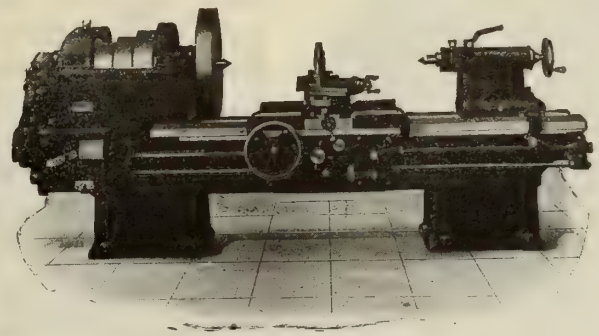

Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

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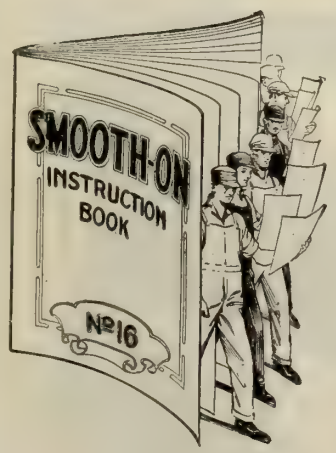

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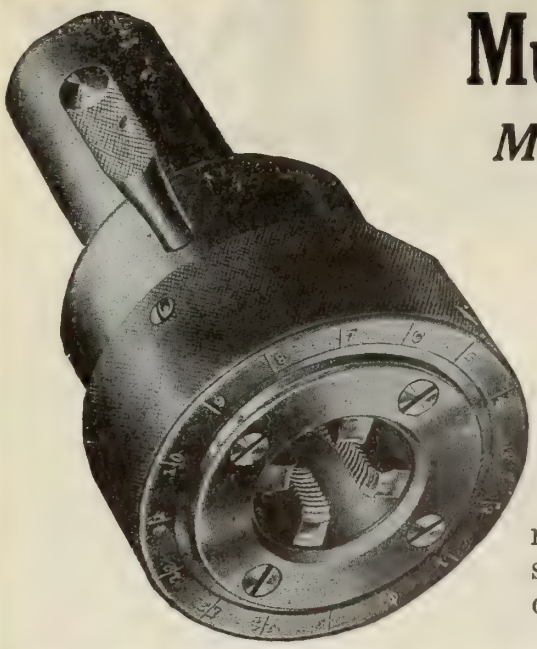

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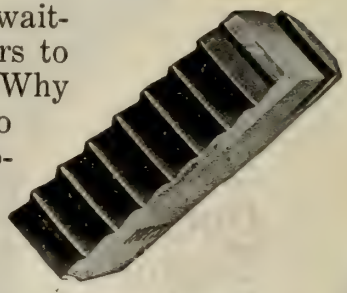
Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?



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Note the flexible spout. It enables you to oil all places—many places that previously could only be reached with force pump cans with specially bent spouts.

Indispensable to those who know. Will last as long as six ordinary oil cans. Saves 50% of oil bills.

Ask your dealer to show you the complete ALL-WAY line of oilers. If he cannot do so, please write to us.

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3

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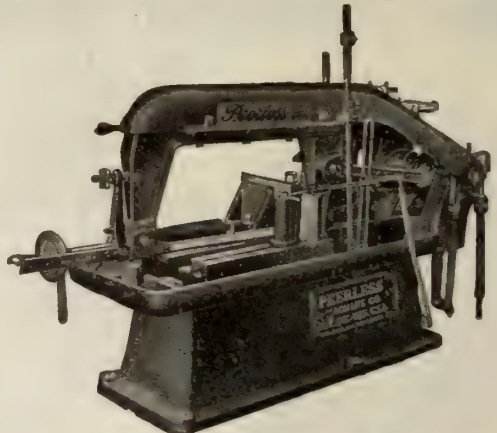
Peerless HIGH SPEED

Machines do 50 to 100% more work



The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

The Balance Lift of the Peerless

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

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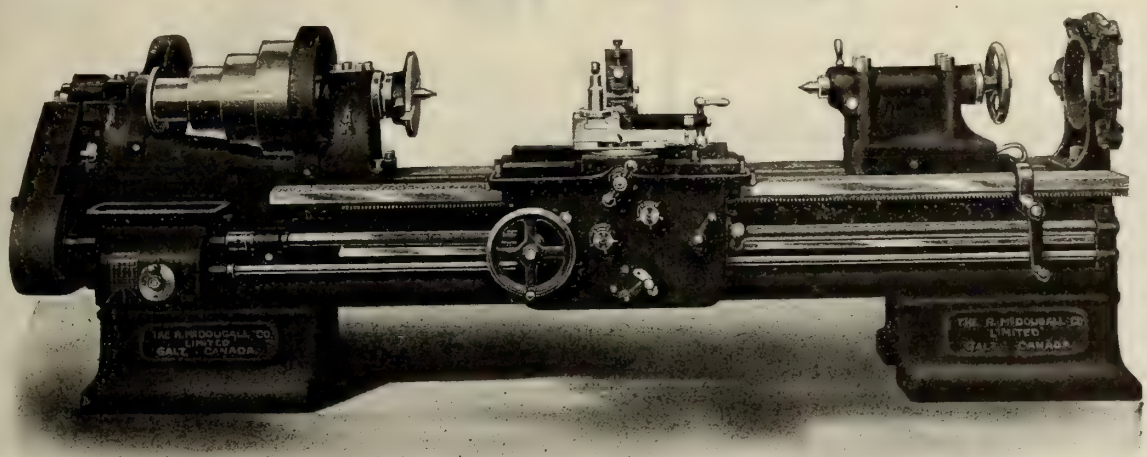

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Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

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Marshalltown Mfg. Co.
Marshalltown, Iowa
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Notes On Grinding

NORTON COMPANY WORCESTER, MASS.

No. 56A

Steadyrest Work Shoes

Many times we are asked why we use hardened steel shoes in some cases and wood shoes in other cases. It may be helpful to explain at this time the reason for these different conditions.

Normally, in the production of commercially ground parts in large numbers, the work shoe must be of such shape, size and proportions as to remain a constant factor in the grinding operation, because the operator is constantly turning out piece after piece at short intervals. If he had to take into consideration variation in size due to change in the work shoe, his production would be cut down materially. Therefore, the hardened steel work shoe of the size of the finished work for finishing, and of the size of the rough ground work for roughing, provides a means of supporting the work and removing one of the variables in the grinding operation, because the hardened steel work shoe retains its size longer and can be depended upon to produce parts of the same size, piece after piece, without consideration on the part of the operator.

Where a machine is used for general all-round grinding, when there are seldom more than one-half dozen pieces to be ground at one given time, it would be manifestly unreasonable to hope to have hardened steel shoes of the proper size for all the various pieces being finished. Therefore, a steadyrest with adjustable wood shoes is provided which has a range within the capacity of the size of machine being used, and can be readily adjusted to the diameter of work being ground.

Much discussion has been met with in connection with the use of hardened steel shoes because, it is argued, the work being ground is liable to be scratched. This has proved to be a false line of reasoning, and it is readily understood when one considers that the steadyrest shoes of soft material will pick up particles of dirt, abrasive, chips, etc., and retain them, really converting the shoe into a lap; and consequently the hardened steel shoes will not become imbedded with these particles so easily. Therefore, if it fits the work properly and is in line with the work, hardened steel is less apt to scratch than the soft materials.

In the case of hardened steel shoes it is very important that they be properly constructed and properly mounted in the steadyrest. The shoe must present a considerable portion of its bearing surface to the work being ground. It must be in line with the axis of rotation of work, securely fastened in the steadyrest, and properly hardened and smooth.

The other forms of steadyrest do not need such careful attention as the hardened steel for, since they are soft by nature, they quickly wear to a point where they meet all of these conditions. The fact that the hardened steel shoes do **not** wear so rapidly is the reason why they must have more attention in the making.

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec, Que.

Grinding Wheel Plants, Worcester, Mass.

Electric Furnace Plants		New York Store	Chicago Store
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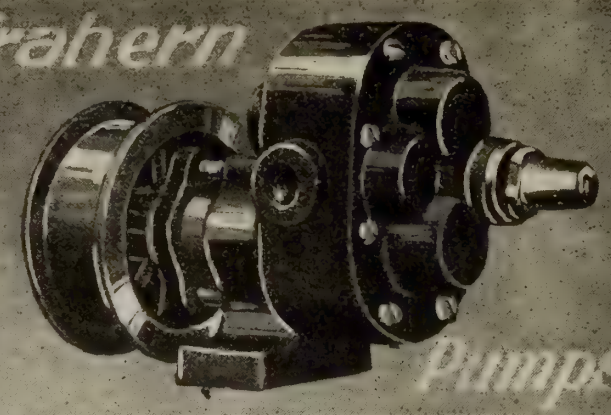
Trahern



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TRAHERN LUBRICATING PUMPS are for use on metal working machines of all kinds: planers, milling machines, gear hobbers, lathes, drill presses, saws, etc.

TRAHERN PUMPS are known to machine tool manufacturers the world over. Our customers are satisfied customers and install Trahern Lubricating Pumps on their machines as a regular equipment before leaving their factories.

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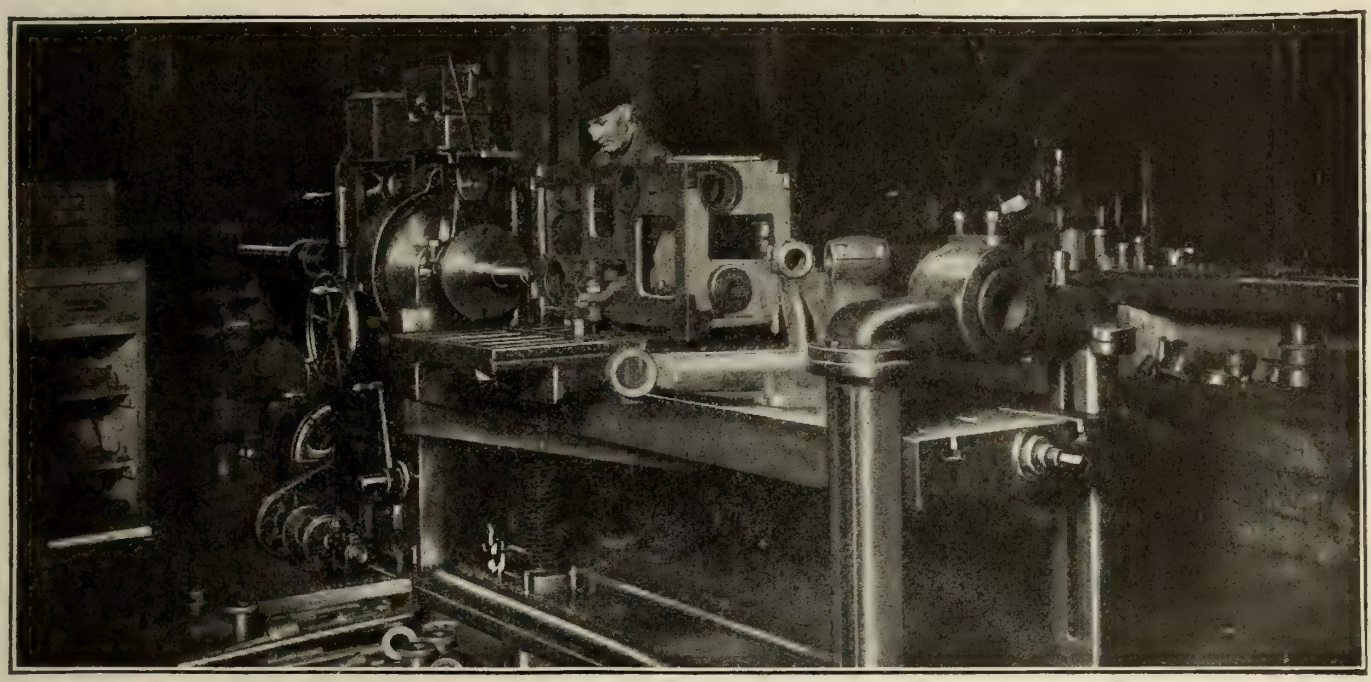

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 12. September 25, 1919

How Do You Prepare Your Shop Photographs?

The Value of Shop Photography is Already Too Well Known to Need Comment. The Preparation of Such Photographs is, However, an Important Point to be Considered

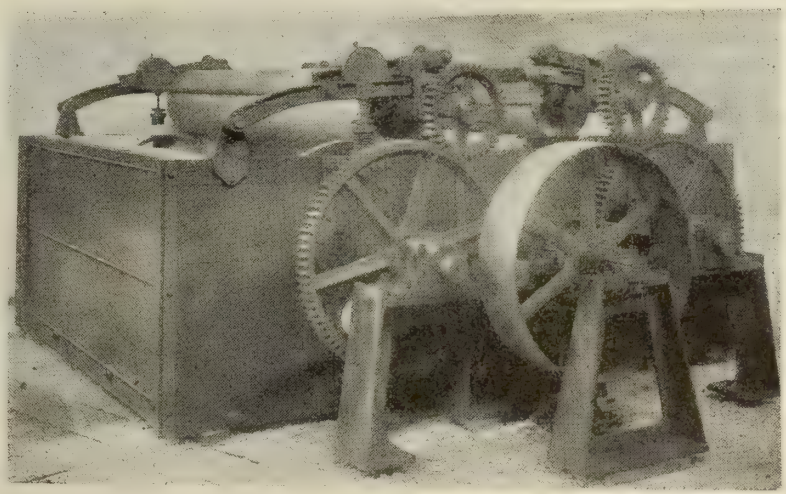
By F. A. McLEAN

PRACTICALLY every manufacturer of machinery, power plant equipment, or mechanical specialties today finds it necessary to occasionally have photos taken of his product, machine-tool equipment or plant, for advertising or reference purposes. In the United States there are many engraving and photographic concerns who make a specialty of this class of work, and fortunate indeed is the man who can secure the services of such concerns at moderate cost. Canadian firms doing this class of work are found only in the larger cities, and, as many of our largest Canadian manufacturing concerns are located in small towns, the cost of sending to the city for expert mechanical photographers is prohibitive in many cases and it becomes necessary to make the most of the means at hand.

In many shops it is customary to have the photos made by local photographers, and in this case it is necessary to give very clear instructions as to what you wish to have done, for it is well to remember that while most photographers are well educated and intelligent men, possessing more or less thorough knowledge of the technic of their craft, one cannot expect them to be advertising men and mechanical experts as well.

One large firm in the United States ran a contest to secure photos of their product—a device for use on planers, lathes, and milling machines—and although they spent several hundred dollars and secured many photographs, they were unable to use any of them, as none of the pictures secured brought out the merits of their appliance in the proper way. The method which they adopted was to send out a form letter to the users of their product, asking what their experience with it had been and asking such firms to have photos taken by a local photographer and charged to them, and, at the close of the contest, prizes would be awarded to those sending in the best pictures from an advertising point of view.

Many of the pictures which this concern received were splendid examples of the skill possessed by some of our small-town photographers, but practically none of them had been taken in such a way as to feature their specialty, and while they would doubtless have been of value to the makers of the various machine tools, the concern which should have reaped the benefit was out several hundred dollars with nothing to show for it.



PHOTOGRAPH TAKEN WITH MOVING WHITE SHEET IN BACKGROUND. NOTE THE ABSENCE OF WRINKLES.

Had this company gone into details and asked their customers to try and have the picture taken in such a way as to make a prominent showing of their device in operation, they would have been more successful.

To secure the best co-operation it is advisable to have the majority of the pictures taken by one photographer. Firms which have all their photos made by the ordinary small-town professional photographer will find it better to place all their work with one studio than to farm it out where they can have it done the cheapest, as the more often you have a man take pictures for you, the more familiar he becomes with the requirements of your work and the nature of and variations in the light which prevails in your plant, and consequently is able to render better service and is more likely to give you a higher grade of work and get it out quicker than when he knows that probably your next job is going to his competitor on the other side of the street.

If the photographer you employ does a considerable amount of amateur work, it will be a good plan to make it plain to him that your work must have special attention and care, for which you are willing to pay, rather than have it thrown into large tanks with a lot of amateur work, to be gotten out on a speed, rather than a quality basis. Should you require about the same amount of work in winter as in summer, it should not be hard to bring him to your point of view, as, during the winter time, a good deal of the amateur work slacks off and he will be more dependent on your work than in the summer time.

It is sometimes impossible to get a professional photographer to come to your plant when he is needed most, and if pictures are required frequently it will pay any concern to train one of their own staff to do some of this work. With the almost universal interest in amateur

photography at the present time, it should not be hard to discover amongst the employees of the draughting room or shop a man having some of the necessary qualifications for this work.

The Proper Camera to Use

Having secured a man to do the work, the next thing to consider is the camera, which should be either of the film or plate type, but preferably the latter, as films do not give as good a negative as plates for this class of work, and are not as easily handled should it be necessary to paint out some portions of the negative for any reason. Plates are less susceptible to temperature changes than films, but are more easily broken, and for this reason they should be kept in a vault when possible. It is a good plan to number each negative with India ink near one of the edges, and place them in envelopes on which is also written the date, number and title of the negative. Dates, numbers, titles and sizes of the negatives, should then be entered in a book or card index record.

The size of the camera to be used will depend on the average size of the objects to be photographed, the amount of detail required, etc. For the average shop a 5 x 7 or 8 x 10 will probably be the most suitable, as the cost of plates and prints for the 10 x 12 and larger sizes is high, and pictures made with cameras below 5 x 7 seldom contain sufficient detail to bring out the desirable points of a machine or mechanical device clearly. Retouching a 5 x 7 view of an object containing much detail is usually expensive and unsatisfactory. For such the 8 x 10 size is best.

The ground glass screen with which these cameras are fitted allows the object which is being photographed to be brought into much sharper focus than is possible with cameras equipped with finders alone, and this has a good deal to do with the ultimate quality of the picture obtained. The focus should be adjustable by a rack and pinion and the camera should have a rising and falling front to prevent distortion when photographing high buildings, towers, structural steel work, etc.

A well-constructed, rigid tripod, should be purchased with the camera, as a poorly-constructed tripod will often allow the camera to move when inserting plate-holders, withdrawing or replacing plate-holder-slides, etc., causing blurred negatives.

Before deciding on the type of lens to be used, it is well to obtain the advice of a reliable manufacturer of photographic apparatus, informing him just what you wish to do with the camera and relying on his advice in choosing the lens you will use. The old reliable rapid rectilinear lens will turn out some very satisfactory pictures, but some of the more modern types are much quicker and better adapted to operating in poor light.

If floor space is available and conditions warrant it a small dark room may be constructed and the pictures developed and printed on the premises, but unless a comparatively large number of prints are to be made it will probably be better to have this work done by a nearby professional photographer, who will unload and develop the plates, make the prints, and reload the plate holders.

Some firms build machinery for which the demand is too small to warrant the expense of having half-tones made for use in the publication of descriptive literature and when this is the case photographic prints or blue prints made from the negatives will be useful. A number of prints of this nature may be mounted on sheets (with little stickers called Art Corners) with neatly lettered descriptive captions under each print, and the whole bound into a book for the use of the sales force. Small booklets may be gotten up in a somewhat similar manner, using mimeographed sheets interleaved between the prints to carry the sales message or description of the product.

Photos of Set-Ups

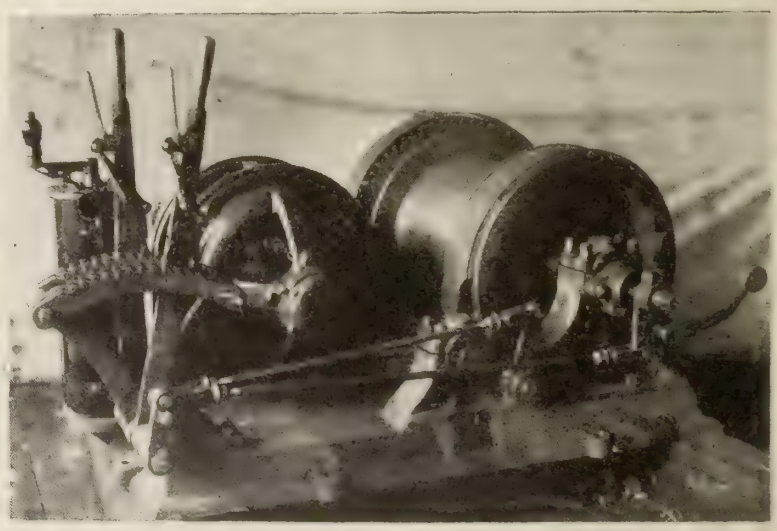
Photos of the tooling set-ups for certain jobs will often be found of value to a mechanic who is called upon to handle a certain job for the first time, and it is also useful at times to have photos made of the assembly of special machines which are being made for the first time and for which there is some likelihood of having repeat orders. These photos will save considerable time if for any reason the men who assembled the first machine are not available.

In the production of half-tone engravings, the cost of retouching is usually one of the largest items, and any method which will eliminate some of this cost by reducing the amount of retouching required is well worth application. It is often possible to do away with some of the retouching required by properly preparing the machine before having the photos taken. One of the first points to be considered is the painting of the machines which are to be reproduced; if they are painted a very light color and a light background is used, the outlines of the machine will be hard to distinguish from the background, and will require retouching to make them stand out properly, and if a very dark paint is used and the background is naturally dark, a considerable amount of detail will be lost and will have to be painted in before a good half-tone can be produced. In either case the retouching will be difficult and expensive. Even with a comparatively light background in the rear of the machine many small parts of the subject which have as their background the main body of the machine will not come out clearly if the machine is painted a very dark color. Dark slate-colored paint, made from white lead and lamp black and mixed so as to dry without gloss is the most satisfactory. Some painters add blue, but this is misleading and has the effect of lightening the tint in the photograph.

When taking photos of machinery in the average shop it is customary to place a sheet of white cloth behind the object being photographed in order to cut out some of the extraneous light and to provide a light background against which the outline of the object being photographed will appear in strong relief. After this sheet has been used a few times it becomes very dirty or spotted, and as these spots sometimes show in the finished print they have to be painted out in order to prevent them showing in the engraving.

If this sheet is large enough to clear the range of the lens on each side of the camera and it is kept in constant motion while the exposure is taking place, it will be found that the print will be sharper and the dark spots and wrinkles which had very often to be painted out when the cloth was held stationary have entirely disappeared.

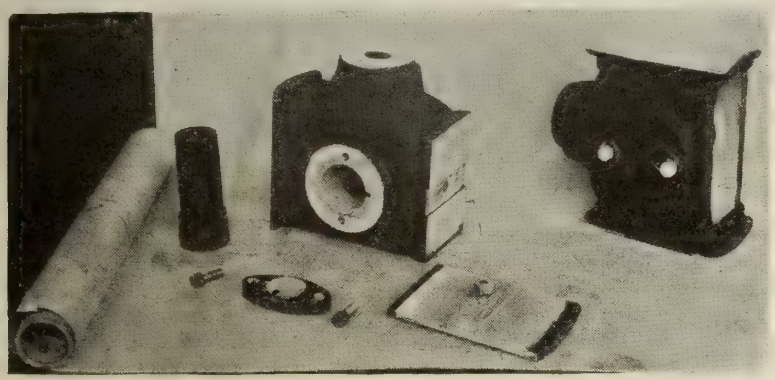
When the machine rests on a dark floor it is a good plan to spread sheets of white paper on the floor around its base to lighten the background and reflect the light. Sometimes sheets of paper are not readily obtainable, and in this case flour, sawdust, or shavings will accomplish much the same result, although the latter will require some painting out.



PHOTOGRAPH TAKEN WITH STATIONARY WHITE SHEET IN BACKGROUND NOTE THE WRINKLES AND DIFFERENCE FROM THE ONE ON PRECEDING PAGE.

Watch These Points

When it is desired to have cap screws, nuts and bolts, or letters on a casting, etc., show up strongly, they should be rubbed with chalk or coated with a thin covering of white lead. Lettering figures, etc., may be painted in white on the machine, as is done by many makers of tanks and steel plate work, and will show up very well. Where a number or descriptive matter is to appear in an engraving it may either be cut into the finished plate by the engraver or painted on the photo by the retoucher. A scheme used by at least one large Canadian maker of machinery is to have a small board on which is painted the name of the machine, firm, or any other matter desired, and this board is placed near or against the machine being photographed in such a way that the lettering will appear clearly in the finished print. This method is particularly adapted for making up sets of photographs or blue prints for sales purposes, or draughting room use.



THE DANGER OF MAKING CERTAIN SURFACES TOO LIGHT IN COLOR. NOTE THE FACT THAT SOME SURFACES ALMOST MATCH WITH THE WHITE BACKGROUND. THIS IS AN OBJECTIONABLE FEATURE.

It is sometimes desirable to take a picture of a machine or device in operation for advertising purposes, and here the shop photographer has advantages over the commercial studio as he is not liable to picture a man wearing a silk hat at work on a lathe, or some other equally ludicrous combination which one sometimes sees in the efforts of some advertisers to secure atmosphere for their advertisements. One point which should be watched, however, is the pose of the machine runners, riveters, miners, or whatever they may be, as it is one of the failings of mankind from childhood to try to appear at their best when having a picture taken, and unless this posing is carefully watched some very unnatural pictures will be the result. Many men will want to look at the photographer or camera instead of at the machine they are running, or at the work they are supposed to be doing, or they will assume a rigid position when they should be relaxed, etc. It is sometimes possible to get a picture of a man at a machine in operation without the operator knowing that it is being done, and, while there is always danger of the man moving and spoiling the picture, it is sometimes possible to get a picture in this way which cannot be obtained in any other. Occasionally it is possible to fool the subject by pretending to take the picture, leaving the actual exposure to a more favorable moment.

The illustrations used in the Norton grinding machine advertisements are one of the best examples of what may be done in the way of securing good pictures of machine tools in use.

Retouched photos may be filed in folders having a proof of the cut pasted to them and placed in vertical filing cases for storage. A simple numbering method may be arranged by numbering the pages of a blank book from 1 to 1,000 or as high as required, entering the description of the first photo taken with its size, number of prints, size and number of half-tone and electrotype made from it, and where the photo and cuts are kept, etc., on the first page. This scheme may be varied to suit different conditions.

Illustration for part lists, etc., can be made by fastening the parts to a board covered with light-colored paper, on which is marked under each part, its serial number, or these may be painted on the photo when it is retouched. Care should be taken to see that the parts are so distributed that they will not interfere with each other and that one piece does not rob its neighbor of the light necessary to make it show up properly.

In taking pictures in the shop, it will generally be found better to use the smallest stops on the camera with correspondingly longer exposures than those required for the larger openings, as the pictures with the smaller stops will be much sharper.

Study the Details

Care should be taken when arranging machinery which is to be photographed that all small parts such as oil cups, pipe fittings, etc., are properly screwed in place, as any misalignment in these small details looks very bad in the finished engraving. In one case of this kind which came under my observation, a large globe valve was not screwed on straight, and this point was not noticed until half-tones had been made and work started on a catalogue in which this half-tone was used. When the printer sent back the first proof this defect came to light and the printing had to be held up while the retouched photo was sent to the engravers to have this defect rectified and new plates made, at an additional outlay, whereas, had a little attention been paid to this point in the first place everything would have been all right.

Sometimes oil holes or threaded openings in some classes of machinery are plugged with corks or wooden plugs to protect the machine from dirt and moisture during shipment, and where this is the custom the shop photographer should be cautioned against forgetting to withdraw these plugs before making the exposure, as otherwise they will have to be painted out on the print and sometimes threads or other matter painted in. The cleaner the shop is at the time the pictures are taken the better, and when views of a number of small machines are to be taken, they should be arranged in neat rows when possible as they will look better than when scattered around any old way.

Generally speaking, the object to be photographed should be lighted from the upper left-hand, but in a crowded shop and with large machines, it is seldom possible to arrange this as it should be and all that can be done is to choose that time of day when the light will be most favorable, avoiding as much as possible having the camera face strong light from shop windows, overhead monitor or saw-tooth roof, or if this cannot be avoided the light should be blocked off by sheets of cloth or paper if time will permit.

Considerable judgment may be exercised in the choice of the point of view, especially when photographing large machines, selecting such locations as will show the greatest number of important features and avoiding positions which will result in an unbalanced or distorted effect. Correct judgment or good taste in this respect is generally the result of experience, and no general rule can be laid down. As an instance of what is meant, it is best to photograph cross compound engines or compressors from the high pressure side. If taken from the low pressure the difference in cylinder diameters is exaggerated and the effect is unsatisfactory. It is always safe to check the finished machine over before exposure and see that all parts have been assembled, that all operating levers, etc., are in correct position, and if necessary have the machine turned over until all moving parts are in the most effective position as regards appearance.

The application of commercial photography in the machine tool and manufacturing industries is too large a subject to be fully covered in a short article of this kind, but if a little attention is given to the foregoing suggestions it will be possible to secure some very good pctures at a reasonable cost.

The second course of the table d'hote was being served. "What is this leathery stuff?" demanded the diner. "That, sir, is filet of sole," replied the waiter. "Take it away," said the diner, "and see if you can't get me a nice tender piece from the upper part of the boot, with the buttons removed."—San Francisco Argonaut.

Plant of the Hull Iron and Steel Foundries

A COMPREHENSIVE story of the business from its inception up to the present, including the system of recording and cost keeping.

By F.H.B.

BIRD'S-EYE VIEW OF THE "HISCO" PLANT OF THE H. I. & S. FDY.

THE Hull Iron and Steel Foundries, Limited, whose works are shown in the accompanying illustration, is an establishment of which its promoters and founders are justly proud. As its name would imply, it is essentially a foundry, although a machine shop of no mean proportions accompanies it. As its name also implies, its products are both of iron and of steel, although the steel predominates.

Grey iron foundries are not an uncommon part of the make-up of most every industrial centre, and the grey iron department of this plant is practically a duplicate of other foundries which are equipped for doing heavy work. The melting capacity of this department runs into tons and the equipment consists of enormous cupolas and ponderous cranes. With the foundry specially equipped, as it is for doing large work, they have no particular advantages in the way of doing small castings, and do not cater to that trade, but for such castings as fit their capacity they take second place to none, and are prepared to fill orders for grey iron castings of very large dimensions.

The Steel Foundry

It is to the steel foundry branch of the plant, however, that we will pay particular attention on this occasion. Although not built for a munition plant or in any way as a war-time necessity, it appeared on the steel producing horizon at a most opportune time and did much toward deciding the issue and winning the goal toward which all were struggling.

In the year 1913, when times were not any too good in any line of business, when in fact many industries were working with very reduced staffs and hundreds of workmen were in idleness, Mr. A. H. Coplan, of Ottawa, with a keen eye to business, saw an opening for just such a business as this, and with characteristic determination and enterprise succeeded in completing the structure and getting it in first-class running order at just about the time of the beginning of hostilities. The war did not bring much business to Canada at first, but on the contrary, it added to the depression; however, in no time it was found necessary to call upon Canada for supplies other than foodstuffs and while our machine shops were found to be of inestimable value in the production of shells, etc., the foundries, particularly the steel foundries, were also called upon to produce enormous tonnage of steel castings, with the result that the Hull Iron and Steel Foundries found themselves very busy and getting busier. In fact, it was found necessary to strain

MODERN STEEL FOUNDRY PRACTICE HAS BEEN SO PERFECTED THAT TOP POURING CAN BE DONE SUCCESSFULLY ON MANY LINES OF WORK.

every muscle in order to meet demand for castings, and many additions were added to the plant as a consequence.

Now that the war is over and the country is calling for such lines as were neglected for so many years, the experience gained during the war, particularly in making goods which would pass the rigid examination of the munition board and also in producing the maximum output in the shortest possible time, places them in an enviable position for filling large orders, particularly of large castings, on surprisingly short notice.

It must not be inferred from this, however, that the experience gained during the war is all they have to fall back upon. The company was very fortunate in securing the services of Mr. A. Baillot as foundry superintendent. Mr. Baillot is a thorough master of the steel foundry business, having had exceptionally wide experience in Belgium and France, especially in Paris, France, and this, along with the experience of the last six years, places them where they are to-day.

Unlike many plants of the mushroom order, which sprung up as it were during the night in order to do munition work, and which suspended operations as suddenly as they began on the conclusion of peace, the Hull Iron and Steel Company never even slacked down, but on the contrary are busier than ever and are at present making extensive additions.

Present Capacity

The present capacity of the foundry is 600 tons per month, and the equipment consists of electric as well as open-hearth furnaces, ordinary foundry cupolas and Trapman Converters. They are also well provided with annealing furnaces and drying ovens, in addition to special equipment for heat-treating manganese steel castings.

Special Features

A unique feature of this plant is that they can produce practically all of their own raw material. With the aid of the electric furnace steel turnings make ideal raw material, while wrought or even cast turnings can be used if so desired. It has also been demonstrated that first-class metal can be produced direct from the crude iron ore. Of course, none of the metal procured from any of these sources is poured into steel castings. This metal is poured into pigs, after which it is tested and analyzed for carbon, silicon, sulphur, phosphorus, etc., and graded accordingly.

Moulding Equipment

In the moulding shop the equipment includes pulley and gear machines for work up to fifteen feet in diameter and electric cranes capable of handling castings of this size, in addition to the regular run of foundry requisites. Another interesting operation for which they are well equipped is that of heating and compressing certain castings in order to make the grain more dense and sound.

Sure of Quality

Steel castings are not ordered in the manner so commonly in vogue in grey iron foundries, where the principal requisite is that they be soft. Steel castings are ordered to be made to specified chemical content as well as physical strength, and from every batch of metal used test bars are poured which are analyzed by a competent analyst, and physical test taken on powerful testing scales. The company has both the physical testing apparatus and compiete testing laboratory of their own in charge of F. H. Young, a practical chemist and metallurgist. A view of the laboratory is shown in the accompanying illustration.

Additions Under Way

At the present time two additional buildings of large dimensions are under construction along with some smaller ones. One is a complete two-storey pattern department remote from the main building, with five bays downstairs and six upstairs. These bays are separated from each other by automatic fire-proof doors, in fact, the entire building is to be as near fire-proof as man's ingenuity can devise. One large bay is to be equipped with machinery and tools for doing pattern work, while the remaining ten will be for pattern storage purposes. The other building will be a modern machine shop equipped with tools for keeping the shop equipment in order, and also for machining such castings as have to be machined before shipment. Many of the castings turned out of this foundry are of such proportions that few machine shops could handle them. Among the tools in the present machine shop might be mentioned a boring and turning mill capable of handling work 75 feet in diameter, and other machines of equally large proportions.

Undoubtedly the grandest feature of the entire business is its "system." System is certainly the keynote of success, and system has certainly played its part in the successful upbuilding of this business.

Calculating Recorder

Probably the most interesting feature of the entire "system" is the Bishop Electric Calculating Recorder, by which the actual cost of producing a job is recorded in the office by the workmen in the shop. To describe this in detail would be a greater undertaking than an article of this kind calls for, but it will be interesting to note that every pattern which is brought to the shop is registered and given a number. This pattern is placed in the pattern vault and its location is registered. When any pattern is wanted, it can be located instantly. When the pattern is given to a moulder, he does not have to leave his floor in order to register the minute he began work on it and when he finished it, by a simple movement on his part. he lets the office know what pattern is being moulded, who is moulding it, and how long he took to mould it. So complete is the system of recording that it is quite possible in answering a long distance call to tell at once just how any job is progressing, which jobs are being done, how many are completed, and how many are being done per day.

TESTING LABORATORY OF THE HULL IRON & STEEL FOUNDRY, LIMITED.

The output of this business consists of locomotive wheels, bridge work, crane castings, railroad contracts, in fact, all kinds of steel castings of whatever chemical content is required.

Mr. A. H. Coplan, the founder of the business, is president and general manager, and Mr. F. H. Cross is assistant manager.

DON'T TINKER WITH ECONOMIC PRINCIPLES

Lowering the standard of living by artificial methods makes for popularity, but this course ignores economic principles, thus setting aside temporarily the law of supply and demand. But, back of all is that economic law which grows out of the experience of years and which, in the end, will prevail. Governments, and more especially those recently engaged in war, have borrowed heavily under inflated conditions. It would seem unreasonable to expect that there would be any attempt to meet the interest obligations on such indebtedness contracted under inflated conditions out of taxes to be raised under a deflated condition.

Such being the case, it would appear to be sound business to expect the Governments to refrain from any drastic measures to bring about a general widespread deflation until the public debt had been cared for in permanent form on a basis where the revenues from direct taxation under a moderate revenue law would be ample to meet the interest charges and provide the necessary sinking fund.—Continental and Chemical National Bank, Chicago.

EXCHANGE NO FACTOR IN BASIS OF TARIFF

Ottawa.—The Customs Department has had many requests from importers that, in view of the fact that the British pound sterling has heavily declined, this should be taken into consideration when Canadian importers pay customs duties on imports from Great Britain. The practice is that they pay on the par value of $4.86. They believe that they should be given the benefit of current exchange.

The Customs Department points out that the practice is fixed. The matter of exchange is not taken into consideration as the value of the pound sterling is fixed by the Currency Act of Canada as compared with the dollar. Officials claim there is no injustice to the importer, as the goods he imports are worth at the rate of $4.86 2-3 in Great Britain, and under the customs law goods are valued at the time and place whence they are shipped direct to Canada. The importer gets sufficient advantage in the favorable rate of exchange.

The matter has been up for consideration several times. The practice is the same in the United States, the valuation for customs purposes there being $4.86 2-3, as here. The department has refused to entertain all requests to accept payment at the exchange rate.—T.M.F.

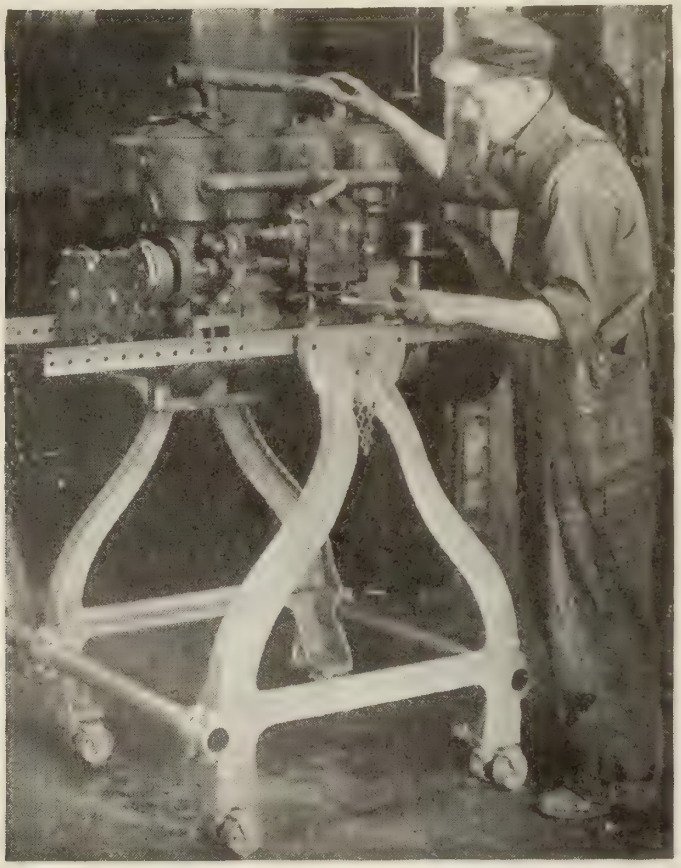
A Novel Gasoline Motor-Assembly Stand

By FRANK C. PERKINS

THE accompanying illustration shows a novel gasoline motor stand developed at Knightstown, Indiana.

It is held that this motor stand will handle any motor from that in the smallest passenger car to the largest truck and tractor motor. It is instantly adjustable to any width from 0 to 30 in., and in height from 32¼ in. to 39¾ in. The motor is placed in the stand in the natural way—the same way that it is placed in the car.

The side rails of the stand compare to the frame or sub-frame of the car.



VIEW OF THE STAND IN USE.

After the motor has been clamped in the stand it can be turned to any desired position and locked there by means of a small steel pin. This pin is attached to the stand by a chain and cannot be lost. The motor can be completely inverted so the lower crank-case may be readily removed, and the bearings exposed in such position as to be very easy to get at, and bearings may be scraped in and rods lined up with ease.

It is maintained that in motor assembly this stand meets every requirement, with no obstructions to the mechanic. All parts of the motor may be reached with the minimum amount of waste effort. In progressive or individual assembly, after the crank-case has been fastened to the stand it is not changed until the motor is ready to be removed. It is portable and is particularly adapted to speed up the work and keep all men busy.

A Ford attachment was designed to facilitate the assembly and repair of the Ford motor, the peculiar construction of which makes it impossible to handle this work in the same manner as the ordinary type of motor. This attachment securely clamps the cylinder block to the motor stand in such position that the Ford crank-case, transmission, crankshaft, flywheel, magneto, connecting rods, pistons and cylinder head can be removed without rearranging the cylinder block in the stand. This makes it possible to tear down a Ford motor and leave only the cylinder block in the stand, as is shown in the lower illustration

These stands are regularly equipped with double wheel castors which enable the stand to be moved from place to place with ease. In motor assembly the crank-case may be clamped to the stand and all parts of the engine assembled in the motor room. The stand, with the completed motor, may then be taken to the chassis department, where the motor is removed and placed in the chassis, and the stand is ready for another motor. In repair the motor can be removed from the car and be immediately placed in the stand, after which it can be removed to the motor room for repairs, and when ready to install again the motor stand conveys it back without removing the motor from the stand.

A man from the north of Scotland was on a holiday in Glasgow. On Sunday evening he was walking along Argyll Street when he came upon a contingent of the Salvation Army, and a collection-bag was thrust in front of his nose. He dropped a penny into it.

Turning up Queen Street, he encountered another contingent of the Salvation Army, and again a smiling "lass" held a collection bag in front of him.

"Na, na!" he said. "I gied a penny tae a squad o' your folk roon' the corner jist the noo."

"Really?" said the lass. "That was very good of you. But, then, you can't do a good thing too often. And besides, you know the Lord will repay you a hundredfold."

"Aweel," said the cautious Scot, "we'll jist wait till the first transaction's feenished before we start the second."—Tit-Bits.

IT WAS TIME

A preacher at the close of his sermon said: "Let all in the house who are paying their debts stand up." Presently every man, woman and child, with one exception, rose to his feet.

The preacher seated them and said: "Now every man not paying his debts stand up." The exception, a careworn, hungry-looking individual, clothed in his past summer's suit, slowly assumed a perpendicular position.

"How is it, my friend," asked the minister, "you are the only man not able to meet his obligations?"

"I run a newspaper," he answered, "and the brethren here who stood up are my subscribers, and—"

"Let us pray," exclaimed the minister. —Exchange.

Did you ever realize that every time you grumble you are making connection with the grumbling currents from other grumblers; that every time you find fault or scold or nag, that every time you show a mean, nasty disposition, you are making connection with vibrations from others along the same line?—"Success" Magazine.

Holding Devices Used on Jigs and Fixtures

By ROBERT MAWSON

ALMOST every modern machine shop uses some jigs or fixtures to obtain intensive and interchangeable parts for manufacturing.

In the larger plants a special department is maintained, where these special tools are designed. Under such conditions some system may be followed when designing the details which are used in the tools.

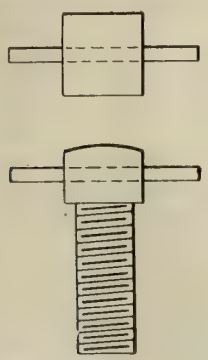


FIG. 1.

However, in the smaller shops, where only a comparatively limited number of jigs and fixtures are used, the work of designing is carried out either by one of the machine designers or draftsmen, or more often, by the tool room foreman, or one of the tool makers.

Under these latter conditions very little thought is given, as a rule, to provide tools according to any system of interchangeability of details. It will sometimes be found that on a fixture or jig the various bolts or screws are made of different sizes. This means, of course, nuts of different sizes, and the consequence is that the operator of the tool must use a number of wrenches when tightening the fastenings to hold the piece being machined in the tool.

This entails a loss of time, for the bolts should, whenever possible, be the same size so that only one wrench is necessary.

It is, however, advisable to avoid the use of any wrench, as under such conditions the tool is made quicker acting.

One method by which this can be done, and which is often used is to make the screw with a head, of larger diameter than the body of the screw, whenever possible, and having the periphery of the head knurled, the disadvantage of this holding device (which is at best unsatisfactory to use) is because when the man's hands are greasy, which is usually the case, sufficient pressure cannot be brought to bear on the screw and also by frequent use the fingers of the operator become sore by reason of the knurled surface.

One way to overcome these objections is afforded by making holding screws as shown in Fig. 1.

This is a very simple medium, being a standard or stock screw, either square or hexagonal head, with a pin forced into the head as illustrated.

This method overcomes the objection of using a wrench, but it is found that it is also hard on the operator's hands, the small pins being uncomfortable to the man when used frequently. The device shown in Fig. 2 was designed to meet the demand and it has been found to "fill the bill."

These knobs are made of malleable iron castings to provide strength and also cheapness, and as illustrated, are made with four wings formed on an arc and terminating into a boss at the rear.

The wings afford a convenient and easy hold for the hand so that the man can exert suitable pressure for any desired case.

A hole can be machined in the boss so that a turned portion of the screw can be forced into it and held by a pin placed at right angles. The screw is then integral with the knob and can be used in a manner similar to a bolt, or set screw.

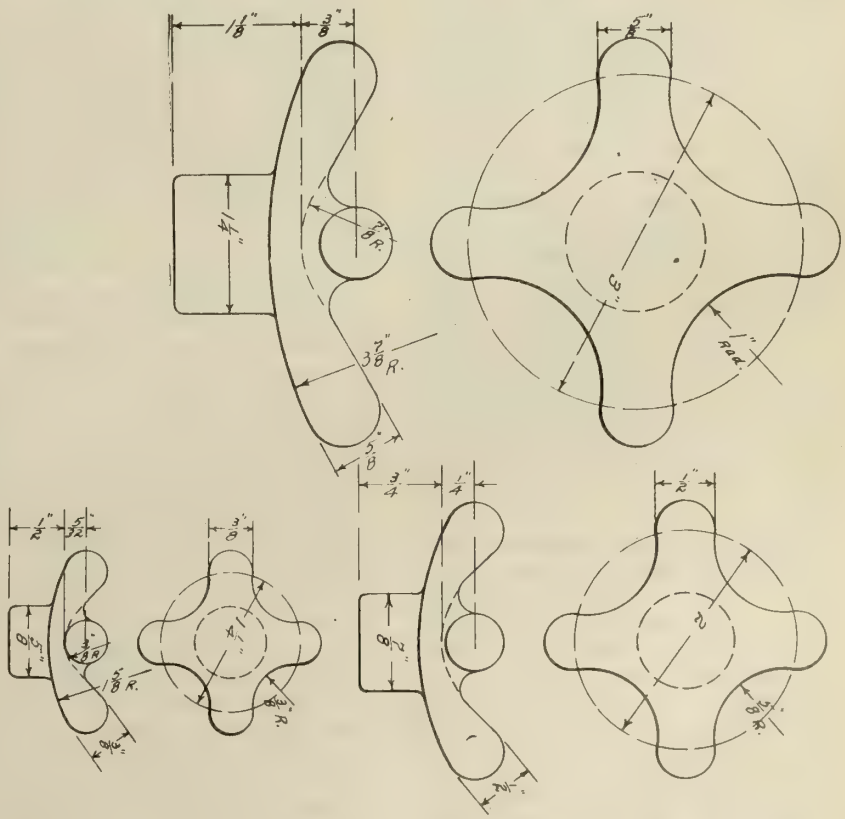
The knob can be threaded if desired and used as a nut on a threaded stud. The knobs are made in three sizes, and the dimensions given.

With these sizes the knobs are applicable to all types of jigs or fixtures, from the smallest to the largest.

A further advantage may also be noted. Namely, that these elements being carried on hand in the tool room, enables the fastening screws to be made much cheaper as it is only necessary to chase a straight piece of steel for the thread and turn down the end to suit the hole machined in the knob.

This is much cheaper than turning, threading and knurling a large diameter of steel to make a knurled head pin or screw. We have found such success with the device, both cheapness, quickness and satisfaction to the operator that they are now being used on all our special tools, superseding all other types of holding screws.

The number of the knob, either 1, 2 or 3, is usually cast on top of the casting, so that when calling for one on a design it is only necessary to mark on drawing say "knob No. 3," and the tool maker knows what is required and asks for it from stock.



KNOBS NOS. 1 TO 3.

The Strength of Screws, Bolts and Nuts

In His Memorandum to the Manchester Steam Users' Association the Author Gives Some Interesting Data Regarding These Much Discussed Items of Mechanical Design

By C. E. STROMEYER

IN my last year's Memorandum I mentioned that this subject was receiving consideration, but, with the exception of a few failures, which have occurred in the meantime, no practical enquiry into this subject had been carried out. The subject was dealt with in a paper read at the Spring Meeting of the Institution of Naval Architects. It was there shown that very slight irregularities in the shapes of screw threads, and more particularly in the relative pitches of screwed bolts and nuts, could produce very serious local stresses at the roots of the threads, stresses which were found to be far more intense than the overall tension stresses in the core of the bolt. It was also found that the finer the threads the intenser the local stresses, and that, contrary to the generally accepted view, a bolt with a fine thread and, therefore, with a relatively large core is no stronger than a bolt with a coarse thread. In fact, this conclusion is almost self-evident, if, as an extreme case, we look on the bolt head as being a nut with microscopically fine threads welded together in order that they may not become disengaged. Of course the corner between the bolt and the imaginary nut would be a mathematically sharp one, and, as is well known, a sharp corner is very weak because, as would happen if a microscopic thread had actually been used, all the shearing stress is concentrated close to the corner. It follows that a bolt with a microscopically fine thread is a very weak structure. The other extreme case is a bolt with such deep threads that it has no core, a mere cork-screw. Such a bolt would also have very little strength; but there is some intermediate ratio of depth of thread to diameter of bolt for which the strength is a maximum.

Unfortunately, this maximum has a comparatively low value, being about one-third of the strength of the shank of the bolt measured over the threads. This, no doubt, accounts for the comparatively low stresses which are allowed in bolts. For instance, the permissible stresses on boiler shell plates between the rivet holes reaches 13,000 lbs. per square inch, and still leaves an ample margin of safety, whereas 10,000 lbs. on the cores of bolts, or about 7,500 on the shank of a bolt is considered fairly high. In reality the local stresses at the roots of the threads, combined with the longitudinal pull of 10 000 in the core, works out at about 20,000 lbs. per square inch, and it is probably only due to bolt materials being very plastic, and the threads being very small structures and, therefore, capable of adjusting themselves, that nominal stresses of 10,000 lbs. corresponding to actual local stresses of 20,000 lbs. do not result in failures.

These local stresses can be greatly intensified by making the pitch of the nut finer than that of the bolt and this malpractice is a not uncommon one. Most bolts have their threads cut with dies, and when these get blunt they tend to lengthen the bolts while they are cutting and compressing them. Then also large bolts and nuts are turned in lathes, and when these have seen much service, the leading screw has become more severely worn near the headstock where the nut would be turned than further off where the bolt thread would be turned. The result seems to be that many large nuts have finer threads than their bolts. The result is that when these bolts are loaded, it is only the threads near the lower end of the nuts which carry the load, and the severe resulting local stresses combining with the longitudinal pull, which is also a maximum at this level, produce very severe stresses; so intense indeed that no simpler means for breaking off a bolt end could be devised than using a hard steel nut with a relatively fine thread and wrenching off the bolt end.

Conversely a very marked reduction in the stresses near the lower level of the nut can be effected by making the nut thread of a slightly coarser pitch, say one-tenth per cent., than that of the bolt. When the nut is screwed on and a pull applied, the bolt will at first rest only on the upper threads of the nut, and gradually, as the load is increased, the bolt lengthens and more and more threads become engaged until all the threads are offering a fair share of resistance. It is of course no easy matter to produce absolutely correct pitches, but seeing that irregularities do occur, and that relatively fine threads in the nuts are dangerous, it would be an advantage to aim at not allowing the bolt thread pitch to exceed a certain limit, and also not allowing the nut thread pitch to fall below this limit.

Some insight into the nature of the stresses which occur in bolts and nuts is afforded by the following short modified extract from the paper previously referred to.

The depths of the nuts are assumed to be equal to the cores of the bolt. The numbers in the table, express the resulting stresses at the roots of the threads in the bolts in pounds per square inch for every 10,000 lbs. stress in the unreduced shank of the bolt.

No. of Threads per Core	Bolt and Nut Thread Pitches are equal		Nut Threads are 1-1000 coarser than Bolt Thread Pitches	
Diameter.	Bottom of Nut	Top of Nut	Bottom of Nut	Top of Nut
8	30,800	5,700	17,400	21,600
16	29,700	3,500	13,400	22,500
32	33,400	1,900	11,500	27,500

When the pitch of the nut thread is finer than that of the bolt, the maximum stresses at the roots of the threads are approximately given by the formula—

$$s = 4\sqrt{[T.Z.D. \div 2h \times (T \div 3E + 1/p)]}$$

where T is the tension in the core of the bolt of the diameter D. The depth of thread is h, E is the modulus of elasticity, say about 13,000 tons per square inch, and Z is the shearing modulus of elasticity of the threads, say 1,000 tons per square inch. The ratio of excess pitch of bolt thread over nut thread pitch is 1/p. The above formula does not apply unless 1/p is larger than 1-1000. For a tension stress T of 6.5 tons per square inch the value of T/3E is about 1/6000. We may therefore write—

$$s = 4\sqrt{[T.D. \div 2h \times (1/6 + 1000/p)]}$$

Let $2=65$ tons, $h/D=1\text{-}16$ and $p=1/1000$, then $s=21.2$ tons per square inch, to which shearing stress a portion of the 6.5 ton tension stress has to be added.

If 1/p, the discrepancy between the pitches, should be 4/1000, which was actually the case with a boiler stay-bolt which failed, the shearing stress would be nearly 60 tons per square inch. No wonder, therefore, that this 2½ in. bolt should have failed while its nut was being screwed up.

Doubtless many similar cases occur in practice, but comparatively little notice is taken of them, they being attributed to bad material or carelessness on the part of the workmen. The faulty shape of the threads and pitches seems never to be suspected. However, as this subject deserves the very closest study, it is hoped that cases of broken bolts either of boilers or engines will be mentioned to me for the purpose of fuller investigation.

One reason why it is desirable to look very closely into this matter is the growing practice, started by American automatic tool makers, to supply mild steel which will mill easily. This steel con-

Drilling and Trepanning Tests of Various Qualities of Steel.

Letter	Relative Drilling Revolutions	Relative Trepanning Forces	Sulphur per cent.	Remarks.
O	0.96	1.21	0.010	Pure high carbon steel.
R	1.26	1.11	0.014	High phosphorus.
S	1.13	1.20	0.014	High phosphorus.
L	1.36	1.34	0.022	High phosphorus and nitrogen.
P	1.26	1.13	0.023	
N	1.26	1.06	0.026	
M	1.10	1.02	0.031	
BB	1.17	1.12	0.032	
W	1.09	1.00	0.034	
T	1.15	1.18	0.035	
Z	0.92	1.14	0.036	
J	1.13	1.00	0.043	High copper.
G	1.04	0.94	0.046	High copper.
V	1.02	0.98	0.047	
F	0.91	1.08	0.048	Very high phosphorus, also copper.
E	0.92	0.91	0.053	High phosphorus and copper.
K	1.01	1.01	0.056	High phosphorus.
B	1.07	0.78	0.057	
C	1.01	0.84	0.060	High carbon.
Q	1.04	1.04	0.060	High nitrogen and copper.
X	0.93	0.94	0.061	
H	0.94	0.79	0.062	High phosphorus and nitrogen.
A	1.07	0.92	0.078	High copper.
U	0.85	1.13	0.083	
D	0.71	0.89	0.193	Very high sulphur.
Y	1.06	0.05	0.031	High tenacity silicon steel.

tains a large percentage of sulphur. Unfortunately phosphorus is frequently also present in large percentages, and then the bars are very brittle. Quite recently all the screwed stays of a new locomotive boiler had to be removed on account of their brittleness, and other loco boilers having screwed stays from the same steel-maker are constantly breaking their stays.

The above-mentioned new stays contained 0.06 per cent. sulphur, 0.09 per cent. phosphorus, which is already rather high, and .020 per cent. nitrogen, which is very high and suggests that the steel maker had been using a large percentage of Bessemer scrap.

Some time ago, Mr. Dempster-Smith of the Manchester Municipal College, kindly carried out some drilling and trepanning experiments on samples of steel plates of which the chemical analyses and other tests will be found in my pervious notices. As there was a marked blunting of the tools after drilling or trepanning a few holes, a standard sample of steel was drilled for comparison both before and after drilling two test piece holes.

In table 11. the first column contains the distinguishing letter of the sample. The second one contains the relative number of revolutions of the drill per inch of depth of hole drilled, the load on the drill being constant. The third column contains the relative turning force for enlarging the drilled holes to a given size by trepanning, the rate of feed being constant. The fourth column contains the percentage of sulphur, and the fifth one contains remarks about the other impurities.

It will be noticed that sample L with only 0.022 per cent. sulphur offered a maximum resistance of 1.34. Sample D with 0.193 per cent. offered a minimum resistance of 0.71 and 0.89, say 0.8 mean. In other words, the increased percentage of 0.171 per cent. sulphur reduced the cutting resistance by 40 per cent. In view of this very great machining advantage offered by sulphur steels, efforts should be made to make them more reliable than they are at present. They seem to have been tried for motor chains, because blanks made from them punched very easily, but the experiment is said to have proved a failure.

A METAL WITHOUT A PRESS-AGENT

Zinc Needs Publicity

George S. Harney, of the American Zinc Products Company, Greencastle, Ind., advises in an address before the American Zinc Institute, that whenever zinc is used or mentioned in future, it should be called by its proper name. The public must be informed of its desirable qualities and its varied industrial applications. What becomes of all the zinc? For what is it used? The average citizen remembers the sheet zinc that used to go under stoves, and he hazily knows that he has seen zinc-lined refrigerators. But zinc is at work in thousands of other places under what Mr. Harney calls "many noms de plume and noms de guerre," and he is determined that these disguises shall be stripped from it. He says:

"We ought to so change our phraseology and nomenclature that the word 'zinc' should be omnipresent in our discussions. 'Jack' and 'spelter' are good names, perhaps, but they do not convey to the world that they are zinc. 'Galvanizing,' besides being a misnomer, is certainly not the correct term for coating a substance with zinc. 'Zincking' a substance—zinc-coated sheets, nails, wire, and similar material—would be an expression that would convey to the ear of the public the fact that zinc was used to preserve that metal or substance, and from this the public would learn that zinc was the principal factor in the operation. Similar reasoning should apply to 'sherardizing' and other processes in which zinc and the preserving qualities of zinc are necessary to give the other metals life and standing in the commercial world. I suggest these changes for the reason that not one person in ten of this great public that we want to win to the uses and benefits of zinc knows that the words 'jack,' 'spelter,' 'galvanizing,' and 'sherardizing' have any relation to zinc and its preserving properties. And if the public did know these things our battle would be half won.

"Secondly, zinc needs a press-agent. I do not refer to the grandiloquent and verbose personage who writes the fanciful stories of the prima donna's diamonds, nor the lurid picture of the circus, its daring performers and rare animals, but the artist that would write the interesting stories of the usefulness of this strange metal and of the benefits it confers on mankind. Such articles I am sure would go 'big' in our trade papers and publications, and, in view of the fact that the newspapers are searching everywhere for readable and instructive paragraphs that will interest humanity, they would no doubt willingly print them. . . . .

"If short and readable stories concerning the diverse and industrially valuable applications of zinc are furnished them, they will give such articles their initial push on their voyage over the world and on their mission of instruction. But these stories must use the word 'zinc.' The daily paper wants general items of interest, and not trade-names. It wants short stories of human interest.

"Stories about zinc may be semi-scientific in their nature. The world is ready to hear again the story of the Swiss clock that is run by the expansion of zinc. It will willingly read of the non-conducting properties of zinc as it relates to heat and cold. Why, even the story of how in years past zinc has been abused in having to work under so many noms de plume and noms de guerre is a good one and will not only be read, but it will correct an old-time error and aid the work we seek to do.

"I recall the concentrated publicity that has been engendered by manufacturers and producers of other products, and they were not so favorably situated. Take cement. One cent per barrel from the manufacturer, contributed to a central bureau, gave his product the publicity he sought. The railroad was told how to construct a water-tank, and the farmer was instructed in making a pig-trough of cement. Within the year, school children could talk in cement terms and knew of its use. Team-work won for cement. Team-work will win for zinc! . . . .

"In the coming years zinc is to have a more extensive use. Those who fabricate the pig zinc or rolled sheets in a finished product must tell the world of its utility and usefulness, if they are to succeed. Be it a sheet for a roofing, or a slab for casting, the word 'zinc' should follow on to the consumer.

"Hereafter the world will get its vegetable products, such as teas, tobaccos, and like commodities, in zinc containers. It must be told that it is a zinc container, and that zinc is the very metal that will properly preserve the

Continued on page 323

WELDING AND CUTTING

Repairing a Large Centrifugal Pump

It Often Pays to Repair, Rather Than Replace Machinery, as the Time Saved is a Great Consideration. Here is a Case Where Both Time and Money Were Saved

By J. H. RODGERS

THE type of centrifugal pump used by dredging contractors and mining operators for such purposes as dredging silt, sand, mud and gravel from the bottoms of channels and for mining soft ore by hydraulic mining system, is subject to excessive wear, due to constant abrasion of the sand and gravel against the inner walls of the pump chamber. When the wear becomes so great as to interfere with the operation of the pump, or "sand sucker," as it is commonly called, it becomes necessary, not only to put the pump itself out of commission for repair, but also to hold an expensive dredging barge and its crew in idleness.

Such a sand sucker chamber that had become badly scored through use was recently restored to practically its original condition by the Chicago job welding department of the Oxweld Acetylene Co., by means of the oxy-acetylene process. When it is considered that new castings would have cost about $3,500, and that the actual cost of repairing by welding methods amounted to only one-third as much, it is not surprising that the contractor decided to repair instead of to replace, especially in view of the still more important fact that repairing enabled him to get the dredge back into service with only a few days' delay, whereas replacement meant a delay of from 10 to 12 weeks.

Delay Meant Great Loss

In order to gain some idea of the cost of delay of a hydraulic dredging outfit, an estimate of the earnings of a dredge will be given. In the year 1912 the United States Government estimated the cost of hydraulic dredging to be 7.18 cents per cubic yard. This figure represented the average total unit cost of operating a fleet of hydraulic dredging vessels. The record for one month for one dredging pump having a 20-inch outlet pipe was 456,000 cubic yards of material. At the average unit cost given above, the monthly cost of dredging this amount of material represents over $30,000. The sand sucker shown in the illustration is much larger than the one referred to above. Furthermore, the cost of materials and labor is much greater to-day than in 1912. When such factors as loss of profits, overhead expenses, non-productive labor and contract penalties are taken into consideration, obviously every week of idleness meant a loss of thousands of dollars.

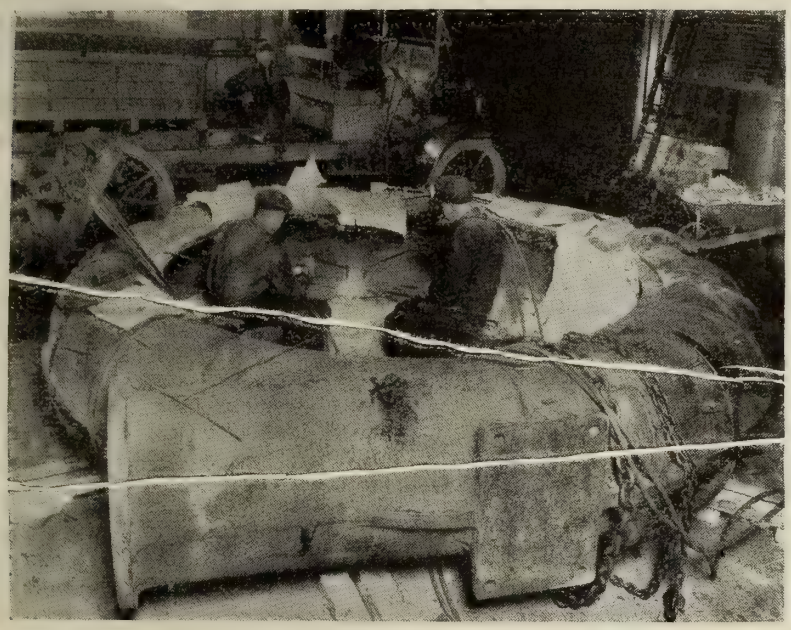
Over Half Ton of Metal Deposited

The pump chamber of the sand sucker illustrated is 14 feet in outside diameter, and consists of two massive steel castings having a total weight of 7 tons. The abrasion had been so severe it was necessary to rebuild both side walls of the pump chamber for a distance of 8 inches from the inner circumference. The thickness of the added metal varied

THIS COMPLETED WORK MEANT A SAVING OF SEVERAL WEEKS TIME, AND NEARLY $2,500 IN CASH TO THE CONTRACTOR.

from 1½ to 2½ inches. In addition, a new section, approximately 14 by 18 inches in area, had to be welded into the throat of the casting. The latter was approximately 3½ inches in thickness.

In order to insure holding the two halves of the chamber in alignment during preheating and welding they were



THIS CASTING IS 14 FT. OUTSIDE DIAMETER, WEIGHING 7 TONS.

bolted together, and the heavy, outer reinforced sections of the castings were not heated as this would have produced internal strains, either breaking the castings or shearing the bolts that held them together. Preheating by means of charcoal was applied locally for a distance of about 14 inches in from the edges of the flanges, each preheat extending for a distance of 3 feet around the inner circumference.

The total weight of steel added to the castings by welding amounted to 1,264 pounds. The operators, each using an Oxweld blowpipe fitted with No. 15 welding head, worked in pairs. As the heat in the small enclosure where the men worked was intense, it was necessary to hold several welders in reserve and to work on the relay plan, each welding shift extending for a period of 20 minutes. Six days were required to complete the building-up work.

Construction Improved by Use of High Carbon Steel

As the built-up surface will be subjected to the same abrasive action of sand and gravel, high carbon steel welding rods were used for the purpose of building up, thereby giving an extremely hard surface, in fact, one that it was impossible to cut with a file, after cooling.

The oxy-acetylene welding work was completed in six days, saving the contractor the expense of several weeks of idleness, nearly $2,500 in cash on the cost of the casting alone, and giving him a pump actually improved in construction, because lined with abrasion-resisting steel.

CUTTING TO A STRAIGHT LINE

There are several methods of following straight lines with the cutting torch, and the one to be used will depend on the conditions, equipment provided and the training of the operator. A line may be followed without a method, by painful concentration on the chalked and prick-punched layout, but this is a hard way. The cutting is likely to be irregular and the operation will tire the cutter. Hand cutting should be done in a manner that requires the least effort and at as nearly uniform speed as possible. Otherwise, the gas consumption will be excessive and the cutting will be ragged.

The method often recommended for long cuts is using a light angle iron laid on the part parallel to the cut, and at such a distance from it that it will permit the torch to be supported on the upturned flange with the head held against the edge, so that the angle forms both a support and a guide. But the cutter cannot always use an angle iron, and it is therefore highly desirable that he learn to cut by another method which will be general in application. The method cannot be very clearly described without illustrations, but sufficient may be said here to give the general idea.

The operator, having laid out the line of the cut, takes a position with reference to the beginning of the cut so that he will be able to move the torch nearly one foot before having to change position. The left elbow is rested on the piece to be cut, with the palm up and the fingers and thumb lightly grasping the torch tubes. The right hand holds the handle, and, as the cut progresses, the left hand is rolled over on the edge of the palm as far as possible before stopping. A straight cut, nearly one foot long, can be made in this manner without changing position.

Another method, somewhat similar, is swinging the left arm on the point of the elbow and letting the torch slip back and forth between the thumb and fingers of the left hand. This latter method is not so elegant, however, as the one just described, for the reason that the operator then must guide the torch with the eye, making it necessary to concentrate on the line. In the before-mentioned method the tip will automatically follow a straight line, provided the correct position is taken and maintained throughout the cut.—"Autogenous Welding."

RESCUE WORK

Oxy-acetylene in rescue work was recently again employed by firemen of the New York City Fire Department, when a young boy was caught in the machinery which operates one of the amusement places, known as the "Witching Waves" at Rockaway Beach, New York.

The boy in some unexplained manner crawled under the waves and was caught in what is known as the left arm rocker. This carried his body up against the bottom of the steel waves and clogged the machinery, which stopped and held him.

It was some time before his cries could be heard, and then the firemen were called. Captain Henry Misfeldt tried to pry him loose and tried to chop the machinery to pieces. It resisted all efforts until an acetylene cutting torch was secured.

The machinery was then cut apart and the boy released. He is seriously injured, in the opinion of the hospital authorities, and would probably have died where he was caught had it not been for the use of the torch.

BREAKING IT GENTLY

The proprietor of a certain traveling menagerie had struck a streak of bad luck, having lost a number of valuable animals by accident and otherwise.

Therefore, it was with sympathetic mien that one of the keepers undertook the task of breaking the news of another disaster. He began thus:

"Mr. Smith, you remember that laughin' hyena in cage 9?"

"Remember the laughing hyena?" demanded the owner angrily. "What the deuce are you driving at?"

"Only this, Mr. Smith, he ain't got nothin' to laugh at this morning."

WITHOUT A PRESS AGENT

Continued from Page 321

contents. Nay, more: the man who offers the spurious substitute must be publicly denounced, and, if possible, prosecuted for his counterfeiting. We must no longer keep our light under the bushel. It is zinc that preserves steel and iron, and wood and fabrics. We must proclaim this fact wherever possible. Every advertisement must boldly proclaim that the product is zinc, and science will verify that zinc is the best metal for such use."

DEVELOPMENTS IN SHOP EQUIPMENT

¼ IN. SOLID DIE, SINGLE STROKE HEADER

The Kent Machine Company of Kent, Ohio, has recently placed on the market a new and improved solid die, single stroke header of ¼ in. capacity, which has many decided advantages when viewed from the standpoint of construction, maintenance and operation.

The principal features of excellence in this machine as provided in the design are as follows:

A Scotch yoke mechanism with solid wedge adjustment replacing the usual connecting rod, with right and left-hand thread adjustment.

A cut-off of generous proportions and great strength with ample wearing surfaces.

A friction feed of unusual accuracy and flexibility.

For assembling and dis-assembling, to repair or otherwise get at the inner working parts of this header, especially convenient arrangements have been provided.

A very small floor space for the capacity of the machine is a feature.

The illustration shows this machine to be strong and heavy in its design, with metal well located to withstand the heavy stresses to which a header is subjected. The bed frame is large in cross section where the tension forces act, and is well reinforced to resist any torsional or distorting forces arising from heading the special non-symmetrical heads at present so much used by automobile manufacturers. The bearings for the crank shaft are large, made of a special alloy bronze and located close to the crank pin, thereby giving no opportunity for any springing or bending action.

The use of the Scotch yoke mechanism for driving the cross-head forward eliminates that vibratory action in the machine which is found in those using the oscillating connecting rod, and at the same time gives such a direct action on the cross-head that it does away with any flexibility due to the angularity of connection. The fly wheel has a tapered square hole in it which fits the end of the shaft, having the form of a frustrum of a pyramid. This is a decided advantage when it is necessary to dis-assemble the machine and, at the same time, gives a positive drive to the full capacity of the belt.

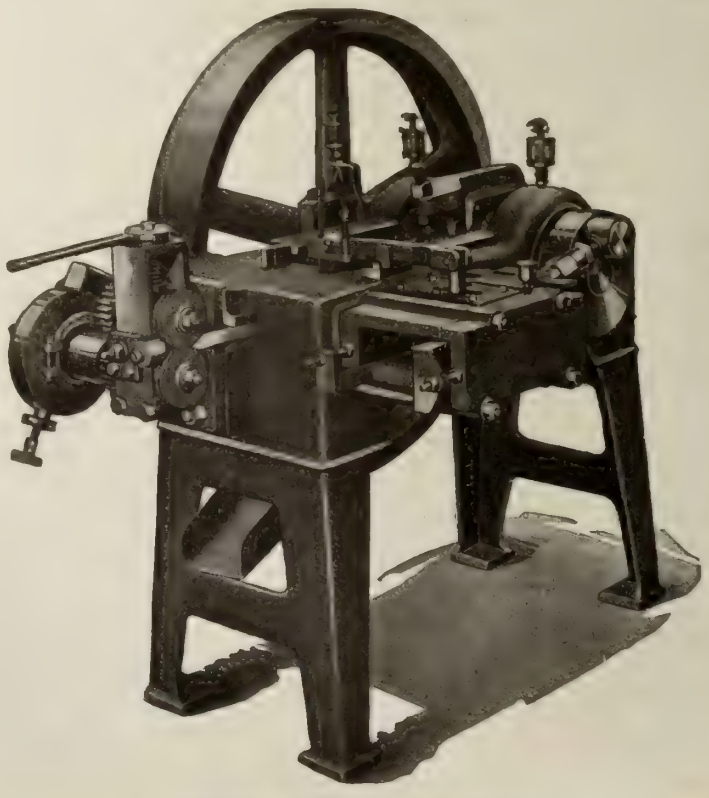
Particular attention has been given to the design of the cut-off mechanism and all parts are of good size, with extra large wearing surfaces and liberal adjustments for wear. The same thought and attention has been given to the accessibility feature in the design of this portion of the machine, and, in case of repair, the removal of four nuts opens up practically the entire cut-off actuating mechanism.

A friction feed is provided, consisting of two grooved feed rolls actuated by a combination ratchet and ball friction device, which in operation gives exceptionally accurate results. A feed stop finger is provided to look after any overfeed setting of the feeding arrangement, although the accuracy of the fe- lieves this finger from any great amount of work or pressure. The length of the feed is regulated and controlled by the hand and check knobs shown projecting from the lower part of the faced disc. The feed may be instantly thrown off by an eighth turn of the lever located on top of the feed roll support.

To dis-assemble the header to get at any portion of the inner working parts is a very simple process. For instance, by removing the gibs used to hold the cross-head in place, the entire cross-head and connection with the crank may be lifted out without disturbing other parts. This is a very important feature when we consider the amount of labor necessary to take down the connecting rod header. The cut-off and feed arrangements may be removed from the bed as units; in fact, one of the strong points of the design is the fact that it has been laid out on the unit design principle.

The adoption of the Scotch yoke mechanism has reduced the size of this machine to such an extent that the saving in floor area of a battery of these machines is a material one.

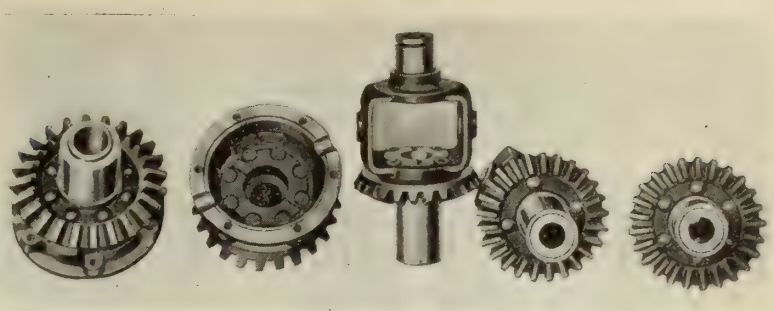
The Kent Machine Co. have had this machine in operation in one of the largest rivet plants in this country for the past two years and its success has demonstrated, without doubt, its efficiency and its serviceability. This is the first of a line of rivet making machinery to be placed on the market by this company.



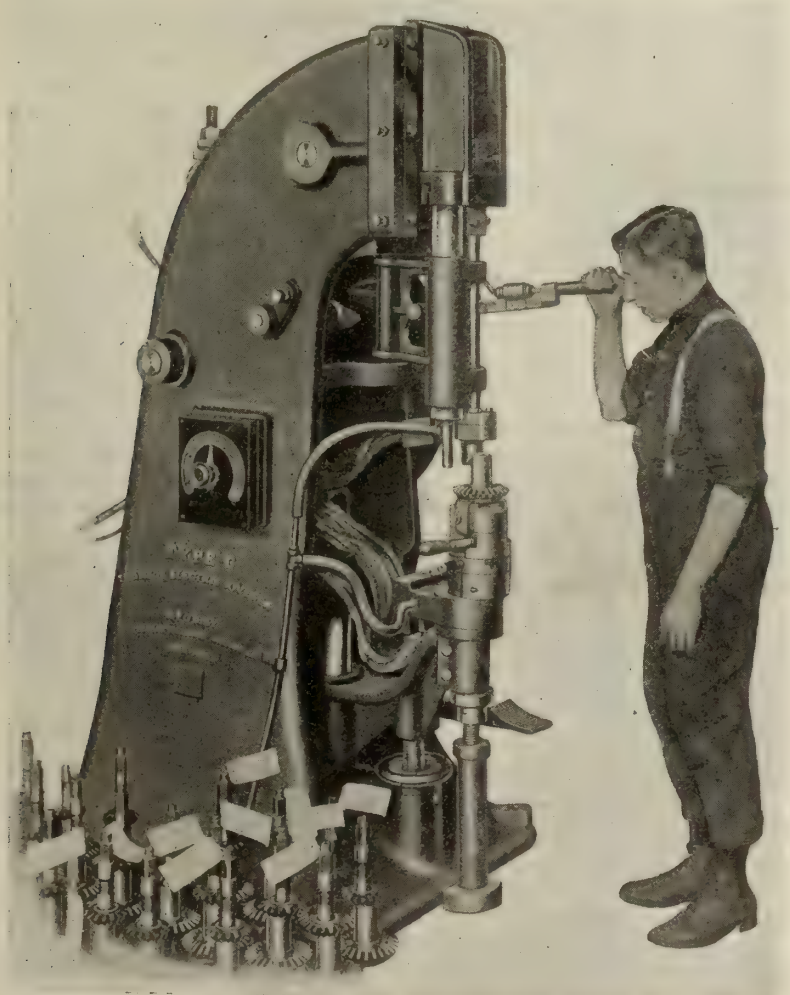
GENERAL VIEW OF THE HEADER.

THOMSON ELECTRIC RIVETING MACHINE

A TYPE C electric riveting machine, which has capacity for handling medium-sized work, has recently been developed and placed on the market by the Thomson Electric Welding Co., Lynn, Mass. This machine will accommodate any commercial lengths of rivets in sizes from ⅜ to ¾ in. in diameter, and it has been so designed that the cycle of operations may be easily controlled with a minimum expenditure of physical effort on the part of the operator. The rivet to be heated is first set in place in the work, which is then laid on the lower die of the riveting machine, so that the head of the rivet rests in a small recessed pocket provided on the face of the lower die in order to preserve its shape. By means of a hand-controlled lever mounted on the sliding head of the machine, the operator now swings the whole head to the left, thus bringing the right-hand copper die directly over the rivet shank. Then by pulling down on the operating handle, the copper heating die is forced into intimate contact with the upper end of the rivet shank that is to be heated. By the application of pressure on a push-button on the outer end of the controlling lever, the electric current is turned on and heating of the rivet is started. When the rivet shank has reached a temperature corresponding to a white heat, the operator releases the pressure of the hand-lever, which allows the copper heating die to be lifted out of the way by a spring, after which he swings the whole sliding head to the right, thus bringing the steel heading die into line over the hot rivet. He then depresses the foot control at the right-hand side of the machine, which engages the clutch on the belt-driven fly-wheel with the press mechanism and causes the heading die to make one full down stroke, after which it returns to the starting position. The clutch is automatically disengaged upon the completion of the return stroke of the press, regardless of whether the foot control is held down or released.



VARIOUS TYPES OF WORK DONE ON THIS TYPE C MACHINE



GENERAL VIEW OF THE MACHINE.

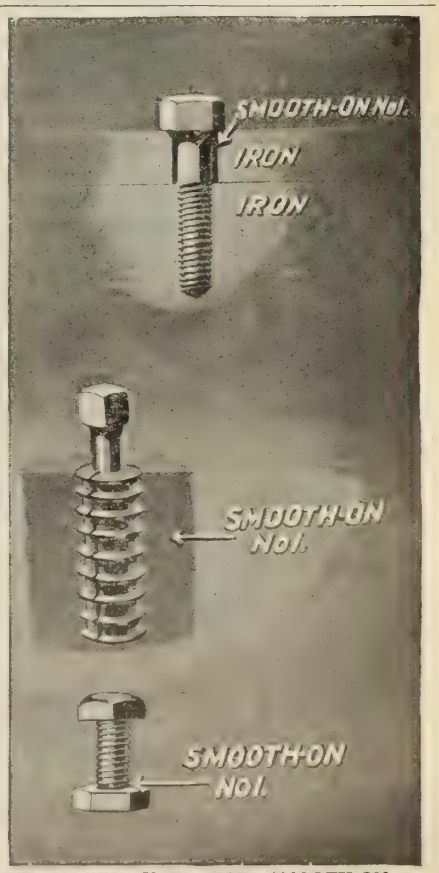
TAPPING MACHINES

The Bicknell-Thomas Co., Greenfield, Mass., have recently brought out a bench type tapping machine

Some of its distinctive features are: compactness, can be operated by girl as there are no protruding parts to catch the fingers or clothing; has cone friction driving mechanism which enables the operator to tap to the bottom of a hole without danger of breaking the tap and it also enables the operator to tap a larger number of holes per day. Twenty four 3-16 holes have been tapped per minute. It has two-speed noiseless gear transmission, which is constantly reversing in grease, oiling all parts of the machine with the exception of the motor.

All spindles are hardened and ground and the main spindle has ball bearings.

The table slide, which is made to hold suitable work holding fixtures, has ball bearings, making it very sensitive to operate, has adjustable stop for the table and is furnished either with or without oil pump and piping.



SOME NOVEL USES FOR SMOOTH-ON.

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Strike or Revolution?

THE strike in the steel mills of the United States will take a few days to become clearly defined. Strikes do not stand still. It is easier for them to grow than dwindle and the reason is easy to see. The man who wants to work is marked, and at once becomes the object of pickets, going and coming, and his hours at home are turned into hours of torture for himself and family. It is easy for him to quit work, and very hard for those who want him to work to get in touch with him. Hence it would be natural to look for a growth rather than a shrinkage in the number of those on strike.

There is something about this latest strike that needs explaining, and that is the connection of the American Federation of Labor with it, in view of the fact that the leading spirit of the strike, William Z. Foster, is an I.W.W. agitator, a Syndicalist and an advocate of bloodshed and brute force.

There is plenty of proof of this. Earl C. Ford and Wm. Z. Foster are given as the authors of a book called "Syndicalism." In the last paragraph of the book these words are found: "All workmen interested in this movement, to place the American labor movement upon a Syndicalist basis, can secure full information by communicating with . . . . ." and here follows Foster's address.

This matter has been put squarely before Foster. George Smart, one of the editors of *Iron Age*, went to Pittsburgh and after finding Foster's office, put the accusation straight to him. In Mr. Smart's own words:—

"I said to Foster that I understood he was the man who, at the meeting of the American Federation of Labor in St. Paul, in 1918, introduced a resolution providing for organization of the steel workers and that since he had been in charge of the organizing campaign; that at one time he was an active organizer of the I.W.W. and in 1911 was sent to Europe by that organization and spent much time in France, Germany and Austria-Hungary, mingling with radical laborites; that he was one of the authors of a book on "Syndicalism"; that he appeared at Budapest, Hungary, in August, 1911, and attacked the credentials of James Duncan, first vice-president of the American Federation of Labor, as a delegate of the trade unions of the United States, making a vigorous effort to obtain a seat in the convention on the representation that the I. W. W. was THE labor organization of the United States; that during his stay in Europe he was a regular contributor of "Solidarity," the organ of the I. W. W., and after returning to the United States became a candidate for editor of "Solidarity"; that failing in his ambition, he announced that he would no longer remain in the I. W. W., but would join the A. F. of L. and "bore from within"—that is, get into the stronger organization and inoculate it with his theories."

From evidence produced those charges stand as made. The book published by Ford and Foster is the rankest piece of revolutionary propaganda let loose yet. Here are extracts:—

"Another kind of sabotage widely practised by Syndicalists is the tactics of either ruining or turning out inferior products. Thus, by causing their employers financial losses, they force them to grant their demands. The numerous varieties of this kind of sabotage are known by various terms, such as 'passive resistance,' 'obstructionism,' 'pearled strike,' 'strike of the crossed arms,' etc."

Again, speaking of the industrial revolution:—

"**Bloodshed.**—Another favorite objection of ultra legal and peaceful Socialists is that the general strike would cause bloodshed.

"This is probably true, as every great strike is accompanied by violence. Every forward pace humanity has taken has been gained at the cost of untold suffering and loss of life, and the accomplishment of the revolution will probably be no exception. But the prospect of bloodshed does not frighten the Syndicalist worker, as it does the parlor Socialist. He is too much accustomed to risking himself in the murderous industries and on the hellish battlefields in the niggardly service of his masters, to set much value on his life. He will gladly risk it once, if necessary, in his own behalf. He has no sentimental regards for what may happen to his enemies during the general strike. He leaves them to worry over that detail."

One of the most revolting things in the book of which Foster is joint author reads as follows:—

"**Neo-Malthusianism.**—The Syndicalist is a 'race suicider.' He knows that children are a detriment to him in his daily struggles, and that by rearing them he is at once tying a millstone about his neck and furnishing a new supply of slaves to capitalism. He, therefore, refuses to commit this double error and carries on an extensive campaign to limit births among workers. He has been a powerful factor in reducing births in France, which, according to recent statistics, are annually 35,000 less than the deaths. He is turned from his course neither by the inspired warnings of physicians nor the paid appeal of patriots. He has no race pride and but little fear. He sees in 'race suicide' an effective method of fighting his masters; therefore, he uses it."

Now, the thing is this: Where is the line going to be drawn, if a man holding such views can have the power to call tens of thousands of men to quit work at a given moment on a given day?

Of all the strikes, good, bad and indifferent, that have been staged in recent months, the present one requires the most explaining. The great majority of the strikers are foreign born, from lands where their lot was unspeakably worse than in United States. The reason for this strike is not floating on the surface.

The widespread development of electric power is fast bringing the electric furnace to the front in foundry operations. Not only is it being used in the production of high grade steel castings, but there are indications that its installation in grey iron and malleable foundries will be one of the marked developments of the near future. Thus will be eliminated, certain coal and coke uncertainties and the country's electric wealth be still more widely applied to industrial requirements.

The Coal Business

THERE appears to be too much man-made machinery between the chap who wants to buy a load of coal and the company that owns it when it comes from the mine.

There are coal dealers in the city of Toronto who cannot buy coal from the mines. Were they to approach the company that takes the coal from the mines and ask to be allowed to purchase one or a hundred cars, the answer would be, "Get out of here!" Perhaps not in those words, but the meaning would be the same, and the net result of his purchasing expedition would be likewise.

These dealers are of the opinion that there is so much juggling between the mines and the coal bins of the nation that the last buyer is paying more than necessary.

It is strange beyond explanation that just at a certain time each year there should be a shortage of coal. The well-to-do will tell you to buy in the spring.

Very well, but there are thousands of homes where they cannot afford to buy in the spring. There are thousands of homes where they have to buy coal a ton at a time. There are thousands of little buyers who have no association or organization to protect their interests. Not much. They can shiver or sweat as their luck comes or goes.

The coal business, from pit to furnace, has been raked over and pawed over times without number, and each raking and pawing has seen the ultimate buyer going down a little deeper into his pocket, and has seen the little buyer standing in line a little longer.

The Port Colborne Disaster

THE coroner's enquiry into the fatal explosion at Port Colborne has ended in the way that most of these enquiries do, by a verdict which exonerates everybody concerned, and suggests tacitly that the thing just had to happen. With this view we are not inclined to agree. During the enquiry, evidence was adduced which showed that blowers which are fitted for the express purpose of removing dust, were not allowed to be used, and that in one instance an elevator nearly lost its license through using the blowers after receiving notice to desist.

The Port Colborne elevator is under the control of the Department of Railways and is unique in that respect. However, the Board of Railways does not seem to have interfered in the use of the blowers. This action seems to be the province of the Board of Grain Commissioners, which will not allow the dust to be removed before the grain is weighed. The whole trouble seems to lie in the question of who is going to bear the loss in weight if the dust is removed before the grain is placed in the elevator, and the question is shirked in a manner that deliberately endangers human lives. The fact that the risk is always present where there is dust is amply proved by the number of minor explosions which take place, and as further proof, we have the explosion of a nest of elevators in Kansas City just a few weeks after the Port Colborne disaster. Here again the results were fatal.

Boards have been appointed to enquire into this situation, and they have sat and presumably deliberated and made reports. The evil still persists. Truly it would seem that the cheapest thing in this country is human life. While the country is filled with exhortations to count "Safety First," men are being killed by a preventable cause, which is not prevented through the greed of the principal users of the elevators. The presence of a dust-laden atmosphere, whether it is coal dust, grain dust, sawdust, or textile material dust as in the New York triangle fire, is a source of danger of the highest potential. Its admixture with the surrounding air is so complete, that the introduction of the tiniest spark starts combustion, which takes place so rapidly and perfectly that it is explosive in its intensity.

There may be some loss occasioned by blowing the dust, or there may be some reason apart from that of financial loss against the use of the blower. The public and the men who work in these elevators should be satisfied beyond any reasonable doubt that all necessary precautions are being taken to make their occupations a safe one.

Our Old Friend John Barley

THEY used to raise a song on high to old John Barleycorn, and voices filled with clinkers jarred the early hours of morn, when chaps who made their homeward jaunt with tangles in their feet, and tried to find a keyhole somewhere along the street.

Oh, in them days what's went and gone and never to come back, men used to meet their gentle wives, salute 'em with a whack, and put their feet upon the couch and muss up all the duds, when they had lingered far too long before the cheering suds.

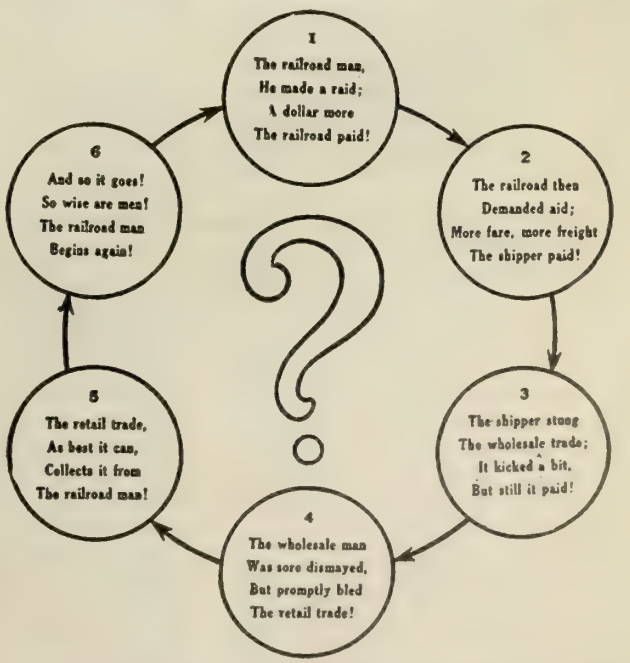
They used to try to make a speech, they used to start a fight, they used to decorate the porch and sleep out there all night—they never had a dollar then to buy two pair of shoes, when they was passin' out their coin to saturate in booze.

Men used to take and plant their feet upon the old brass rail, and call up thirsty ones to quaff large hunks of rye and ale.

But now they've learned to wend their ways unto the water spout, and souse their long and thirsty throats without a drunken bout.

So when they come to us and say old Barley's at the door and wants to come and dwell with us like in the days of yore, we'll double up our horny fist, we'll grab the boot-jack, too, and swat that chap who used to bring the red nose and the stew.

We'll take him by the collar and we'll lead him to the fence, and tell him for to speed up quick and take his carcass hence—and when he tries to tell of days when we swigged rye and beer, we'll shake our horny fist and say: "John Barley, scat from here!"—ARK.



"The vicious circle is infinite; increased wages are over-capitalized for inflated profits, and the cost of goods mounts faster than the wage level."—Statement of the Four Brotherhoods of Railroad Employees. From the New York *Evening Post.*

Hours of Work a Point Not Settled at Ottawa

Labor Delegates Were the Orators, While the Employers Seemed to Have a Greater Array of Facts and Statistics at Their Disposal —Summary of Industrial Conference

By T. M. FRASER, Ottawa Representative of MacLean Papers

OTTAWA.—It was the intention of the Government, in order that there might be no appearance of capital and labor being drawn upon opposite sides with the suggestion that they were in hostile array, that the delegates to the National Industrial Conference should take their seats in chance fashion; but the sheep and the goats automatically sorted themselves, the representatives of capital occupying the seats on the left of the chairman, Hon. Senator Gideon Robertson, while labor faced them on his right. Down the middle of the Senate Chamber were grouped the representatives of the Governments. Such of the common people as could get room hung about the door of the chamber, though there were few of these.

The daily proceedings of the conference have been so fully reported that it is not the intention here to do more than mention a few of the interesting features and side-lights. How much, if anything material the conference may accomplish will not be known immediately. Broadly speaking, the expectations of the different parties to it might be summed up sufficiently well by an examination of three or four of the principal speeches delivered. As. Hon. W. L. Mackenzie King very ably pointed out in the able speech he delivered on the opening day of the convention, the parties to industry and its problems are not the two, capital and labor, most commonly mentioned; they are four: Capital, labor, management, and the community. And of these, the community is the most important and the most interested, in that it embraces the other three as well as the people in general.

While the two main parties to the conference came together with as much diplomatic courtesy as could be expected, and while the proceedings and debate suffered nothing from comparison in this or any other respect with any debate in the House of Commons, it would be only camouflage to say that capital and labor were not very far apart on their conception of what was rightfully due to each. Self-interest rather than pure reason has dominated the councils of both for so long that it is vain to expect that now or, probably, for a long time to come shall we find either being distinguished by a spirit of "sweat reasonableness," or see self-interest give way to self-sacrifice. On the first day of the convention, if we could have read the mind of those who looked across at each other, we might have found distrust, resentment, and the sense of being subjected to tyranny. It was plain that each expected more from the party in the middle (the Government) than from the party opposite.

The Two Attitudes

The attitude of Labor at the convention was one of aggressiveness. Capital typified resistance. Labor said: "How much can we get?" Capital pondered: "How far can we afford to go?" And if the resistance of capital to the demand, for instance, for a 44-hour week was strong, it must be borne in mind that that, in the words of one of the labor representatives, was "not an ideal, but a compromise." And when Mr. Tom Moore, president of the Trades and Labor Congress, and chief labor representative, exclaimed heartily, "Hear, hear," those present were reminded that he himself, in a speech at Toronto not long ago spoke of a 36-hour week as about right. Capital, recognizing the necessity of production, sees the hours of labor heading towards an impossible minimum, with overtime, the handmaiden of the "shorter working day," reaching an impossible maximum. Capital believes, and not without justification, that the ideal of the vast majority of working men is to cut the length of the "straight" working day as short as possible in order that more overtime, with its enhanced rates, may be secured. The plea of certain of the speakers among the labor representatives that, with the present working hours, there is no time left to the workingman for "improvement," is sufficiently refuted by figures which the Minister of Labor introduced for the purpose of showing that the shorter day already obtains in large measure in Canada. Forty-seven per cent. of the working men of Canada already work eight hours or less.

The Farmer's Status

This question of the reduction of the hours of labor—a constant scaling down of the length of the "straight" workday, then, is the big point—at least the big controversial point—of the convention. As stated above, it obtains so commonly that employers must, on the whole, be far from making much fight against it, but the object of labor is to have it made a statutory matter for the whole of Canada. I think the final quietus was put on this in a brief and moderate speech by Hon. Charles A. Dunning, Minister of Agriculture, and in charge of labor matters in the Government of Saskatchewan. He desired to have it made plain in the status of the farmer, who was in a sense both a capitalist and a laborer, and who represented probably the largest industrial element in the population of Canada, under a statutory standardization of the hours of labor. "It seems to me," said Hon. Mr. Dunning, "as a farmer of very long experience, that until it is possible for you to legislate to control the sun and the winds and the clouds and the rain, it is impracticable for you to legislate to effectively control the hours and the distribution of labor in agriculture."

It seems scarcely probable that agricultural labor, even if omitted from the operation and benefits of any possible 8-hour or other day which might be made law, would long rest content under this exclusion, or that organized labor could refuse to support the extension of the principle to them. As was also pointed out by Mr. Dunning, if working conditions are to be made still more attractive in the cities by shorter hours, the difficulty of getting men for farm work would be almost insuperable. The consideration of possibilities of this sort struck the members of the convention very forcibly.

Eloquence vs. Facts

What would strike the impartial observer of the proceedings was that the right side of the assembly seemed to have almost a monopoly of the eloquence. There was scarcely a man among the many who spoke for labor but could present his arguments in well-chosen and grammatical language, and without a trace of diffidence; there were some who were speakers of a very high order, while the speaker with perhaps the most distinct enunciation, the most clear-headed manner of thinking, and the most fluency in the whole assemblage was a tailoress of Vancouver —Miss Gutteridge. She is an Englishwoman—and here it might be noted that the great proportion of the representatives of labor present were not Canadian-born. In fact, very few were. Perhaps the other ninety per cent. of labor in Canada, which was not represented at the convention, belong largely to that class. I mentioned to a representative of the manufacturers this striking fact that the speaking ability was so largely confined to the other side. "Naturally," he replied. "They spend most of their leisure time at it, and practice makes perfect. We have been too busy trying to raise the payroll to have had much time for practising oratory."

I think it would be fair to say, however, that if the position of the labor

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MARKET DEVELOPMENTS

Canada Watches the U. S. Steel Strike

May Have an Important Bearing on the Markets Here—Structurals Are Much in Demand—Machine Salesmen Report Orders as Being Very Satisfactory

THE MARKETS AT A GLANCE

THE strike in the steel mills of United States has a very direct interest for the whole Canadian steel, iron and machinery trade. Stocks in the warehouses of this country are fairly well filled, but warehouse business is not the kind that keeps things going, for most of the tonnage goes direct to the mills and is shipped direct to the purchaser, warehouse prices being higher and less popular in consequence. Canadian steel mills are in good shape to take care of many lines, but not so in plates particularly, a hold-up of which would be poor business were it continued for any length of time.

There is a big demand for structurals in Ontario at present, and one of the dealers took occasion to remark that now that the United States mills stand in danger of being shut off, the rush sets in to buy structurals. Big tonnages are in the offices of architects and fabricating concerns, and although it is late in the season it looks as though the much talked-of buying movement in structurals has set in.

Machinery dealers report good business. In fact many of the best houses are getting all they can handle and a little more. They find it difficult to secure the machines as rapidly as needed.

Speaking of the machine tool situation, it is interesting to note that there is not much export business going to United States firms at present. For instance, Sweden is in need of quite a large list of machine tools, and the chances seem to be that Germany will get the business. The reason is this, that Germany can undersell United States in Sweden to the extent of between fifty and sixty per cent. Prices, the rate of exchange and the low value of the German mark all help to stimulate this movement.

Prices remain firm in all lines in the machinery field. Many cases have values up to war times, and there does not seem to be any good evidence in sight that a reduction is even being considered.

U.S. STEEL STRIKE REFLECTED IN MONTREAL MARKET CONDITIONS

Special to CANADIAN MACHINERY.

MONTREAL, Que., Sept. 25.—The near approach of a tie-up in the steel industry has been partly responsible for the quiet tone of the existing market, and the general situation here has been in a reserved state of tension for the past week. To some extent this is still more or less evident, but a more optimistic feeling prevails throughout the trade, and it is thought by many that the strike situation will be confined to those works that are now involved. However, it is premature to even guess to what extent a strike of this nature will affect general business. Business in this district is moving steadily, but it is still of a conservative character. Metals are moving freely on a firm market.

Machinery demand shows a little improvement with used equipment less pronounced. Scrap is quiet but may be affected by the strike of steel workers.

Local Interest in Steel Strike

The attention of the entire steel industry is now centred in the steel strike that is in force in the United States. It is a little too early to pass on the possibilities that may arise as a result of the strike, but the situation and the developments will be closely watched by all those associated in any way with the steel business. Asked as to the effect on Canadian conditions, a dealer here stated: "It will be some days before we can tell the effect of the strike, but unless the cessation of operations spreads throughout the entire steel producing districts, and the independent mills become involved, we will not be affected here to any great extent. We are carrying considerable stock, and this will be ample for existing requirements for some little period. Then again, we will be able to get supplies in from the States as there are many sources of supplies apart from those actually affected by the strike. Ship plates will be harder to get, but many of the yards here are fairly well stocked and would be able to operate for quite a spell before feeling the pressure of the strike. On the whole we do not expect a serious condition here, but, as stated before, it is too early to predict the events of the immediate future. Should the strike spread and other mills become involved, and the situation develop into a general fight between the men and the producers, the effect will naturally be felt here, and as a consequence prices may show a tendency." Trading here is of a general character, not heavy but of steady volume. Prices are unchanged and very firm.

Used Machinery Being Absorbed

While it cannot be said that the business in the machine tool trade is of the active kind, there appears to be visible signs that the demand is improving, even though slight. Some dealers report a very good week with new tools showing up better. It was remarked by one dealer that the available supply of used machinery is apparently diminishing, and it is believed that no small amount of this class of equipment has already been absorbed. In this connection one dealer stated: "During the past season we have disposed of quite a large number of tools that we picked up from many of the shell shops, such as lathes, drills and shapers. The demand on the aggregate has been quite heavy and these tools have been going to all sorts of places. Quite a number have been acquired by men who, prior to the war, lived on farms or in villages throughout

the province. Inquiry showed that many of these men who had attained a fairly good knowldege of machine shop work intended starting a small repair shop, where they hoped to reap returns on their shell experience. The money they had earned, and the reasonable price of the old machines were factors that induced them to start out on their own account, and some of these men are doing well."

Scrap is Unchanged

The tension that has been evident in steel circles over the possibility of a strike in the States has been reflected here to some extent, and as the atmosphere to-day is filled with the first real signs of strife, the trade here is anxiously awaiting further developments. The past week has seen little but normal trading in scrap and the business passing is mostly going to the foundry trade, as the demand for machinery scrap and stove plate is of good volume. There is a steady movement in the non-ferrous scraps but the demand in this respect is about as usual. Dealers are not disposed to state what will take place should the strike attain any degree of magnitude, and for the present will hold to current quotations. Should the strike be of long duration it is altogether likely that the market here will be stronger. However, it is the opinion of the trade here that a settlement will be made before the close of the week. Word received from Cleveland by a local dealer was to the effect that the situation last Friday was more serious than it appears to be to-day. Few here will commit themselves, and several days must elapse before the full possibilities will develop. Price quotations remain unchanged with the market firm.

POINTS IN WEEK'S MARKETING NOTES

The steel strike is going to have an effect on the Canadian market, though just how soon or how marked it is hard to say. Some warehouse stocks are fairly well filled up, but most of the business is direct from mills to users, on account of price.

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The movement in structurals is particularly marked at present. Some contracts as high as a thousand tons are being figured on.

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Machine tool dealers report business as being excellent, sales being of new tools with a decrease in the request for used machinery.

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Capacity for handling tool room work on a large scale is not easy to find in this district.

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Firms selling steel from U. S. mills were taking on business as usual this week, subject to the usual strike and other contingency provisions.

STILL ACCEPTING ORDERS FOR STEEL

No Difference Noticed Yet—Business in Structurals is Better Than Ever

TORONTO.—The trade in general watches the steel mill strike in the United States with keen interest. While some lines may not be hit for some time to come, there is a feeling that cannot be disguised that the ramifications of the struggle are extremely wide, and that no particular section of industry can claim immunity.

As far as CANADIAN MACHINERY could learn as this issue went to press, the firms selling for the American steel mills were not making any difference in their selling policy. They were accepting business, and reported particular activity in structural material. In fact one of the dealers emphasized the fact that the amount of structurals offering now was an outstanding feature of the business. "Those who want to buy now and who may be inconvenienced in the matter of delivery are paying the price for staying out of the market too long. For months past there has been plenty of capacity in the mills rolling structurals to give splendid deliveries, but prospective builders continued to stay out, thinking that the prices were going to come down. It was useless to point out reasons why prices would not come down, although the steel trade has known for a long time that prices were going to stay up as costs would not permit anything else."

It must be remembered, of course, that business placed with the mills at any time is subject to strikes and other delays over which the authorities can have no control.

Selling is Brisk

Machine tool business is good in this district. And when that is said, there are no reservations or unstated conditions. There are, in some cases, good machines tools of standard makes standing on the floors of the Toronto warehouses. If one will look carefully enough he will see that the word "Sold" has been written on them. There are places where that same word could have been written three or four times, and as a matter of fact, in several cases they have been sold twice.

The automobile business is buying a lot of machinery in Ontario. This industry has been by long odds the best purchaser on the market for a good many months.

There is danger that the effects of the strikes in this country are going to be felt still in some places. Moulders are out of some shops yet, and in others work has been turned to other channels. There is, it is safe to say, a scarcity of tool room capacity in this province at the present time. Not that there may not be tool rooms that could take on more work, but we refer here to the capacity to handle the special tool, jig and fixture work of a fairly large concern. Machine salesmen are anxious, naturally, to hold as much of this sort of work on this side of the line as possible, but are finding it difficult in some cases to do so.

There is a tendency on the part of some concerns to hold back to see if there is going to be any limit to the things that are being asked for by some of the strikers. For instance, many of the Detroit metal workers are going to ask for $1 per hour, and the same feeling may grow in the Canadian territory across the river from that centre. These jumps now, coming on the top of a long list of things that drive costs up, are not going to help the placing of business.

Machine tool builders find that labor efficiency is not improving in many instances. They claim that increases in wages have been much larger than increases in efficiency or production. Of course, it is impossible each time that an increase in wages is given to have it accompanied by an increase in production, as such a thing may be physically impossible. Yet the fact remains that the increases in wages have far outstripped the increases in production. That has brought costs to a high plane, and they are there to stay for some time.

For the most part the machinery that is being sold now is new stuff, direct from the shops. By this, it is not meant that the used machine has departed from the market, but the war shop bogey has become a thing not to be afraid of any more.

How About the Strike?

The strike in the steel industry in United States will be felt in this country if the production is curtailed. It should make a good demand for material that can be produced by the Canadian mills. Of course, it is hard to tell for a few days just how effective the strike may be. Steel making is such a continuous process that there are several ways in which the whole works can be tied up. But the selling offices of the United States Steel Corporation have nothing to say about the situation, and it would be thought, were conditions serious, that they would be less sure of future deliveries. Only in one or two orders so far this week have they held back. Most of the business that passes from Canada to U. S. mills is straight mill, not warehouse business, and in this way the effect of the strike, were it serious enough to affect production, would be felt almost at once here. Warehouses carry a general stock, but much of the stuff that Canadians want from the U. S. steel mills is special material, rolled to order, and not taken from warehouses. Not only so, but the warehouse prices are so much higher than mill as to make too great a difference, unless there is real urgency in the job, and a chance to recover the difference between warehouse and mill prices from the customer.

STRIKE IN STEEL MILLS FLATTENS OUT THE MACHINE TOOL PROSPECTS

Special to CANADIAN MACHINERY.

NEW YORK, Sept. 25.—The expectation of a steel strike has had the effect of reducing demand for machine tools to the minimum. With the exception of scattered orders for single tools or lots of two or three, there is very little in the market, so far as domestic trade is concerned. As for export, the European countries are barred from buying here on favorable terms by the exchange situation, and until there is a more even balance of exchange it is impossible to expect that any very important buying for shipment to Europe will develop. One exception to this is noted in the case of a concern in Switzerland which is placing orders here against a list of tools required for the manufacture of electric motors in that country. Purchases will total about $250,000, and a part of this business has already been booked.

American exporters of machine tools hear more of German competition in some of the European countries. For example, Sweden needs large numbers of machine tools, but a good share of the business probably will go to Germany. That country is quoting prices that are 50 or 60 per cent. lower than American prices, irrespective of the exchange.

The principal domestic buyers of tools in the East are the Gillespie Motors Corporation, Paterson, N.J., and the E. W. Bliss Co., Brooklyn.

THE I.W.W. CAST-OFFS ARE SAID TO BE BEHIND THE STEEL STRIKE

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., September 23.—At this writing it is quite impossible to gauge the extent or make any attempt to estimate the duration of the strike in the iron and steel industry. The matter rests not so much upon the proportion of men going on strike at the outset as upon whether the movement gains or loses as the days pass. An important fact is that it is much easier to induce a man not to work than to induce him to work. If he attempts to go to work the strikers can fine him and employ the familiar methods of intimidation. If he stays away from work those who want to work are quite certain not to hunt him up and threaten him if he does not work. Undoubtedly the strike leaders depend much upon mob psychology to carry their point. Nor can the amount of idleness in the iron and steel industry be measured by the proportion of men who strike, first because a few strikers may close a plant because it cannot operate with a certain department idle, and second, because there are such ramifications between plants. A strike tying up the lake vessels that carry iron ore would not affect the blast furnaces, as nearly all the season's ore has been moved, the full movement of one navigation season being sufficient to carry the furnaces into May or June the following year. Of the many cases in the opposite direction one may be cited. The foundries making ingot moulds for the steel works use direct metal from the blast furnace (no cupolas), and if the steel works close they do not need ingot moulds. Accordingly, the ingot mould foundry closes, the blast furnace must bank and the blast furnace suspends shipments of coke whereby coke ovens are made idle. At the other end of the chain there may be a rolling mill which uses purchased steel. Its men may be ready to work, but the stock of steel is small, hence, eventually the finishing mill would have to close if the steel producing mill closed. Thus the closing simply of steel producing plants would close coke works at one end of the chain and finishing mills producing merchant bars, sheets, tin plate, etc., at the other end of the chain

Who are the Strikers?

Just who the strikers are is well defined. William Z. Foster, secretary-treasurer of the general organizing committee, and the leader in the Pittsburgh district; Fitzpatrick, the chairman, being in Chicago, was formerly an I.W.W. man and left the organization years ago upon being defeated in his aspiration to be editor of Solidarity, the I.W.W. official publication, joining the A. F. of L. with the statement that he intended to "bore from within." A pamphlet he wrote years ago, advocating the most lawless methods, is now being circulated to show his real character, which undoubtedly has not changed. Even as to the "24 unions" which the organizing committee was formed to represent, there is not unanimity. The officials made an effort to conceal the fact that the session occupying Wednesday and Thursday of last week was for the purpose of discussing whether the strike order should be recalled in view of the White House conference on labor, scheduled for Oct. 6, asserting that the subject was not being discussed, the meeting being for the purpose of making plans for the strike, but it became known positively that there was much dicussion of that subject, and in the letter the organizers sent to President Wilson the statement is made that they carefully considered for two days the matter of calling off the strike.

Just how many of the 24 unions were in favor of postponement is not known, but on Friday, the day after the conference adjourned, one of the unions, the International Union of Steam and Operating Engineers, sent an order to all its locals, saying that the officials were in favor of awaiting the result of the labor conference of October 6, and saying "all members are instructed to refrain from affiliating themselves in any way with the proposed strike." There may be several unions, anything short of a majority of the 24, to take similar action. As to the American Federation of Labor itself, its position is not clear. The strike is by individual unions banded together, not by the federation itself, and it is generally believed that Samual Gompers, president of the federation, is opposed to the strike.

Is There a Strike Fund?

As to funds, it does not appear that there is any large strike fund. Foster made a curious statement more than a week ago, to the effect that strike benefits would be paid to strikers who had not joined as well as to those who had. Joining, at least in the case of a large part of the common labor taken in, consisted in the joiner paying $3, of which the organizer received $2 as payment for his work. Unions like the boiler makers, machinists, etc., may have much money, and as the great bulk of their membership is outside the steel industry, they can raise funds, but it is quite improbable that any of the funds would be diverted to payment of strike benefits to men not members of their respective crafts.

Considering all the information now available practically all the chances are that the strike will either fail shortly or will develop into an I.W.W. or Bolshevist movement. A regularly conducted strike such as union men usually plan to have seems entirely improbable.

A fortnight or more ago it was a common idea among iron and steel producers that if there was any prospect of trouble at any particular plant, that plant should be closed at once so as to "beat the men to it." This idea was abandoned a week or so ago by almost all the producers, through their concluding that it was improper to take the risk of closing a plant that might otherwise have been able to run, as public sentiment might be adverse. A few plants in the Pittsburgh district were closed before the end of last week. In the case of the two at Brackenridge the officials made a statement that the closing was for the purpose of giving the men opportunity to hold meetings Satuday to decide whether or not they desired to strike.

Stocks Are Normal

Jobbers and manufacturing consumers of steel have approximately their normal stocks, and much larger stocks than they had last April and May, when buyers of steel had no confidence in the future of prices and were conducting business on a strictly hand to mouth basis. Normal stocks, however, are not large stocks, except in the case of a few manufacturing industries like the automobile industry. While jobbers' stocks would last for several weeks in fair

shape, and for longer periods in broken condition, they would last but a very short time should consumers who ordinarily draw supplies from mills turn to jobbers instead. This, however, is quite improbable, as the cost would be too high. Moreover, it was understood several days ago that many jobbers had already planned to advance prices promptly in the event of any scarcity developing, so as to make as much money as possible out of their position. As this might be regarded as "profiteering," many jobbers may refrain from advancing prices in the event of a scarcity.

The Strike Report

A rough guess would be that one-third of the iron and steel industry of the United States is idle on account of the strike. In some cases there are men willing to work, but the department is unable to run on account of other departments being on strike. The Chicago district is largely closed; the Wheeling district is practically altogether closed, or will be within a day or two. The Youngstown district is three-fourths closed, and the Pittsburgh district, including the Monongahela Valley, is operating almost full. Various detached plants are but little affected. Steel officials are strongly of the opinion that if the Monongahela Valley can be kept operating as well as at present, the men now on strike in other districts will return to work. The Carnegie Steel Co. has twenty-seven blast furnaces in the Monongahela Valley, of which twenty-two were operating and eleven are now banked, the other eleven being in full operation. At the steel works at these same points the operations are very good, as Duquesne is operating one hundred per cent., Edgar Thompson is operating practically full, and Homestead nearly full. The strike is confined entirely to the foreign-born labor. Officials of the steel companies state that the strike situation is somewhat better than they expected, and while they regard it as premature to predict that the strike will play out in a week or two, they have strong hopes in that direction.

BUYERS NOT LIKELY TO BOOK VERY HEAVY ON QUOTATIONS GIVEN FOR 1920

Stocks are still being depleted, and iron for 1920 is not very easy to get. In these circumstances advances are to be had for the asking. Foundry iron is the principal demand. Following are reports from U. S. points:

Cleveland.—Although 1920 business is not being sought after, some orders have been placed. One for 5,000 tons was accepted at the $26.75 furnace base.

Foundry iron for this year's delivery is hard to get, and furnaces are making sales at points far distant from their natural selling zone. Steel making sales are quiet. Stocks are being lowered by continued heavy shipments.

Boston:—Selling here has been confined to small tonnages, and with one notable exception, 1920 iron is quoted at an advance of $1 on present prices. The exception is a Buffalo furnace, which is offering 1920 iron at $29 for 2X eastern. Some large orders are expected to materialize in the near future, but 300 ton lots represent the largest sales just now.

New York.—There have been small sales to local foundries which find they require additional tonnage to fill their orders. Business generally is in small lots of foundry grades, which have reached a fair aggregate. One order for 10,000 tons, about equally divided between this year and next, was placed at full price.

Philadelphia.—The market is quiet, with both sides holding off. The rate quoted for No. 2X is $31, delivered, although where rates are favorable $30 has been mentioned. Steel making grades, as well as low phosphorus iron are dead, while charcoal iron producers are booked up and out of the market for this year.

Pittsburgh.—General dullness marks the trading here, and what little demand there is in evidence is for foundry iron. Prices for next year delivery are being quoted at a rate which is plainly meant to discourage the buyer. Steel making grades are dull, and while prices are holding up nominally, purchases are said to have been made at 50 cents below the quoted rate. The demand from automobile makers for deliveries has stimulated this market.

Buffalo:—Sales for 1920 are still small, as the labor situation is still a cause for uneasiness. Some small tonnages have been accepted at small advances. The demand for foundry iron is increasing.

Chicago.—A fairly large tonnage has been sold here for next year delivery. No. 2 foundry is being quoted at $26.75, with $1 added to the usual silicon differentials above $2.25c. There is a good enquiry from a few users for malleable and foundry, but there is no sign of a general demand. Enquiries are for lots of 500 to 5,000 tons.

Cincinnati.—Business in the south is exceedingly light, with furnaces showing no disposition to get after new year business. Jackson Co. furnaces are still idle. Virginia iron is quoted at $30, furnace, with not much iron offering.

St. Louis.—There is a good business being done in small lots of pig iron, and the outlook is good. Most of the business is for immediate shipment, or not later than October, and prices are firm. Freight car shortage is still a factor, deliveries on contracts being much delayed.

Birmingham.—Brisk sales and increased prices are the conditions here. Car shortage is helping to keep deliveries back, and in addition to this, production is falling short of sales. 1.75 to 2.25 silicon iron has sold at $27.50 and $27.75, furnace. A new schedule of silicon differentials quoted by one maker adds 4c to the prices for each half of 1% above 2.25.

SUDDEN DEATH OF W. C. GURNEY

Prominent Toronto Business Man—President and General Manager Gurney Foundry Co., Ltd.

W. Cromwell Gurney, president and general manager of the Gurney Foundry Co., Ltd., collapsed suddenly while visiting the office of his physician for routine treatment. In spite of the efforts

The late W. C. GURNEY.

of two other physicians present, resuscitation was impossible, and Mr. Gurney passed away from heart failure.

Earlier in the year Mr. Gurney suffered from influenza, from which he had not made a complete recovery. The sudden death of his mother only recently affected him profoundly, and since that tragic event he had been upset and unlike himself. The news of his death came with shocking suddenness.

Mr. Gurney, who was in his 46th year, was the son of the late Edward Gurney, whom he succeeded as president of the firm upon the latter's death a few years ago. He was educated at Upper Canada College, and then entered the Gurney Foundry Co. He was a member of the National Club, Lambton Golf Club, the Canadian Manufacturers' Association, the Board of Trade, and was one of the best-known of Toronto's business men.

CORRECTION

In the leading article of last week's CANADIAN MACHINERY on "Tractor Ploughing Machine of Unique Design," there is an error appearing in the closing paragraph. It states that the machine is capable of ploughing an acre an hour. This should read—three acres an hour, or 30 acres in 10 hours.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	.....
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$26 50	$26 25
Electro copper	25 50	26 00
Castings, copper	25 50	25 00
Tin	60 00	58 00
Spelter	9 75	10 00
Lead	7 25	7 00
Antimony	10 00	10 50
Aluminum	35 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 00
Sheets, black, No. 10	5 15	5 45
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 50
Premier, 10¾ oz.	....	7 80
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$25 00	$.....
1¼ in.	27 00	.....
1½ in.	28 00	26 00
1¾ in.	30 00	26 00
2 in.	30 00	26 00
2¼ in.	33 00	28 00
2½ in.	40 00	32 00
3 in.	46 00	38 00
3¼ in.	.....	45 00
3½ in.	56 00	42 00
4 in.	70 00	54 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide. 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

STEEL STRIKE HAS PUT SHIVERS IN THE U.S. SCRAP METAL TRADE

The market is dull and unsettled all over the country. The uncertainty due to the threats of the steel strike is causing a waiting attitude on the part of buyers. Following are reports from various U. S. points:

Chicago.—There is very little scrap being sold, and prices are softening. Dealers are inclined to hold their stocks as they feel that the market has intrinsic strength, which will develop after the labor situation is more settled. Railroad offerings are small, aggregating about 5,000 tons.

Boston.—The market has been marked by unsteadiness during the week. Prices are off, heavy melting steel having been sold at $15. Several lots of Government scrap were withdrawn owing to the low prices offered. Malleable scrap was bought at $21, delivered.

New York.—The best demand is for cast scrap, but even in this grade the business is small. In spite of this there is a firm tone to prices. The fact of Government offers being withdrawn till better offers are forthcoming has had a good effect in keeping up prices.

Philadelphia.—Machine shop and blast furnace turnings, and the lighter grades have been in good demand, and prices have advanced somewhat. The demand for heavy melting steel has been very small. The Ordnance offer approximately 6,000 tons of forgings at various locations.

Pittsburgh.—The demand for cast iron scrap is good here, and has resulted in advances of from 50 cents to $1 in these grades. Malleable is also a strong grade, demands being ahead of offerings. Heavy melting can be got at $21 delivered at Pittsburgh, and prices show a tendency to weaken further.

Buffalo.—Melters are busy, and the demand for scrap is accordingly stronger, some fair tonnages having been sold. Borings and heavy axle turnings are also in request.

Cleveland.—The labor situation is influencing consumers, who are waiting developments. The scrap market is very dull, and this condition is looked for for some time, transactions even among dealers being few few. A sale of 50,000 tons of heavy melting steel at $21.50 to a large consumer is reported.

Cincinnati.—There is little demand, and the market is weak. While foundry scrap prices are holding their own, steel mill scrap is weak. The car shortage is still being felt.

St. Louis.—There have been some backward movements of scrap prices during the week, but foundry scrap is in good demand. Railroads are offering 4,000 tons, and the Ordnance about 7,000 tons at two different plants.

Birmigham.—There is a better demand for iron and steel scrap, and prices are holding firm. It is probable that there may be an advance shortly, as business for the last quarter is expected to be brisk.

MONTREAL NOTES

Lawrence Russell, vice-president and general manager of the Armstrong, Whitworth of Canada, Limited, will leave on a business trip to England about the first of October. He will be away about six or eight weeks, and during his absence his work will be temporarily taken over by Herbert Johnson.

* * *

D. F. Glass, who has been secretary-treasurer for the Montreal branch of the Navy League of Canada for the past two years, will shortly resign from this position to accept an executive position with the Ocean Accident and Guarantee Corporation, Limited, with headquarters in Toronto. His new duties will be taken up about the first of December.

* * *

In view of the increasing number of tourists coming to Montreal, the Canadian Pacific Railway Company are contemplating the rebuilding of the Place Viger Hotel. The proposed change will transfer the station hotel into a building of ten storeys. During the past summer the city has been taxed in accommodating the travelling public, and many visitors have had to seek accommodation in private houses.

It is the opinion of the officials of the Montreal Harbor Commissioners that the proposed damming of the River St. Lawrence, at Morrisburg and Long Sault, will be of enormous benefit to navigation and power development. The level of the water in the Montreal harbor will be more uniform throughout the year and the danger of floods would be practically eliminated. There is frequently a variation in water level of from 10 to 16 feet, between the spring and the fall.

* * *

Plans are now under way for the construction of a large arena in the City of Montreal, which will have a seating capacity of 6,000. While the idea is primarily one for skating and hockey purposes, arrangements are being made for interchange on summer attractions and other amusements. Plans have been prepared by Chas. M. Mitchell, architect, of Montreal, and the building will be built of wood, concrete, brick and steel. The front of the building is to be in the form of an apartment house, with the arena in the rear. Every modern convenience will be provided. The company will operate under the name of the National Sporting Club, Ltd., which is now in process of incorporation.

* * *

The Standard Equipment and Tool Works have opened an office at 179 St. James St., Montreal, for the purpose of buying and selling of all classes of machinery. They are prepared to purchase metal and woodworking machine tools, as well as contractors' and mining equipment. All machinery will be carefully inspected, repaired or rebuilt, as found necessary, before reselling to the trade. They are in the market to receive offers of entire plants which owners are disposed to sell. Joseph Presner, M.E., is managing director of the company. He was 12 years with Robt. W. Hunt and Co., the last six being spent in executive work in many of the principal offices of the company. He traveled considerably, appraising and inspecting plants and machinery in many cities throughout the United States and Canada.

BIG CONVENTION OF FOUNDRYMEN

Launching to be One of the Events for Those Who Attend Philadelphia Gathering

In recognition of and to commemorate the twenty-fourth annual convention of the American Foundrymen's Association, to be held in Philadelphia during the week of September 29, the International Shipbuilding Corporation has arranged to launch a ship at the Hog Island yard on Tuesday afternoon, September 30. This ship will be named "Afoundria" in honor of the American Foundrymen's Association and the great industry which this organization represents. The "Afoundria" will be christened by Mrs. A. O. Backert, wife of the president of the association.

The launching of the "Afoundria" at the Hog Island Shipyard will be one of the features of the boat ride on the Delaware River Tuesday afternoon, September 30. The boat will leave the Chestnut Street wharf at 1.30 p.m. The name of the ship "Afoundria" was coined from the first letters of the name of the association, namely, A. F. A. and the word foundry.

A Busy Shop.—The Electric Steel and Metals, Ltd., Welland, manufacturers of steel castings, report good business. They have recently installed new cleaning equipment, large core ovens, and sand-blasting machinery. Additions made to building during the war have thus been converted to good purpose.

Welland.—The British American Shipbuilding Co., Welland, are completing their last cargo boat on Munition Board account, and expect to deliver by the end of September. They will then proceed with two 320-foot cargo boats for the Department of Marine and Fisheries. These boats are over canal size and will be taken to Montreal in sections.

MORE ORDERS FOR THE PACIFIC YARDS

Twelve More May be Put Under Way There For Speedy Construction

According to a despatch from Vancouver the construction of twelve more steel ships in Vancouver yards may result from a conference which opened between Mr. Charles J. Fisher, of Seattle, and representatives of local builders.

Mr. Fisher has been instructed by his principals in New York to, if possible, conclude negotiations with Vancouver interests for the undertaking of a programme of constructions which may extend into 1921.

Ships similar to those recently turned out by the Coughlan yards are sought and the division of the work planned would be fifty-fifty as between the Wallace and Coughlan yards, Mr. Fisher said this morning.

Like Government Ships

"Announcement as to the conclusion of negotiations must come from Coughlan's or Wallace's," said Mr. Fisher. "The work planned calls for ships of the same type as those being turned out at the Coughlan yards. There will be changes in certain details, such as the leaving out of equipment for wartime purposes.

"It is planned to begin the work within the next two months and it is expected that one ship per month should be turned out."

Mr. Fisher's contracts would total something like $15,000,000 and would mean increasing the complement of workmen at the local yards to twice the present number. The work would keep the yards busy until the first months of 1921.

Representatives of the local yards were not prepared to discuss Mr. Fisher's visit. Upon his arrival here he was met by Capt. S. F. Mackenzie of the North-Shore yards.

Long Negotiations

It is said that the Seattle man represents Norwegian interests. He has been negotiating with Vancouver shipbuilders for six weeks past. His arrival this morning prepared to discuss the final phases of the business naturally created somewhat of a flurry.

In the event of the deal being closed contracts will be forwarded to New York for the signatures of certain of the contracting parties and Mr. Fisher says a week will probably elapse before announcement of their being signed, sealed and delivered could be officially made.

The South African Trade.—Mr. Egan, the Canadian trade commissioner to South Africa, is spending some time in this country and has been meeting many of the Canadian manufacturers with a view to explaining to them conditions in that country. There has been a report current that some Canadian firms had made a serious mistake in shipping too much to that market immediately on the signing of the armistice, while the freight rates were still very high, around the $60 mark, as against from $20 to $27 now. Mr. Egan, when asked about this, said that the situation had righted itself, and that now there was no glut in the market. Last year Canada had done with South Africa a business worth $9,704,000. The lines of goods needed in South Africa are covered pretty well in the Bulletin issued by the Intelligence Bureau, Department of the Trade and Commerce Department at Ottawa. The tractor is just getting a start in South Africa, and there should be a nice business there for a machine burning crude or coal oil. One thing is certain, and that is that if Canadian manufacturers want to get the best results from the service established by the Trade and Commerce Department they will have to co-operate. If a firm wants to know anything they should ask specific questions. This paper happens to know of one paint firm that sent word to the various trade commissioners, asking what were the prospects for them getting into the South African and Australian markets. Well, under the circumstances, all the trade commissioners could do was to send back word stating the amount of paint that had been sold and where it came from. Another paint maker sent out a list of twenty-five questions along with their color cards, analysis, prices, etc., and then asked the commissioners to answer the questions. It was possible to do so, and very satisfactory results were obtained from the field. There is an opening in the South African market for steel and iron, a fairly large amount of which is now sent in from the Canadian mills.

An Australian Visitor.—Mr. William Hoskin, of Wm. Hoskin & Sons, Sydney, Australia, engineers and jobbers, has been in this district for a few days, prior to leaving for Vancouver, from which port he will sail for home as soon as he can get passage. Trade conditions in his country are satisfactory, considering the manner in which trade conditions had been interrupted with on account of the war. "There should be a bigger opening for Canadian goods than has been made use of so far," stated Mr. Hoskins, to CANADIAN MACHINERY. "We would be pleased to get into touch with any of the Canadian makers of Canadian machinery or tools, who want to know more about the Australian field. It will be a long time yet before Australia will roll all the steel she needs, although good progress has been made in that direction, but it is not possible yet to get it out at a price." The scarcity of shipping tonnage piled up a tremendous amount of wheat in that country and now there are heaps of it waiting shipment. The feeling in Australia is favorable to Canada, but Canadians need more than catalogues to sell their goods. Mr. Hoskins claims that the best results are obtained by firms that have their goods on the field and their own men there to introduce them.

Representation in Australia.—Information in regard to this can be secured from the Intelligence Branch of the Trade and Commerce Department at Ottawa by mentioning No. 2201. A manufacturers' agent in Sydney, New South Wales, is in a position to represent reputable Canadian manufacturers in Australia and New Zealand. He will make personal visits to Melbourne, Adelaide, Perth, Brisbane, Auckland, Wellington, Christchurch, and Dunedin each buying season (twice a year), and will have resident agents in each centre. He will only do business with wholesale firms, manufacturers and large retail shops, consequently the business is big. He would require to act as the selling agent and require the selling firm to quote always c.i.f. and e. Sydney, with 5 per cent. commission included for himself. Would cable all orders for confirmation and post contracts containing speculation of colors, designs, etc., accompanied with a letter of credit for the full amount of invoice from buyers that can be drawn by sellers at sight for two to four months when shipped. Firms must give a written guarantee that all shipments are equal to their samples. Three years' agreement with, if mutually agreeable, extension for a further three to five years' period.

POINT NOT SETTLED AT OTTAWA

Continued from page 328

representatives were represented with words, the so-called capitalists had almost a monopoly of the facts and statistics given to the assembly. Labor argued from what it had been able to force on capital in the past in Canada and other countries; capital presented the statistical position of the different industries, produced evidence to show what had followed the introduction of the minimum hour day in other countries, and the present position of industry in Canada. And labor listened with smiling tolerance.

Threats Were Few

Only in a few cases was the note of intolerance struck, and it was mainly in the case of some more or less notorious labor delegates such as James Winning, one of the leaders of the Winnipeg disturbance. There were threats of what would happen if the 44-hour week did not come; but mainly labor seemed to have a supreme confidence in its strength to secure its desires.

On the whole the conference should do good. It will be an expensive matter. With about two hundred delegates, with an expense allowance of $10 a day each, and an average of about ten days from the time they leave home until they return, the "indemnity" will run into a matter of close on to $25,000; but it will have been well spent if labor and capital can be brought to see each other's problems face to face, and to learn the necessity of give and take, and of increased production to help meet Canada's enormous commitments and debts. —T.M.F.

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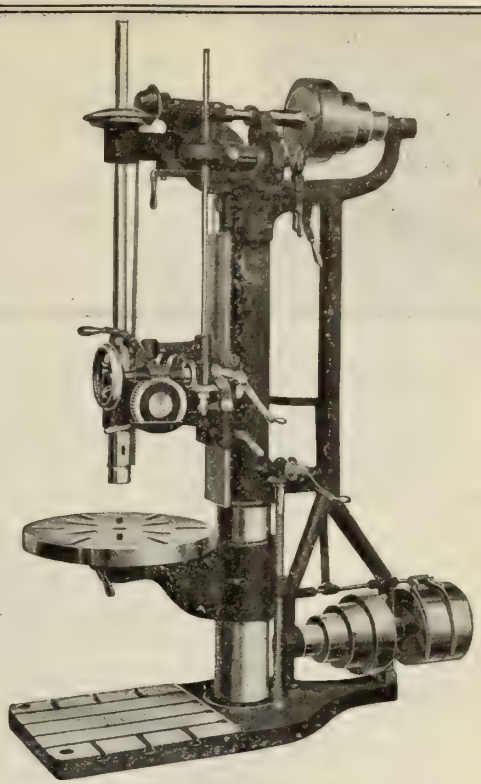

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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

OBITUARY

The death is announced from Nova Scotia of Mr. George Gray, assistant general manager of the Acadia Coal Co. Mr. Gray passed away at his home in Stellarton after a short illness. His connection with the Acadia Coal Company dates from 1883, when he started as a clerk in the office in Stellarton. He advanced step by step to his position as assistant general manager. He is survived by a widow and two sisters.

PERSONAL

Wm. E. Kelly, president and general manager of the Kelly Reamer Co., Cleveland, has retired from his position, his duties being turned over to J. M. Davie, assistant general manager.

It may interest your readers to know that Mr. E. G. Buckwell, secretary and manager of sales of the Cleveland Twist Drill Company, has just returned from a three months' visit to England and the continent, where he has made a thorough trade investigation in conjunction with the European branch of the Cleveland Twist Drill Company—Cleveland Twist Drill Company of Great Britain, Ltd., London.

Purchasing Agents Meet.—The Purchasing Agents' Association of Toronto held their monthly dinner meeting at the King Edward Hotel Wednesday evening. The dinner was largely attended and a very interesting address was given by Mr. J. R. K. Bristol, manager of the Tariff Department of the Canadian Manufacturers' Association, on "The Reason for a Tariff, the Recent Changes, and the Future Outlook," which allowed a great field for discussion. The members also enjoyed a musical programme. Mr. J. I. Nicholson, of Gunns, Limited, and Mr. G. P. Biswick, of the Polson Iron Works, were elected delegates to the convention of the National Association of Purchasing Agents at Philadelphia, Pa., Sept. 22, 23 and 24.

Hercules Smart, formerly manager of the New York office of Illinois Tool Works, Chicago, has been appointed to succeed Mr. D. J. Rice as manager of the company's Detroit store.

TRADE GOSSIP

Rumored Big Concern.—It is being stated that an organization with a capital of $15,000,000, will be located in Toronto, to build locomotives.

Inducements to Industries.—The town of Deseronto is advertising its willingness to grant free sites and tax exemption to any industry locating in the city. Two large boards, containing the offer, will be erected at the railway entrances to the town.

Machine Industry Better.—From Galt comes the good news that the Canada Machinery Company employees are once more on full time. For a while the plant has been shut down Saturday all day, but the demand for wood-working machinery has so increased that full time is again necessary.

No Sign of Settlement.—The case of employees on the Welland ship canal has been taken out of the contractors' hands and is now under the jurisdiction of the Department of Railways and Canals. The men have sent a telegram to Tom Moore, President of the Dominion Federation of Labor, requesting him to get in touch with the minister, with a view to expediting matters.

Prescott to Get Coal Terminals.—The G.T.R. are said to be conducting negotiations with a view of erecting coal terminal facilities at Prescott. The project would necessitate the formation of a subsidiary company to operate a car ferry between Prescott and Ogdensburg. By this means coal that enters this country by way of Rouse's Point for Montreal and Ottawa Valley points, would be routed through Ogdensburg.

Lower Ocean Rates.—The greatly accelerated production of ocean shipping will undoubtedly soon have an effect on the rates for ocean-born freight. According to Lloyd's there are now 2,500,000 tons more steam vessel space than before the war. Another 10,000,000 tons is building, and the effect of this new cargo space on prevailing rates is sure to be in the way of reduction. In fact, some people prophesy a drop sharp enough to be termed a crash.

New Glasgow Strike Ends.—After a strike lasting less than a week, the men employed in the New Glasgow yards of the Nova Scotia Steel Co. returned to work. Some concessions were made by the company, but none of the specified demands have really been granted. The company guaranteed that on the completion of the two ships now on the stocks, a new 6,000-ton vessel will be laid down.

Good Trade Balance.—The figures for Canadian export and import trade for the month of August show up in a satisfactory manner. Exports for August, 1919, exceeded those for August, 1918, by $26,000,000, while imports for August show an increase over that month last year of only a little more than $1,000,000. Total exports for August amounted to $116,564,792, against $90,153,888, while imports amount to $81,357,485, as compared with $79,652,526.

Subsidies for Shipbuilding.—At the meeting of the Port Arthur Board of Trade a letter was read from Mr. J. F. Paige of the Port Arthur Shipbuilding Co. Mr. Paige asked for the endorsation of a petition to the Government asking for the granting of a subsidy of $10 a gross ton and $10 per indicated horse power to Canadian shipbuilders. Mr. Paige said that there was $47,500,000 invested in Canadian yards, and the pay roll was $42,000,000, while the associated industries received wages amounting to $40,000,000.

Workman Sues Iron Company for $9,000.—R. Baltschunas, a former employee of the Canadian Tube and Iron Company, Limited, Montreal, is suing this firm for $9,000, claiming, it is said, that he received permanent injuries while operating a machine used in making gun shells. In his allegation the plaintiff claims that an apparatus, which was designed to stop the machine, failed to work. He maintains that he was instructed by his foreman to apply an iron tube or pipe as a lever when he desired to halt the machine. Though what he claims to be negligence, as stated, he makes the above statement of claim. It is understood that the defendant company disclaims any liability or negligence.

Prescott.—The town of Prescott is looking forward to the deepening of the Welland canal and is trying to secure Government docks. The water front is at present in private hands. The matter has been brought to the attention of Hon. Dr. Reid, Minister of Railways and Canals, who represents the town.

Three Rivers.—The steamer C-9, the ninth vessel built at the National Shipyards, Three Rivers, was launched successfully. The christening ceremony was performed by Madame J. A. Tesser, wife of the Provincial Minister of Highways. The company have an-

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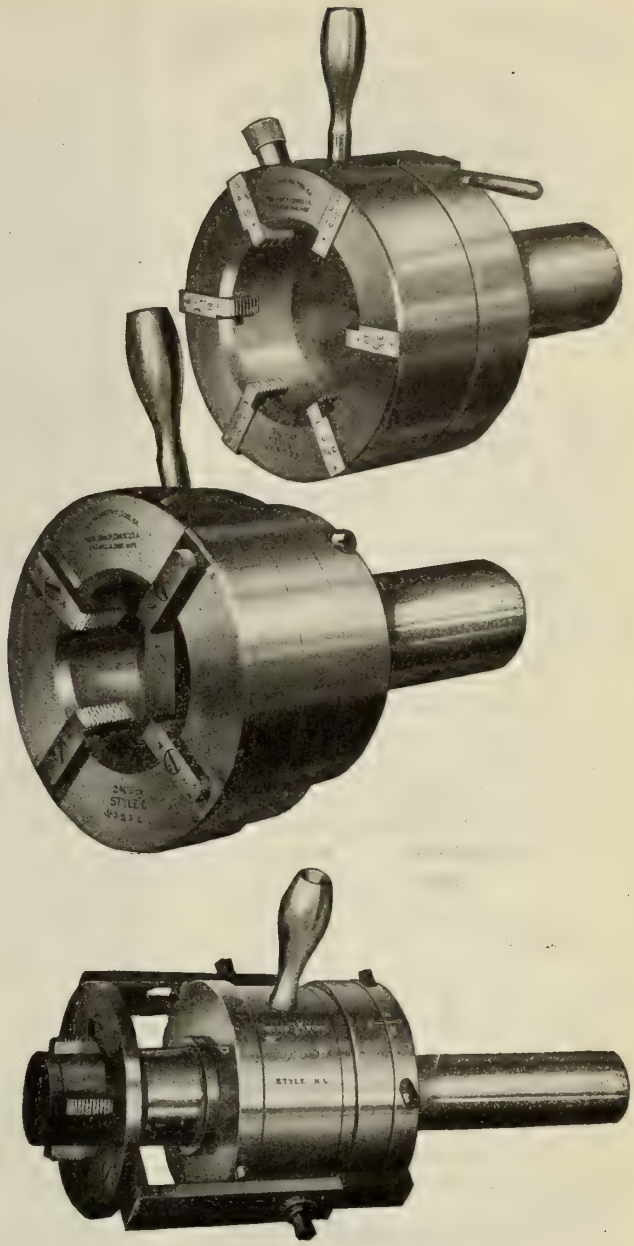

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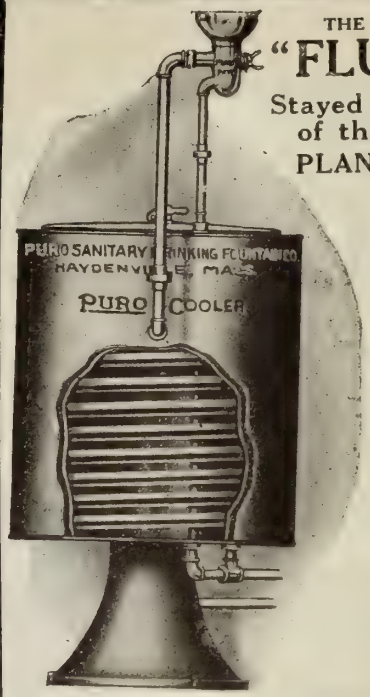

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other vessel to launch on the present contract, and have a further contract for four large steel vessels for a French firm.

Bought Furnace.—After an extensive investigation of the various types of electric furnaces and a visit to the U.S. Navy Yard at Puget Sound, where a 6-ton "Greaves-Etchells" furnace is in operation, the Vancouver Engineering Works, Ltd., Vancouver, B.C., has given an order to the Electric Furnace Construction Company for a "Greaves-Etchells" furnace.

Port Salon Ireland.—Salvaging the cargo of the "Laurentic," or that part of it which was formed of specie, is proceeding successfully. The strong room was blown open and a passage made for the divers. After a few buckets full of copper and silver coins had been sent up the work of salving the gold was started. The gold is sent up three bars at a time, each bar being worth about $5,000 and weighs 28 pounds. The whole cargo of bullion is valued at $35,000,000.

Toronto.—The crew of the barge "Chickamango," consisting of six men and a woman, were saved from drowning in Lake Huron by the gallant action of two men. The large was being towed by the steamer "Centurion" when she sprang a leak and sank. A heavy gale was blowing and the "Centurion" was unable to render any assistance to the crew of the barge. She therefore put into Sand Beach and blew distress signals. The tug "James Whalen," Capt. Graham, chief engineer M. Hepburn, put out and in spite of the darkness and heavy sea rescued the six men and the woman. The American life-saving station rescued three more.

Open New Office.—The Carborundum Company announces the opening of branch offices and warehouse in Detroit, Mich. The new Detroit quarters will be located in the Burkhardt Building at Second and Larned Streets. The Detroit branch is under the management of Mr. Anthony Dobson, who will have charge of the Detroit sales district. The new offices and the warehouse are opened with a view to giving quicker and better service to the users of Carborundum products in the Detroit district.

Machinery Wanted in France.—Hon. Philippe Roy, Commissioner General for Canada in Paris, France, reports that Captain Bisson, of the "Office de Reconstitution Industrielle des Departments Victimes de l'Invasion," 14 Rue de la Tremoille, Paris, would like to get into communication with Canadian manufacturers who can make prompt delivery of the following articles and the prices at which they could supply: Vertical lathes, milling machines, shaping machines, automatic lathes, machines for rolling mills, mortising (slotting) machines, planing machines, boring machines, grinders.

Brantford Planning. — Following out the plan that has been adapted with advantage by some of the larger American cities, Brantford is considering the formation of a City Planning Commission,

which would consider and pass upon all municipal improvements of any kind, such questions as zoning, streets, buildings, parks—everything having to do with growth and development along systematic lines. What is more, Brantford has in view a population of 50,000 or more, and after all is said and done the people realize that it is desirable to have a city that will compare favorably with any.

Robbins and Myers' Plant.—The Robbins & Myers Co., Springfield, O., manufacturers of generators, electric fans and motors, are locating a Canadian factory in Brantford. It is announced that they will erect a factory on what is known as the Waterworks property, occupying ten acres. The concern will begin operations with about 300 employees. The industrial commission of Brantford is negotiating with several other firms planning to open branches in Canada.

Scrap Prices High.—Reports from the Welland and St. Catharines districts place values of from $13 to $16 a ton on available high-grade munition scraps, with every indication of still higher prices.

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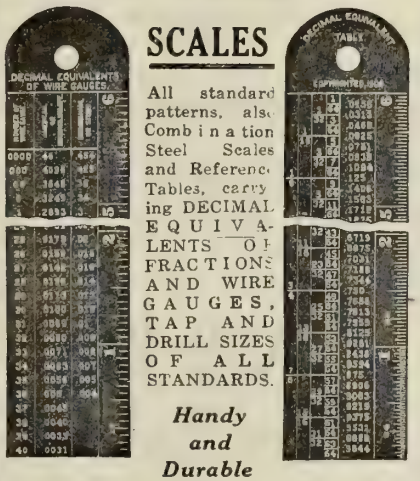
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A firm of Canadian engineers to manufacture and sell on royalty basis a hand-operated stoker. This is an established appliance, and is the ideal installation for the small plant, where investment cost is an important item. Combustion principles are same as on highest priced automatic stokers. The ideal stoker for the Canadian market, where the one boiler plant is in the majority. Write to Box 632, Canadian Machinery, 143 University Ave., Toronto, Canada.

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Two Canadian Patented Steam Specialties for sale; one Steam Trap, Patent Number 187215, and one Steam Separator, Patent Number 183340.

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Mill lengths of the following sizes:—		Diameter
30,000 lbs...	.250"	¼"
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62,500 lbs...	.625"	⅝"
73,250 lbs...	.750"	¾"
27,500 lbs...	.9375"	15/16"
46,750 lbs...	1.000"	1"
45,000 lbs...	1,250"	1¼"
26,000 lbs...	1.375"	1⅜"
39,000 lbs...	2.000"	2"

Above is all new material stored at the manufacturers' plant in Connecticut, ready for prompt shipment and has passed Government inspection. **Address Box 625 Canadian Machinery.**

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Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.
Ingersoll-Rand 800 ft. Air Compressor.
1 Tube Mill Fraser & Chalmers 5 x 22.
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Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

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One Oliver Tool Room Lathe, 16 in. by 7 ft. bed, complete with taper attachment, relieving attachment, chuck, etc., hollow spindle, double back gear, large and small face plate and steady rest, in perfect condition.

One LeBlond Tool Room Lathe, plain change gears, single back gear, hollow spindle, 16 in. by 6 ft. bed.

Ten C.M.C. Lathes, 20 in. by 8 ft. bed, double back gear, hollow spindle, semi-quick change gear.

Two Davenport, 22 in. by 10 ft., quick change gear Lathes, like new, very cheap.

Also full line of other Machine Tools and Woodworking Machinery. For full particulars apply to the Standard Equipment & Too lWorks, 179 St. James St., Montreal, Que. (c15m)

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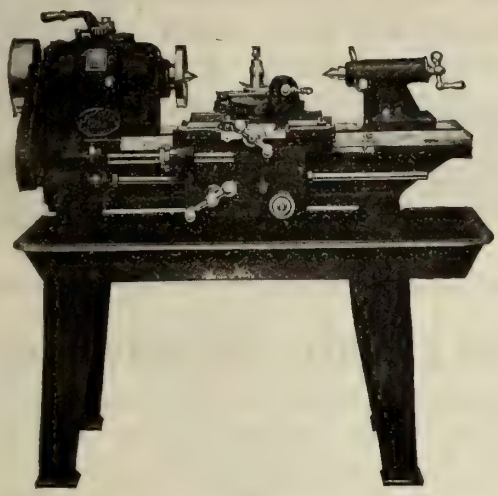
Write S. A. GIBSON, Industrial Commissioner, or MAYOR J. V. BUCHANAN, Ingersoll. c14m

Wanted representing agents and merchants to sell and represent firm manufacturing Milling Cutters, Twist Drills, Reamers, Lathe Tools, Planer Tools, High Speed Steel and Alloy Tools, and Merchants' Tools. Good terms and discounts for selling or representing offered. Apply Lawton Bros., Woodseats Engineering Works, Sheffield, England. c13m

ADAMS SHORT CUT LATHE



Floor space 54 x 28. Swing 13⅝. Between centres 20″. Will do 50 per cent. more work than regular engine lathe of same capacity, and will do it better.

For those making short, duplicate parts, twist drills, machine, automobile parts, etc., this lathe is unexcelled.

Last week Ford Motor Car Co., and Hudson Motor Car Co. of Detroit bought seven. Westinghouse Electric and Brown-Lipe-Chaplin Co. added several to their present installations.

This lathe will make you money. Get particulars to-day from

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An excellent opportunity is offered to established brass manufacturing shop or a small manufacturing company to be organized to produce in Canada complete line of welding and cutting apparatus.

This equipment was placed on the United States market early in 1918, is fully protected by United States patents, and Canadian patents have been applied for within the required time.

Already being sold in Canada to an extent which will insure success of Canadian manufacturing company. Can be handled either direct or through jobbers. Net profits very large.

Patents, complete blue prints and specifications of entire line, as well as initial services of designer and inventor, may be obtained at a reasonable figure.

Box 631

Canadian Machinery and Manufacturing News

Toronto, Canada

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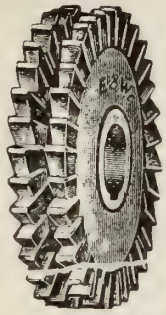
Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

Elliott & Whitehall Machine & Tool Co.
GALT, ONTARIO, CANADA
MILLING CUTTERS AND SMALL TOOLS



We manufacture the following tools, etc.

Standard and Special Milling Cutters of all descriptions, Gear Cutters, Hand Reamers, Shell Reamers, Chucking Reamers and Taper Pin Reamers, Lathe Mandrels and Arbors, Metal Stamping Dies, Gauges, Jigs and Fixtures, Etc.

All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.

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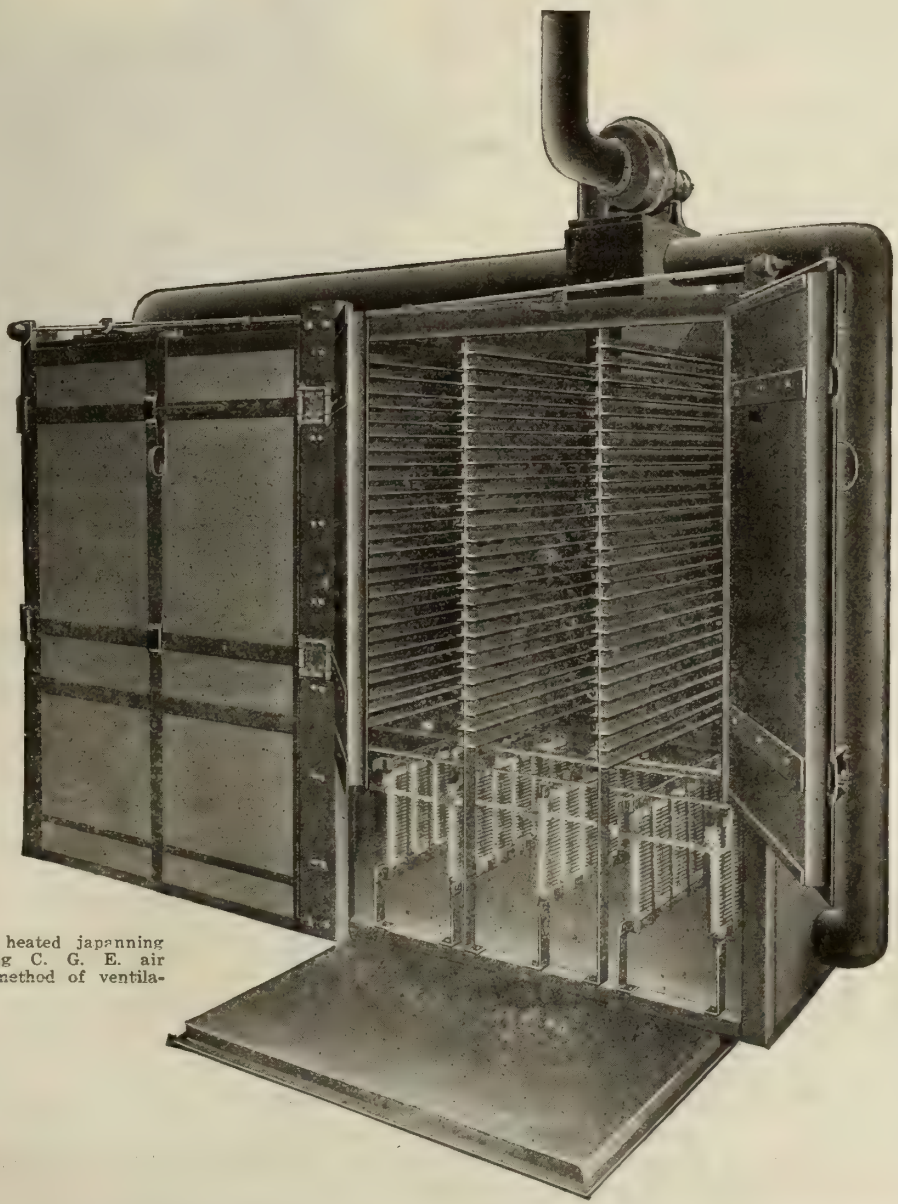
C. G. E.
Electric Ovens



Electrically heated japanning ovens showing C. G. E. air heaters and method of ventilation.

Experience proves that electric heating gives perfect heat distribution and permits greater flexibility in temperature control than can be obtained with fuel. The resister material in C.G.E. Heaters is capable of enduring a continuous heat of 800° C. (1472° F.). It is carried on insulating material which maintains its insulating qualities at 1000° C. (1832° F.) with no expansion or contraction.

Write our nearest Sales Branch for full particulars

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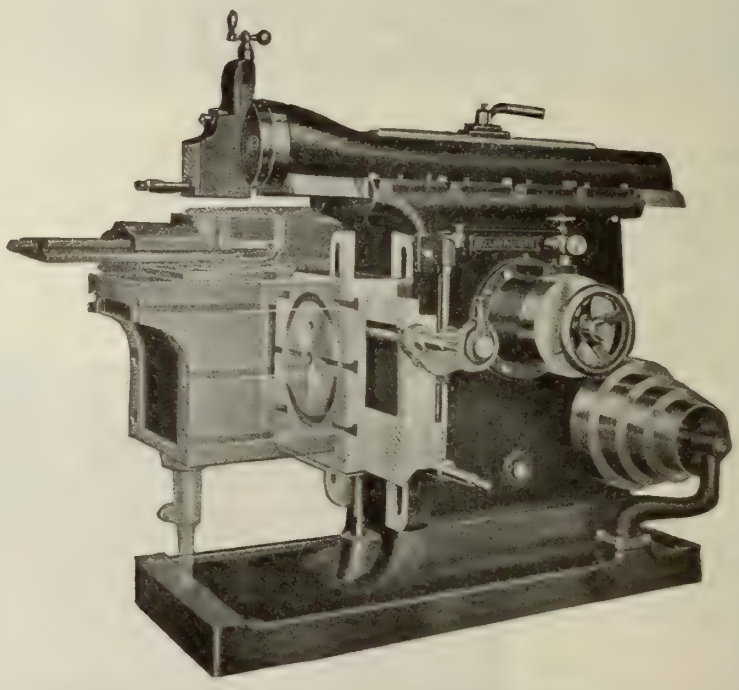
Milwaukee Shapers

Are needed in Up-to-date Canadian Shops

Milwaukee simplicity, power and accuracy play an important part in turning overhead expense into profitable production.

Milwaukee Back Geared Crank Shapers are built in 16-inch, 20-inch and 24-inch sizes.



MILWAUKEE SHAPER CO.

1029 Coldspring Ave.

Milwaukee, Wisconsin

4¾ Min.

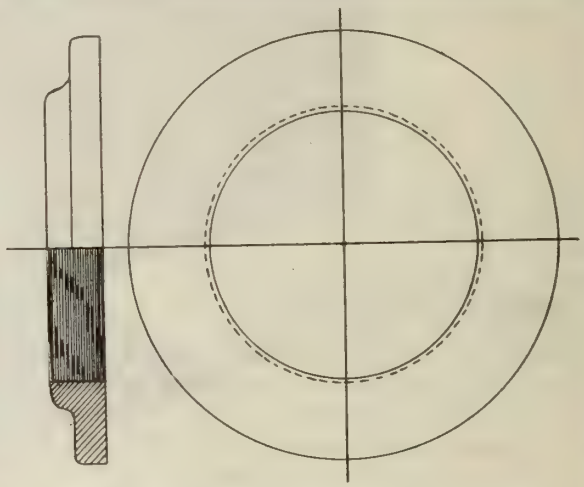
To Complete Operation on this 125-lb. Standard Cast Iron Piece with

SMALLEY-GENERAL THREAD MILLER

Milling and facing a standard cast iron flange in 4 min. and 45 sec. is a performance that must appeal to every machinist. This is what the Smalley-General Thread Miller accomplished, on the piece illustrated herewith. This is saving time and cutting costs with a vengeance.

Have you a manufacturing proposition that needs stimulating? Then the Smalley-General Thread Miller is the machine you need.

Send us blue prints, or actual piece of work. Our engineers will then show you how our Miller will turn out the work for you.



Typical Operation and Time Study

Machine—Smalley General Flange Thread Miller No. 1. Air operated collet Chuck.
Piece Milled and Faced—Standard cast iron 125 lb. pressure 8" flange. Facing 13½" O.D. x 8¾" I.D.
Thread—8⅜" diameter, 1¾" long, 8 pitch Briggs tapered.

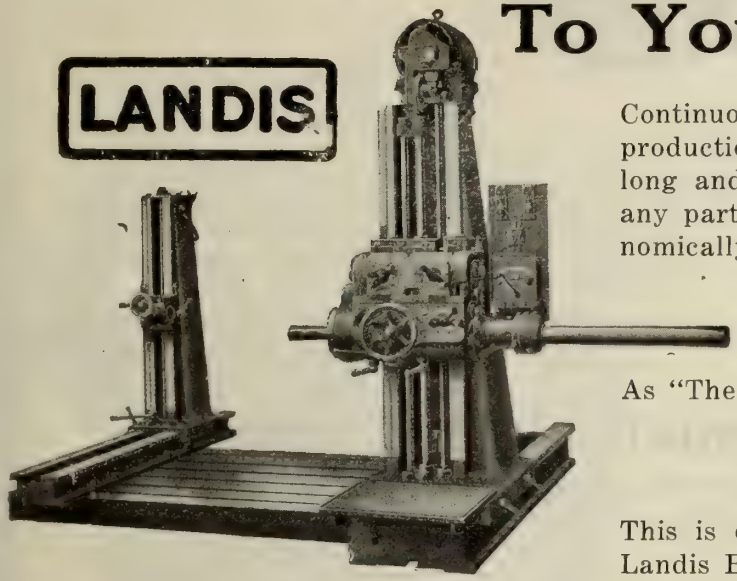
Time study—	Min.	Sec.
Chucking from floor	..	15
Facing ⅛" feed	1	40
Adjusting hob	..	10
Milling	2	30
Removing from chuck	..	10

Time complete operation, floor to floor.. 4 min. 45 seconds
Milling Feed—10½" per minute. Limits .003. Entire flange finished in one chucking. Face and threads in perfect alignment.

SMALLEY-GENERAL CO., Inc., BAY CITY, MICH.

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

Does Continuous Operation Mean Anything To You?



Continuous operation means more than super production; it means the ability to withstand long and continued abuse without failure in any part and yet produce accurately and economically.

As "The Cincinnati Planer Co." states:

"It is operating night and day, on very heavy work, without a moment's trouble, and is giving first class satisfaction."

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60 Rivets in a Minute

Faster if the work can be fed faster.
But at least 60 every minute.
And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

GRANT

Rivet Spinning Machines

handle any rivet up to ¼-in. shank.
If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.
The Grant Book called "Perfect Riveting" tells how to give an extra appearance of quality to your product. For your copy

Write to-day

GRANT MFG. & MACHINE COMPANY

Holland Avenue, Bridgeport, Conn.

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"There's a Drill Speed **NATCO** *for Every Need"*

The Detroit Gear Grinding Machine Company use NATCO Multi-Drillers in completing the drilling of 46 Clutch per hour. Each hub has four ⅜-in. and four 25/64-in. holes which are drilled ⅜-in. deep in one operation. In the next operation four of the holes are countersunk.

Change of Speed for each Spindle permits each tool to remove its proportional amount of metal. Idle spindles are in neutral, saving wear and power. Results are greater production with less wear and breakage of drills.

If you have more than one hole to drill in a given piece there's a NATCO for the job. **NATCOS are built in 11 sizes, ranging from 2 to 72 spindles.**

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drillers.

National Automatic Tool Company

Richmond, Ind., U.S.A.

List of NATCO *Foreign Agents:*

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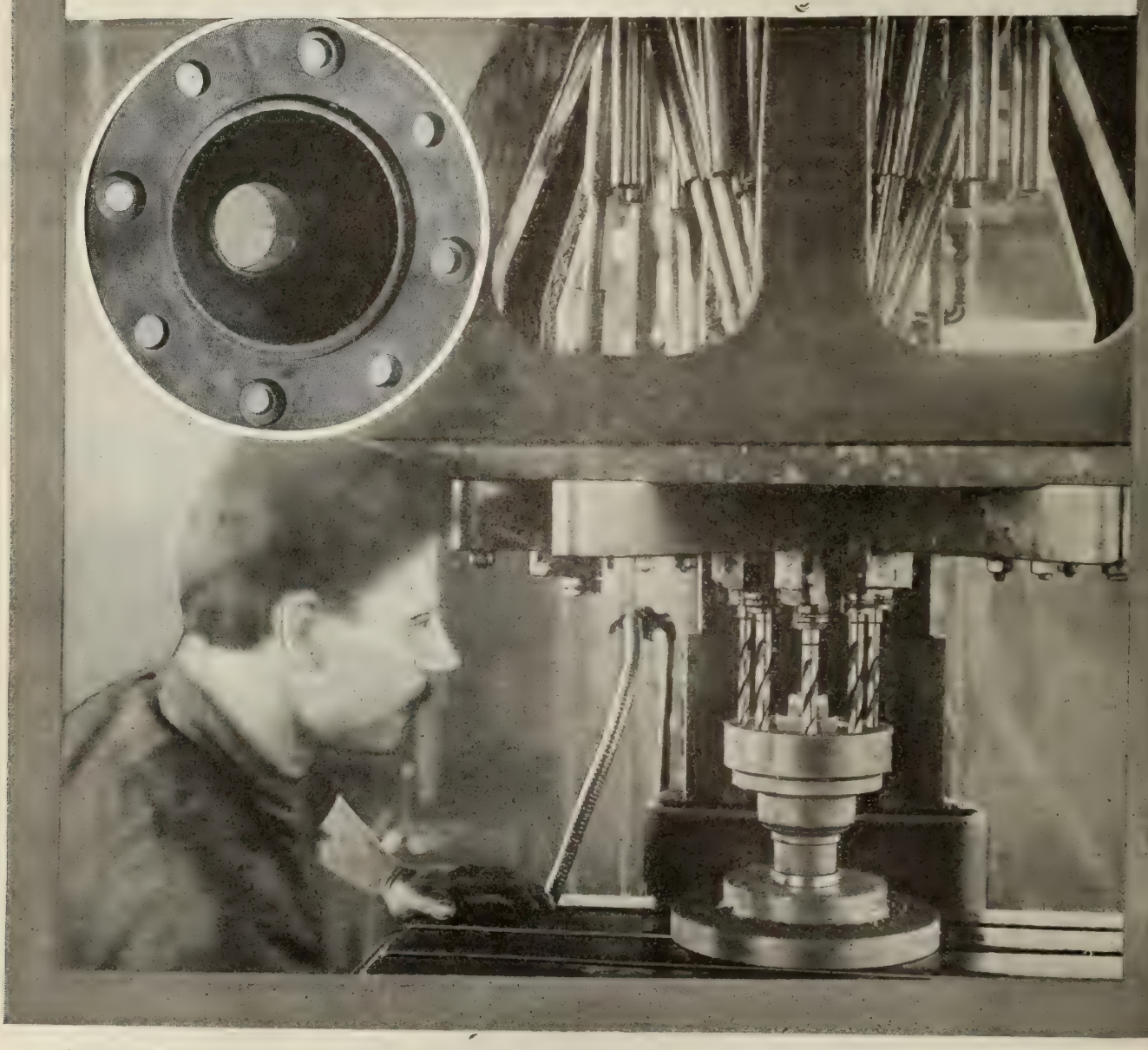
E. Isbecque & Co., Belgium.
Aux Forges De Vulcain, France.
Allied Machinery Co. of America, Italy, Spain, Portugal and Switzerland.



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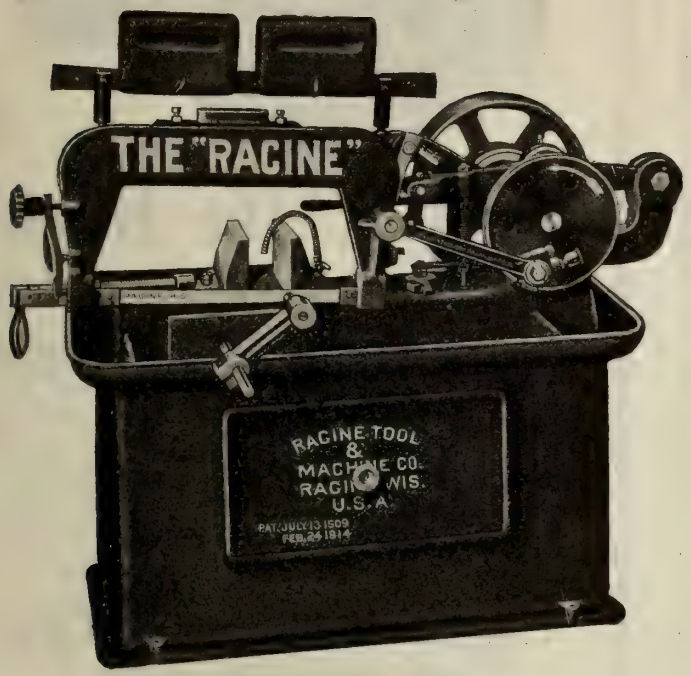

HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic liftting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

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Use "Racine" H.S. Tungsten Power Blades

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Melbourne Avenue, - RACINE WIS. U.S A.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

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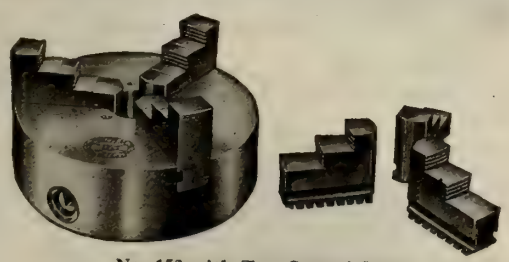

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Have many points to recommend them. SOLID BODY —Gives strength and rigidity. WEIGHT—All parts are heavy and strong, and reinforced where necessary.

QUALITY OF MATERIAL—Best that can be procured.
LAST AND BEST OF ALL—ACCURACY. Union Chucks are Accurate.
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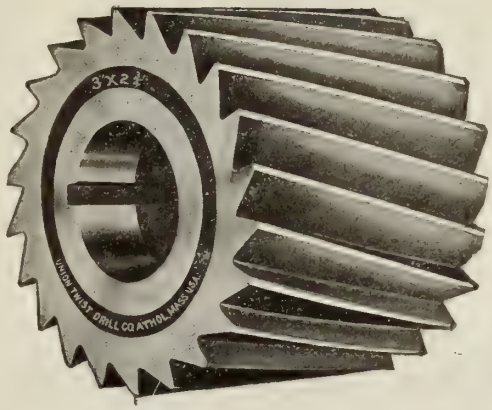

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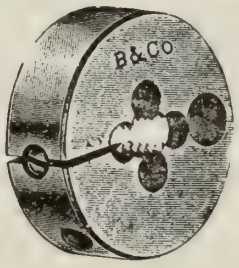

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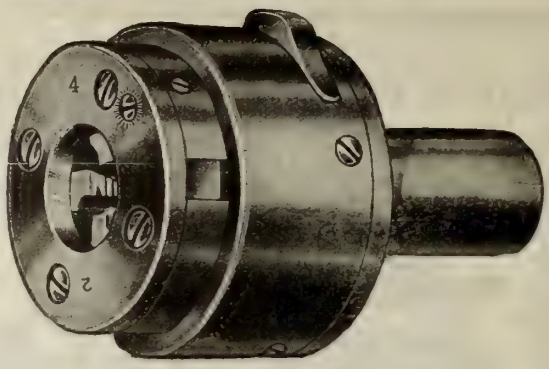

H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

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Eastern Machine Screw Corp.
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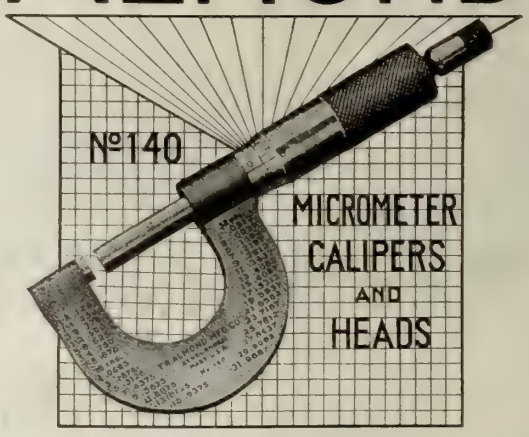

All Almond Micrometers are inspected and adjusted to Johansson Gages and recognized comparison only with these gages.

Almond Service.—Should the Micrometer need readjusting at any time or defect in material or workmanship develop send to Ashburnham and readjustment or replacement will be made without expense.

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Fits Any Make Drill

A friction mechanism inside the body of the attachment is automatically adjusted by the driving-pressure, creating a very sensitive drive and eliminating the sudden strain of the reverse—responsible for many broken taps. This attachment is fitted with a plain chuck with jaws that grip both the round and square end of the tap shank.

Made to take taps from 3-32" to 1-4" in diameter.

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FOR NEARLY 60 YEARS

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Files That Save Time and Effort

and do their work with an efficiency that brings satisfaction to the workman—

That is the reputation enjoyed by Famous Five Files for more than fifty years.

Accurate grinding, cutting and scientific hardening give the highest cutting and wearing qualities to Famous Five Files.

Give men Famous Five Files, and teach them to throw away a file as soon as it becomes dull, and you will get the best results.

Specify them when ordering.

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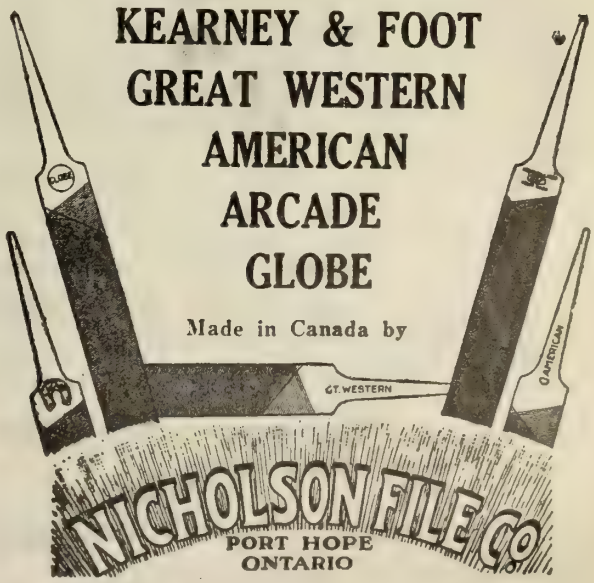

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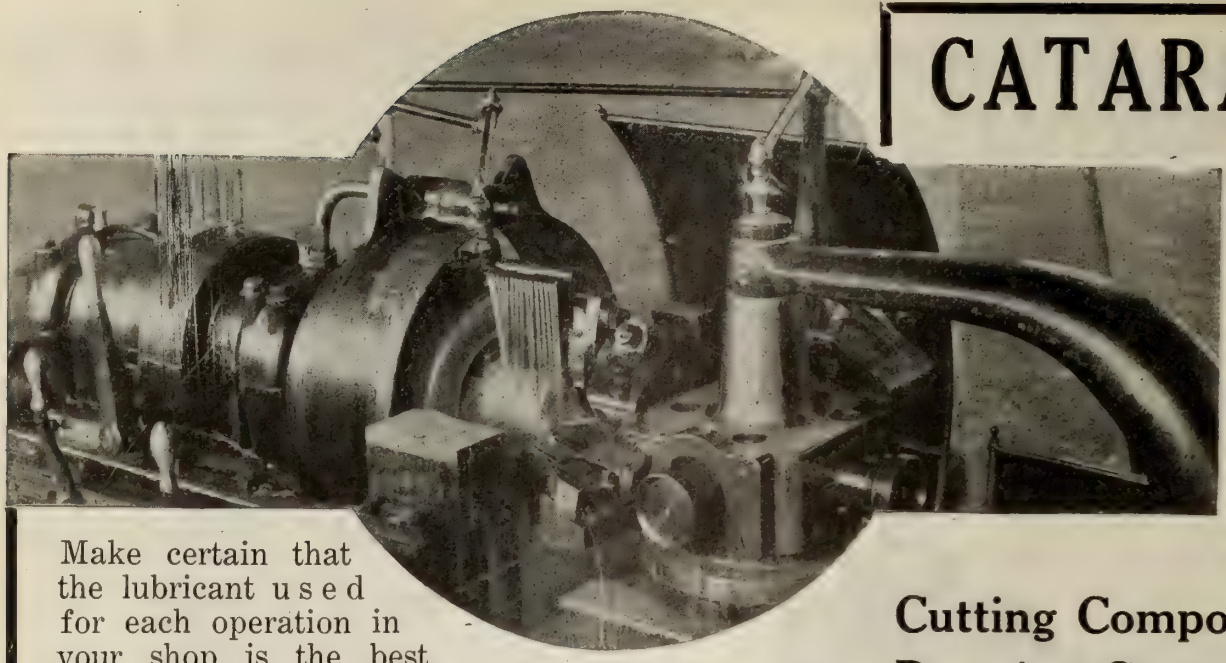

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SPECIAL

Make certain that the lubricant used for each operation in your shop is the best obtainable for the purpose. Otherwise your men and your tools and your machines work at a disadvantage.

Write us to-day that we may demonstrate how Cataract Lubricants can increase production and reduce cost in your plant.

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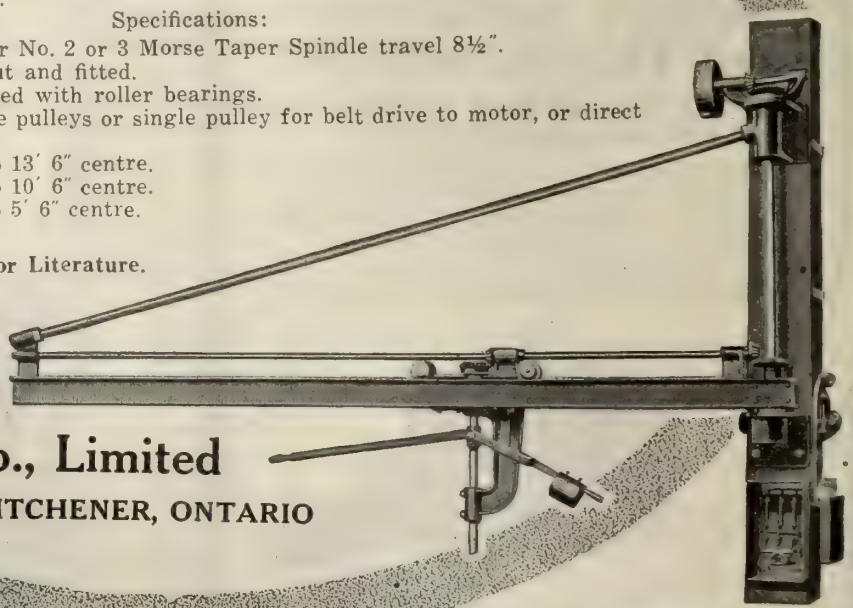
Built for Service

The Canadian Radial Drill is designed particularly for work in structural shops. For seaming and countersinking large surfaces such as structural shapes, boiler plates, long beams, etc.

Specifications:

Spindle 2 3/16" diameter No. 2 or 3 Morse Taper Spindle travel 8½".
All gears accurately cut and fitted.
Carriage wheels equipped with roller bearings.
14" x 14" tight and loose pulleys or single pulley for belt drive to motor, or direct connected to motor.
15 ft. Beam will drill to 13' 6" centre.
12 ft. Beam will drill to 10' 6" centre.
7 ft. Beam will drill to 5' 6" centre.

Write Dept. 16 for Literature.



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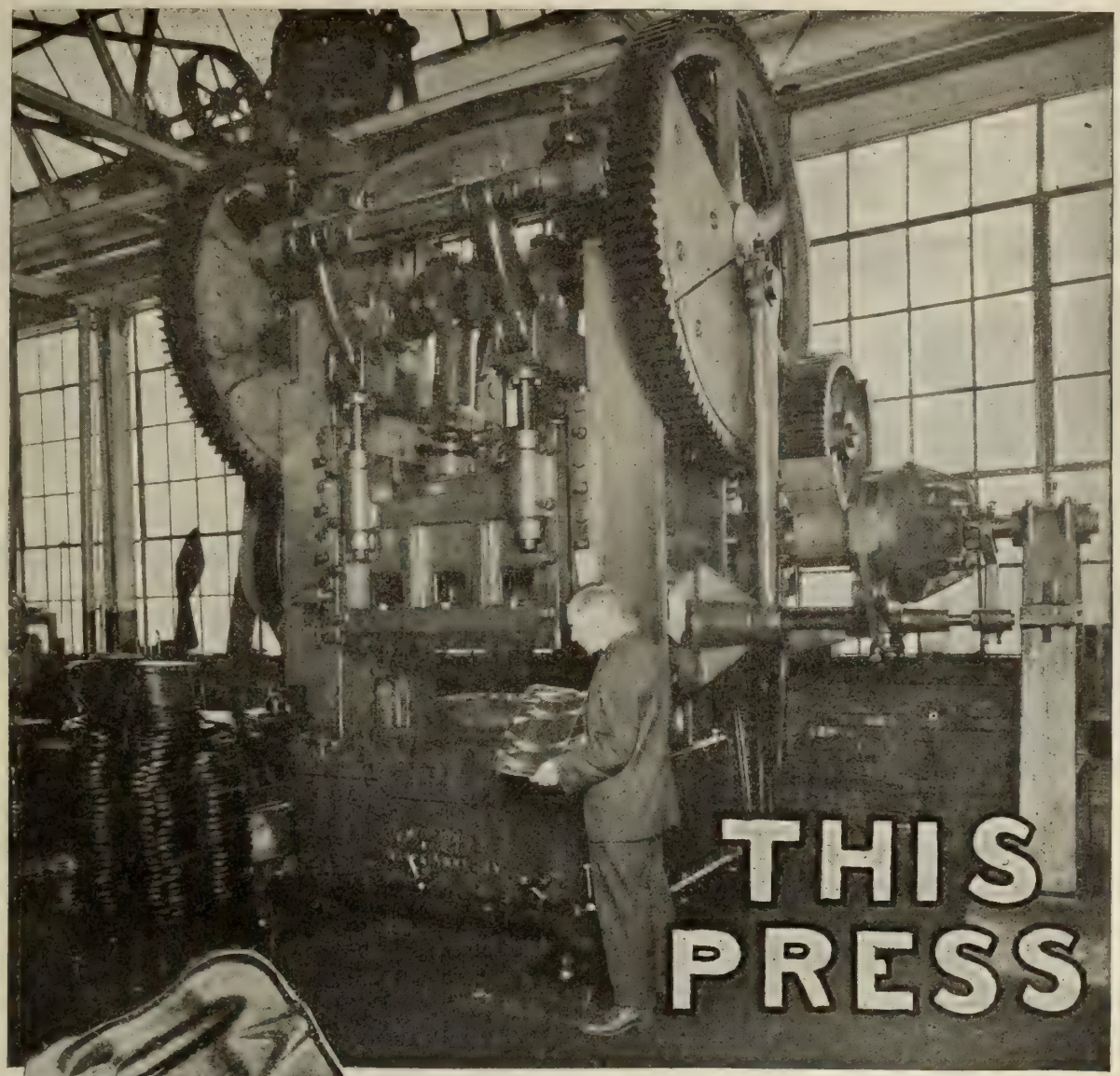

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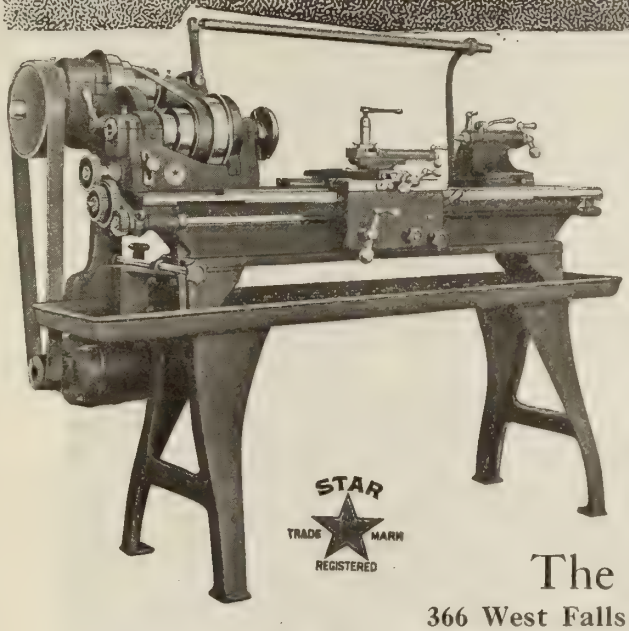

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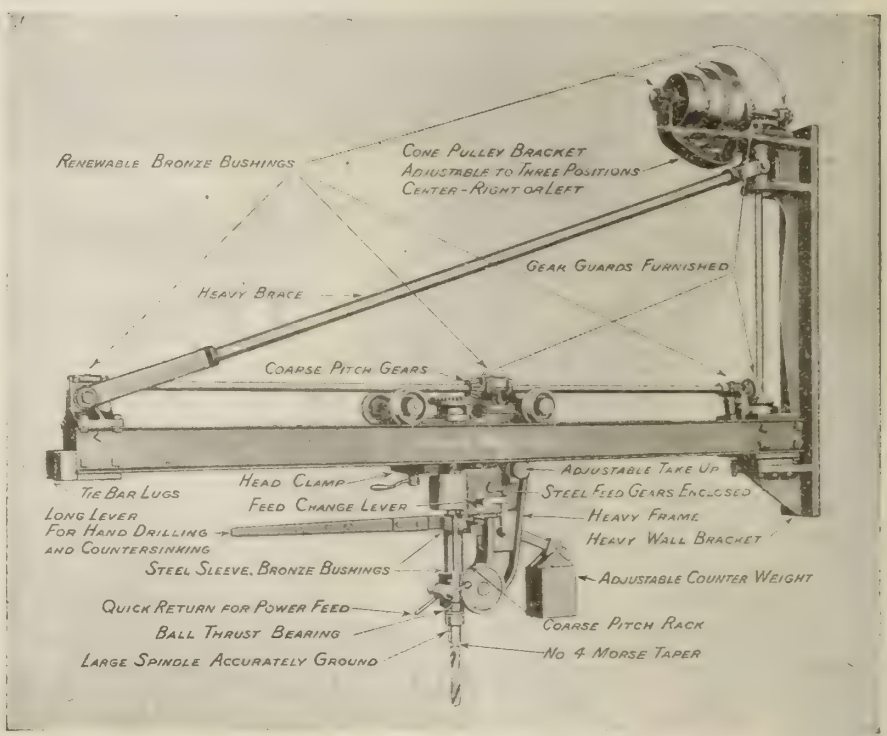

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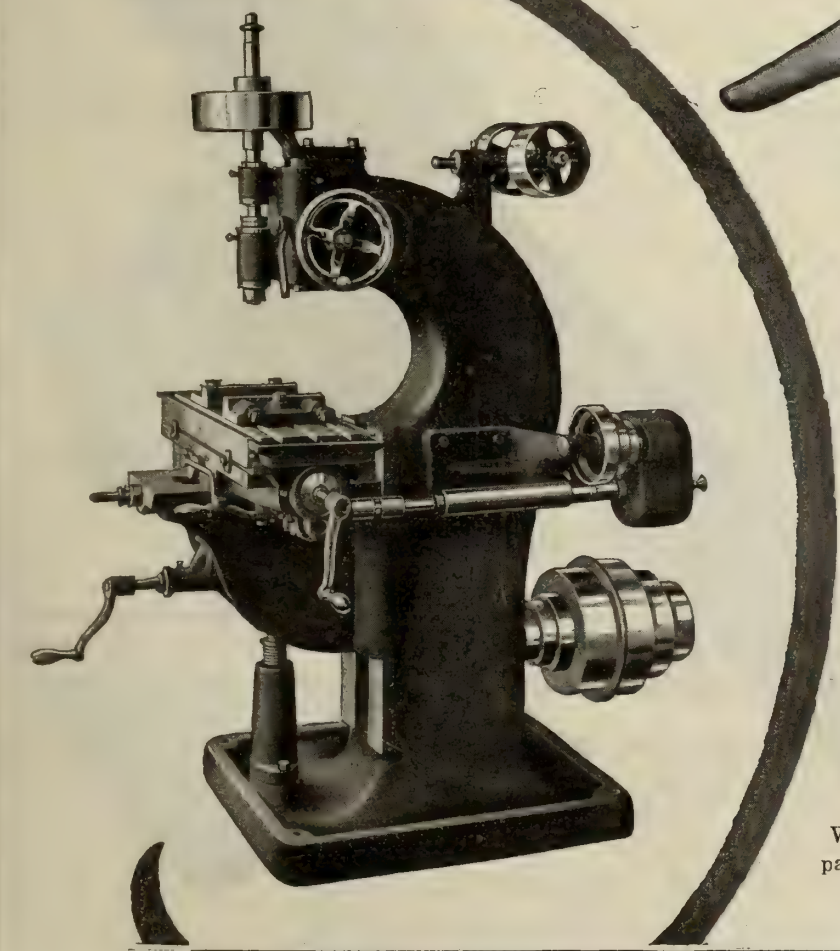

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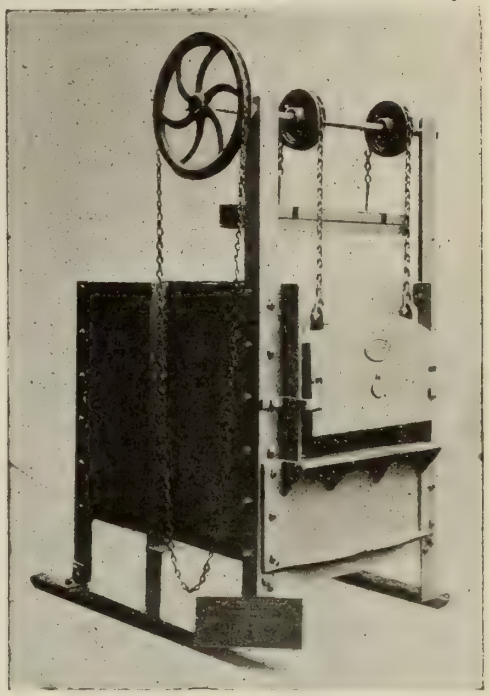

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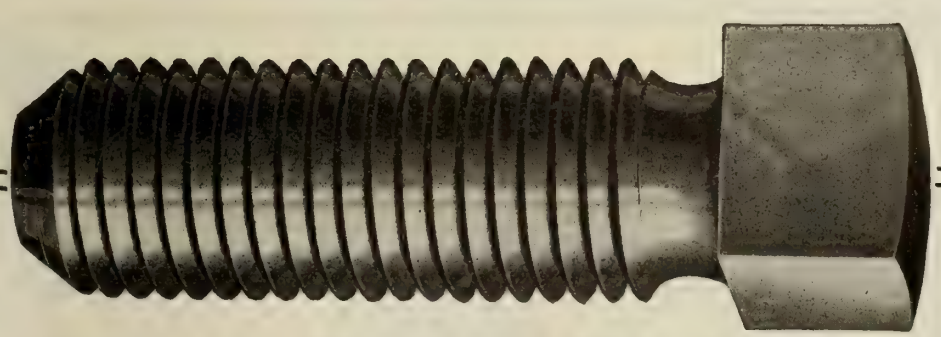

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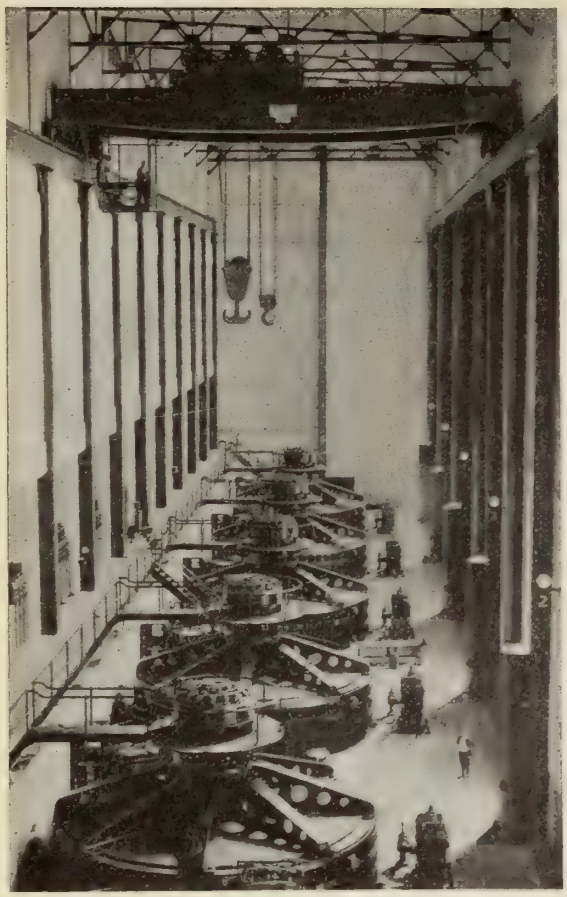

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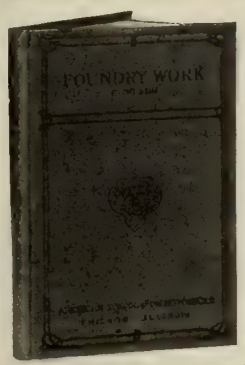

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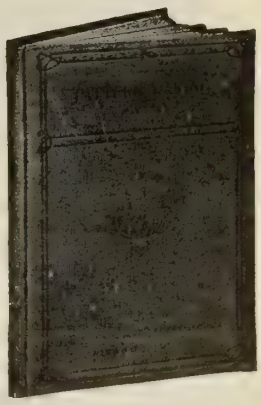

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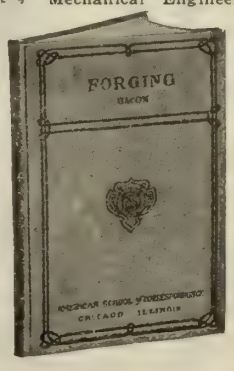

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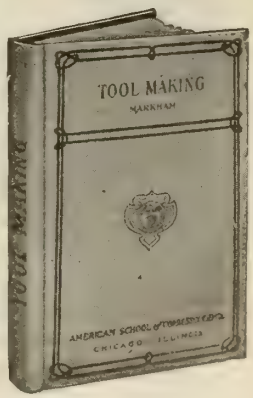

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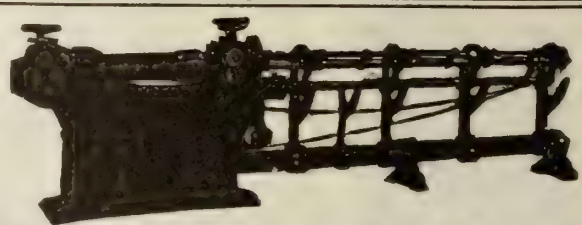

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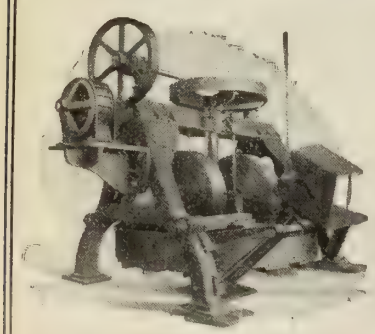

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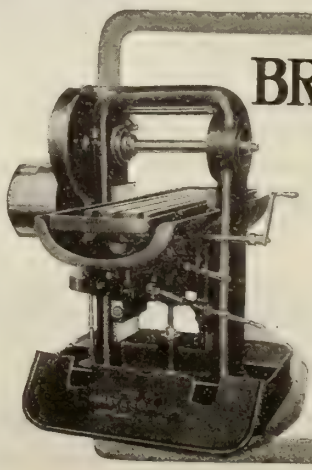

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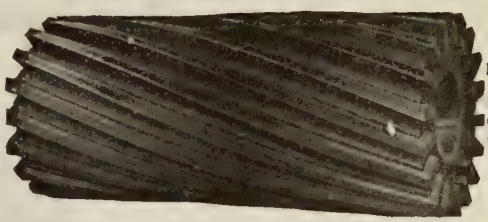

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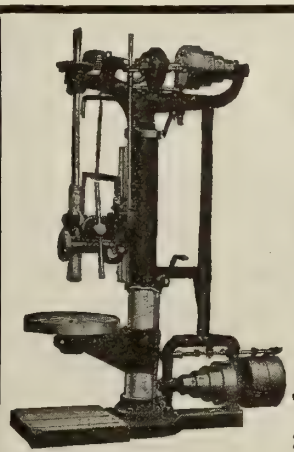

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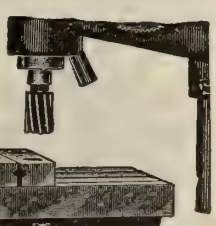

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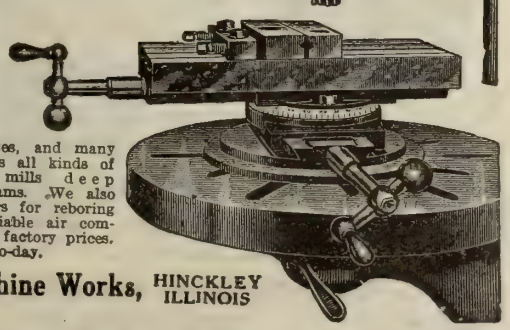

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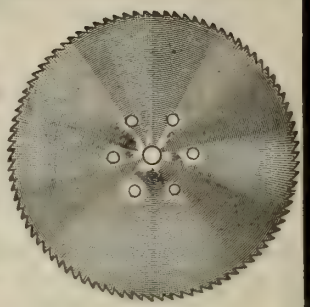

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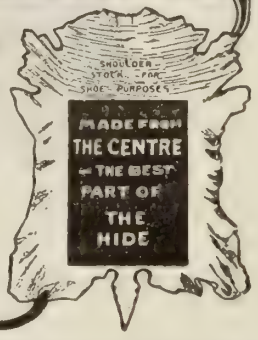

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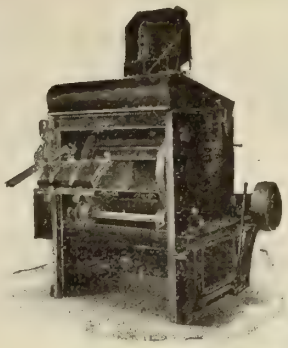

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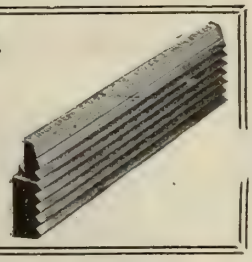

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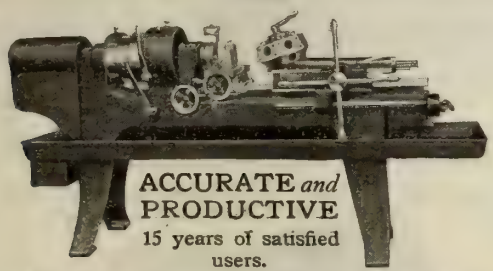

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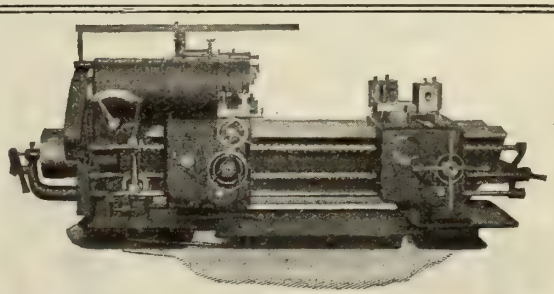

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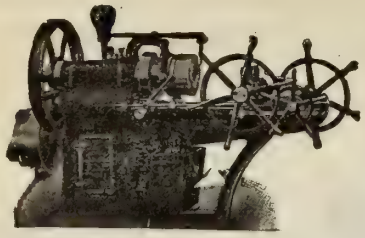

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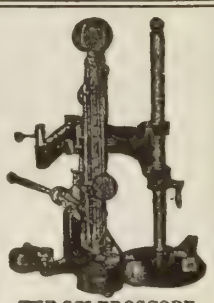

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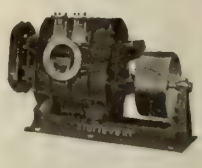

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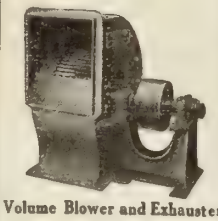

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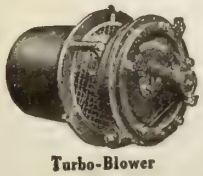

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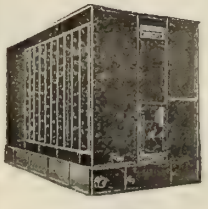

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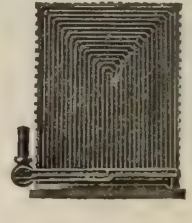

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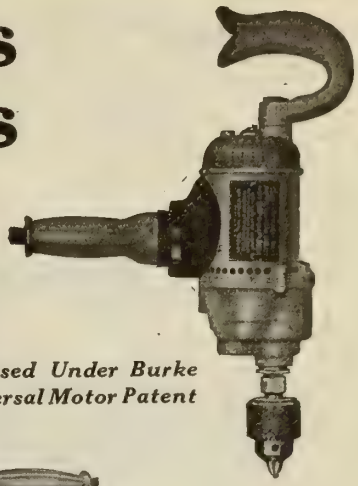

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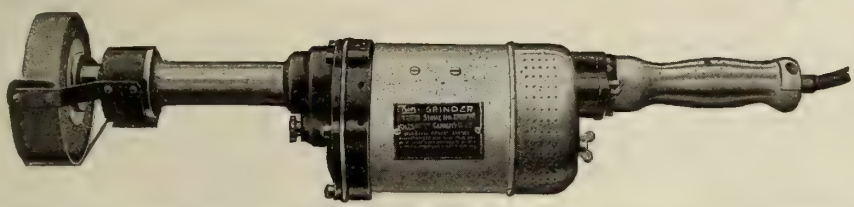

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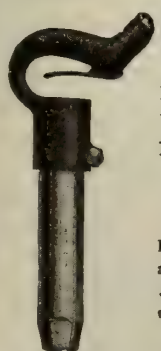

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Wells Brothers Co., of Canada, Galt.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Banfield, W. H., & Son, Toronto.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Standard Machy. & Supplies, Montreal.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

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Butterfield & Co., Rock Island, Que.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
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Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
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Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Windsor Mach. & Tool Co., Windsor.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

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Swedish Steel & Importing Co., Montreal.

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Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRAWING
Henry Hope & Sons, Ltd., Peterboro, Ont.

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Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

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W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

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John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

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Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal.

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Blomquist-Eck Mach. Co., Cleveland, O.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Fry's (London), Ltd., London, Eng.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
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Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

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Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
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Cincinnati Electrical Tool Co., Cincinnati
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Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Garlock-Walker Mach. Co., Toronto, Ont.

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Armstrong-Whitworth of Can., Montreal.
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Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
McKenna Brothers, Pittsburgh, Pa.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
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Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
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Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

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Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

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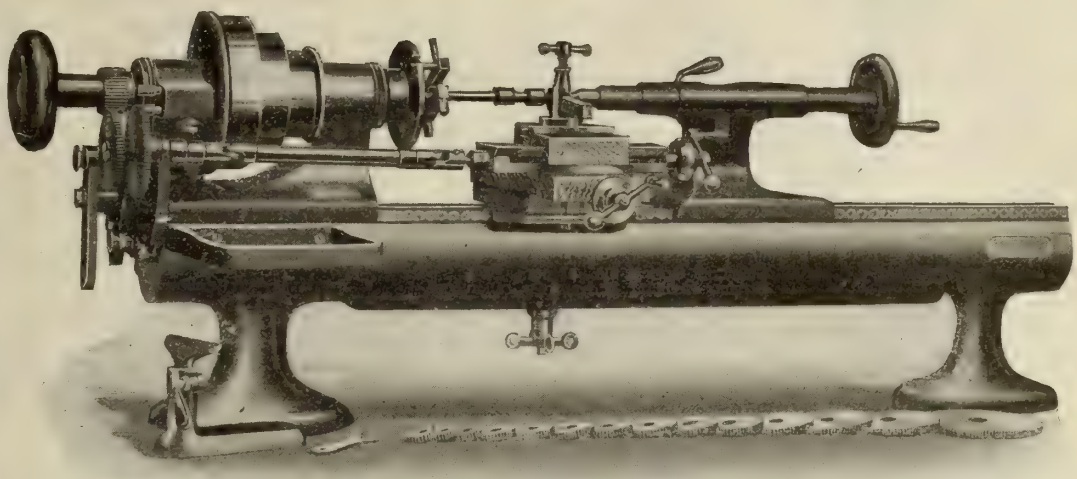

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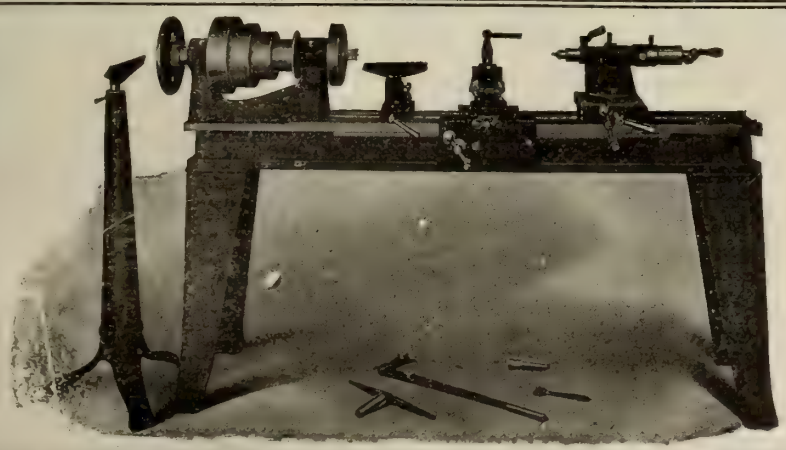

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Garlock-Walker Mchy. Co., Toronto, Ont.
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Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

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The Foss Mchy. & Supply Co., Montreal.
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Williams & Wilson, Ltd., Montreal, Que.

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Vanadium-Alloys Steel Co., Pittsburgh, Pa

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Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
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Williams & Co., J. H., Brooklyn, N.Y.

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Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

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Standard Fuel Engr. Co., Detroit, Mich.

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FURNACES, LEAD AND SALT

Standard Fuel Engr. Co., Detroit, Mich.

FURNACES, RIVETING

Standard Fuel Engr. Co., Detroit, Mich.

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Brown & Sharpe Mfg. Co., Providence, R.I.

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Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC

Taylor Instrument Co., Rochester, N.Y.

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Wells Bros. of Can., Galt, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Wickes Bros., Saginaw, Mich.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.
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LATHES, TOOL ROOM
Cisco Machine & Tool Co., Cincinnati, O.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

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St. Lawrence Welding Co., Montreal.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

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Can. Winkley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LINOLEUM MILL MACHINERY
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LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton.
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MACHINERY GUARDS (See Guards)

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Brown & Sharpe Mfg. Co., Providence, R.I.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
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Chesterman & Co., Jas., Sheffield, Eng.

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METAL SAWS
See Saws.

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Hoefer Mfg. Co., Freeport, Ill.

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Canada Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

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Taylor, J. A. M., 318 Stair Bldg., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Elec. Steel & Metals, Welland, Ont.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

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Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Kearney & Trecker Co., Milwaukee, Wis.

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Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
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Blancke Co., L. C., New York City.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
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MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
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Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
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Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fox Machine Co., Jackson, Mich.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
LeBlond Mach. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
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Williams Machy. Co., A. R., Toronto.
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Garvin Machine Co., New York.

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Baker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
See Steel.

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Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

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Galt Machine Screw Co., Ltd., Galt, Ont.
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National-Acme Co., Cleveland, Ohio.
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Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
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Landis Machine Co., Waynesboro, Pa.
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MacKinnon Steel Co., Sherbrooke, Que.

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Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
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PARTITIONS, WIRE
See Guards

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Oliver Machy. Co., Grand Rapids, Mich.
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See Lathes.

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Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

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Stoll Co., Inc., D. H., Buffalo, N.Y.
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STAMPINGS, SHEET BRASS, COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Hope & Sons, Henry, of Canada, Peterboro, Ont.
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

STAMPS, STEEL ALPHABET, FIGURES
Matthews, Jas. H & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STAPLE MACHINES
Sleeper & Hartley, Inc., Worcester, Mass.

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.

STEEL BALLS
See Balls Steel.

STEEL, CRUCIBLE TOOL
Atkins & Co., Ltd., Wm. Sheffield, Eng.
Illingworth Steel Co., John, New York.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

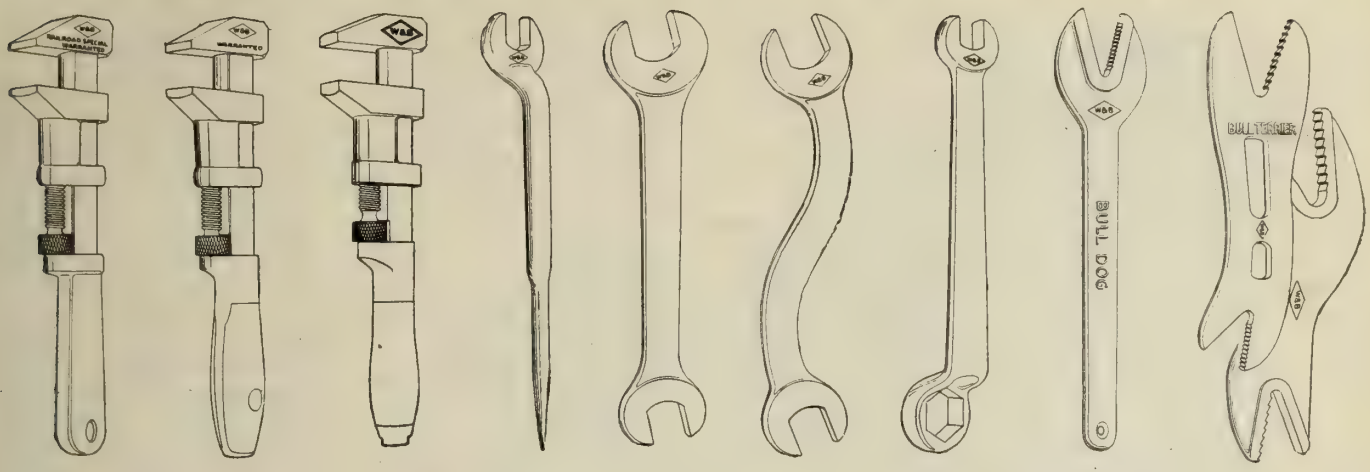
STEEL CHROME VANADIUM
Blancke Co., L. C., New York City.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto.

STEEL CHROME NICKEL
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

STEEL CASTINGS
Joliette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor
Swedish Crucible Steel Co., Windsor

STEEL, COLD ROLLED
Atkins & Co., Ltd., Wm., Sheffield, Eng
Can. Drawn Steel Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.

Why "W & B" Wrenches?



W&B
TRADE MARK

Canadians-on-the-job are doing their work with Canadian-made wrenches bearing the "W & B" Diamond Trade Mark and made in accordance with this principle:

"Make it better than anyone else can make it, put your name on it and stand by it."

The Purchasing Agent

says the prices are right for the quality, shipments are prompt, the assortment is the most complete made in Canada, and he can fill his wrench requirements in one order, saving shipping charges and office details, and simplifying handling of materials. Besides, the men like to use "W & B" wrenches since they last longer than any others.

The Production Manager

says he can get more work out—less time per nut tightened—with "W & B" wrenches. Says they fit the nut snugly and hold their shape better.

The Man-on-the Job

says he feels safe with a "W & B" wrench. He says the fit is clean and the jaws won't break or spread, no matter how hard the pulling may be.

The Whitman & Barnes Manufacturing Co.

Offices and Factory: St. Catharines, Ont.

European Office: 139 Queen Victoria Street, London, E.C.

Established 66 Years

Whitman & Barnes

TWIST DRILLS — REAMERS — WRENCHES — HAMMERS

If interested tear out this page and place with letters to be answered.

Norton, Ralph B., Agent, Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.

STEEL, NICKEL

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Blancke Co., L. C., New York City.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vulcan Crucible Steel Co., Aliquippa, Po.

STEEL, HIGH SPEED

Armstrong-Whitworth of Can., Montreal.
Blancke Co., L. C., New York City.
Wm. Atkins & Co., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., J., New York.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Plewes, Ltd. Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.; represented in Canada by Norton, Callard & Co., Montreal, Que.

STEEL, GRIT

Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE

Joliette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH

Illingworth Steel Co., John, New York.

STEEL, CRUSHED

Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL, ROCK DRILL

Armstrong, Whitworth of Canada, Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.

STEEL, STRUCTURAL

Algoma Steel Corp., Sault Ste. Marie.
MacKinnon Steel Co., Sherbrooke, Que.

STEEL, TOOL

Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Wm., Sheffield, Eng.
Blancke Co., L. C., New York City.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
General Steel Co., Milwaukee, Wis.
Drury Co., H. A., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto, Ont.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.

STEEL, VANADIUM

Wm. Atkins & Co., Ltd., Sheffield, Eng.
Armstrong, Whitworth of Can., Montreal.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Vulcan Crucible Steel Co., Aliquippa, Pa.
Wells Bros. of Can., Galt, Ont.

STOCK RACKS FOR BARS, PIPING, ETC.

Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

STOCKS, PIPE

Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

STRAIGHTENING MACHINERY

Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND

Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES

Brown & Sharpe Mfg. Co., Providence, R.I.

STRUCTURAL STEEL WORKS

William Hamilton Co., Peterboro, Ont.

SWEDGES AND WEDGES

Whitman & Barnes Co., St. Catharines.

SWITCHBOARDS

Can. General Electric Co., Toronto, Ont.

SWITCHES, RAILWAY

Can. Steel Foundries, Ltd., Montreal.

TABLES, SAND-BLAST

Panghorn Corporation, Hagerstown, Md.

TACK (DOUBLE POINT) MACHINES

Sleeper & Hartley, Inc., Worcester, Mass.

TAPPING MACHINES (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.

TANKS, GASOLINE, KEROSENE AND OIL

S. F. Bowser & Co., Inc., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.

TANKS, LUBRICATING, OIL STORAGE

S. F. Bowser & Co., Inc., Fort Wayne.

TANKS, RUBBER CEMENT

S. F. Bowser & Co., Inc., Fort Wayne.

TANKS, STEEL, WATER PRESSURE

S. F. Bowser & Co., Inc., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS

MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal.
Toronto Iron Works, Ltd., Toronto.

TANKS

Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

TAPER PINS

Galt Machine Screw Co., Ltd., Galt, Ont.

TAPES, MEASURING

James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.

TAPPING MACHINES AND ATTACHMENTS

Bertram, John & Sons Co., Dundas.
Bicknell-Thomas Co., Greenfield, Mass.
Rudel-Belnap Mach. Co., Ltd., Montreal.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchy Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal.

TAPES, MEASURING, STEEL AND WOVEN

Lufkin Rule Co. of Can., Windsor, Ont.

TAPES, POCKET

Lufkin Rule Co. of Can., Windsor, Ont.

TAPS, ADJUSTABLE

Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Po.

TAPS, GUN, HAND, BOILER

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW

Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

TAPS, STAYBOLT, TAPPER

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

TAPS, DIES AND WRENCHES

Butterfield & Co., Rock Island, Que.
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. F., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

TAP EXTRACTORS

Walton Co., The, Hartford, Conn.

THERMOMETERS, INDUSTRIAL ENGRAVED TEMPERATURE AND PRESSURE

Taylor Instrument Co., Rochester, N.Y.

THERMOMETERS, RECORDING AND INDEX

Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

TESTING INSTRUMENTS, METALLURGICAL

Shore Instrument & Mfg. Co., New York.

TENOVERS

Oliver Machy. Co., Grand Rapids, Mich.

TESTING LABORATORIES

Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES

Can. Fairbanks-Morse Co., Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Garlock-Walker Mach. Co., Ltd., Toronto.
Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt., Ont.
Williams & Wilson, Ltd., Montreal, Que.

THREADING TOOLS

Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES

Greenfield Tap & Die Corp., Greenfield.
Wells Bros. Co. of Canada, Galt., Ont.
Williams & Wilson, Ltd., Montreal, Que.

THREAD MILLING MACHINES

Taft-Pierce Mfg. Co., New York, N.Y.
Gray Ball Bearing Co., Ltd., Toronto.
Smalley-General Co., Bay City, Mich.

THUMB SCREWS AND NUTS

See Screws.

TINSMITHS' TOOLS

Brown, Boggs & Co., Hamilton, Can.
Williams & Wilson, Ltd., Montreal, Que.

TIRE BENDERS

Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC

Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES

Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS

Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE

Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM PARTITIONS

Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BENDING

Peck, Stow & Wilcox Co., Southington.

TOOLS, BLACKSMITHS'

A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING

Kelly Reamer Co., Cleveland, O.
Williams & Wilson, Ltd., Montreal, Que.

TOOLS, ELECTRIC

Independent Pneumatic Tool Co., Chicago.
Williams Machy. Co., A. R., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
U. S. Electrical Tool Co., Cincinnati, O.

TOOLS, FORMING

Davidson Tool Mfg. Co., New York, N.Y.

TOOLS, LATHE, PLANER, SLOTTER

Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE

Foster Machine Tool Co., Elkhart, Ind.

TORCHES, BLOW

Int. Mach. & Supply Co., Ltd., Montreal.

TORCHES, STEEL

Armstrong, Whitworth of Can., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

TORCHES, GASOLINE, KEROSENE AND ALCOHOL

Turner Brass Works, Sycamore, Ill.

TRACK SYSTEMS

Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

TRANSFORMERS

Can. General Electric Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.

TRANSMISSION CHAIN

Morris Chain Co., Ithaca, New York.

TRANSMISSION MACHINERY

American Pulley Co., Philadelphia, Pa.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Coventry Chain Co., Coventry, England.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
Wilson & Co., J. C., Belleville, Ont.
Williams Machinery Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

TRANSMISSION ROPE

Jones & Glassco, Montreal, Que.
MacKinnon Steel Co., Ltd., Sherbrooke.
Wilson & Co., J. C., Belleville, Ont.

TRANSMISSION TOWERS

Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TRANSVEYORS

Cowan Truck Co., Holyoke, Mass.

TROLLEYS

Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

TRUCKS, FACTORY, FREIGHT, ETC

Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing, Toronto.
Cowan Truck Co., Holyoke, Mass.
MacKinnon Steel Co., Sherbrooke, Que.
Rice Lewis & Son, Toronto, Ont.

TRUCKS, LUMBER AND KILN

Swedish Steel & Importing Co., Montreal.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS AND COPPER

Standard Tube & Fence Co., Woodstock.
Tallman Brass & Metal Co., Hamilton.

TUBING COILERS, FLEXIBLE METAL

Almond Mfg. Co., Ashburnham, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.

TURRET MACHINES, LATHES

Brown & Sharpe Mfg. Co., Providence.
Garlock-Walker Machinery Co., Toronto.
Greenfield Tap & Die Corp., Greenfield.
Oliver Mchy. Co., Grand Rapids, Mich.
Pratt & Whitney, Hartford, Conn.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

TUNGSTEN FILAMENT COILING MACHINERY

Sleeper & Hartley, Inc., Worcester, Mass.

TURBINES, HORIZONTAL

Wilson & Co., J. C., Belleville, Ont.

TURBO GENERATOR UNITS

MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURNBUCKLES

Canada Fdrs. & Forg. Ltd., Welland.
Morrow Screw & Nut Co., Ingersoll, Ont.
Rice Lewis & Son, Toronto, Ont.

TURNTABLES

Can. Link-Belt Co., Toronto, Ont.
Elec. Steel & Metals, Welland, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TWIST DRILLS

Blancke Co., L. C., New York City.

UPSETTING AND BENDING MACHINERY

Bertram & Sons Co., John, Dundas.
Brown, Boggs Co., Ltd., Hamilton, Can.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

VALVE LEATHERS

Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)

Cleveland Pneumatic Tool Co., Toronto.

VALVES, HYDRAULIC

Metalwood Mfg. Co., Detroit, Mich.

VENTILATING APPARATUS

Brantford Oven & Rack Co., Brantford.
Can. Blower & Forge Co., Kitchener, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

VENTILATORS

H. H. Robertson, Ltd., Sarnia, Ont.

VISE STANDS, PORTABLE

Williams & Co., J. H., Brooklyn, N.Y.

VISES, BENCH

Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Foss Machy. & Sply. Co., G. F., Montreal.
Williams & Wilson, Ltd., Montreal, Que.

VISES, PIPE

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

VISES, MILLING MACHINE

Brown & Sharpe Mfg. Co., Providence, R.I.

VISES, PLANER AND SHAPER

Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

WASHER MACHINES

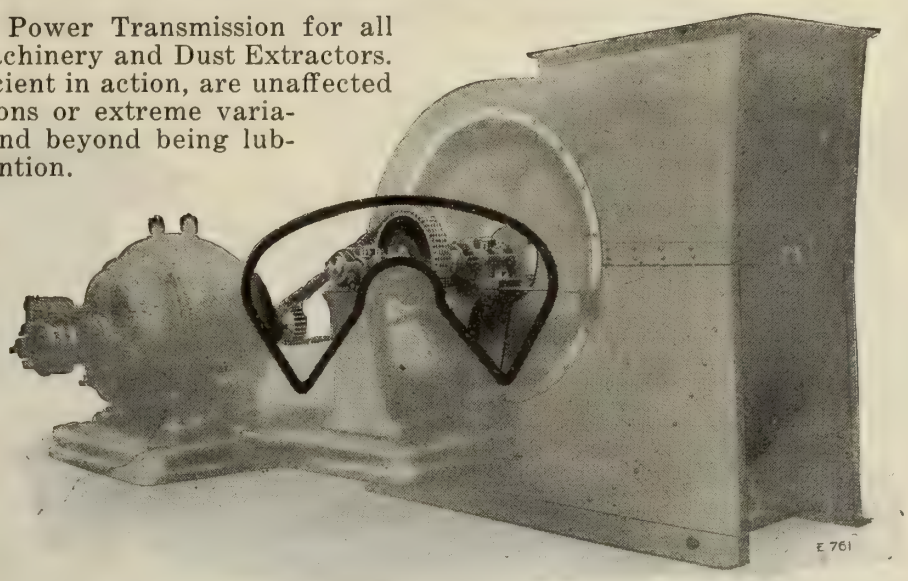
National Machy. Co., Tiffin, Ohio.

WASHERS

Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes, Wallace, Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Norton, Ralph B., Agent, Montreal.
London Bolt & Hinge Wks., London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

"The Coventry" Noiseless Chains

are the ideal form of Power Transmission for all kinds of Ventilating Machinery and Dust Extractors. They are silent and efficient in action, are unaffected by atmospheric conditions or extreme variations of temperature, and beyond being lubricated, require no attention.



A 25" Keith fan, driven by "The Coventry" Noiseless Chain Motor of 7½ h.p., running at 950 r.p.m., fan 400 r.p.m. This illustration shows how floor space is saved by using chain transmission.

"The Coventry" Chain Company, Ltd., Coventry, England

CANADIAN AGENTS--TAYLOR & ARNOLD, LIMITED, Bank of Toronto Building, MONTREAL

When Writing Advertisers Mention this Paper

BUYERS' DIRECTORY

WASTE
Wilkinson & Kompass Hamilton, Ont.
Wood Turret Machine Co., Brazil, Ind.

WATER-INTAKE SCREENS
Can. Link-Belt Co., Toronto, Ont.

WATER TOWERS
Toronto Iron Works, Ltd., Toronto.

WELDING, WIRE
Page Steel & Wire Co., Adrian, Mich.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal.
Welding & Supplies Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

WELDING MASKS
Strong, Kennard & Nutt Co., Cleveland.

WELDING GOGGLES
Strong, Kennard & Nutt Co., Cleveland.

WELDING RODS AND WIRE
Page Steel & Wire Co., Adrian, Mich.
Welding & Supplies Co., Montreal, Que.

WELDING SUPPLIES
Union Carbide Co., Toronto, Ont.

WHEELS, CAR, STEEL
Elec. Steel & Metals, Welland, Ont.

WHEELS, SPROCKET AND TRACTION
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

WHEELS, TURBINE, WATER
Elec. Steel & Metals, Welland, Ont.

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

WHEEL TRUEING TOOLS
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Ltd., Montreal, Que.

WINCHES
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Hall & Sons, John H., Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

WIRE, CAST STEEL AND MUSIC
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Shuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Worcester, Mass.

WIRING MACHINES
Quickwork Co., St. Marys, Ohio.

WRENCHES, PIPE, POWER
Peck, Stow & Wilcox Co., Southington.

WIRE RAILS
Sleeper & Hartley, Inc., Worcester, Mass.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods, Hamilton.
Page Steel & Wire Co., New York, N.Y.

WIRE FENCING
WIRE, COPPER, CLAD STEEL WIRE, LINK FABRIC
Page Steel & Wire Co., Adrian, Mich.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Can.
Shuster Co., F. B., New Haven, Conn.

WIRE NAILS
Page Steel & Wire Co., New York, N.Y.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Sleeper & Hartley, Inc., Worcester, Mass.
Page Steel & Wire Co., New York, N.Y.

WIRE, SPARK PLUG, MANGANESE NICKEL, COPPER NICKEL, MONEL METAL
Can. Driver-Harris Co., Ltd., Walkerville.

WIRE SPRING
Page Steel & Wire Co., Adrian, Mich.

WIRE STEEL, BRASS, COPPER
Page Steel & Wire Co., New York.
Steel Co. of Canada, Ltd., Hamilton, On.

WIRE, TELEPHONE, TELEGRAPH, GALVANIZED AND ELECTRICAL
Page Steel & Wire Co., Adrian, Mich.

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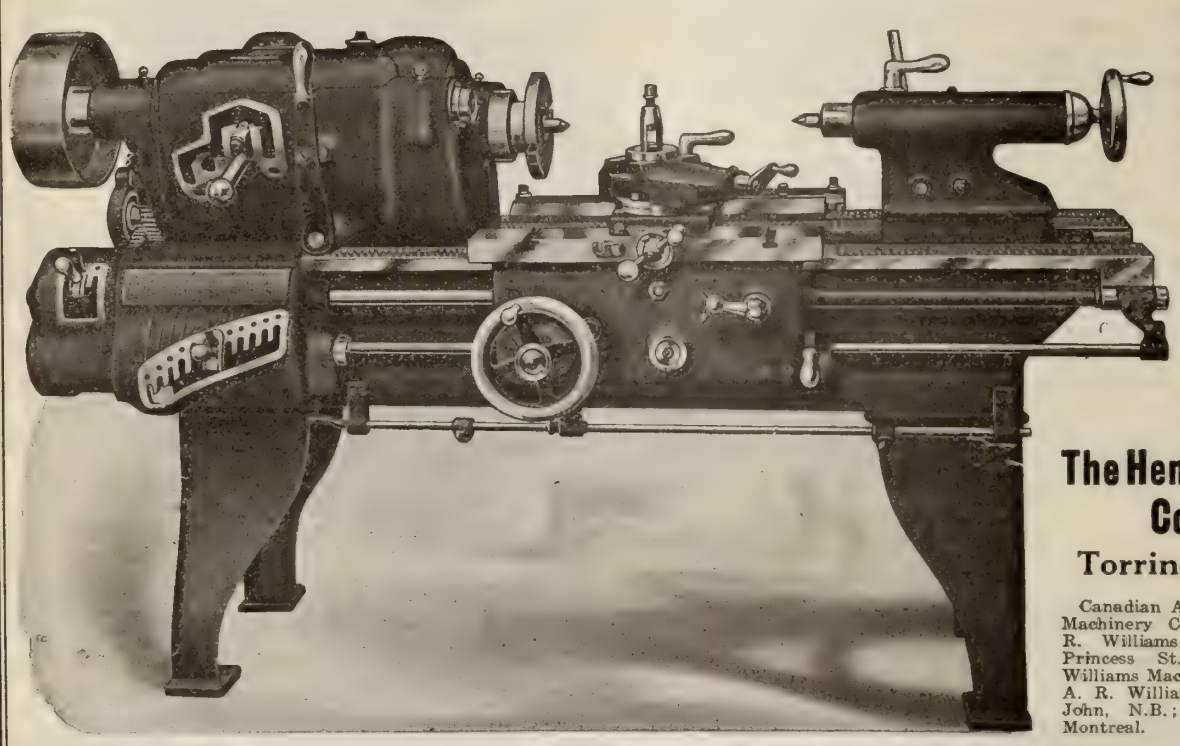

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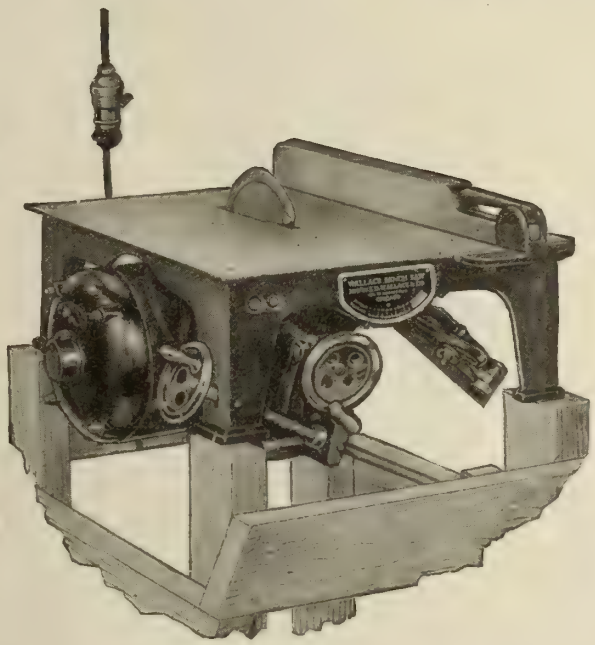

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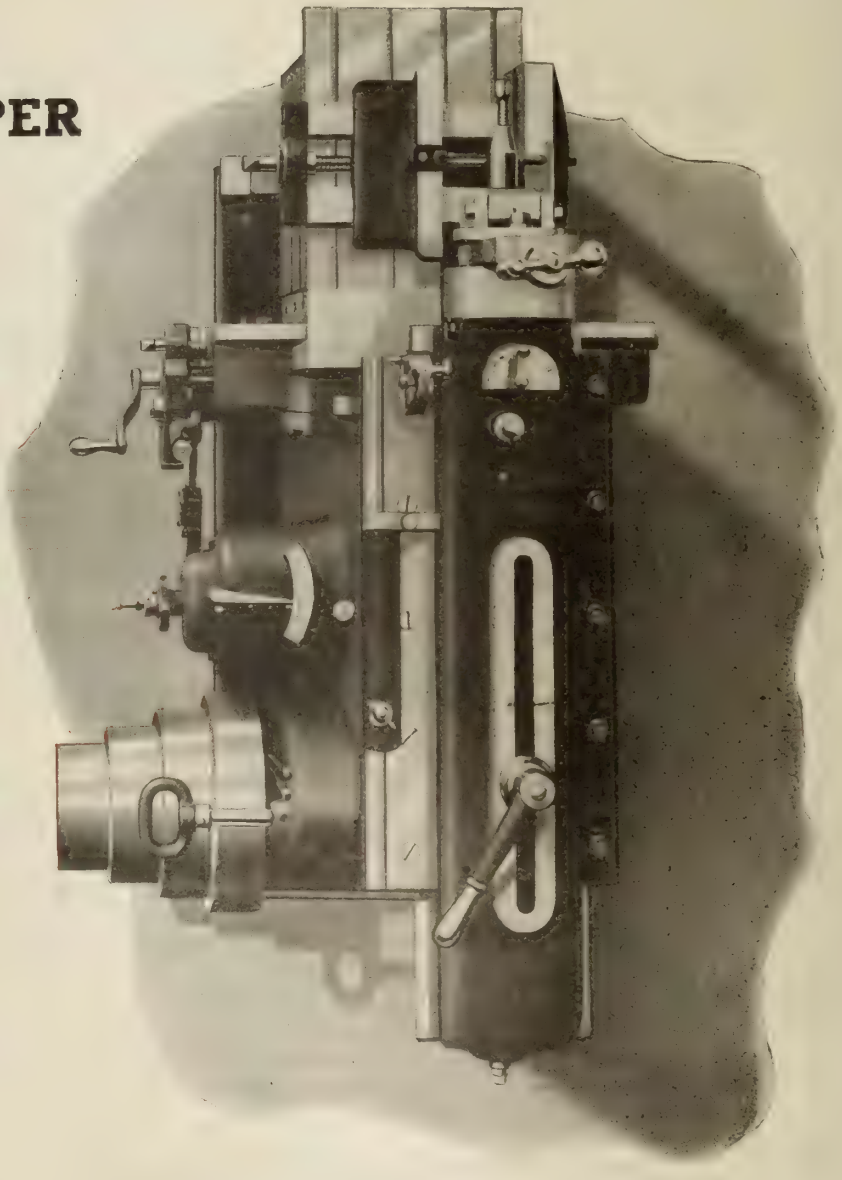

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII., No. 14 Publication Office: Toronto, October 2, 1919. Subscription Price $3.00 per year.

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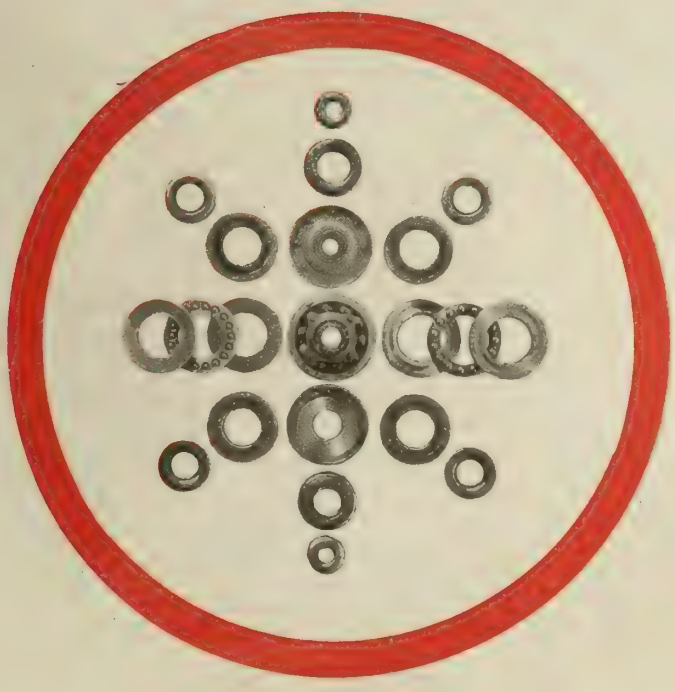

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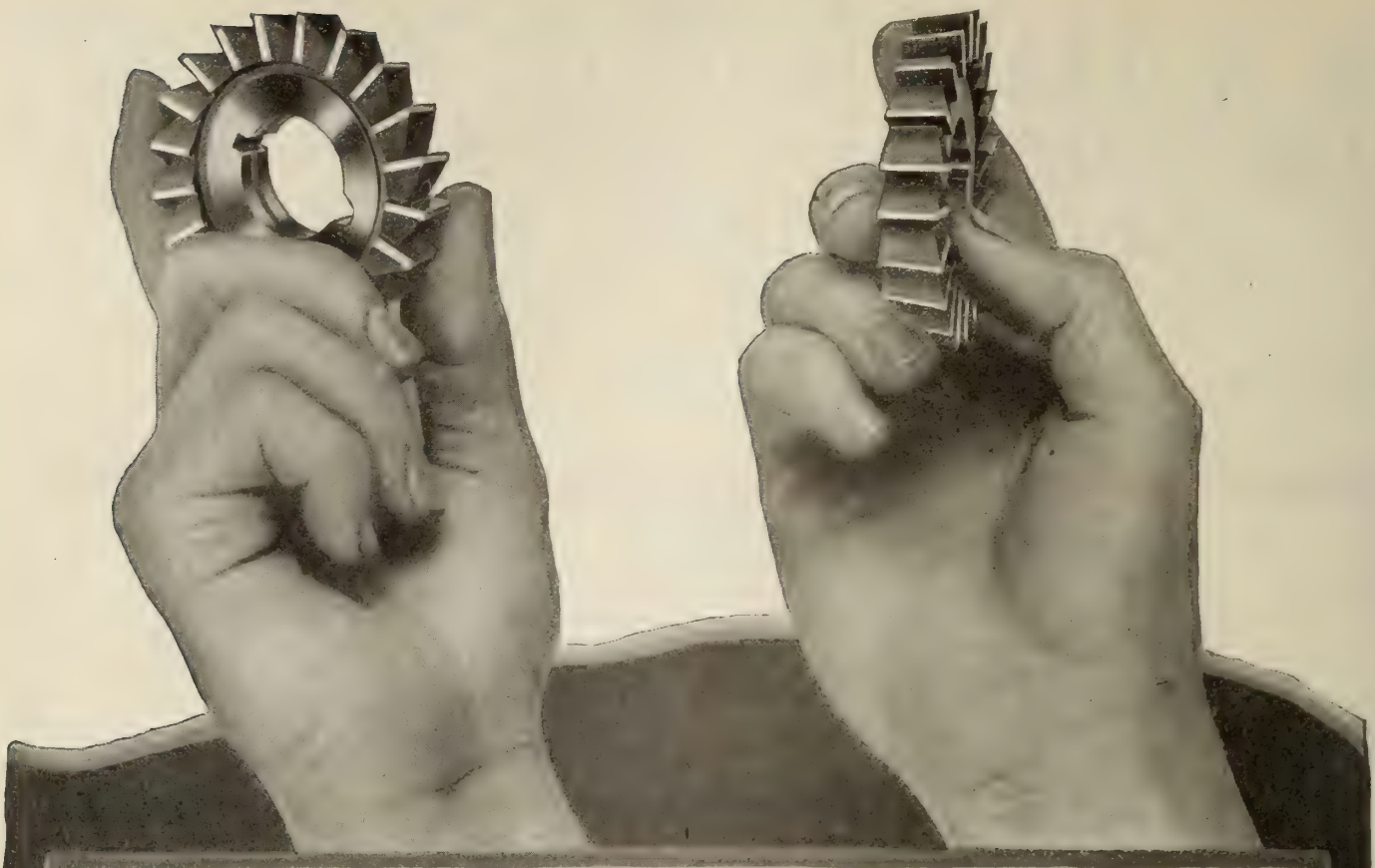

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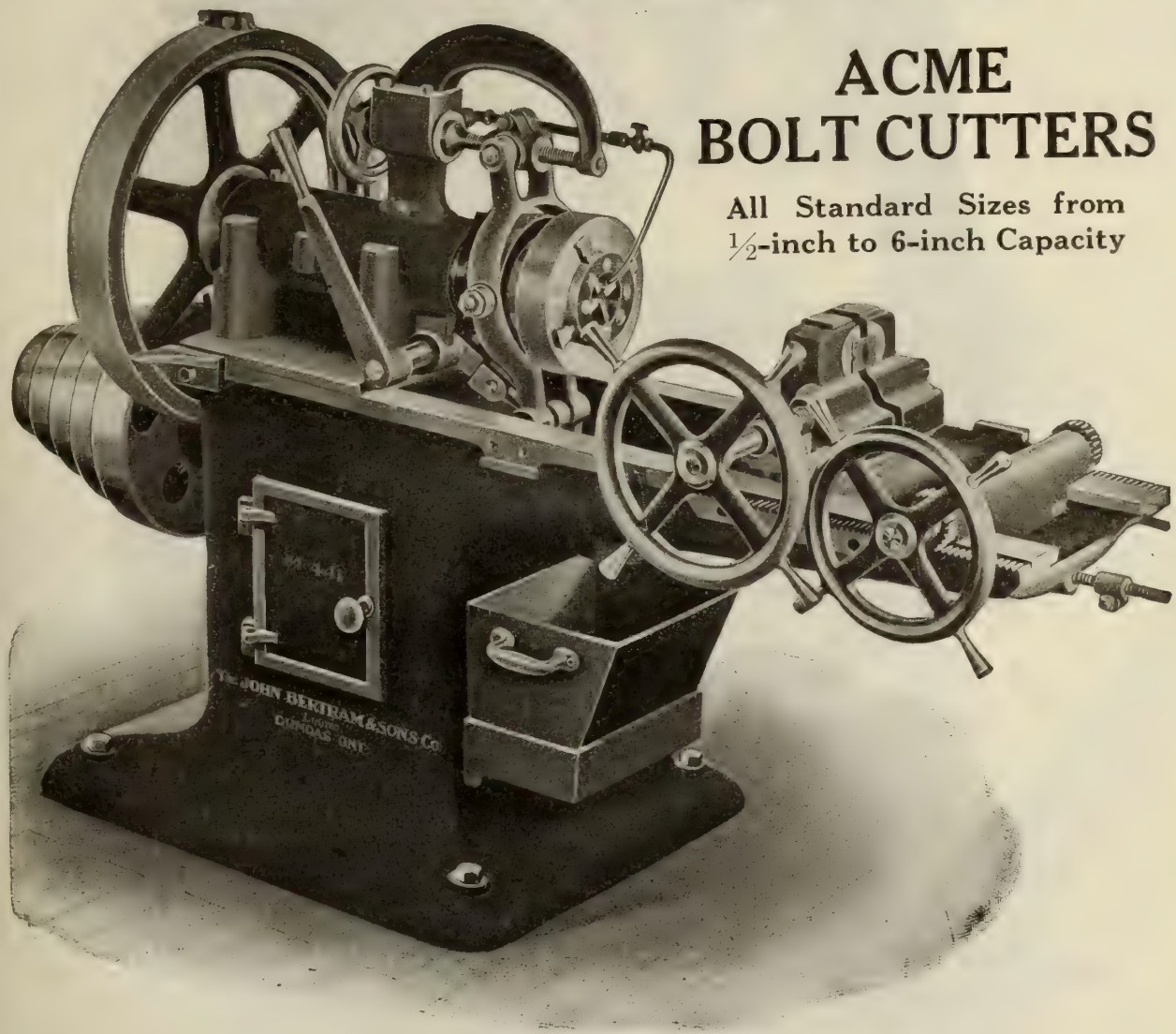

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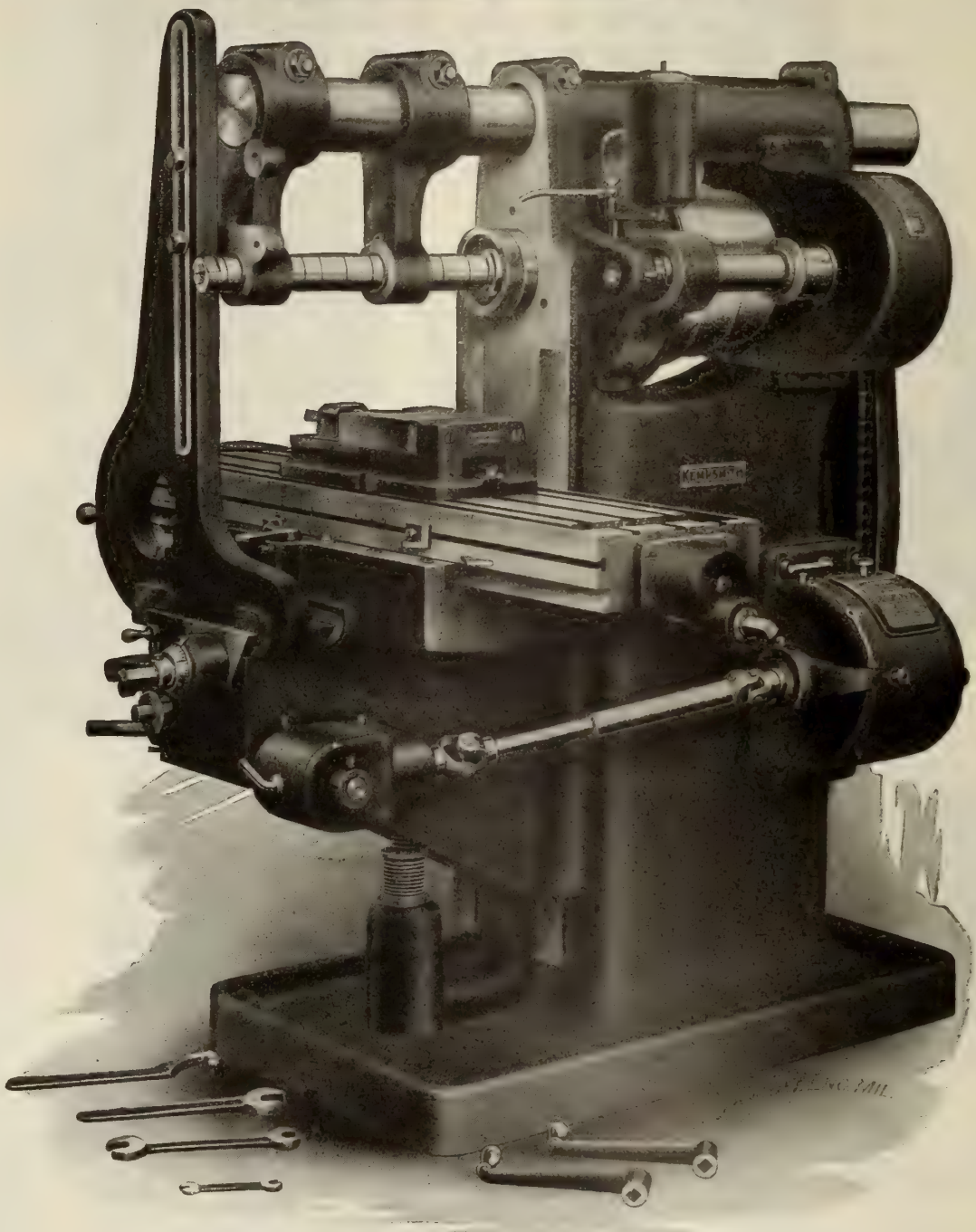

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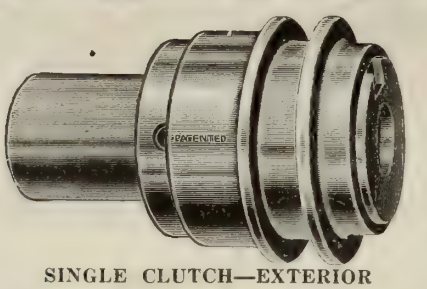

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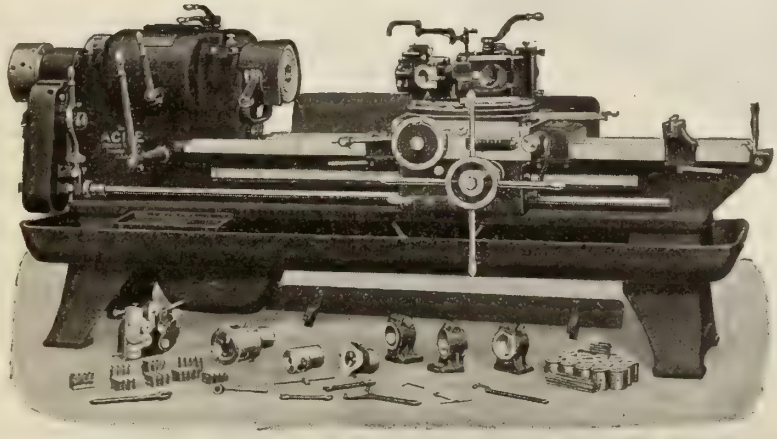

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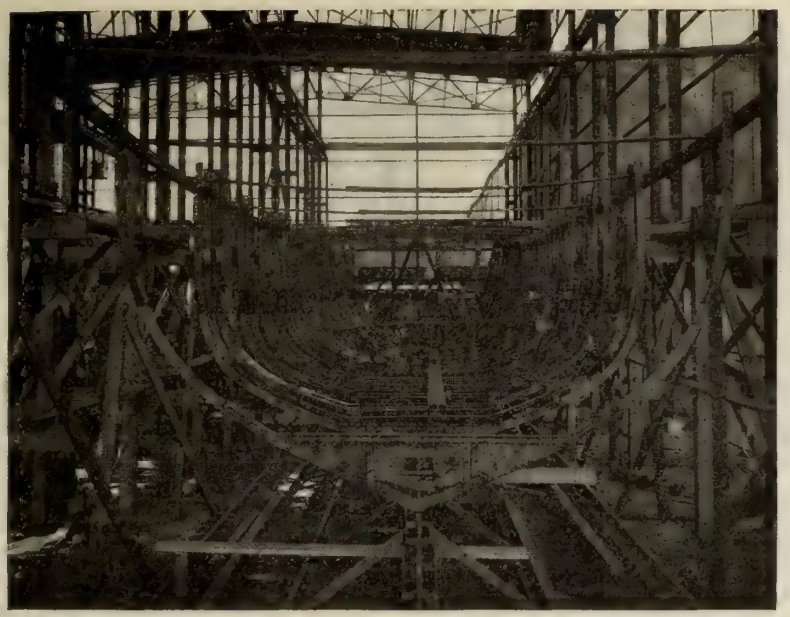

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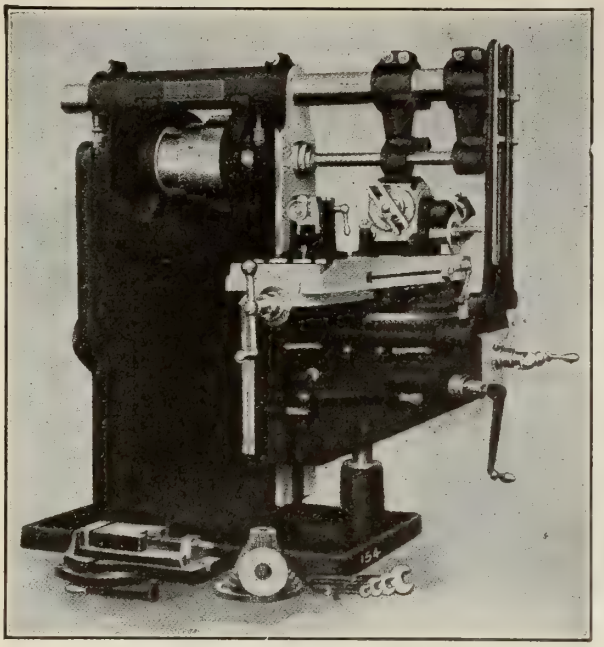

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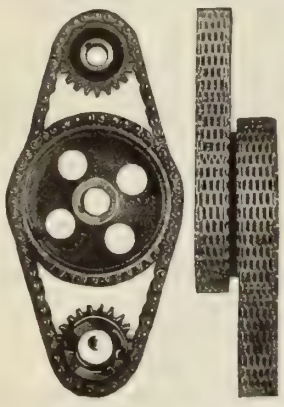

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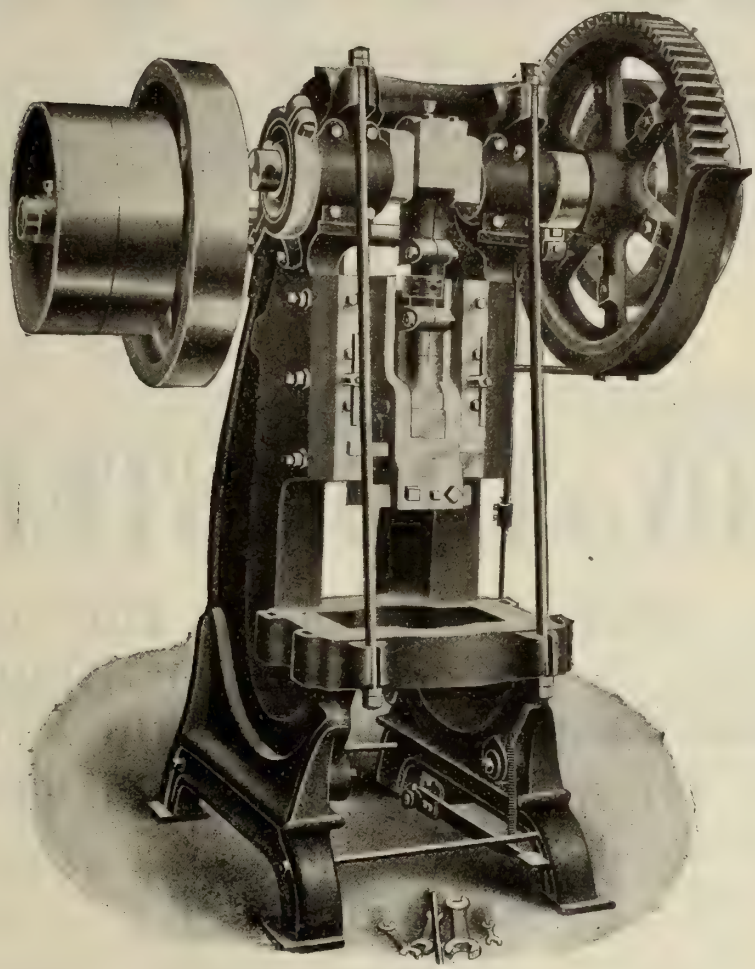

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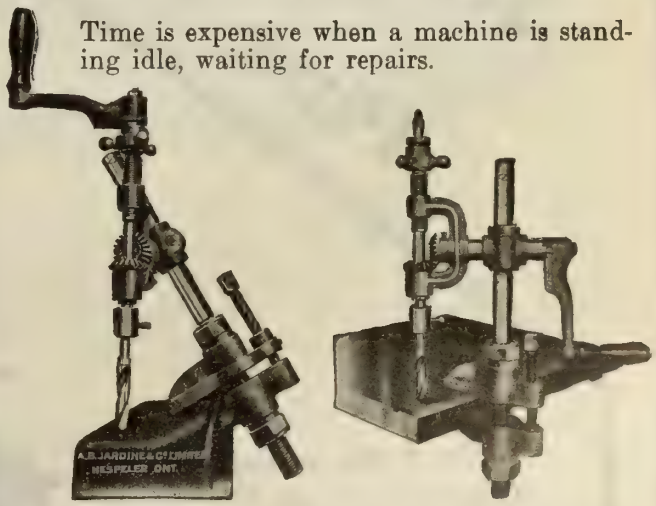

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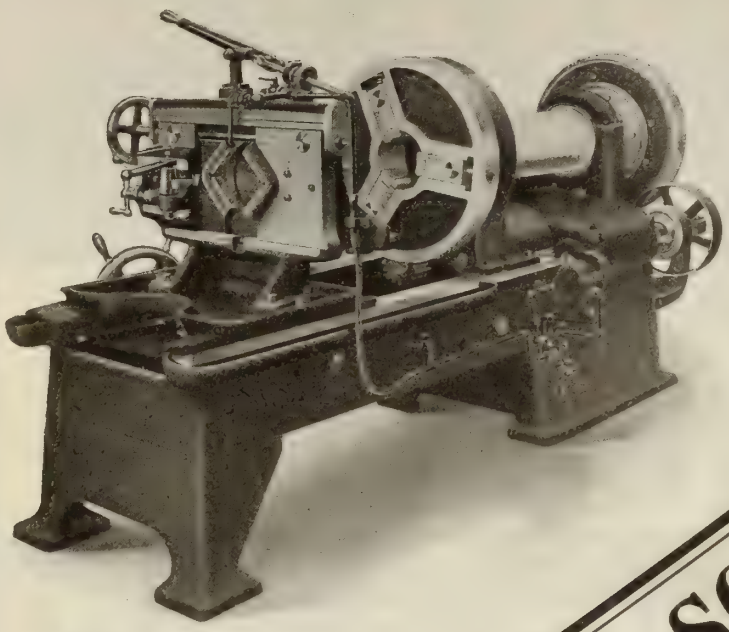

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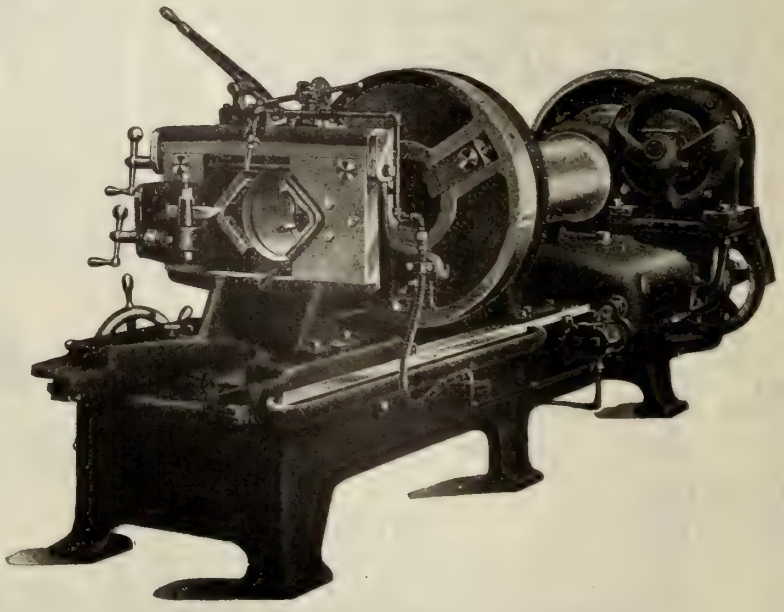

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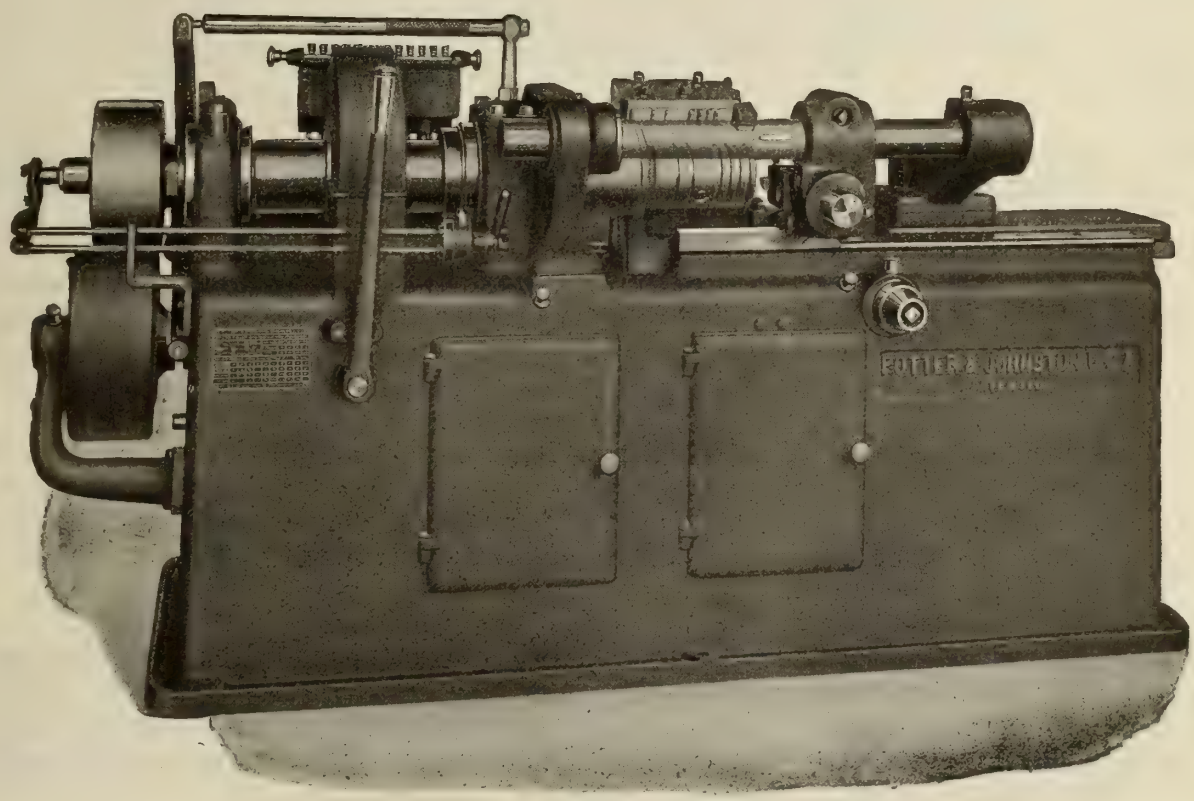

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Counter-

No. 4

Of a series of Technical Talks on Ball Bearings

THE top diagram shows the rigid type hanger and standard type radial bearings, and also a ball bearing loose pulley. The point of interest in this application is the use of rigid hangers, which is made possible by the self-aligning feature of the SKF Ball Bearings. The shaft is turned down at each end to form a shoulder against which the bearing is locked by a nut. Felt grooves are provided on the inner side of each housing and end caps on the outer sides. The outer race of one bearing is rigid in the housing to take care of the end thrust and the outer race of the other bearing is free to "float."

The application shown in the centre drawing is similar to the one described above, except that the hangers are adjustable. Plain radial bearings are used and the shaft turned down at each end as in the above application.

The lower diagram shows SKF adapter type ball bearings mounted on a countershaft with standard type hangers. The housing is held in the frame by four adjusting screws and has felt washers for retaining the lubricant and excluding dust or dirt, etc. Set collars are used for taking care of the side play.

For loose pulleys the ball bearings, two in number, usually 1200 series, are mounted on a sleeve which is clamped to the shaft by means of a set collar. The bearings are mounted against shoulders on the sleeve the necessary distance apart, the inner race being held firmly in position by the two end caps. The housing is dust proof and provided with a filling plug for grease.

SKF Ball Bearings are also used in clutches, jack shafts and idlers, the method of mounting for idlers being very similar to that employed for loose pulleys and the same series of bearing usually used. In clutches, adapter type ball bearings are usually employed, although radial bearings can also be used. In the latter case the bearings are mounted on a sleeve and locked in position by nuts.

The advantages of the above applications are apparent, as countershafts usually run at high speed and the elimination of friction, saving in lubrication and attention are important factors. The application to the loose pulley is worthy of special notice, as the pulley revolves round a stationary shaft. In plain bearings this causes the lubricant to leave the point of lubrication through centrifugal force, with consequent heating and seizure. In the case of the ball bearing pulley, the oil or grease is flung against the outer chamber which is the point of lubrication, thus preventing the bearing running dry and heating.

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Shafts

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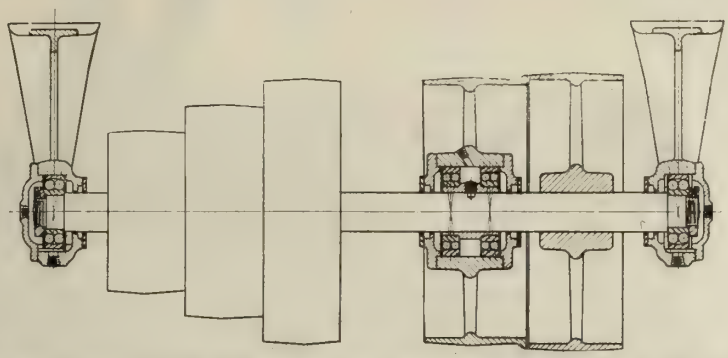
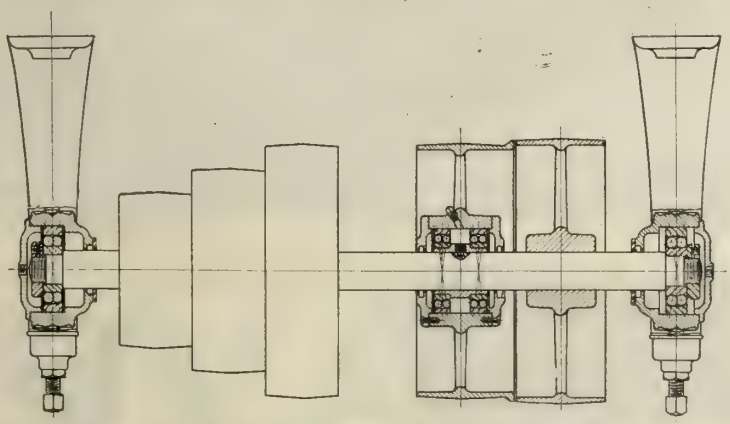
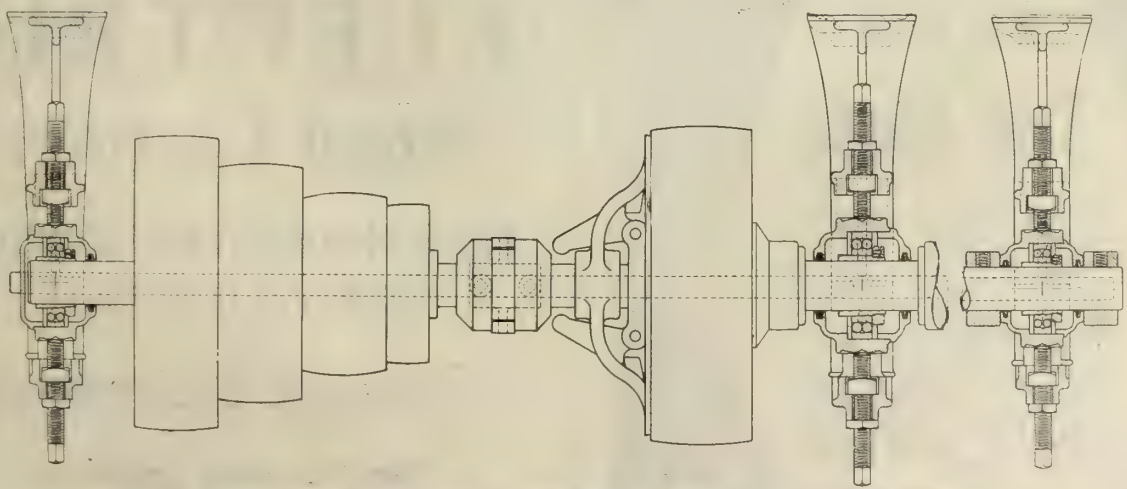


Rigid type hanger and standard type SKF radial bearings. The aligning feature of the SKF bearing allows the use of rigid hangers. No other bearing will give satisfaction when used with rigid type hangers.



Adjustable type hanger and standard type SKF radial bearings.



Ball bearing mounting showing SKF adapter type bearings applied to countershaft, standard type adjustable hanger casings.

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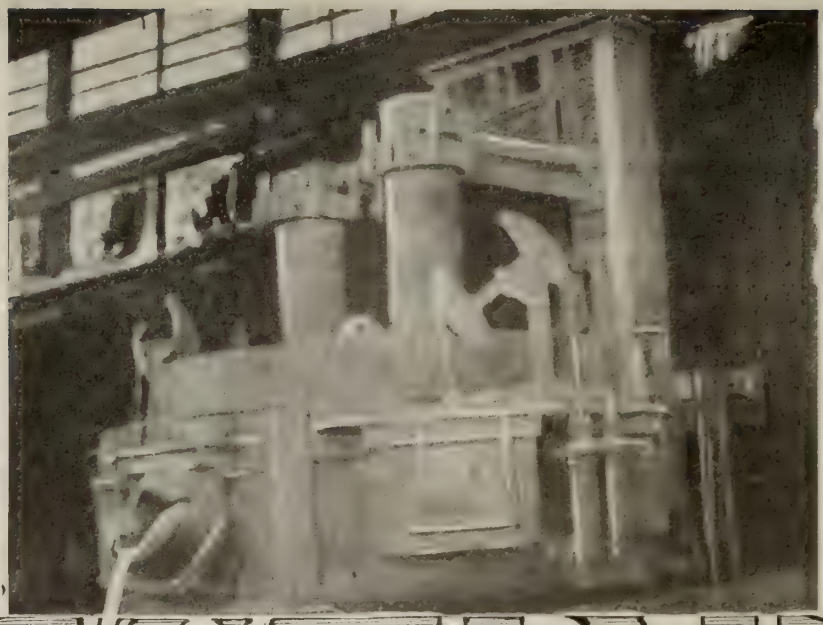

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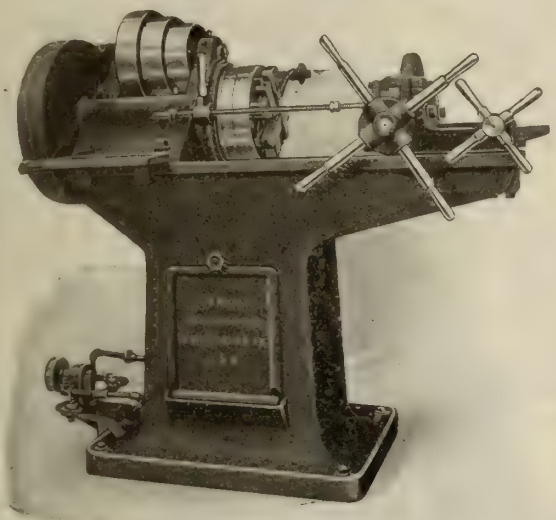

No annealing, hobbing or retempering, a slight grinding at the cutting edge renews the die.

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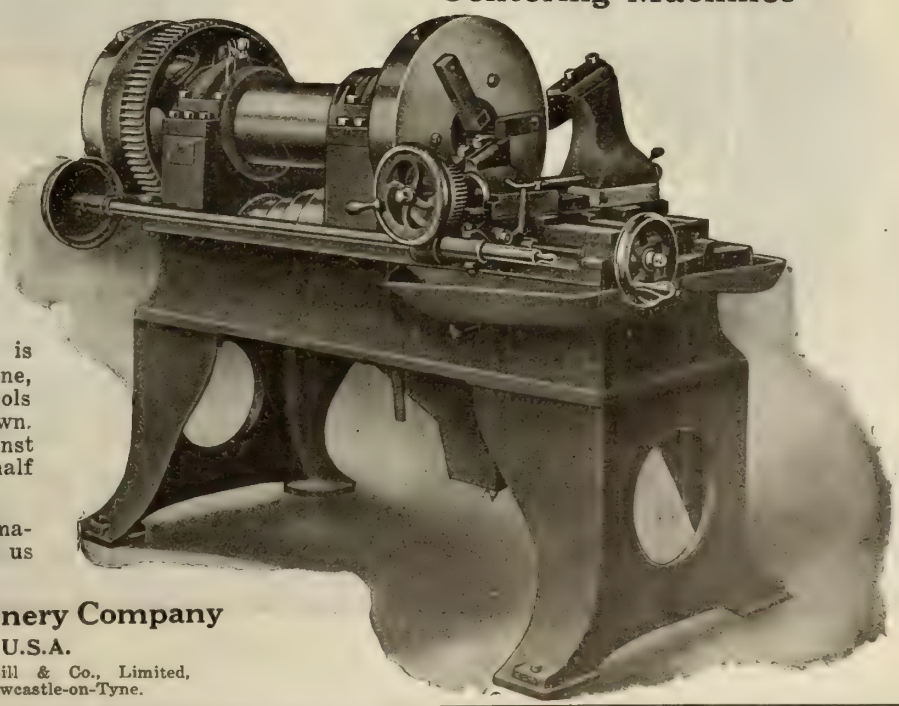

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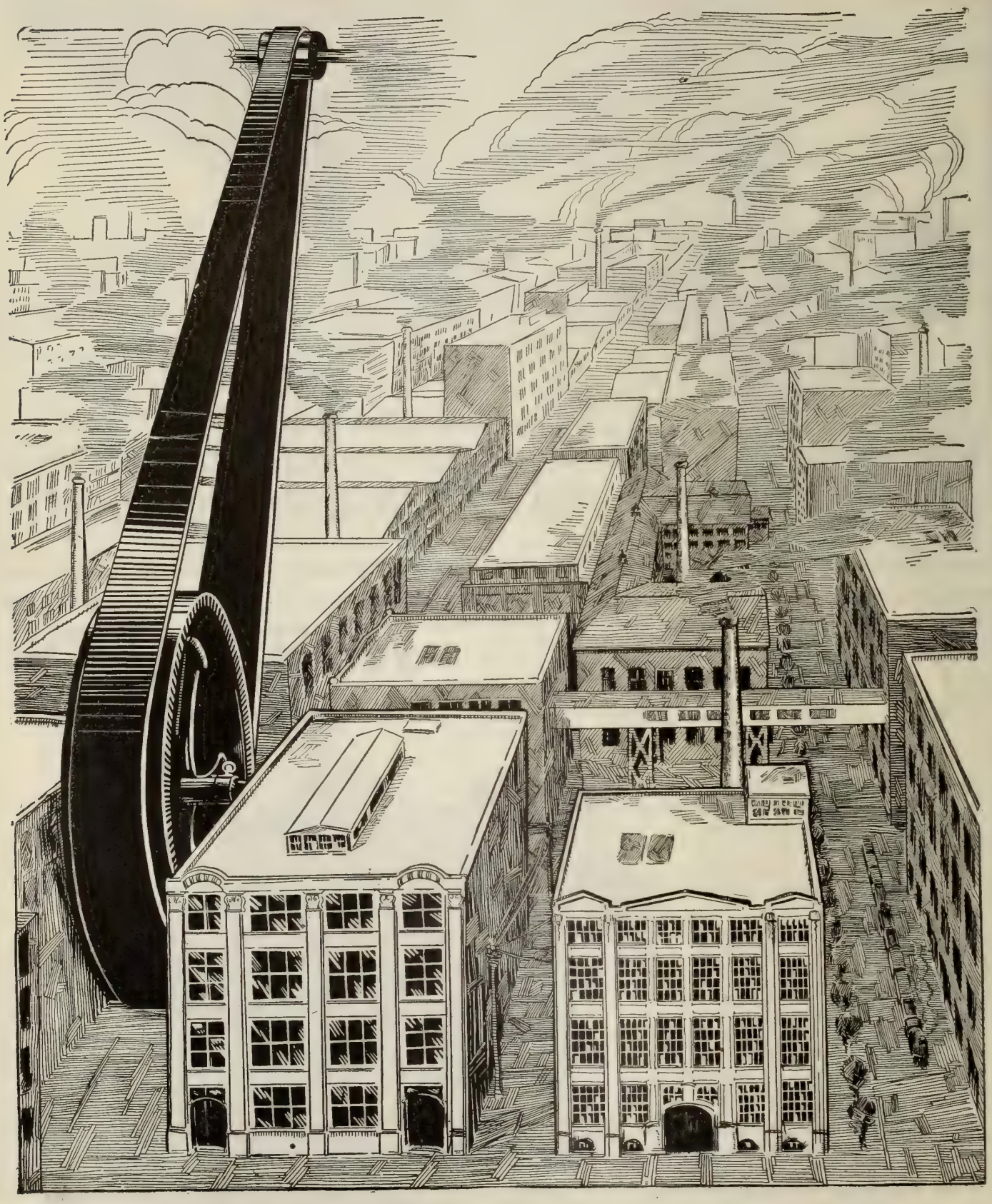

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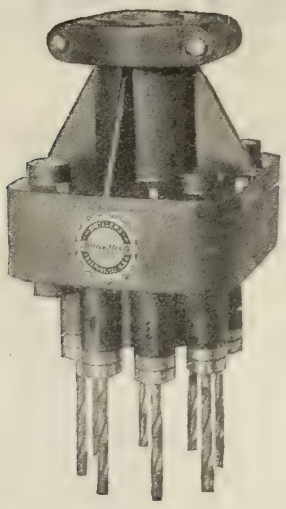

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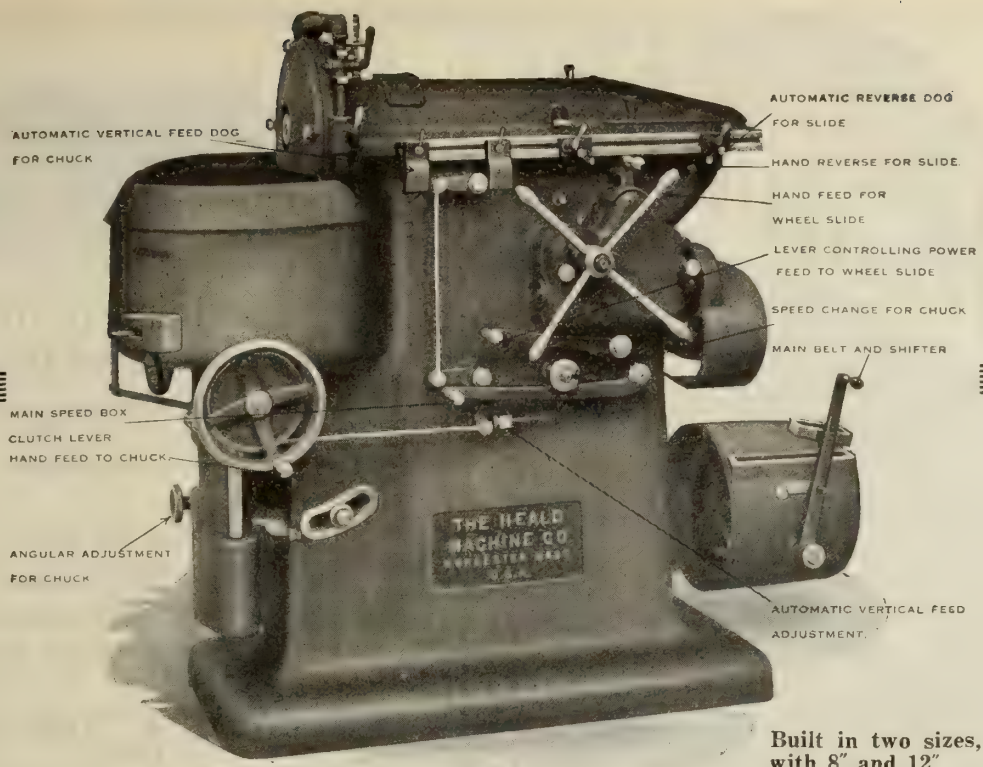

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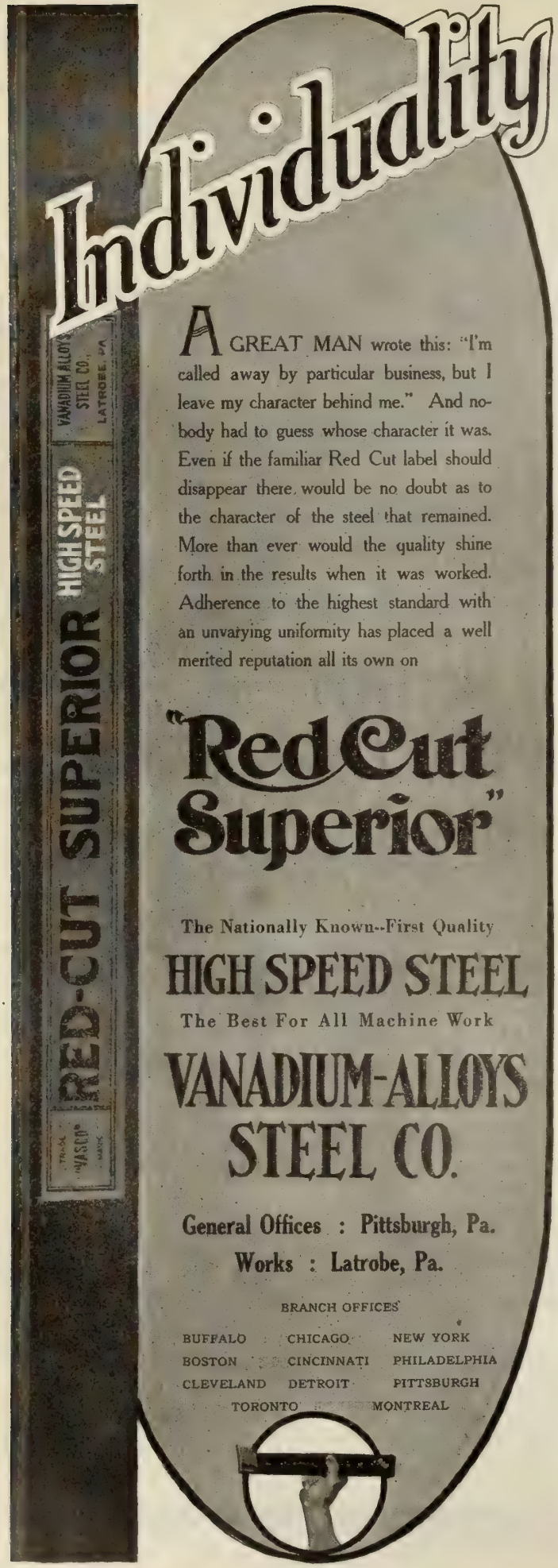

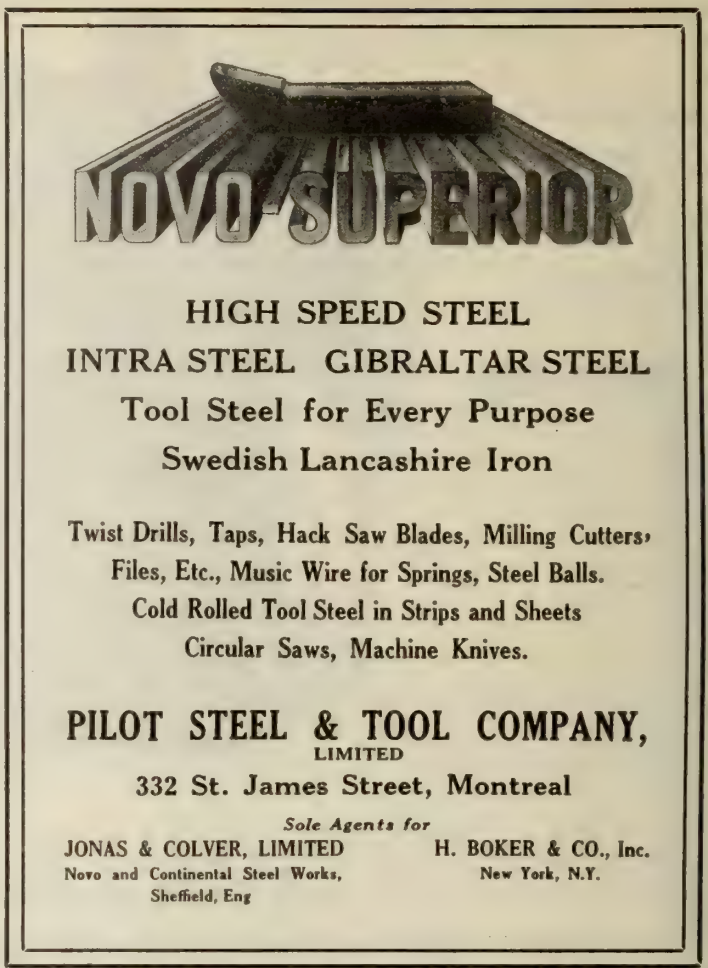

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"Production" Tools that "Produce"

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"A TOOL ROOM IN ITSELF"

Every size in Roughing and Finishing reamers from 1″ to 5⅜″ diameter in Fractional or Metric sizes. No matter how odd the size, it's there. No delay, no holdup in production, always Ready for Service. They Adjust.

Indispensable to your tool room, Turret Lathe or Screw Machine Department. No machine shop should be without this set.

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Just one of the KELLY TOOL FAMILY

Write for our new catalogue J-4 and see THEM ALL

THE KELLY REAMER COMPANY

CLEVELAND, OHIO, U.S.A.

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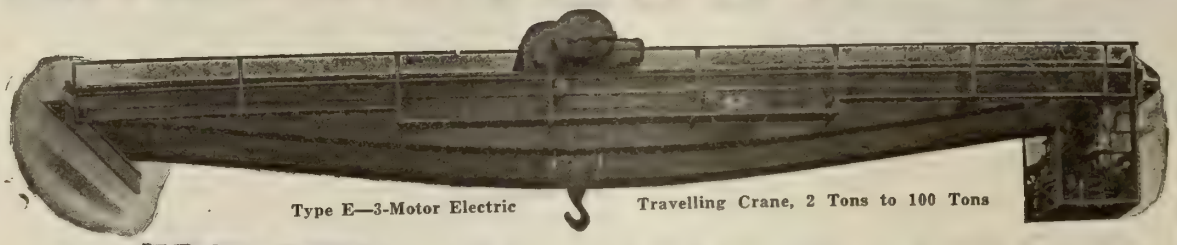
Electric and Hand Traveling Cranes



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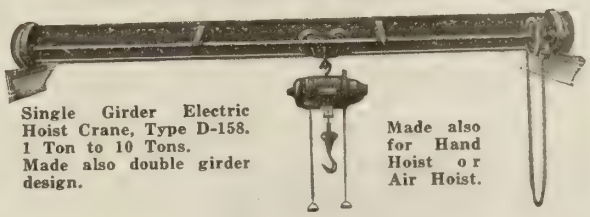

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Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

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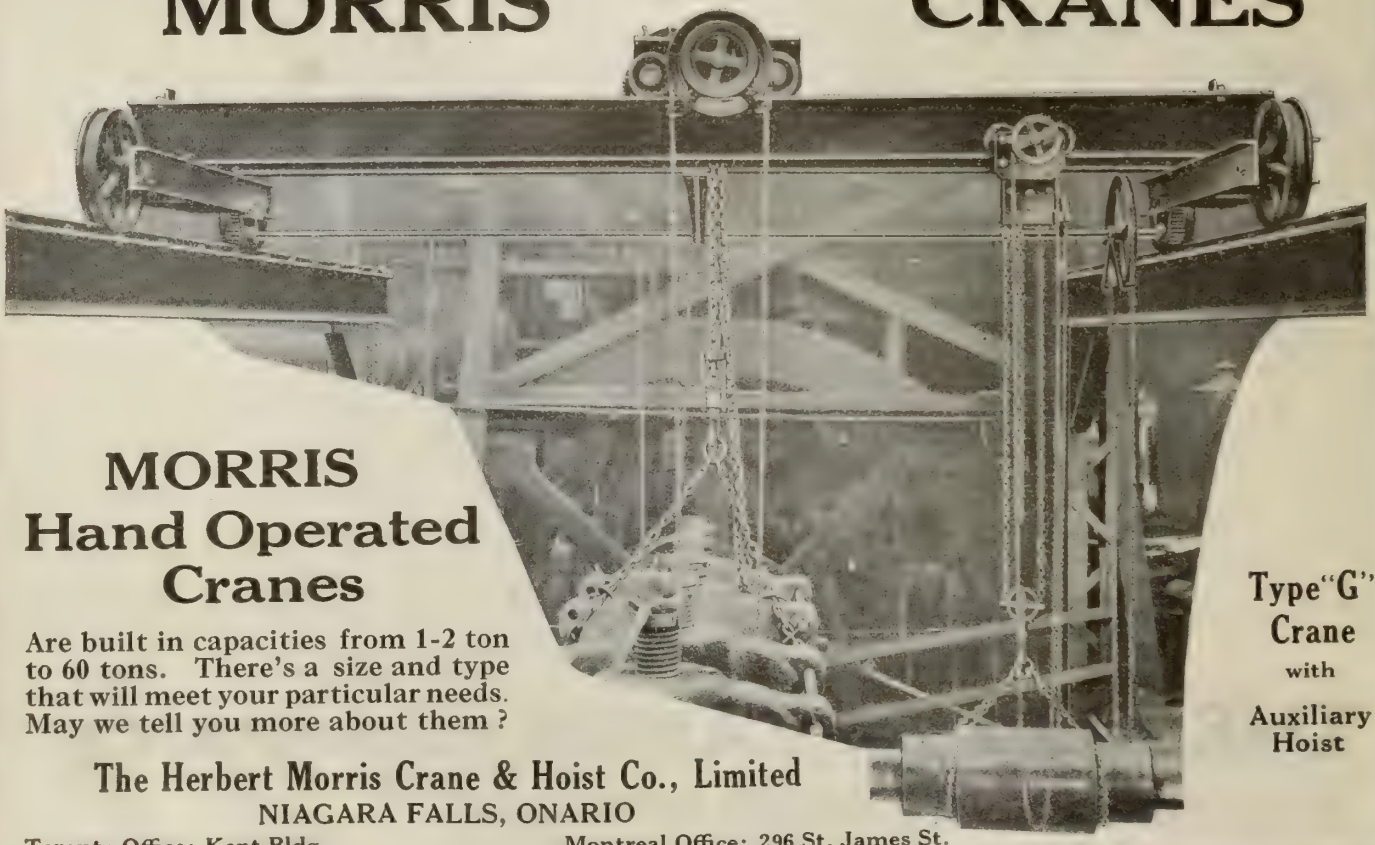

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Are built in capacities from 1-2 ton to 60 tons. There's a size and type that will meet your particular needs. May we tell you more about them?

Type "G" Crane with Auxiliary Hoist

The Herbert Morris Crane & Hoist Co., Limited

NIAGARA FALLS, ONARIO

Toronto Office: Kent Bldg. Montreal Office; 296 St. James St.

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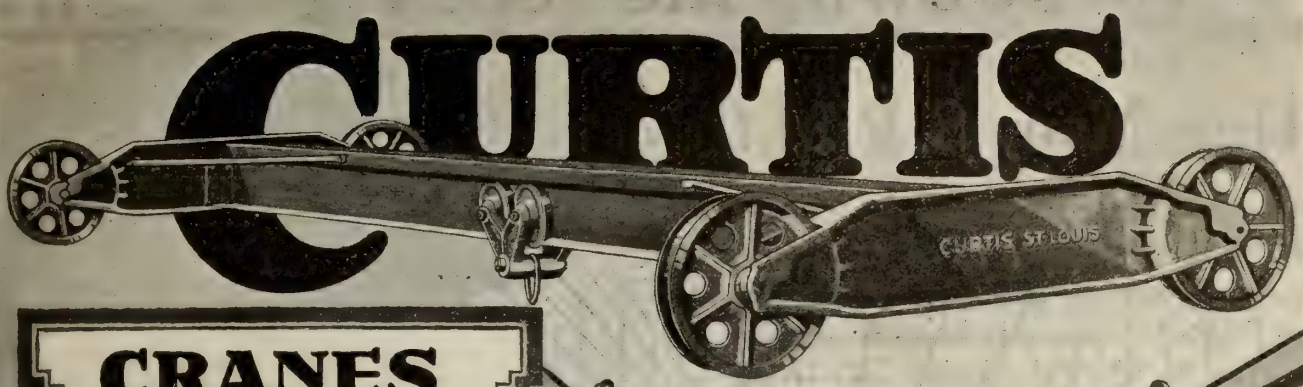

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Have an enviable reputation for safety and ease of operation. Preferred in many leading industrial plants for their simplicity of design, being quick and easy to erect and therefore very low in cost of installation. Strong, rigid, dependable. Right in every detail. "They move the load with minimum energy." Hyatt Roller Bearings throughout.

Various types, hand and pneumatic, up to 20,000 lbs. capacity. *Write for illustrated descriptive literature.*

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Sectional view of Curtis Crane Wheel showing Hyatt Flexible Roller Bearings.

Keeps down the cost of milling Small Parts

These small millers are built to handle small milling jobs, quickly, accurately and economically.

The U.S. Miller so greatly increases output of small parts as to actually reduce milling cost 1/3 to ½.

Neither in power nor capacity is any other miller of similar size its equal.

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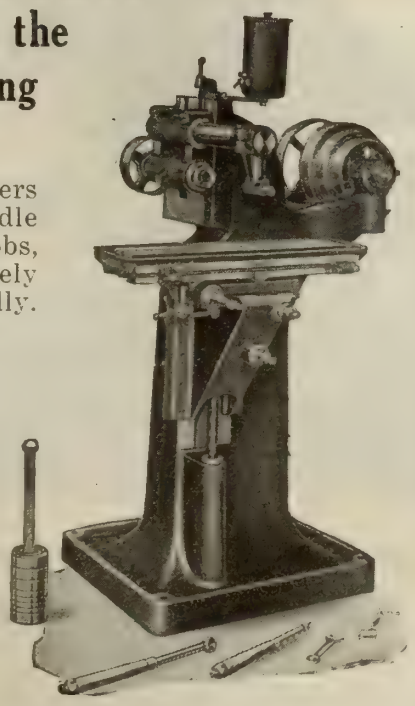

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Manufactured by
United States Machine Tool Company
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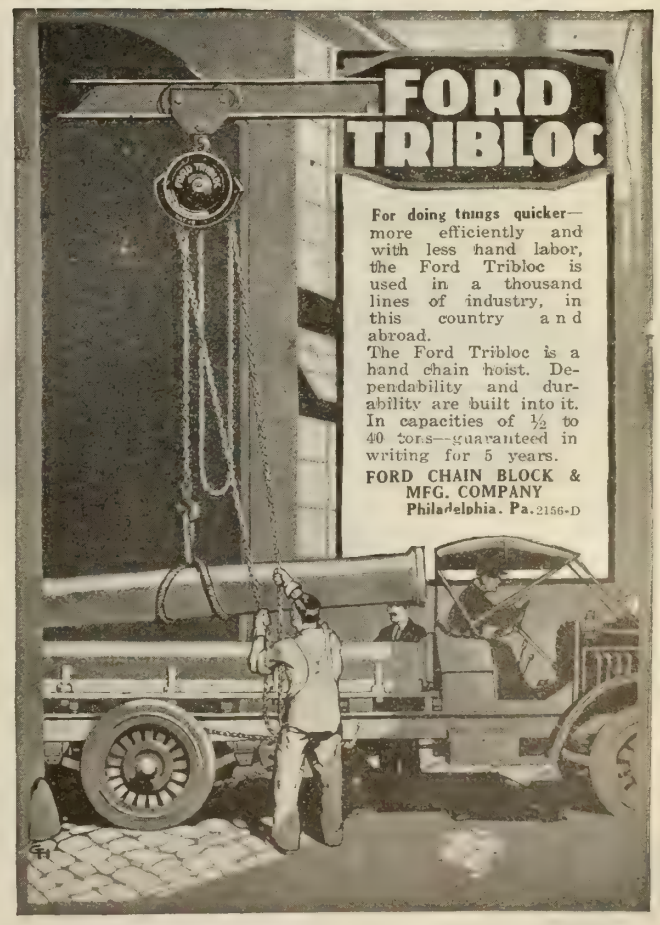

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To cut down the cost per cut

How Many S. P. M.?

"Haste makes waste" is just as true of hack saws as of anything else. Forcing a blade by increasing the strokes per minute means a quickly dulled blade. 50 to 60 strokes per minute is about as fast as it is economical to run when cutting dry. On soft steel, using compound, saws may be run to advantage at about 100 S. P. M., at from 65 to 80 on annealed steel, and on unannealed tool steel at about 60 to 80 strokes per minute.

Follow the Starrett Hack Saw Chart, put on the weight and watch the cutting cost decrease.

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The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

Use Starrett Hack Saw Blades

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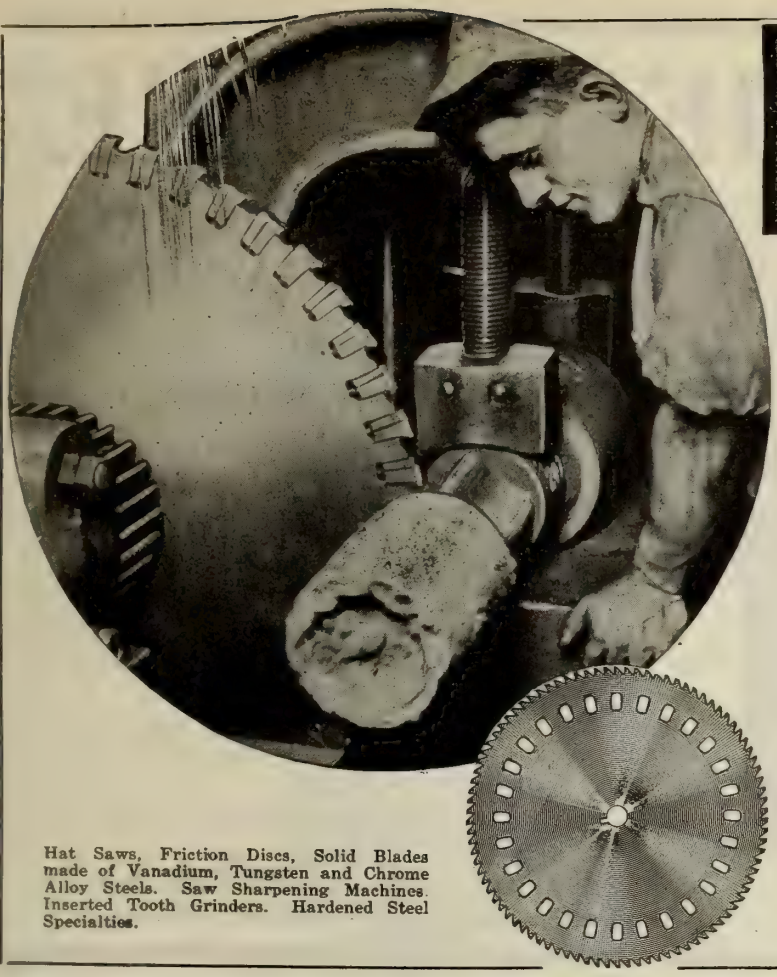

Hat Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines. Inserted Tooth Grinders. Hardened Steel Specialties.

HUNTER
Duplex Saws

The selection of many of the best and largest companies in the country for cutting ingots, bars, forgings, castings, rails and structural shapes.

Their fast cutting qualities mean a saving of time and power, plus increased production.

Teeth are accurately formed, ground and set for highest speed and greatest endurance. Made in sizes up to 90 in. in diameter.

Write for price list and full particulars

HUNTER SAW & MACHINE CO.
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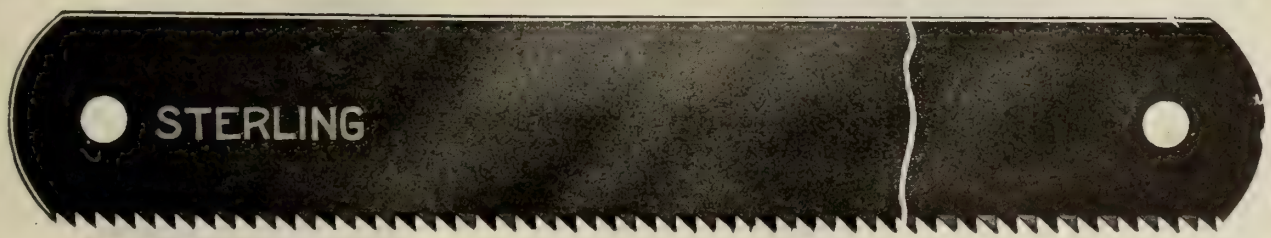
"STERLING"
HACK SAW BLADES



A brand once adopted, difficult to replace.

REASONS—High quality of material used, mechanical construction, and special heat treatment.

RESULTS—Economy, which means satisfied customers.

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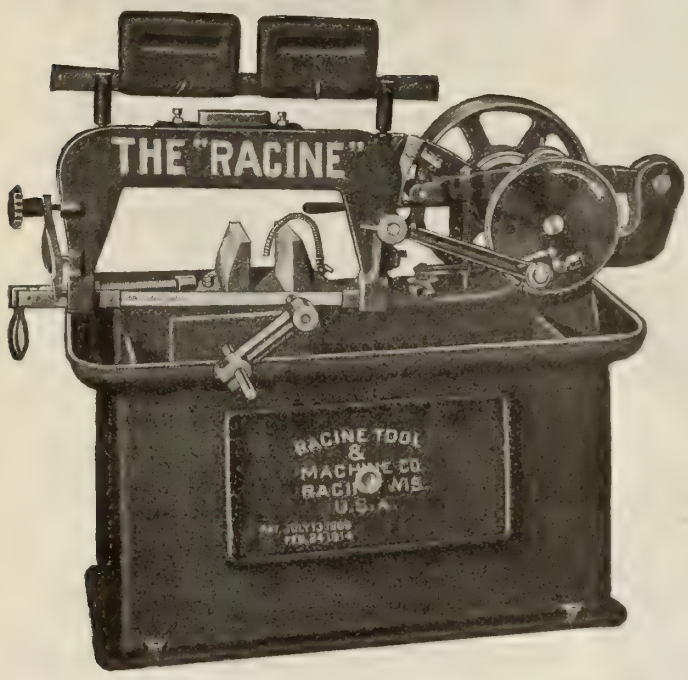
"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
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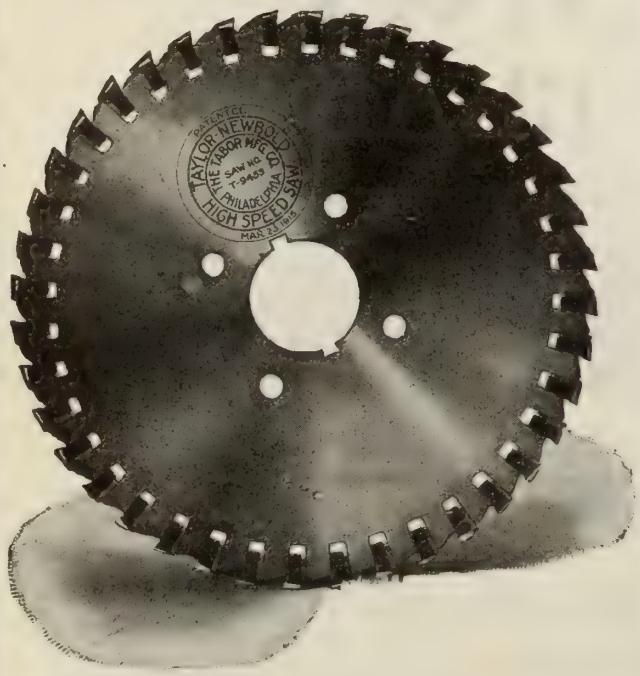
THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

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Would you like to have us prove that

Peerless **HIGH SPEED**

Machines do 50 to 100% more work

The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

The Balance Lift of the Peerless

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

The Peerless assures you the peak of production at very lowest cost. Write for full details.

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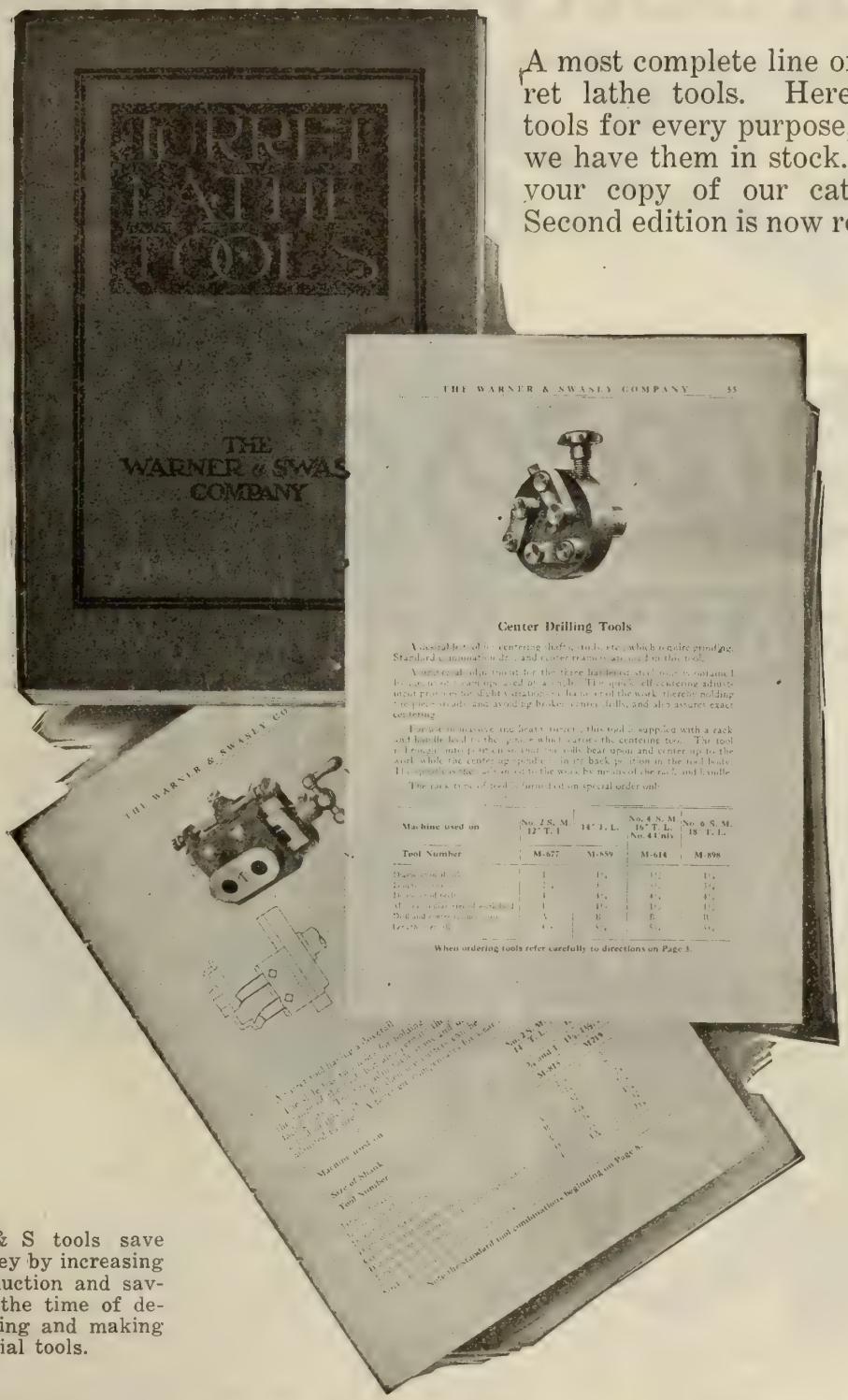

A most complete line of turret lathe tools. Here are tools for every purpose, and we have them in stock. Get your copy of our catalog. Second edition is now ready.

W & S tools save money by increasing production and saving the time of designing and making special tools.

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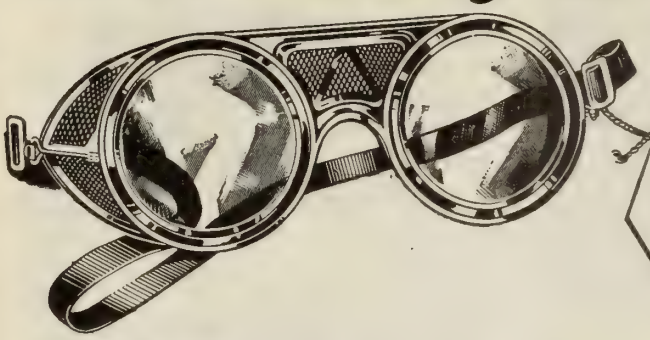
Your Safety Committee Will



The STOCO SAFETY GOGGLE
O.K.
STANDARD OPTICAL CO.
GENEVA, N.Y.

STOCO CELOGLAS
SHATTER-PROOF LENS

SAFETY GOGGLES

When you bump into the problem of "how to get the men to wear their goggles," you'll find the STOCO Safety Goggle offers you a quick solution. It's comfortable. It has broad smooth surfaces bearing on the face, easy cable earbows or elastic headbands and in spite of its sturdy construction is remarkably light. Moreover, the man who is to wear the goggle will appreciate the fact that if the Celoglas lens does fracture it will stay in the frame and not fly into his eye.

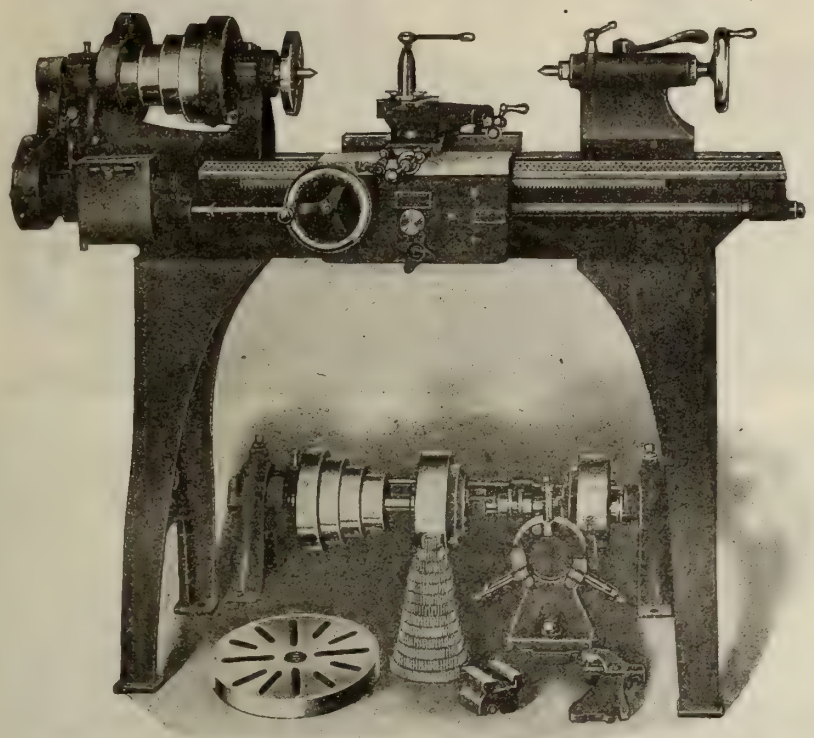
PRICE

With Celoglas "Shatter Proof" Lenses - $115.00 per hundred
With Clear Glass Lenses - - - $ 90.00 per hundred

A sample of the STOCO Safety Goggle will be sent without charge to Safety Engineers, Purchasing Agents and Superintendents upon receipt of request on letterhead.

STANDARD OPTICAL CO.
GENEVA, N.Y.

WORCESTER LATHES



12″ AND 14″ SWING CONE OR GEARED HEAD SINGLE PULLEY OR MOTOR DRIVE.

These are strictly high grade engine lathes and are especially noteworthy for their excellent design and good workmanship.

They are consistent in proportions, handsome in appearance and in accuracy and reliability they are exceptional.

Write for complete information.

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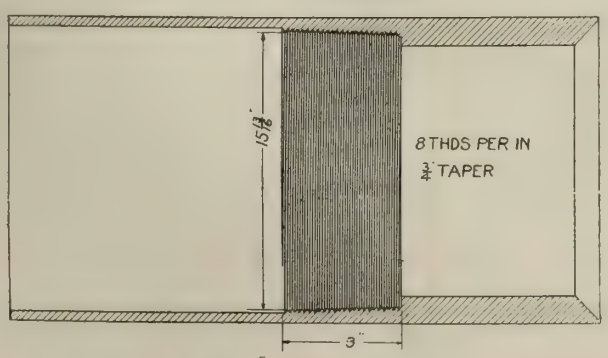
SMALLEY-GENERAL

THREAD MILLING MACHINE

Cost-Cutter :: Time-Saver

Saved 29 Minutes on This Job

Typical Operation and Time Study



Machine—No. 1 Thread Miller.
Piece Milled—Drive Shoe.
Thread—16¼ inches diameter, 3 inches length, 8 pitch, Briggs std., tapered thread.
Milling Feed—7 inches per minute.
Material—.55 carbon steel; air collet chuck used.
Time Study—Seven minutes floor to floor for complete operation.
Note—Former time, 36 minutes chasing in a lathe.

Are you not convinced that Smalley-General Thread Millers can save you time and expense? Let us have blueprints for time study of your work.

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Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

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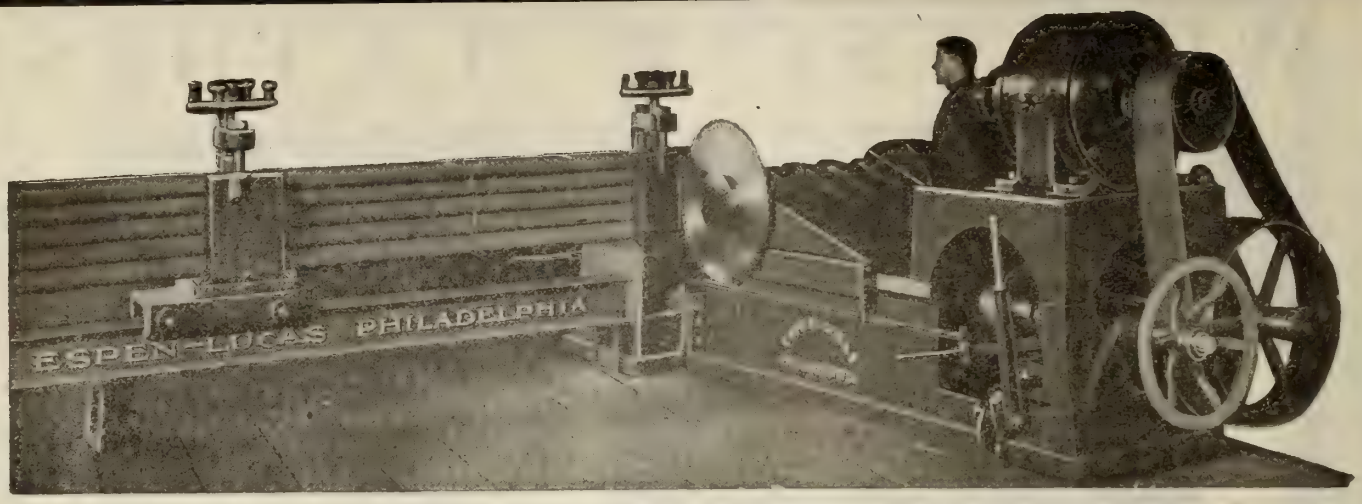
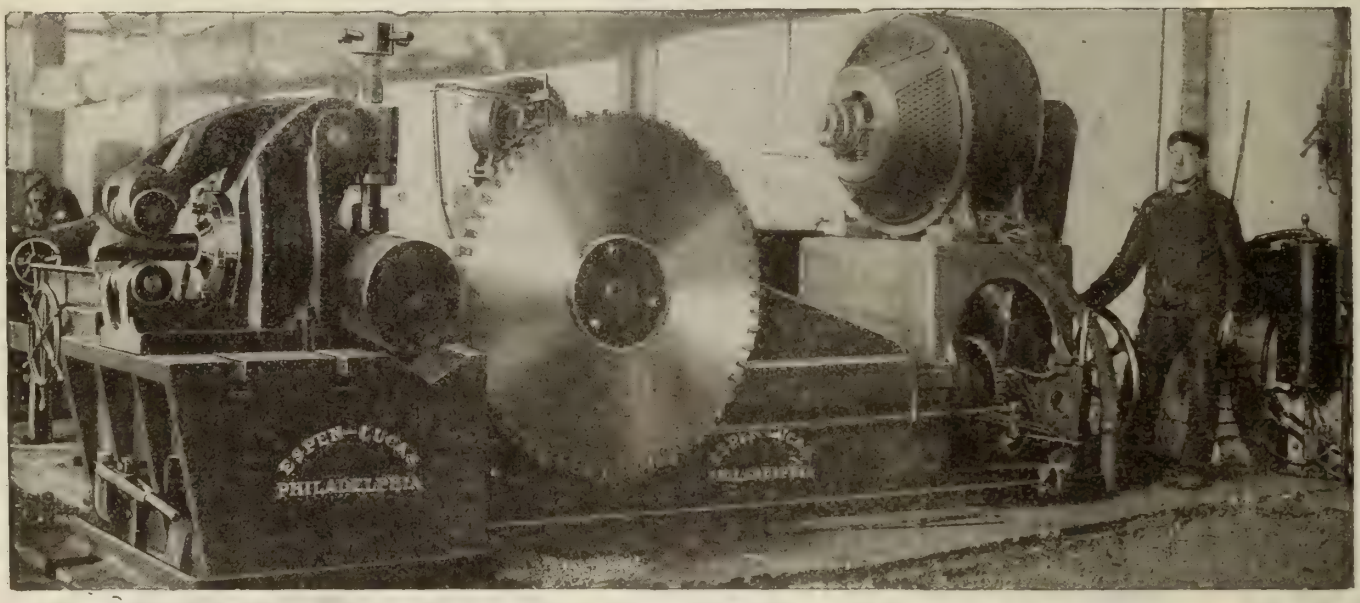
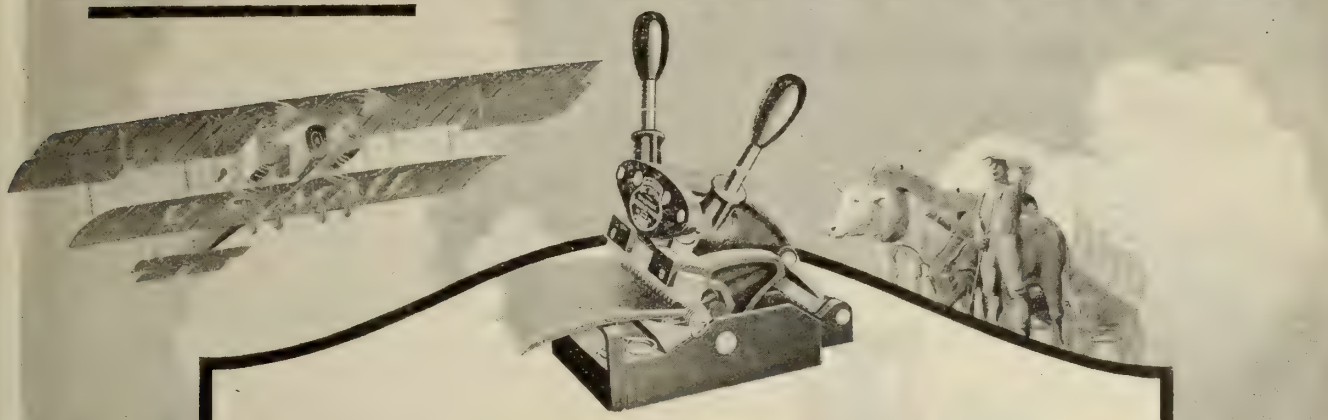




THE ESPEN-LUCAS MACHINE WORKS, FRONT & GIRARD AVENUE PHILADELPHIA, PENNA., U.S.A.

TIME-*the* All Essential



STEAM, electricity and motors—even aeroplanes—have given the world wings to save time since ox-team days—a revolutionizing leap within a few years. The Clipper Belt Lacer has achieved an equally huge saving of time to industry.

Before "Clipper" Lacing came, the breaking of a factory belt caused a serious halt of manufacturing energy—and with it an incalculable loss of workmen's time. It used to take from ten minutes to half an hour to make even an inferior joint. To-day

The Clipper Belt Lacer
Laces a Belt in Three Minutes

It makes a durable joint that is perfectly smooth and flush with the belt on both sides--one that pulls better and is absolutely dependable. The "Clipper" is so simple that any workman can use it—and so important that nearly a hundred thousand of the world's industrial plants have adopted it.

The "Clipper" goes to manufacturers on free trial. It is backed by a perpetual guarantee.

Most mill supply dealers sell the Clipper.
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GRAND RAPIDS, MICHIGAN, U. S. A.
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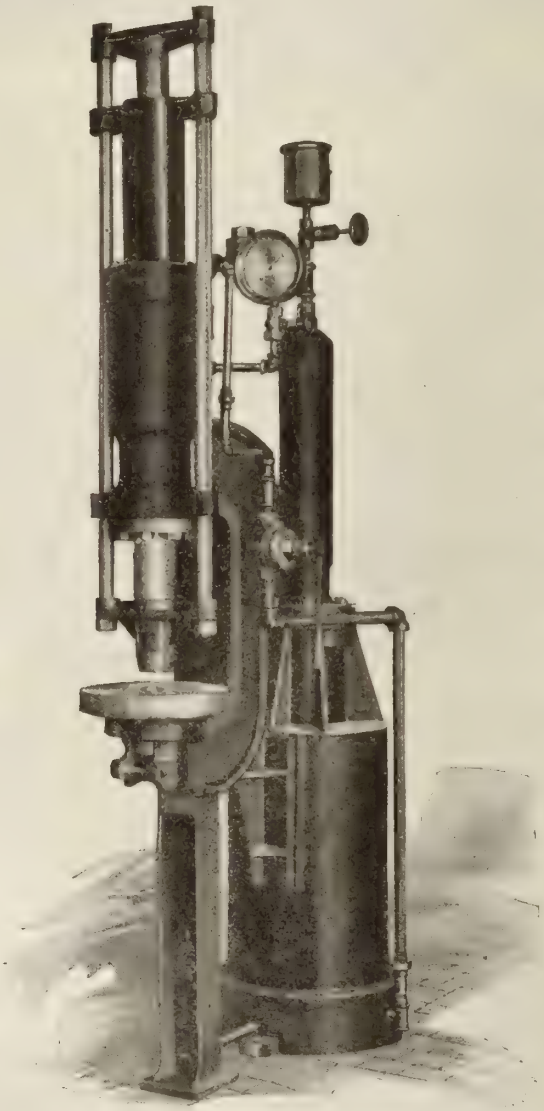
ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

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High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

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Double Production

Another Competitive Record for DAVIDSONIZED High Speed Steel Tools

Here are the facts which speak for themselves. The name of the plant in which the record was made, will be furnished on request:

Four straddle mills on arbor, size 6 inches by ½ inch.
Material: High Manganese steel forgings.
Operation: On one machine using cutters of a standard make (not Davidsonized),

2 minutes, 40 seconds

On adjoining machine, using Davidsonized Cutters of same size and type, on the same operation.

1 minute, 5 seconds

A clear case of **more than 100% increase** in production speed through the use of Davidsonized High Speed Steel Cutters.

Furthermore, the Davidsonized Cutters, even at the increased speed, stood up to the work as many hours as the others. Thus, the increase in number of pieces per grinding was also in excess of 100%.

Tool costs, labor costs and overhead per piece produced, all come down in the same proportion.

Through record after record of this unquestionable sort, Davidsonized Tools are being adopted by more and more of the country's foremost plants. Can **you** afford to wait longer before trying them out?

THE DAVIDSON TOOL MFG. CORPORATION

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In Canada—The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Winnipeg
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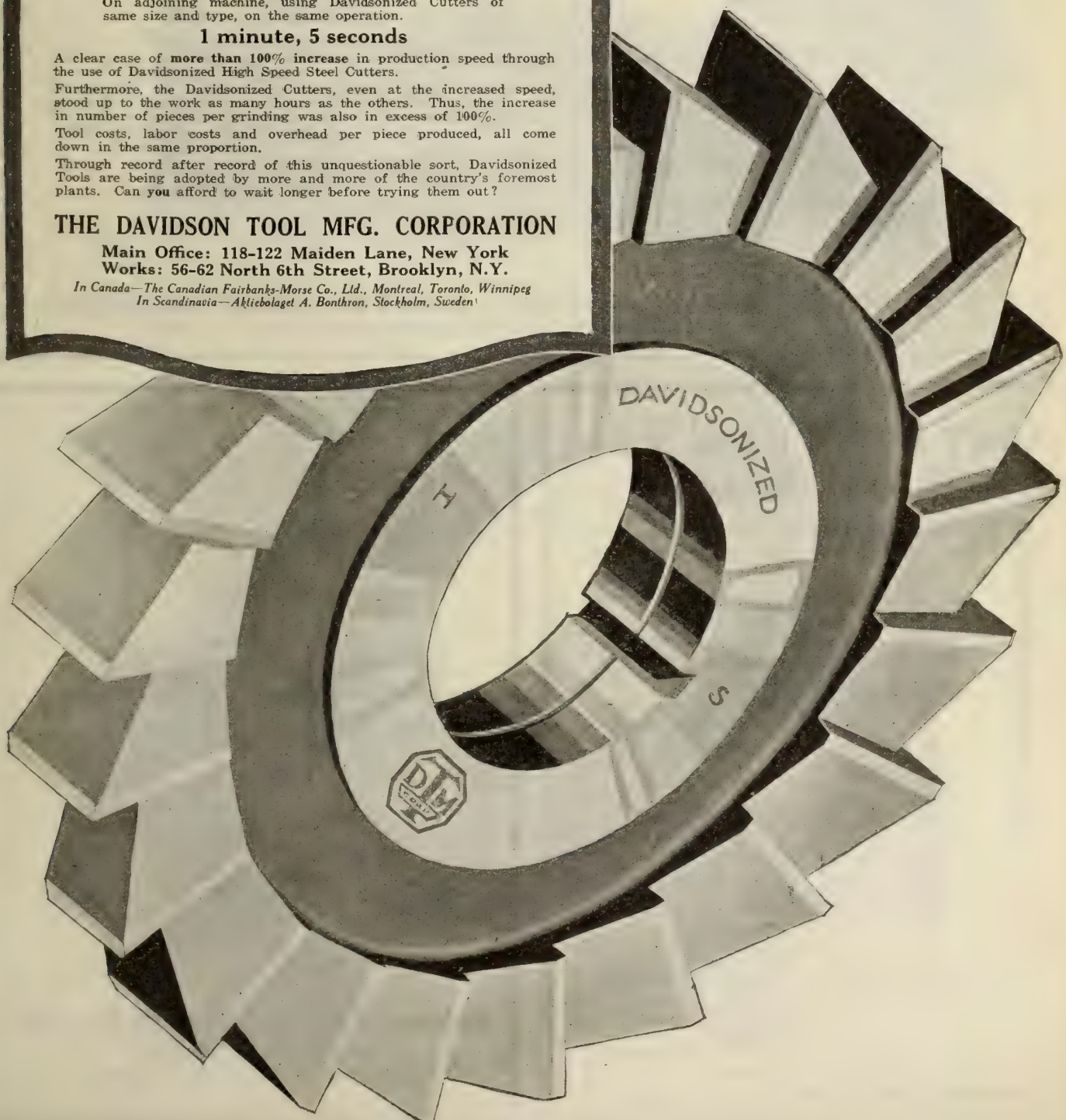
Special Service

To Concerns Who Make Their Own Tools

We will supply Davidsonized High Speed Steel Blanks, semi-finished to within approximately .015 to .020, either soft annealed or hardened.



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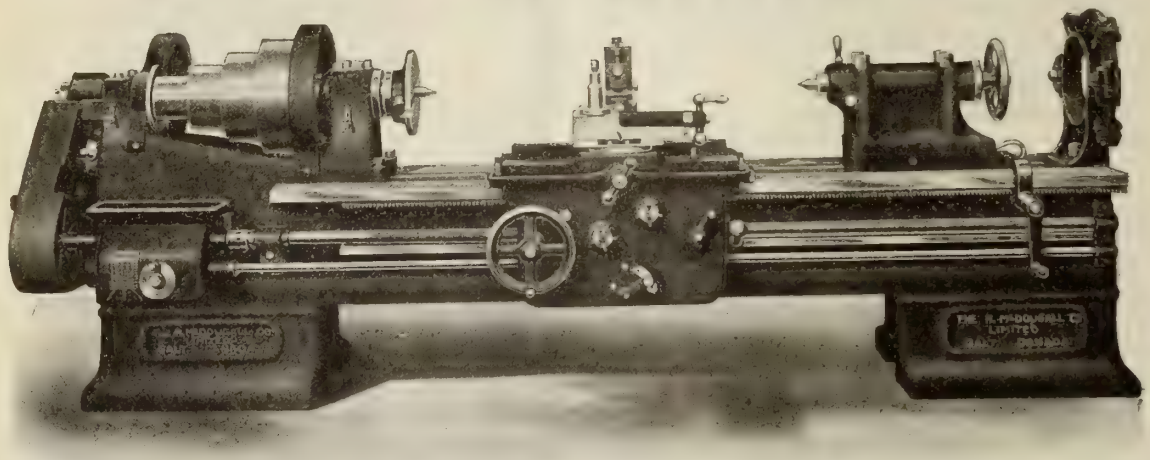
ARE-MAC-DEE IS A GUARANTEE

Every part of our Gap Lathes bears the "earmarks" of expert workmanship.

McDOUGALL GAP LATHES

And every feature is proof of our aim to produce a machine of unusual merit.



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THE R. McDOUGALL COMPANY, LIMITED, GALT, ONTARIO

The Canadian Fairbanks-Morse Co., Limited, Sales Agents

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify "Diamo-Carbo"—the perfect diamond substitute.

For large, coarse, hard wheels ask for the "Desmond-Huntingdon."

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

D.F.&S.Co. Quality & Service

Forgings, Stampings or Pressed Steel Parts

An attractive catalogue showing the facilities this company has for producing Forgings, Stampings and Pressed Steel Parts—particularly in large quantities—sent on request.

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THERE IS "A REASON WHY"

When Germany signed the Armistice, Walcott Lathe Company accepted cancellations of orders for Lathes amounting to hundreds of thousands of dollars. Not one cent of damage from the United States Government or anyone else was claimed on account of the cancellation.

YOU SAY, WHY

Because Walcott Lathes are standard equipment throughout. They are built and designed for manufacturing purposes in sizes to meet every requirement of your shop. Thus, we have had a constant increasing demand for Walcott Lathes for the past thirty-eight years, not from one section of the country, but from all over the world. Our business is good, and our plant is running full time, not a man idle.

If you are interested in new Lathes, specify the WALCOTT, and you will find by their many advantages "The Reason Why."

WALCOTT LATHE COMPANY

Engine Lathes

140 Calhoun Street - JACKSON, MICHIGAN

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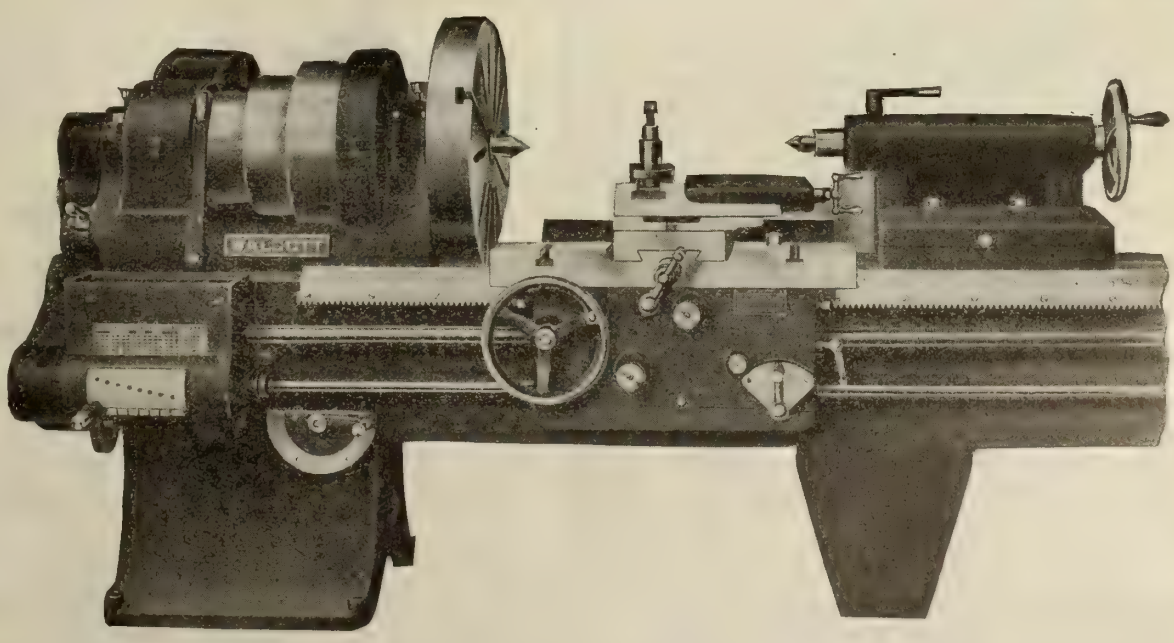

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Notes On Grinding

NORTON COMPANY, WORCESTER, MASS.

No. 67A

Ten Suggestions on Saw Sharpening

1. The success of saw and knife grinding lies in the selection of the right grinding wheel.
2. Soft bonded wheels cut quicker and glaze less than hard wheels. They do not last as long as hard wheels, but produce more work in a given time and are a better investment than hard wheels as they will not case-harden or burn.
3. The proper wheel for the work holds its shape without frequent dressing and cuts freely without tendency to glaze or fill.
4. Keep the face of the grinding wheel true.
5. The grinding wheel of the correct grain and grade running at 5,000 surface feet per minute is the right wheel to use. If a wheel glazes and is found to be running more than 5,000 surface feet, reduce the speed accordingly. If a wheel wears out rapidly and is found to run less than 5,000 feet, increase the speed accordingly.
6. Increasing the speed of a grinding wheel gives the effect of a harder wheel. Decreasing the speed gives the effect of a softer wheel.
   Every saw filer should have a speed indicator.
7. Dressing is not truing but sharpening the wheel. Excessive dressing wears faster than grinding. When too much dressing is necessary it is an indication that the wheel may be too hard, or is running at the wrong speed.
8. The pressure of the grinding wheel should be light on the work. Overpressure does not produce rapid cutting but is liable to cause glazing of the wheel and burning of the teeth. Better and faster results are obtained by light pressure.
9. A wheel that is too fine works with about the same results as a wheel that is too hard.
10. Be sure your machine is free from vibration before you condemn the wheel.

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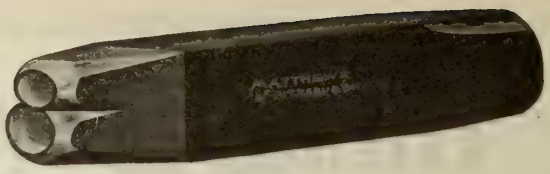

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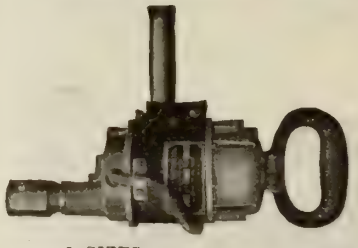

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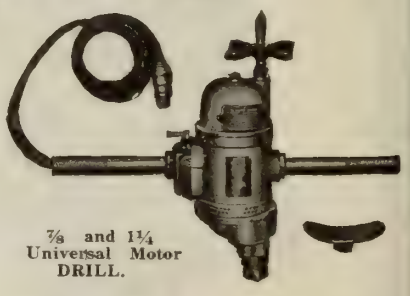

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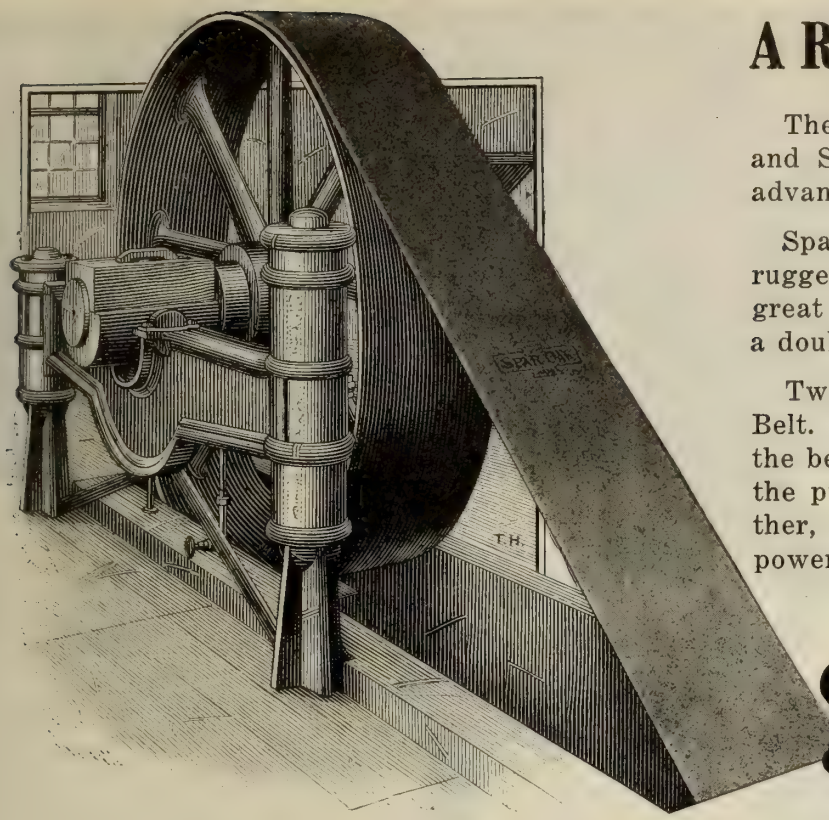

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SparkOak Belts grip from the start. During the weeks most new belts take to "work in," a SparOak Belt is giving full power and keeping production up to normal. And SparOak Belts keep on gripping for years under adverse conditions. They withstand repeated shifting, and the wear against step cone or flange pulleys. They render efficient service on drives with high speeds, small pulleys, and heavy loads. In short, any of the factors that quickly wear out ordinary belts affect SparOak belting amazingly little.

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MADE IN CANADA MADE IN CANADA

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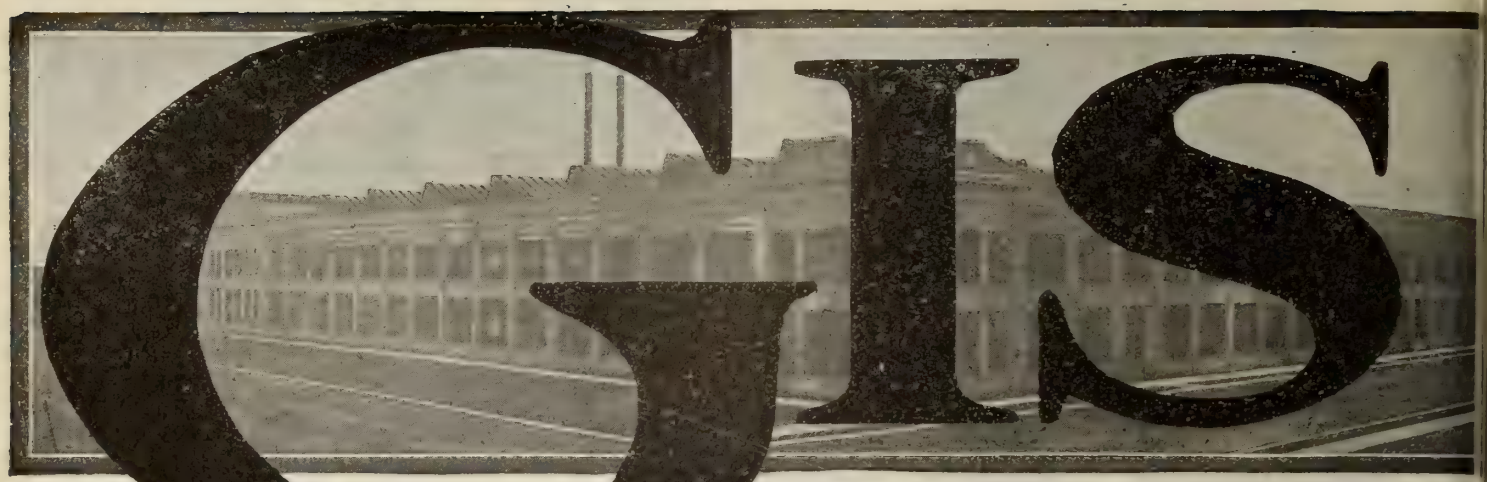
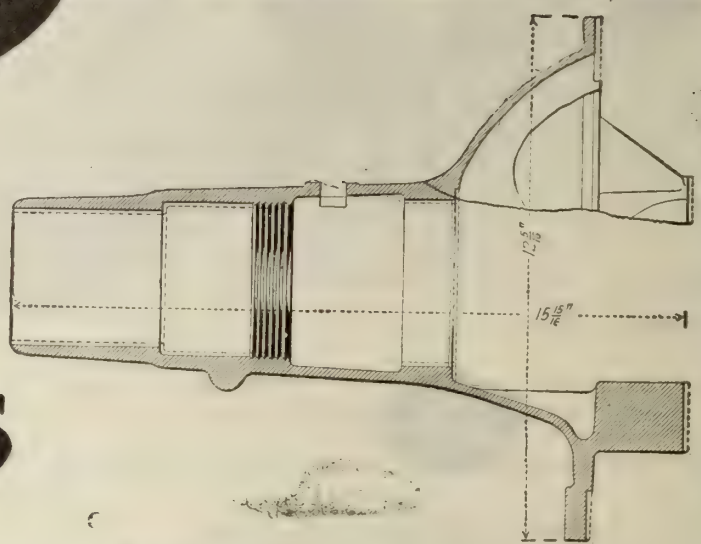


Eight Minutes



The Gisholt Automatic time for machining this Differential Carrier is eight minutes.

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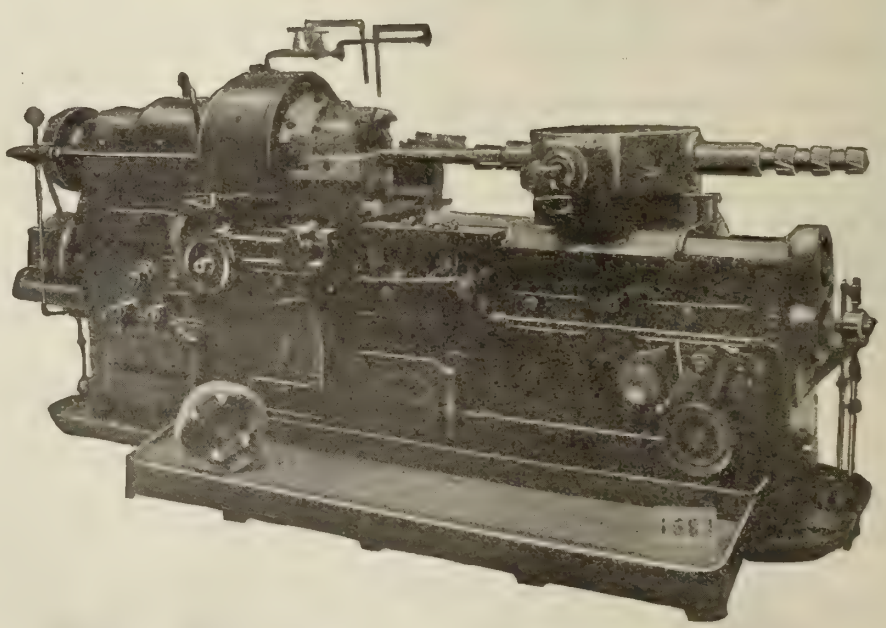

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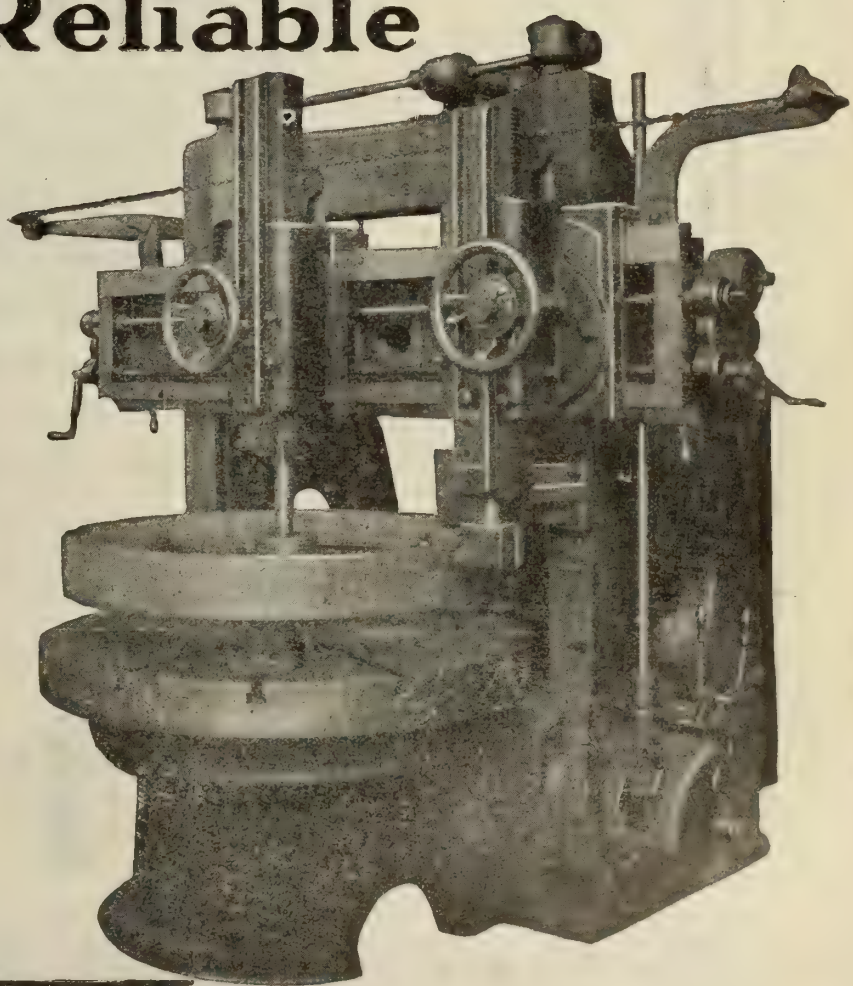

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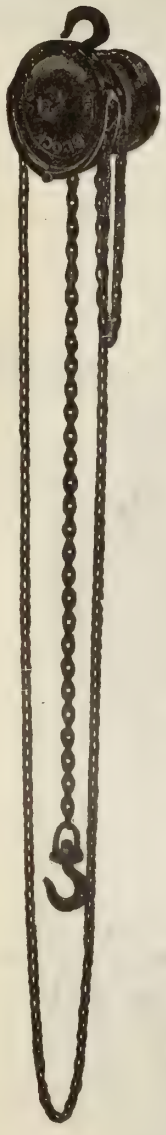

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 13. October 2, 1919

Making the "Hall" Line of Pipe Machinery

Four Brothers With One Aim, Namely, to Turn Out the Best Line of Pipe Machinery Possible.

By J. H. MOORE, Associate Editor
Canadian Machinery

A Brantford Industry Which Has Shown Remarkable Growth and Progress in Recent Years.

TO get properly enthusiastic over anything, you must first get cause for that feeling of enthusiasm. Nothing creates such a feeling quicker than a like enthusiasm on the part of the person, or persons, describing some particular operation or system of manufacture, which brings the writer up to the point where he will describe his visit to the plant of John H. Hall and Sons, Limited, Brantford, Ontario.

The moment he entered the plant he was struck with the earnest spirit of enthusiasm pervading the atmosphere. Here was a plant manufacturing a product which it not only thoroughly believed in, but was willing to guarantee to the limit. "When we send goods out of the shop, we do not by any means consider that the end of it," commented Mr. L. S. Hall, "but rather the starting point of our interest, for we have been, and are even more so than ever, following out the policy to check up closely the career, as it were, of our machines. We watch and inquire carefully into how they please, and stand up to their work, and I am glad to say," he concluded, "that the results are very gratifying."

Before going into the methods of this firm any further, it might not be amiss to give readers a short history of this concern, how it started, and its war-time record.

How It Started

The start was made as far back as seventeen years ago, in the same place, namely, Brantford, Ontario. At that time, J. H. Hall, the founder of the concern, was president and general manager, and together with his four sons, L. S., E. W., E. L. and A. R. Hall, respectively, he launched out as a manufacturer of special machinery. Screw cutting machines for the John Morrow Co., were amongst their first orders, and also special pipe machines for the Page Hersey Co; pipe benders, straighteners, etc., were also manufactured during this period. The idea, however, kept to the fore was the developing of their line of pipe machinery, improving this in every way possible, in order to keep not only abreast of the times, but ahead of them.

When war broke out, there commenced an enormous demand for cutting off machines. This firm stepped into the breach, and made certain changes to their pipe machines which turned them into at least a good temporary cut-off machine. But the demand for a special machine grew so insistent that work was commenced on designing one. A point worthy of note, is the fact that they do their own designing; Mr. L. S. Hall being the brother with the designing qualifications.

He promptly got to work with the result that a special rugged machine, equipped with ball thrusts, friction clutch and air chuck, was soon on the market, and in great demand. During last year over a quarter of a million dollars' worth of business was handled by this concern. From the start of war 1,400 machines were sent out, and in many cases exported, one case in point being the sending of a 12 in. machine expressed to Moscow in Russia, during the submarine scare. This is about the only case where the Hall Brothers admit, they haven't followed up the career of their machine. A notable feature showing speed which was exhibited, is as follows: that three weeks after the placing of the first order, the first machine was shipped.

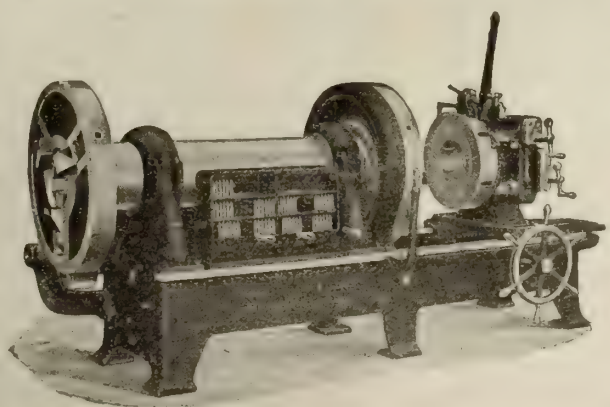


FIG. 1—THE MACHINE AS IT IS NOW BUILT.

But to continue a little more on the personnel of the firm. The father, John H. Hall, who established the business in 1902, lived to see the concern grow to splendid proportions, but passed away suddenly in Los Angeles, a short tim ago, at the age of 67, leaving the business in the hands of his sons, who had so splendidly helped the good work along. It might be well to add that three of these sons are all practical mechanics,

the other being the business spoke in the wheel. Speaking of wheel, gives us an excellent opportunity to show this firm's novel trade-mark, which was designed by L. S. Hall himself.

In each of the spokes is placed a photograph of the brothers, together with the founder of the business. The novelty of this trade mark alone defies its being copied. At the death of J. H. Hall, a shake-up was made in the positions, and following is present duty of individuals mentioned: Mr. L. S. Hall, president and general manager; Mr. E. W. Hall, secretary and treasurer; Mr. E. L. Hall, director; Mr. A. R. Hall, vice-president; Mr. E. L. Williams, office manager and director.

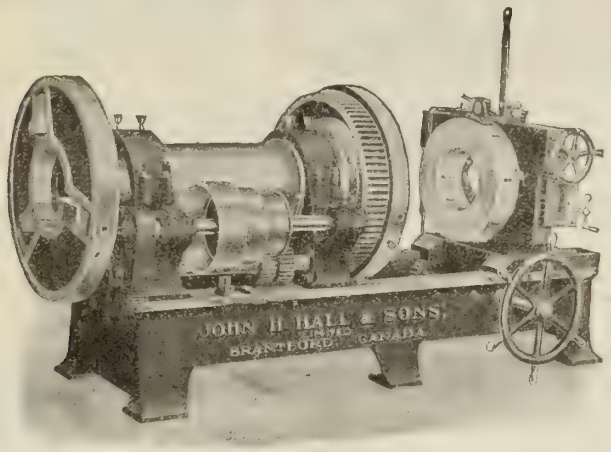


FIG. 2—THE MACHINE AS IT USED TO BE BUILT. (NOTE THE DIFFERENCE AND READ THE TEXT.)

The Actual Manufacture

So now since having placed before readers the inside history, as it were, let us proceed to consider the actual manufacture of their line of pipe machinery.

Pipe lathes, rapid nipple machines, rapid upright roller pipe cutters and special machinery for the tube mills about cover their regular line, but we will chiefly interest ourselves in their pipe threading lathes. Those machines are made in various sizes, from the hand machines up to the enormous capacity of 18-inch pipe. Two of these huge machines are at present under construction.

Their smallest power machine has a capacity up to 2 inch, while they next range as follows: No. 4 Simplex, No. 4 Standard Improved, No. 6 Standard Improved, No. 6 Duplex Improved, No. 8 ditto, Nos. 10 and 12, ditto. Then, of course, comes any larger size desired, such as 16-inch, 18-inch, etc. To go over all their lines in detail would be impossible, but one thing that impressed the writer was the compactness, yet absolute rigidity of these machines. All gear changing levers are within easy reach of the operator, and driving pulley is entirely out of his way.

Perhaps the best way to point out what the writer refers to, would be to compare Figs. 1 and 2. At Fig. 1 we see the machine as this firm used to build it. Note: the driving pulley and gears all exposed, and very much in the way. But now, refer to Fig. 2 and see the difference.

A Comparison

Where before, the cone pulley and gears stood in the way, we find these placed entirely out of the way. In their place is a convenient cabinet for storing the dies used on the machine. The advantage of such a cabinet is self-apparent. There is also a small pocket cast on the side of this cabinet to hold orders, etc., that the operator might need to refer to. In other words the operator is considered at all times in the design.

The gears are also totally enclosed, and run in oil, which is a great improvement over the former method.

The lever operating these gear changes come out as shown on photo, within easy reach of the operator, and all the different changes obtainable are plainly marked, in order that the operator cannot get confused. A single drive pulley is placed at the back of the machine, on a special drive shaft. A friction clutch is also installed in connection with this pulley. Such a scheme allows the operator to turn the spindle head around a very short distance when desired. A feature such as this needs no coment to impress readers with its benefits, for the lack of this feature has been a serious drawback so far.

There is also a rotary gear pump on the rear of machine. This pump is re-

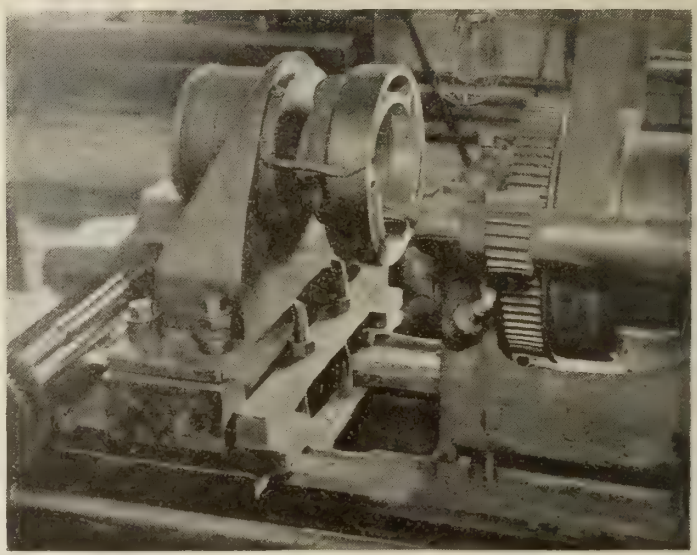


FIG. 4—MILLING THE CAMS ON THE DIE HEADS.

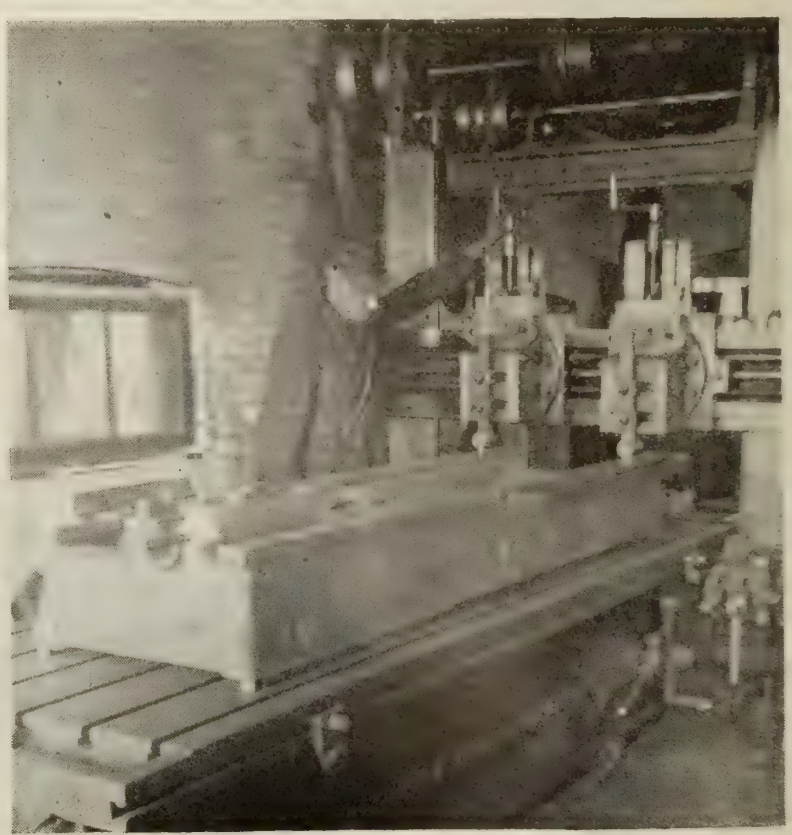


FIG. 3.—PLANING THE BED OF A DUPLEX PIPE LATHE.

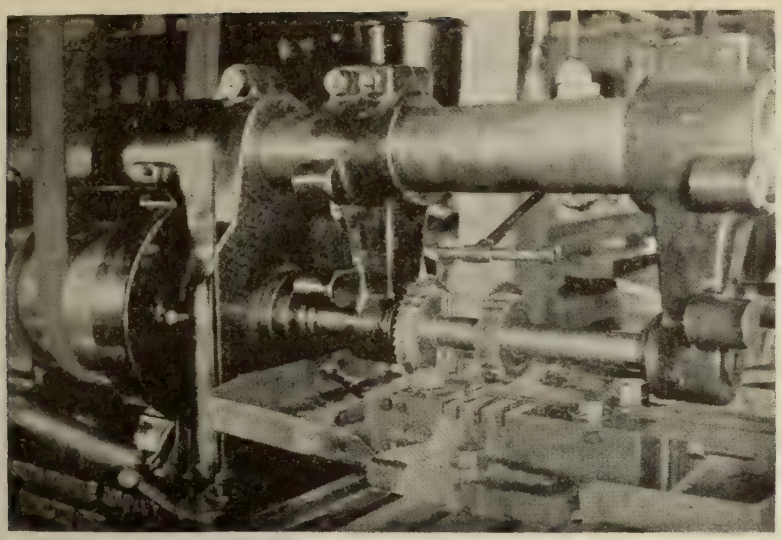


FIG. 5—MILLING THE DIE BLANKS WITH A FORD-SMITH MILLER.

versible, so, of course, it does not matter whether you are cutting right, or left hand threads, the pump will work equally well.

All spindles are self oiling, and the main spindle bearings are oiled from a chain which runs at all times in a well of oil. This feature is obtained through the design of the bearing and caps, which have a hollow core to accommodate the oil and chain. Interchangeable bronze nuts are furnished in all jaws of machine.

Micrometer adjustment is arranged for in the die head, also a special arrangement for centering the pipe. There is also a cut-off tool, and reaming tool, in connection with the die head on the large size machines.

To enumerate all the points of design would occupy too much time and space, suffice it to say that each point throughout these machines has been carefully thought out, and designed with the idea in mind to make them as far as possible in a class by themselves.

Of course, as the reader will understand, these machines can be fitted up with motor drive, in fact, in many cases, this is done and the machine is designed with this idea in mind. To place a motor on these machines is not a case of afterthought, for there is a pad, and special bracket, so arranged that when desired this method is installed.

It might be well at this point to show by illustration some of the operations on these machines.

Planing the Bed

At Fig. 3 we see a bed for one of their duplex pipe lathes being planed. There are a few points to which the writer would call your attention. Note how the bearings for the gear box are all self-contained in this bed. Directly below these bearings there is a trough, which holds the oil in which the gears run. Another feature is the trough shown on the side of the bed. This trough or tray catches all the oil drips, which would have a tendency to run down the side of bed, giving it a sloppy appearance. By means of this tray the machine is always kept looking neat and clean. One other point in connection with this bed, is the fact that all points slope toward the centre, that is, such points where oil would strike. In this way the oil all runs to the centre of machine, and later passes through two drain holes, with strainer attached. In this way the same oil can be used over and over again, yet is always clean and free from cuttings.

The other points of interest in this photograph can easily be ascertained by a study of the photo.

Milling the Cams on Head

Another of interest is shown at view at Fig. 4. Here is a novel fixture designed to mill, on the lathe, the die

FIG. 6—HOBBING A SET OF DIES ON SPECIAL FITTED LATHE.

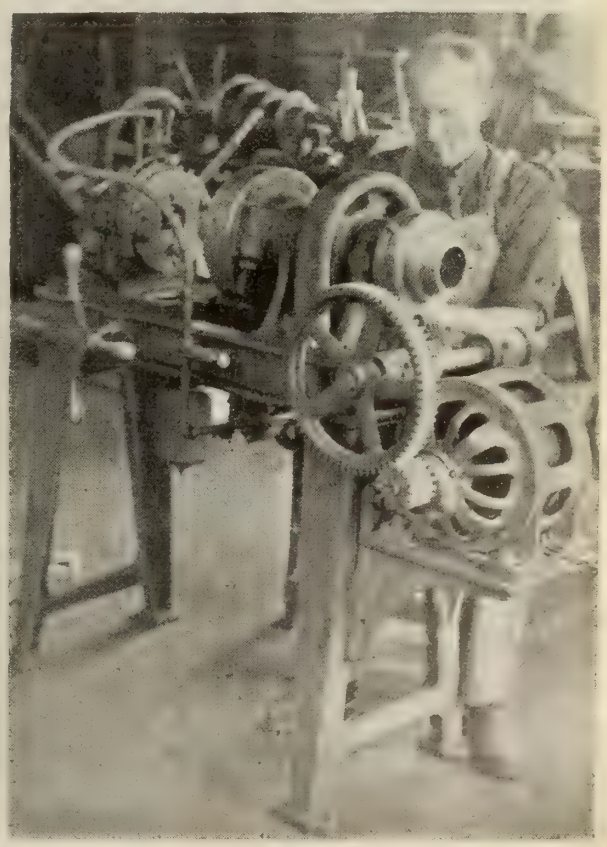


FIG. 7—ASSEMBLING A SMALL MOTOR-DRIVEN MACHINE.

heads, which have three, four or six peculiar shaped cams, as the case may be, on their face. The one illustrated has three such cam shapes. This lathe has been specially rigged up to take all sizes of these heads, and is fitted with worm drive at back, connected to the saddle. Of course, this feeds the saddle crosswise at a certain speed, depending on the cutter, and cam being machined. Different plates are placed on master cams, to suit conditions. High speed cutters are used and one operator runs three machines. Readers can, by studying this picture, follow further its various details.

In Fig. 5 we see a Ford-Smith miller busy at work on die blanks for these machines. Four cutters are used, two slitting and two lipping cutters; of course, the two lipping cutters mill the lip on the die blank, while the slitting cutter cuts them off.

Hobbing the Dies

Fig. 6 shows the operator at work on the hobbing out of a set of dies. This operation is a very important one, and is performed in a very creditable manner.

The die blanks are placed in a specially constructed jig as shown, and a special saddle has been constructed to hold the milling cutter, which is made of first-class high speed steel.

The driving mechanism for the head is also special, being a worm drive to reduce the head speed to suit. These dies are now cut with special care, for after all is said and done, the dies are the main portion of the machine. Pure lard oil is used, and the dies are hobbed at a very slow speed to ensure absolute accuracy. Approximately 6 hours is occupied in the cutting of a set of dies.

Readers will notice that this machine is also a lathe converted for this special purpose.

The hardening of the dies is also an interesting study. A special chart has been made, based on what has been found best for each particular purpose, and this is strictly adhered to. Pyrometer, etc., etc., form a part of this hardening department.

At Fig. 7 we see a smaller machine with motor drive attachment being assembled. Readers can readily grasp the compactness and general appearance of this machine from the photograph.

Throughout this article the writer has endeavored to emphasize the fact that the work on these machines is carried out with extreme care, and before going on to the next portion of this article it will be well to lay stress upon the fact that no work is passed through the shop except perfect in every detail.

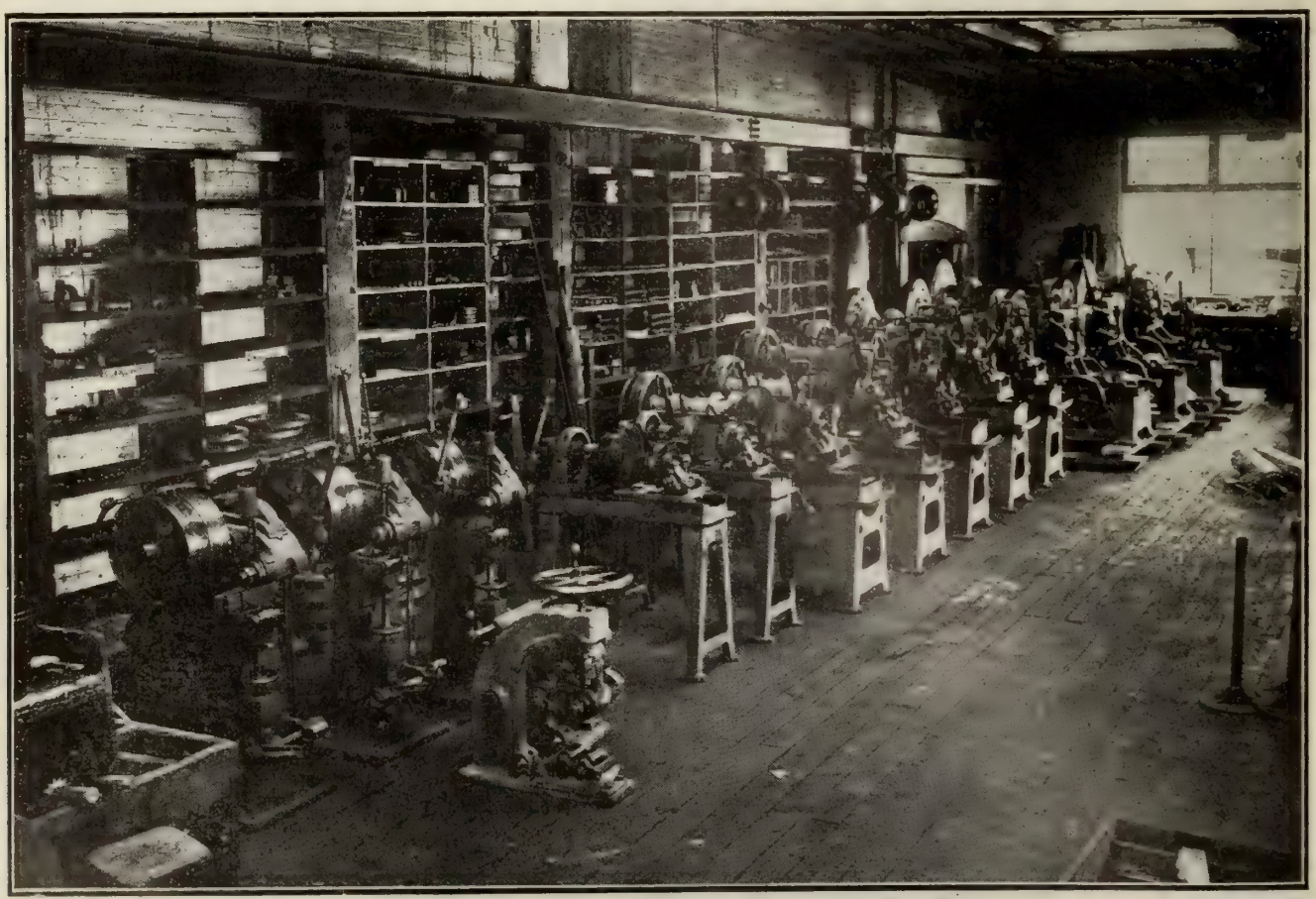
And now a word as to the service schemes instituted by this firm.

As stated before, they do not consider their obligations ended by the sale of a machine, but they follow up its subsequent performance. They know that the die problem is a large one, in fact, that it is the main problem, and so to cope with this as far as possible they have issued a bulletin entitled: "How do your dies die"? In this pamphlet, with such a novel heading, they go on to describe first—questions you should ask yourself—for instance: "What production am I getting from my dies?" etc., etc. All these questions are real practical ones, met with every day. They then show photographs of dies improperly ground and show why you cannot get results from such dies. They last of all tell you how to secure the maximum production and make up a chart, strictly for the man on the machine to work from.

They also issue a chart, showing every part of their machine, so that anyone can easily get familiar with all parts. Numerous other service bulletins are on the way, and as Mr. L. S. Hall told the writer, "our aim is to make our service practical and worth while."

Perhaps the best method of concluding an article of this nature would be to quote a little statement, made by L. S. Hall himself, which he mentioned in an offhand way to the writer. "I have always had a pet hobby," he said, "to feel that whatever I designed was a stop above any former effort, and I also felt that a business, to succeed, must not only give the customer all that he expects, but a little more.

It is this policy that is making them feel cramped in their present quarters in spite of the addition made to their plant during wartime, and it's a safe bet that there will soon be another addition added if the present policy of this company continues, as it will, of course, so long as the present executives hold office.



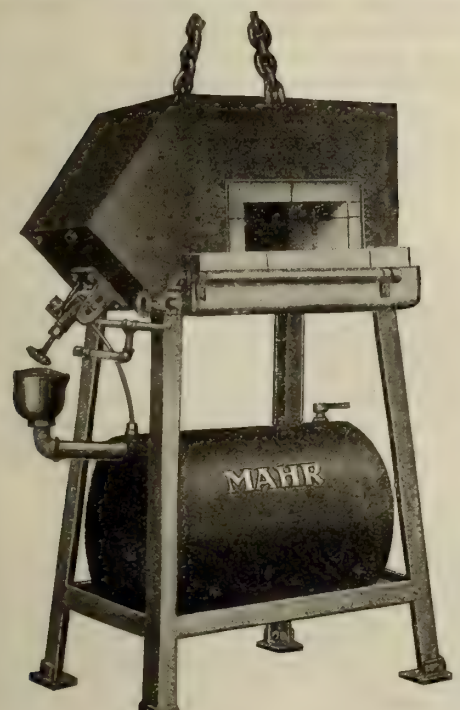
A GENERAL VIEW OF MACHINES HELD IN THE SHOP FOR EXHIBITION AT THE RECENT C. A. S. E. CONVENTION AT BRANTFORD.

Description of a Mahr Calorizor and Furnace

Oil Burning Furnaces For Forging and Heat Treating Purposes Are Rapidly Becoming the Usual Installation in the Industrial Plant of To-day. This Describes One Such Furnace

By J. H. RODGERS, Associate Editor Canadian Machinery

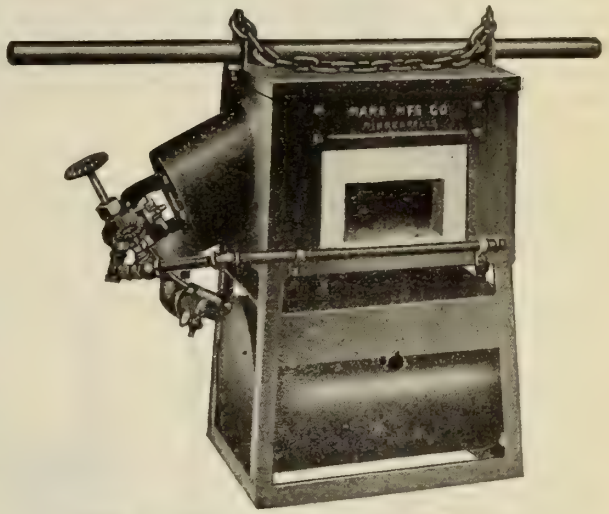
THE oil-burning furnace, for forging and heat treating purposes, is rapidly becoming a very essential feature of present industrial enterprise. The necessity of scientific application of heat in the treatment of shell forgings, to conform to definite specifications relative to the manufacture of munitions, has demonstrated the advantages that could be derived from a better knowledge of this branch of engineering practice. The acceleration of efficiency in the construction of furnaces during the war, was amply illustrated in the improved designs that were in successful operation at the close of active shell production. Experience, coupled with the study that has since been given to this all important unit, the oil-fired furnace, has enabled engineers to make further progress along these lines, and faulty design is gradually being eliminated and being replaced by improvements that will eventually establish the extreme economic value of this particular type of furnace.



GENERAL VIEW OF THE MAHR FURNACE.

In many styles of furnaces the actual heating chamber, in which the parts are subjected to the heat treatment, is likewise utilized as the combustion chamber, and the inevitable presence of oxygen necessary for combustion, invariably results in oxidizing the metal in the furnace. This has always been a serious factor in the process of heat treatment of steel or other metals, and unless extreme care is exercised, the resultant effect of oxidization is frequently costly and inconvenient.

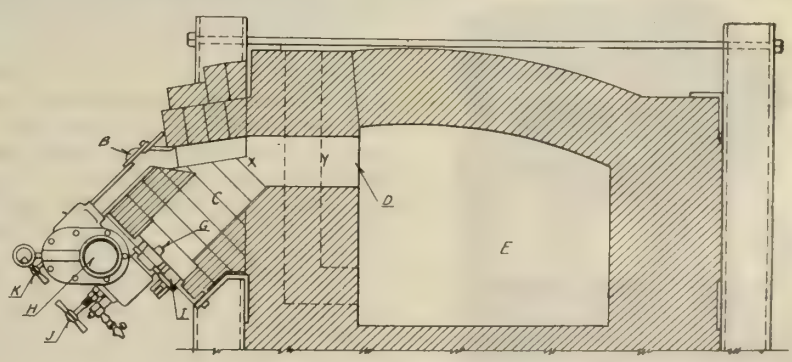
Realizing that a high efficiency furnace must be one in which the oxygen in the fuel mixture would be entirely consumed before coming in contact with the work in the furnace, the Mahr Manufacturing Co. of Minneapolis, Minn., have perfected a design of furnace in which the above requirements have been met. Apart from the method of carrying off the waste gases, the general design of the furnace proper differs little from those of other makes, but it is the design and construction of the burner and the combustion chamber that gives to the furnace its individuality and economic value.



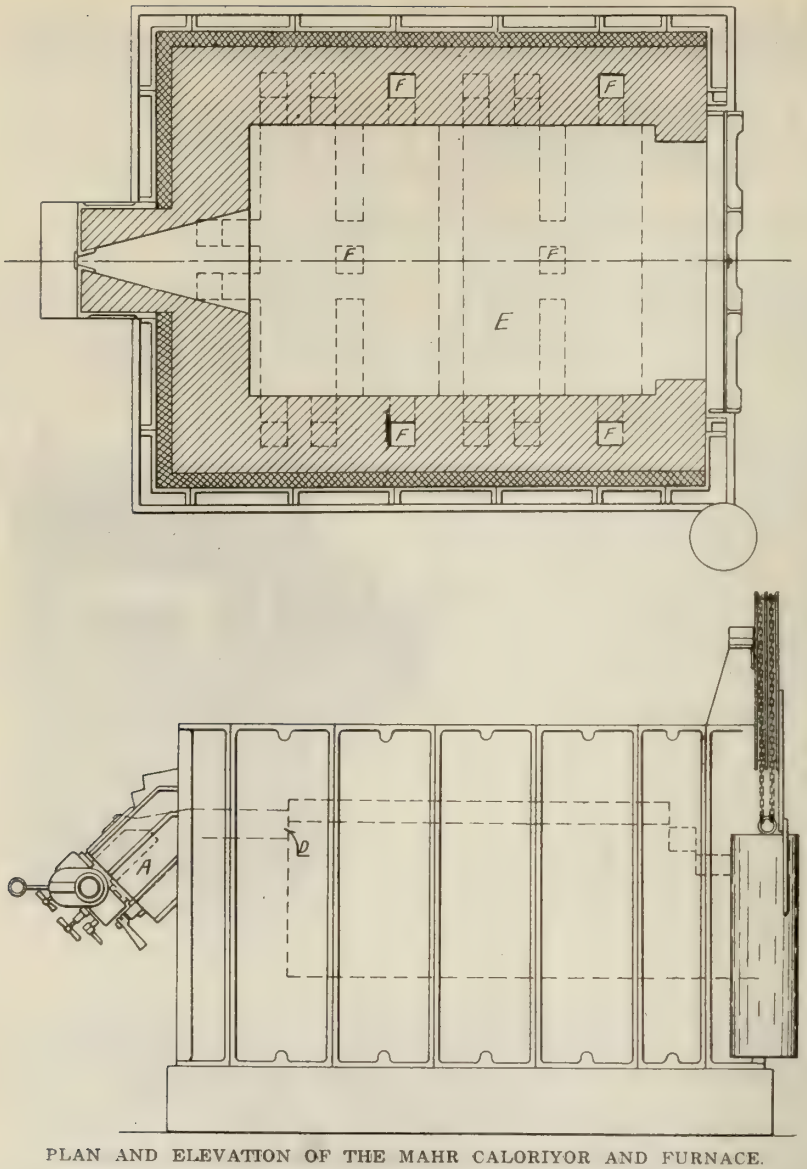
A TYPE OF FURNACE OF LOWER CONSTRUCTION.

It will be seen from the illustrations that the calorizor A is attached to the outside wall of the furnace in such a position that the opening D into the furnace is located near the roof of the heating chamber E. This permits of a swirling movement of the gases as they distribute to all sections of the heating chamber. Even after the gases have done their initial work, the surplus heat is still further utilized by a special arrangement of the outlet flues F, F, etc., as these circle the fire chamber, through the brickwork, before passing to the atmosphere—a decided improvement over the old method, where the waste gases passed directly through the roof.

A brief description of the action of the calorizor may be given as follows: The oil enters the combustion chamber through the oil nozzle G, and is atomized by the main air supply entering at H and passing into the combustion chamber around the oil nozzle. The atomized oil, having been lighted through the lighting hole I, receives a further supply of air through the lower air valve J. The effect of the due adjustment of these valves is to carry the flaming gas up to the point X, where it is met with an additional supply of air entering through the upper air valve K, this second current of air completing the combustion at the point approximately marked Y, at the same time giving the hot gases, so produced, the necessary velocity to carry them across, and circulate through the heat chamber. In the lower duct, between the oil nozzle G and the point X, the atomization and the combustion should be carried well forward, but the supply of air should not be so great as to draw the flame entirely away from the lighting hole pocket. The peep hole is shown at

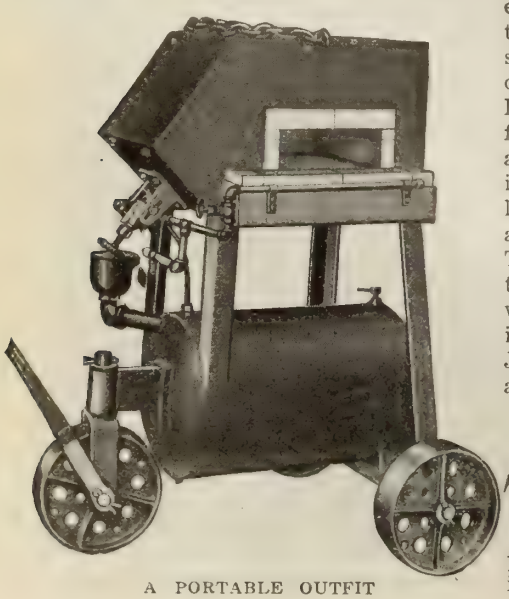


SECTIONAL VIEW THROUGH THE FURNACE.



PLAN AND ELEVATION OF THE MAHR CALORIYOR AND FURNACE.

B. If the above directions are closely adhered to it is claimed that but a short tongue of flame, at most, will find its way into the heating chamber, and the gases therein will be so free of oxygen that no oxidization of the metal will take place. The even distribution of the heat is aided by the fan-shaped calorizor duct, where it enters the furnace. The action of the calorizor is similar to that of the carburetor on an automobile, where the latter is fitted with independent air valves. For satisfactory operation of these calorizors it is only necessary to have an air pressure of about 8 ounces, supplied by means of a blower. In general, the Maar calorizors are uniform in size, but in the smaller furnaces and portable forges the calorizor is built into the furnace frame, while for the large furnaces the calorizor is a separate unit and can be located as desired. These furnaces are made in various types and sizes, including rivet, flue welding, forging, annealing and hardening types of every description. The James Buckley Company, of Montreal, are the exclusive Canadian agents.



A PORTABLE OUTFIT

AN IMPORTANT AFFILIATION

THE National Safety Council announces an affiliation with the University of Cincinnati for the purpose of carrying out a program that is unique—almost radical—both to the fields of education and accident prevention, and that opens a new and promising avenue for the service of the council.

Briefly, this program includes the establishment of an industrial medicine division at the University of Cincinnati, where medical students and graduate physicians will be given special training not only in industrial medicine, but in industrial relations, including sanitation and all the fundamentals of safety work as well. This school, which is already under way, is unusual in many respects, chief among which are the following:

1. The student physicians alternately spend part of their time in school and and part in the field among the industries of Cincinnati, Dayton and other Ohio cities, receiving actual experience in the work for which they are being prepared;

2. The enterprise was conceived by, and is being financed by the industrial leaders of Cincinnati and the vicinity, who have guaranteed a fund of about $40,000 annually for five years;

3. In addition to the regular courses special courses will be given in such subjects as: (a) the medical, industrial and safety problems arising from the coming of women industry; (b) public health, and (c) hospital management;

4. The facilities of the school include an industrial research laboratory where physical conditions menacing the health of employees arising in industry will be brought up for investigation and solution. How can dust be eliminated in a certain plant? Is this gas injurious? How can the lighting problems of a peculiarly arranged factory be solved? These and all similar problems arising among the industries represented among

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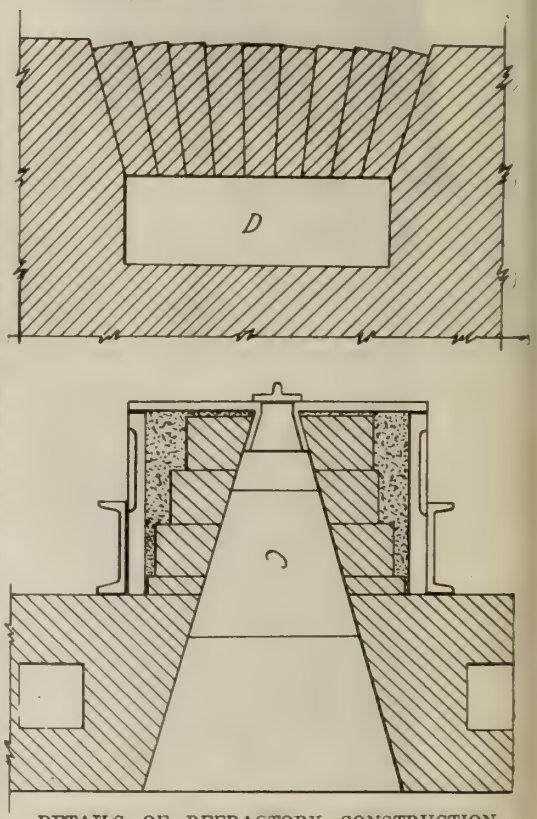


DETAILS OF REFRACTORY CONSTRUCTION.

Nichrome Castings for Heat Treatment

The Subject of Proper Material For Heat Treating Receptacles is a Vital One and Herein Are Described Points of Merit in the Properties of Nichrome For Such Use

By HARRISON JENKINS

IN heat treating processes such as annealing, carbonizing, hardening and tempering, there is a demand for containers or receptacles made of metals or alloys which will maintain their strength and durability at high temperatures. Such receptacles undergo repeated cooling and heating from 1,500° F. to 1,850° F. and in order to avoid costly maintenance due to additional expense for labor, fuel, material and constant replacement, the heat treating containers must not be subject to cracking, changing in form, forming a surface scale or warping. Where the walls of annealing boxes, carbonizing boxes, etc., increase in thickness due to growing, or form a hard surface scale, relatively more time is required for the completion of the heat-treating process. In this case it takes longer for the heat to penetrate into the work. Where the physical strength of the material is comparatively small, it is necessary to increase the dimensions and weight of the receptacle to such an extent as to make handling difficult and to require considerable labor. The walls of heat treating containers are preferably to be made thin as possible in order to facilitate the greatest heat penetration.

Strength of Materials at Low and High Temperatures

Although many metals and alloys have almost any required physical properties at ordinary temperatures, still all undergo a reduction in strength, change of form or scaling of the exposed surface at high temperatures.

There is a destructive reduction in the physical strength of cast iron, cast steel, structural steel, and wrought iron, and other ferrous materials when subjected to relatively high temperatures. Athough in one set of experiments, structural steel at 400° F. showed an increase of 32 per cent. of it normal strength of 70° F. and similarly wrought iron at 570° F. had a 16 per cent. greater strength than its normal strength at 70° F., nevertheless both of these materials had a tensile strength at 1,500° F. less than 18 per cent. of their normal strength at 70° F. At 1,100° F. cast iron had lost 42 per cent. of its normal strength at 70° F. and copper and bronze showed reduction in strength at as low a temperature as 200° F. The figures given would be, in general, subject to variation because of differences in the composition of materials of this class. Nevertheless, they are examples of the destructive effects mentioned above.

When cast iron is repeatedly heated to 1,700° F. it undergoes a change in size, which is generally known as "growth," always accompanied by an increase in weight, equivalent to approximately 7 or 8 per cent., which is due to the absorption of gases in the formation of oxide.

At high temperatures the oxidation of the heated metal causes a scale to be formed on the surface of cast steel and wrought iron containers, which usually reduces the size of the pot upon repeated heating, as in the case of annealing and case-hardening processes where the original scale cracks off, thereby exposing a fresh surface, which again scales.

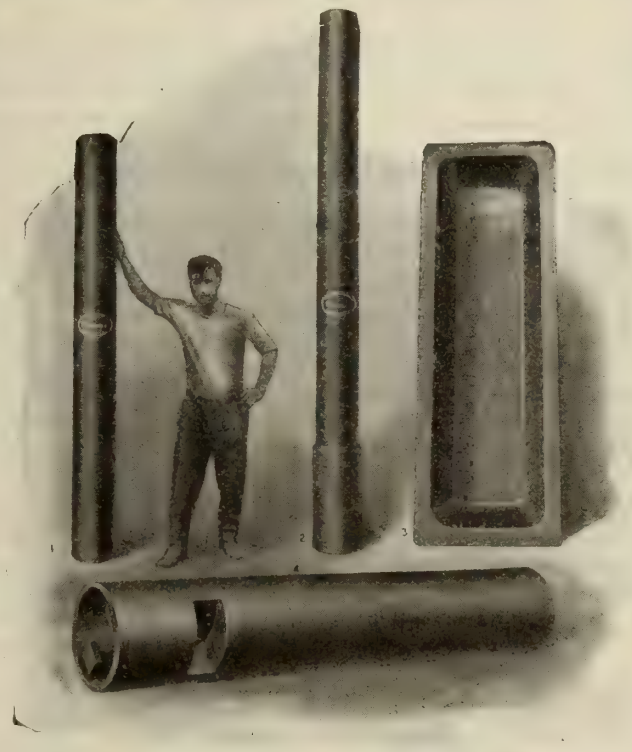


FIG. 1—TUBES OF CAST NICHROME.

Properties of Nichrome

The injurious effects referred to are claimed to be avoided in many cases by the use of a nickel chromium alloy known as "Nichrome." This alloy made by the Driver-Harris Company, Harrison, N.J., is composed of about 60 per cent. nickel, and the remainder principally chromium. It is melted in an electric furnace, and is cast in various shapes and in any weight up to 5,000 lbs. Nichrome is already well-known since it has been used for some time in the manufacture of resistance coils and elements, for electrical heating apparatus and rheostats. The surface of nichrome boxes and containers does not oxidize at high temperatures, except in oxidizing atmospheres when a thin film of the oxide is formed, which is extremely strong and durable. This oxide film resists the action of alkalies and of such acids as sulphuric and hydrochloric. It is non-flaking and affords additional protection against corrosion or further oxidation.

Unlike iron or steel, nichrome is said to show no growth or appreciable change of form, as a result of alternate heating and cooling.

It will bend considerably before breaking, even when red or white hot. This quality may be demonstrated by heating to a red heat a plate of nichrome ¾ in. thick, and then striking it with a 20 lb. sledge upon the unsupported centre of the plate. The result is a very gradual bending.

The tensile strength of cast nichrome at 1,500° F. is approximately 24,500 lb. per sq. in., or about 30 per cent. greater than the tensile strength of cast iron at 70° F. When cold, nichrome has a tensile strength of about 50,000 to 55,000 lb. per sq. in. It softens at about 2,500° F., and melts at approximately 2,750° F.

For heat treatment, cast nichrome is adapted for annealing and carbonizing boxes, heating retorts of various kinds, cyanide hardening pots, lead tempering pots, etc.

Some of the most useful applications of this alloy will be mentioned to illustrate the possibilities of cast nichrome as a substitute for other materials, in order to avoid cracking, growing, scaling, warping, change of form, corrosion or reduction of strength.

Nichrome castings are used extensively for annealing and carbonizing boxes. (See Fig. 1). They are much more durable than boxes made of cast steel. Whereas a steel box must be made quite thick in order to withstand reduction of thickness caused by scaling or oxidation, nichrome containers can be made thin and correspondingly light. Thus, efficient heat conduction is insured, at the same time maintaining sufficient strength. The durability of ferrous boxes is limited to approximately two hundred and fifty hours' service at

1700° F., whereas cast nichrome boxes under the same conditions quite commonly give seventy-five hundred hours' service, and in some cases as many as eleven thousand hours' service has been obtained. While nichrome castings are more expensive than cast steel or cast iron containers, the difference in cost is more than offset by the superior qualities mentioned, and by the low operating cost per hour, which its use assures.

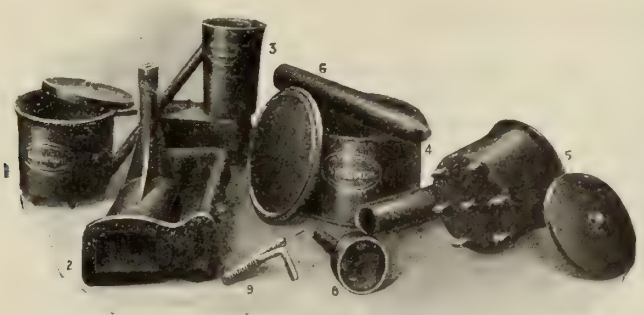


FIG. 2—ROTARY RETORTS.

An important industrial application of cast nichrome is the dipping basket and holder used in immersing small heated iron or steel parts in a carbonizing cyanide bath at 1700° F. Similar baskets or utensils are used for pickling purposes and heat treating work. These nichrome baskets may be used for a considerable period of time without being appreciably affected by the cyanide, nor do they shrink or lose weight They are about one hundred times as durable as iron or steel wire baskets.

Rotary retorts (see Fig. 2) of cast nichrome for gas furnace applications are used in a great number of plants throughout the country with a life at temperatures of 1600° F. to 1800° F. of from eighteen months to two years, as against twenty days to four weeks with ferrous materials.

Tubes of cast nichrome are used in many processes, as in the manufacture of hydrogen and rare gases from the atmosphere, or the treatment of wire in the manufacture of lamps, and also in the ball bearing industry.

Miscellaneous Applications of Cast Nichrome

The fact that cast nichrome withstands high temperatures, has enabled this material to be used for many important industrial purposes, besides containers for heat treating processes.

Cast nichrome is being substituted for other materials for many parts of special glassmaking machinery, for equipment for melting, pouring, conveying and rolling molten glass. The nichrome molds withstand a high temperature and produce more highly polished glassware. As in other applications, the molds are strong while hot, and therefore can be made much lighter than cast iron molds.

The Telautograph and Its Uses

An objection to the telephone is that it makes no record. For purposes where accuracy and a written record are required, the telautograph, which gives electrically, at any distance, an exact facsimile of writing or drawing done at the transmitting station, is being substituted in many commercial and industrial plants. How it now serves a valuable purpose in great steel mills is described by a contributor to the "Iron Age." These mills, we are told, have had to resort to messengers for carrying and distributing messages and analyses. The use of the telautograph does away with this unsatisfactory and dilatory service and reduces cost as well as increases the speed of distribution. We read in the magazine named above:

"Whatever the saving in dollars by eliminating the messengers' salaries, after all is far less than the indirect saving accomplished through the quicker delivery of analyses to the points where the progress of the work is dependent upon them. This is particularly and strikingly true at the open-hearth furnace. Before the telautographs were installed, in one plant, one hour elapsed between the time a sample was taken of the heat of steel from the open-hearth bath and the time the messenger came back from the laboratory with the analysis. All this time the steel was oxidizing and changing its constituency and the work of the plant was halted. With the use of telautographs this period of waiting has been reduced to about one-half hour, and therefore the melter at the open hearth is able to perform his duties more skilfully and more effectively.

Blast-Furnace Department

"In the blast-furnace department the chief gain also is not in money saved through the employment of less labor but through increased efficiency obtained by getting laboratory reports quicker, and thereby enabling the mixers and furnaces to handle their work with precision.

"In the blooming-mill it is impossible to say just how many dollars and cents are saved by the telautograph through the elimination of mixing of heats which results in the shipment of wrong qualities of steel to the various customers. It is not possible to estimate how many mistakes would be made and how costly they would be if the telautographs were not used to keep things straight. Very often ingots have been rolled into billets, cut into required lengths, and loaded on flat cars for shipment when it was discovered that the steel had probably been mixed, making it necessary for a chemist to enter the car and drill a sample of every billet for analysis. Also frequently errors in mixing are not discovered until shipments have been received by a customer, and the plant officials were not aware of the fact until they received the complaint.

"The telautograph is not limited to the sending of words only, but it can transmit numerals, signs, symbols, sketches, or anything else that is written at the transmitting end and accurately reproduce them at the receiving stations. Furthermore, it can send messages to a single point or simultaneously to any number.

Specification Records

"Practically all orders for iron and steel contain specifications describing just the quantities of carbon, silicon, sulphur, phosphorus and manganese that the materials to be delivered on the orders should contain. Each order is given a heat number to identify it throughout the plant, and copies of the order with specifications and heat numbers are sent to the laboratories, blast-furnaces, open-hearth and Bessemer mixers, soaking pits of the blooming-mill, chief recorder of the blooming-mill, hydraulic shears, billet and bar-mill, breaking-down mills and bloom yard office or other place where lies the control of final assignment to orders of heats or blows of steel."

The manufacture of all steel starts with the blast furnaces and the mixers. A sample of each heat from the blast furnace is sent to the laboratory for analysis and the results are written simultaneously to telautograph stations at the blowers and the mixers. This enables the blowers to know just what kind of iron they are making and whether they are approaching the specifications, while by obtaining this information in advance the mixer is able to prepare for handling the ladles when they arrive. This same plan runs through all the other operations in the mill. In addition the telautographs are employed at the billet-mill and at the shears to notify the chief recorder when any breakdown occurs and how long it will take to repair the damage. This enables him to plan a re-distribution of the work. To quote further:

"According to the geographical layout of the mills the need of various special telautograph services develops in different mills. In some they make good use of a telautograph line between the tube-mill and the tube-mill shipping-office for the shipping-office to report the names, numbers, and weights of freight cars they have loaded, together with the net weight of material in the cars.

To Those Interested in the Drafting Course

SO great has been the demand for reprints on our Drafting Course that we felt this demand was worthy of special consideration.

"Are the reprints satisfactory in every way, or would it be good policy to republish this course from Part 1?" we asked various outside responsible parties, and in every case this suggestion met with immediate approval.

As one party remarked, "Why not run Parts 1 to 7 inclusive every week in place of every two weeks? Offer prizes as before. Let new students have an equal chance to earn prizes, but also allow old students to again participate. It will only take seven additional weeks to run these former parts, and you will have given all an equal chance in this very necessary study."

So, following this advice, we republish Part 1 in this issue, and suggest that students, old and new alike, send in their work for judging as early as possible. Part 2 will appear next week.

Three prizes will be given for each part as heretofore, and as the number of students is greatly increased the competition is bound to be keen and full of interest.

The sooner we receive the plates, the quicker we can announce the winners, so again let us say: "Let us have your work promptly."

We shall be pleased to receive the opinion of students in general regarding our policy of republishing the course in this way.

Canadian Machinery Drafting Course, Part I

The Full Page Announcement on Page 345 Fully Explains Why We Republish This Portion of Our Course. We Hope the Interest Shown Will Continue, and Increase as Time Goes On

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE re-entering upon this series of talks or lessons on the art of mechanical drafting, the readers, both old and new, must realize that we could never, through the medium of a paper of this nature, conduct a rigid and very detailed course, for such would take years to complete, and ten chances to one become tiresome to the average reader.

What we do intend, however, is this, that for the reader who wishes to grasp the art of drawing as quickly as is practical and possible, we will prepare for him such lessons as we believe will help him along. The idea of re-issuing the seven parts which we formerly published is two-fold. First, to accede to the wishes of the many new students, and to be fair, we want to give them an equal chance from the beginning, while secondly, it will, after all, do no harm to those already enrolled to go over the ground once more, and perhaps win a prize where they did not before.

It is only a matter of seven weeks' difference, for in these reissues we will publish a portion every week in place of every second week.

We are especially desirous of having the students send in their work. We, in this way, see how they are progressing and know that a keen interest is being taken in the course. We expect about 250 students to be taking part in these lessons, so keen competition is sure to be the rule. Old students and new alike are eligible for these prizes, so let us see your work as early as possible.

Regarding the course, we will try to only touch on the most essential points as we go along, keeping in mind that this is a course specially arranged to meet the requirements of the machinist apprentice, in order to illustrate to him the basic principles of mechanical drawing and its application to the working drawing.

We will work up gradually from the straight line problem into the actual assembly drawing, but will go to such a stage by easy steps. We want the apprentice to feel that here is a course specially arranged for him, and should he get puzzled at any time that we will be only too willing to answer him, and lift him over the difficulty. Close study of this course should increase the earning power of the student, and besides, the objective of each student should be to land at least one prize. So now that we have introduced the object and aim of this series, let us proceed at the very beginning and see what mechanical drawing really is.

Mechanical Drawing

To put it as briefly as possible, mechanical drawing is the method of showing graphically the intricate details of machinery. It is, so to speak, the language by which the draftsman speaks to the workman. A brief study of a well-executed drawing gives a much better idea of the machine portrayed than a long-winded verbal, or even a detailed written, description would ever do. In fact the better and clearer the drawing is made the easier the workman can comprehend the ideas of the draftsman.

A neat drawing for instance was never made by a careless worker, nor even by a good draftsman with poor instruments, but as you seldom see a good designer with poor instruments one can usually tell the character of the draftsman by his style of drawing.

To the beginner, however, a cheap grade of instruments would suffice, but as he becomes more expert he would do well to secure a better grade of tools. In fact, if one can afford it, the best plan is to purchase the better grade right at the start, but this is simply a matter which rests with the student himself.

Instruments and Materials

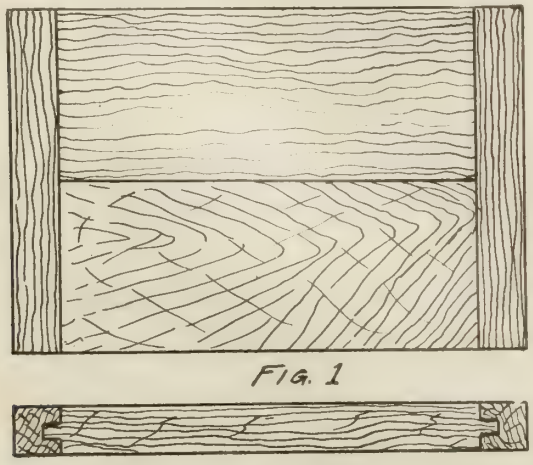
First comes the question of paper. In selecting drawing paper, the first thing to be considered is the kind of paper most suitable for the proposed work. As we are principally interested in the needs of this course, we will consider only the paper most suitable for our purpose, for practically every drawing office throughout the country have their own particular pet paper, which they claim is the best ever.

To keep the expense item down to the lowest possible figure, we will call for sheets 9½ x 13½ in. in size. This allows students to purchase their paper in what is called the demy size of sheet, this being a sheet 15 in. x 20 in. By careful cutting you have two sheets from each large one, 10 in. x 15 in., sufficient size to cover the work. Whatman's paper is considered by many the best grade of paper, and either the cold pressed, or hot pressed, will answer the purpose. The hot pressed paper has a smoother surface, but does not stand erasures as well as the cold pressed sheets, so it might be well for readers to get the tougher material, for no doubt there will be considerable erasure made at the beginning.

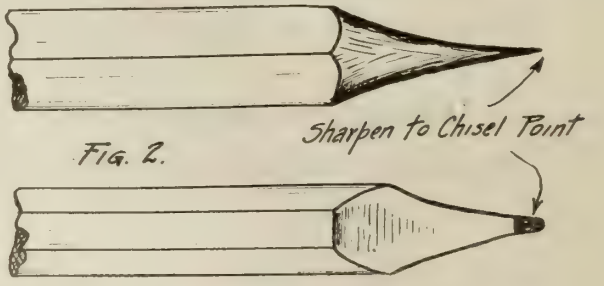
Drawing Board

The drawing board, Fig. 1, is usually made of well-seasoned, and straight grained soft pine. Each end is protected by a side strip, usually about 2 in. wide. This strip is trued accurately to suit the T-square, but as students will more than likely purchase their drawing boards, we will leave this matter for the reader to study at his leisure.

Thumb tacks are used to fasten the paper to the board. There are all kinds on the market, but a grade about 10c to 20c a dozen will suit the student's purpose admirably.



SKETCH OF DRAWING BOARD.



SHARPENING THE PENCIL.

In regard to the pencils required. Lead pencils are graded according to their hardness, the degree of which is indicated by the letter H. For example, H means simply one degree of hardness; 6H, six degrees, and so on. A pencil of 4H grade is ideal for general working conditions. Some authorities claim 2H or 3H are better suited for lettering purposes, while for intricate detail work a 6H pencil will be found best suited to this class of work.

The hard pencils should be sharpened as shown at Fig. 2, so that in penciling a drawing the lines may be made very fine and light. The wood is cut away so that about ¼ in. to ⅜ in. of lead projects. Lead can now be sharpened to a chisel edge as shown on the sketch. In the drawing of the lines the student should place the chisel edge against his T-square, or triangle, enabling him to draw a clean-cut fine line, through points as desired. Should no inking be necessary, a softer grade of pencil is used than if it is intended to ink in over the pencil work.

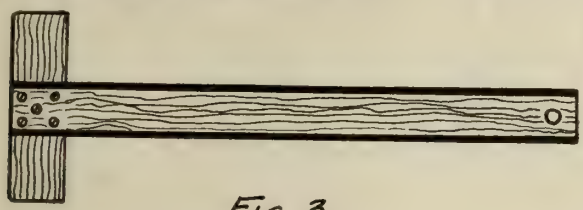


Fig. 3.

SKETCH OF "T" SQUARE.

T-Square

The T-square gets its name from its general appearance, and consists of a thin straight edge called the blade, with a short piece called the head, and fastened at right angles to it, see Fig. 3. T-squares are usually made entirely of wood, pear and maple, in the cheaper grades; mahogany, with protection edges of ebony, in the middle class, while celluloid edges are placed on the more expensive ones. Readers need not go to much expense on this end, except they really wish to, for a T-square of good quality can be secured for very little cost. Some T-squares are also provided with swivel heads, but for the purpose of this series we will not discuss this point, as it is not a necessity.

To show clearly the use of the T-square, refer to Fig. 4. Always keep the head A up against the left-hand edge of the board, otherwise the various lines drawn will not be parallel. Lines A, B, C, D, and E, are drawn ¼ in. apart and 6 in. in length.

Take a piece of paper and practise this exercise. You will be surprised how the pencil will want to go still further, until you learn to control your hand properly. Mark your ¼ in. distances with your rule, and draw your vertical lines 6 in. apart with a triangle, which we will now describe, both as to its uses and material.

Usually triangles are made in two styles, 45 degrees and 60—30 degrees as shown at Fig. 5. A represents the 45 deg. triangle, while B illustrates the 60 deg. —30 deg. These instruments are made of wood, steel, celluloid, or rubber, depending on the price. The student's pocket-book capacity can be his guide as to the kind he purchases.

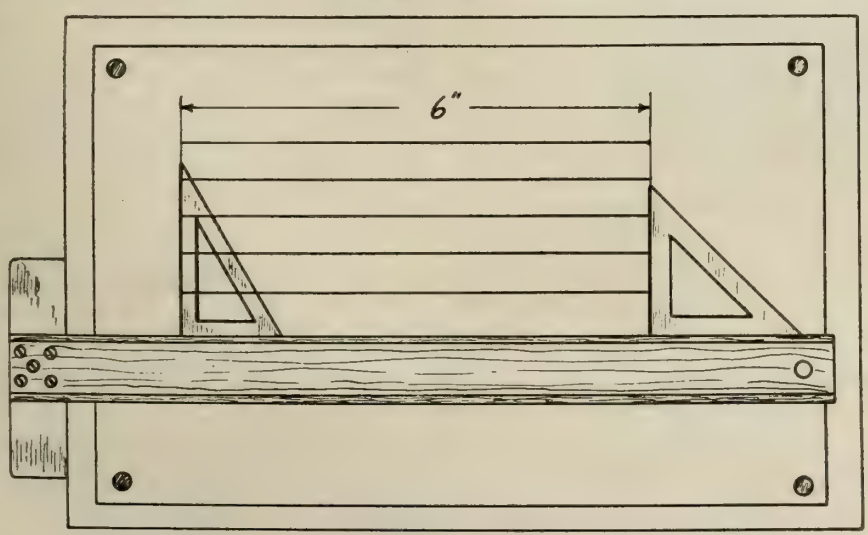


Fig. 4.

PRACTISE LESSON ON HAND CONTROL.

A 6 in. or 8 in., a side size, will be found convenient for most work, and will be ideal for this course. By purchasing a triangle of each style as already described, the student is well equipped for such work as the course will present at the start.

Taking it for granted that the student has now a drawing board, T-square, pencils, rubber, and triangles, we can go ahead with the exercise at Fig. 4.

First practise making the lines A and B 6 inches apart. Draw these vertically by means of the T-square and triangle, either one, as shown. Next use the T-square only, and draw your horizontal lines, meeting the vertical lines, yet not going over them. This is most important, for the exercise is simply one to teach control of the hand. All lines must touch, but not go over, yet be sure of the point, that they much touch. Draw these horizontal lines ¼ in. apart, marking off the spaces with your ruler, or scale, as it is usually called.

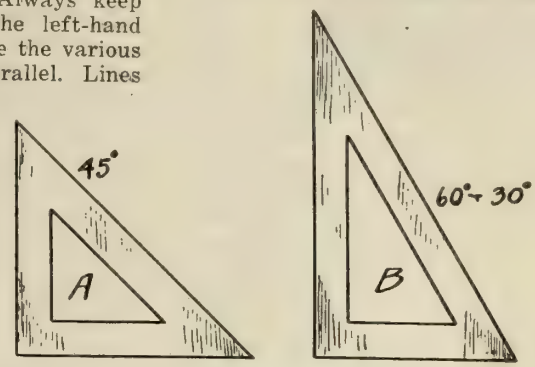


Fig. 5.

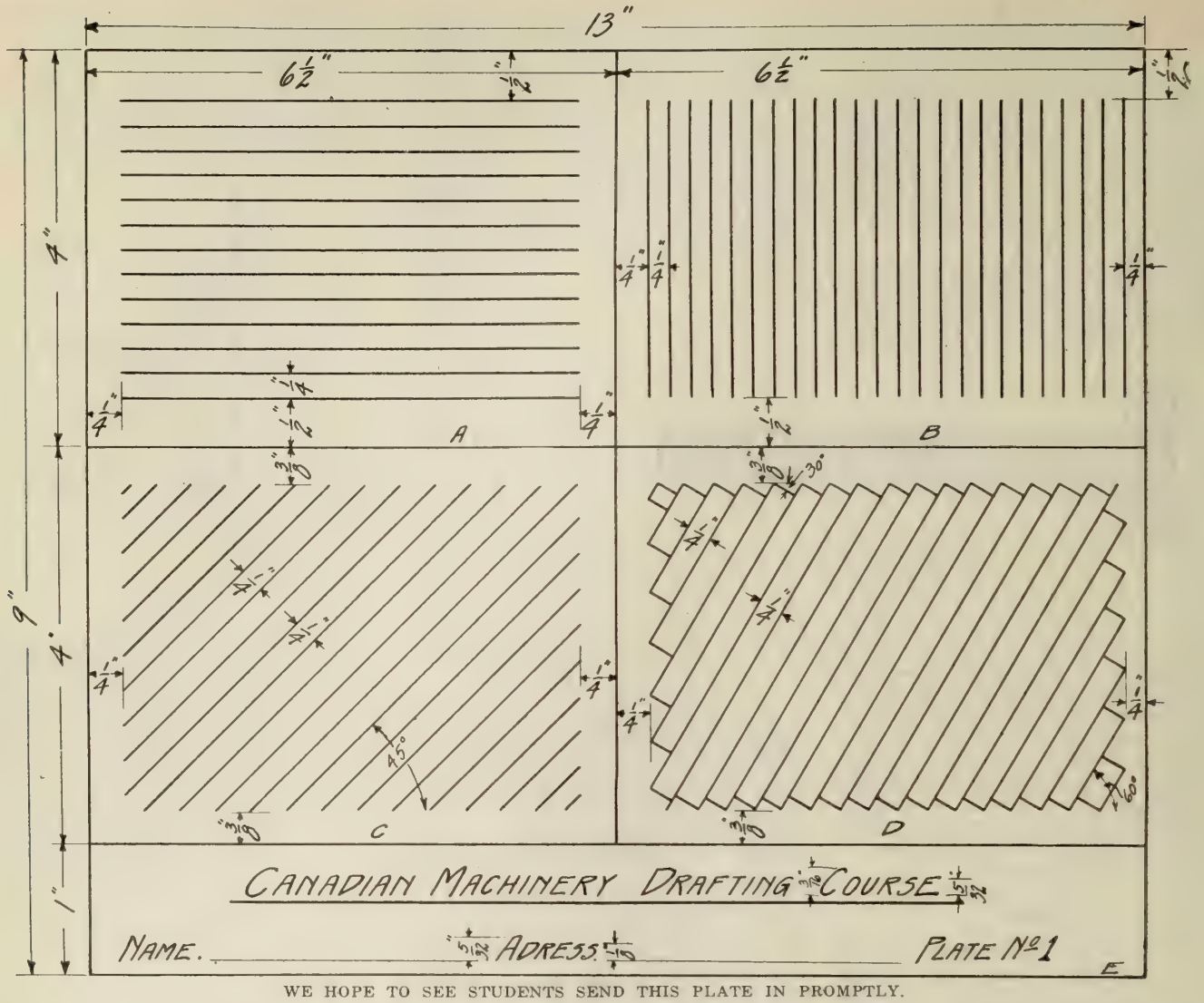
SKETCH OF TRIANGLE.

After you believe yourself proficient enough, study Plate No. 1. To the best of your ability follow the instructions closely, draw up the plate, and send us in your work.

To the three neatest plates received, we will award a prize in the shape of a special 6 in. steel scale, with drill sizes, decimal equivalents, etc., stamped on its face, and in all future issues on this series, will carry out the same plan, forwarding a scale to the three best and neatest plates received on each part or plate.

Instructions

First tack a piece of paper 10 in. x 15 in. on the drawing board, using T-square to see that it is placed on fairly square. Now draw the trimming lines 9½ x 13½ in. Next draw border lines as shown at Plate No. 1, 9 in. x 13 in., and join. Divide the sheet up into 5 sections A, B, C, D, and E. In portion E print in the lettering as shown, and while we do not expect this lettering will be of splendid standard, still it will help you to get ready for the separate lesson to come later in the course. In section A, complete the horizontal lines, each ¼ in. apart as illustrated, stopping ¼ inch away from the border, and dividing lines. In section B, draw up the vertical lines, following out the dimensions given. At section C, draw 45 degree lines as shown, using your T-square and sloping edge of 45 deg. triangle. At section D draw up the 60



WE HOPE TO SEE STUDENTS SEND THIS PLATE IN PROMPTLY.

deg. and 30 deg. lines as illustrated, using your 60 deg.—30 deg. triangle, together with your T-square. In all cases study the plate carefully, and work to the dimensions shown.

Remember that neatness counts. For the drawing of this plate use a 3 or 4H pencil, and make your lines decided, and plain. Send us in your work as soon as you can. We will judge each plate two weeks after its issue, giving you lots of time to send your work along steadily, so get busy with a capital B, and watch for Part 2, which will further explain the various instruments, and their uses. When sending in your plate, use the coupon, and fill the same in carefully. At the same time if you feel so inclined, write us your ideas on this course, and if it appeals to you. We are mighty anxious to make this course of great benefit, so let us hear from you when your work comes in.

In studying the plate, do not pay any attention to the scale shown on the sketch. Work to the dimensions given, and the result will be what we want. We purposely do not give you an exact copy to work from, but rather let you prove that you have followed instructions closely. It is not necessary to ink in this first plate, so as stated before use a 3 or 4H pencil, and make your lines plain and decided.

Tear off and send with drawing

Name .....

Address .....

Position .....

Firm's name.....

Mail your plate flat, do not fold, or if desired you can roll it up and place it in a regular mailing tube. Be sure you have sufficient postage placed on the same. We will not return plates unless specially requested to. In such cases return postage must always accompany the request. Address all correspondence on this course to CANADIAN MACHINERY Drafting Course, McLean Publishing Co., 143 University Avenue, Toronto, Canada.

The Germans have not the glory of being the original gas-attackers; for a certain kind of beetle has been gassing its enemies for centuries. When it sees a gargoyle-like creature, it promptly ejects an explosive fluid from the last ring on its abdomen.

This fluid smells very much like nitric acid, and consequently is a great help to the beetle in its battle for existence.

The War Department's 15,000,000 excess hand grenades are to be remodeled as penny and dime-savings banks, and will be distributed to schoolboys and girls who can show one or more War Savings Stamps earned during the coming summer.

WELDING AND CUTTING

Milling Machine versus Oxy-Acetylene Machine

An Interesting Description of the Work Done by a Straight Line Cutting Blowpipe in Cutting Slots in a Slip Socket—The Dimensions of Same Deserve Attention

THE cutting of slots or openings in steel or wrought iron is a machine shop operation that requires a great deal of time when performed by milling machines, drill presses, broaching machines, or any of the other machine tools. The cheapest known method of performing the operation is by means of the oxy-acetylene cutting blowpipe. Such cutting can be done free hand with surprisingly good results, but where an absolutely true cut is desired, it is advisable to use an Oxweld straight line cutting machine, Fig. 1. The cut made with the aid of this machine is as true as a cut made by any other method, and almost as clean, in fact for most purposes it is sufficiently clean without any further finishing operation. Even in the few cases where finishing is necessary in order to obtain an absolutely square edge, the time gained by roughing out with the blowpipe constitutes a big saving.

A very interesting example of this sort is furnished by Fig. 2. This picture was taken at the plant of the Acme Finishing Tool Company, Parkersburg, West Virginia, and shows slots cut out with an Oxweld cutting blowpipe, which were formerly cut at a much greater cost by means of a milling machine. This operation as applied to slip sockets, which are tools used for the purpose of "fishing" churn drill tools out of oil or gas wells after they have broken loose from the drilling rope.

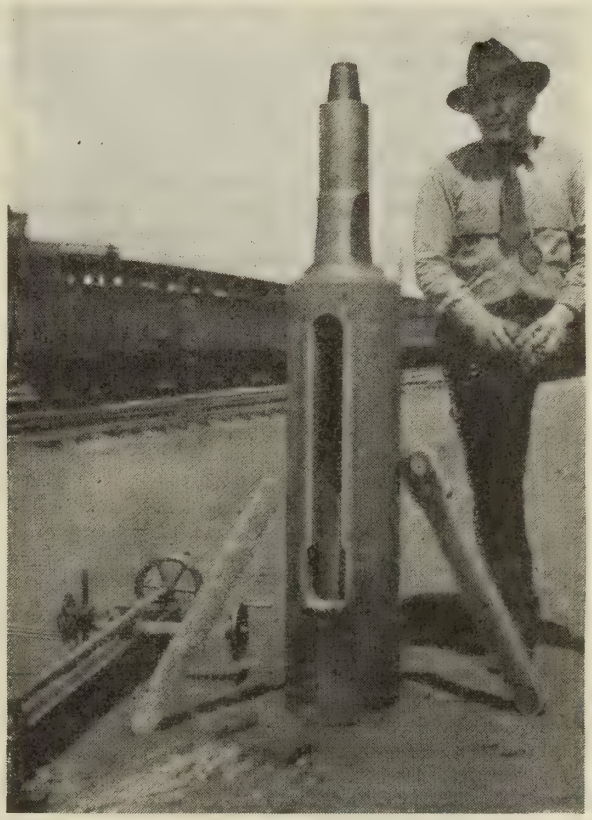


FIG. 2—SHOWING SLOTS CUT IN SLIP SOCKET. THIS PIECE WEIGHS 1600 POUNDS.

The steel slip socket illustrated in Fig. 2 weighed 1,600 pounds. The pieces cut out by the oxy-acetylene blowpipe were 3 inches in thickness, 26 inches long, 4 inches wide up to 6 inches width at wide end. The cutting was done with

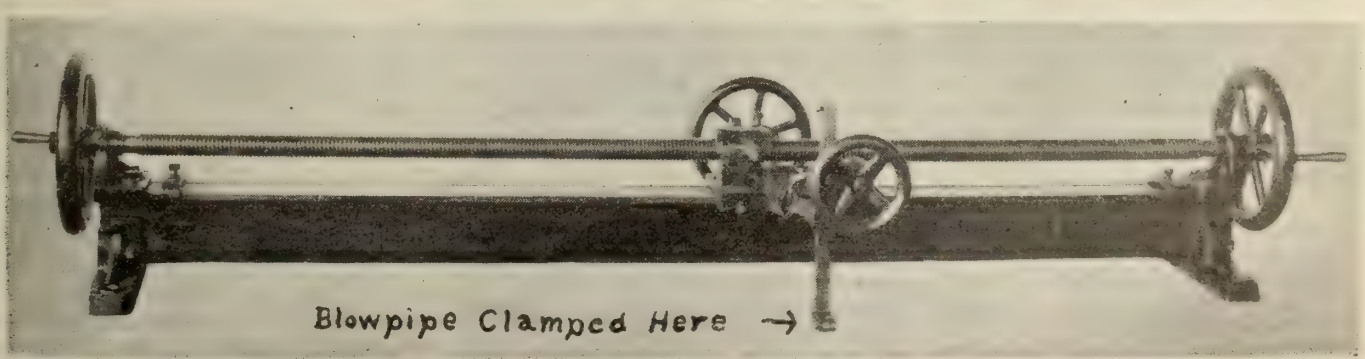


FIG. 1—A GENERAL VIEW OF THE OXWELD STRAIGHT LINE CUTTING MACHINE.

the aid of the Oxweld straight line cutting machine, which held and guided the blowpipe, feeding it at a uniform rate of speed. By the aid of the straight line cutting machine the cutting was done so smoothly that no finishing was necessary. A cut of this sort is very easy to make, the rounded ends being the only parts causing any difficulty whatsoever.

Each of the two cuts was completed in eight minutes. Formerly it required one machinist eight hours to make both cuts on a milling machine; in other words the new method requires one-thirtieth as much time, and it is estimated that the net saving per socket by the use of the oxy-acetylene process amounts to $25.

Acetylene in Chemical Warfare

By MAJOR-GENERAL W. L. SIBERT, U.S.A.

Address delivered before the 1919 Convention of the International Acetylene Association.

WHEN I was in the Philippines and was confronted with the necessity of learning the Tagalog names of the cities and towns on the maps of that region, I felt that I could never accomplish it. Later, in China, when I had to have on my tongue's end such names as "Hwangho," "Yangtze kiang," "Chinkiang Pu," etc., I felt as if I were in a more hopeless condition than when in the Philippines. But when I first gathered together the representatives of the 1,000 research men of the Chemical Warfare Service, and they commenced to talk about diphenylchlorarsine, diphenylamine arsine, brom benzyl cyanide, chlorpicrin, etc., I felt more helpless than I did in the Philippines or in China, and told them that while all those things might kill Germans and win the war, they had to limit the substances to the number of names that I could remember.

I can understand why the doctor who depends often upon the psychological effect of things still adheres to Latin names, but the chemist ought to simplify his nomenclature if he expects the support of the everyday man.

I do not know anything about acetylene, except the uses to which the engineer puts it in cutting up and welding steel with the oxy-acetylene flame, and by the use of an acetylene light converting night into day.

I remember in Panama when the work indicated the necessity of transferring a dredge from the Atlantic side of the Isthmus to the Pacific side, and it was not practicable to tow it around the Horn, a plan was adopted of dismantling the dredge, cutting the hull on cross section into pieces that could be handled by a wrecking crane, loading them on cars, shipping them across the Isthmus, reassembling them on ways, and riveting a steel batten over the cracks; all of which was possible on account of acetylene.

My mind within the last year has been drawn to the necessity of chemical development in every direction in this country. When one looks back he must appreciate the absolutely helpless condition the United States would have been in prior to 1917 had it been called upon to prosecute a war with a great nation, and had it been unable to control the seas. Its effort to resist a foe would have been on a par with that of China. It would not have had powder enough to last two weeks, and would have had no nitrates out of which to make more. The absence of a dyestuff industry with its by-product coke-ovens, would have limited the supply of raw materials for the manufacture of explosives and gases. Future will be more and more chemical wars, more and more scientific, and the nation that has developed its chemical possibilities will enjoy a great advantage.

One of the big questions presented for solution to-day in this country is chemical preparedness for war, through the development of chemical industry that has peace application.

There is nothing to indicate that Germany, prior to the war, had made any systematic arrangement to utilize her dye factories for war purposes, because many of her chemists were in the beginning called into military service. This and many subsequent developments of chemical plants for war needs causes one to think that Germany confidently expected the war to end in a very few months, that she had sufficient materials in storage, and that her mind was not turned to the full utilization of the chemical resources of the nation for the support of the army, until after the results at the Marne.

There is one notable exception to this, and that is the development of the processes for the production of ammonia from atmospheric nitrogen. It was not until the end of 1912 that there was any large scale production of ammonia by this method. In other words, the great war was not brought on until the way was clear—that is, it was not brought on until Germany could produce within her own boundaries a supply of ammonia and nitric needed in the manufacture not only of her propellants, but also for the fertilization of the land, so as to make the feeling of the army certain.

When it became apparent, after the battle of the Marne, that the available supply of material for the manufacture of suitable propellants and explosives would soon be exhausted, it was then that the great chemical establishments of Germany were called upon to convert their plants, that had been utilized in making dyestuffs, into high explosive plants and gas plants; it was then that the chemists that had been drafted into the army were returned and utilized with existing plants and with necessary extensions—all in order that the needs of the army might be met. The existence of this great potential reserve made Germany a powerful adversary.

It is a peculiar fact that if you probe nearly any line of chemical industry you will find that it has a war application as well as a peace application. You gentlemen are engaged in the carbide and acetylene industry, and while I am not a chemist, I would take a few minutes of your time to mention some of the ways that our people think the manufacturing plants for acetylene may be a preparation for war. Of course, the ordinary uses of it, the process of welding and cutting steel, and its use for signal flares and illuminating processes, need not be repeated. The use of burning acetylene to light the fields of England in order that all the land possible might be planted, is merely an extension of a well-established use.

The great development of airplanes in this war called for a large supply of acetone for the preparation of airplane dope. The synthesis of this chemical commodity as well as acetic acid, beginning with acetlyene as a starting point, is now a commercial reality. The Government expended over $100,000,000.00 in its nitrate plants, which nitrates were to be used in making propellants and fertilizers, both in times of peace and in times of war. The largest of these nitrate plants utilized the cyanide process of fixing nitrogen, and this audience need not be told that cyanamide in turn is prepared from calcium carbide.

Mustard gas is prepared from ethylene, which is usually prepared from alcohol. Have we not in acetylene a raw material from which ethylene can be prepared on a successful commercial basis? Further research and development may establish such a fact. In fact, our research people tell me that the entire subject of the chlorination of acetylene, and the preparation of its chlorine derivatives, is one that should be carefully investigated, not only from the standpoint of chemical industry in times of peace, but also from the standpoint of the preparation of raw materials for war needs.

The interaction of acetylene with phosgene, with arsenic trichloride, with stannic chloride, and with antimony trichloride, are all fertile fields for investigation. It is apparent, therefore, that we have in the acetylene industry, an association with war problems which may be as important as the association of the coal-tar chemical industries with such problems.

What the Government needs is chemical industry in every line that nature has made it commercially practicable to develop. We want to be in the same position that Germany was in during this last war, so that whenever research indicates that some new substance or some substance hitherto not manufactured, has a military value, the heads of the chemical interests of the country could be called together and given the problem with the full expectation that they could solve it and would solve it. that some existing chemical plant could be changed into one suited for making this substance, that the various well-

tried research establishments could soon overcome any difficulty in its manufacture, and that there would always be a personnel available for such manufacture; because this war has shown more strongly than it has shown anything else, that a country without an extensive organic chemical industry will be seriously handicapped in war against the nation that has such industry.

Of course there is no need for me to tell this audience these things. If they stop to think they will know them. But it is always well to impress upon people that there is a public use that might be made of their appliances when their country is in need, because the average man takes pride in assisting his Government when it is in need.

This country needs now to develop a certain and sure nitrate supply; it needs to develop large dyestuff industries; it needs to have its acetylene industries developed and protected, if need be against hurtful foreign competition.

Chemical warfare, as such, made its first appearance in this war. It probably caused more casualties than any other single implement in the war. It has in it more possibilities than any adopted implement of war. If the Chemical Warfare Service of the Army keeps closely in touch with all of the chemical industries of the land, if such industries are sympathetic with the needs and aspirations of the Government, and each of them exchanges research information of value to the other, and if the Congress of the United States insures the development of such chemical industries, we can trust to the ingenuity of our chemists and chemical engineers to see that his country enters no future war except upon equal terms with any adversary, in so far as chemical warfare is concerned.

Had the Germans known at Ypres the effect of the first chlorine cloud that they passed over the allied lines, and had they had confidence in their own protective devices and followed closely such chlorine cloud, they could have penetrated to the channel ports—all of which shows what the surprise use of a chemical substance means.

Although the gases used in the great spring drive by the Germans in March and April, 1918, were known gases, the new tactical use of gases made possible through Germany's ability to make them in great quantities almost caused a German victory. By saturating the strong points of the line with mustard gas for 48 hours before an attack, back to a depth of five or six miles, and by saturating the road crossings through which reserves and ammunition must pass, one of the English armies in the first onset in March was largely paralyzed —its strong points were made ineffective, and the weak points easily taken.

The inspection of the German gas plants in the Rhine district indicates that this country has nothing to fear in the chemical world provided competition is fair and protection is the same. I wish the statesmen of this country could visit Edgewood Arsenal, and see what our people can do when put to the test.

AN IMPORTANT AFFILIATION

Continued from page 342

the students and sponsors of the department of Industrial Medicine will be tackled at the industrial research laboratory.

This plan being carried out jointly by the College of Medicine of the University of Cincinnati and the Cincinnati Local Council of the National Safety Council which represents the first attempt in America to train doctors for industrial work, in the opinion of C. W. Price, general manager of the National Safety Council, promises much for other cities.

"The Cincinnati plan grew out of a very definite need," Mr. Price said. "During recent years there has been a great call for industrial physicians but there was no institution that gave special instruction in industrial medicine. The new department of industrial Medicine and Public Health of the University of Cincinnati special courses for the training of industrial physicians and surgeons are now being offered. In connection with the regular medical courses the student will be given instruction in industrial medicine, shop sanitation, occupational hazards and diseases, labor economics, labor conditions and problems, industrial relations, accident prevention and employment. "The product of this special training will be not merely an industrial physician, but an executive who in the larger plants can take charge of an Industrial Relations department that would include, the safety engineer, the plant physician, the employment manager and others. The men who receive the special training offered at Cinninnati also will fill a long-felt want among the smaller industrial plants where conditions do not justify the hiring of a safety engineer, a physician, and an employment manager. In such a plant all three of these positions could be filled by one man with the training now available at Cincinnati."

Dr. Carey P. McCord, who did notable work in organizing and conducting military hospitals during the war has been appointed director of the Department of Industrial Medicine and Public Health of the University of Cincinnati. The National Safety Council will be repreented at the school by C. H. McLain, formerly safety engineer and assistant to the supervisor of labor at the Dayton Electrical Company, Dayton, O., who has been appointed secretary of the Cincinnati Local Council of the National Safety Council.

The Cincinnati plan provides for the co-operation of the National Safety Council, not only with the University of Cincinnati, but with the general educational system of that city. The secretary of the council will give twelve lectures on school and public safety in the teachers' college of Cincinnati, so that the teacher in making will be prepared to pass on such instruction to young America. Later, a similar series of lectures will be given to a class made up of one of more teachers from each public school in Cincinnati so that she in turn may acquaint fellow-teachers with the fundamentals of education in accident prevention.

Finally, a course of safety lectures similar to that given at the National Safety Council's schools for safety supervisors at St. Louis, Cleveland, Pittsburgh and Rochester will be given to every class in the Engineering School of the University of Cincinnati.

An entire general session and two sectional meetings of the Eighth Annual Safety Congress of the National Safety Council, which is to be held at Cleveland, O., October 1st to 4th, inclusive, will be devoted to discussion of health service in connection with organized accident prevention work.

The program of the congress, just issued, lists 160 speakers, including some of the men most prominent in the practice of industrial medicine. It is expected that more than 3,000 safety engineers, industrial physicians, plant managers and others interested or actively engaged in the work of accident prevention will attend the congress.

Dr. Charles A. Lauffer, medical director of the Westinghouse Electric & Manufacturing Company, will preside at the general health session on the afternoon of October 3 in the ballroom of the Hotel Statler at Cleveland, and at the health section meetings during the mornings of October 3rd and 4th.

While not generally known it is a fact that during the nineteen months of our participation in the war with Germany, the casualties from accidents in peaceful America were more than twice as great as the casualties among the American troops in France. The statistics of the United States census show that more than 70,000 persons died each year as the result of accidents in America. It is estimated that 20,000 of these deaths are caused by industrial accidents and 50,000 by accidents in the streets and homes.

It has been the experience of men and women engaged in organized accident prevention work that a large number of the deaths attributed to accidents result only indirectly from accidents and more directly from causes than can be eliminated by health education. The National Safety Council and the 3,300 industrial concerns included in its membership are, therefore, giving more and more attention to health education and health service in the war on accidents.

An Imperial Mineral Resources Bureau has been established in London, charged with the duties of collecting information regarding the mineral resources and metal requirements of the British Empire and of giving advice to the Government authorities in reference to the same. The Bureau is to be directed by a board of governors, comprising one appointed by the Home Government, who will serve as chairman, one by each of the five self-governing dominions, one each by the Government of India and the secretary of state for the colonies, and six representatives of the mineral, mining and metal industries.

WHAT OUR READERS THINK AND DO

Another Outburst on the Parting Tool Question

We Invite Readers to Send Us Their Practical Experiences. There is No Reason Why This Page Should Not Go Strong, so Send Us Your Ideas, and When Published You Will Be Paid For the Same

CURLING OF THE CHIP

J. H. RODGERS

In the setting of parting tools one of the most important factors to consider is the relative position of the cutting edge to the direction of the feed.

Some operators advocate a slight rounding of the nose, so that the edges of the chip will tend to curl to the centre as the tools advance to the work.

This method frequently assists the easy cutting of the metal, but the essential point to keep in mind is that the neutral line of the cutting edge—be it slightly rounded, or perfectly flat—should be at right angles to the direction of the feed; in other words, parallel with the axis of the lathe. The sketch will show the advantages of the above suggestion.

If the cutting edge is at an angle with the centre line, be it ever so slight, the chip will curl at right angles, forcing the cut metal against the edge A.

As the particles break off, they work down between the side of the tool and the slot, and force the tool to spring in the direction of the arrow, thus causing the side of the tool to bite into the side of the groove.

If the tool is not strong enough to stand this additional stress, breakage will follow.

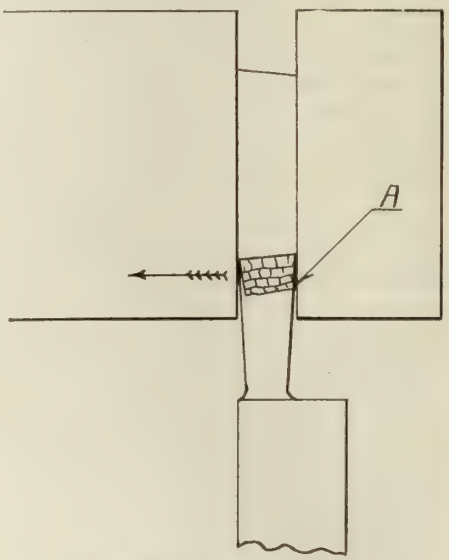
Clearance, rake, and set of the parting tool are essential to good results, but this feature of the curling of the chip must not be overlooked, otherwise the work performed will not be satisfactory.

ANOTHER VIEWPOINT

In your issue of July 17, on the subject of parting tools, I am one reader who does not coincide with the views of the author. First of all I could not say that "The most peculiar thing is the lathe nearly always gets blamed in connection with parting off stock." As I have seen troubles in that connection in shops where the parting is done entirely with saws (which is the best method where there is any depth of cut and wherever practicable).

As I presume the discussion is on what is commonly known as the parting tool, however, I will not say any more about the saws. As to the ordinary forged tool being the best, I would modify Mr. Ernest's statement and put it in this way: That it is the best for lathe shaper or planer where there is any depth of cut to be taken.

I agree that there must be clearance from the cutting edge in every direction, front, top and sides. The corners should have all the support that it is possible



THIS IS MY THEORY.

to give, and still have clearance about one degree on each side away from the corners, front clearance about five degrees for the lathe tools and three degrees for shaper and planer tools. There should be a lip ground on the top about ⅜ of an inch radius, deep enough to make the top slope from cutting edge about twelve degrees. Care must be taken in the setting of the parting tool to get the support as directly under or behind the cutting edge as possible, as the more overhang, the more apt it is to break.

The flat steel with the Armstrong holder is a very handy tool to have around the lathe or shaper where the parting cut is not very deep, but it does not take the place of the forged tool entirely. I would not recommend the method of peening the edge with a hammer as I prefer to find the blades too hard to do that; like the forged tool, you will find that grinding a slight lip it gives better results, and as the stock used in the Armstrong holder has about one degree clearance on each side by having a lip it leaves the cutting edge a little wider than the bottom of the lip, when you take this tool to the blacksmith and have it upset that defeats its purpose I would avoid this and keep the tool for the work it is best adapted for.

I have found that the ideal position of setting a parting tool is (whether it be single or double) the one commonly used in special cutting-off machines, where the tool holder is shaped on the side nearest the chuck to take flat stock, held firmly by a clamp on top, the tool is set on a slope of 13 degrees, this position giving the cutting edge the best support; being ground straight on top gives the same effect as a lip on a tool that is set horizontal. The front is ground at an angle of 18 degrees. This type of tool can stand more side clearance than the ordinary forged tool. For heavy work, such as cutting off billets for shells ¼ in. by 2 in., flat stock was used; this can be upset to ⅜ in. wide at the point and be used until it is less than 5-16 of an inch, keeping the same clearance away from the cutting edge always.

It will be found that when this type of tool is used single, it should be set with point a little above centre so that any spring or slackness there might be is taken up and it is working at centre.

A simple method for upsetting these tools is to cut a piece out about half the width of the tool and ½ inch from the end, leaving a shoulder to rest on the anvil, flattening out the point, then turned over with top of tool on anvil, then hammered on sides and end, reheat and cut off the corner.

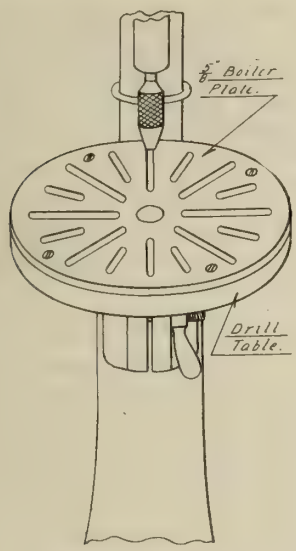
It is now ground to shape and hardened In conclusion I would say that

the most important points to be observed about the parting tools are that the cutting edge has clearance in every direction and that it is well supported in both grinding and setting.

DRILL TABLE PAD

By Chas. H. Willey

A simple idea like this one shown in the sketch may save some reader many dollars if he adopts it. It saved many for the writer, so I pass it along. The drill press table when new is perfectly



DRILL TABLE PAD

smooth and true, and inside of six months, if all hands are allowed to use it at will, it becomes sadly abused, scratched, scarred, nicked, drilled into, and otherwise ruined as far as being able to set up and drill accurate work. Eventually it means a new table will have to be gotten. To protect the table in the first place would be best, so when we installed a new drill I obtained a piece of ⅝ boiler plate and made a false top for the table and bolted this on. It is never removed except when fine, accurate work is to be drilled.

AN EMERGENCY LATHE NUT

By J. H. Houldsworth

It might be interesting to tell readers of CANADIAN MACHINERY how I made an emergency nut for the compound rest of a lathe which we wished to get into commission again at the earliest possible moment.

Having no time to cut one on the lathe, we secured an iron plate, and drilled a hole central in this plate, an exact fit for the spindle. In the case in point the size was 15-16 in. diameter.

Referring to the sketch, the remainder of the scheme is easy to explain.

We now constructed a framework of wood and placed the old nut on the spindle, then stood the assembled spindle as shown. We now made a regular mould of the affair, packing loam (or fireclay if desired) inside the framework constructed. We now withdrew the spindle and nut, removed the nut, and replaced the spindle in the central hole; we now poured a good grade of hard babbitt into this mould, when we had a good temporary nut to operate our lathe until such time as we could make a permanent one.

A KINK IN LAYING OUT WORK FOR THE SHOP

By F. A. McLean

The most widely used methods of preparing work for laying out are probably those in which chalk is used for coating rough surfaces, and copper sulphate solution for finished surfaces or template work.

Both of these methods have limitations, as the copper sulphate is no good for rough surfaces, and chalk is of little use on finished work, and in either case the chalk often gets rubbed off, making the marks hard to distinguish.

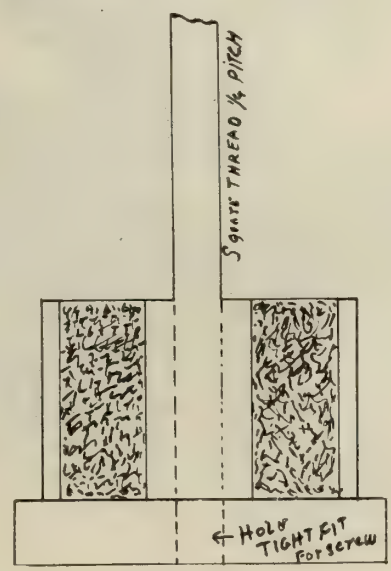
The use of a whitewash made of whiting dissolved in water will be found much more efficient than either of the methods just mentioned, as it will make a smooth coating on either rough or finished surfaces, and is not liable to be rubbed off accidentally.

More surface can be covered in less time as two applications of the brush will cover a surface that would require several minutes to coat with chalk or copper sulphate.

OIL CUP FILLER

By Chas. H. Willey

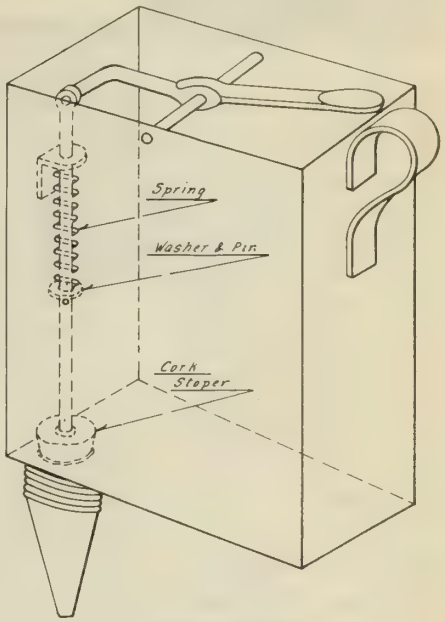
Here is another scheme for using up empty 1-gallon oil tins, and the device shown in the sketch is one that will be found advantageous in filling oil cups and reservoirs.



HOW THE NUT WAS MADE.

To make it, the bottom of the oil container is cut out and then the arm and levers are made and fitted in. The place on the top edges of the device where the rocker shaft turns is reinforced by soldering on washers. The levers and fittings are very simple to make from ¼-inch rod, the joints being made by flattening and drilling, and the spring is made from small size brass wire.

A funnel of small dimensions is soldered into the screw cap opening and the flow of the oil is controlled by the pressure of the lever which raises the cork that is secured to the end of the ver-



OIL CUP FILLER.

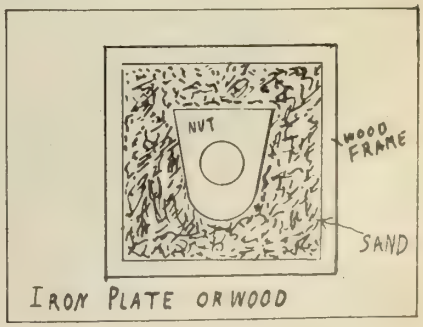
ticai rod. The sketch conveys the idea in clear form.

The Woodman and his axe are giving way to the engineer and his dynamite, for dynamite works much more easily and quickly than does the axe. You tie dynamite around the tree-trunk, then attach a fuse to it and set it off. Down comes the tree.

Colored Patient (in hospital)—"Boss, how do you all do yoh cookin in thah?"

Orderly—"Well, Sam, you know we have the latest fandangled methods over here; we do our cooking by electricity."

Colored Patient—"Hum, by e-lectricity, huh? Well, boss, you sho' ought to have given dem beans anotha shock."—Truth.



DEVELOPMENTS IN SHOP EQUIPMENT

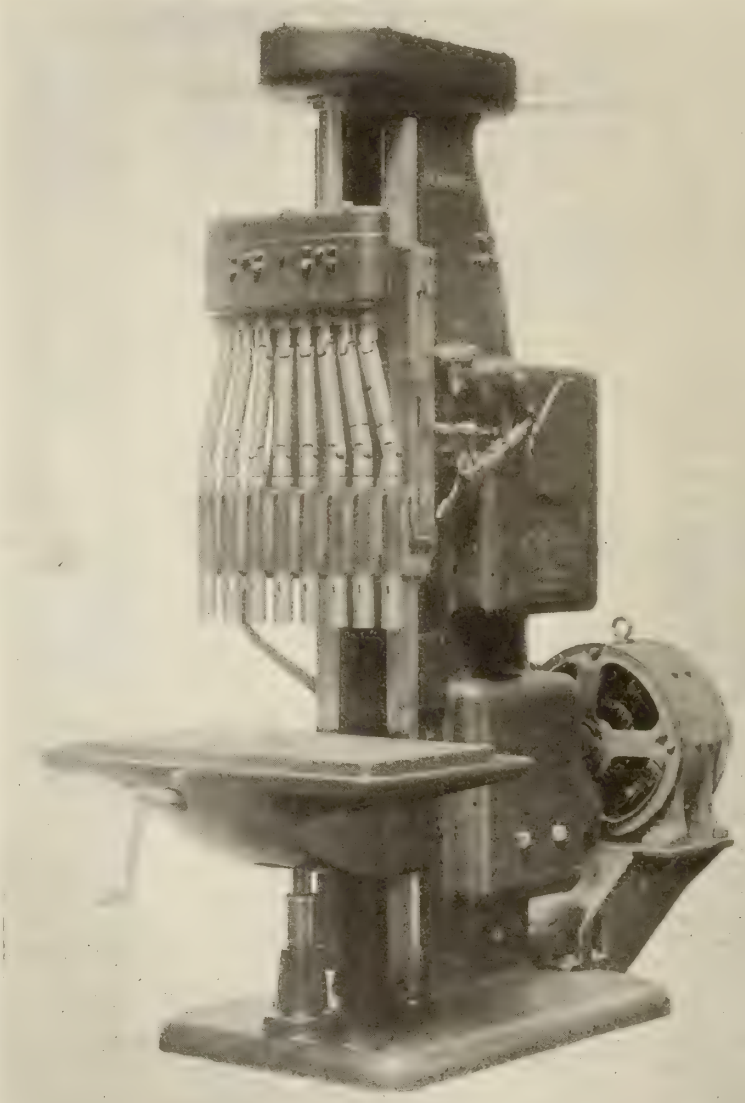
THE No. 10 multiple spindle drilling machine—with straight line adjustable spindles—as shown by the illustration on the opposite page, has been designed with improved features incorporated to meet the extensive requirements in a production machine for multiple drilling operations. This machine can be equipped with a group of spindles —with fixed centres— arranged in a straight line or in a cluster, or with a group of universally adjustable spindles arranged in a straight line, a rectangular or circular cluster.

The Speed Mechanism

The speed mechanism is located in the column near the base so that vibration, ordinarily excessive in a belt-driven machine, is entirely absorbed. Power is transmitted to a vertical drive shaft from a three-step cone pulley through back gears and hardened steel bevel gears. A Johnson friction clutch is used to engage the power and to select the back gear, and these back gears, when used in conjunction with the 3-step cone pulley allow six speed changes. The vertical drive shaft is fitted with a sleeve gear through which the spindles are driven, and this sleeve gear is made to slide along the drive shaft with the spindle head as it is fed either up or down, which construction provides a drive closely coupled to the spindle head at any position on the column. Back gears are unnecessary and are not furnished when the machine is arranged for a direct connected variable speed motor.

The Feed Mechanism

The feed mechanism is driven from the drive shaft through hardened steel bevel gears, and is housed in the column above the speed mechanism. It consists of two friction clutches and a jaw clutch. The friction clutches are immersed in a bath of oil, the end thrusts being taken by S. K. F. ball bearings. By engaging one of the friction clutches the spindles are rapidly advanced until the drills come in contact with the work, at which point the jaw clutch is automatically engaged to feed the drills through the cut. When through the cut the other friction clutch is automatically engaged to effect a quick return of the spindles to the starting position. The levers operating these clutches are interlocking, which prevents the possibility of more than one clutch being engaged at the same time. With this system of feeds, work having obstructions above the drilling plane, which the drills must clear when in a raised position, is accomplished with a minimum loss of time. Feed changes can be made by merely removing a gear case cover and changing two gears.



GENERAL APPEARANCE OF THE MACHINE.

The Feed Screw

The feed screw is large in diameter and of substantial pitch. It is operated by the feed mechanism through a vertical drive shaft and a train of spur gears. The threads on these screws are engaged by a hard bronze nut, which is immersed in a bath of oil and located low in the spindle head to prevent the threads from being exposed when the head is fed to its lowest position on the column. The advantage of this screw feed, which is located directly above the work, lies in obtaining an absolute vertical feed-thrust in central alignment with the spindles, thereby eliminating all side thrust to the spindle head and column ways and maintaining them in their original true alignment for a long period of use. End thrusts on this screw are taken in both directions by large S. K. F. ball bearings.

The Spindle Head

The spindle head is a substantial casting of box construction and is securely gibbed to the column by a square lock method. This head supports the spindles and retains the spindle drive gears. Each spindle, when arranged to be adjusted, either universally or in a straight line, is connected to the drive gears by a telescopic drive shaft fitted with universal joints. When the spindles are arranged

with fixed centres they are connected with the drive gears in a more direct manner without universal joints. The universally adjustable spindles are supported by substantial brackets, which are fastened in two "T" slots to a planed flange located at the lower end of the spindle head. Straight line adjustable spindles are supported by L-shaped brackets which are fastened to a cross-rail. The thrusts on all spindles are taken by S. K. F. ball bearings.

The Table and Column

The table and column are cast of a close-grained gray iron, and are of sufficient weight to ensure rigidity. The table can be furnished in either a knee or box type. The knee type is gibbed to the column by a square lock method, and is adjustable vertically. This adjustment is obtained by means of a crank lever, which, through a spiral gear mechanism, actuates a heavy jack-screw. The box type table is made with its top surface provided with "T" slots, to which the work or a jig can be clamped. The bottom part of this table is fastened to a planed surface on the base, which is also provided with "T" slots.

The Oiling Method

The oiling method—consisting of a force feed, gravity flow and splash system combined—is made possible by the all-enclosed unit construction. The speed and feed mechanisms taken collectively, and the spindle head separately, are each provided with independent and self-contained oiling systems—which ensure positive lubrication, and, as a consequence, economical maintenance. Each of these units are tightly encased and partially submerged in a bath of oil, while the bearings are lubricated by a force feed through individual leads which carry a sufficient flow of oil to flush all enclosed parts on its return to the reservoir.

Extra Attachments

Extra attachments, such as hand-feed for the spindle-head, motor drive, holding fixtures and tools, and equipment for cutting compounds or lubricants, including pump, tank and pipe fittings, can be furnished, but are not included in the regular equipment of this machine.

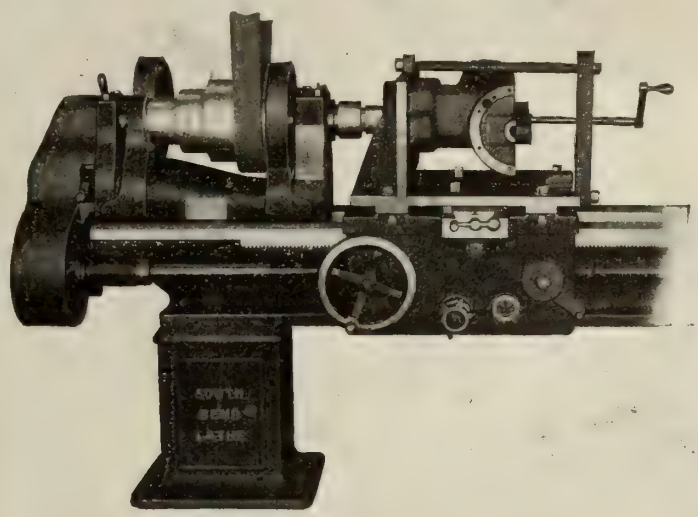
Following are its Principal Specifications:

Capacity	Eight ¾" holes
Minimum distance center to center of spindles	2"
Maximum distance center to center of spindles	22"
Vertical adjustment of collet in spindle	¾"
Diameter of spindle nose	1 31/32"
Morse taper in spindle	No. 3
Diameter of joints	1¾"
Maximum distance nose of spindle to base	44"
Minimum distance nose of spindle to base	30"
Maximum distance nose of spindle to table	32"
Vertical travel of spindle head	14"
Distance center of spindle to column	9.970"
Table—vertical adjustment	12"
Table—working surface	20" x 36"
Back gear ratio	1 to 2
Spindle speeds—six	110, 137, 172, 220, 275, 344 R.P.M.
Electric motor—speed variable	500 to 1500 R.P.M.
Width of belt used	4"
Feeds—change feed gears to suit character of work	

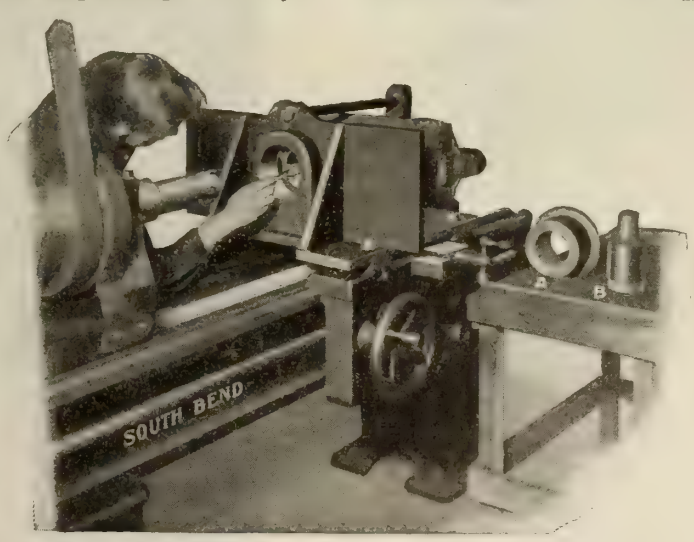
Any further information on this machine can be secured from the makers, the Defiance Machine Works, Defiance, Ohio.

SOUTH BEND CYLINDER-BORING ATTACHMENT FOR LATHES

The South Bend Lathe Works, 425 East Madison Street, South Bend, Ind., has just placed on the market an attachment by means of which any of its lathes can be quickly set up for reboring the cylinders of automobile engines. The illustration shows the attachment in place on a 21-in. lathe, but the device is applicable to all lathes of 15 in. or larger. In putting the attachment in place, the compound rest is removed from the saddle, the jib being secured in position by means of two taper pins and bolts fitting the T-slots in the carriage. A feature of the device is the method of locating the work. There is a hole in the attachment in line with the lathe spindle. This hole is fitted with a removable bushing which is in its turn fitted with a plug, on the end of which a shoulder is turned of the same size as the cylinder bore. This bushing and plug are put in place with the end of the plug projecting through. The cylinder is placed over this plug and clamped in place, after which the plug and bushing are removed, allowing the work to be done. The boring bar fits into the taper of the lathe spindle and is provided with a cutting tool that will bore holes 3½ to 4 in. in diameter and can be adjusted to the thousandth of an inch. If larger cylinders must be rebored a collar can be fitted in the end of the boring bar to hold cutters of larger size. The attachment is said to be of great value where cylinder boring is only done occasionally, as it can be easily put in place or removed from the lathe.



GENERAL VIEW OF THE FIXTURE.



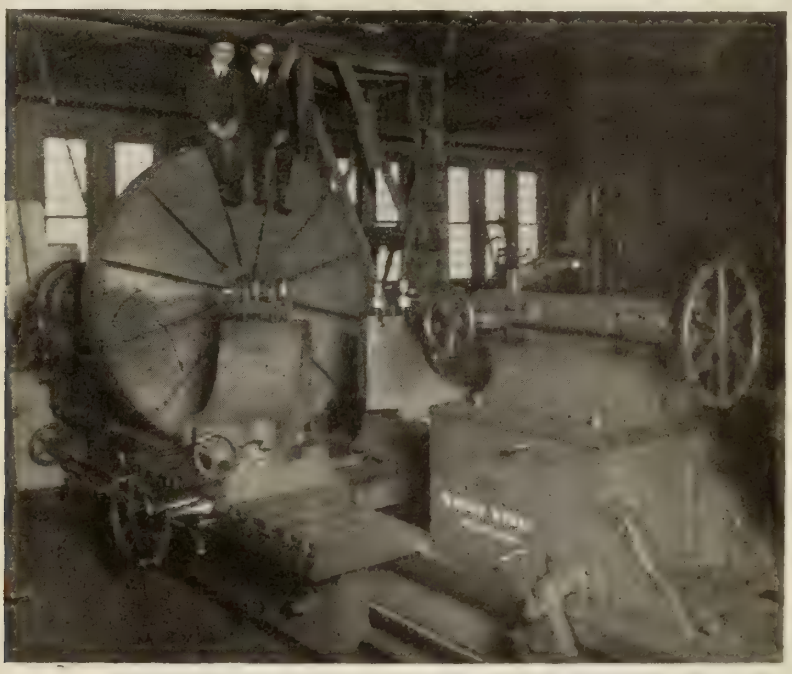
CLOSE UP VIEW OF THE FIXTURE.

A most ingenious little night lamp has been introduced by an American manufacturer of fixtures. This device is made of porcelain, and of an odd shape strongly suggesting a Japanese type of lamp. The shade is made an integral part of the base. In the base is a step-down transformer, which reduces 110-vole alternating current to 6 volts, so as to furnish current for a six-volt two-candlepower automobile type bulb. A simple switch is provided for turning the light on and off.

This little night lamp furnishes just sufficient illumination for dimly lighting a medium-sized room, and the bulb is properly shielded so as not to be troublesome. The current consumption is so slight as hardly to make the average meter register.

96 IN. FIFIELD ENGINE LATHE

What is said to be one of the largest lathes in the world, a 96 inch swing triple-geared Fifield, has just been produced by the Wright Works, 1150 S. Washtenaw Avenue, Chicago, Illinois. The machine is depicted in Figure 1, which shows a front view of the lathe with faceplate removed. The machine is cone-driven from a backshaft, this procedure being necessary to obtain enough power to take the heavy cuts which a device of this size would be subjected to. An eight-inch belt from a countershaft running at 200 r.p.m. transmits forty horsepower to the spindle of the lathe. To reduce chattering, the spindle is made of cast iron. The theory of using cast iron is that it is less elastic and therefore will not spring on heavy cuts and thus reduces chattering. To compensate for the strength of the steel spindle the spindle is of generous proportions, the front bearing being 16 in. diameter and 24 in. long and the rear bearing 14 in. diameter and 20 in. long.



GENERAL APPEARANCE OF THE LATHE.

The lathe is triple geared and all changes are obtained by moving the hand-wheel, which is conveniently placed in front of the cone pulley, thus making all changes within easy reach of the operator. The handwheel is geared to a lever shaft, which reduces materially the effort required to shift the back gears into their desired positions. Only one of the changes is through sliding gears, the balance being by means of massive tooth clutches. The gearing and cone pulley is designed so that all speeds are in geometrical progression, the slowest speed being 0.75 r.p.m. and the fastest speed 76 r.p.m. Twelve speeds are obtainable through the four steps cone pulley and triple gearing with a ratio of 1.52 between each speed.

All of the gearing in the headstock, as well as throughout the machine, are made of steel and the pitch and width of face gears increase in proportion to the load which the teeth have to stand in reducing the backshaft speed to turn the faceplate at the slow speeds required when turning large diameters. The triple gear which engages the faceplate internal gear is of one diametral pitch and has a face width of six inches.

Every shaft in the headstock runs in phosphor bronze bearings and is well lubricated by means of sight feed oilers, which are in the operator's sight at all times.

The feeds are also in geometrical progression and are obtained from a quick change gear box, which is integral with the headstock. They are manipulated by means of the two levers shown in the illustrations, which move in either direction, giving four feeds of 0.025 in., 0.050 in., 0.100 in., and 0.200 in. per turn of faceplate. More feed may be had by changing the regular feed gears with the thread cutting gears. Twenty-four different threads may be cut by means of changing gears. All the gears are guarded by covers or guards, which are made conveniently removable where necessary, while the change gear guard is provided with a door.

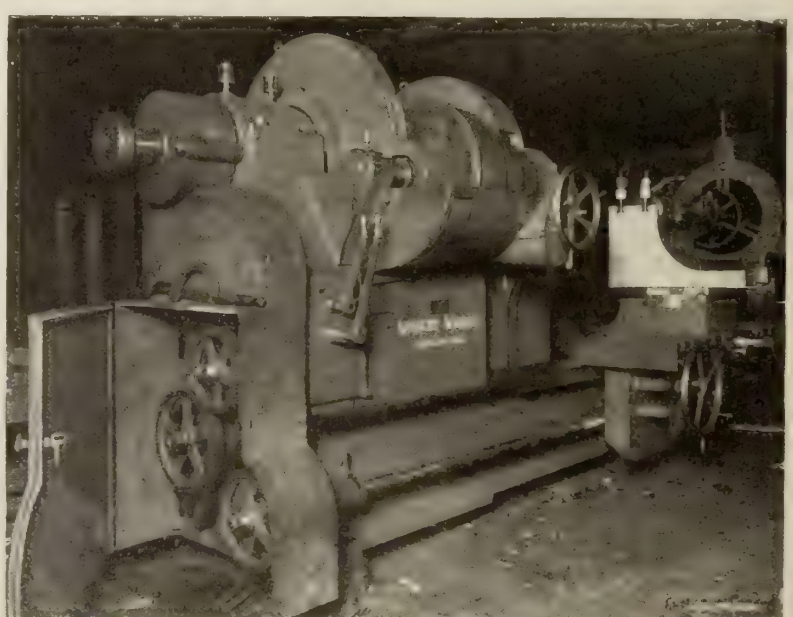
The carriage in the illustrations is equipped with two compound slides, which may be fitted with power angular feed at the request of the purchaser. The carriage bears upon the ways for a length of 90 in. The apron is made of steel gears and is bush throughout.

The lead screw is kept from buckling by means of supports, which are adjustable and placed at about ten feet apart.

The tailstock, like headstock, is of box construction and is moved easily by hand by means of a geared device, which engages the teeth in the rack of the bed. The tailstock spindle is moved by a handwheel, which is placed convenient to the carriage.

A massive steady rest is supplied with each and every machine.

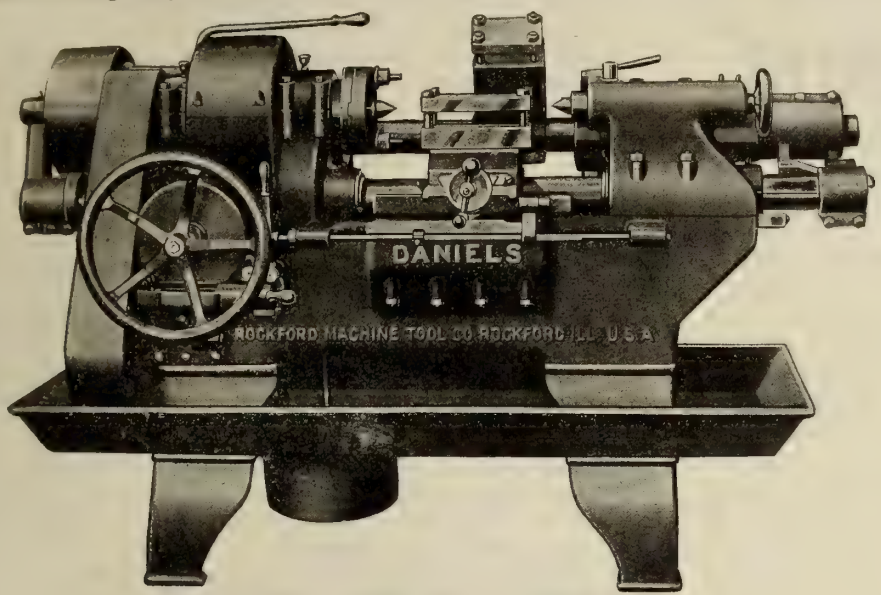
The bed is ribbed throughout with box sections and is fitted with a rack down a centre rib, which engages a pawl on the tailstock, removing the thrust of a cut from the clamps of the tailstock direct to the bed of lathe. The bed provided for the machine in the picture is 48 feet long and will take 34 feet between centres. The total weight of the machine is 150,000 lbs. An idea of the massiveness is furnished by Figure 3, which shows two men sitting on the faceplate.



ANOTHER VIEW OF THE MACHINE.

"DANIELS" AUTOMATIC LATHE

The automatic lathe illustrated, which is intended for the rapid production of duplicate parts in large quantities, is a recent product of the Rockford Machine Tool Co., Rockford, Ill. This machine was designed by Lee G. Daniels, and, while having only a 14-in. swing over the carriage bar, is said to be built on 22-in. heavy-duty lathe lines in order to withstand severe service. After being set up for an operation, the work, either centred or mounted on an arbor, is placed in the machine, the speed clutch thrown in, and the feed worm lifted into position; after which the machine goes through its operations and the tools return to their starting position.



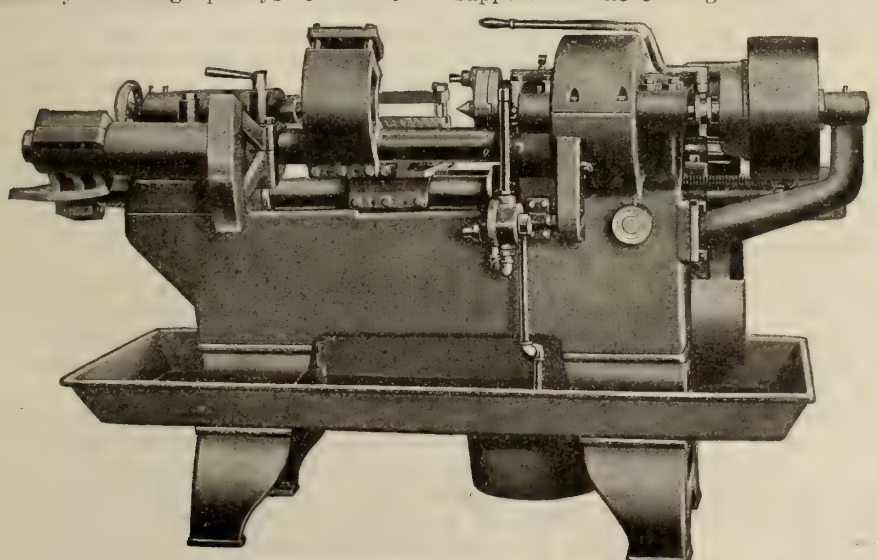
GENERAL APPEARANCE OF MACHINE.

The side and right-angle carriages are arranged to carry multiple tools, the side carriage for turning different diameters and the right-angle carriage for facing and recessing. It is possible to use four or more tools in each carriage, all operating at the same time.

The machine is of the one speed and feed type. If necessary, change gears can be used to vary the feed, but it is necessary to change pulleys to alter the speed. The drive is to a friction pulley and then through a pair of helical gears to the spindle. The headstock is cast integral with the bed. A heavy steel bar bearing directly in the head and tail stocks serves as a support for the side carriage. This is solidly and permanently clamped to the bar. The carriage also bears on a hardened steel way at the front of the bed and when the feeds are tripped the carriage is automatically moved away from the work so that the tools will not drag in returning to the starting position. Special hardened-steel ways can be furnished to give the work taper, convex or concave form if desired.

The right-angle carriage is mounted on a bar supported in bearings in the head and tail stocks, a segment cam on this bar being actuated by a roller from the side carriage bar. The tailstock is of the four bolt type cast in one piece and fitted with a taper gib.

The bars for supporting both carriages are finished by turning and grinding from high-carbon forged-steel bars and are 3½ in. in diameter to insure rigid support for the cutting tools.



VIEW OF MACHINE FROM REAR.

A lubricating system is provided, the oil pump being driven by a chain from the clutch shaft. Flexible tubing for delivering the lubricant to the work is regular equipment.

"W & B" WRENCH BOARD

The Whitman & Barnes Manufacturing Company, St. Catharines, Ont., are putting out an attractive new board for displaying their drop-forged wrenches. The background is light golden oak, the display card is black with gold lettering.

The wrench board is designed to be of greatest assistance to both the dealer and the purchaser. Each wrench number is plainly marked in red. Wrenches may be had either semi-finished or black enameled finish. As the new board is only 8 inches wide by 28½ inches high it may be used to advantage in the window as well as in its more usual location or store column or walls.

The assortment of ten sizes of double head wrenches, three of each size, is not intended to be complete or to take the place of the dealer's regular stock. It does, however, include the most popular sizes for general use, and so serves as a guide to the purchaser as well as a silent but effective salesman and stock-keeper for the dealer.

GENERAL APPEARANCE OF THE BOARD.

A handy little booklet describing the new wrench board will be mailed to dealers on request.

The MacLean Publishing Company
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The Good-will of the Men

WHY is it that there are some of the steel mills of United States running 100 per cent. to-day, while others were shut up tight the first day of the strike?

Now there is no chance work about this. Organizers and strike leaders are just as eager to tie up one mill as another, although it is a fact that the strike is aimed primarily against the Steel Corporation.

At Vandergrift, for instance, the strikers made no headway. George McMurtry was at the head of this mill long before it went into the Corporation. He made a study of men. He wanted to make life pleasant for them. His men were greater to him than the steel they were to turn out.

At Middletown, the home of the American Rolling Mills, the influence of such a man as George M. Verity is seen in the present crisis. That mill is running and chances are that it will continue to run. That mill is managed not for the one purpose of turning out a product that is recognized as par excellent, but it is run in such a way that to turn out anything else would cause the men to feel guilty of wounding a friend in his own house.

When is industry going to learn this lesson?

Contented workmen will turn out a good product. Men who are on the "edge" all the time will not.

The successful manufacturer to-day is out to buy more than eight hours of a man's time. If his interest in the human element in his establishment begins and ends as the men pass in and out by the time clock, he is going to get a very perfunctory service. He is not going to have an organization that will stand behind him in spite of all that strike-agitators can do.

Don't say that it cannot be done. Do not take refuge in the experience of someone who has made a half-hearted attempt.

Men are still men. They can be appealed to as such. They can see when a firm comes to them on the "dead level," and they have also learned to look a gift horse in the face.

You cannot run your shop on the card-index plan. A man must be something more than a number on a card or a necessary load on the pay roll.

Do you know your men? Do you know anything of their living conditions? Do you know if they are up against a big load in the way of sickness or hard luck?

You say you have too many to know in this way. Then that is all the more reason to set at this work systematically.

There are Canadian manufacturers who know their men. They can get out in the shop or the mill and call most of them by the first name. Do they lose prestige? Do the men get too familiar? Not much! These men are having a good time every day, and at the same time they are wisely practising a commendable sort of self-preservation.

I Don't Know

THE superintendent of a fairly large shop in a Canadian city went to one of the mechanics not many days ago. He said, "We need a new key-seater in this shop. What make would you advise?"

That mechanic did not have to spend a cent to have all this knowledge at his tongue's end. The firm placed a number of mechanical papers at the disposal of its men. All that was necessary was to apply at the circulating library.

Right then was his chance to have told the superintendent what he thought. He should have been able to tell him what he preferred and why. He knew the class of work done in the shop; knew what was necessary, but—

He said: "I don't know."

And right there he passed up a chance to become an authority on what was good shop equipment.

The superintendent was in quest of information. He was out to find a mechanic who recognized that this is a day of machine production—a day when shops must have the machine suited to their work.

He wanted to know which was THE machine for their plant, and why.

Now it was quite natural that he should go out and ask a mechanic in his own shop. The superintendent may have had something else in his mind, for promotions come at the most unexpected moments.

But that mechanic, at the first test, in the first round, passed along his chances when he said: "I don't know."

This is the day when the man who is going to the top of the heap will be able to say: "We need this make of machine. It will do the work here because—" and then he goes on to tell why.

The advertising and new equipment pages of a paper like CANADIAN MACHINERY are full of the newest developments in the machine tool field. They are an education to the mechanic who is bound on getting into the "I know" class. They are a sealed book to the "I don't know" mechanic.

The "I don't know" list is a long one. It has few men who can reach very far through the cashier's wicket on pay day. The "I don't know" chap has only 44 or 48 hours of his time for sale each week. He has nothing else of value to his firm.

The "I know" man is in demand. He has his skill plus his information on up-to-date equipment and methods.

If you want to enter the field of larger service, get away from the monotony of production—get in the "I know" class. It is entirely a personal matter. No one else can do it for you, and no one can keep you from learning.

Is There To Be No Limit?

THE United Mine Workers of America, at the Cleveland session, state their programme as follows:—

> Sixty per cent. increase in all mine wages.
>
> A limit of six hours upon the day's labor underground.
>
> A five-day week, with time and a half for overtime, and double time for work on Sundays and holidays, and important improvements in conditions of labor.

If these demands are not met the miners will strike on November 1.

The sixty per cent. increase in pay and the decreased hours of labor mean easily a hundred per cent. increase in the price of coal.

Readers may at first be inclined to take these demands with some degree of levity, but there is the utmost seriousness in the presentation of the demands, and in the whole proceedings.

This continent needs coal—needs a lot of it, and needs it right now. The miners propose to stifle production and enormously increase the cost.

They propose to saddle every worker in Canada and United States with a load that he cannot carry and decently exist.

The strike, as a legitimate weapon, is being abused beyond words. There have been times, many of them, when a strike was the only thing to which labor could turn and maintain any reasonable degree of self-respect.

The continued resort to the strike by men who have not a large enough grievance to warrant this extreme measure is making the phrase "they've gone on strike" a word that arouses little sympathy and less support.

President Tom Moore, of the Trades and Labor Council of Canada, at the Hamilton convention, had this to say:—

"A number of leaders of labor and those who follow them have been repeatedly warned of the economic danger of too frequent or too wide a use of the strike weapon. They have been told that it is inimical to production and to the best interests of the nation, and so will ultimately rebound upon themselves. They have not, however, been sufficiently warned of the danger they run of spoiling their final and best weapon of defense by its too great use and by attempts to force by its means decisions that such a weapon ought never to obtain."

The very word "strike" is being stripped of its real meaning, and robbed of its strength in portraying to the mind the idea of a struggle of the weak against the strong.

The wise labor leader cannot afford to take "the public be damned" attitude. The public in the last analysis hold a tremendous amount of power that they have never yet exercised, but it looks as though it might be necessary to organize and harness some of this power for the purpose of protecting the great mass of the community—the common people.

Back to the Stone Age?

HERE is an item from the "society" columns of a Toronto newspaper:—

> "Five hundred dollars was paid for an evening cloak and four hundred for a gown one day this week by a well-known Toronto woman."

The chances are that had the paper inserting this paragraph thought seriously about present-day conditions, about the volcano of unrest on which we are sitting, or of the things men and women are thinking about and saying, the paragraph would never have found its way into print.

There was a time when people took it for granted that it was all right for some people to have all they needed, and more, while others had not enough to keep body and soul together.

During the days of the war much was said of the breaking down of class lines, of the levelling of the people to the plane of service and sacrifice. In fact, were one to have taken seriously all that was said, it would be reasonable to expect that we should now be in an era quite different to that before the war.

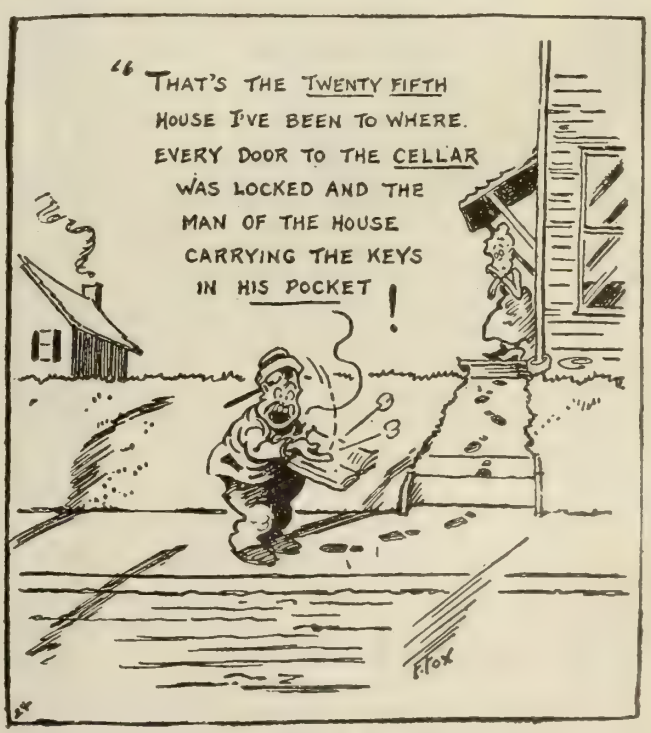
But that was a war-time dream. The sacrifice was made, but the selfishness returned. It is here to-day. It crops up all over and will not be downed. The pursuit of dollars is once more the centre and circumference of man's life.

And so we have this vulgar display of wealth again. Oh, yes, it is interesting to read of $900 being paid for a gown and an evening coat! In fact it might be more so were it not a fact that one can see women with market baskets going to butcher shops and stalls looking for cheap cuts of meat, and turning away again with empty baskets because there happened to be no cheap cuts on that day.

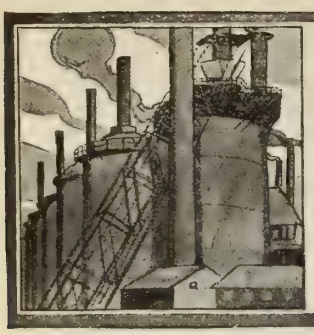
This old world is in the melting pot, and the outpouring has not yet come to pass. Nor are we going to have the dross skimmed from the gold by the poor vaporing of the social columns of the daily press, where some censor has the job of selecting the social sheep from the unfortunate herd of goats that have committed the awful crime of not being wealthy.

It is a fact that this old world hungers for love, for the handclasp that has a heart-throb behind it, for genuine worth stripped of its trappings, and for manliness that is saturated with integrity and honor.

All things that make for the bringing to the surface of these attributes are worthy of our greatest encouragement, while everything that, in these times of uncertainty and unrest, tends to build anew class lines, emphasize social distinctions, or place dollars above character is unworthy of a place in the thought and acts of serious-minded men and women.



THE METERMAN IN A DRY LAND.
—From the Youngstown (Ohio) "Telegram



MARKET DEVELOPMENTS

The Steel Strike Touches Canadian Markets

Firms Using Much Material May Have to Pay Higher Prices—New York Reports That Machine Tools Are on the Level of the War Period and in Some Cases Higher

HOW long can Canadian industry stand the steel strike in United States? That question is concerning a lot of people just now. There are plants that will be touched very quickly, while there are others that will not feel the pinch for weeks yet. On a broad basis, though, it can be accepted as a fact that it is not possible for industry on this side of the line to prosper while the same business across the border is in the throes of a desperate strike.

The strike came at a bad season of the year for Canadian business. Warehouse stocks are very low in many lines. Roughly speaking, plates, tubes and large structurals are the lines that we must import, and there are certain gauges in sheets that are much in demand, with only a limited production capacity in Canada. Buying from warehouses has been very brisk for several weeks, in anticipation of strikes, with the result that these places are pretty well cleaned out.

Prices will be firm and higher on many lines. One user of sheets, for instance, who wanted 20 tons, found that by the time he had made the rounds of several houses to secure his requirements, he had to pay $400 more than he figured on. Although the actual lists may not be altered, the chances are that premiums will be secured on a good many lines where there is any chance of delivery.

It might be supposed, at first glance, that Canadian steel mills would benefit largely from the strike. They may for a short time, but not in the long run. For instance if a factory cannot secure plate, it will be only a matter of time before it will be closed off, and out of the market as a buyer of those lines the Canadian mills are in a position to ship.

TROUBLE IN ENGLAND WILL HURT OCEAN SHIPMENTS FROM CANADA

Special to CANADIAN MACHINERY.

MONTREAL, Que., October 2.—In addition to the uncertainty that has followed the inauguration of the steel strike in the steel districts in the States, the action of the railway men in Britain has added to the unsettled condition in this district. Not that the situation here has been directly affected, but the consequence of these disturbances will eventually be reflected throughout the industrial world. The immediate result of the strike in England will be to create a congestion at ocean terminals that will cause the Government to place a virtual embargo on imports and exports. Already the ports in the Old Country are unable to take care of the material that is accumulating, and restrictions are looked for every day that will curtail the activities until the situation can be relieved. Officials at the port here are looking for some action that will call for revised regulations in regard to shipping to British ports.

Strike Shows Little Effect So Far

Despite the fact that the steel strike in the States is casting a cloud over the activities in this district, the business here has shown no outstanding developments as a result of the unsettled state prevailing in the American steel centres. The conservative attitude that has been only too pronounced during the past few months has become additionally emphasized during the week just passed. The present demands, however, are not of a character that activities would be suspended in consequence of the close-down of the United States mills. It is learned here, that, apart from the heavier classes of materials, such as plates and large shapes, the requirements of the trade can be supplied from the Canadian mills, or stocks that are in the hands of dealers. In some respects the strike has been foreseen, and many consumers have protected themselves by covering their requirements for weeks ahead. This, with the light volume of present business, will assist in tiding over what would otherwise be a serious situation. So far there has been no alarming conditions here as the mills have been able to supply all the needs for immediate demands. Should the strike extend for a long period the effect would be first felt in plates and shapes, and the demands for this material here is very light at present. While it is impossible to predict what will eventually take place, the trade here is quite optimistic, and many believe a settlement will be reached within a very short time. However, should the present trouble spread, the market would undoubtedly strengthen and price quotations would likely advance. Dealers here are holding to current quotations and do not anticipate an advance unless a serious turn develops across the line.

Metal Showing Weakness

The metal situation here has felt the effect of the unsettled condition now prevailing in the States, not in a direct way, but consumers are adopting cautious methods until affairs become more stable. The demand has shown a slight falling off, and as a result dealers are quoting weaker prices on all the metals. Copper is now quoted at 25½ for lake, and 25 cents for electro and castings. Tin is down 1 cent, and the price asked is 59 cents per pound. Spelter is now 9½, this being a decline of ¼ cent on the week. Antimony shows a similar decline and is quoted at 9¾ cents. Aluminum is lower and the quotation of 33 cents represents a decline of 2 cents per pound.

Little Scrap Movement

Dealers here are closely watching the developments across the line, but the effect so far has only been one of passive interest as the market here has not been affected by the tie-up of the producing mills. It is difficult to state what will

Six Post Readers in New Cabinet

FORMER Finance Minister Cashen, who, following the crisis which led to the resignation of Premier Lloyd, of Newfoundland, has been called upon to form a Ministry, has already selected nine members to act with him.

Six of these, including the Premier himself, have been regular readers of THE FINANCIAL POST for some time.

This does not only indicate the quality as well as the extent of our circulation, but indicates also that men who carry big responsibilities find THE POST of value to them. It indicates, therefore, the approval which is meeting the effort of our editors and the great importance and value of the business information to which subscribers have access through the columns of THE FINANCIAL POST.

When the Government of Newfoundland was recently arranging the flotation of a $5,000,000 bond issue THE POST'S opinion as regards some methods of marketing was quoted by members of the Cabinet.

The Financial Post at Ottawa

IN the Dominion House of Commons the other week the attention of the Government was drawn to an article in THE FINANCIAL POST containing a reference to the financing of Roumanian orders through an agency established in London by Sir Clifford Sifton. Sir Thomas White mentioned that in reading his FINANCIAL POST that week, he had formed the opinion that the reference was to private marketing of bonds.

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take place should the strike continue for any length of time, and it is hard to get any dealer to commit himself in this connection. The feeling is general that the strike will be of short duration, and for this reason the dealers are reluctant to speculate on the market. They are willing to let present prices stand for another week.

MUCH INTERESTED IN STEEL STRIKE

Canadian Firms In Some Lines Must Secure Their Supplies From U. S. Mills

TORONTO,—The strike in the steel mills of the U. S. is the big cloud on the horizon this week. Warehousemen want to know how they are going to make out. Firms that have orders in the U. S. mills at the present time want to know what chances they have of getting deliveries from them, and the firm that wants plate rolled to keep the shops going are keen for any intimation of how serious will be the curtailment of output at the mills.

So far the strike has not hurt this country. But it would be folly to say that Canada is going to be free for any length of time. Indications point clearly to the fact that if the trouble continues, this country is going to be seriously affected.

How It Works Out

The Canadian steel mills should get a larger tonnage of material than they are capable of handling. If they are in shape to handle much more is not certain. For instance, one firm—an American concern that is putting a branch in Canada in the Windsor district—was going to buy 50 tons of sheets. The order in the natural course of events was going to be placed at the U.S. mill where the parent concern had been securing material for some years past, and in the use of which they were accustomed. There is some urgency in the order, and it will go to a Canadian mill. There is no reason to suppose that this one case will not be duplicated many times.

How the Stocks Stand

Warehouses report that their regular supply of plates has been largely shut off, although there are some deliveries coming through yet. That is to be expected as there would be a large amount of material practically ready for shipment, and some of it actually on the way when the strike started, and of course, there are mills that are making shipments even yet.

There is very little plate in the warehouses of this country, and the fact that there has not been very heavy buying is responsible for this. Jobbers preferred to do an import business and pass on orders for mill shipment rather than stock heavily in a rather uncertain market. During the past few weeks when it seemed probable that there would be trouble in getting material from the United States mills, there has been a run on the warehouses carrying wanted sizes and gauges, and so it is that plate stocks in the warehouses are low—very low in fact, with very little prospect of getting them replenished for the present.

It would not be surprising were prices to stiffen at once. For some time past there has been more or less juggling with the prices of plate, which has been the weak spot in the whole steel list. Business, while nominally at 2.65, has in many cases been going across at 2.50. The strike situation will no doubt take care of this tendency, although the selling agencies of the mills state that they do not intend to enhance prices on the strength of the strike.

The Case of Sheets

The case of sheets is different, as this is an article that has some capacity in this country. There is no guess-work in sheets, though, because they are going to go up. In fact, they have already gone up. Just who to blame for this order of things is hard to state. It is a question much the same as who is the greatest offender, the man who takes or gives a bribe. Very often the purchaser, finding that his plant is very much in need of a certain line, will pay a premium for delivery, in which case the seller is relieved of the embarrassment of approaching this rather delicate question.

But here is a case in point. One Ontario firm wanted 20 tons of sheets, and they were very anxious to get them. That twenty tons is costing the buyer, by the time that several warehouses have contributed their quota, something like $400 more than the former price which was good up to a few days ago.

There are not many galvanized sheets in several of the warehouses, and prices vary a little on these, while the chances seem to be that, with black sheets, their raw material, going to a higher level, the galvanized product will move in the same direction. Sheet stocks are very low at the moment. This is due to the fact that there has been such a rush for sheets in the last couple of weeks that the warehouses have been brought down to very little to choose from. Many of the orders coming in are for No. 10 gauge, and for this there is little capacity in Canada, one mill in Nova Scotia alone being able to do this up to a limited sized strip. This is in reality a thin plate, and is used largely for smoke stacks, tanks, etc.

Tubes Not Plentiful

The strike has found the stock of tubes in Canadian shops and warehouses "shockingly low" as one of the sales managers put the case to CANADIAN MACHINERY this week. They are low in sizes and qualities, because there has been a very heavy demand. In this case there is no reason to doubt what prices are going to do. Already there has been a ten per cent. increase announced by the larger warehouses on the other side of the line. Two, three and four-inch tubes are wanted in this country, but they are not to be had with any degree of certainty or freedom in regard to the quantity ordered.

It looks as though the strike had come at a bad time for the Canadian warehouse trade. CANADIAN MACHINERY knows that there are large orders across the line, as warehouses had decided in several cases to stock up ready for whatever uncertainty might come in the winter months from transportation problems. Deliveries are not coming through against these orders, and as a result, they have little to offer their customers.

Doing a Good Business

Dealers in machine tool supplies report that they are doing a lot of business, and that it is well distributed, taking in a large number of industries.

And while speaking of small tools, such as certain makes of drills, one Toronto dealer remarked to CANADIAN MACHINERY this week: "This is a line that no person seems to be making money out of. I know for a fact that the man who sells them is now doing little more than breaking even in many cases, while it hardly seems likely that the makers are showing a decent profit. There has been too much competition and cutting to meet local and special conditions. I wish the makers would have some understanding, for as matters stand at present there are cases where the customer is actually in a position

POINTS IN WEEK'S MARKETING NOTES

New York reports that there have been several increases announced in the price of standard tools, and that in many cases the prices are now even above those that prevailed during the war period.

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Canadian manufacturers using much material that is imported from U. S. steel mills report that in most cases they have enough stock on hand to last them for some weeks to come. They admit that if the strike is continued for any great length of time, however, matters will be serious for them.

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Pittsburgh reports speak hopefully of the strike in the steel mills falling through.

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The steel strike is having its effect already on Canadian materials. Increased prices are reported on sheets, and buyers are in some cases willing to pay premiums for delivery.

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A new list is out on steel tubes, showing increases. The stock of tubes in Canada is particularly low at present, especially in two, three and four inch sizes.

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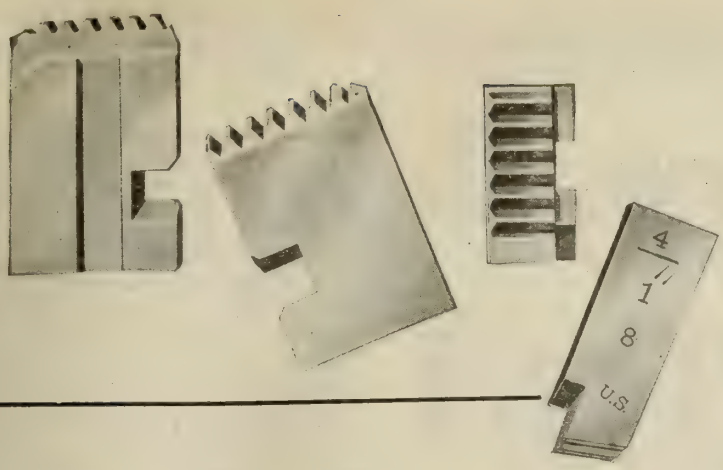
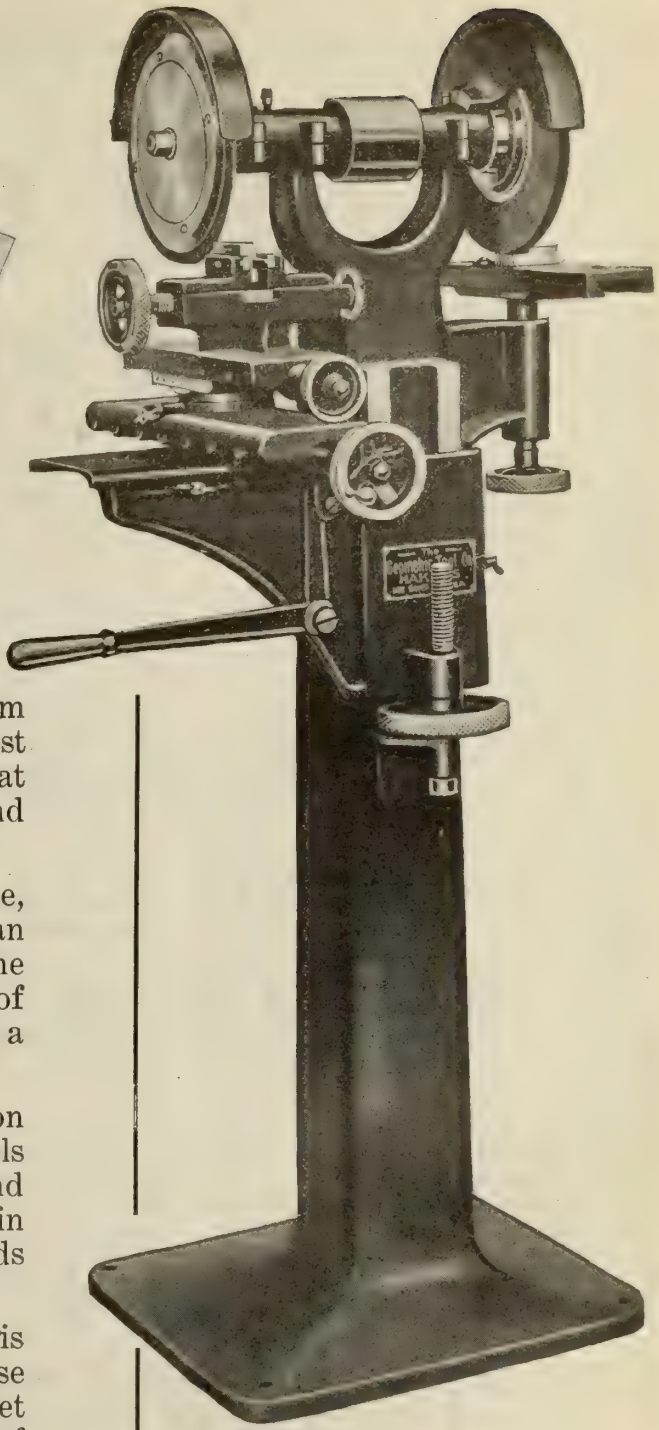
Montreal fears that the strike in England will bring out embargoes which will tie up ocean shipping.





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to name the price which he is going to give you his business."

It would not be surprising were something done along these lines, not with the idea of creating a combine to boost prices, but simply to put the whole business on a fair basis where all would be treated alike.

NEW YORK REPORTS SOME TOOLS EVEN HIGHER THAN IN WAR TIMES

Special to CANADIAN MACHINERY.

NEW YORK, October 2.—The effect of the strike in the steel industry upon machine tool trade has been to reduce the number of inquiries. On the other hand, a very fair amount of business, most of which has been pending for weeks, has been closed within the past week. The falling off in inquiries indicates that manufacturers in metal working lines will not make new plans until the outcome of the steel strike is definitely determined. A victory for the unions would be a severe blow to American industry, and, while no such result is expected, there is a degree of uncertainty in the outlook that will hold up business. What the steel companies now fear is that President Wilson may attempt to take a hand in the situation and suggest an arbitration commission. The steel manufacturers have nothing to arbitrate. The issue in this strike is clear-cut—it is a fight on behalf of right-thinking Americans against the despotism of labor leaders who are un-American in their ideals and aspirations.

The thorough publicity given to the revolutionary character of W. Z. Foster, secretary of the strike committee, and the statements of John Fitzpatrick, chairman, to a Senate committee that labor is aiming at the socialization of all basic industries, has focussed public attention upon the crisis in Governmental affairs that might come through a victory for the unions in the steel strike.

Among domestic buyers of tools in the past week may be mentioned the Dusenberg Motors Corporation, Elizabeth, N.J., now a part of the Willys Corporation; the Hendee Manufacturing Co., Springfield, Mass., manufacturers of motor cycles; the De Laval Separator Co., Poughkeepsie, N.Y.; the Sharples Separator Co., West Chester, Pa.; the Crown Cork and Seal Co., Baltimore, Md.; the E. W. Bliss Co., Brooklyn, and the Bessemer Gas Engine Co., Grove City, Pa.

In the export field there is considerable inquiry but not much buying. The J. G. White Engineering Corporation, New York, is placing orders against a $250,000 list for Switzerland. An export company is asking for quotations on about 100 or more tools for locomotive and car repair shops in South America, and a South American mining company, with offices in New York, has issued a list of about fifty tools.

Manufacturers of planers have advanced prices from 15 to 20 per cent. Practically all types of machine tools are now back at war-time prices, while a few are even higher.

Crane business is fairly good, and prices show a tendency to advance in view of the difficulties in getting steel that may result from the steel strike. The Phelps-Dodge Corporation, New York, is inquiring for twelve cranes; the Kennedy-Van Soun Manufacturing and Engineering Co., New York, asks for quotations on seven, and the Cerro de Pasco Mining Co., New York, is in the market for five. An export company, the Transcontinental Merchants, Inc., New York, asks bids on 50 triplex chain hoists for shipment to Japan. The Standard Oil Co., of New Jersey, has bought twenty-eight jib cranes for its plant at Rahway, N.J.

STEEL STRIKE NOT AS SERIOUS A MATTER AS AT FIRST ANTICIPATED

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., October 2.—The steel strike started out as a serious matter, but not altogether as serious as expected. For four days, or until Friday morning, September 26, the matter hung in the balance, whether the strike would spread or would recede. The information gathered together Friday morning showed positively that the strike was losing ground, proving conclusively that, barring accidents, it would be lost, and probably in a few weeks.

The character of the strike was determined the first day. The organization campaign, authorized at the annual convention of the American Federation of Labor at St. Paul, June, 1918, was under the auspices of 24 unions affiliated with the federation, these unions being of various crafts which had more or less employment in the iron and steel industry as a whole, but did not represent any large proportion of the men employed. Machinists, engineers, moulders, etc., are employed to an extent and their joining the unions and going on strike would cripple operations more or less. The organization campaign also took in common labor.

When the strike started it was at once disclosed that it was not primarily a strike of these skilled men at all, but of the common labor, and chiefly the foreign born labor at that. The latter struck practically 100 per cent., while of the American born common labor many were willing to work. Then two things occurred, making the influence of the strike more serious. Men who wanted to work were thrown out of employment because other men, needed for operating a plant or a department as a whole, were on strike, and men who were at work were intimidated by strikers and gotten out. For illustration, practically all of Youngstown was on strike by the end of the second day, but the Trumbull Steel Company, operating a steel mill and sheet and tin plate mill at Warren, a few miles distant, was in full operation. Strikers marched up the Mahoning valley to Warren and "got" the mill at the time of changing turns, the fresh turn not being allowed to go to work. The same thing occurred at Canton, the men from a striking plant marching to the Canton Sheet Steel Company plant, which was not on strike, and closing the mill.

By Tuesday night a low point in operations was reached. When the strike started, at 6 a.m. Monday, September 22, about 35 per cent. of the productive capacity of the iron and steel industry was thrown idle. Then a process began of the strike losing at places where it had started poorly, and of spreading where it had started well. By Tuesday night the idleness amounted to about 40 per cent. Then began a close watch of how things broke from hour to hour. As the Youngstown and Wheeling districts were down tight and the Monongahela Valley was working moderately well, while the rest of the Pittsburgh district was nearly normal, it was evident that if the Monongahela valley could continue operating the fact would break the strike in Youngstown and even Chicago and Gary, which were about two-thirds down, would eventually

GET ON THE JOB

"Don't be an alibi artist. Get on the job," is the legend that is emblazoned on a signboard at the entrance to one of the big steel mills near Pittsburgh; and there are authentic reports to show that the honest-to-goodness American is getting on the job. "It is a case of America for the Americans with those fellows," said a steel man to CANADIAN MACHINERY. "What the majority of them cannot swallow is anything in the shape of dictation from so-called foreign agitators as to what they shall do. That has been a big factor in the present strike. The real American is from Missouri. Moreover, a good many workmen who own stock in steel concerns are getting a glimpse of the other fellow's side of the question. They realize that unreasonable labor unrest and agitation endanger their investment."

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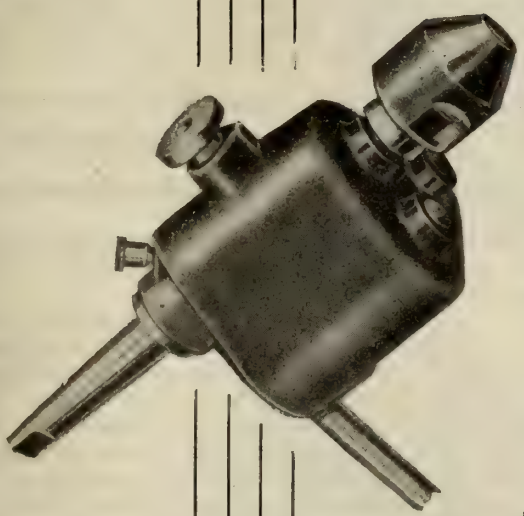

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feel the influence. Accordingly, the close watch was kept on the Monongahela valley. As it was chiefly a strike of common labor the blast furnaces were most affected, and the blast furnaces were also more vulnerable because the men have to work in the open. After Tuesday night the number of blast furnaces began to gain, but as there were losses elsewhere it was not a clear case, Chicago and Gary going down more and more, while the strike in Cleveland became practically complete. By Friday morning, however, as noted above, there was good news only and the swing was towards the strike waning. An important influence outside the Monongahela valley was that Tuesday and Wednesday there was a cleaning out of Bolshevists at Sharon, in the Shenango valley, 70 miles north of Pittsburgh. Nearly a hundred were gathered in. Then the intimidation that had gotten out many men in the valley in addition to those who had struck, ceased, and beginning with the resumption of one Shenango merchant stack at Sharpsville Thursday night, operations in the valley increased, although very slowly. This is counted upon to have a favorable effect upon Youngstown and the rest of the Mahoning valley, just over the state line in Ohio, where everything is still closed.

It is largely a matter of protection by the civil authorities. In Pennsylvania nearly all the county and municipal authorities have done well to preserve order, and the magnificent Pennsylvania State Constabulary, a perfectly trained body of mounted men, has worked wonders. Two of these men can take care of a moderate sized riot. In Ohio there is no state constabulary.

The issue of a strike is usually settled the first week, though the strike itself may last much longer. With the start this strike made, it could have no hope of success unless it continued to gain throughout the first week, but it gained only during the first two days. Wednesday it was suffering more losses than gains, and since Wednesday it has had losses only, and no gains. Barring accidents, it is lost to the agitators and won by the manufacturers, and not by the latter doing anything except endeavoring to keep the agitators from doing mischief.

Winning a strike and producing steel, however, are different things for the manufacturers. The test, in this instance, has not been the amount of steel produced, but the number of men willing to work. Men have been kept in employment at works when the efficiency of the plant was more or less diminished by departments not being uniformly manned, and production has not been in the same proportion as employment. Thus, if as estimated there was 40 per cent. idleness when the strike was two days old, that does not mean that actual tonnage production was 60 per cent. of normal.

Furthermore, assuming that there are no accidents or unexpected developments and the manufacturers have virtually won the strike, it does not mean that production will be fully restored in the near future. The strikers in some districts may hold out for weeks, perhaps many weeks, depending in considerable part how well order is preserved, for twenty per cent. of the men can often intimidate eighty per cent. of the men and keep them from working. At the best there will be a large loss of production and consumers of steel will be incommoded very considerably. There are stocks in buyers' hands, but the stocks are not large and are probably somewhat below normal. Buyers of steel products have displayed a fine feeling of sympathy for the steel producers and are indisposed to bother them about deliveries.

Of course, it is impossible to be absolutely precise as to the extent various producers are affected by the strike, but the following is a summary that cannot be far from the exact fact, dealing with conditions as they were at the end of last week: East of Johnstown, Pa., and Buffalo, N.Y., practically everything working. Cambria at Johnstown, closed tight, also Lackawanna at Buffalo and some of the merchant furnaces at Buffalo. Cleveland, down tight; Lorain, nearby, running full. In the Pittsburgh district, Jones & Laughlin Steel Company operating both South Side and Woodlawn works practically full, the remainder of municipal Pittsburgh operating above 50 per cent. Monongahela valley, the largest single section of the Pittsburgh district, lower part including Homestead, Duquesne and Edgar Thomson works of Carnegie running nearly full; middle part of McKeesport, almost full; Monessen, at upper end, both steel plants closed. New Castle, at foot of Shenango valley, operating almost full; Farrell and Sharon, near middle, operating little, but increasing; upper part, almost idle, but gaining. Mahoning valley, including Youngstown, down tight. Wheeling district, down tight, except a few mills running practically full. Calumet district (Chicago and Gary) almost down. The south running almost normal.

PIG IRON TRADE

The demand for pig iron thrives. Fear that deliveries may be away off on account of the strike is responsible for this.

Philadelphia.—Inquiries are coming for big tonnages. Some are from three to five thousand tons. In one other case the American Bridge Co. is reported to have asked prices and delivery on 25,000 tons.

Boston.—In the past week Boston dealers placed a tonnage of at least 14,000 for 1920 delivery. Largest buyers are makers of textile machinery.

New York.—It is hard to secure "right now" shipments of pig iron, and for this reason several big orders are now held up. Export business is poor, owing to exchange and shipping conditions.

Pittsburgh.—Prices of all grades of iron are more or less nominal at the moment, because there are no large sales going through to actually determine the values. Several merchant furnaces have been banked, due to the strike.

Buffalo.—Caution is the word in furnace circles here. Bookings for 1920 business are being discouraged.

Chicago.—Deliveries of iron are poor and a brisk demand exists for spot iron. Sellers having iron in transit have no trouble in cleaning out their stock.

New York.—The British Ministry of Shipping has handed over the former Hamburg American liner "Imperator" to the Cunard Steamship Company. The company have dry-docked the vessel and will refit her for their passenger trade between New York, Cherbourg and Southampton.

U.S. SCRAP METAL

Scrap metal trade is much curtailed. Strike conditions are causing a holding-up of shipments.

Chicago.—Buying and shipping of iron and steel is almost at a standstill, owing to the strike. Dealers have been told to stop shipments in many cases. Many grades are 50 cents weaker.

Boston.—For the first time in months heavy melting is accumulating at some plants. Steel rails are $1 down. The ordnance department are offering scrap steel.

New York.—Buying is pretty much on a hand to mouth basis, pending the outcome of the strike. The prices remain nominally the same.

Philadelphia.—The strike has killed the market. Mills will not buy, as they fear that deliveries cannot be made to their mills, and dealers do not want to take the chance either.

Pittsburgh.—The halt has been put to business here. Prices are only nominal, and some of the mills are asking suspension of contract shipments.

Look for Settlement.—One hundred moulders, employees of the Canadian Ingersoll-Rand Co., The Sherbrooke Iron Works, the E. & T. Fairbanks Co., and other plants walked out, demanding a $5 per day wage and other conditions. Some weeks ago the moulders made certain demands, chief among which was a nine-hour day with the same pay which they had been receiving for ten hours. This was granted by the employers, and the men went back to work. After this a meeting of the union was held and a strike vote taken. The officials of the companies stated that the walk-out would not tie up the production of the factories, and that they hoped for an early settlement.

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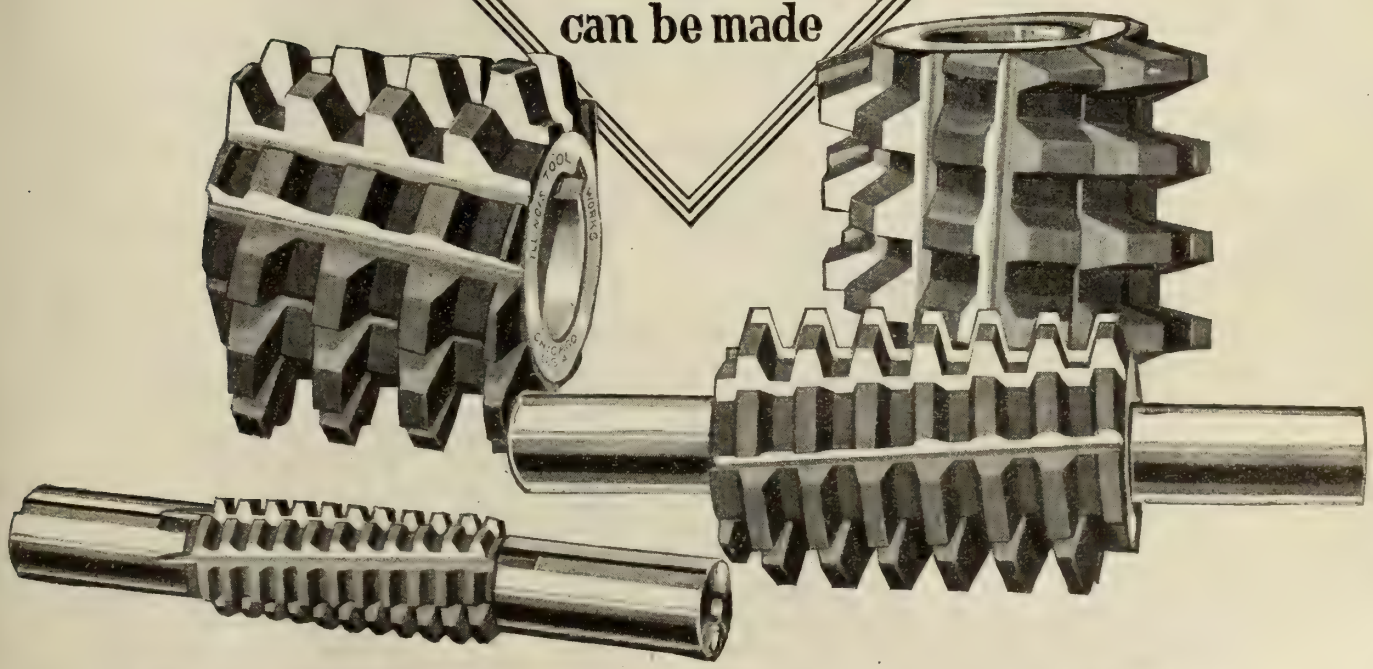

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Rose Tool and Supply Co.
111 Market St., Pittsburgh

Louis G. Henes
75 Fremont St., San Francisco.

Title Insurance Building,
Los Angeles.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$35 00	$26 25
Electro copper	25 00	26 00
Castings, copper	25 00	25 00
Tin	59 00	58 00
Spelter	9 50	10 00
Lead	7 25	7 00
Antimony	9 75	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Shell turnings	7 00	6 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	20 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

The Value of the Business Press to Business Men

"Business men do not realize the value which trade journals and technical magazines may have for them in increasing the efficiency of their factories and in giving them a broad and comprehensive view of their business.

"Our foreign competitors read almost every article published upon their business with great care and thoroughness. Many of them have duplicate copies of their favorite trade paper sent to their homes so that they may read them away from the business without being disturbed. Many foreign manufacturers contribute articles to these journals on phases of the business with which they are most familiar. Such articles are bound to be helpful and have a constructive effect.

"Our trade journals and technical papers are the best in the world, and they should be supported and encouraged by our business men.

"Copies should be placed where employees can see them and they should be urged to read and study them.

"These papers are preaching the gospel of sound business on practical lines and are helpful not only to business but to the country as a whole.

"If the suggestions made by them in the past had been followed by our business men it would not be necessary at this time to point out some of the fundamental weaknesses in American business."

—Edward N. Hurley, formerly Chairman of the Federal Trade Commission, in "The Awakening of Business."

The following is list of the MacLean publications. Every publication is a leader in its field. Write us for any information you may desire with regard to the field covered, advertising rates, etc.

TRADE NEWSPAPERS

Hardware and Metal	Canadian Grocer	Dry Goods Review
Men's Wear Review	Bookseller and Stationer	Sanitary Engineer

TECHNICAL PAPERS

Canadian Machinery	Canadian Foundryman	Marine Engineering
Power House	Printer and Publisher	Can. Motor, Tractor and Implement Trade Journal

MAGAZINES

MACLEAN'S MAGAZINE FARMERS' MAGAZINE

Financial Post—Weekly Commercial Newspaper

The MacLean Publishing Company, Limited

153 University Avenue, Toronto Southam Bldg., 128 Bleury Street, Montreal
1207 Union Trust Bldg., Winnipeg, Man.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill ..... list plus 5%
At warehouse ..... list plus 25%
Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 25
Sheets, black, No. 10	5 15	5 25
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 75
Premier, 10¾ oz.	....	8 05
Zinc sheets	20 00	20 00

PROOF COIL CHAIN
(Warehouse Price)

B

¼ in., $13.50; 5-16, $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.15; $13.00; ⅞ in., $9.60; ¾ in., $9.70; ⅝ in., $9.95; 1 in., $9.50; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $14.20; 5-16 in., $11.50; ⅜ in., $10.50; 7-16 in., $9.30; ½ in., $10.50; ⅝ in., $10.00; ¾ in., $9.70.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Koyalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

WELLAND SECTION

Small Town Advertised and Became a City

MANY cities in Canada can point with pride to phenomenal industrial growth. Once having started to expand, their development has continued, and assessment figures show constant annual increases, not only in property values, but in population as well. One of the most outstanding examples of the effects brought about by well-directed effort to secure industries, and through their agency, build up a strong industrial community, is demonstrated in the new city of Welland. This is the "baby city" of Ontario, and can well be termed the lustiest of all the youngsters of the municipalities. Welland was incorporated as a city on July 1, 1917, and is making prodigious strides to double the population for the next census. Geographically, Welland is particularly favored, and its unusual advantages, the greatest of which is cheap Hydro-Electric power, place this city in a class by itself. In addition to cheap power Welland possesses exceptional rail and water facilities, a combination that has helped materially in securing the large manufacturing plants for the city.

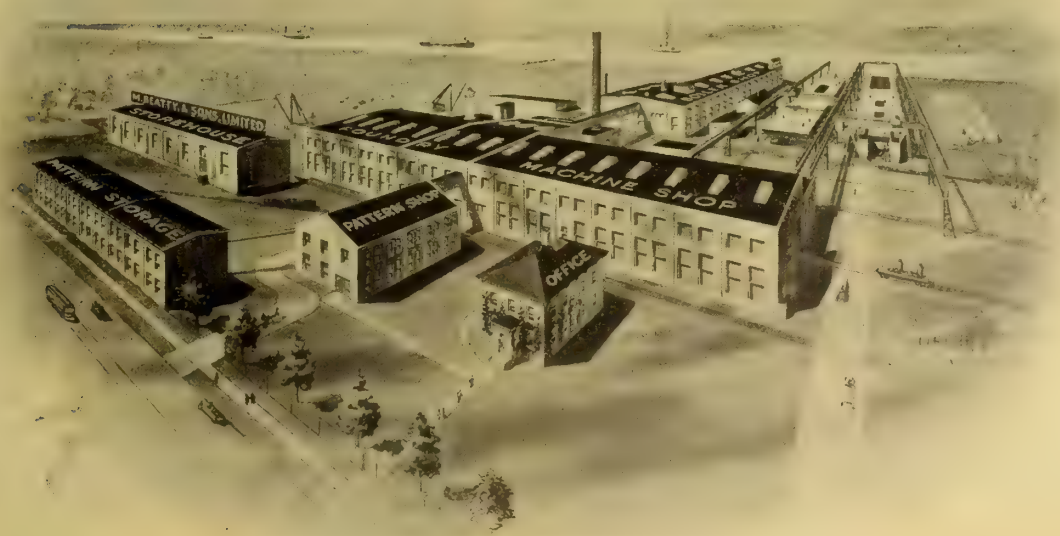
Welland Enters Upon New Era

Welland's present importance as an industrial centre dates from 1906. This was the year of the coming of Hydro-Electric power. First came the Cataract Power Co. of DeCew Falls, to be followed later by the Ontario Power Co., and the Hydro-Electric Power Commission of Ontario. An American, B. J. McCormick, saw the wonderful possibilities that would follow the harnessing of Niagara power, and decided to devote his efforts to promote its interests in Welland. He became the first industrial commissioner, and to his energy and foresight must be credited the location of many of the largest factories in and around the city. In 1915 he was succeeded as industrial commissioner by Louis Blake Duff, who looked after Welland's interests in this respect until 1918, and was followed by W. M. German, who holds this position to-day.

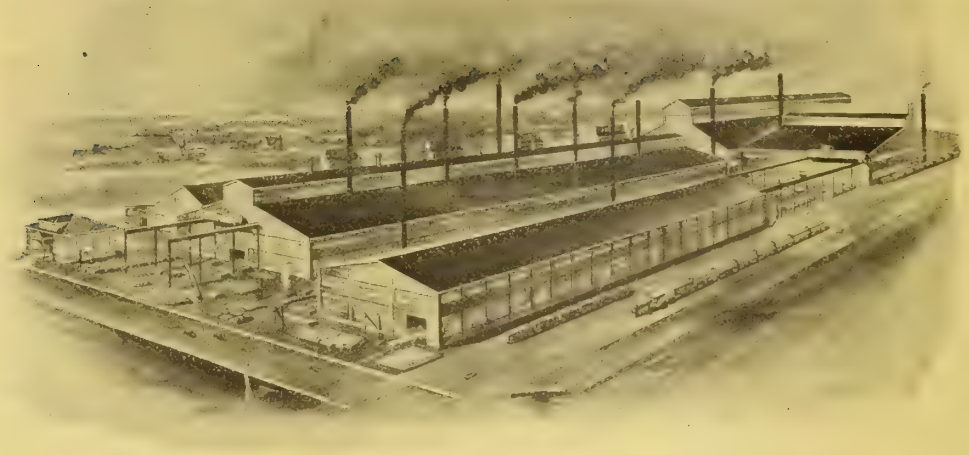
From 1907 to 1917 Welland continued to grow. Its population ten years ago was only about 2,000. To-day it contains 8,825 people, its increase running about ten per cent. per annum. In 1906 the assessment was slightly less than a million dollars. In 1917 it amounted to $6,758,920. The industrial expansion has been equally striking. In 1906 the small sum of $150,000 would have covered the total value of Welland's manufactured products, and ten years later, in 1916, they had expanded to $19,375,115, and of this total only $5,500,000 represented munitions. The industrial payroll was but $50,000 for the entire year of 1906, and in 1916 it amounted to $3,610,336. The number of workers had increased from 100 to 5,000 in these ten years.

Railway Facilities

The railway facilities of Welland are equalled by very few places in Canada. Lines radiate from it in all directions. The Grand Trunk railway from Bridgeburg to Detroit, over which pass, in addition, the trains of the Wabash railroad, the Michigan Central's line from Buffalo to Detroit, also used by the Pere Marquette; the Toronto, Hamilton and Buffalo railroad, direct from Welland to Hamilton and Toronto; and the Grand Trunk Railway's line from Port Colborne to St. Catharines, all pass through or close to the city. The Canadian Northern system also has access through the Niagara, St. Catharines and Toronto Railway, an electric line, paralleling the Welland Canal. The fact that there are so many lines competing for business renders the freight service particularly efficient.



PLANT OF M. BEATTY & SONS, LIMITED, WELLAND.



BILLINGS & SPENCER PLANT OF CANADA FOUNDRIES & FORGINGS

The Welland Canal

The presence of this waterway gives Welland manufacturers the advantage of lake and rail rates. The present canal, though large enough when it was constructed, to admit of the passage of the biggest ships trading on the lakes, has long since become too small to accommodate the long upper lake freighters. To provide for their movement from Lake Erie to Lake Ontario, the new ship canal, now under construction, was designed. This new canal will have locks 800 feet long, 80 feet wide, and 30 feet water depth. There will be seven of these locks, all of the same dimensions.

A Few of Welland's Industries

One of Welland's earliest industries is the plant of M. Beatty & Sons, which was established in 1850, and has since carried on business continuously. The principal output of the company is made up of dredges of the dipper, hydraulic and clamshell types, hoisting engines of all sorts and sizes, both steam and electrically driven, mine hoists, travelling derricks, etc. The firm has built many large dredges, and these dredges can be seen on work throughout the Dominion. At the moment seven large "Beatty" dipped dredges, one hydraulic dredge, several drill boats, and numerous steel scows are in operation on the various sections of the ship canal construction. During the war M. Beatty & Sons concentrated on shrapnel shells, being one of the first firms to undertake this work in Canada. They also made high explosives. After the need of munitions had passed the crucial point, the manufacture of auxiliary ship machinery was taken up, and this company filled large orders for windlasses, cargo winches, ash hoists and similar equipment for the Imperial Munitions Board, the Emergency Fleet Corporation, and other interests.

The Canadian Billings & Spencer Plant of the Canadian Foundries & Forgings, Ltd., was engaged extensively on munitions during the war. This company is now just as busy turning out forged tools, the well-known "Endurance" brand being made at the Welland factory. All the operations in the manufacture of their product are accomplished in this factory, from the making of the original castings to the finished article.

The Electric Steel & Metals Co., Ltd., was formed in 1913 for the manufacture of steel castings by the electric method. This company employed 278 hands on munitions during the war, and is now producing high-grade steel castings of every description for bridge, dock and harbor construction. They have gone in extensively for welfare work on behalf of their employees, and provide many facilities for their comfort.

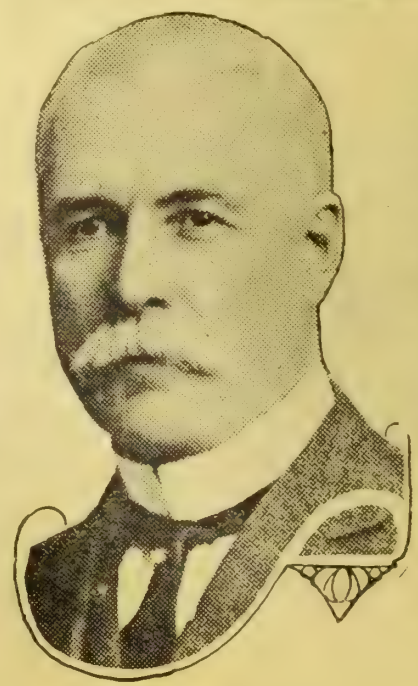
One of the newest industries is the Empire Cotton Mills, Ltd. They manufacture seamless bags, ducks, bag cloths, gray cotton fabrics and twine.

The metals - Chemical, Ltd., are engaged in the making of chemicals, and the Union Carbide Co. of Canada, have a large plant making acetylene and calcium carbide. The H. S. Peters Co., Ltd., are manufacturers of overalls and canned goods are put up by John Goodwillie & Sons. Chipman-Holton Knitting Co of Hamilton have a branch located in Welland, which produces hosiery. One of the plants of the Page-Hersey Iron & Lead Co., Ltd., is located here, which makes wrought, black and galvanized pipe.

At the Electro-Metals, Ltd., ferro-silicon and electrodes and manufactured, while at the Volta Mfg. Co., the product is electric regulators, winches and magnetic brakes.

A complete list of the things made in Welland factories is quite large, and includes such imported articles as automobiles, agricultural machinery, brick, binder twine, boilers, coal stoves, cotton goods, canned fruit, cement blocks, contractors' machinery, dredges, derricks, electric trucks, engines, furnaces, gas ranges, hosiery, hoists, knitted goods, launches, overalls, rope, saws, sash and doors, scows, twine, underwear, etc.

The coming of factories has meant much more than a growth of urban population, with all its attendant advantages in the way of increased business for merchants and more work for builders and laborers. Its effect is noticed throughout the entire County of Welland. The roads have been improved and motorists find little to be desired. The city market is now large and active.



W. M. GERMAN, K.C.,
Industrial Commissioner.

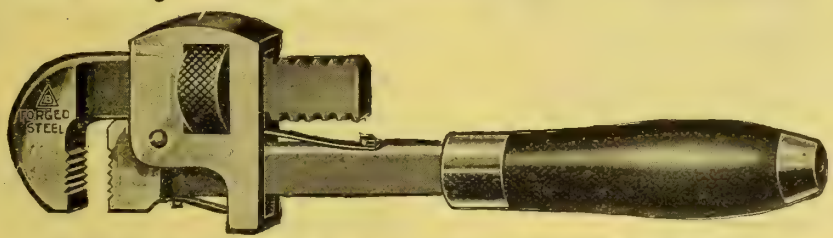
Much of the credit for Welland's industrial growth and prosperity can be traced to its publicity campaigns and it can be held up as an example to other communities to show what energy and up-to-date advertising can accomplish.

At this writing everything points to further expansion in the near future, as Welland is to get the first 100,000 h.p. from the Chippewa Development, and plans are now being made to inaugurate a big industrial campaign.

CANADA
FOUNDRIES & FORGINGS
LIMITED

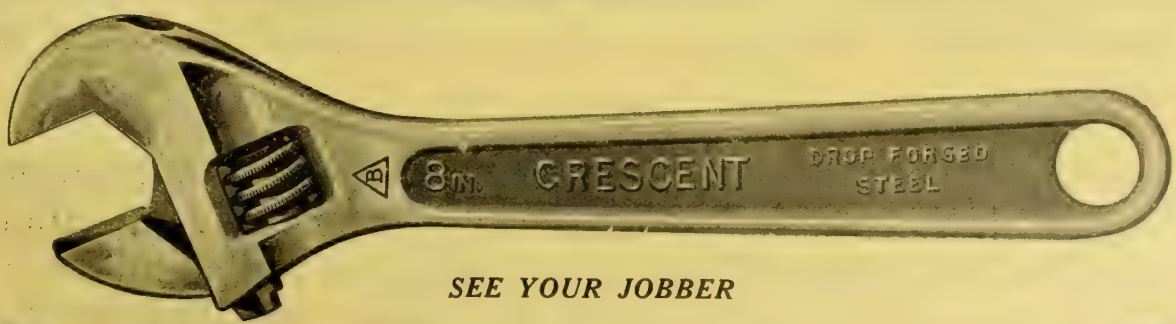
The World is full of "NUTS"

Every Nut Needs a Wrench



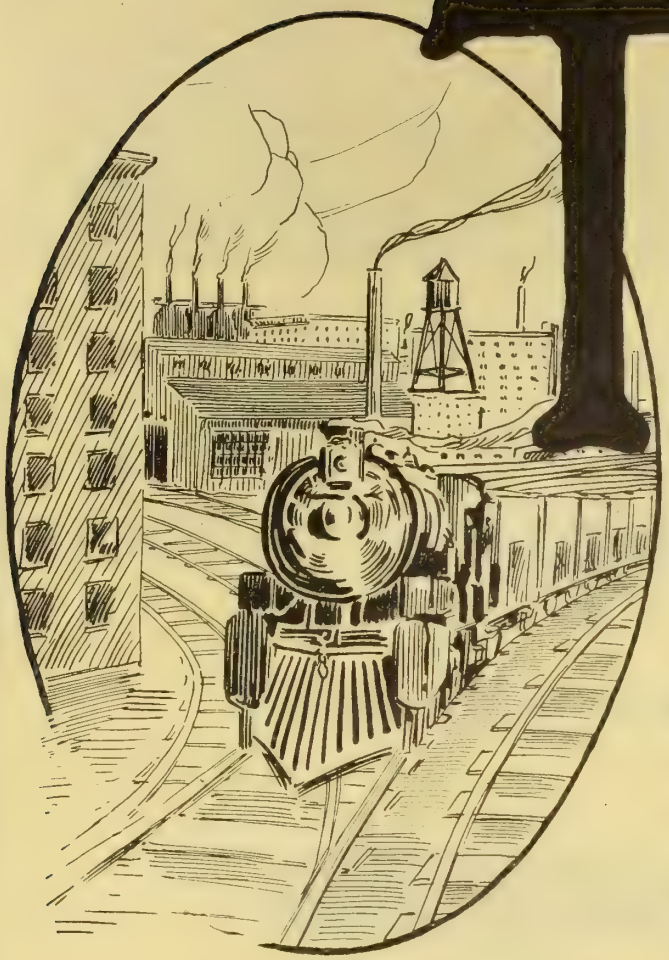
"ENDURANCE BRAND"

Never Wear Out



SEE YOUR JOBBER

Canadian Billings & Spencer Plant
WELLAND, CANADA



The City

Railway and Wa
UNEQU

LAKE SHIPPING : Welland is situated on the Welland Canal, the great marine highway, between tide water and the Canadian North-West, with daily freight service both ways.

RAILROAD RATES : Rates from Welland to the North-West and Pacific Coast, all rail, are the same as from all other manufacturing points in Eastern Canada lying between the Detroit River and Montreal. These rates are fixed by the Board of Railway Commissioners for Canada.

On account of the close proximity to the border, Welland is in the Buffalo switching group, and takes the Buffalo rates from the east and south, and enjoys quick delivery on all raw material imported from the United States.

The fact that all of these roads centre here creates competition, and is the biggest lever the manufacturers have for securing efficient service from the railroads. The seven railroads are as follows : Grand Trunk, Michigan Central, Toronto, Hamilton and Buffalo, Canadian Northern, Pere Marquette, Canadian Pacific, Wabash.

W. M. GERMAN, K.C.
Industrial Commissioner
WELLAND - - CANADA

# of Welland

ter Transportation ALLED

Electric Power at lowest cost

Every factory in Welland is driven by electric power supplied by the Ontario Power Company, of Niagara Falls, which is about twelve miles east of Welland, or from the Dominion Power Company of DeCew Falls, which is about twelve miles north of Welland. The fact that we have competitive companies operating in this district gives us competitive prices on power.

Excellent factory sites at low prices.

Labor conditions are eminently satisfactory.

Liberal advantages and concessions granted by City Council.

Prompt and Full Replies will be made to all inquiries.

May we send Book of Information telling all about Welland?

Personal Interview Solicited

W. M. GERMAN, K.C.

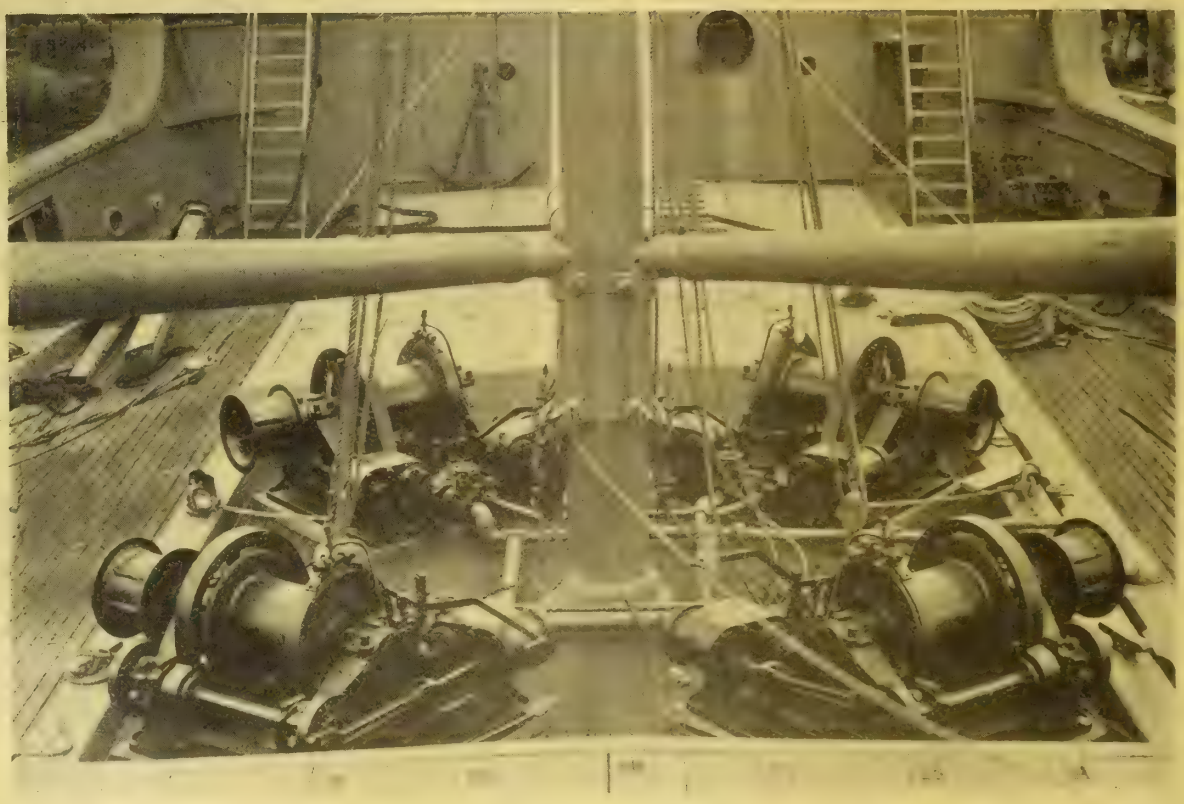
Industrial Commissioner

WELLAND - - CANADA

"BEATTY"

Cargo Winches
Hoisting Engines
Clamshell Buckets
Dipper Dredges
Steel Derricks

Anchor Windlasses
Electric Hoists
Mine Hoists
Hydraulic Dredges
Derrick Irons, etc.



8¼" x 8" cargo winches arranged on deck of 1,500-ton ship

This view shows one of the ships built by Wm. Lyall Ship building Co. We also supplied the Northern Construction Co., the Davie Shipbuilding Co., the Pacific Construction Co., the National Shipbuilding Corp., the New Westminster Eng. Co., and others with this same type of winch. All types and sizes built to jigs.

Equipment of this kind is our specialty. Let us have your inquiries. Our facilities for quantity production enables us to interest you.

Agents { H. E. Plant, Montreal; E. Leonard & Son, St. John; H. Turnbull & Co., Toronto; Kelly-Powell, Ltd., Winnipeg; R. Hamilton & Co., Vancouver

M. BEATTY & SONS Limited
WELLAND
CANADA

Electric Furnaces and Equipment

THURY REGULATORS, NEW TYPE

ELECTRODE WINCHES

ELECTRODE HOLDERS

MAGNETIC BREAKS

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HAND CONTROLS

BUSS BARS SYSTEMS

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FOR SMELTING FERRO ALLOYS AND REFINING STEEL

PORTABLE ELECTRIC HOISTS,

MONO RAIL HOISTS,

GENERAL CONSULTING

VOLTA MANUFACTURING CO.

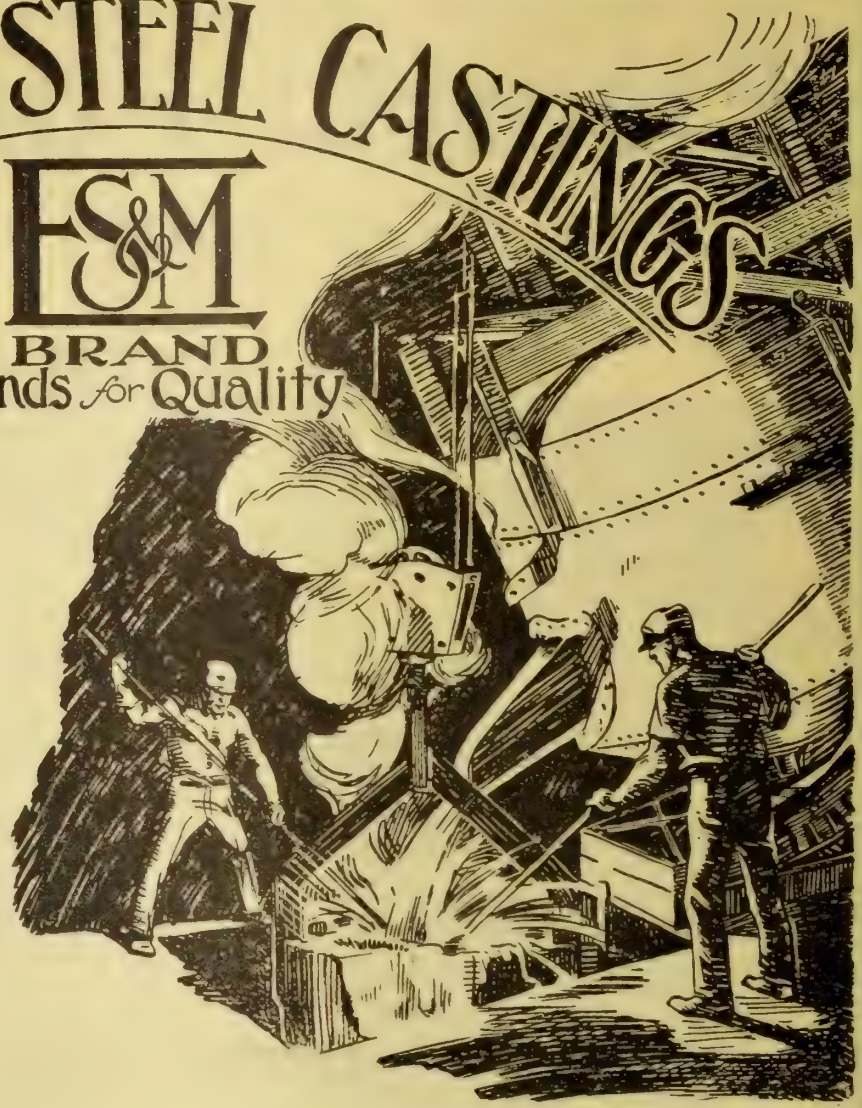
WELLAND, ONTARIO

If interested tear out this page and place with letters to be answered.

WELLAND SECTION

ELECTRIC STEEL CASTINGS

E S & M BRAND Stands for Quality



HIGH Grade **Steel Castings** of every description. Put our quality and service to the test and you'll be convinced that we offer the best.

Machinery Steel Castings

Bridge, Dock and Harbor Construction

Manganese Steel

Wearing parts for Gyratory Crushers, Dredger Pins and Bushes, etc., etc.

All Alloy Steel Castings.

Write for prices and particulars.

The Electric Steel & Metals Company, Limited

WELLAND, ONTARIO

MALLEABLE AND CAST IRON PIPE FITTINGS

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

When ordering from your jobber be sure you buy---"the brand that has the quality." They are different. A trial order will convince.

International
Malleable Iron Company, Limited
Guelph, Ontario, Canada

If interested tear out this page and place with letters to be answered.

Canadian Trade and United States Steel Strike

HOW will the steel strike hit Canadian firms? It may be a little early yet to secure an intelligent answer to such a question. Some firms can go along indefinitely. Others can not. In some cases the effect will be felt very shortly.

Goold, Shapley & Muir, Brantford, make gas engines, tractors, windmills, tanks and towers, etc. They state:

"In our opinion, if the strike amongst the steel workers in the United States is at all prolonged, it will have a most serious effect upon industries using this class of material in Canada, as it will undoubtedly force many industries to shut down until supplies can be secured.

Unfortunately our Canadian steel industries are not yet sufficiently developed to secure all the product necessary in our own country, and in any case they would be so severely taxed that it would not be possible to supply the demand.

We sincerely hope that this matter may be adjusted at a very early date, as we look forward to serious consequences to the workers of Canada if Canadian manufacturers are compelled to close their works through a lack of supply of necessary material."

C. H. Waterous, of the Waterous Engine Works Co., Brantford: No doubt if the steel strike conditions for any length of time, and the production of steel is thereby decreased (which probably will be the case), it will have the effect of reducing the quantity of this material, and this will have a bad effect on Canadian business. Quite a number of sources of supply that were available before the war started are not now in a position to furnish material, which adds to the possibility of shortage."

Alex. R. Goldie, of the Goldie & McCulloch Co., Limited, Galt: "It is, of course, impossible as yet to foretell the result of this strike, as I do not know what stocks the steel companies in the States have been carrying, but, undoubtedly, if the strike continues for any length of time it will very seriously interfere with our business as a great part of the steel that we get from the United States cannot at present be obtained elsewhere. We have at present a good stock of steel material, so that we are not interfered with as yet, but certainly will be if the strike continues."

One of the largest makers of machine tools in the Dominion says: "We would advise that our purchases of hot rolled steel in the States are limited to small tonnage of hot rolled bars, 4 in. and larger, but, as we have ample stocks of these sizes on hand for some time, we do not think it will seriously interfere with our work. As we are large users of cold drawn steel, it may affect us, as we understand a great amount of steel drawn in this country is done from American bars."

E. Leonard & Sons, Limited, London, Ont., manufacturers of engines and boilers, state: "We have material on hand (or in transit) sufficient to cover the majority of orders now on our books. We also have a small stock of standard boiler plates, tubes, etc., with which we think we can take care of any orders that may come in for standard articles during the next month or six weeks. Orders for special boilers requiring special material would be delayed through the present strike."

Wm. Inglis, president of the John Inglis Company, Limited, Toronto, engineers and boiler makers: "I do not believe that this strike will amount to anything as far as Canadian business is concerned, as I understand the steel companies are taking care of all the business for this country under present conditions, as the mills that are affected do not make material that we import."

The Hamilton Bridge Works Company, Limited: "If the strike continues indefinitely and extends further, it is only a matter of time before firms in similar lines to ourselves will be unable to operate, for the reason that a large percentage of our materials, such as plates and structurals, come from the United States. At the present time only a small range of angles are manufactured in this country, and, therefore, our requirements cannot be obtained in Canada, and obtaining supplies from Britain and the Continent is out of the question at the present time. The Algoma Steel Corporation, Ltd., of Sault Ste. Marie, expect to be in a position in a few weeks to be rolling beams and channels up to 15 in. and angles up to 6 in. x 6 in., and as soon as this program is carried out some relief will be obtained."

Inquiry at the Dominion Shipbuilding Yards, Toronto, brought out the information that they have enough plate in stock to finish the two ships at present laid down. This will carry them through the winter, so they will not be affected, unless the strike extends over six months. Apart from the actual supply of material, the Dominion yards report they have plenty of labor, but the Port Arthur yards are having difficulty in getting men. Mr. Miller of the Port Arthur Shipbuilding Co. was in town a few days ago looking for riveters.

A despatch from St. Catharines says: The shortage of tin plate, caused by the steel strike in the United States, is causing a great deal of inconvenience among the canners and growers throughout the whole province. This district is especially hard hit, a few canneries being compelled to shut down owing to their stock of cans having become exhausted. The plants of the Dominion Canners at Welland and Niagara-on-the-Lake are closed, and the plant at Jordan Station will have to close.

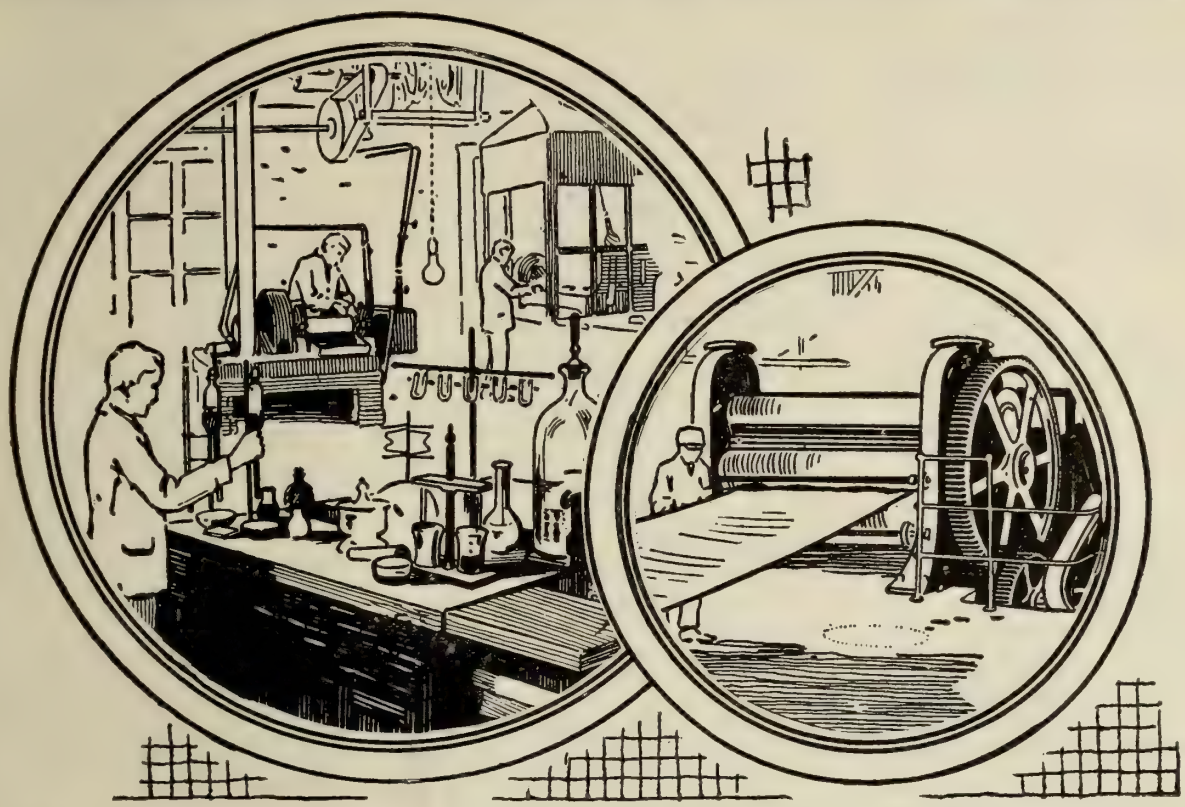
The Schenck plant, in this city, has a sufficient supply for to-day, while the Simcoe plant has by far the best supply, and will be able to keep in operation for a few days to come.

The Position in Montreal

MONTREAL, Que., Oct. 2.—The Steel Company of Canada continue to operate on a fair volume of business which may have shown a slight increase during the past week, which condition may have developed as a result of the steel situation in the States. Officials of the Steel Company state that it is largely heavy products, such as steel plates and shapes, that will be affected by the strike, and as the business in this direction is comparatively light at present, and a conservative policy is practised by builder and manufacturer, the Canadian situation will not feel the brunt of the strike in the States. Asked as to whether there was any danger of the strike spreading to this country, the official did not think so, and was under the impression that the strike among the American steel mills would be nearer a settlement by the end of the week. This appears to be the general opinion among steel men here.

The purchasing department of the Canadian Pacific Railway advises that the present requirements for steel supplies are such that the strike in the States has had little effect so far. In anticipation of a strike some time ago, they took care to obtain sufficient material to carry them over a reasonable period of idleness at the mills. In addition to this, their present steel requirements are not excessive, and unless the situation takes a more serious turn, they expect they will be able to carry on without being seriously hit by conditions in the steel districts.

Officials of the Montreal Locomotive Works report no serious effect as a result of the strike in the States. As a matter of fact, the plant here is operating much below normal, and their present requirements are not sufficient to feel the pressure of restricted supplies. They are optimistic regarding the strike and believe that a settlement will be reached within a short time. They state, however, that a long strike would materially upset the plans of Canadian manufacturers, as American conditions would naturally be reflected here, in which case the curtailed production of steel would be experienced all along the line. Considerable stock is now on hand, and with the small business booked, will be sufficient to carry them along for some time.



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In Dominion Rubber System Belting, the worth is known because every ounce of material—each individual operation and each finished belt must test up to the highest quality standard ever made for belting.

From the time the materials come into our factory until the belt is running on your pulleys, there is no chance of your getting anything but "plus service" belting.

This is the result of over fifty years of belt making experience and research by the oldest, largest and most completely equipped rubber organization in Canada.

The rubber that goes into Dominion Friction Surfacing Belting is not a mere waterproofing substance—our chemists have given it a far greater value by making it into a friction compound that prevents practically all power wastage on the pulleys.

"Plus service" includes the free technical advice of our belting engineers who are ready to help you with your transmission and conveying problems without placing you under obligation to us.

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DOMINION RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Service Branches:

Halifax,	Toronto,	Fort William,	Edmonton,
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Quebec,	London,	Brandon,	Lethbridge,
Montreal,	Kitchener,	Regina,	Vancouver,
Ottawa,	North Bay,	Saskatoon,	Victoria.

If interested tear out this page and place with letters to be answered.

MONTREAL NOTES

Sometime ago it was announced that Paul Mercier, chief engineer of the city of Montreal, was resigning from the position. It is now learned that he will not be entirely dissociated from the affairs of the city, as he has been retained in the employ of the ratepayers as a consulting engineer. His time, however, will only be partly occupied in this connection, as he will join the staff of the Ecole Polytechnique as an instructor and lecturer.

* * *

On the recommendation of the chief of the fire department the Administrative Commission of the city of Montreal have under consideration the revision of the regulations regarding the installation of dry sprinkler systems in big office buildings and inudstrial plants, so that hose connections from the outside could be utilized when conditions prevent the access to the interior. A revised by-law is now before the council for their approval and ratification.

* * *

The shipbuilding plant of the Canadian Vickers Limited was the scene of a serious accident last week, when one man was so badly injured that he died shortly after, and fourteen or more were so seriously hurt that they required medical attendance either at the plant or at the hospital. It is supposed that an acetylene tank had been placed too close to an open fire and that the tank had become overheated, resulting in the explosion. The effect of the explosion was to wreck the walls of the adjoining building and break almost all of the glass in the side and the roof in which the accident took place.

* * *

Should the railway strike in England continue for any length of time there is the probability that the shipping activities will be seriously interfered with, as the inability to remove the goods from the respective wharfs will cause a congestion that can have only one result, the practical embargo of imports and exports of anything but the most essential products. This condition has not yet been felt here, but it is not unlikely that some action will be taken within the week. Prior notification to this effect has already been issued by the British embassy at Washington, and a confirmation of this order is almost imminent.

* * *

During the recent stay of the C. P. O. S. liner Corsican in the port of Montreal, a test was made of a new apparatus designed to facilitate the lowering of lifeboats from a vessel at sea. The device is a simple attachment of skids placed over the ordinary lifeboat, and it was shown that, no matter what angle the ship may be listed at, the presence of these skids permits the lowering of these boats with perfect ease and safety. This appliance was designed by Mr. Hylands, of New York, and has already been adopted by the United States Navy and the U. S. Shipping Board, and the recent demonstration at Montreal was effected with a view of introducing the invention in Canada.

* * *

For many months the Dominion Bridge Company have been actively engaged in the making of machinery for the paper industry. While in some respects the initial work was more or less in the nature of experiments, the rapid growth and the future needs of this great Canadian industry has practically decided the officials of this company to manufacture this line of equipment as part of their post-war developments. The bulk of the machinery now used in the pulp and paper mills has been imported from other countries, but the enterprise of this firm will enable them to supply Canadian-made products for Canadian production. It is believed that contracts have already been made with some of the provincial mills.

* * *

Members of the Kiwanis Club recently paid a visit to the Angus shops of the C. P. R., and had the opportunity of viewing the activities that are going on at these works. They were royally entertained by the officials of the company, lunch being served in the dining room at the plant. It might be mentioned that some of their past activities have been the production of 77 large locomotives in a year, in addition to about 338 passenger and 6,530 freight cars. At present the shops are engaged in heavy repairs to 50 locomotives and are also turning out four new ones a month. They are also repairing about 100 freight cars and eight passenger coaches per day. Among the new productions are refrigerator and flat cars, as well as a new type of all-steel tourist coaches, of which thirty are being made.

* * *

Some comment has been made by manufacturers here on the report from England, that Canadian manufacturers are taking orders that they cannot fill, or cancelling the same after they have once been accepted. It is stated that in many cases Canadian manufacturers here are unable to take care of the business that is offered, but the real fault lies with the brokers and commission agents, who are too ready to accept export business before ascertaining whether the goods or articles can be supplied. It is generally contended that strikes and industrial disturbances have prevented anything like capacity production, a condition that is seldom attained in reorganization or reconstruction periods. Large quantities of manufactured goods, for variety requirements, are being demanded by foreign countries, but combination of circumstances prevent the handling of these goods.

* * *

On Saturday of last week the cargo steamer "Alsace" was successfully launched from the yard of the Canadian Vickers Limited. The vessel was first consecrated by the French clergy here, and the ribbon was then cut by Madame Begard, wife of Capt. L. Begard, the representative of Cie Francaise d'Armement d'Importation de Nitrate de Soude, of Paris, France, for which company the vessel was built. The S. S. Alsace is a single screw steamer of approximately 8,400 tons and will have a speed of about 11 knots. She is 400 feet long, 52 feet beam and with a depth of 31 feet. She is especially designed for the nitrate trade from Chili to France. and is fully up to the requirements of the French Board of Trade and Lloyds 100-AE classification. It is expected that the vessel will be completed and ready for loading in the course of three or four weeks.

ST. JOHN, N.B., NOTES

ST. JOHN.—Damage to the extent of some $25,000 was done this week in the destruction by fire of two warehouses owned by the Wallace Machinery Works, at Sussex, N.B. Some material in the warehouses was destroyed, including eight threshing machines, wood-cutters, and some valuable patterns. The loss was partly insured.

* * *

A new pork-packing plant is to be established at Moncton, N.B., by two St. John men, Walter Jones and Wm. Davis, under the firm name of Jones and Davis. They have purchased land and begun construction of the plant which will have a front of 50 feet, and in which modern machinery will be installed.

* * *

H. J. Ramshaw, of Hamilton, Ont., manager of the Garlock Packing Co., was in St. John this week and established a branch of the company here. They will carry a stock of engines and other apparatus for industrial plants. The branch will serve as a distributing centre for the maritime provinces.

* * *

Capt. William Burrill has returned home after a lengthy period of service overseas. He left here in June, 1915, as paymaster with the 26th Battalion, and went to France with it that year. With the exception of a brief visit home for a few days last spring he has since been overseas. He was formerly with the Canadian Fairbanks-Morse, Ltd., in St. John.

* * *

Plans for the supplying of power from the Nepisiquit River will come before the Provincial Government at its meeting in Fredericton, N.B., next week. The power is for the Bathurst Lumber Co., to supply their pulp mills, and will be an important factor if the Government approves of the scheme.

* * *

Work was begun this week on the construction of a new brick addition to the buildings of John Palmer, Ltd., at Fredericton, N.B. The work will give an additional floor space of 15,000 feet for the oil tanning footwear department. The construction work is in charge of John C. Smith and the contract represents approximately $25,000. It will be quite an addition to this manufacturing concern's plant.

PERSONALS

James R. McNeil, who recently resigned his position as manager of No. 11 colliery of the Dominion Coal Co., to assume charge of the Florence mine, of the Nova Scotia Steel and Coal Co., at New Glasgow, has entered upon his new duties. Mr. McNeil's engagement by the Scotia Co. follows closely upon the appointment of Mr. A. S. McNeil as superintendent of mines of the Nova Scotia Steel & Coal Co., and D. H. McLean as manager of their Princess mines, both of whom severed their connection with the Dominion Coal Co. to take up new responsibilities with the Co. on the north side of the harbor. The Florence, or No. 3 mine, is Scotia's largest producer with a daily output of between 800 and 900 tons.

TENDERS

Tenders will be received up till October 6, 1919, for the construction of a grain conveyor in St. John Harbor, N.B. Plans and specifications can be obtained at the Department of Public Works, Ottawa, or at the offices of the District Engineers, Shaughnessy Building, Montreal, and Equity Building, Toronto, also the engineer in charge, St. John, N.B.

TRADE GOSSIP

Equipment Wanted.—C. P. Wilson Co., 509 Lumsden Building, Toronto, are in the market for a travelling crane; also a locomotive crane, both of ten-ton capacity.

Wants Machinery.—G. W. Allan, of Allan & McKelvie, Engineering Co., Ltd., Vancouver, has been in the east on his way to the Philadelphia convention. He is in the market for an open-sided planer and a miller. His firm is going in for saw-mill machinery.

Leaside Shops Busy.—There are a good number of locomotives and coaches being overhauled at the Leaside shops of the C. N. R. More men are being take on from day to day, and it will soon be necessary to add another coach to the work train which runs daily from North Toronto.

Busy Ingersoll.—Mayor Buchanan, Ingersoll, Ont., reports that all industries there, including two new ones added during the year, are in a thriving condition. The town has available for immediate use a building of 25,000 feet floor space, suitable for manufacturing purposes. Its location is most favorable, standing as it does between the two lines of railway serving the town.

Error in Classification.—Owing to an error in classification, the Volta Manufacturing Co., of Welland, has not been fully listed in our Buyers' Directory. The name now appears under the following headings: Electric furnaces, drum controls, electric furnace regulators, winches, roof coolers, and electrode holders, electric hoists, stationary and monorail, cranes, overhead (hand and electric), current transformers.

Increase Capital.—The Lufkin Rule Co. are increasing their capital from $100,000 to $150,000 by adding 5,000 shares of $10 each.

Plant Extending.—The latest branch of industry to announce an extension is the Brantford Oven & Rack Co., which will double its plant here owing to increased demands for its output. Almost every factory in the city has either extended this year or is working on plans for such extension, and the boom is not inflated, as never were building costs so great. It is expected that within a few days another important announcement will be made along industrial lines.

Machine Tools, Etc.—The import department of a firm with head office in Calcutta and branches in New York and London, desires to secure representation in India for Canadian manufacturers. They are interested chiefly in machine tools, mill and factory equipment, marine and stationary engines, electrical apparatus, motor cars and equipment. Their organization is exceptionally strong. References, particulars by addressing Trade and Commerce Dept., Ottawa, and referring to No. 2767.

Canadian Steel Corporation.—Although actual construction has been held back rather than rushed, the work on the plant of the Canadian Steel Corporation at Ojibway has been going on slowly. One foundation for a 600-ton furnace is now in and work started on a second. Speaking of costs, one of the Steel Corporation men told CANADIAN MACHINERY that the foundation of a 600-ton blast furnace now cost as much as a complete 250-ton stack in pre-war days. Although no definite plans are yet announced, it is known that the Canadian Steel Corporation have big plans under way for the Ojibway plant.

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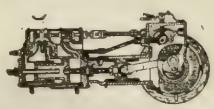
The Patent on a continuous impulse REVERSIBLE GENERAL PURPOSE INTERNAL COMBUSTION ENGINE, inexpensive to build and most economical to use. Patented, Canada, Jan. 18, 1916, No. 167,188. Patented in England, Sept. 11, 1912, No. 20,762. Address W. T. Smith, 638 Arlington Ave., Lockland, Cincinnati, Ohio, U.S.A.

SAYS THE MASTER MECHANIC: The Greb Automatic Grip Puller is a One-Man Puller—Quick-acting, strong and simple in the extreme. May be locked in any desired position. A combination of two or three arms. Heavy Duty Size capacity 1" to 16"—Junior size capacity 1" to 7". Two sets of jaws furnished with each size.
TEN DAYS' TRIAL.—If your dealer or jobber does not have them we will send you one. Try it ten days. If not satisfactory, return to us and we will refund your money. We also make the GREB RIM TOOL.
THE GREB CO., 318 State St., BOSTON

Canadian Goods for New Zealand.—The Canadian Trade Commissioner for New Zealand addressing a meeting of the Chamber of Commerce at London, Ont., advised them to develop the export trade. The people of New Zealand were anxious to buy Canadian goods, and were even to pay a little higher price for articles that were imported from Germany previous to the war.

Bonus for Workmen.—The employees

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Will give twice the cut of a regular tool steel at one grinding.

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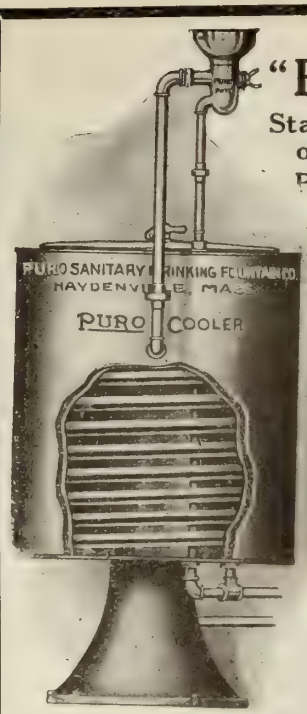
Brantford, Canada.

BLACK DIAMOND OVENS



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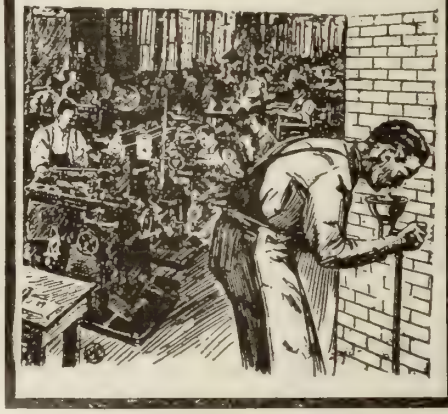

of the Engineering and Machinery Corporation of Canada, St. Catharines, are paying a bonus of 5 per cent. to all their workmen, on the year's wages ending July 31 last.

The Electric Furnace.—At a recent conference of metallurgical specialists in Chicago, an Electric Furnace Association was formed with Atchison Smith, Niagara Falls, N.Y., as president. Membership is open to Canadians interested in the development and manufacture of electric furnaces, materials, supplies or equipment. It is becoming increasingly evident that the electric furnace is about to become a big factor in the metal industry, not only in connection with the production of steel and steel castings, but also in malleable and grey iron castings. An authority states it to be an established fact that the strength of a grey iron casting poured from an electric furnace can be improved from 50 to 90 per cent.

For Trade Abroad.—If any Canadians are interested in the following, write: Intelligence Branch, Trade and Commerce Department, Ottawa, and refer to 15 R. S.—Steel and iron products, machinery, etc.—A returned soldier who spent four years with the Canadian army in France, having technical and practical knowledge of the production and distribution of steel and iron products, machinery, etc, possessing a board commercial and business training, and extensively traveled, would like to get in touch with manufacturers or others who are desirous of establishing or increasing European trade. Before the war he held the position of sales manager for an important firm dealing in iron and steel products.

Plant Changes Hands.—The plant of the Canadian Aeroplane Ltd., on Dufferin street, north of Lappin avenue, has been sold by the Imperial Munitions Board to the Columbia Graphophone Company for $600,000. With the single exception of the Massey-Harris works this is the largest plant under one roof in Toronto. It was used for the building of aeroplanes during the war. The building is two storeys high, of concrete and brick construction and contains over 250,000 square feet of floor space, while the site contains a little over 10 acres. The frontage on Dufferin begins a few yards north of the corner of Lappin and Dufferin on the west side and runs north 333 feet, while the depth of the site is exactly a quarter of a mile.

New Steel Cars.—The first of approximately 100 new steel passenger cars was delivered to the Canadian National Railways, and it is confidently expected that the entire order, comprising six classes of cars, will be completed by the end of January, 1920. It has been thought that the Canadian builders might have been tampered by the convulsion in labor in the steel trade in the United States, but Mr. George E. Smart, General Master Car Builder of the C.N.R., who has been to the affected centres investigating, reports to-day that the steel for the "National" cars was shipped just prior to the outbreak of trouble at the great steel plants. The new steel passenger equipment under order for the C.N.R., includes 20 tourist cars, 18 standard sleeping cars, 9 dining cars, 20 mail cars, 20 first-class coaches, and 13 compartment observation cars. Travel has been heavy all through the summer season, and the C.N.R. is inaugurating shortly new trains to round out a daily transcontinental service in both directions across Canada. The new steel equipment that is now under construction for the National lines is most modern in every respect.

Want a Six-Hour Day.—The United Mine Workers of America at a recent convention formulated demands for a six-hour day, 60 per cent. increase in all mine wages, and a five-day week, with time and a half for overtime and double time for holidays and Sundays. The convention adjourned to await the result of the joint wage scale conference, with the operators of the central competitive district. If a satisfactory issue is made of this conference they

will reconvene at Indianapolis to accept or reject it. If no agreement is ratified before November 1 a general strike of bituminous miners will automatically ensue on that date. This may easily extend to the Canadian fields if the International officers so decree.

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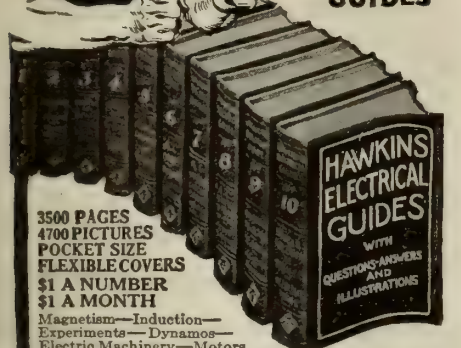

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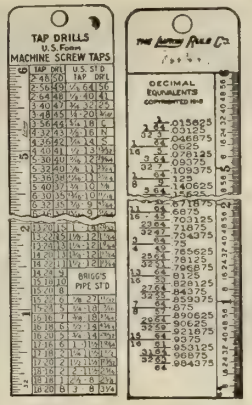

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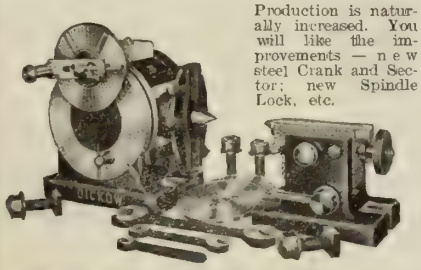

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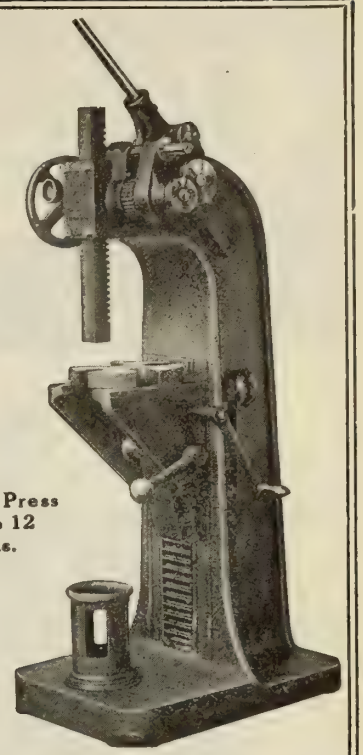

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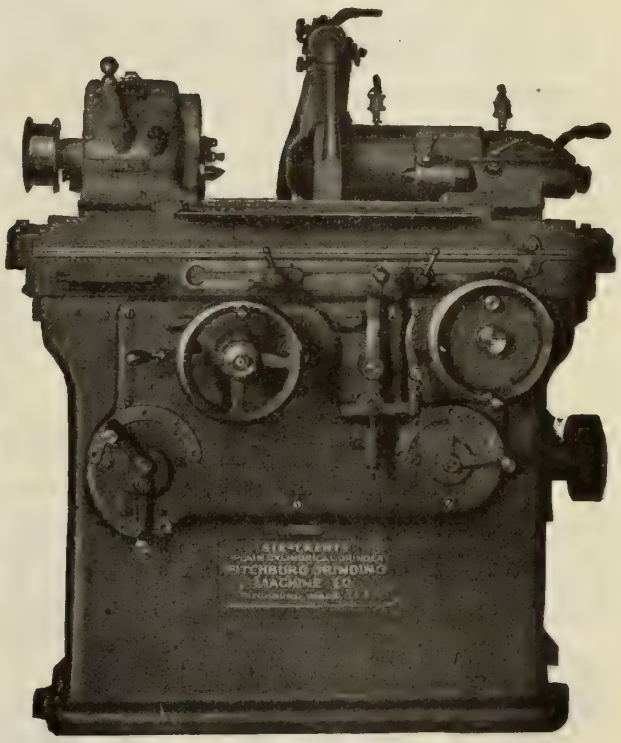

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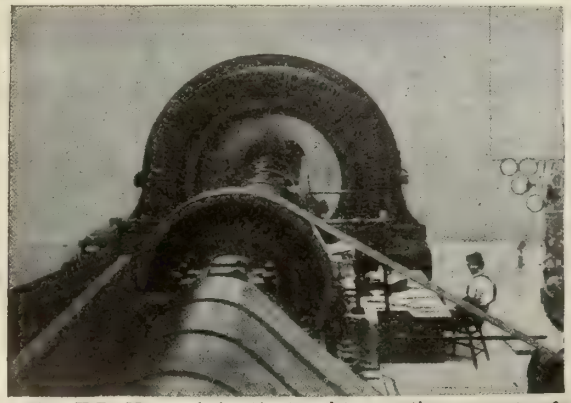

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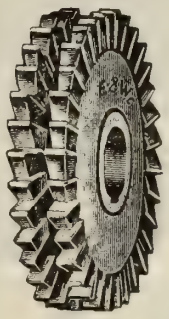

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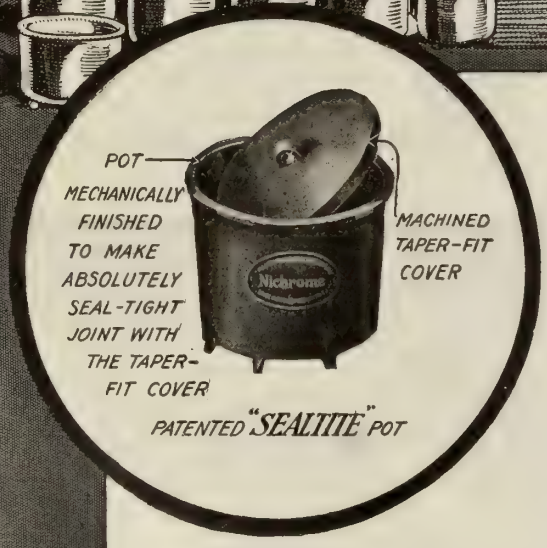

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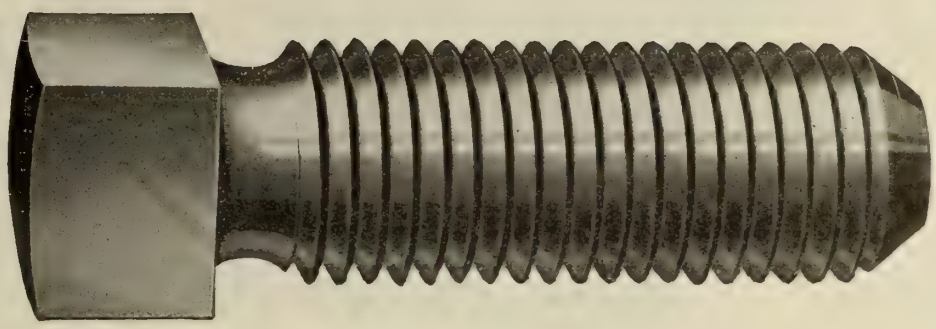

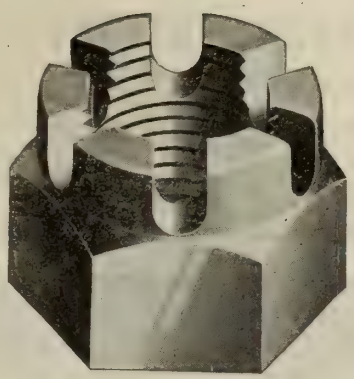

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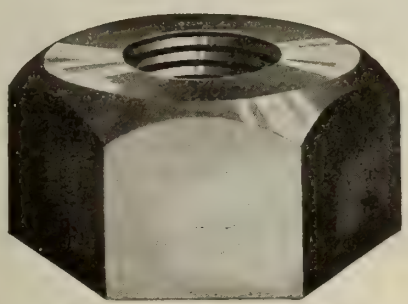

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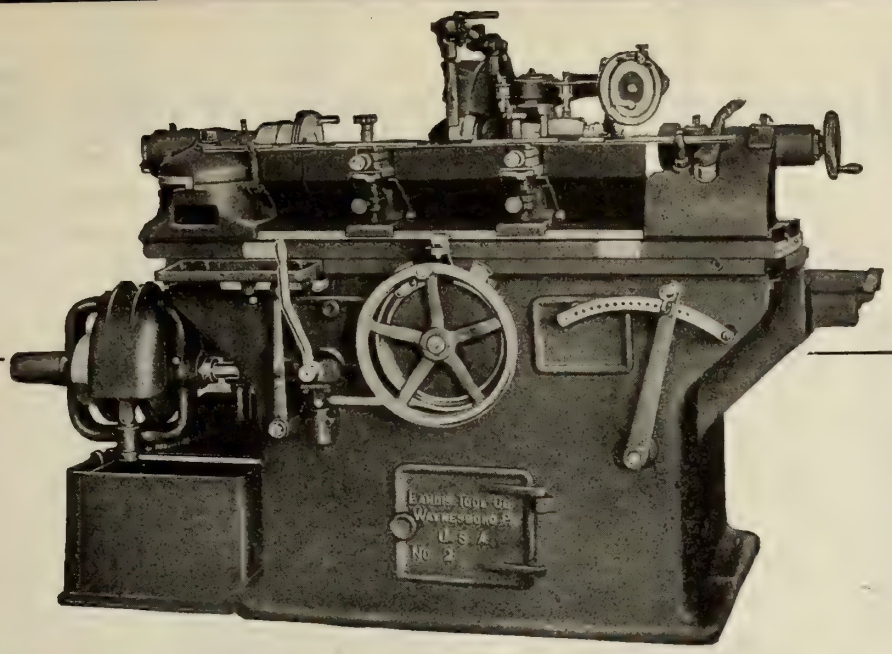

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Canadian Machinery
Classified Advertising Section
143 University Ave., TORONTO

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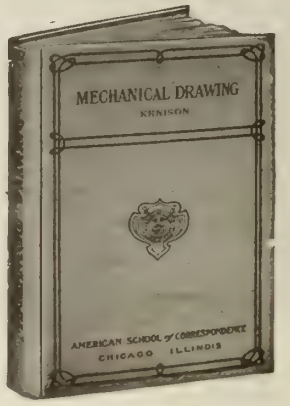
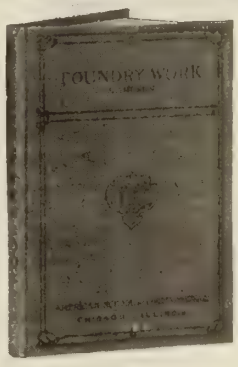
Mechanical Engineering Books

If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.

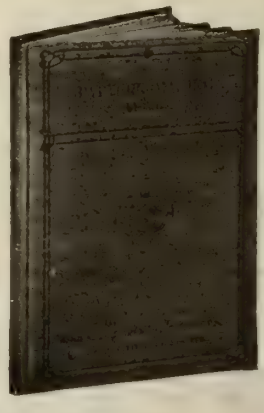
MACHINE-SHOP WORK. By **Frederick W. Turner,** Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price $2.00



MECHANICAL DRAWING. By **Ervin Kenison, S.B., Assistant** Professor of Mechanical Drawing, Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price $1.25

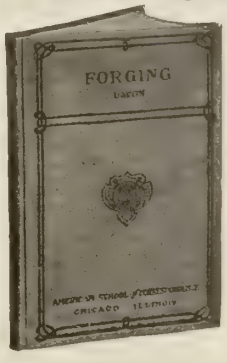


FOUNDRY WORK. Revised by Burton L. Gray, instructor in Foundry Practice, Worcester Polytechnic Institute. 224 pp., 191 illus. Cloth binding. A practical handbook on standard foundry practice, including hand and machine molding, cast iron, malleable iron, steel and brass casting, foundry management, etc. Includes use of various types of molding machines. Price, $1.25



PATTERN MAKING. By **James Ritchey,** Instructor in Wood Working, Armour Institute of Technology. 160 pp., 250 illus. Cloth binding. Shows the reader how to take the blueprint and from it make the pattern for any kind of casting under any condition. The allowances for shrinkage, draft, and finish are explained. Simple and built-up patterns of all kinds are clearly treated. Various special cases are taken up, such as pulleys, cranks, pipe connections, valves, etc. Price.....$1.75

MACHINE DESIGN. By **Charles L. Griffin, S.B.,** Assistant Engineer, the Solvay-Process Co., American Society of Mechanical Engineers. 208 pp., 82 designs. Cloth binding. Explains in detail how to make the entire design of all kinds of machinery, how to lay out gears, etc., with complete specimen designs of numerous machines. Price ... $1.75



FORGING. By **John Lord Bacon,** Eng. and Supt. of Construction, with R. P. Shields & Son, San Diego, Cal., American Society Mechanical Engineers. Author of "Forge Practice." 128 pp., 180 illus. Cloth binding. A working handbook of practical instruction in hammering, working, forming, and tempering of wrought iron, machine steel, and tool steel, including the important modern development of electric welding. Price $1.25

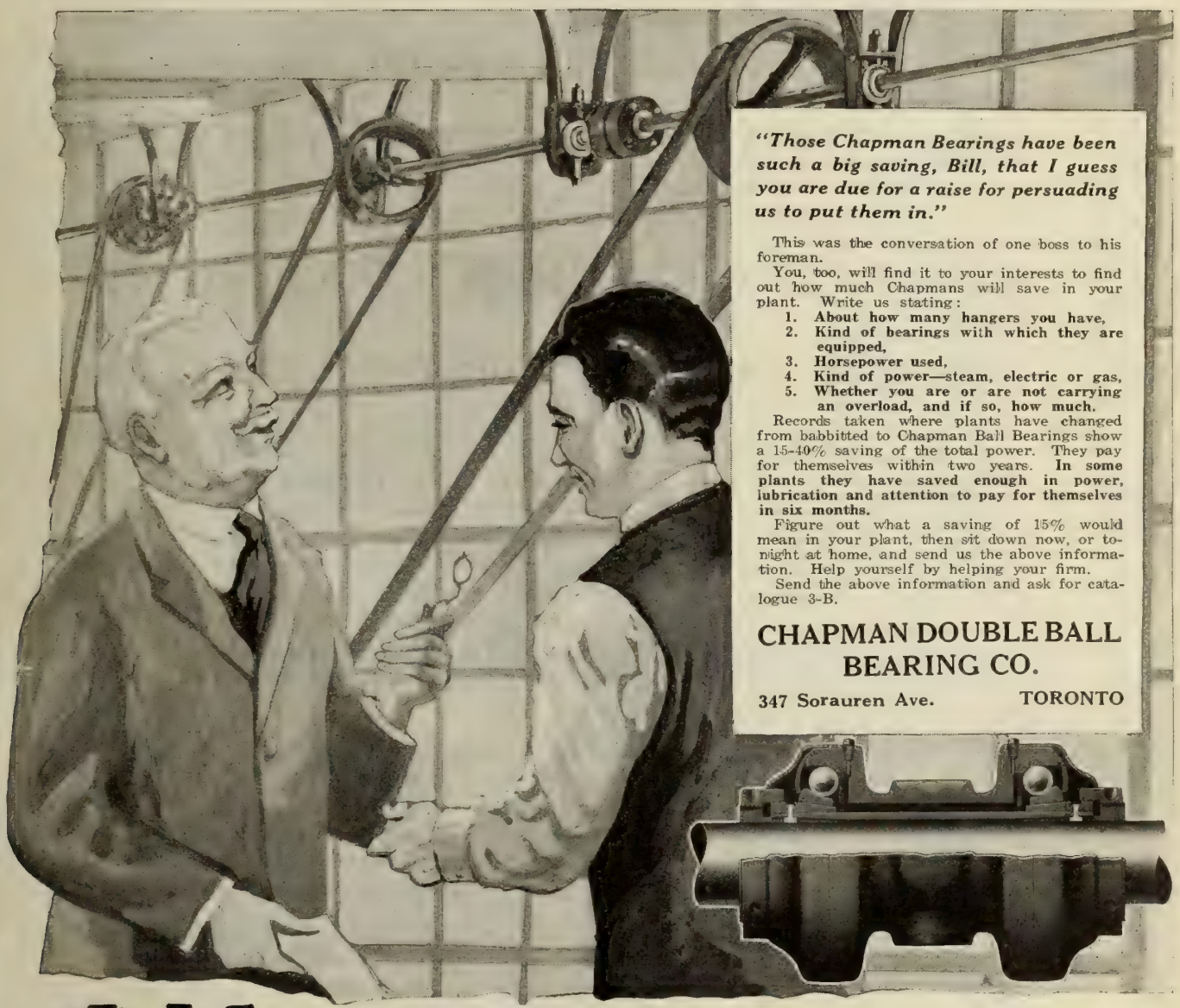
TOOL MAKING. By **Edward R. Markham,** Consulting Mechanical Engineer, formerly Superintendent of the Waltham Watch Tool Co., American Society of Mechanical Engineers. Author of "The American Steel Worker." 224 pp., 325 illus. Cloth binding. Takes up the methods of treating tool steels—annealing, tempering, spring tempering, hardening, case-hardening, etc.; how to make drills and reamers of all kinds; the making of arbors and mandrels, taps, hobs, reamer and tap-holders, jigs, gauges, dies and die-holders of all kinds, counterbores, facing tools, milling cutters, hollow mills, and forming tools. Gives all necessary information for tool making in all its branches. Price $1.75

Sent postpaid on receipt of price. We can also furnish you with other standard works on Engineering in all its branches, including books for Civil Engineers, Contractors, Electricians, Foundrymen, Steam Engineers, Mechanical Engineers, Municipal Engineers, Railroad Engineers, Sanitary Engineers, Gas Engineers, Hydraulic Engineers, Technical Men.

Technical Book Department

MacLean Publishing Company **143 University Ave., Toronto**

RAISED!



"Those Chapman Bearings have been such a big saving, Bill, that I guess you are due for a raise for persuading us to put them in."

This was the conversation of one boss to his foreman.

You, too, will find it to your interests to find out how much Chapmans will save in your plant. Write us stating:

1. **About how many hangers you have,**
2. **Kind of bearings with which they are equipped,**
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4. **Kind of power—steam, electric or gas,**
5. **Whether you are or are not carrying an overload, and if so, how much.**

Records taken where plants have changed from babbitted to Chapman Ball Bearings show a 15-40% saving of the total power. They pay for themselves within two years. **In some plants they have saved enough in power, lubrication and attention to pay for themselves in six months.**

Figure out what a saving of 15% would mean in your plant, then sit down now, or tonight at home, and send us the above information. Help yourself by helping your firm.

Send the above information and ask for catalogue 3-B.

CHAPMAN DOUBLE BALL BEARING CO.

347 Sorauren Ave. TORONTO

CHAPMAN BALL BEARINGS

"YOU PAY FOR THEM WHETHER YOU BUY THEM OR NOT"

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Machinery Exposition

Opens in the Greatest of World Markets

GRAND CENTRAL PALACE

Opening Date to be Announced Later

PERMANENT - COMPREHENSIVE - REPRESENTATIVE

BUYERS!! Come to the Palace of Machinery if you are looking for efficient modern production machinery. See the reliable and representative products of the best mechanicians and geniuses in America. The tried and proven product no matter what its cost is the economical purchase. See what America offers to the world at this permanent comprehensive exposition:—

Prime Movers, Machine Tools, Presses, Lathes, Milling Machines, Belts, Drills, Radials, Gear Shapers, Chucks, Turrets, Bearings, Grinders, Taps, Welders, Slotters, Screw Cutters, Borers, Can-Making, Wood-Turning, Saw-Making, Tack-Making, and other automatic machines of various types—in short, every modern machine used in making machinery, and every exhibit guaranteed in all claims by American firms of magnitude and irreproachable worthiness.

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ACCURACY-RELIABILITY

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MACHINES, EQUIPMENT APPLIANCES and TOOLS
for
SPECIAL PURPOSES
DESIGNED AND BUILT

We will make what YOU want as you want it.

Write us about it.

WOOD METAL PATTERNS
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OUR REGULAR PRODUCTS:
THREAD GAUGES
SNAP GAUGES
CYLINDRICAL GAUGES

WE ARE GENERAL AND SPECIAL TOOL MAKERS

Let us quote you on your requirements, and have your tools made as you want them made.

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Steel Plate Work

BOILER BREECHINGS, SMOKESTACKS, STAND PIPES, TANKS, BINS, HOPPERS, RIVETTED STEEL PIPES, FLUMES AND PENSTOCKS

STRUCTURAL STEEL WORK

Machine work of all descriptions. Send us your specifications.

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Automatic Machinery
for all purposes
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Screw Machine Products
Consult us on your machine problems

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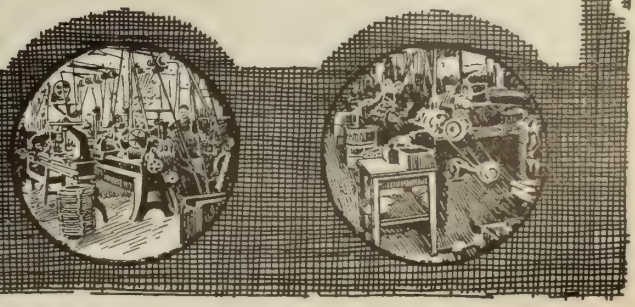
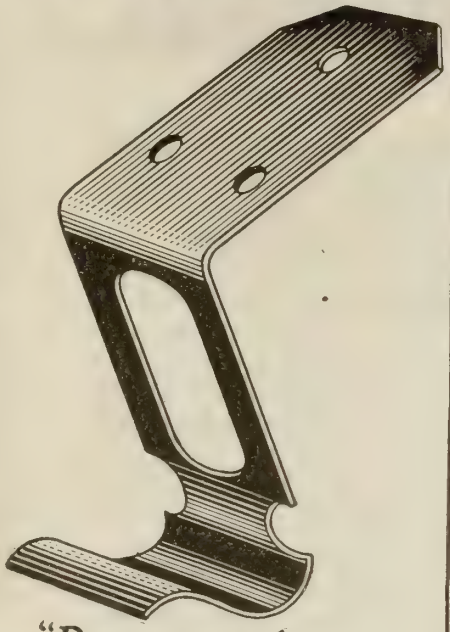


The Wallace Barnes Company



"Barnes made for every trade"

SPRINGS, WIRE & STEEL — EST. — "BARNES-MADE" PRODUCTS — 1857 — SCREW MACHINE PRODUCTS

Further Evidence of Ability

Raw materials for "Barnes-made" Springs are purchased to exact specifications.

The proof of our readiness to fill orders efficiently is best given by the fact that there are always between 3000 and 4000 tons of steel on hand in 3,500 different sizes and varieties.

Out of this Stock Department come the materials from which are constructed the quality products that are individualized by "Barnes-made."

ESTABLISHED 1857

THE WALLACE BARNES COMPANY.

FLAT AND WIRE SPRINGS OF EVERY TYPE

SCREW MACHINE PRODUCTS - HIGH CARBON COLD ROLLED STEEL

MAIN OFFICE AND WORKS, BRISTOL, CONN.

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View in Stock Dept.

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THE absolute uniformity—always and everywhere—of each particular degree of a VENUS Pencil, and its remarkably smooth, gritless, non-crumbling, easy writing and drawing leads, have placed this famous pencil in the offices and drafting rooms of engineers in every part of the world.

17 Black Degrees and 3 Copying

Free Send for a box of five trial samples and VENUS eraser

American Lead Pencil Company

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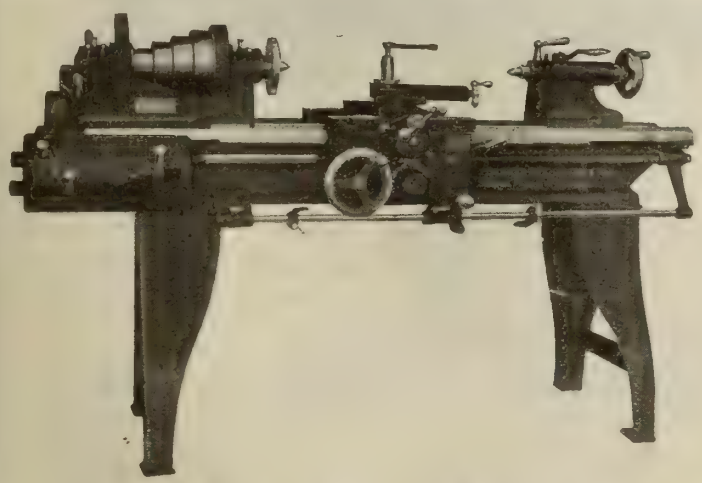
The Largest Selling Quality Pencil in the World



"Star" 12'x6' Lathe

The Paramount Machine for Tool Room Work

Economical in first cost, operation, maintenance and floor space

"STAR" TOOL ROOM LATHE

Special features in the "Star" Tool Room Lathe include—

Micrometer Cross Feed Stop (Patented) eliminates all guessing at the depth of a cut.

Automatic Stop for Carriage in either direction when actuated by friction or screw feeds.

48 feeds or threads without removing a single gear.

Automatic Safety Device in apron prevents engaging opposing feeds.

Our latest catalog describes other interesting features of this remarkable lathe. Send for one to-day.

THE SENECA FALLS MFG. CO., INC., 366 W. Fall St., Seneca Falls, N.Y.

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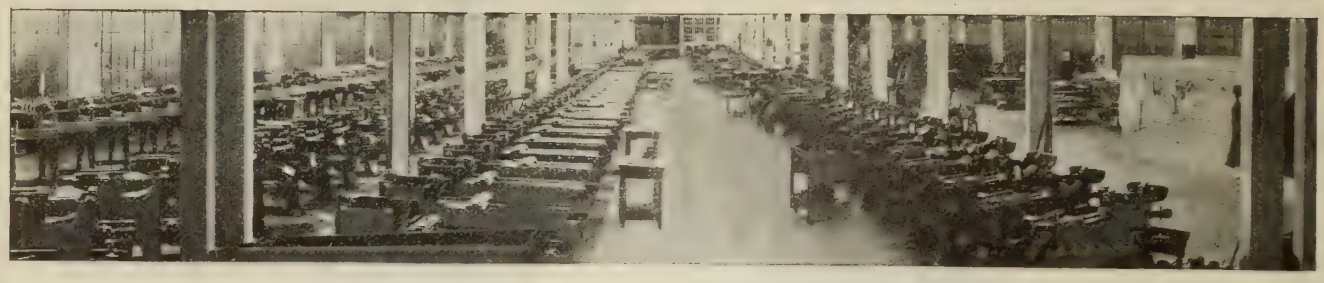
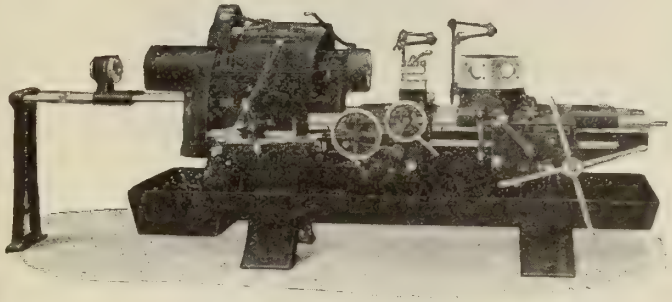




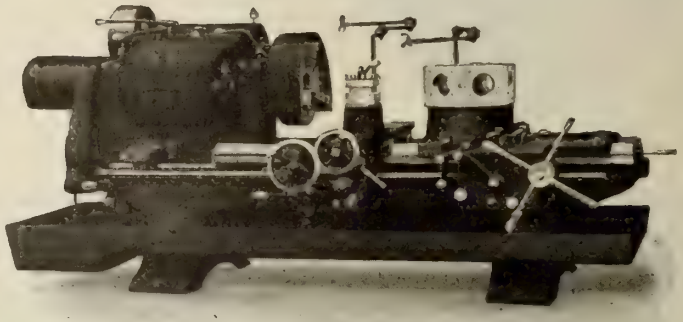
Foster Universal Turret Lathe

THREE SIZES

1---B

2---B

3---B



EQUALLY EFFICIENT ON BAR AND CHUCKING WORK

DO YOU HAVE ANY IDLE MACHINES IN YOUR FACTORY?

You probably do.

The character of the work has been shifting. Only a few months ago the war created a demand for certain articles, and your factory equipment had to be changed to meet it. To-day the past war reconstruction calls for products of another kind.

If your factory equipment is not flexible enough, if your machine tools are not capable of being adapted to the periodic changes in the character of your work, there will be idle machines in your factory eating into your profit even though you are flooded with orders.

The UNIVERSAL TURRET LATHE will adapt itself readily to the changing character of your work. It can be changed over from bar work to chucking work or vice versa in a short time and is equally efficient on either.

Furthermore, the Universal Turret Lathe will keep down your production cost to the minimum, no matter whether you handle your work in lots of 10 or 10,000 parts.

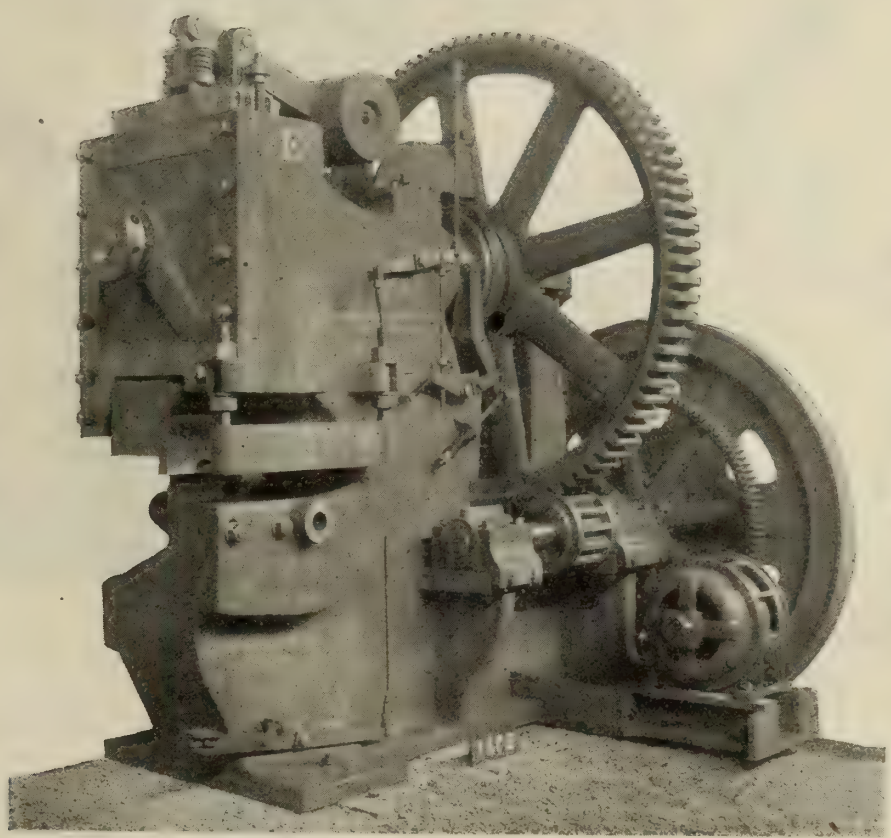
YOU CANNOT AFFORD TO IGNORE THE MERITS OF THIS MACHINE. WRITE FOR OUR CATALOGUE AND LEARN MORE ABOUT IT. THEN SEND US BLUE PRINTS OF YOUR WORK AND LET OUR ENGINEERS FIGURE WITH YOU.

FOSTER MACHINE CO., ELKHART, IND.

"The Quality Line"

PUNCHING and SHEARING MACHINERY

Machinery Equipment for Rolling Mills Bridge and Structural Works



Machinery Equipment for Steel Car Plants and Shipyards

No. E. OPEN THROAT BAR IRON SHEAR
Capacity 11" x 2¼" Flat, 4" Round, 3½" Square

All machines are built of same high-grade workmanship and material that have given the "L&A" product a recognized standard of quality for over 50 years.

May we send you our big catalogue.

The Long & Allstatter Co.

Established 1856

American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

Incorporated 1878

Canadian Agents:
RUDEL-BELNAP MACHINERY CO., LIMITED
Toronto Montreal

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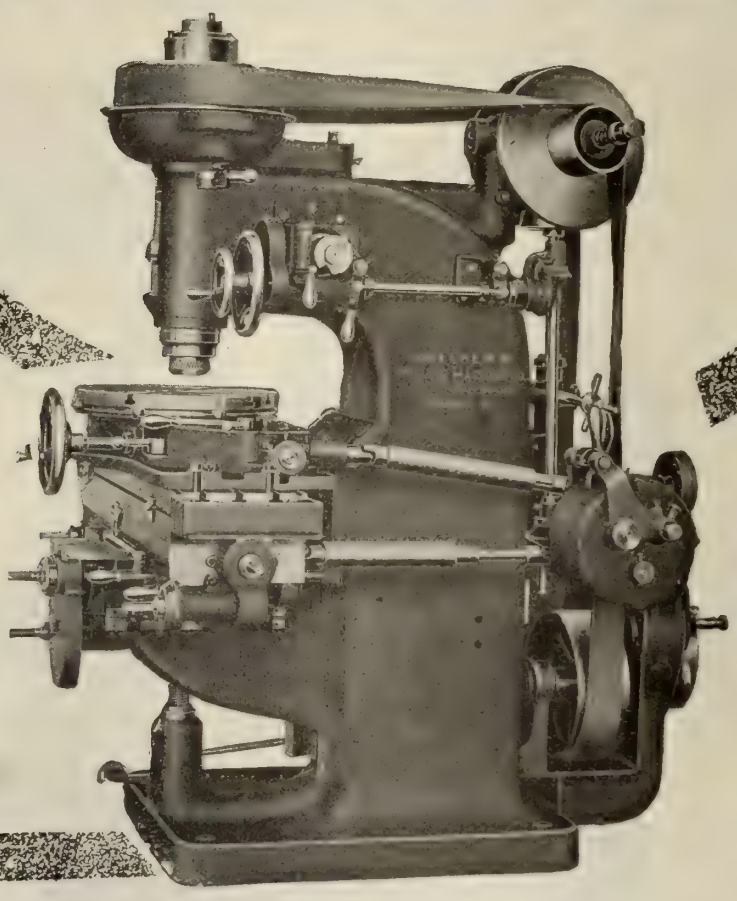
Becker



"Becker Belt Driven Millers"

The Machine that gives the Smooth Finish

Model B

The machine shown above is a Becker Model B Belt Driven Miller—Like the other machines of this line it is a Production Tool of the first class, embodying all the features that have made Becker Millers the standard.

The strenuous period of war work has introduced Becker Belt Driven Millers into Canadian factories. They were essential then because they greatly increased production without adding to manufacturing costs—and now, they are essential also because they will enable you to reduce your manufacturing costs in order to cope with the keen after-war competition.

You need a Becker Belt Driven Miller.

Write for Circular O-501—NOW

BECKER MILLING MACHINE COMPANY

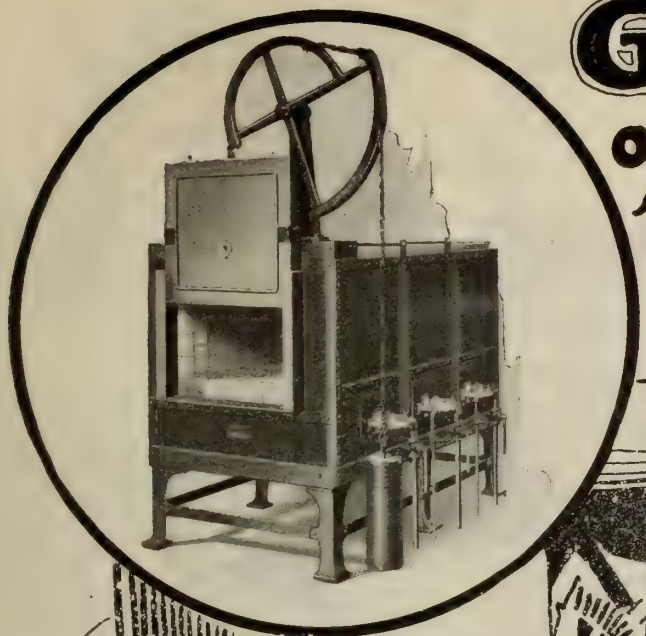
Hyde Park, Boston, Mass.

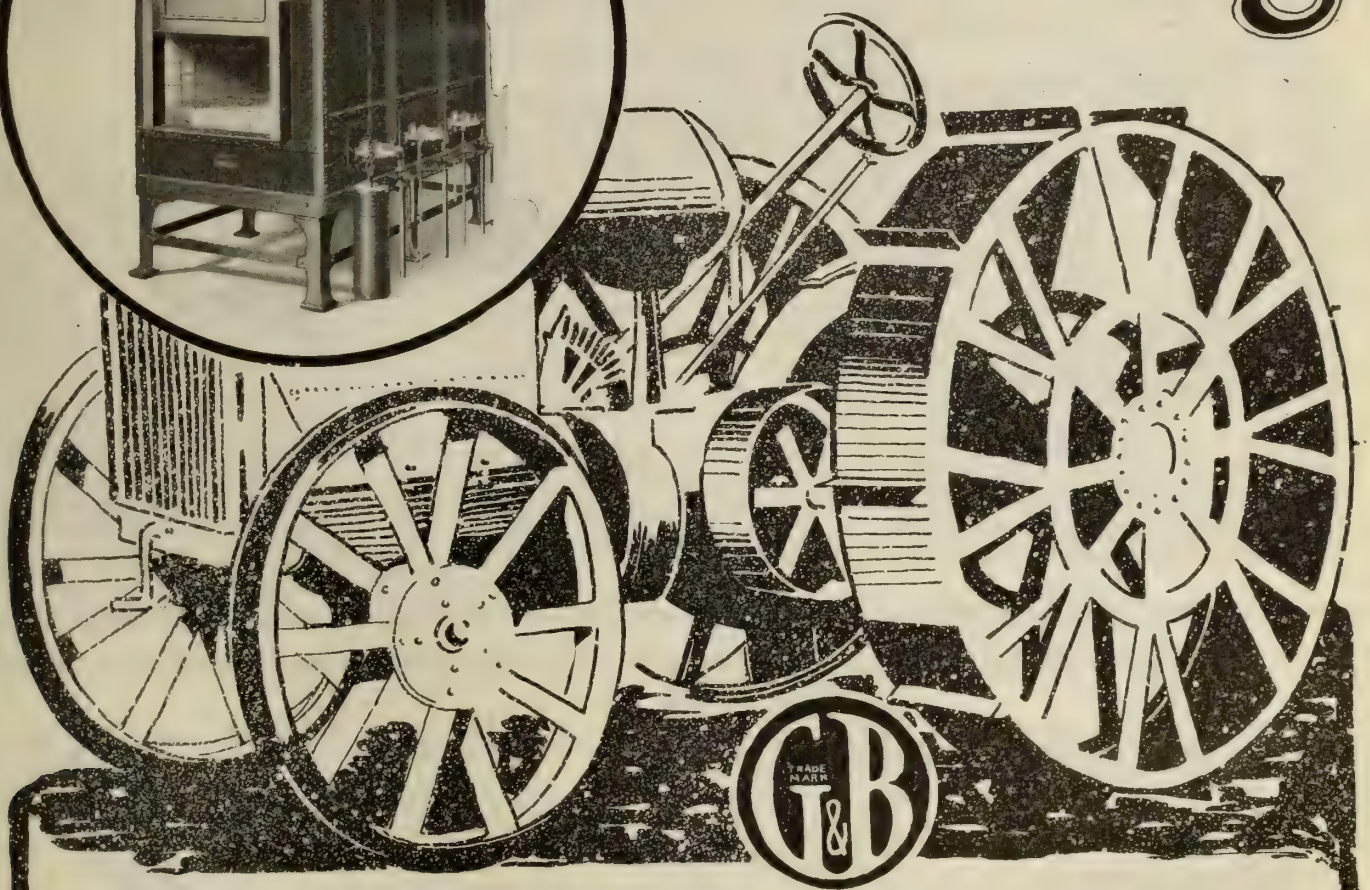
Canadian Agents :

Rudel-Belnap Machinery Company, Ltd., 137 McGill St., Montreal.

A. R. Williams Machinery Company, Ltd., 64 Front St. West, Toronto.

G&B Method of Heat-Treating





Gilbert & Barker Method the Right Method of Heat-Treating

Used by the Largest Manufacturers of Autos and Trucks.

Whether you manufacture tractors—automobiles —trucks—crankshafts—camshafts —tools—machine parts or anything else that requires heat-treating unless you have the **right** kind of heat-treating furnace for the purpose, you are defeating your own purpose, that of turning out a first-class product of uniform high quality.

GILBERT & BARKER FURNACES INSURE
PERFECT COMBUSTION—ABSOLUTE TEMPERATURE CONTROL
UNIFORMITY OF HEAT

the result of which is an exceptionally high grade product which measures up to the best manufacturing standards. There is a G. & B. Furnace exactly suited to your requirements. Let our engineers advise you—write. **To-day is a better day than to-morrow to send for Bulletin 24.**

Gilbert & Barker Manufacturing Company

17 Union Street **Springfield, Mass.**

ESTABLISHED 1865

New York Office: 26 Broadway. Canadian Agents: Williams & Wilson, Limited, Montreal, Que.

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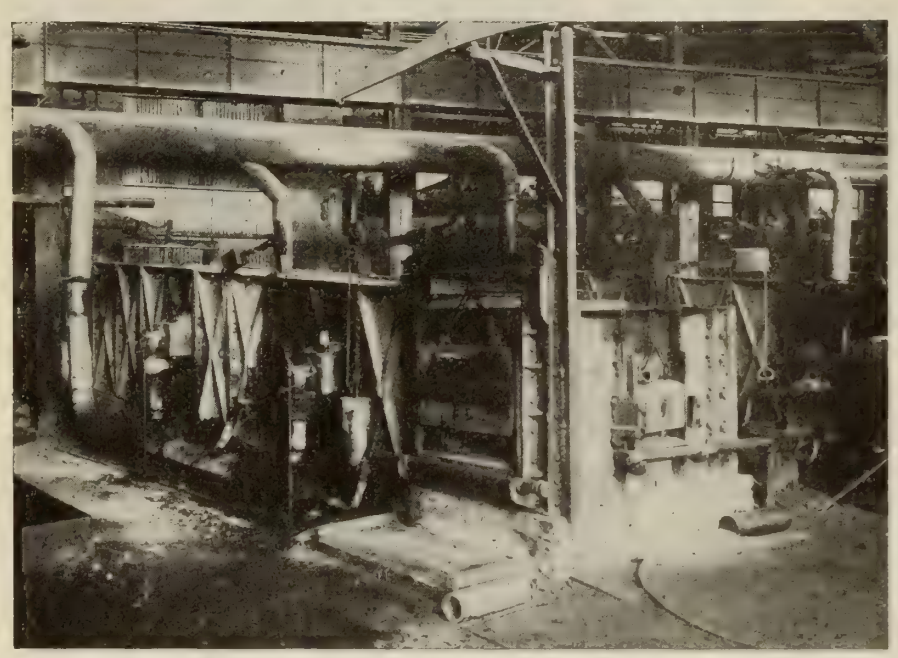
Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.

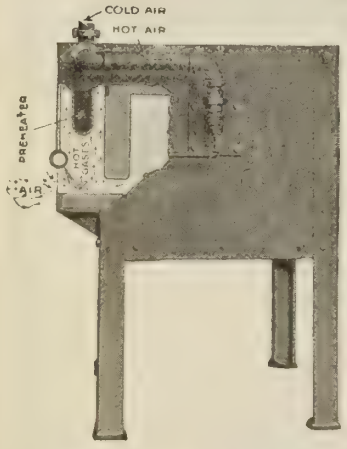


Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

Write

Mechanical Engineering
Company, Limited
Room 308, Bank of Toronto Bldg., Montreal
Three Rivers, Quebec, Canada

ECONOMIZER FORGE



Showing deflection of hot gases, with induced air *toward* the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power: protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

Write to-day for catalogue 34-T

Chicago Office: Ellsworth Building
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Canadian Representative:
R. J. McLEAN
128 Bleury St., Montreal, Canada

W. S. ROCKWELL CO. INDUSTRIAL ESTABLISHED 1888 FURNACES FISHKILL-ON-HUDSON NEW YORK

Look at this again —closely

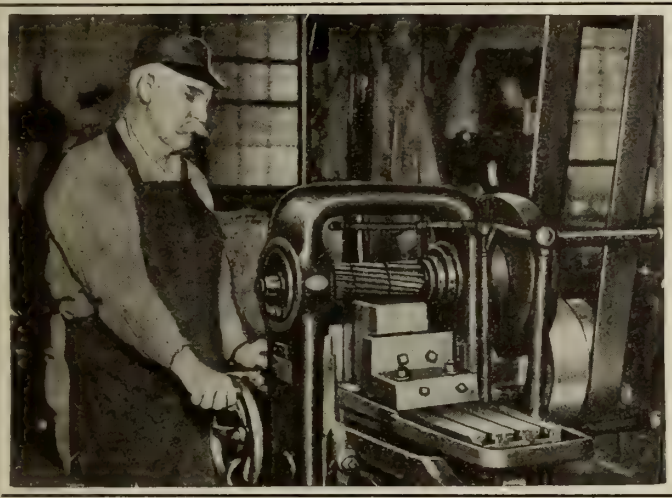
and read what we have to say below

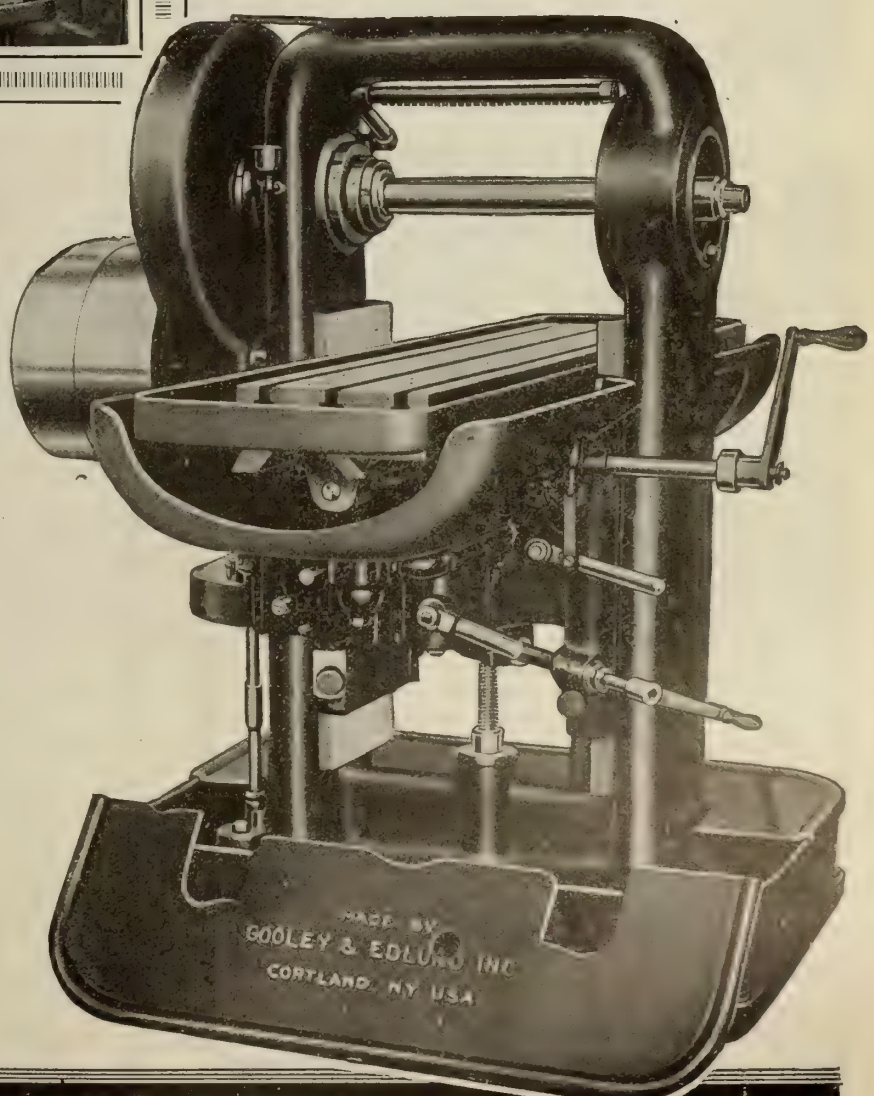
WHEN a tap breaks off close or below the surface, you'll find the Walton Tap Extractor will save a great deal of time and trouble. The crucible fingers grasp the flutes of the tap, a twist of the wrench and the piece is out.
Don't you think it would pay to have a few lying around on your benches?

The Walton Company
Hartford, Conn.

BRIGGS MILLER

Keeps Five Die Sinkers Going





HERE you see the Briggs Miller Squaring Die Blocks, and it is working so fast it keeps five die sinkers going.

Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work. Unusual rigidity accounts for Briggs' higher efficiency.

Don't you think you could use this tool to advantage in your shop? Write for the details.

Gooley & Edlund, Inc.

Cortland, N.Y., U.S.A.

Garlock Walker Machinery Co., Ltd.
Toronto, Ont.

Williams & Wilson, Ltd., Montreal

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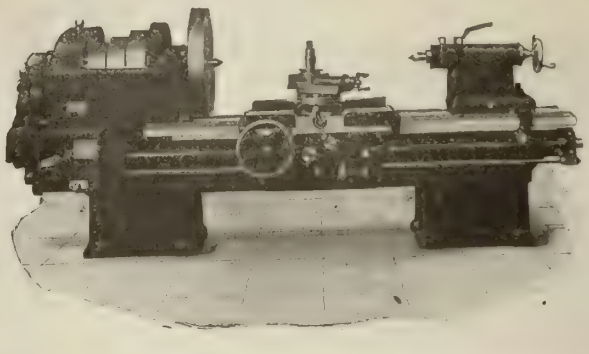
SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double back gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 feet.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: The Geo. F. Foss Machinery & Supply Co., Montreal, Quebec. H. W. Petrie, Limited, Toronto, Ontario.

WONDER "Bending Machines"

BEND PIPE COLD

ELIMINATE FRICTION

3 New Models

"Wonder" Pipe and Tube Bending Machines (pat.) electrically operated to bend from 1″ to 18″.

We also manufacture 10 other sizes

Hand operated to bend from ⅛″ to 8″.

American Pipe Bending Machine Company

52 Pearl Street

BOSTON, MASS. U. S. A.

THE

ST. LAWRENCE WELDING CO. LTD.

MONTREAL, QUE.

A. M. BARRY, Managing Director

Office and Works:
138-140 Inspector Street
Telephone Service:
(Long Distance) Main 5779 and at Night, Westmount 3483

Maritime Branch:
HALIFAX, N.S.

CONSULTING ENGINEERS on all kinds of welding.

BREAKDOWN REPAIRS handled at once; just 'phone us and we will be on the job by next train.

OXY-ACETYLENE WELDING of heavy cast iron frames, cylinders, gears, water wheels, etc.

STEEL, any kind of **welding** on parts of large or small machines, tanks, digesters, boilers, shafts, brackets, etc.

Can be welded in place when necessary.

ELECTRIC WELDING on boilers, digesters, leaking tanks, etc.

MARINE REPAIRS undertaken by our Marine Welding Tug which is equipped with Electric and Oxy-Acetylene Welding Apparatus with Compressed Air Plant complete.

OXY-ACETYLENE CUTTING of any kind of steel construction.

PORTABLE WELDING APPARTUS of all kinds with skilled operators always available to repair your breakdown at once.

THERMIT WELDING on all classes of work is a special feature of present activities.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, etc.; Electric Welders, Oxy-Acetylene Welders, Boiler Repairs, Lead Burning and Thermit Welding.

It's an "OLIVER"

World Renowned for High Quality

"Oliver" 26-inch Extra Heavy Duty Engine Lathe

turning face on 24-inch steel disc and drilling 3-inch hole in the centre

The power and rigidity of the "Oliver" will enable you to get the full cutting power of your high speed steel.

WE ALSO MAKE TURRET LATHES, SCREW MACHINES, SPEED LATHES, DIE FILING MACHINES.

May we send you Descriptive Bulletins?

OLIVER MACHINERY COMPANY

GRAND RAPIDS MICHIGAN, U.S.A.

European Offices: Manchester, England; Paris, France.

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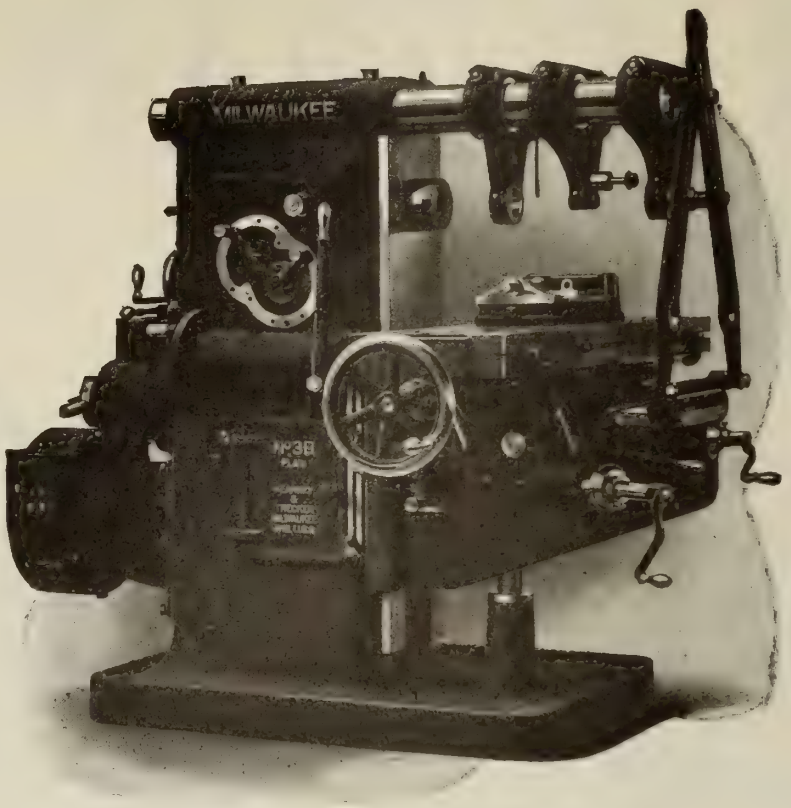

MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

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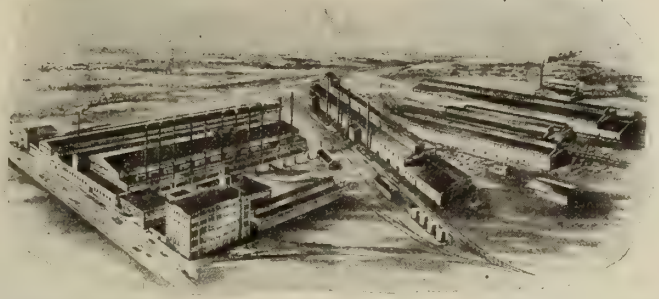
A Plant Equipped in Every Detail to Suit Your Every Need



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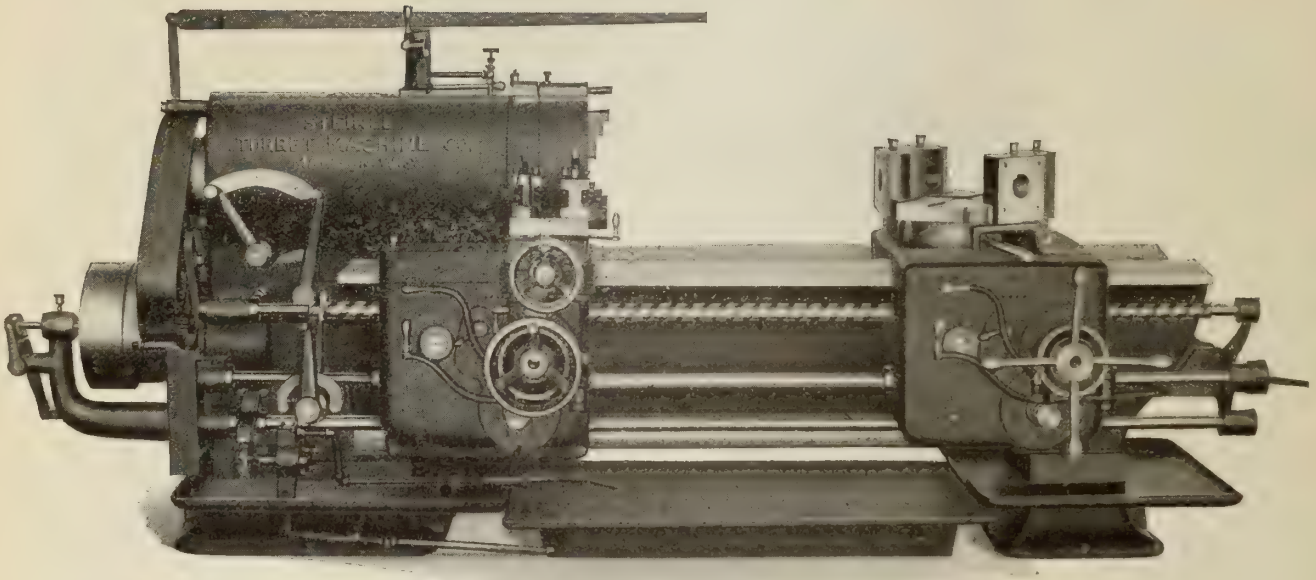


Still another reason why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

THE COMBINATION TURRET

In designing this turret the following points were taken into careful consideration:

The proper manner of supporting different kinds of tool equipment required on a machine of this character.

Avoidance of excessive tool overhang.

Ability to secure the full benefit of the side carriage in relation to the absence of turret tool overhang.

As regularly furnished, the combination turret is hexagon in form, 21" in diameter, and has two open sides and four bored faces. The open sides permit of universal facing heads or similar tool equipment being firmly secured to the bed of the turret and provide for suitable adjustment of tools to the work with a minimum overhang. The bored faces carry drills, boring bars, reamers, die heads, taps, etc.

The combination turret has power traverse and quick change reversible longitudinal feed controlled from the apron.

The bearing on the saddle is the full diameter of the turret. The locking pin is located in front, the greatest possible distance from king pin. One motion of the binding lever releases the pin and turret, or binds same.

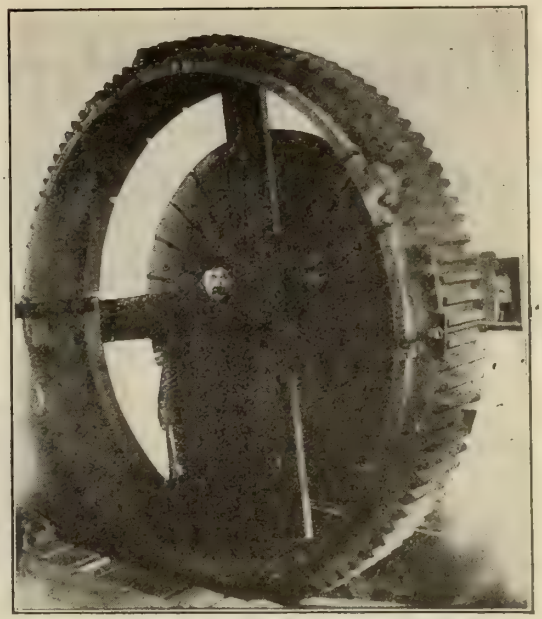
The design of the combination turret secures the full advantage of the side carriage feature.

STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.

Economy A Big Factor In "HISCO" Moulded Gears

In the installation of new machinery in the working out of new processes—you may require gears or sets of gears, and no matter what the diameter, the Hisco process relieves you of the necessity of having patterns made—entailing considerable cost and delay.



"HISCO" machine moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high lumber and wages, and when time is a factor—is something to be considered.

The "HISCO" plant is equipped to produce machine moulded gears up to 18 feet in diameter without patterns—and remember, very often the pattern has cost more than the gears.

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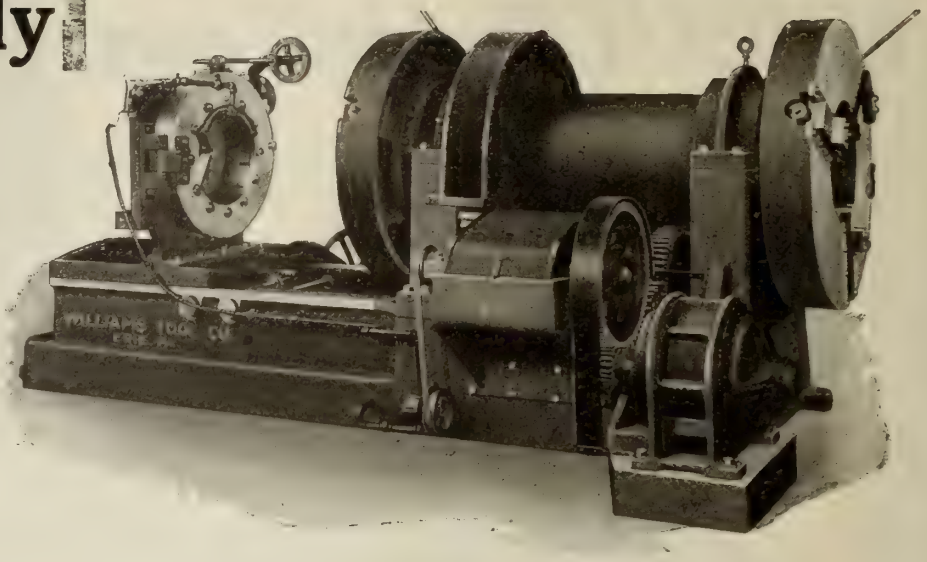
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½″ to 12″. Also nine other sizes to meet your requirements.



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Marshalltown Mfg. Co.

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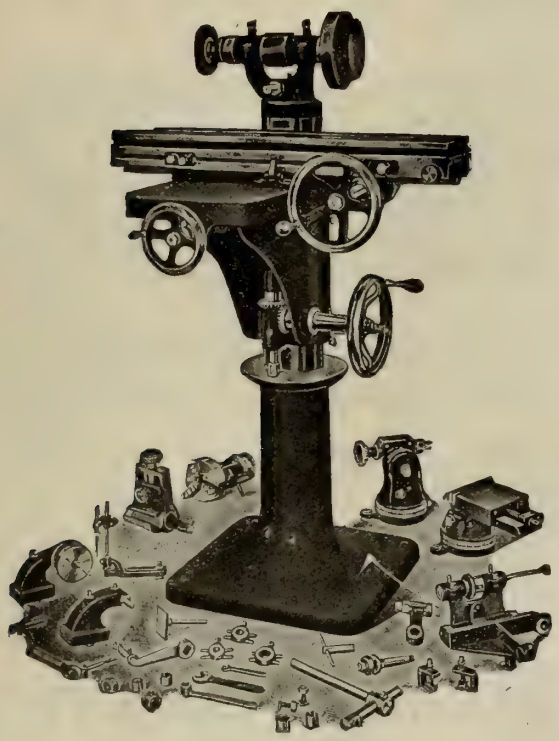

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For General Tool Room Work

This grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

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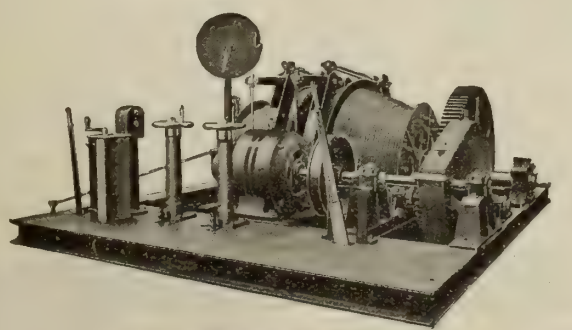

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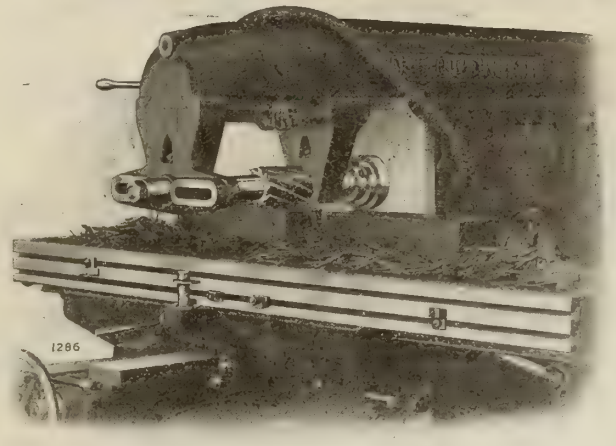
24 Cubic Inches of Steel Removed Without Braces



Material — Machinery steel; cutter 4½″ diameter, Cincinnati designed spiral mill 2″ arbor.

The Rectangular Overarm enables the new No. 5 Cincinnati Miller to take cuts up to its normal rated capacity without the use of braces. Ask for catalog.

Cut ¼″ deep, 5″ wide, feed 19″ per minute, removing 23¾ cubic inches of steel per minute, without the use of braces.

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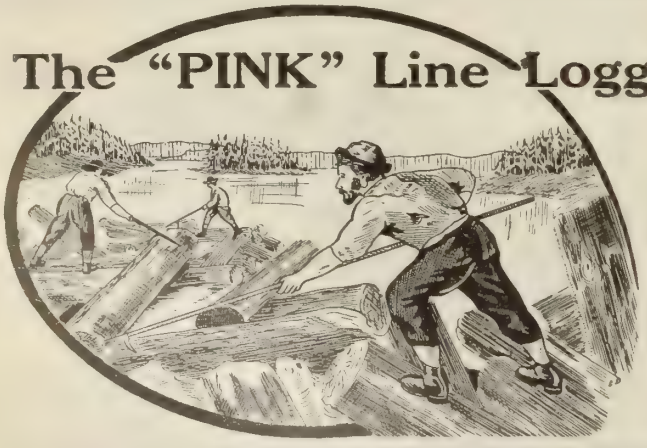

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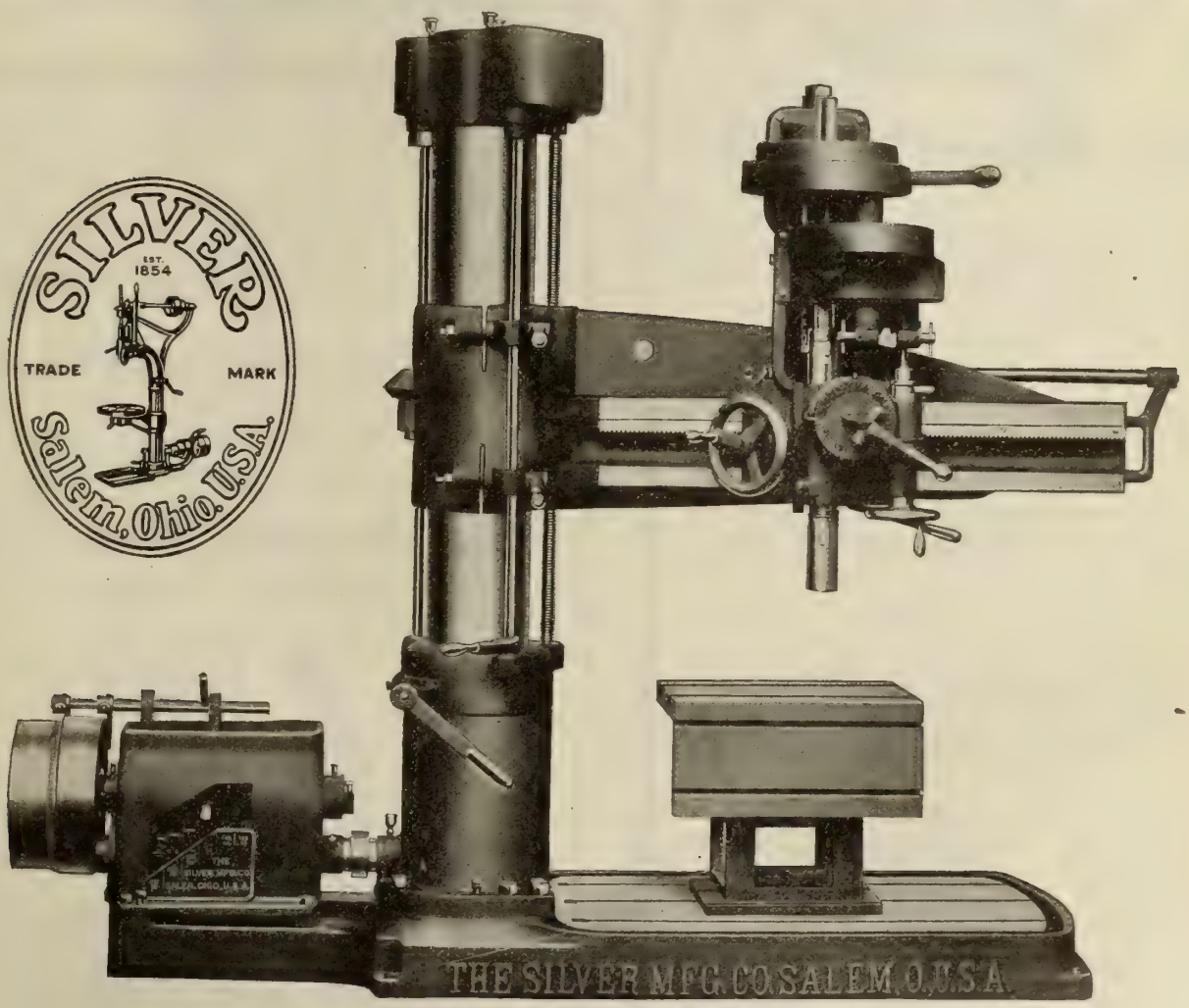
After sixty-five years of successful drill manufacturing experience—four years of experimental work, exhaustive tests and investigation of the requirements and possibilities of radial drills, we are putting on the market the new Silver Radials. They embody principles and incorporate many patentable features not found on other drills.



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Read announcement and description elsewhere in this issue of Canadian Machinery and drop a line for attractive descriptive folder in colors.

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FOUNDED 1854

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Silver Radials are made by the builders of the famous Silver line of 20 and 25 inch drills.

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No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men—a good thing to consider from a production standpoint.

Our Catalogue is of handy pocket size and will be mailed to you upon request

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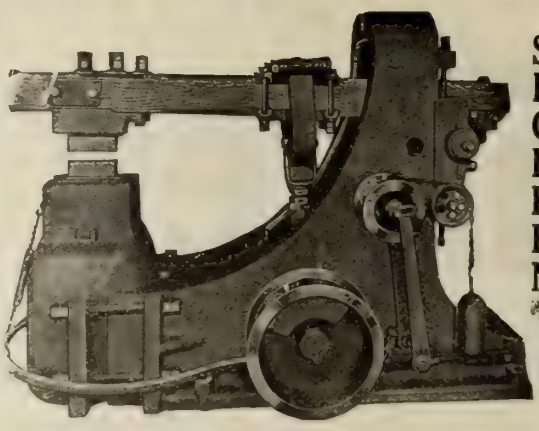

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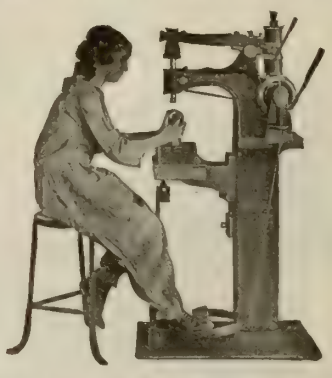

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Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
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Let us shoulder your riveting problems.
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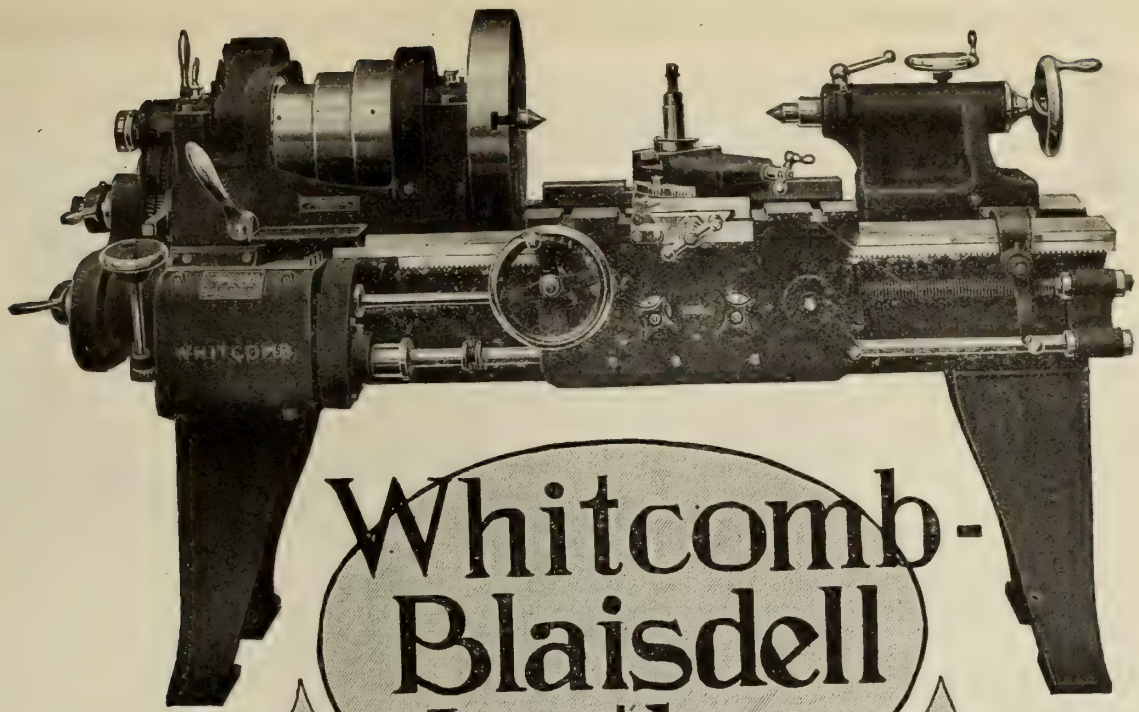

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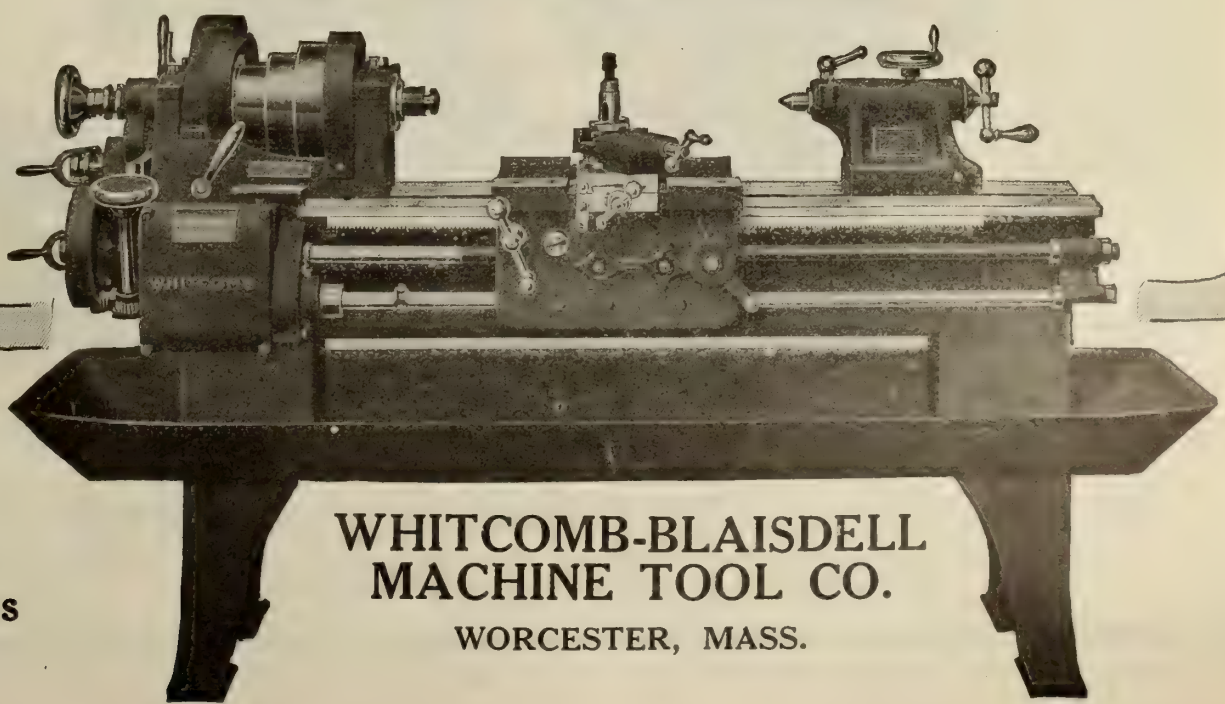
POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product

Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes



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Customers Are Satisfied

with the performance of this machine in their works. A recent letter to us states: "Regarding the WALL RADIAL DRILL, this is operating every day, and we are more than pleased with the results we are getting from the use of this tool. In all probability we will install additional ones later on." Our deliveries are getting further away each day. Better take advantage of the present conditions.

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Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
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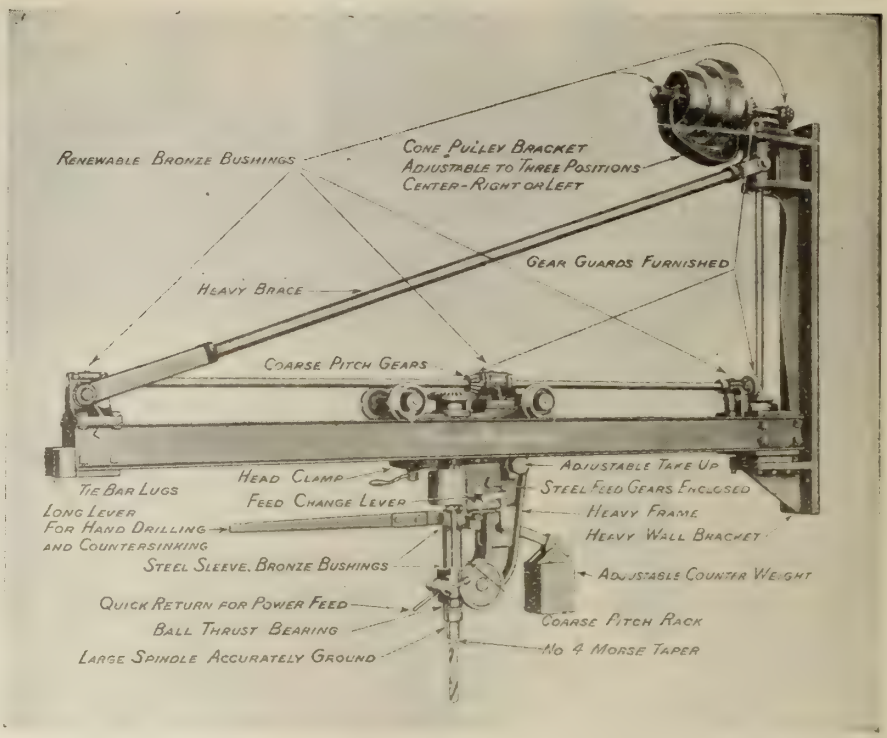
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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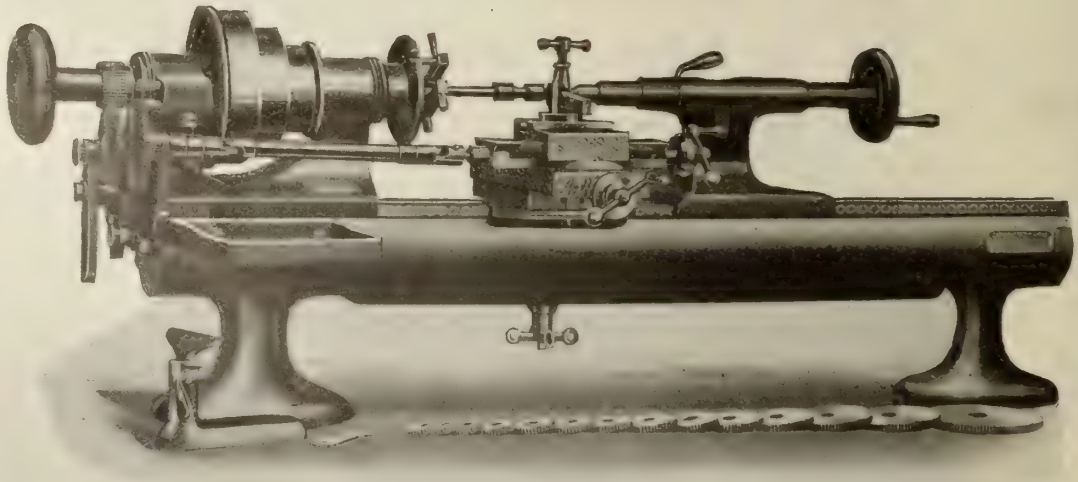
Cataract Bench Lathes are finely constructed precision tools, with responsive controls, simple adjustments and numerous convenient attachments adapting them to a wide variety of work. **Study this illustration.** Note the base, the circular bed, the sliding tool post, massive head stock (indicating strength), range of gears, special tailstock, arrangement of gears.



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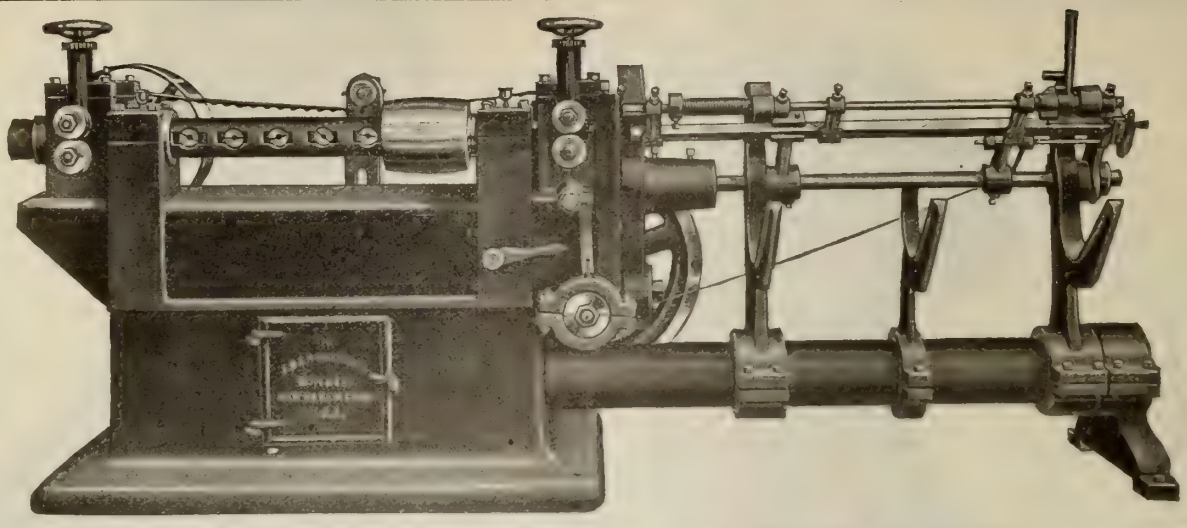

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Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

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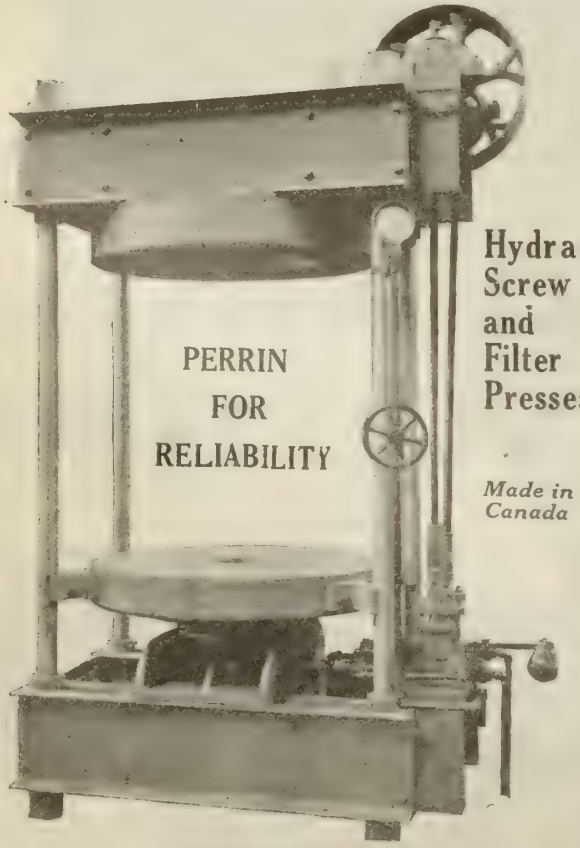

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Made in Canada

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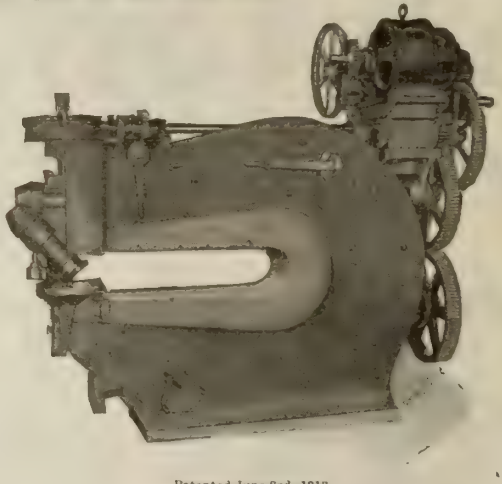
MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



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SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing.

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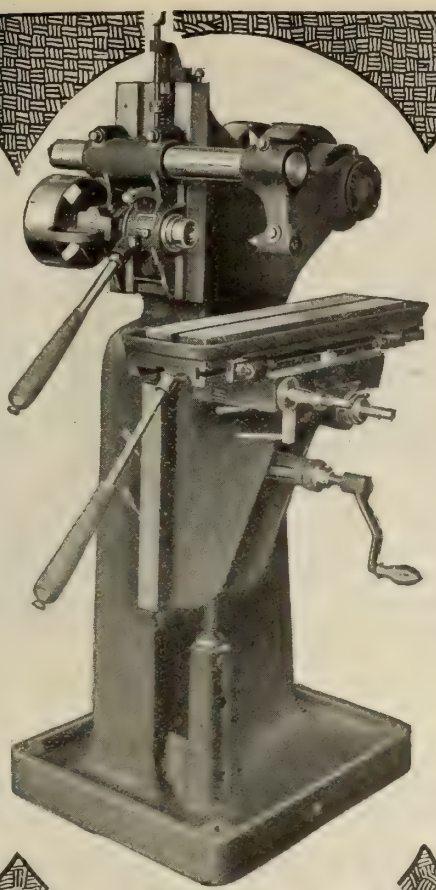
Specially designed for use on work where heavier machine than standard type is necessary.

BRISTOL



Convenience Assures Big Production

The lever controls make a very convenient method of operation, though crank is furnished for table feed for use when so desired.

Users acknowledge these machines to be exceptional producers, proving in many cases more satisfactory than milling machines of the more expensive type.

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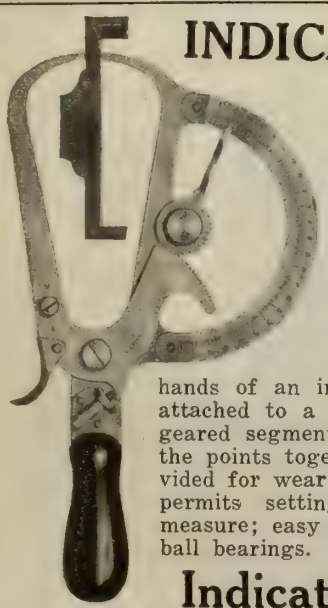
BRISTOL

The Bristol Machine Tool Co., Bristol, Connecticut



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Indicating Calipers

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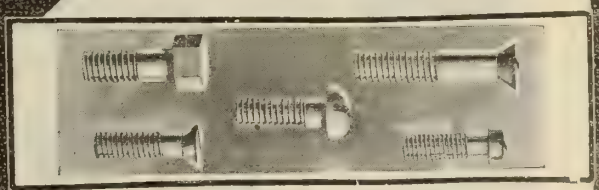

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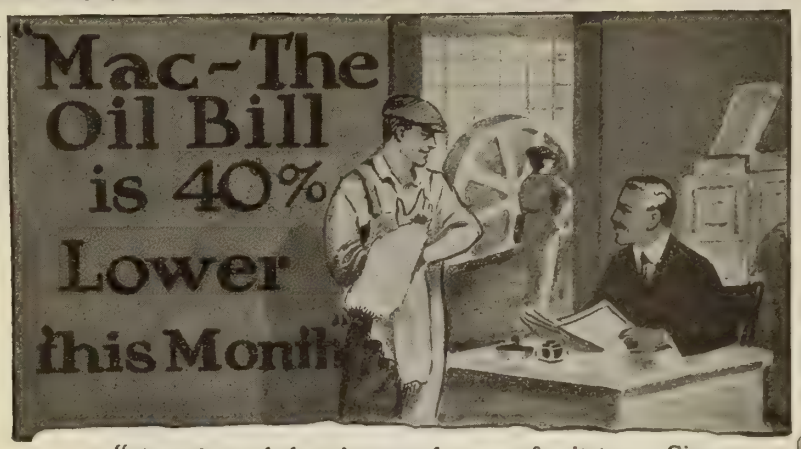

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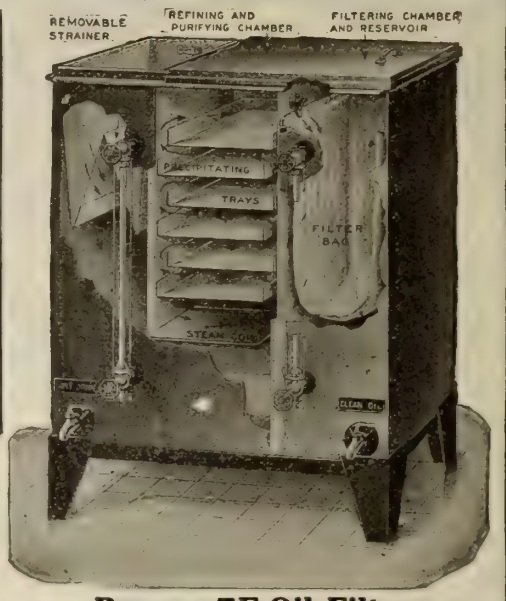

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First, means a cleaner engine room.

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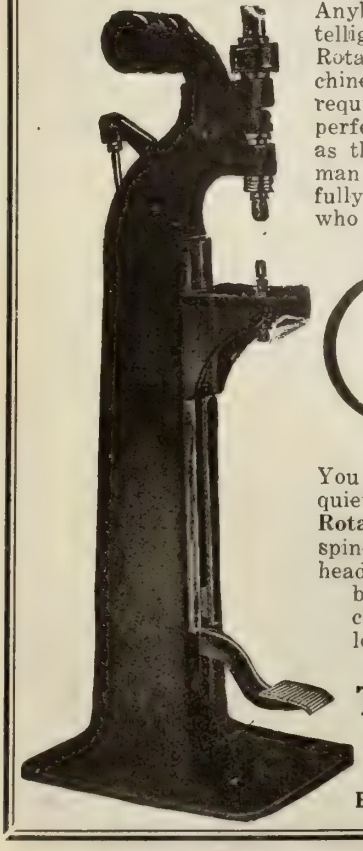

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You are assured of perfect quietness wherever the **Grant Rotary** is running. And it spins a perfect polished rivet head every second without breaking or marring the casting. Rivets tight or loose. Write for details.

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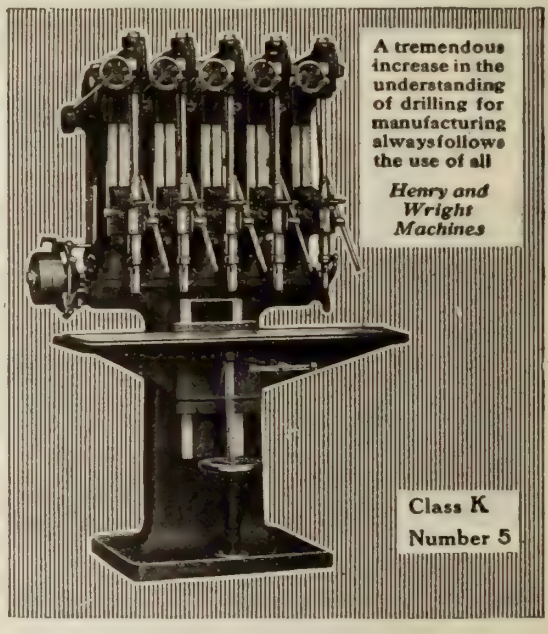

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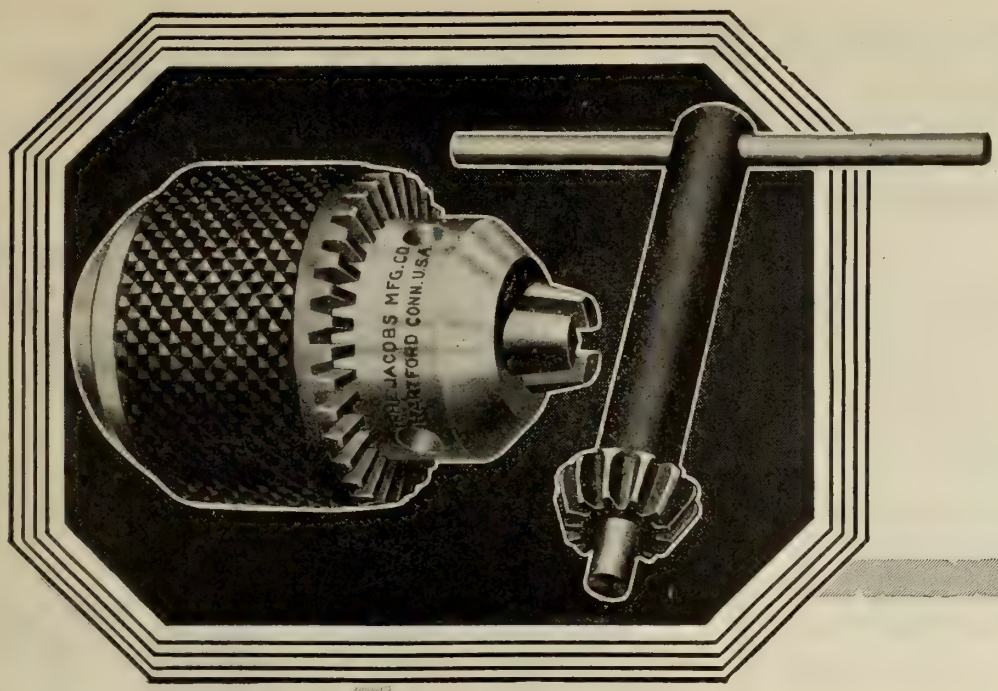

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Jacobs Improved Drill Chucks are standard equipment in the largest, most representative shops and factories throughout the world.

When other chucks have been retired, Jacobs Improved Drill Chucks have been hired, and have retained their places because of their unfailing, unequalled service where equipment must pay its own way.

The workmen know the value of good chucks. Jacobs Improved Drill Chucks are recommended by them as savers of drills and savers of time.

6 different models in 12 styles ranging from 13/64″ to 1″.

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Jacobs Chucks

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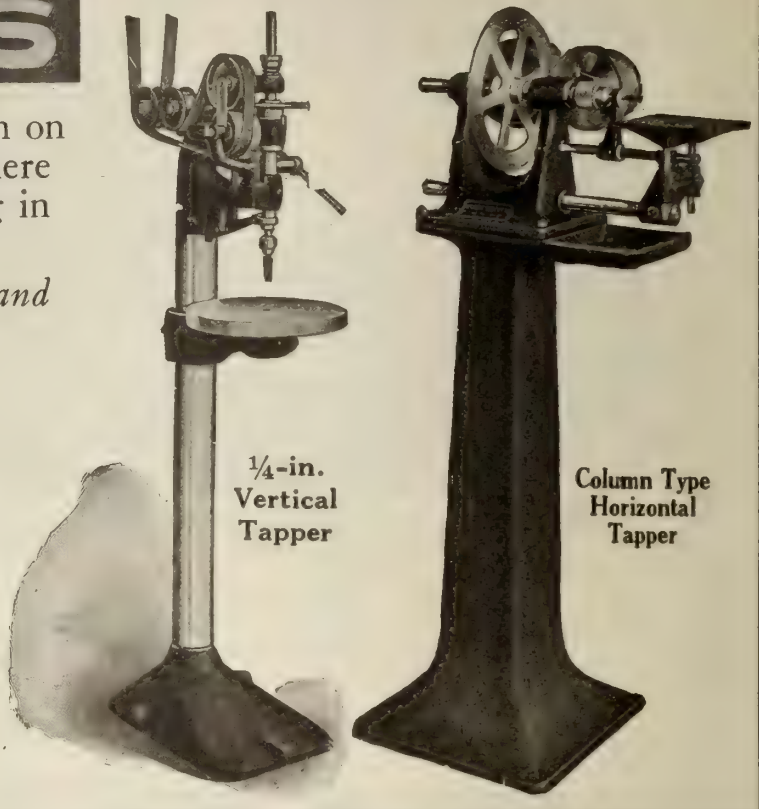
Save Tap Breakage

The *smooth drive* reduces the strain on the taps—they wear longer—and there are fewer delays from taps breaking in the work.

R-S Tappers ensure faster tapping and quicker assembling.

Friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on ⅝-in. work—50 per cent. faster than the usual tapping speed for that size. Uses but 1 h.p.



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Column Type Horizontal Tapper

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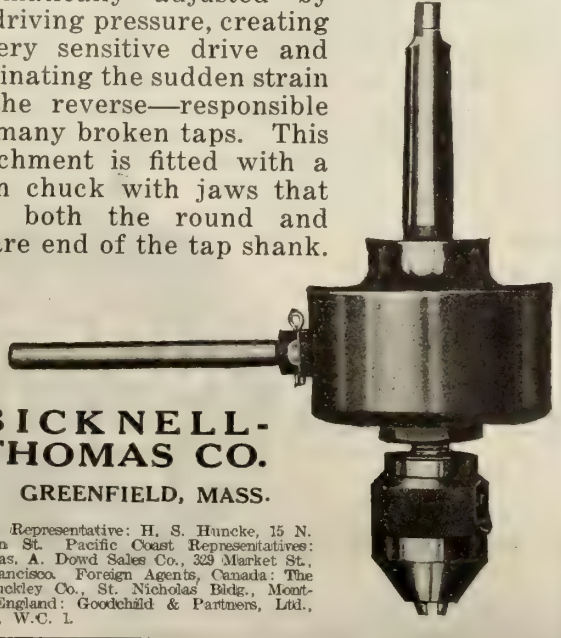
Fits Any Make Drill

A friction mechanism inside the body of the attachment is automatically adjusted by the driving pressure, creating a very sensitive drive and eliminating the sudden strain of the reverse—responsible for many broken taps. This attachment is fitted with a plain chuck with jaws that grip both the round and square end of the tap shank.

Made to take taps from 3-32" to 1-4" in diameter.



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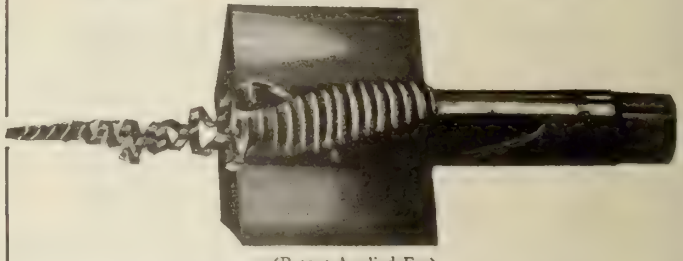

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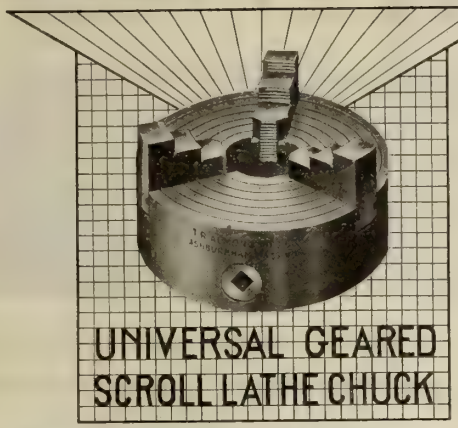

UNIVERSAL GEARED SCROLL LATHE CHUCK

The body is a one-piece casting which eliminates parts and chattering when under heavy cutting pressure. The jaws are made of special alloy steel and hardened through making them stronger than the usual case hardened jaws. Two styles jaws—No. 1 Common Jaws, No. 2 Rervers Jaws.

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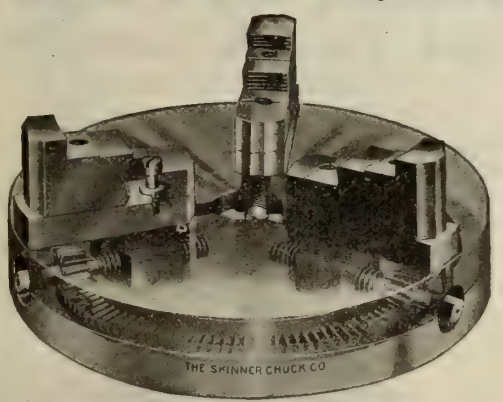
SKINNER CHUCKS

are to be found in the majority of the better metal working plants of the world—because experience has demonstrated that Skinner Chucks are efficient—They grip and hold the work as it should be held—It's easy to quickly attach them. Their jaws are readily adjusted or reversed. They are so adaptable that they save many down hours and increased production results.



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Reclaimed at Small Cost Defective Castings

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employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones; provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

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We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it.

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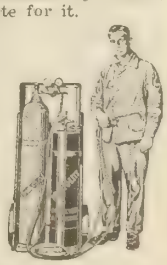

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Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
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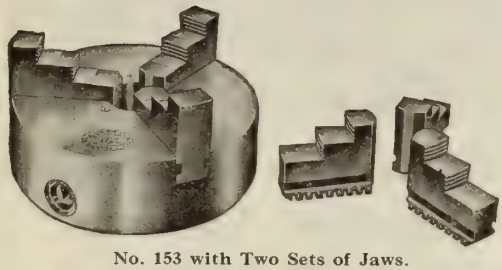

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Union Geared Scroll Chucks

Have many points to recommend them. SOLID BODY —Gives strength and rigidity. WEIGHT—All parts are heavy and strong, and reinforced where necessary.

QUALITY OF MATERIAL—Best that can be procured.
LAST AND BEST OF ALL—ACCURACY. Union Chucks are Accurate.
UNION MANUFACTURING COMPANY - New Britain, Conn , U.S.A.
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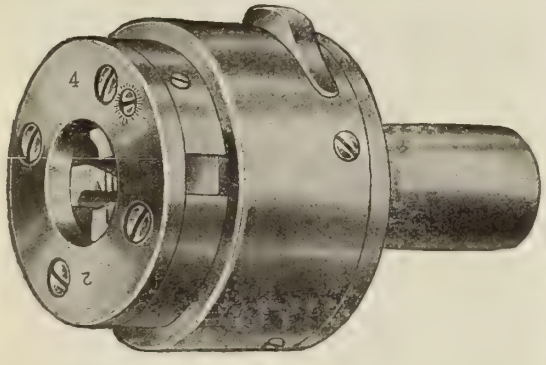

H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

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We've been Manufacturing
Nothing but Chucks and Their Accessories
FOR NEARLY 60 YEARS
AND OUR PRODUCTS SHOW IT

Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

Let us send you our catalogue.
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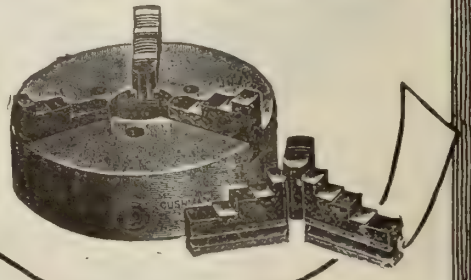

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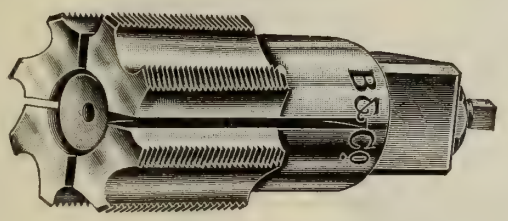

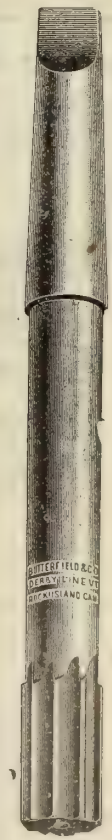

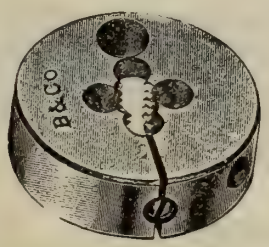

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Every process in the manufacture of Butterfield Tools is performed by experts, whose entire aim is to produce the highest quality—and the rigid inspection prevents any possibility of inferior tools reaching the shipping room.

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Butterfield Tools reflect splendidly our 35 years' continuous concentration on improvement in high speed tools. You can't go wrong with a Butterfield.

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All Williams' Clamps are built with a purpose for every clamping purpose — maximum capacity 18"

They are made for Heavy, Medium, Light and Tool-makers' Service by drop-forgers with nearly half a century's experience behind them. They are all guaranteed.

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Yes, we can make immediate delivery.

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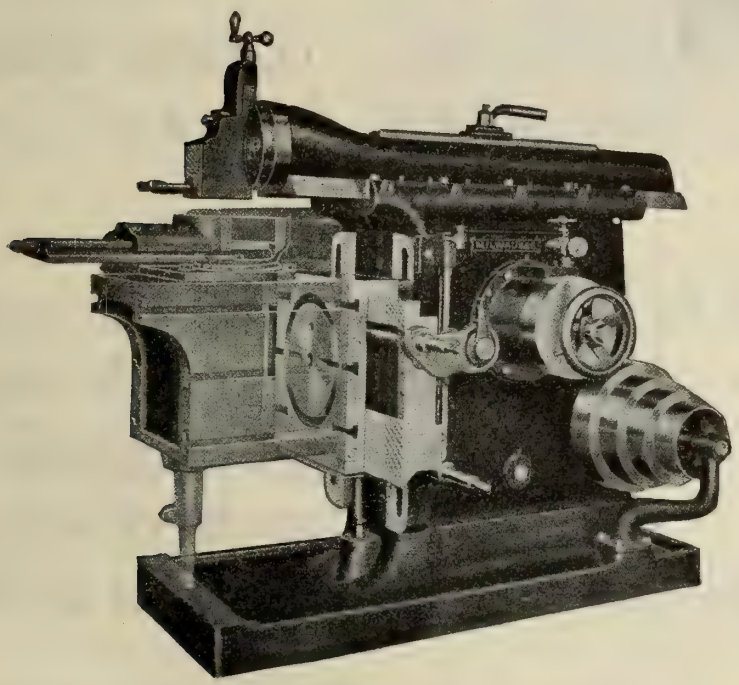
Are needed in Up-to-Date Canadian Shops



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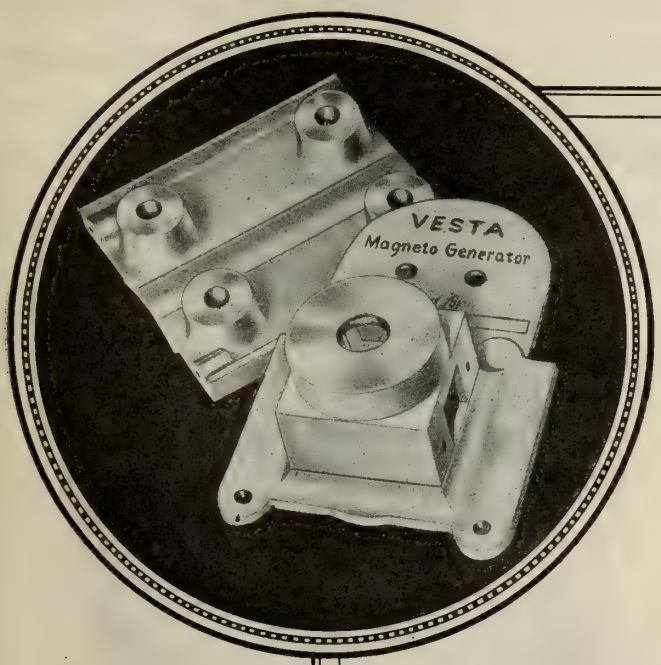

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Our Experience Applied to Your Problem

Franklin Die-castings increase and economize production at a vital point. Machined parts may be ever so perfect, but their cost is high and the process slow.

Where it is practical at all to die-cast instead of machine, Franklin Die-Castings are the ones to use. That is the testimony of many manufacturers.

We have served them in this matter and achieved our reputation for uniform success during a period covering 27 years of specializing in this work.

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Send sample or blue print for recommendation and estimate. Ask for Booklet "C."

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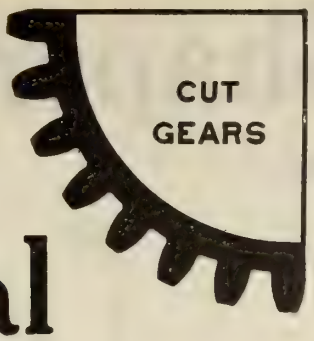
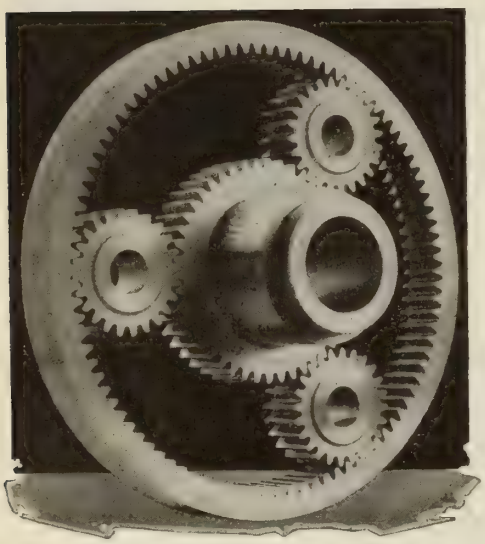


Internal Gears



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Tell men to turn them in when dull and get new ones.

If you specify Famous Five Files when ordering, you can count on getting the right amount of work out of a file before it dulls.

Famous Five Files are accurately ground and cut, and scientifically hardened. Skilled workmen know them as the standard tools. There is one for every kind of work on wood or metal.

They are:

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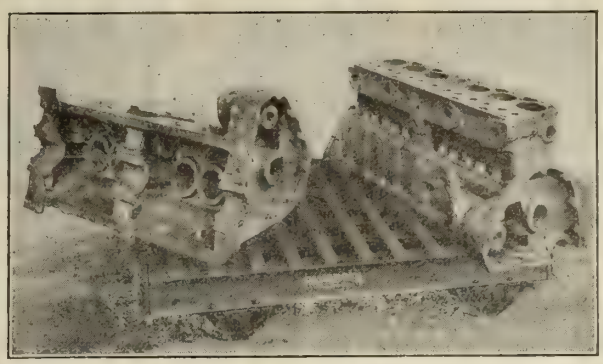

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CLEANED IN THREE MINUTES BY

PANGBORN SAND BLASTS

and whether your requirements are the cleaning of Castings, Forgings, Stampings, Sheet, Plate or Structural, or the removal of scale from Heat Treated Parts there's a Pangborn Unit or Combination for every need, large or small, that will make a saving for you — and a more attractive product.

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To Ensure the Easy Starting of A.C. & Squirrel Cage Motors

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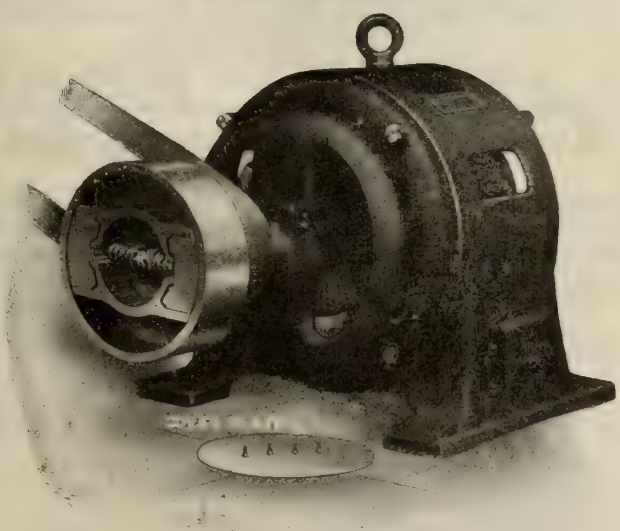

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Entirely Dispenses With all Starting Difficulties

The Clutch also Effects a Great Saving in Current Consumption and Reduces the Initial Cost of Motor and Switchgear.

Please Mention Speed and H.P. of Motor When Sending Enquiries and State the Current Supply.

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Bristol's Recording Pyrometer furnished with patented frictionless smoked chart recording system, especially valuable for processes requiring continuous heat treatment.
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High Speed Steel	High Speed Milling Cutters
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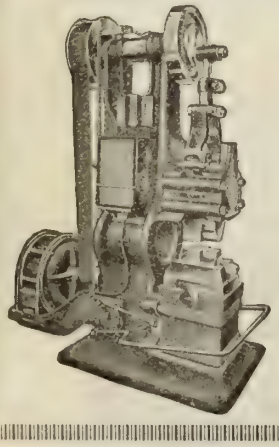

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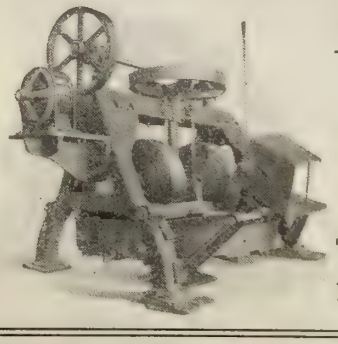

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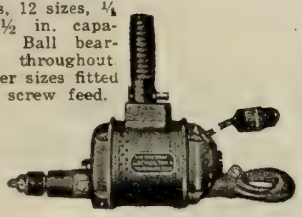

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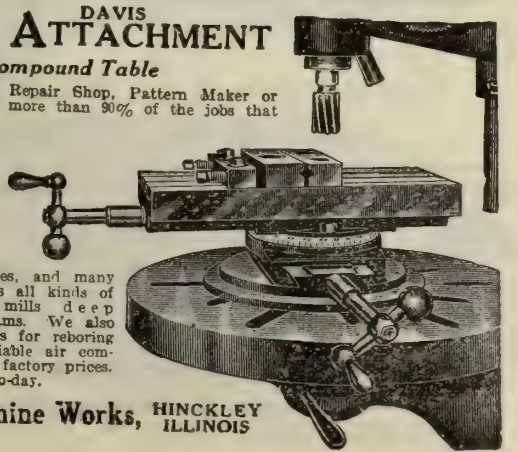

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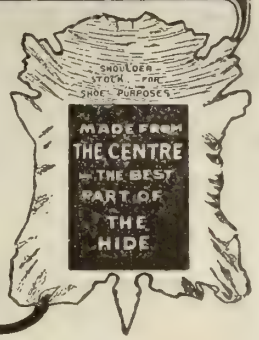

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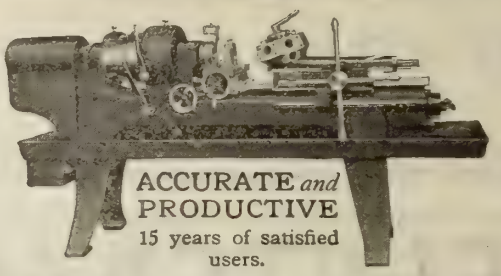

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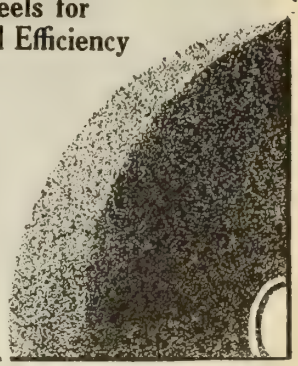

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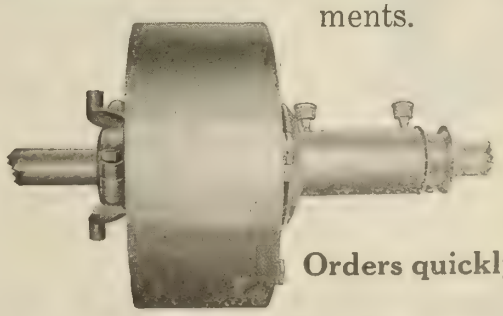

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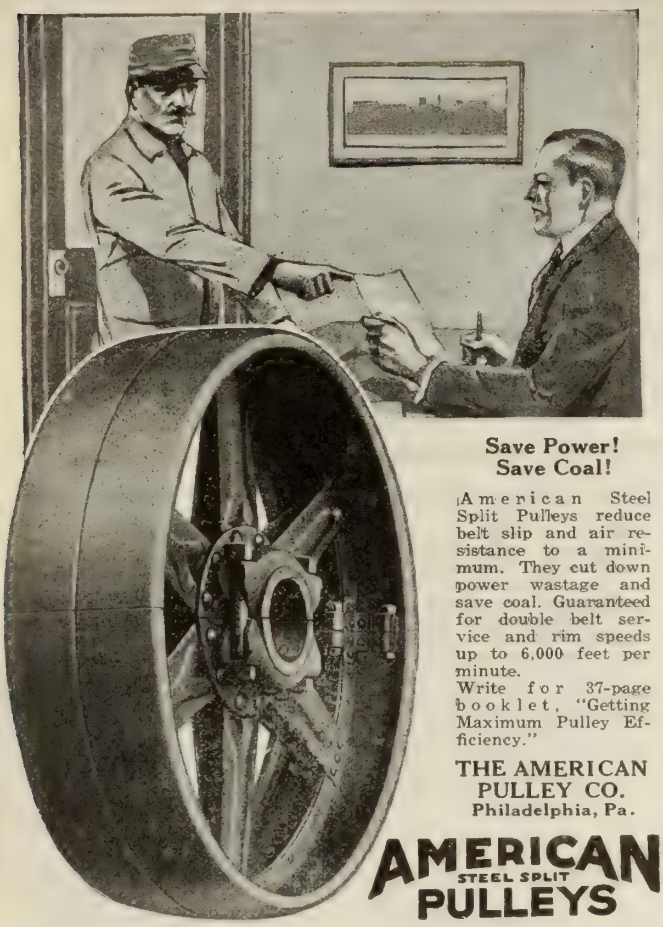

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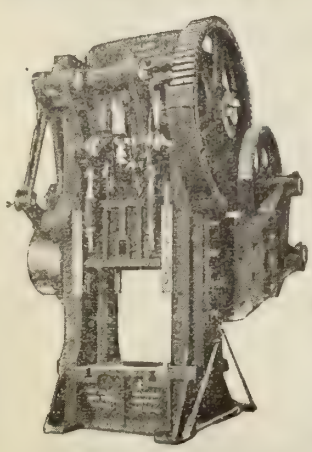

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BOLT CUTTERS AND NUT TAPERS
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Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES. PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Willliams & Wilson, Ltd., Montreal Que.

BUYERS' DIRECTORY

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co,, Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co., Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt. Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal. Que.
Williams & Wilson, Ltd., Montreal. Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blancke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

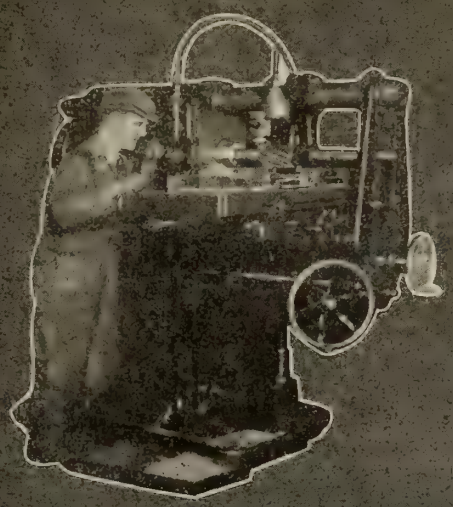
COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

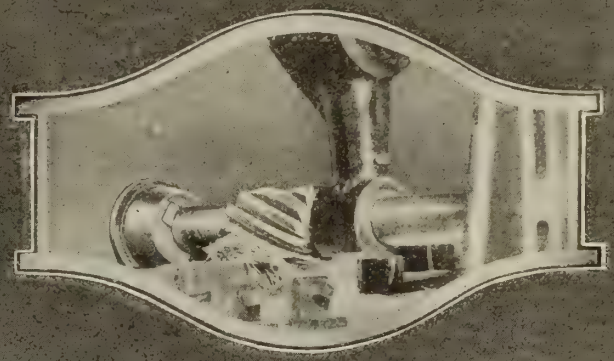
COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.





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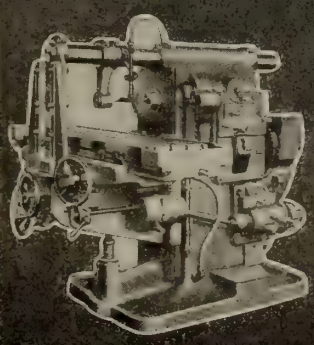
Results reveal more than words—for this reason, we suggest that you inquire in the different shops and judge by what you see and hear about the many accomplishments of

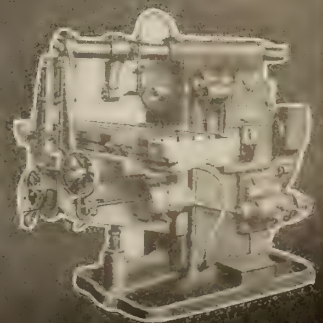
Brown & Sharpe Heavy Service Milling Machines

Then send for our Milling Machine Book which describes the construction of one of the most practical machine tools found in any modern shop.

Brown & Sharpe Mfg. Co.
Providence, R.I., U.S.A.



Brown & Sharpe Heavy Service Milling Machines



If interested tear out this page and place with letters to be answered.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found's & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Sprinfigeld, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Cann.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
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Wells Bros. of Can., Galt, Ont.
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DIES FOR BIT BRACE USE
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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, PIPE THREADING
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Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

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Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
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Kayser-Ellison & Co., Ltd., Montreal.
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Wells Bros. Co. of Can., Galt, Ont.

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Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

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Swedish Steel & Importing Co., Montreal.

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Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

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W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
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Niles-Bement-Pond Co., New York.
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Canadian Machinery Corp., Galt, Ont.
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Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
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John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
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Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
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Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
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Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Keystone Mfg. Co., Buffalo, N.Y.
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W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
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Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
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Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
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Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
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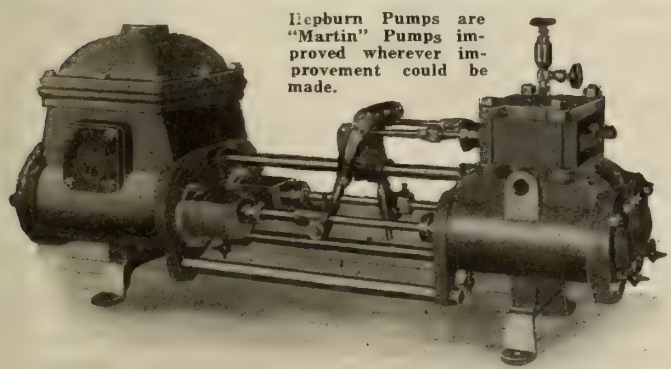

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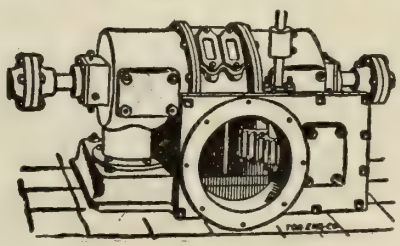

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National Machy. Co., Tiffin, Ohio.
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Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
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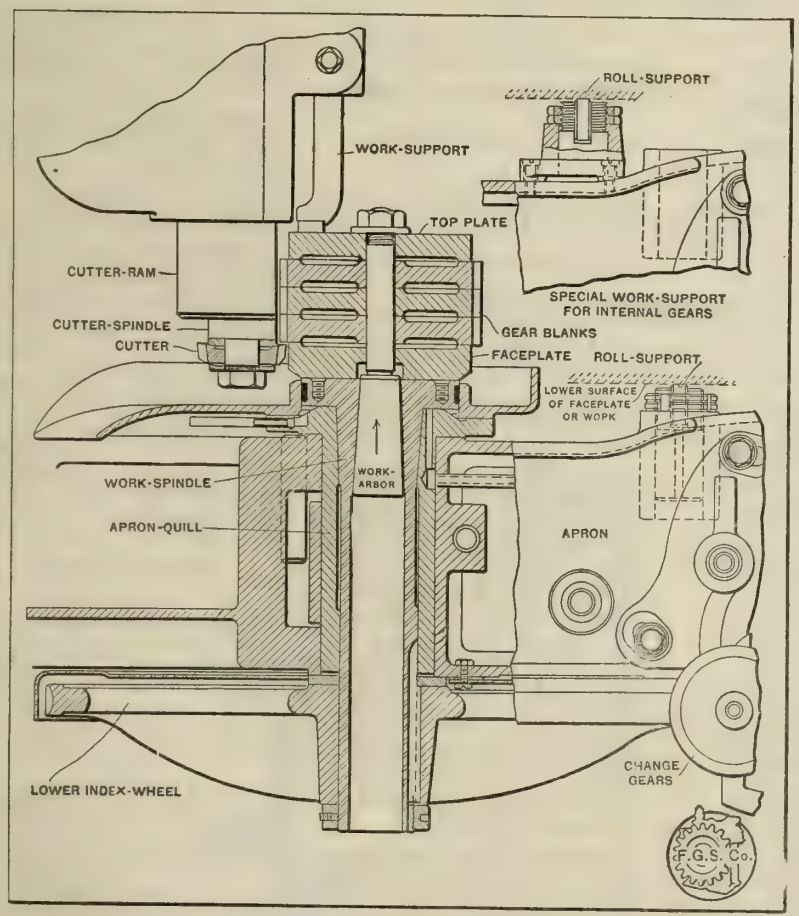
The cutting of accurate gears is not only a question of having an accurate machine and an accurate cutter, but is also a question of the proper application of basic principles in the machine itself.

Gears in which the teeth are not cut concentric with the holes are inaccurate. They are also noisy in operation.

Spur gears in which the teeth do not lie exactly parallel with the axis are also inaccurate and noisy.

In order, therefore, to cut accurate gears, it is necessary that the gears being cut be accurately and rigidly held.

The Gear Shaper method of supporting gears is unique in that the work can be clamped rigidly without springing the work-arbor; also the cutter does not deflect the work when the teeth are being generated.



Section through work-spindle showing rigid method of holding and supporting Gear Blanks.

The accompanying diagram illustrates this point very clearly. The work, it will be noticed, is clamped rigidly to a face-plate. All the arbor does is simply to center the work accurately and furnish the clamping medium.

The tighter the work is clamped, the more rigidly the arbor is held in the spindle, because it has a reverse taper. There is, therefore, no possibility of deflecting the work in cutting, as is the case with other processes where the work is supported by a long slender arbor.

One of the chief advantages of this unique method of supporting the work is that the work can be cut much faster and with a greater degree of accuracy than is possible by any other method.

It will pay you to investigate the many advantages of the Gear Shaper method of cutting gears, which is fully explained in the sixth edition of our general catalogue "Commercial Gear Cutting," copies of which are ready for general distribution to those interested. Simply send your request to—

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Springfield, Vermont, U.S.A.

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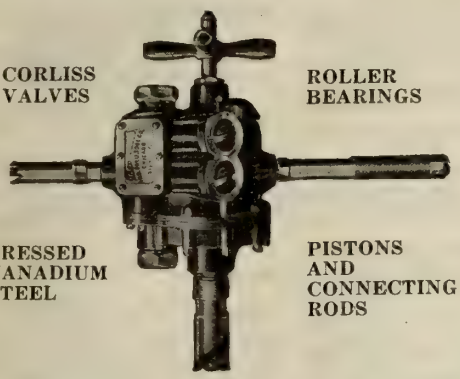

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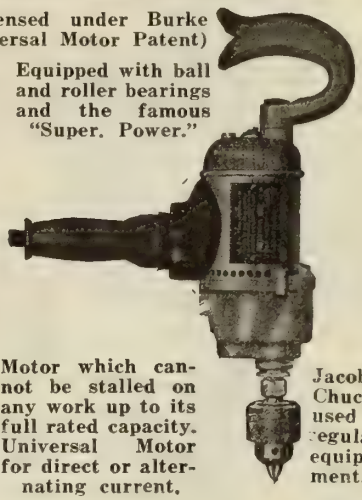

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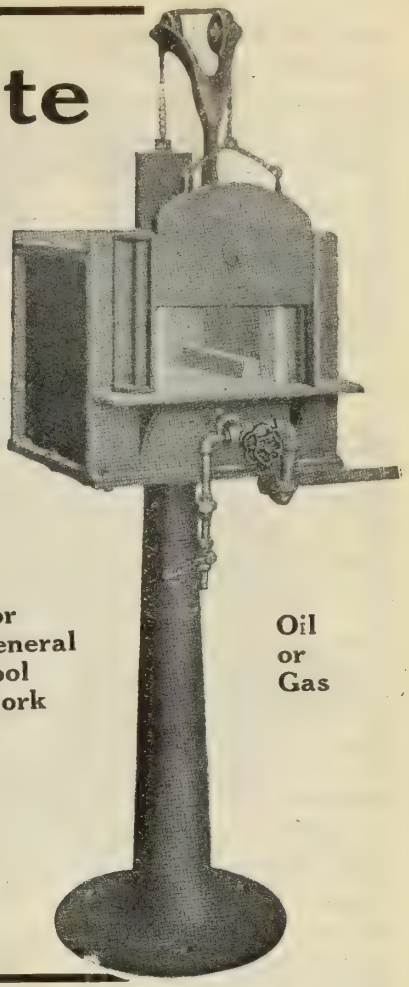

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Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H, Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Whitman & Barnes Co., St. Catharines.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

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REAMERS
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Blancke Co., L. C., New York City.
H. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

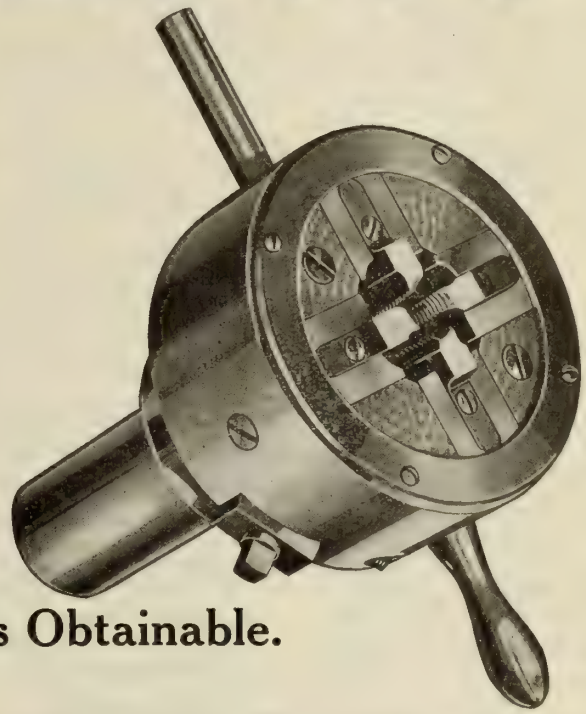
REAMERS, STEEL, TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, HAND
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

MODERN

Self-Opening Die Heads



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Moderns offer many advantages over any other die heads obtainable. They're simple in design—have few parts. They do not clog easily. May be quickly and easily cleaned WITHOUT DISMOUNTING, and without taking entirely apart.

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Modern's chief claim to favor is UNEQUALED ACCURACY. Chasers cannot change position during work. When set they are as rigid as solid heads. Chasers will not "rock," "cock" or "bell at the mouth."

Let us tell you more about these wonderful aids to accuracy and big production in threading operations. Send for bulletins.

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- —Universal Grinders
- —Internal Grinders
- —Chaser Grinders
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- —Collapsible Taps

MODERN TOOL CO.

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Detroit, Mich., 40 Larned St., East.
Cleveland, Ohio, Guardian Bldg.
Cincinnati, Ohio, 2 Greenwood Office Exch.
Export Dept., 2 Rector St., N.Y. City.

Canadian Agents: Rudel-Belnap Machinery Co., Ltd., Toronto and Montreal.
California Representatives: Herberts Machinery & Supply Co., Los Angeles and San Francisco.

If interested tear out this page and place with letters to be answered.

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Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

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American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RESPIRATORS
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Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
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Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
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Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

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Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

RODS, HIGH SPEED AND CARBON DRILL
Blancke Co., L. C., New York City.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROLLS AND TABLES
Elec. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

RUBBER MILL DRIVES
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md
Pittsburgh Crushed Steel Co., Pittsburgh

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW DRIVERS
Whitman & Barnes Co., St. Catharines.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

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Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Milwaukee Shaper Co., Milwaukee, Wis.
Rae Brothers, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
The Quickwork Co., St Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEET METAL ROLLING MACHINES
Peck, Stow & Wilcox Co., Southington.

SHEETS, NICKEL, RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHEARS, PLATE CUTTING, SLITTING
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL MACHINERY
Peck, Stow & Wilcox Co., Southington, C.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

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Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal.

SHEETS, CRUCIBLE, CAST
Kayser-Ellison & Co., Ltd., Montreal.
Ralph B. Norton, Agent, Montreal.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

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Can. Link-Belt Co., Toronto, Ont.
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Peck, Stow & Wilcox Co., Southington, Conn.

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Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.
Jas. Steele, Ltd., Guelph, Ont.

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Is the Alien a Menace?

IN the October issue of MACLEAN'S MAGAZINE a strong presentation is made of the reason why the people of the West are against further foreign immigration.

"The Menace of the Alien" depicts the foreign problem in the Canadian West as it exists to-day, and shows every one of us why we must Canadianize our Ruthenians, Austrians, Slovaks, and our fifty-seven other varieties before we allow any further "unrestricted" immigration.

This article is written by a member of MACLEAN'S MAGAZINE staff who has just returned from a careful, personal investigation of the situation. Shall we have a "White West?" Many Westerners are demanding it. Are the aliens to swing labor into the bosom of the O.B.U.? It is being done—and what must we do to stop it?

The "inside" story of the routing of the Drumheller miner aliens by returned Canadian war veterans is here hold by MACLEAN'S for the first time. What leadership must be substituted for the O.B.U. leadership of these foreigners?

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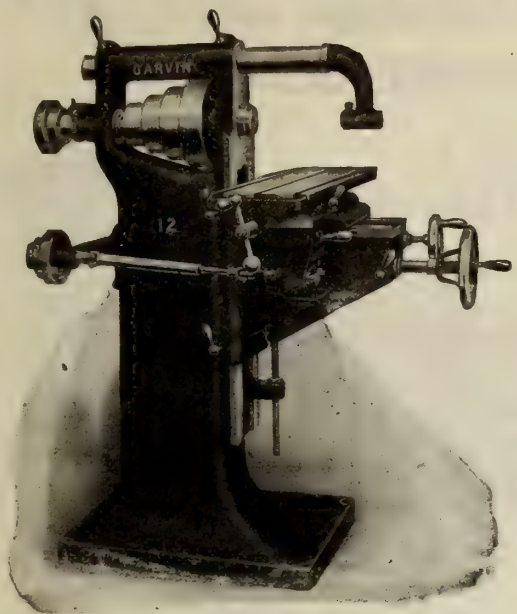

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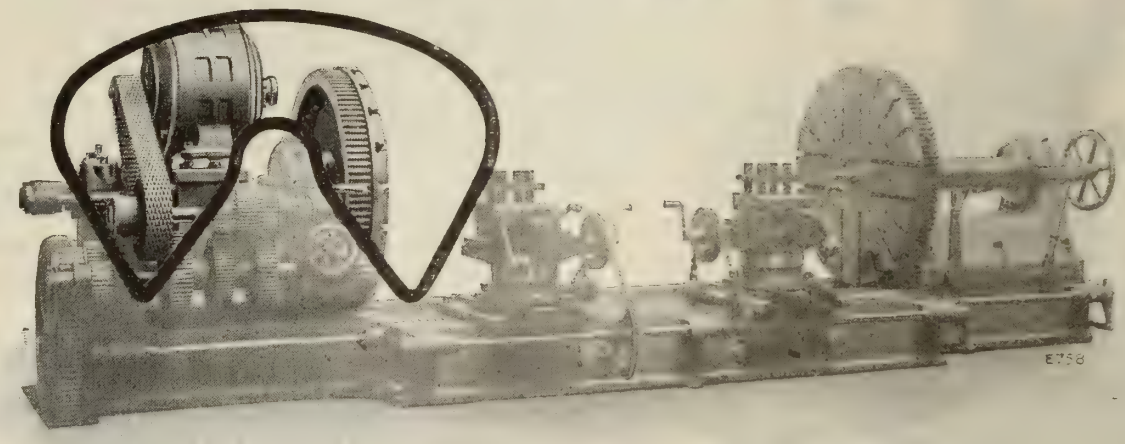

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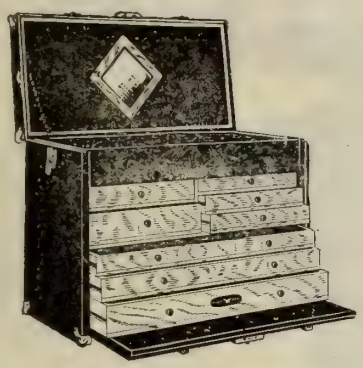

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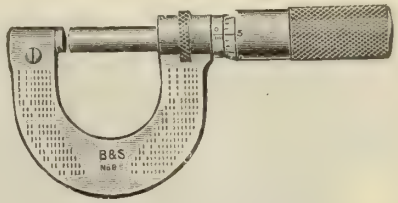

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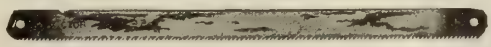

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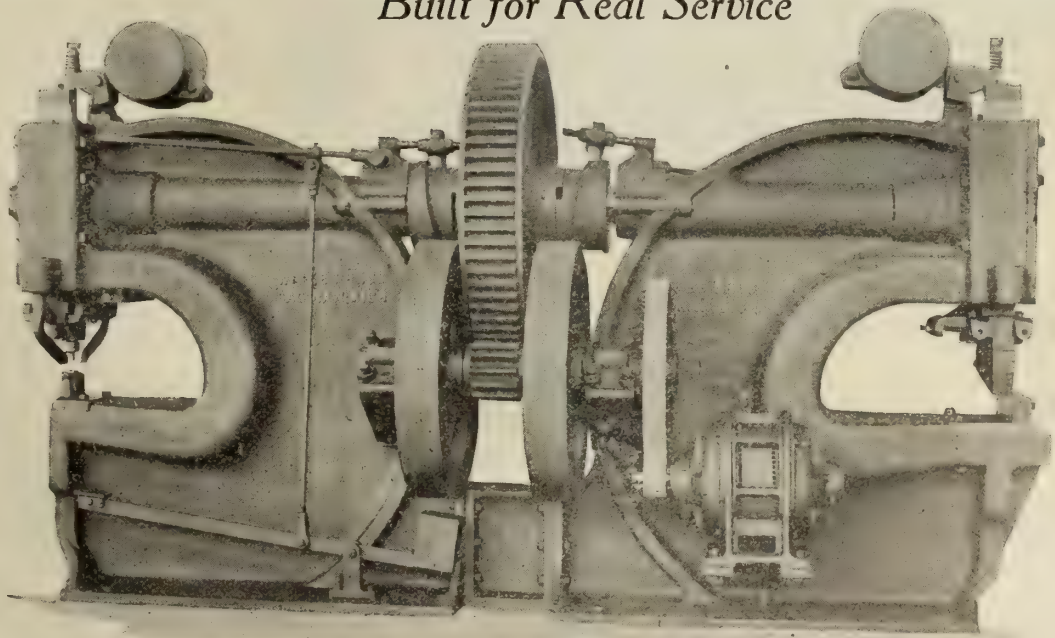

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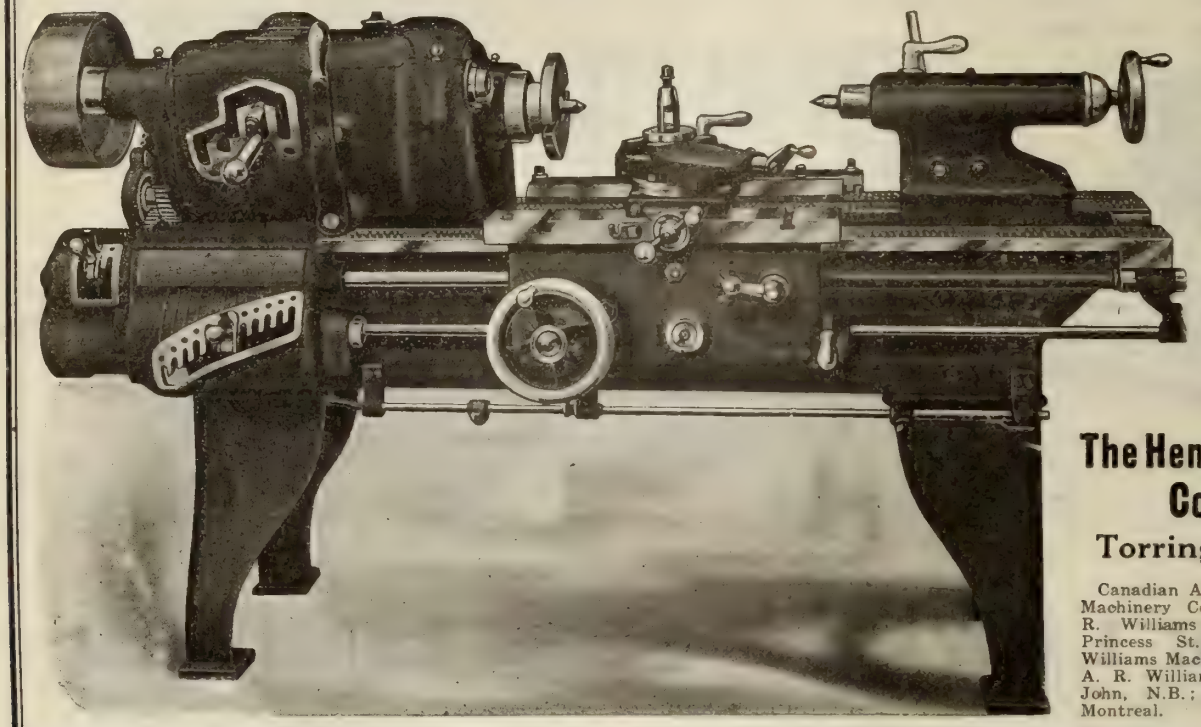

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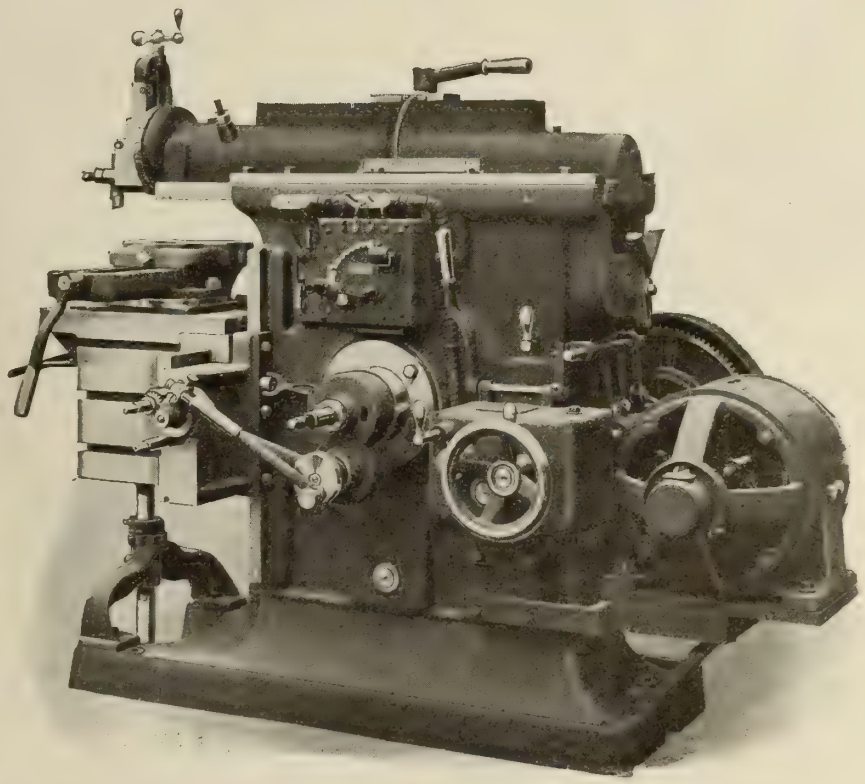

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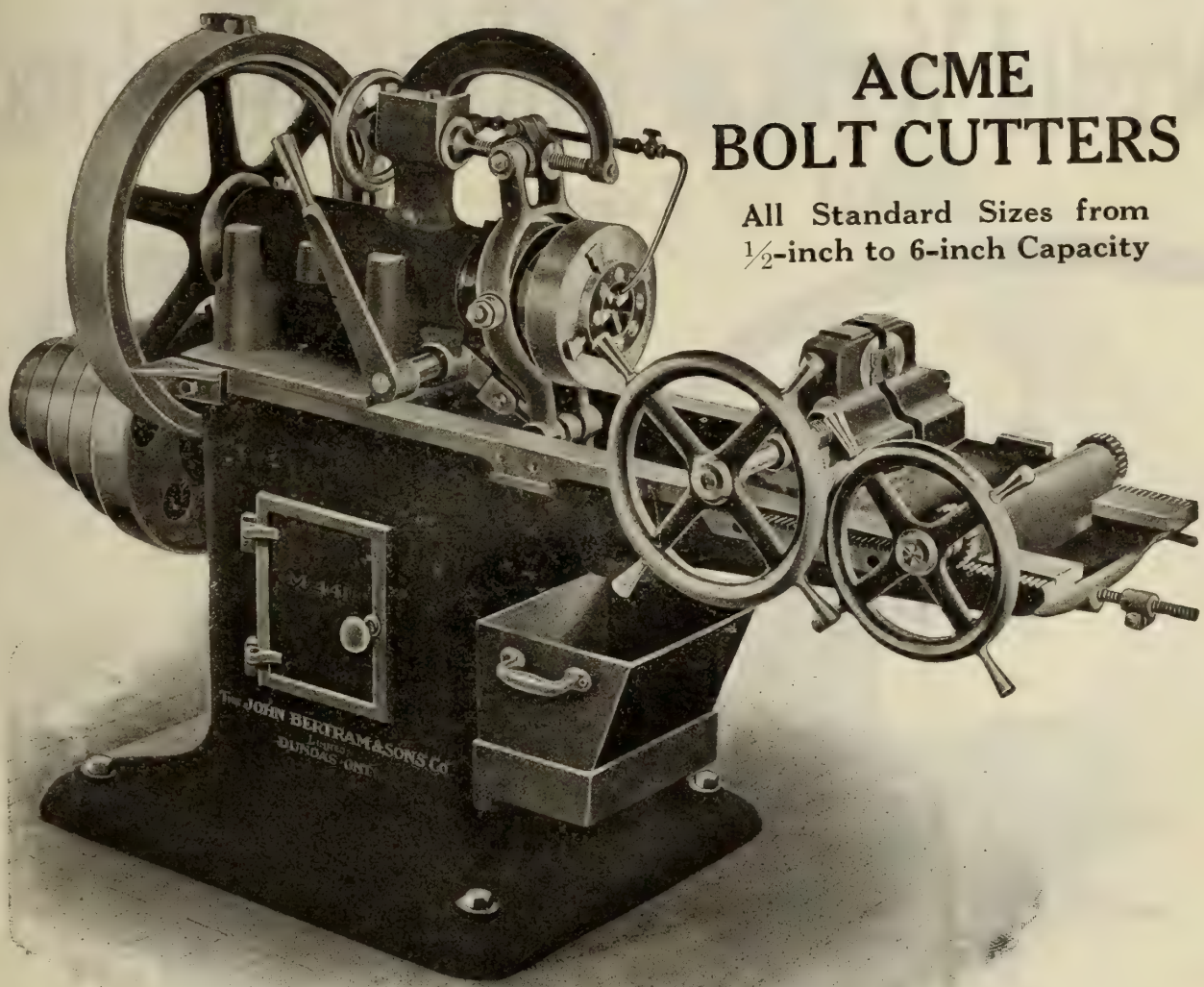

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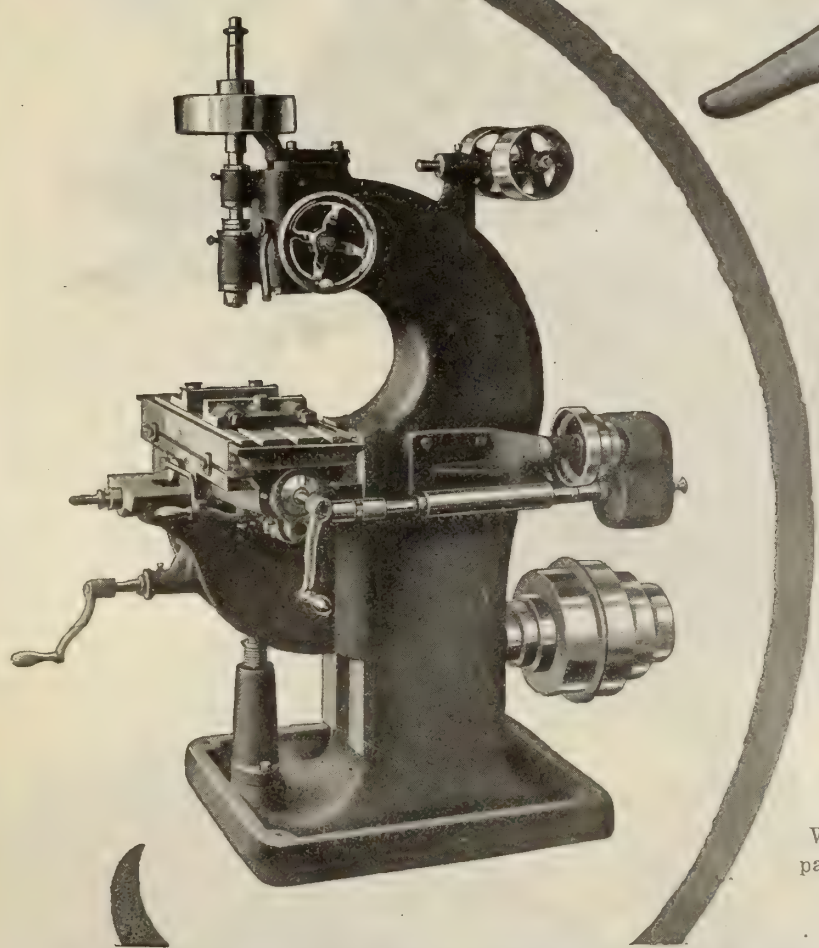

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General View of the Plant of the Algoma Steel Corporation from the Waterfront.

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼" x 1¼", ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14" wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process. and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

The following are the sections which will be rolled:---

ANGLES—Equal Leg—
6 x 6"—5 x 5"—4 x 4"
3½ x 3½"—3 x 3"
2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

CHANNELS—
15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
2 11/16 x 3 x 2 11/16 x ¼"
2¾ x 3 1/16 x 2¾ x 5/16"

ROUNDS—
All sizes from ½" up to and including 4".

SQUARES—
All sizes from ½" up to and including 3".

FLATS—
All sizes from 1 x ¼" up to and including 14" wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

PIG IRON—
Machine cast FOUNDRY MALLEABLE and BASIC.

SULPHATE OF AMMONIA.
NITRE CAKE.

For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.
Your enquiries and business will be appreciated.

ALGOMA STEEL CORPORATION

SAULT STE. MARIE, ONTARIO

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Reamers and Milling Cutters

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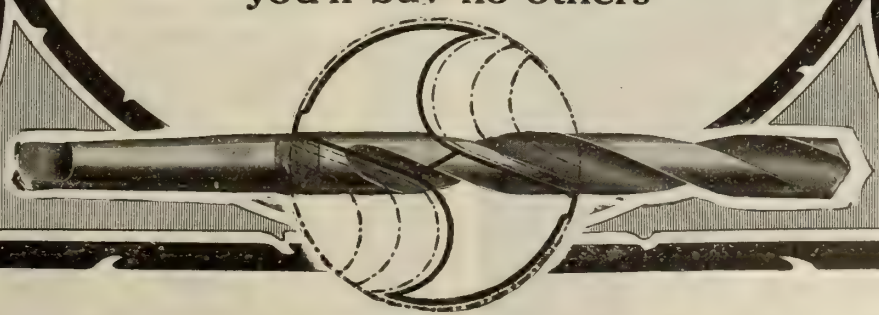

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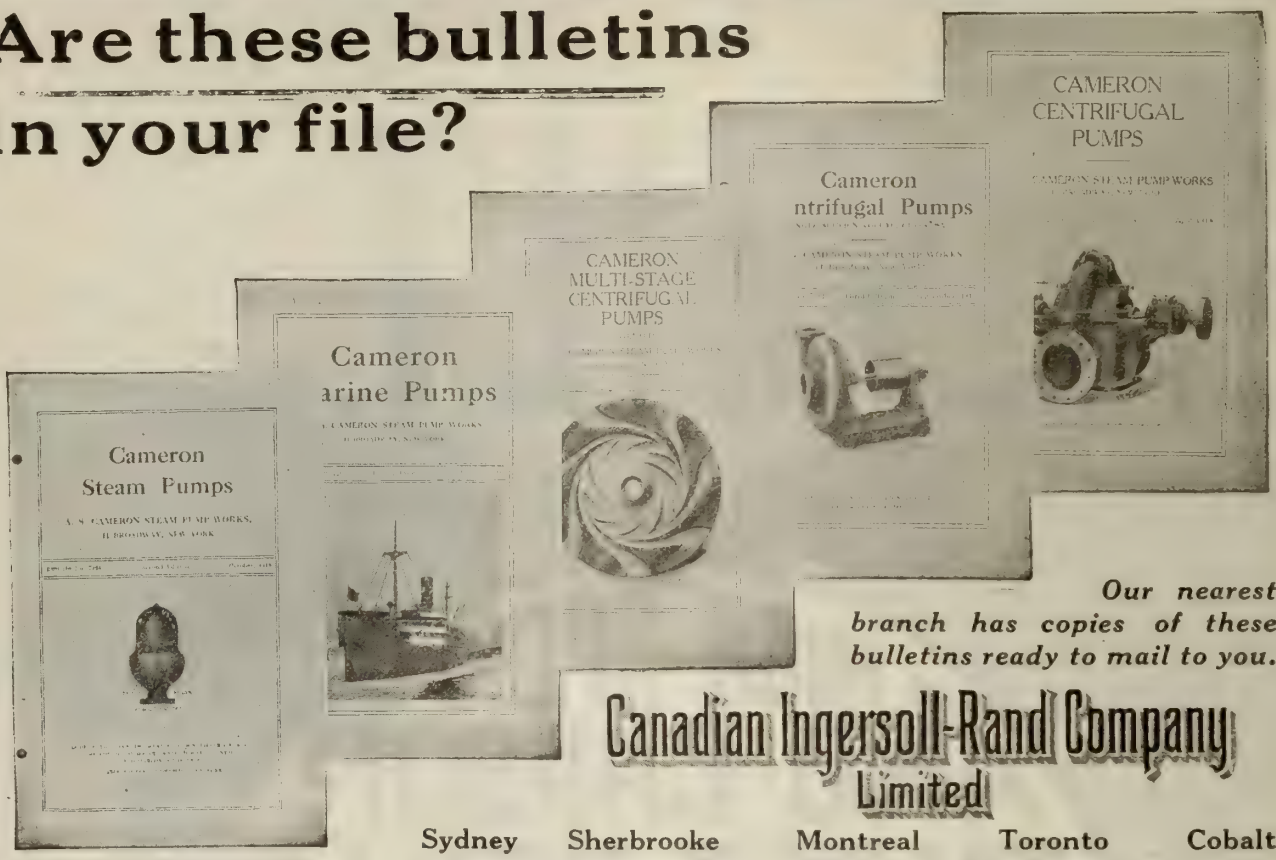

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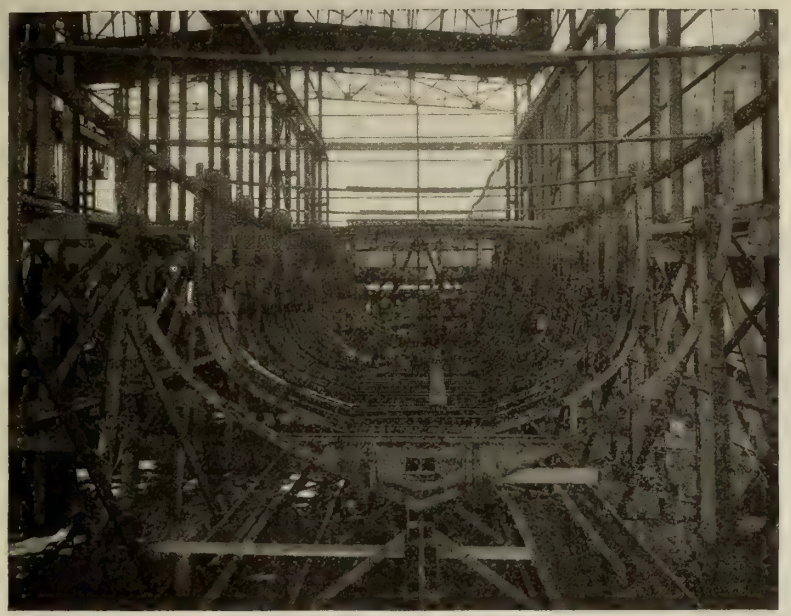

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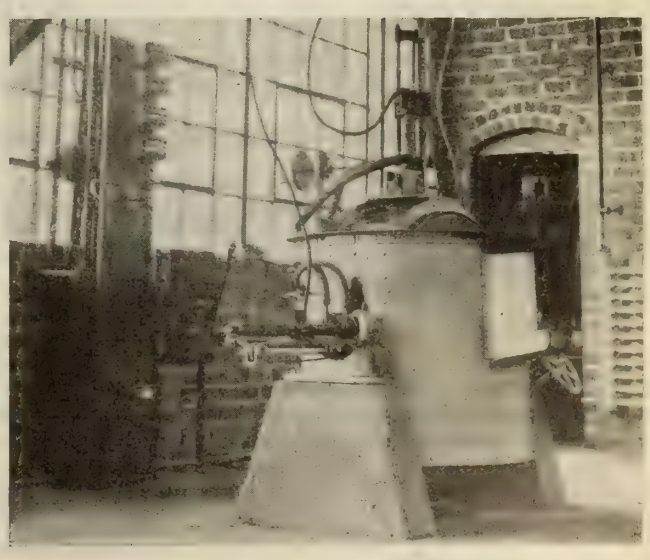

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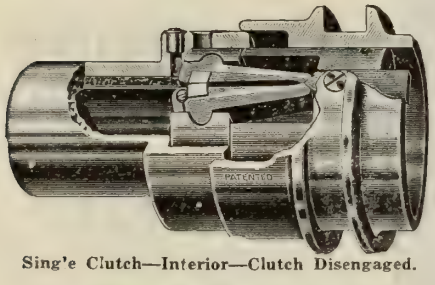
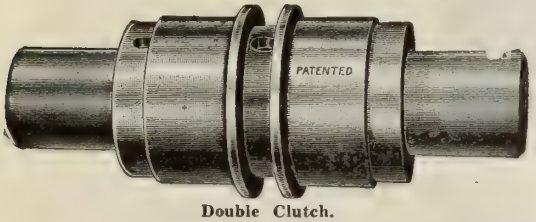
The Clutch for Your Machine Made to Order



Sing'e Clutch—Interior—Clutch Disengaged.



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A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

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send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

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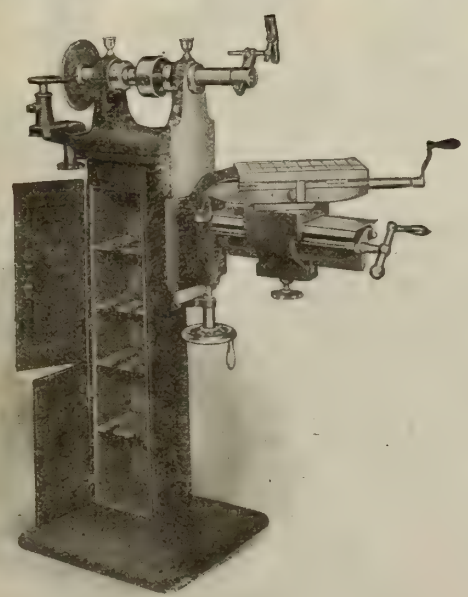

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From Cutters and Tools Kept Sharp on

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Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14″ x 6″; SURFACES, 9½″ x 6″

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We have followed out the very best practice in the design of these millers and the workmanship is only of the highest grade.

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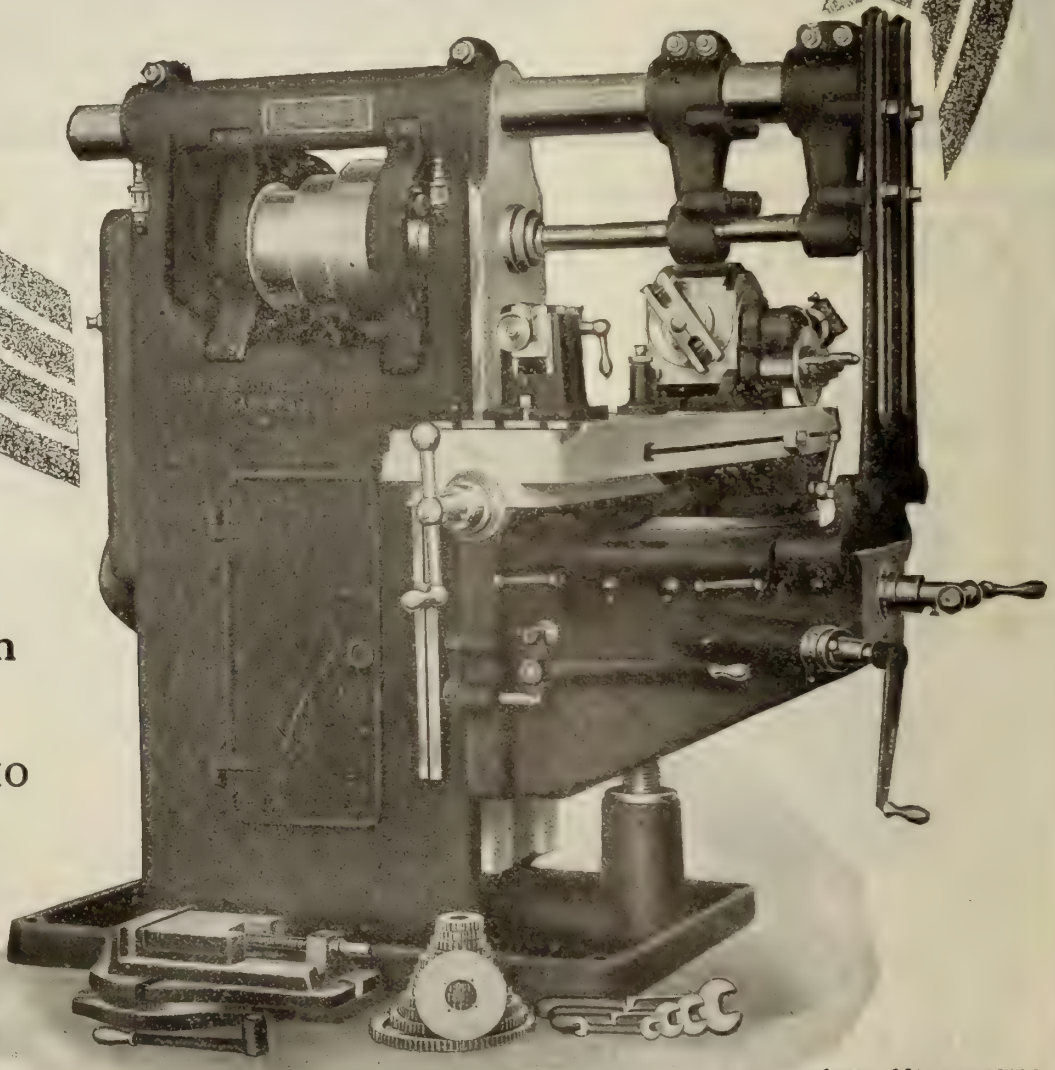

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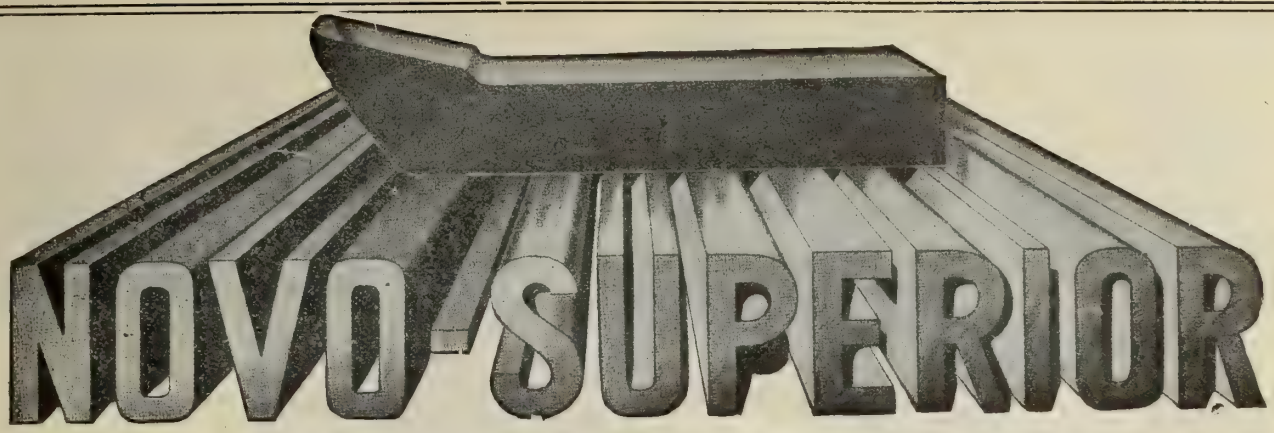

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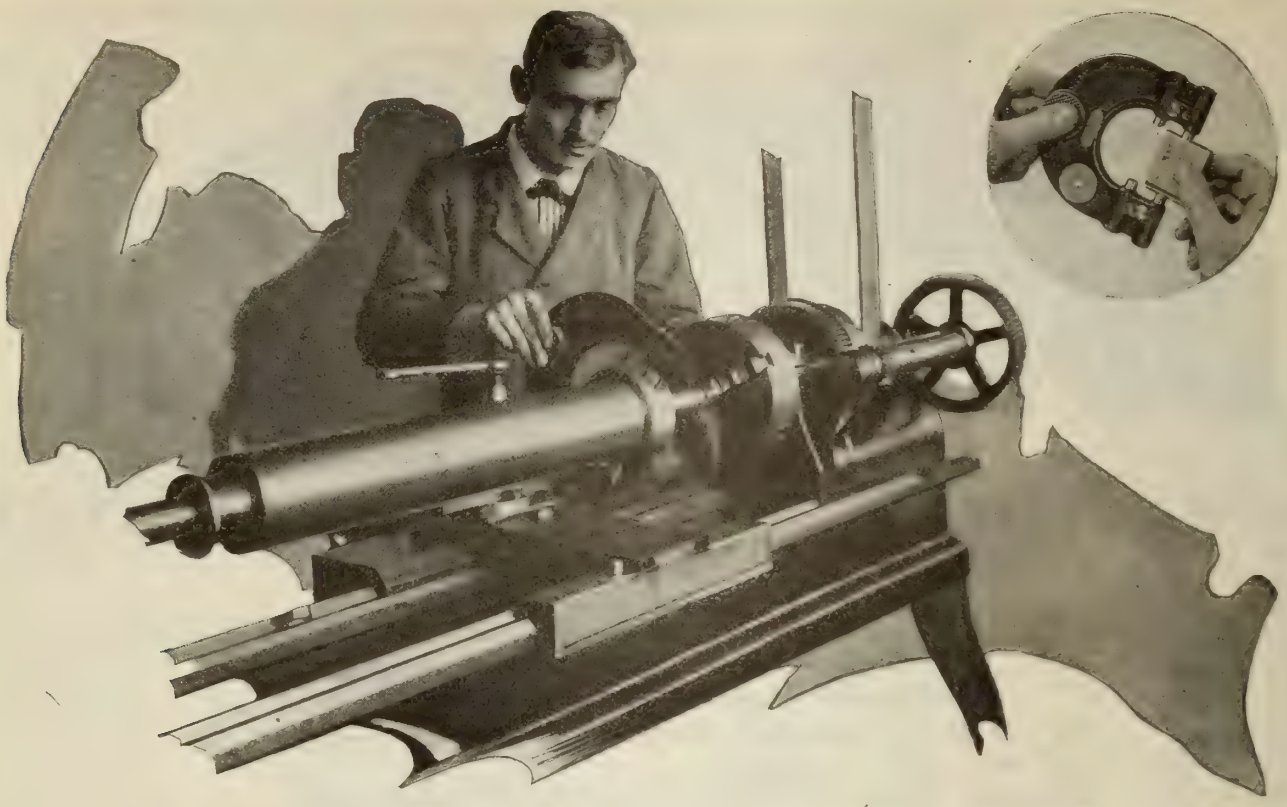

Mechanics Prefer DEFINITE Limits

Mechanics prefer to work between *definite* limits. They want to know *definitely* how large a dimension can be and how small. Ask them and see for yourself.

It may have been all right in the old days to tell a mechanic to "make it ¾ in. scant," "¾ in. full," or "¾ in. exactly," but such instructions are no good to-day.

The modern up-to-date mechanic wants *definite* limits, and when he has these, he can meet any reasonable demands for greater production.

It's the uncertainty of knowing just what is meant by "¾ in. full," "¾ in. scant," or "¾ in. exact," that holds back big production. It puts the whole proposition up to the individual judgment of each man—and no two men think exactly alike.

The way to get production is to find out how wide the limits can be—adjust Johansson Snap Gages to these limits—and keep the men supplied with the work. When this is done, the job gets comparatively easy—a mere matter of keeping somewhere between the high and low limits.

Johansson Snap Gages give the limits in such a definite manner that an unskilled blind man would know when his work was between them. There's no "reading" anything or adjusting anything. It's merely a little game of "Go" and "No Go."

Twenty-one Johansson Adjustable Snaps give every possible dimension from 0 in. to 12 in. New price list (No. 3) now ready.

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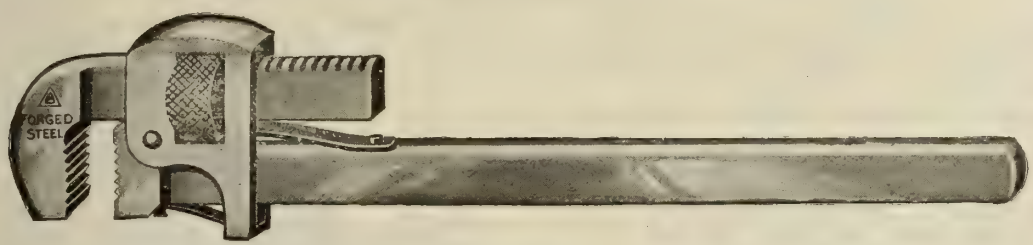

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Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46
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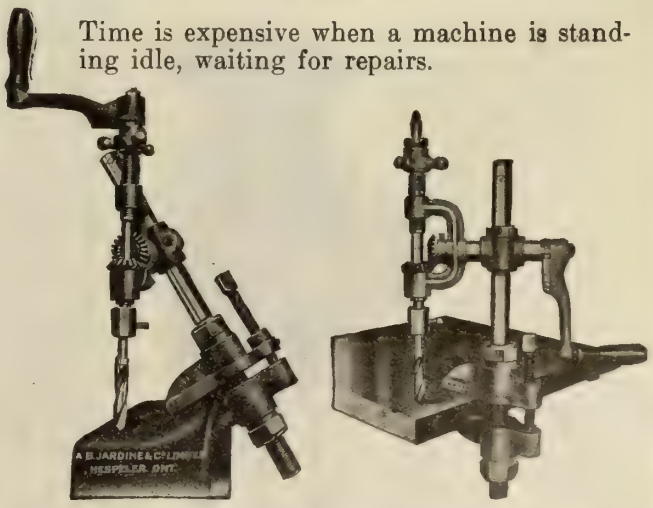
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

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Sold by all Machinery and Supply Houses

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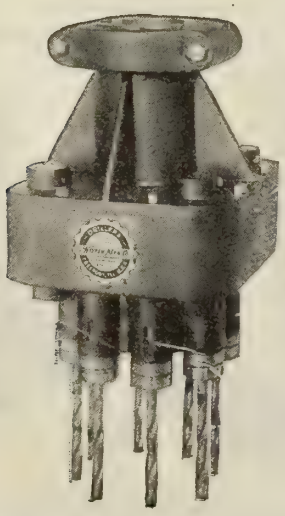

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Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.

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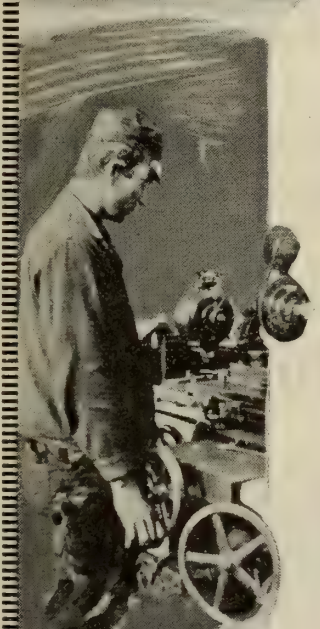
You Can Trust Your Tools to an Aloxite Wheel

WHEN you put a reamer, cutter, lathe tool, a drill or any tool on an Aloxite Wheel, you have a feeling of confidence.

You know you can trust your precious tools to an Aloxite Wheel because it cuts so clean, free and cool. There isn't any of that rasp and drag that creates undue heat to draw the temper.

And Aloxite Wheels hold their shape thus insuring accuracy.

They require comparatively little dressing and last long enough to be a real economy.



Aloxite Tool Grinding Wheels can be had in all standard shapes and sizes for all standard machines—or in any special shapes within the possibility of manufacture.

It is possible that our service department can make your grinding more profitable.

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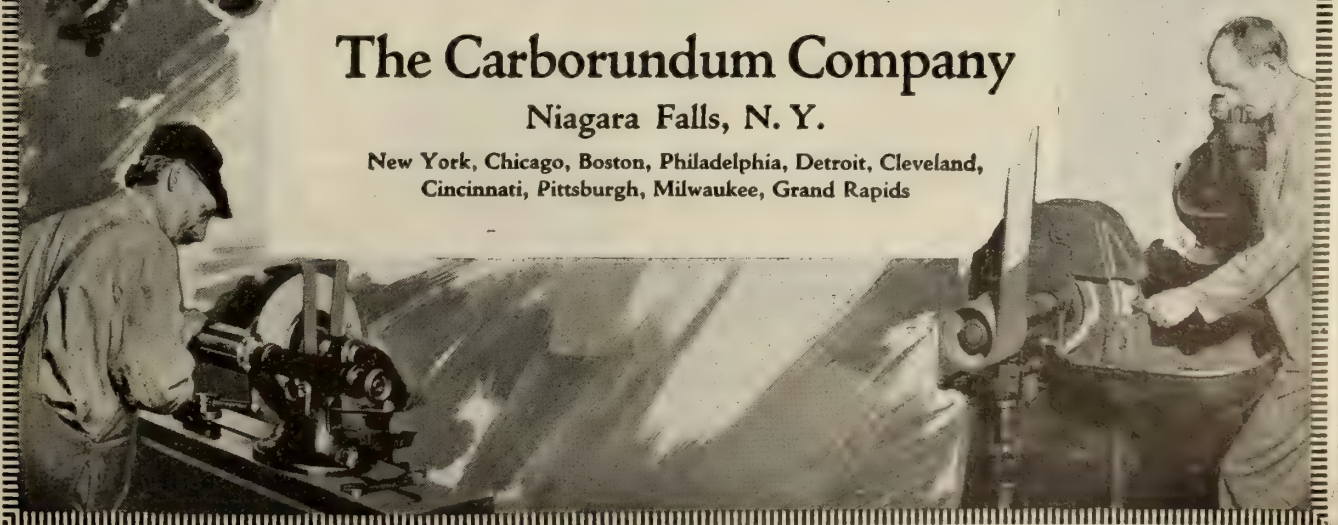

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guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
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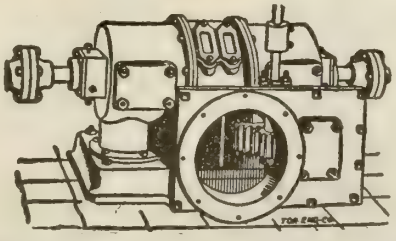


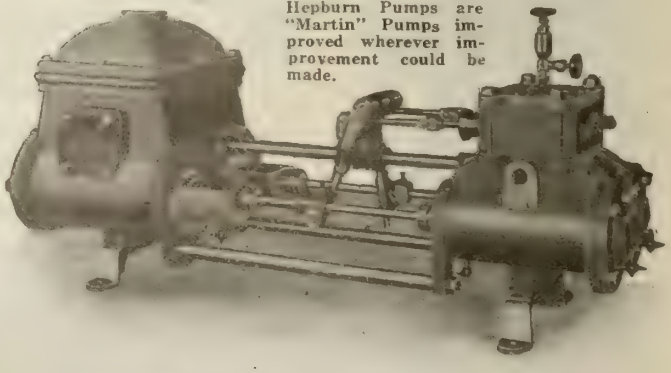
Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.
Can supply complete equipment, including flume, turbine and power transmission.
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

THE J. C. WILSON MFG. CO.
LIMITED
BELLEVILLE, ONTARIO

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

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18-60 Van Horne Street Toronto, Ontario

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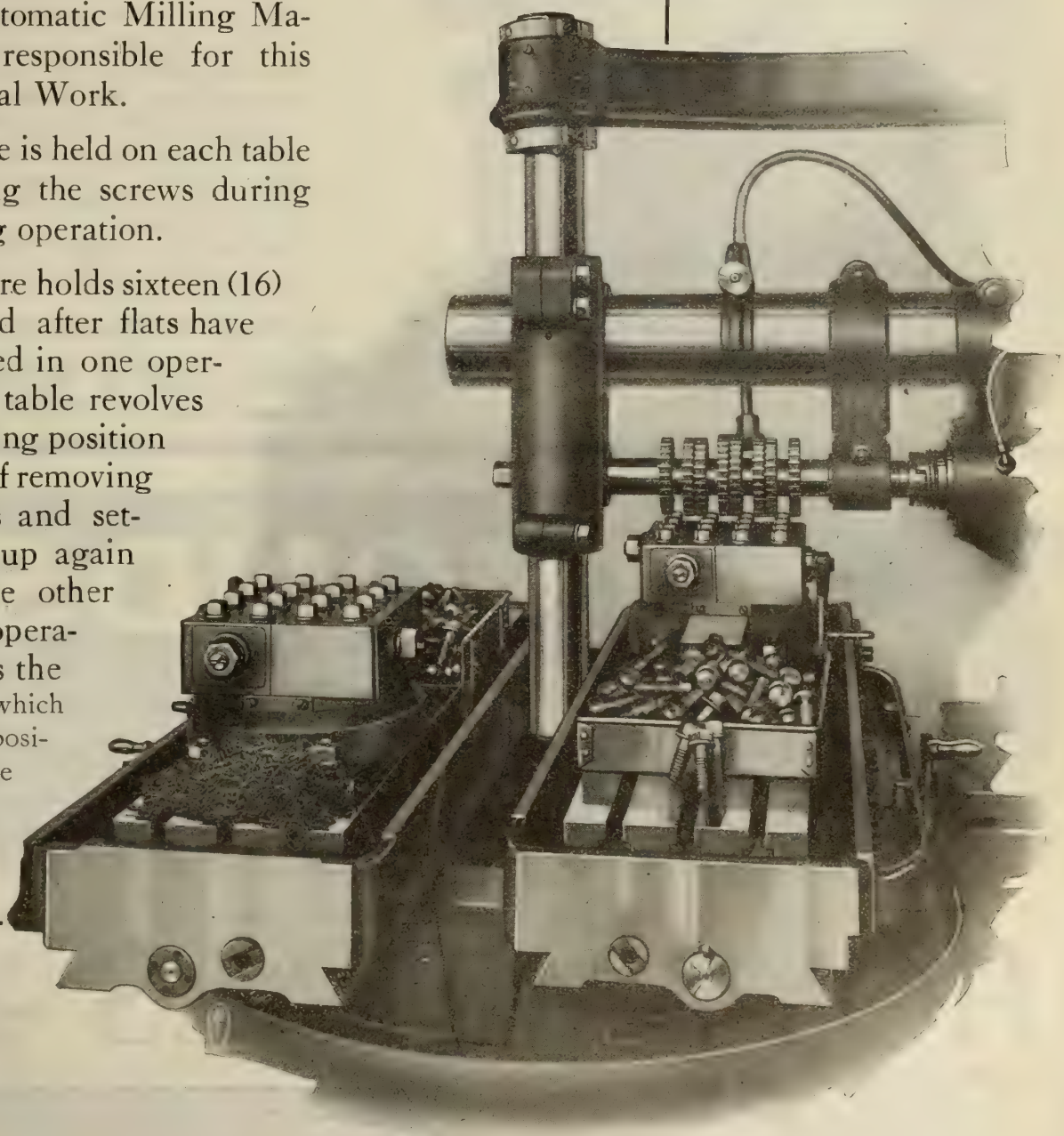
Square Head Screws

The Potter & Johnston manufacturing Automatic Milling Machine is responsible for this Economical Work.

One fixture is held on each table for holding the screws during the milling operation.

Each fixture holds sixteen (16) screws and after flats have been milled in one operation—the table revolves to its loading position—instead of removing the pieces and setting them up again to mill the other flats—the operator indexes the fixture 90° which brings it in position for the next operation.



Investigate the method

Bulletin No. 40

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

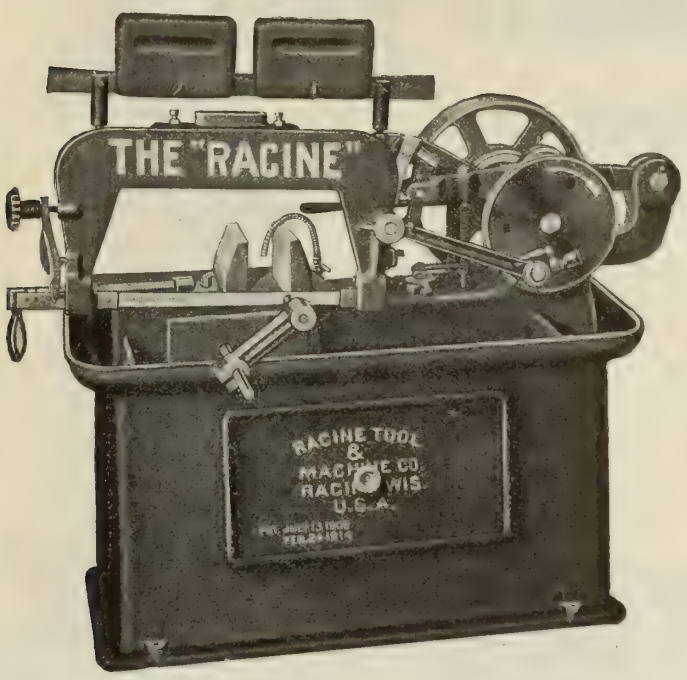
ROELOFSON MACHINE & TOOL CO., LIMITED

Head Offiee: 1501 ROYAL BANK BUILDING, TORONTO, CANADA
Works and Warehouse: GALT, ONT., CANADA

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue, - RACINE WIS. U.S.A.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited.
ST. JOHN MONTREAL VANCOUVER

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
Annual sales over $5,000,000.

Hoyt Metal Co., Toronto
New York, N.Y. London, Eng. St. Louis, Mo.

The machinist says:

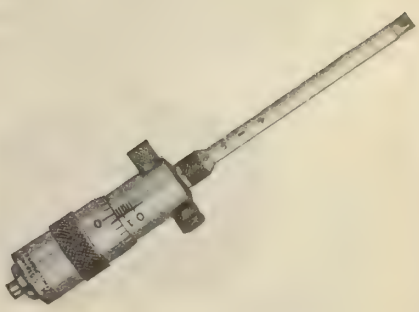
"Sure I'm using them, the same as most of the men in the shop are doing. Some of the Starrett Tools in my kit, I bought when I was an apprentice.

"Y'see, it's like this. We got the habit when we were kids. We saw the older men, the ones that were doing the finer work, preferred Starrett Tools because they knew they were accurate, and we copied after 'em—just like our kids are doing today.

"How's that? No, I wouldn't go so far as to say that Starrett Tools by themselves will make a good machinist, but I'll say this—Starrett Tools will make it a lot easier for any machinist to do good work.

"Yes, I've got one of their 'Starrett Data Books for Machinists,' and believe me, it saves a lot of time and mistakes. If I want to know a decimal equivalent, a taper dimension, the speed of a milling cutter, or something about materials, I don't have to guess or ask — I just look in the book and find out. It set me back seventy-five cents at the hardware store, but it saved me a blame sight more than that in the first week."

Starrett Tools



The L. S. STARRETT COMPANY

THE WORLD'S GREATEST TOOLMAKERS

Manufacturers of Hack Saws Unexcelled

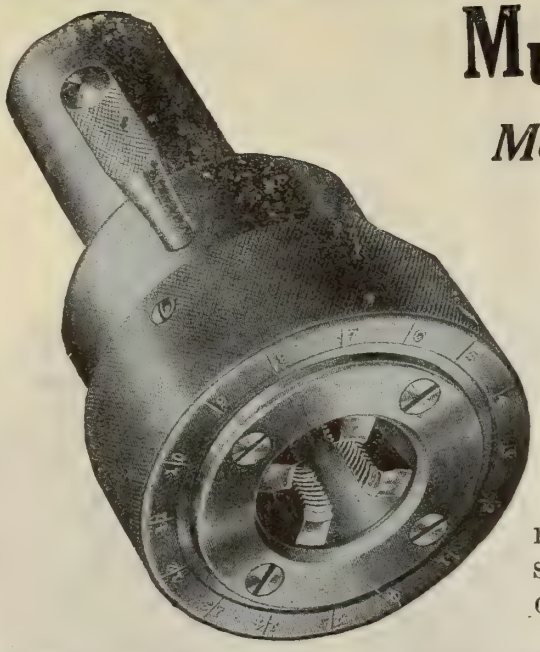
ATHOL, MASS.

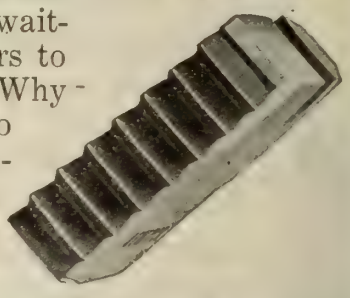
The utility and convenience of Starrett Tools are second only to their accuracy. Catalog No. 21"3" sent free on request.

42-980

Murchey Chasers

Mean Quick Deliveries





Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?

Send for a Murchey Tap or Die on approval and give it a trial. You will then secure actual proof of its value to you.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne,
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France

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We've been Manufacturing

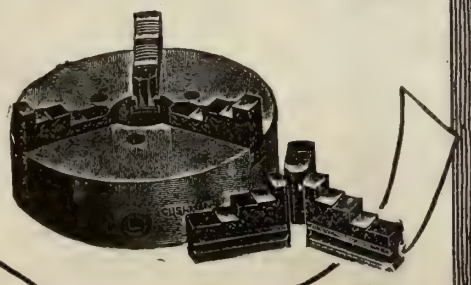
Nothing but Chucks and Their Accessories

FOR NEARLY 60 YEARS

AND OUR PRODUCTS SHOW IT

Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

Let us send you our catalogue.
Cushman Chuck Co., Hartford, Conn., U.S.A.



B-T THREAD LEAD INDICATOR

Exit—Spoiled Parts

Did you ever have to scrap a threaded part because of incorrect measurement in lead? Were you ever forced, during a rush job, to thread a part over again, because it didn't fit as it should?

B-T THREAD INDICATORS

enable you to get the right thread instantly and maintain a constant check upon it. They will detect errors of one-thousandth of an inch—can be used for testing odd and even pitches, as well as internal and external threads.

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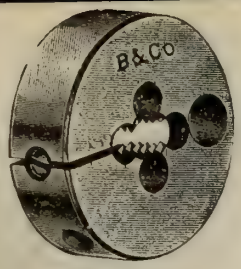

Butterfield

Taps, Dies, Reamers, Drills, Milling Cutters

Butterfield quality gives the Maximum returns on your investment.

BECAUSE

It ensures **clean and accurate cuts** and will duplicate the work over a long period of use.

Butterfield Quality is the result of 35 years' continuous effort to keep our product distinctly in the lead from the standpoint of efficiency and economy.

SEND FOR OUR CATALOGUES. Catalogue Seventeen covers Taps, Dies and Reamers. Catalogue "R" covers our line of Twist Drills, Gear and Milling Cutters.

Butterfield & Co.
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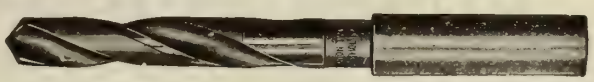
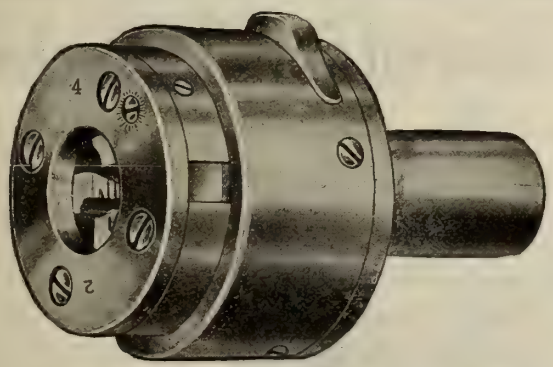




H&G Die Heads

are of small outside diameter compared with the size of work they do.

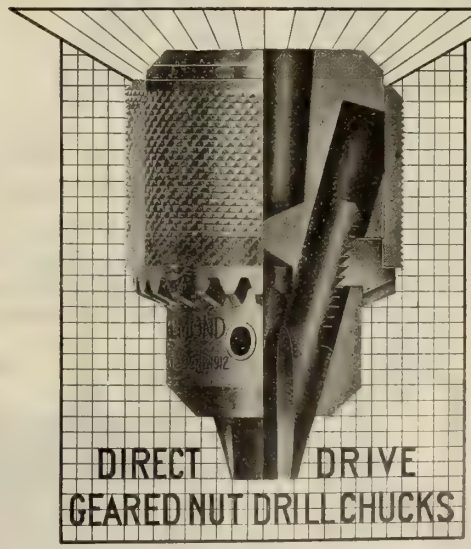
The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

ALMOND



TEETH cut on the nut giving DIRECT DRIVE and the hardened steel Pinion Bushings which prevent wear, insure long life.

OTHER ALMOND PRODUCTS
LATHE CHUCKS, RIGHT ANGLE TRANSMISSIONS, MICROMETER CALIPERS, FLEXIBLE STEEL TUBING

T. R. Almond Mfg. Co., Ashburnham, Mass.

Customers Are Satisfied

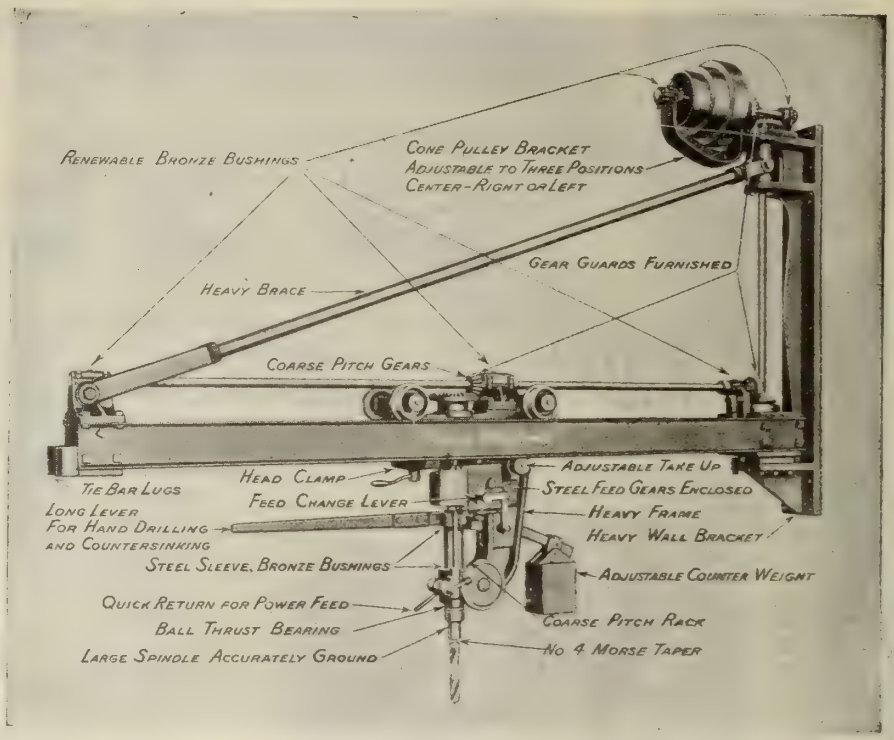
with the performance of this machine in their works. A recent letter to us states: "Regarding the WALL RADIAL DRILL, this is operating every day, and we are more than pleased with the results we are getting from the use of this tool. In all probability we will install additional ones later on." Our deliveries are getting further away each day. Better take advantage of the present conditions.

Want our detailed bulletin? You'll be interested in noting the construction of this machine, as given in same.

MADE IN FOUR STANDARD SIZES.

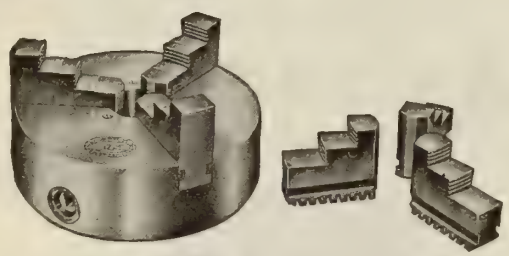
Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue Dept. B **BOSTON, MASS.**



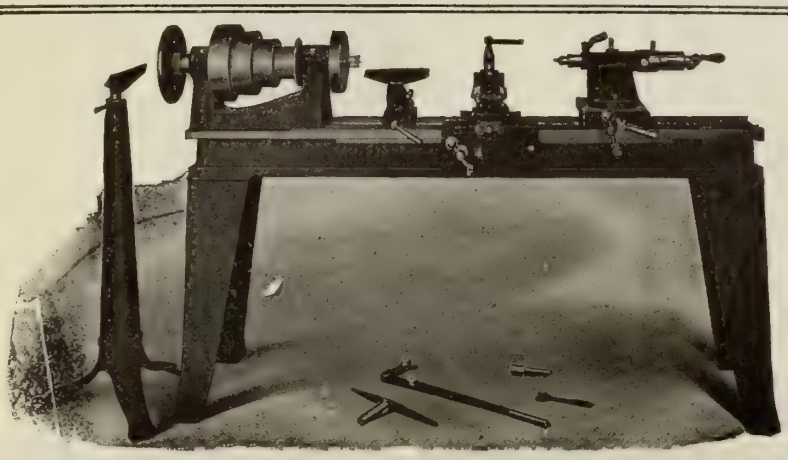
No. 153 with Two Sets of Jaws.

Union Geared Scroll Chucks

Have many points to recommend them. SOLID BODY —Gives strength and rigidity. WEIGHT—All parts are heavy and strong, and reinforced where necessary.

QUALITY OF MATERIAL—Best that can be procured.
LAST AND BEST OF ALL—ACCURACY. Union Chucks are Accurate.

UNION MANUFACTURING COMPANY - New Britain, Conn., U.S.A.
26 Cortlandt Street, New York **Makers of a Complete Line of Chucks**



A Favorite—

Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY
EVERETT, MASS., U.S.A.

Thor

CHIPPING HAMMERS

Drilling in concrete with a size D hammer with a hexagon nozzle. Will drill a hole one inch in diameter, at the rate of one inch per minute.

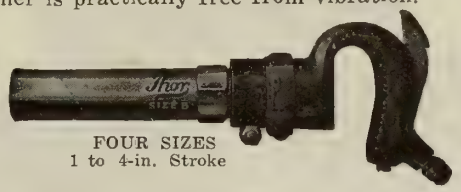
Thor Predominates wherever chippers are used because:

1st. The main valve is large in size and durable, being of the balanced type and having a bearing surface of three square inches.

2nd. Two square inches of the bearing surface retain the lubrication constantly, as no air passes over to blow the oil off.

3rd. The handle is equipped with a self-seating throttle valve, which eliminates all leaks.

4th. The barrel and all working parts are hardened and ground and the hammer is practically free from vibration.



FOUR SIZES
1 to 4-in. Stroke

Riveting Base Plates with Size B hammer. Let our service engineer call at your plant and explain the various uses to which these hammers can be adapted, and how to obtain the best results on your particular work.

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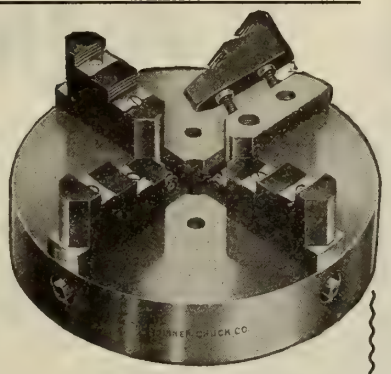
SKINNER CHUCKS



Over 30 years of satisfactory service have placed these chucks where they belong—

On many of America's best machine tools—

In many of the better metal working plants of the world—

In the highest esteem of thousands of operators.

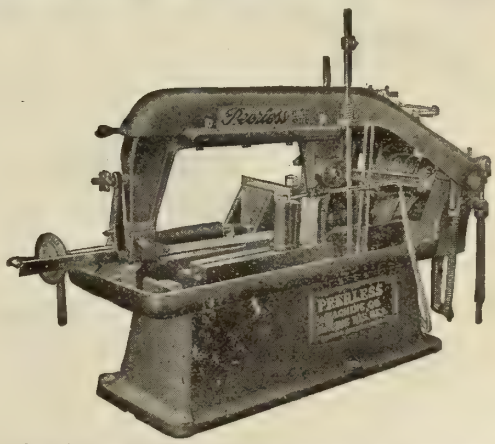
If you use chucks, investigate the Skinner line. It will pay you,

THE SKINNER CHUCK CO.

New Britain, Conn.

New York Office: 94 Reade St.
San Francisco Office: Rialto Building
London Office: 139 Queen Victoria St., London, E.C. 4

Would you like to have us prove that *Peerless* HIGH SPEED Machines do 50 to 100% more work



The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

The Balance Lift of the Peerless

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

The Peerless assures you the peak of production at very lowest cost. Write for full details.

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN

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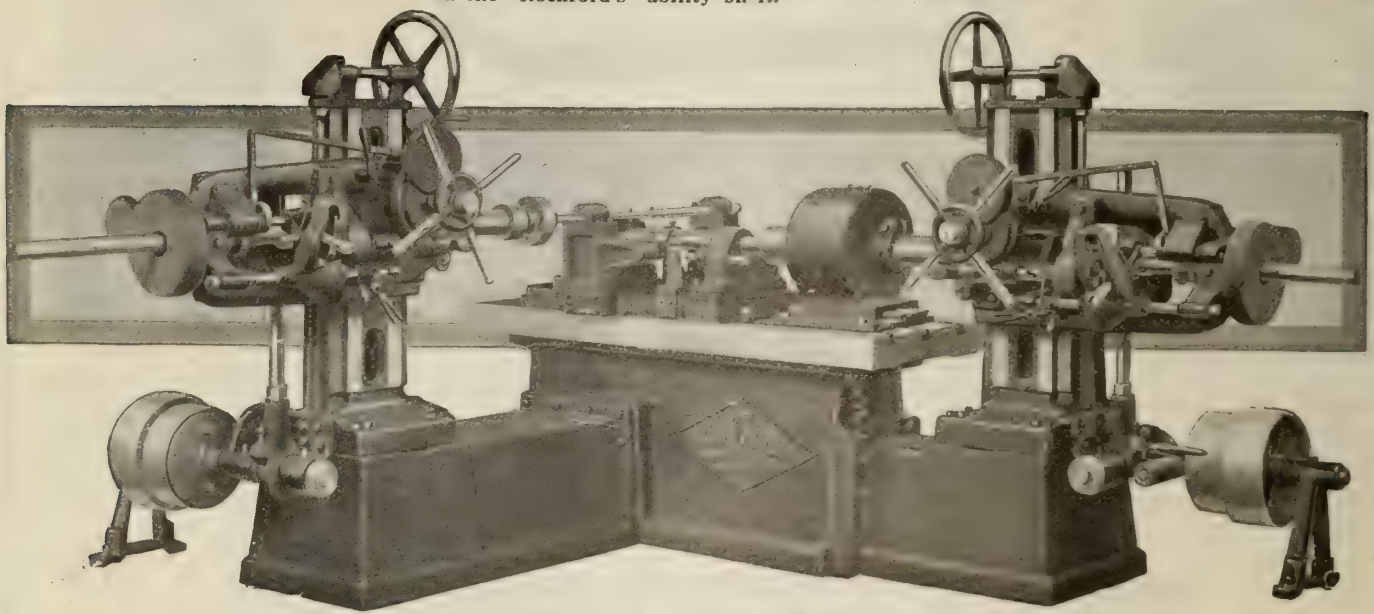
Rockford Horizontal Boring Machine

For Automobile Manufacture

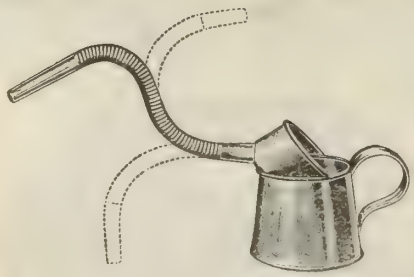
This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



The Rockford Drilling Machine Co., Rockford, Ill.

Say Good-bye to Funnels Use this "ALL-WAY" Oiler



Combination Filler and Funnel

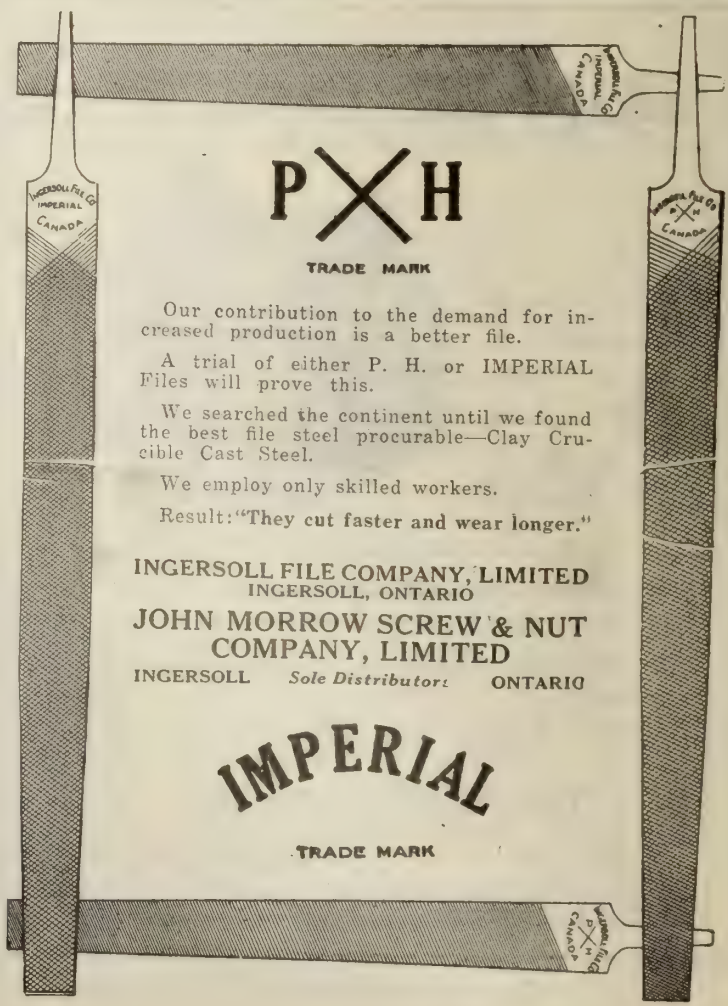
This Filler eliminates the necessity of the use of a separate Funnel. With the Flexible Spout any part can be readily reached.

Saves much inconvenience and avoids dripping of oil.

If your dealer cannot supply you, write us.

We also manufacture the well-known "All-Way" Oil can. Saves you 50% of your oil bill.

THE ALL-WAY OILER MFG. COMPANY
196 King St. West Toronto, Ont.



Whitcomb-Blaisdell Planers

WHITCOMB-BLAISDELL LATHES AND PLANERS PLAY SOME PART IN THE MOST OF THE HIGH-GRADE MACHINE TOOLS MADE ON THE CONTINENT.

ALL-ROUND machines for high grade work, they are equipped with special labor-saving attachments that add to their convenience and enable the operator to "speed up" without endangering accuracy.

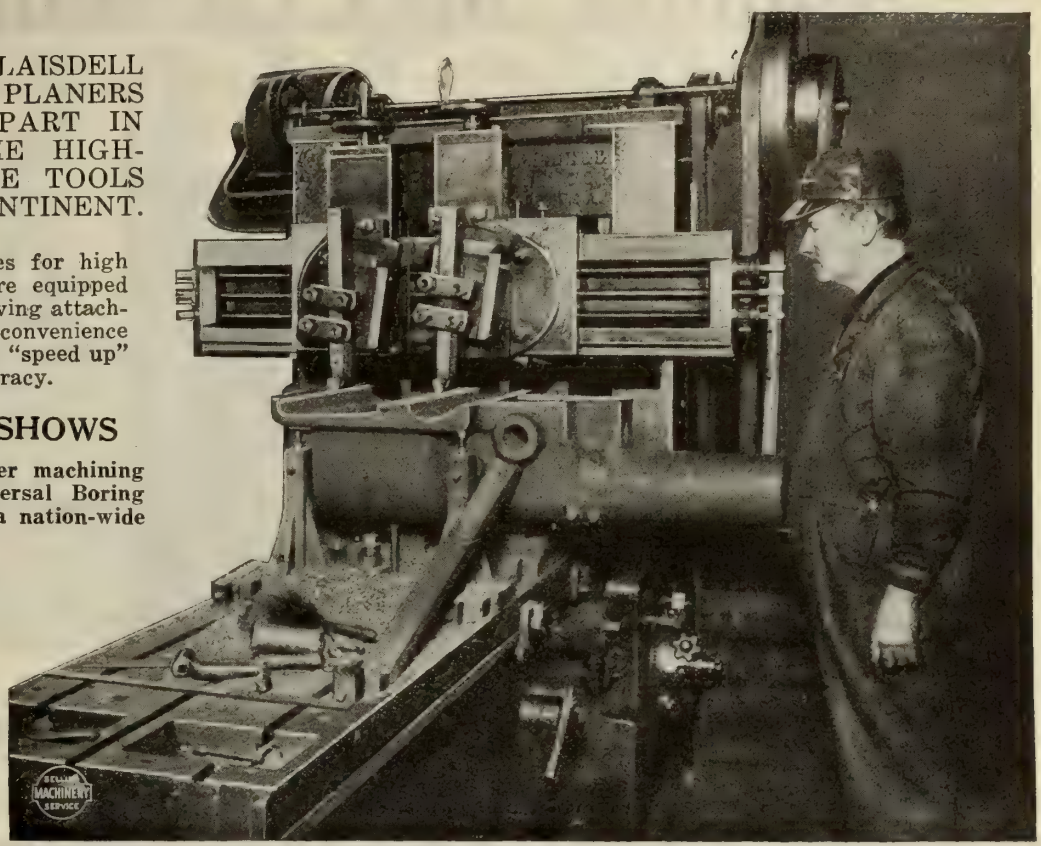
ILLUSTRATION SHOWS

a Whitcomb-Blaisdell Planer machining the head post of a Universal Boring Machine—a machine with a nation-wide reputation for accuracy.

May we send you our catalogue giving full particulars?

Whitcomb-Blaisdell Machine Tool Co.

WORCESTER, MASS. U.S.A.



"STAR" LATHES

ACCURATE
RIGID
ECONOMICAL

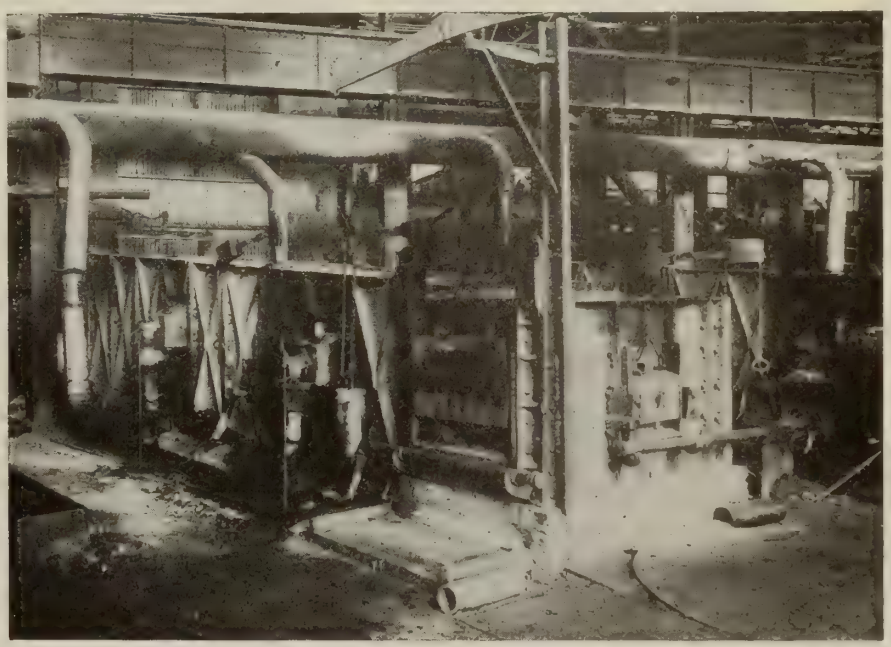
9" - 11" - 12" - 13" Sizes

Built with a full line of ATTACHMENTS

The Seneca Falls Mfg. Co.
Inc.
366 W. Fall St. - Seneca Falls, N.Y.

Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

Write

Mechanical Engineering
Company, Limited
Room 308, Bank of Toronto Bldg., Montreal
Three Rivers, Quebec, Canada

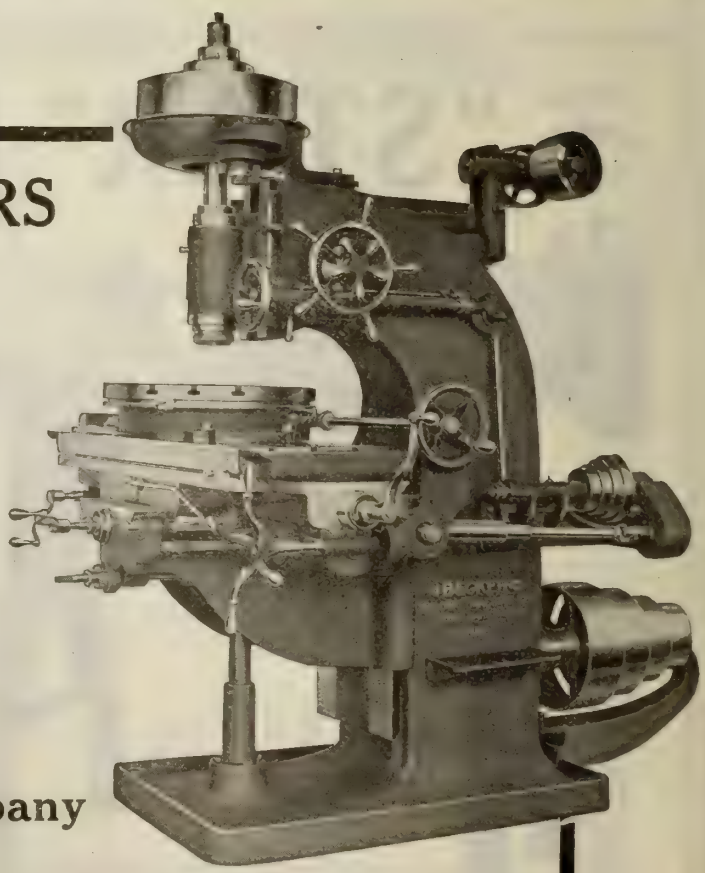
BECKER BELT-DRIVEN MILLERS

for

GREATER PRODUCTION because they work continuously—every hour of operation is a production hour—

ECONOMY OF OPERATION because they are power savers; the internal belt drive forms an elastic drive to the spindle that prolongs the life of the cutter by eliminating chatter and vibration.

ACCURACY because the machines have exceptionally fine feeds and are equipped with micrometer dials and stop gauges. The Patent Becker Gibbing keeps the work permanently aligned with the spindle.



Becker Milling Machine Company
HYDE PARK, BOSTON, MASS.

A. R. WILLIAMS MACHINERY COMPANY, LIMITED - 64 FRONT STREET WEST, TORONTO
RUDEL-BELNAP MACHINERY COMPANY, LIMITED 137 McGILL STREET, MONTREAL

Your Production---
Is It Up To Capacity?

A break in the production schedule through an unreliable hoist is a damper on production.

Your hoisting equipment is the "Go-Between," the connecting link that maintains uninterrupted routine and output.

Avoid breakdowns and unnecessary delays by installing a Wright Inner-Conveying System.

If your lifting requirements are constant throughout the day, there is only one hoist and that's the Wright Hoist.

If you lift only occasionally; or at great heights the Wright Hoist will do it quicker, safer than any you can install.

Why—because all the load sustaining parts are steel and malleable iron, mounted on good substantial roller bearings.

If you will buy your next hoist with the same care and investigation that you would buy any other important piece of equipment, your choice will be Wright.

WRIGHT MANUFACTURING COMPANY

LISBON, OHIO

Send for our Catalog to-day on Improved Hoists, Trolleys, Hand Cranes and other lifting equipment.

A good piece of advice:

BUY WRIGHT

Canadian Representatives
A. R. Williams Machinery Co., Ltd.
Toronto, Halifax, Montreal, St. Johns, Winnipeg, Vancouver

If interested tear out this page and place with letters to be answered.

Notes On Grinding

NORTON COMPANY, WORCESTER, MASS.

No. 65A

HAND GRINDING AND MACHINE GRINDING

ONE is likely to confuse hand grinding and machine grinding when thinking of some of the principles that govern the grinding action of a wheel. Now it is quite an important factor in the selection of the right kind of wheels for these two different methods of grinding, and so it seems necessary to point out some of the differences existing between machine grinding and hand grinding, so that these differences can be taken into consideration when grinding problems in either class come before our readers.

Of course, in both methods of grinding, that in which the work is held in the machine mechanically and passed before the wheel mechanically, and the class where the work is held in the hands of the operator and pressed against the wheel manually, the same general principles govern the results that are obtained —that is, the grain depth of cut, the radial depth of cut, the speed of wheel relative to these cuts, the kinds of material being ground, etc., all have their bearing on the resulting grinding wheel efficiency.

In both methods of grinding the construction of the machine plays an important part. The facts that the centres in the machine grinding method, the headstock, the table, the machine itself and all associated parts are heavy, rigid and substantial, and that they absorb vibration and permit of greater power being applied to the grinding wheel, carry equal weight in the hand grinding method where the work rest, upon which the work being ground is placed, is strong and rigid, offering a good support in case the work is carried up close to the cutting point of a wheel. There is no chance for vibration or cramping action if the spindles and bearings are generous in size and well made, and, therefore, better results are obtained.

There is one factor in hand grinding that does not allow for definite rules to be laid down, and does not permit of the same reasoning that can be applied to machine grinding, and that is the personal element that enters into this operation. Some men become very proficient in hand grinding. They know just how hard to bear on with the work in order to make the wheel cut freely and efficiently. They know just when it is necessary to dress the wheel, to break up the face or surface, in order to produce certain results. They know when the wheel is being burdened with more work than it can do, and they unconsciously and instinctively accommodate themselves to these conditions. They ease up on the depth of cut or pressure that they bring to bear between the wheel and the work, and pass the work over the face of the wheel quickly in order to accomplish certain results. They press or bear on to accomplish certain other results. There is really a considerable amount of art necessary in hand grinding, as well as in machine grinding, but always bear in mind that this personal equation is a factor which may introduce indifferent results or very satisfactory results when work, wheel and conditions may be the same, but two different men operate the machine at different times.

The tendency in hand grinding, as in machine grinding, is toward harder wheels. However, in either case, soft wheels are better producers

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec Que.

Grinding Wheel Plants, Worcester, Mass.

Electric Furnace Plants		New York Store	Chicago Store
Niagara Falls, N.Y.	Chippawa, Ont.	151 Chambers St.	11 No. Jefferson St.

Detroit Store, 73-75 W. Congress St.

Men Can't Work Well With Dull Files

Tell your men to turn them in as soon as their teeth lose their edge, and get new ones.

And, specify Famous Five Files when you order.

They are made of high grade steel, accurately ground and cut, scientifically hardened; and you will get the maximum of service out of them. They are:

If interested tear out this page and place with letters to be answered.

DUNLOP

"Gibraltar RedSpecial" Belting

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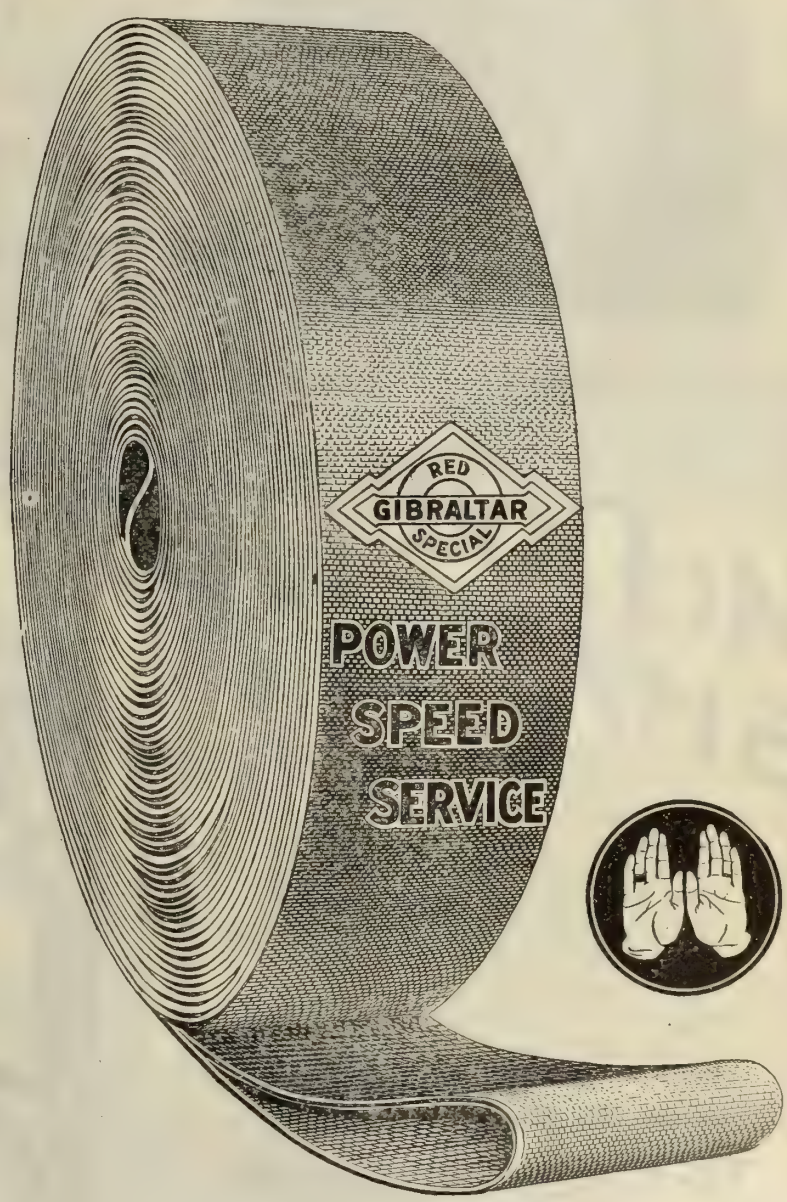

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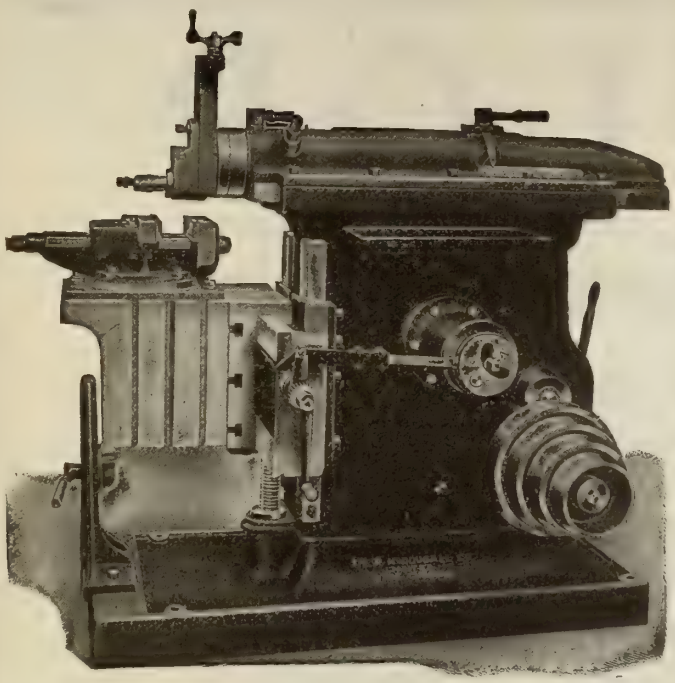

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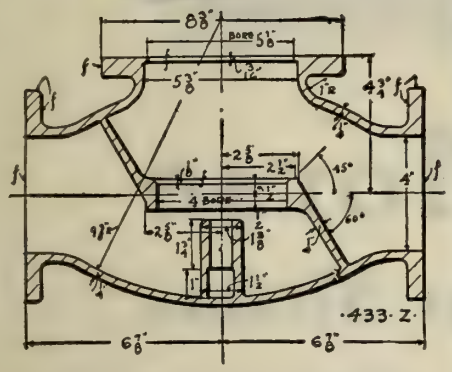

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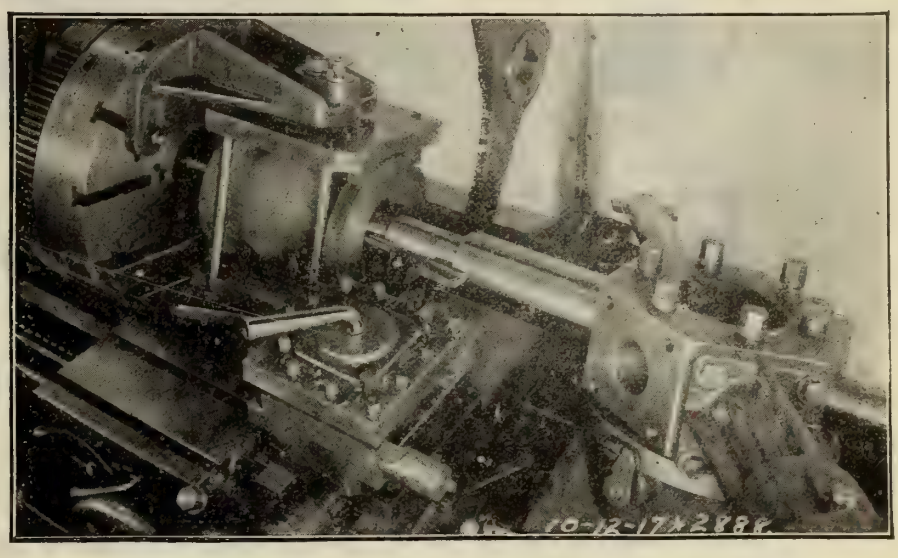

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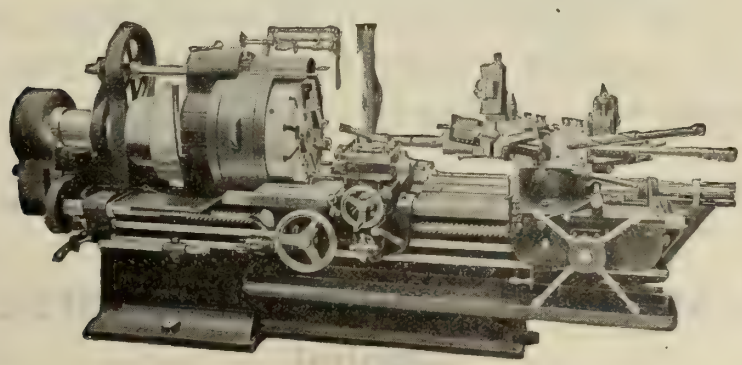

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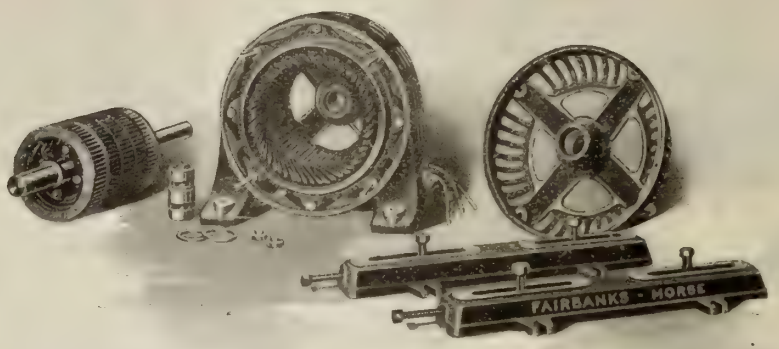

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 14 October 9, 1919

The Blazing of New Industrial Trails

How the Bureau of Standards at Washington is Leading the Home Manufacturers to Fresh Fields—An Example to Canada and Canadians in General. Herein is a Challenge Worthy of Acceptance

By NAPIER MOORE

WITH the Canadian manufacturer bending all his efforts to get back to a pre-war basis now that official proclamation of peace is at hand, it is natural to suppose that he has an eye on his neighbor across the international border and is interested in what Uncle Sam has done by way of helping his manufacturers to compete with foreign trade and genius and break monopolies which continental Europeans held in certain industries before the war.

Probably no department of the American Government has done more for the manufacturer than the Bureau of Standards at Washington. Before the war the Bureau was investigating those fields of finer industry in which the foreigner apparently stood alone. The world conflict, with its consequent disruption of trade with Europe, served to emphasize still further the need for further effort in this direction. Data, painstakingly gathered during long processes of experiment by the experts of the Bureau were placed at the disposal of manufacturers, secrets were fathomed, and to-day, in more than one sphere, American factories are turning out products which five years ago were left to the European.

What Canada Has So Far Accomplished

In Canada, the Bureau of Standards of the Imperial Munitions Board did excellent work, but the exigencies of the situation practically confined its efforts to war work. And, in a broad manner of speaking, the Dominion Government's Bureau of Standards at Ottawa has been little more than a weights, measures, checking and testing office. Happily, Canada has realized the incalculable value of a bureau such as is found at Washington, and the recent appearance before an Ottawa Parliamentary committee of Dr. S. W. Stratton, Director of the American Bureau of Standards, indicates that in the near future the Dominion Bureau of Standards will be in a position to extend help and advice to the Canadian manufacturer that it has hitherto not been in a position to extend.

Through the courtesy of Mr. F. A. Fisher, the writer was recently enabled to make a thorough tour of the Washington Bureau of Standards, and to observe at close range the many activities in which its experts are engaged. To describe them all would necessitate the penning of a massive volume. They included, during the war, experiments with dyes and chemicals for industry and science; new methods for the manufacture of ammonia were tried; the recoil of great guns was tested, as were airplane wings, the latter in the monster wind tunnel. Airplane fabrics, varnishes and motors were tested; improvements in aerial photography were discovered. New recording instruments were designed and perfected. Optical glass was made for the first time on American soil, and the manufacture of delicate precision gages made an actuality.

And the good work done by the Bureau did not end with the war; its discoveries stand as a permanent aid to peaceful industry.

The Fostering of the Hoke Gages

In this day of interchangeability, when parts are manufactured at plants thousands of miles apart to be assembled at a central point, perhaps on this continent, perhaps abroad, the fostering of Major W. E. Hoke and his precision gages by the Bureau of Standards will, it is expected, be more than proved to have been a commendable step. For a dozen years and more Canadian and American manufacturers have been acquainted with the famous Johansson gages—those shiny, rectangular blocks of steel, capable of measuring to within one hundred thousandth of an inch, and even with still greater precision. What system of seasoning Johansson uses for his steel, what system of measurement he employs to obtain such miraculous results, nobody has yet ascertained. Until comparatively few months ago, the "Joe" blocks stood alone as a workable standard of measurement in American and Canadian factories. More than a thousand American shops swore by them.

Then along came Hoke. He told the Bureau of Standards he could make gages as good as or better than Johansson's gages, gages that would be accurate to a few millionths of an inch (the majority of which would prove accurate to within one millionth of an inch).

Director Stratton immediately gave Hoke the chance to make good his claim. Part of the Bureau's workshop was placed at the inventor's disposal. In three days he had set up his machinery and was turning out gages. Within one month he was manufacturing gages which no mechanical instrument could test, so fine was their degree of accuracy. To-day, apart from the Bureau of Standards, two private firms, one of them the Pratt & Whitney Company, of Hartford, Conn., have Hoke's secret, and the former is turning out quantities of gages for commercial use which are sent to Washington for careful checking up of their accuracy.

Has Hoke Beat Johannsson's Method?

Whether or not Major Hoke has discovered a method of retaining the constancy of steel as Johansson has done, time alone can tell. He claims he has. Certainly

no experiment is being spared to achieve this important end.

To back up his claims of greater accuracy, Hoke draws on science for the court of last resort in measurement known to the Bureau of Standards—the interferometer, or light wave method, capable of measuring to within millionths of an inch. Flatter and more parallel surfaces, obtained by his own lapping machine, and a system of working by "accumulative error," are the qualities that ensure a more perfect gage, Major Hoke asserts, and to the Major the writer was indebted for a morning of extraordinary interest, spent in wandering through his workshop and seeing, under his guidance, just "how it is done."

It was as a working tool that Hoke saw his gages, and the problem of equal accuracy for quantity production was one that he overcame by his application of the "accumulative error," or "symmetrical distribution of error" system. With ten of its one-inch blocks placed alongside of a standard Johansson ten-inch block, the variation of which has been checked by the Bureau's optical department to within a millionth of an inch, the aggregate error of the ten individual blocks at once becomes glaringly apparent under the delicate tests used. As an error of, say, three millionths of an inch is glaring when exposed by the cadmium light of the interferometer.

The demand, then, was to reduce the surfaces of the gages to an absolutely uniform degree of parallelism and flatness, and it is here that the Hoke lapping machine comes in. It is claimed that this machine works to a tolerance of three millionths of an inch, and the flatness of its plates is checked to within that leeway. By a carefully timed method of transposing the little cylindrical blocks diametrically at intervals during the lapping operation, combined with rotary movements which ensure every molecule of the steel's surface receiving uniform treatment, perfect equalization is arrived at. Naturally when gages are being turned out in quantities, during the process of manufacture each gage cannot be checked after each operation by the method of light ray measurement. The blocks are, therefore, at various stages of their manufacture comparatively checked with the highest working standard in the possession of the Bureau—that is, Johansson blocks, the accuracy and constancy of which have been most carefully established. With sufficient time to be assured of the constant quality of the steel of the American-made gages, it is likely that the domestic sets will be used as standards. Constancy, of course, is only provable by time, and years must elapse before the American gage makers can be positive that they have the constancy for which the Johansson gages have become famous, and on which, of course, ultimate accuracy depends.

The Use of the Interferometer

Hoke was not satisfied to prove his accuracy by the known variations of any standard, however. Only one method would satisfy him, and that was the court of last resort in measurement—the interferometer. True, the Bureau possessed its standard yard, checked carefully against international metre in Paris, but even the international metre rod is not perfect. It is susceptible to changes of temperature, even as are gage blocks, be the change so slight as to be incalculable by human means. Twenty years ago, however, Professor Albert A. Michelson, of Chicago, went to Paris, and, taking the international metre as the recognized world standard, calculated the number of light waves it equalled. And it is to the standard of the light wave, easily applicable by means of an improved and simplified interferometer devised for the Bureau of Standards by C. G. Peters, that Major Hoke works. He uses cadmium rays, 24,098 waves of which equal one inch.

The method of measurement by light interference has received lengthy treatment in several American technical magazines of late, and it would serve no purpose to repeat details here. Sufficient to say that it has apparently established the superiority of "end" measurement over "line" measurement, under the latter of which even the finest of fine scratches on a measuring rod possesses thickness and so renders absolutely perfect comparison impossible.

The writer witnessed Major Hoke test some of his gages by this light method, detecting errors in flatness of millionths of an inch. The difference in flatness caused by a finger print became as a glaring error in terms of millionths.

To such a standard of accuracy does Hoke work. To what standard Johansson works is a carefully preserved secret. That he does not depend on the interferometer is known, however. He even claims that light waves are inaccurate, and that his gages are of greater accuracy because of more dependable methods that he has worked out. In effect he claims that the new American-made gages cannot be as accurate as his because they are made to a standard which, while regarded as the last word in measurement by the Bureau of Standards, is one which his investigations have shown him is not absolutely dependable. He has yet to prove it. Should he be able to—and all things are possible—science would receive almost as big a jolt as it would were it demonstrated that the world is flat. It is said that Johansson has given much attention to the study of light waves and may soon announce some of his findings.

Real Competition With the Foreign Product

Meanwhile, American-made gages have made possible a real competition with the foreign product.

Major Hoke is still experimenting with the Bureau of Standards. He has applied his discovery to the production of precision ball bearings, and is now working on a new method for the seasoning of his steel. He recognizes that the value of all precision products lies largely in so seasoning steel that it will "stay put." The steel from which the highly accurate Johansson blocks are made has been analyzed repeatedly, and Major Hoke believes he is on the road toward discovering the valuable secrets of the Swedish steel workers.

The Manufacture of Optical Glass

One of the most striking successes achieved by the Bureau of Standards has been in the manufacture of optical glass. Previous to the outbreak of the war, practically all of the optical glass used in America came from a few German, French and English makers. At that time the total annual world demand amounted to but a hundred or two tons. Some secret processes were involved, and no American firm had cared to go to the expense necessary to any investigation upon which manufacture could be based. Therefore, absolutely dependent as she was on these European countries for her optical glass, America was faced with a somewhat grave problem when her supply was cut off by the opening of hostilities.

It was then that the Bureau of Standards came to the rescue. Its experts applied themselves to research and experiment with commendable enthusiasm, and in th winter of 1914 experimental furnaces and auxiliary apparatus was set up in the Bureau's Pittsburgh plant. Several manufacturers were also given the benefit of the data arrived at by the Bureau, and during the following two years pioneer work of great value was done.

The making of optical glass is no easy matter. The pots in which the ingredients, carefully selected as regards purity, are melted presented a knotty problem. Melting glass must be thoroughly stirred to make it as homogeneous as possible. The stirring rod itself, and even a small portion of the inner surface of the pot will dissolve in the glass, and naturally these pots must be made of a substance which will not color or stain the glass. One of the big problems, therefore, which confronted the Bureau was the finding of a suitable refractory material for the pots. After much careful experimenting, the waste bisque of whiteware potteries was decided on, and while formerly it took a long time to

make a pot by hand, a casting method was perfected which cut down the time to three weeks.

In process of manufacture, of course, the melted ingredients of the glass undergo a long and perfect cooling, which in some cases extends to months. Then the pot is broken from around the glass. The utmost care cannot prevent the contamination of that surface of the glass that has been in contact with the surface of the pot, and accordingly sometimes only as much as 20 per cent. of the glass block is available for use.

The Bureau to-day is still experimenting on pots that will give even better results.

However, when the United States entered the war, considerable progress had been made. The Bausch and Lomb Company, Keuffel and Esser, the Pittsburgh Plate Glass Company, and the Spencer Lens Company were among the companies engaged in turning out considerable quantities of excellent glass, while the Bureau in its own plant was manufacturing glass equal to any made in Europe. Then came the demand for increased production to satisfy the immediate needs of the army and navy for optical glass for binoculars, gun-sights, range finders, tank sights, bore-sighting devices, periscopes, airplane cameras, bombing sights, and so on. The Bureau of Standards at once enlarged its Pittsburgh plant, and the manufacturers provided added facilities, receiving invaluable advice from the Bureau experts and those provided by the Geophysical Laboratory of the Carnegie Institution. The total production quickly reached twenty tons per month, and at the time the armistice was signed, the Bureau plant at Pittsburgh was alone turning out two tons per month.

To-day, highly profitable experiments are being continued in the extensive laboratories of the Bureau at Washington. The samples of optical glass on view there speak for themselves. America is making as good optical glass as that of any foreign firm. But there is at present little profit in the industry, so in that respect it loses its attractiveness for the private manufacturer. One or two firms, which, actuated by a high patriotic impulse, manufactured the glass during the war, have ceased to make it. At least two firms, however, will continue its manufacture. The optical glass industry will never be permitted to slide back to a foreign monopoly. The only problem to be solved is that of cheaper production here to compete with foreign concerns on a large commercial scale. This the Bureau will not be long in solving.

The Manufacture of Nautical Clocks

Yet another phase of the Bureau's activity concerns ships' timepieces, practically all of which, before the war, came from England. The ravages of the submarine war and the necessity of filling her own wants, naturally cut off America's supply of nautical clocks, and, when the Emergency Fleet Corporation began to turn out ships by the score, the need for reliable timepieces was great.

Once again the Bureau of Standards jumped into the breech. Several firms were given the benefit of its expert advice, and they were quick to enter into the manufacture of finely-adjusted, large-size watches, which, set in regular gimbals, have taken the place of the familiar ship's clock. Row after row of clocks—thousands of them—may be seen at the Bureau, all being checked with a degree of accuracy which speaks volumes for the fineness of the work put into them. America will never again be dependent on England for her ships' clocks, or, as they are now, ships' watches.

It will thus be seen that the war awakened the American manufacturer to a realization of what a Bureau of Standards could accomplish. Its researches have not ended with the conclusion of hostilities. Door after door in the commercial and industrial world will be opened by the home manufacturer with keys supplied by the Bureau of Standards at Washington, D.C.

Canadian Machinery Drafting Course--Part II

In This Second Portion We Go Still Further Into the Use of the Drawing Instruments, and Discuss the Various Type of Lines as Adopted in General Drafting Practice

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE commencing on the second part of this course, how about the first instalment? Did you study it up and derive any benefit from the same? What is equally important is this: have you sent us in a sample of your work? Remember the three prizes each issue, so get busy, if you have so far hesitated at sending your work along, for it might be your plate that will land a prize.

In Part 1 we touched on the very simple uses of the drawing board, T-square, and triangles. Plate No. 1 was simply a test to see if instructions had been followed, so now let us go still further into the various other instruments, as required in the art of mechanical drawing.

The Scale

Fig. 1 illustrates a very popular type of scale as used in drafting work. These scales are usually constructed of boxwood, and are made in a triangular section as shown. Usually they are graduated for a distance of 12 inches. The type illustrated has six surfaces for different graduations, and the scales are so arranged that the drawings may be made in any proportion to the actual size. For general mechanical work the common divisions are multiples of two, thus drawings are made full size, ½ size, ¼ size, ⅛ size, 1-16 size, etc., etc. Should a drawing be half size, of course 6 inches would then equal 1 foot, while if ⅛ scale is desired, 1½ inches equals 1 foot. The scale is provided with all these necessary graduations, and the student is advised to study his scale and becomes acquainted with the graduations of his scales and how to use them, for later on in the course this will become a necessity.

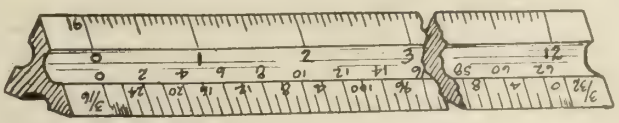


FIG. 1—GENERAL VIEW OF TRIANGULAR SCALE.

Another very handy scale is the flat type, with beveled edge, but as the divisions on these scales are similar to the triangular type we need not discuss the scales question further. For the present, all drawings will be made full size, so students have ample time to familiarize themselves with the use of their scale.

The Protractor

Fig. 2 illustrates the instrument known as a protractor. This tool is used for laying off and measuring angles and is usually made of steel, brass, celluloid, or sometimes paper, but the latter is not to be recommended, as it soon becomes worn and is not to be depended upon for accuracy. For general use in this course, either of the first three

stated will do, with the celluloid the favorite. If made of metal the instrument is cut away as shown in sketch, in order to allow the worker to see his drawing, while if made of celluloid the piece is solid, for the instrument is transparent, a decided advantage over the metal type. In all cases, however, the outer edge is divided into degrees, and tenths of degrees. Perhaps it would be best to sort of jack up readers' minds to the fact that there are 360 degrees in a complete circle, therefore 180 degrees to a half circle. The protractor is laid out in such a manner as to read from 0 to 90 degrees, then reverse, while in some cases both values are stamped on the instrument, as for example, opposite 70 degrees would be also stamped 110, for one would be the component of the other. To prove this in a simple manner for the reader's benefit, let us first take the 70 degree mark. This is 20 degrees less than 90, so in placing the component we must first take the 90 plus the 20, making 110, or the other marking.

To lay off a required angle, use a very hard and carefully sharpened pencil. Place the protractor so that the two zero marks are on the given line and the centre point marked A on sketch is at the point through which the desired

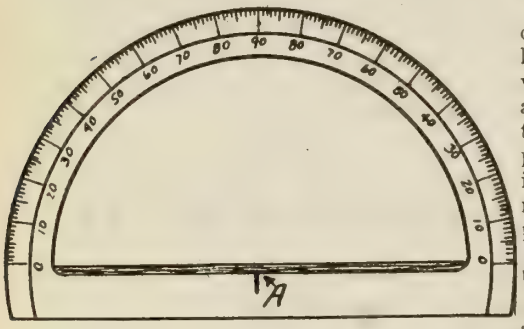


FIG 2

FIG. 2—ONE STYLE OF PROTRACTOR.

line is to be drawn. Mark a point at the degree desired, mark your centre point and draw your line, which will then be at the desired angle from the horizontal.

Irregular Curve

Perhaps as convenient a tool as the draftsman uses is that known as an irregular curve. This peculiar shaped instrument is sometimes called a French curve, but is generally known as an irregular curve. It is used for drawing curves other than arcs of a circle, with either pen or pencil. These tools are made of wood, hard rubber or celluloid, and once more the celluloid is the better owing to its transparency. Any curve drawn by such means is usually termed a freehand curve.

At all times try and get your curve to pass through at least three dots, or points as they are usually called, of the line desired, for a much smoother curved line will be the result. Usually it is good practice to first pencil the line in lightly, then ink it over. In inking in, it is most important that the blades of the pen be kept tangent with the curve, otherwise there is a tendency to blot the work. Later on in the course students will find they require to use this tool, but for the present, at least, they will not be called upon to use it.

Compass, Dividers and Pen

Fig. 4 illustrates the instruments more used than any others, with, perhaps, the

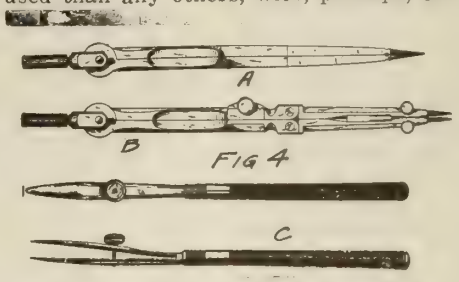


FIG 4

FIG. 4—SOME OF THE VARIOUS INSTRUMENTS USED.

exception of the T-square. At A is shown the dividers, used in laying off distances on the drawing, either from the scale or other parts of the drawing. They are also used to divide a line into equal parts. In fact their use becomes more and more general as the student becomes accustomed to them.

B illustrates the compass, used in drawing circles and arcs of circles. One leg of these compasses has, as readers will notice, a screw which loosens and allows one leg, usually the pencil point, to come out from the lower half, and the pen point or extra length bar to go in its place. By this means the one main body can be used as a pencil compass, or pen compass, simply by interchanging, while by adding the extra length bar, you enlarge the capacity of the instrument, for this bar has also a hole in it to accommodate either the pencil or the pen. From constant practice with this instrument comes a knowledge far better than written instruction can ever give the student. About as easy a method of holding the compass is this. Never use both hands, but learn to handle the instruments easily by one hand.

The pen as shown at C illustrates both views clearly, first as it looks from the top, and secondly as it appears from the side when open. This pen is used for drawing straight lines, or curves that are not arcs of circles. Commonly it is simply termed the ruling pen. The distance between the pen points is adjustable by means of a little thumbscrew as shown. The blades are given a slight curvature, so that there will be a cavity for ink, even when the pen points are very close together. The pen should not be dipped in the ink, but should be filled by means of the quill, which forms a part of the cork on practically all India ink bottles. Do not attempt to place too much ink in the pen at once, about ¼ to ⅜ in. will be found sufficient. Upon finishing your work always take a cloth and wipe carefully both blades of the pen, as all liquid inks corrode the blades if allowed to dry, and no good work can be done with a poorly-kept pen, so students will do well to remember this point throughout the course.

In using the pen be sure that both blades bear evenly on the paper, in order that the resulting line be smooth and even. Study the chart at Fig. 6. A and B illustrate a common danger, namely, first too great a slope outward, and second too great a slope inward. Either one is wrong, and must be avoided if good work is to be obtained. C illustrates the correct method, namely, keep your pen blades as vertical as possible. At Fig. 7 is shown another view of using the pen, and students cannot do better than to study carefully these two views, and practise inking until a good, straight, clear line can always be obtained. Don't be hasty to blame the pen, ink or paper; be sure it's not the operator. A little time spent in this practice work will be time well spent. The other remaining instruments are the bow pencil, dividers, and pen, so called because of their bow construction. These tools are used for smaller and finer work, and are especially adapted for circles having a radius of less than ¾ inch, but their use and manner of using are practically the same. Fig. 8 illustrates a typical set of good quality instruments, together with case. Students need not purchase such an elaborate set as shown unless they so desire. For general work in this course a cheaper set will do equally as well. The only reason for showing

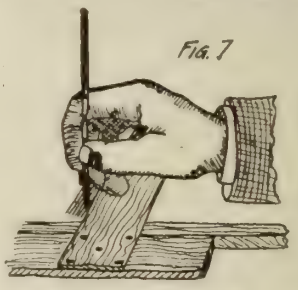


FIG. 7.—THE CORRECT WAY TO HOLD THE PEN.

such a set is to illustrate the class of tools used in the regular drafting business.

Some Triangle Problems

Now that we have gone into the various instruments as used, let us go a little further into the use of the triangles, as started in Part 1. We have so far made 45, 60 and 30 degree lines with these tools, but they have a much wider use, as illustrated in Figs. 9 to 14. Let us consider them in sequence.

Fig. 9 illustrates a very common use, namely, drawing parallel lines at an angle to the horizontal, by means of the T-square and triangle. Fig. 10 illustrates the use of triangles only, and shows the method of drawing a line parallel to a given line. First place triangle A with one edge coinciding with the given line B C. Now take triangle D and place one of its edges in contact with the bottom edge of triangle A as shown. Hold triangle D firmly with the left hand and slide triangle A to the right or left as desired, until you reach the point through which you wish to draw the line E F.

Fig. 11 shows clearly that by combining the 45 and 60-30 triangles with T-square, you can procure angles of 15 or 75 degrees.

Fig. 12 illustrates the drawing of a rectangle by means of triangle and T-square. First draw, by means of T-square, lines A, B, C and D. Now use your triangle and draw vertical lines CA and BD, when rectangle will be complete.

Fig. 13 illustrates another method of drawing a rectangle by means of triangles only. Place your 60-30 degree triangle A as shown at whatever angle you desire, then place your 45 degree triangle B on top of same in manner shown. In the dotted position you can draw in the short sides, while in the heavy position you can finish up the longer sides.

Fig. 14 illustrates the method of drawing perpendicular lines on given lines, by means of T-square and triangles. Either combination can be used and both are used for illustrative purposes. From these six illustrations students can get some idea of the T-square and triangle possibilities. By constant practice they will find that these tools become more and more useful as time goes on.

Lines

So far we have only discussed full lines, but now let us go into the matter deeper and find out just what type of lines are commonly used in drawing practice. Refer to Fig. 15 and follow the lines as they are marked, A, B, etc. A represents what is known as the full line, and is the most common of all. B illustrates two different types of dimension lines, each of which is permissible. C shows the dotted or hidden line, which is used to designate a line hidden from view. D is known as a construction line, and is used in various places, such as joining together two views, or projecting across from one view to another, which gives them their name, construction lines, but the name is all we wish you to get at present, for its application will be fully explained later in the series. E illustrates the centre line, which resembles the construction line, but it will be noticed that two dots in place of one go between each long dash. This line and its uses will be discussed fully later. F shows what is known as a border line. This line is similar to the full line, but twice its thickness. We only touch on this line subject in order to give students practice in the following plate, on the various lines. We wish you to memorize the names, so that when the discussion on their uses comes later, it will be that much easier for students to follow.

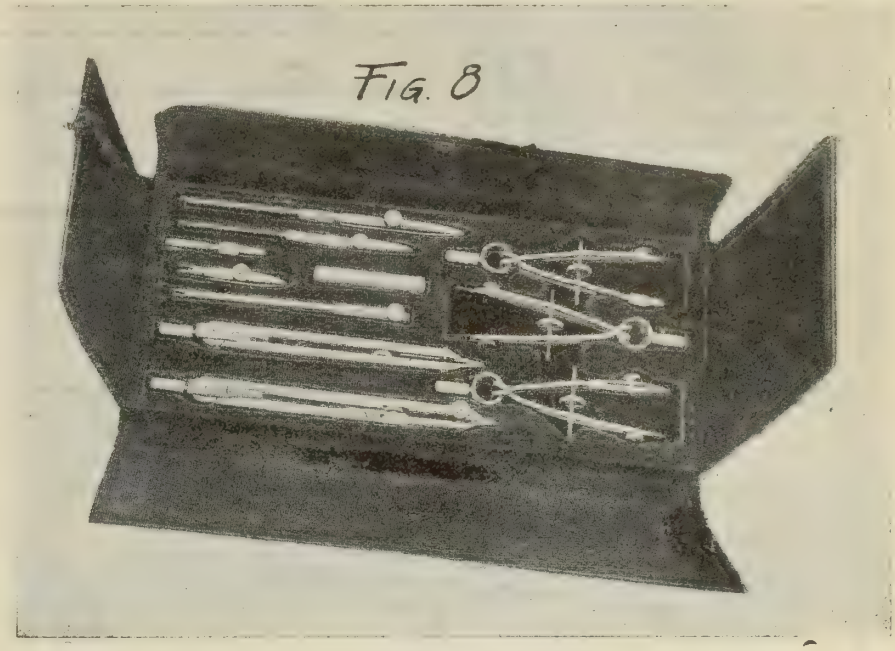
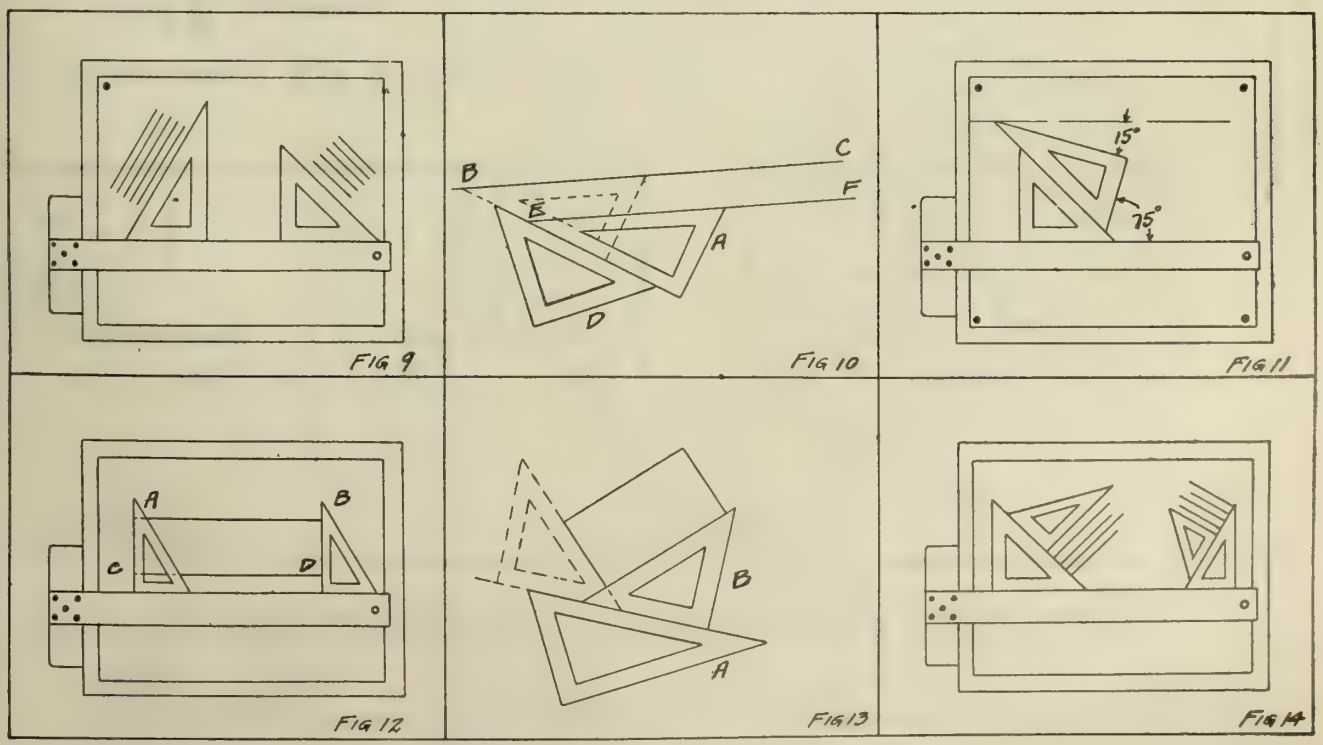


FIG. 8—TYPICAL SET OF INSTRUMENTS

Now since we have covered so much ground in this second part let us close it by instructions for plate No. 2.

Draw border lines as before, 9x13, and trimming lines, 9½x13½, and divide sheet into four sections. Note dimensions and work to these. Study the plate carefully, for all the various lines spoken of in this article are worked in on the practice plate. Draw everything to di-



VARIOUS USES FOR THE T-SQUARE AND TRIANGLE

mensions. In drawing the dotted lines, make each dot about 1-16 in. long and allow 1-16 in. space between each dot. For the other type of lines study the plate. First draw the lines lightly in pencil, then ink in afterwards. Higgins' black waterproof India ink is as good as any. Be careful not to make your pencil line too heavy, otherwise your inked lines will not be as clear. After completing the plate, write on a separate sheet the style of lines marked A, B, C, D, E, F, at Fig. 1 on plate, also lines G, H, I, J, K, on Fig. 2, also on plate. The little f on Fig. 3 denotes that surfaces are finished but the only reason we placed them on drawing is to familiarize students with their use, for later this point will be fully gone into.

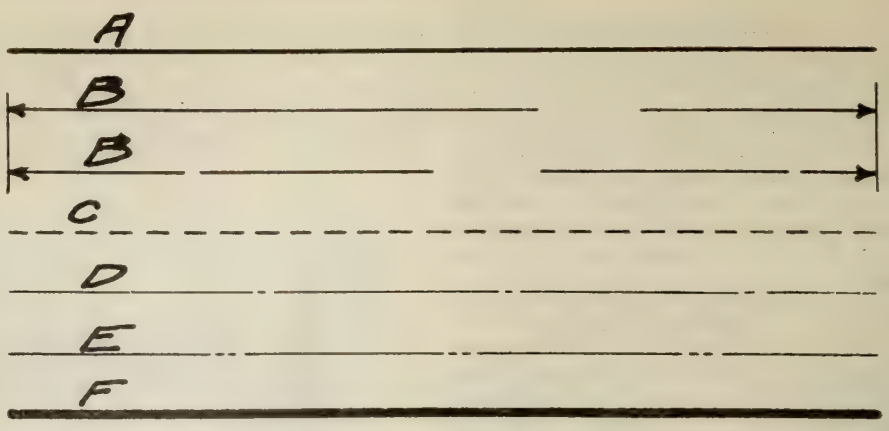
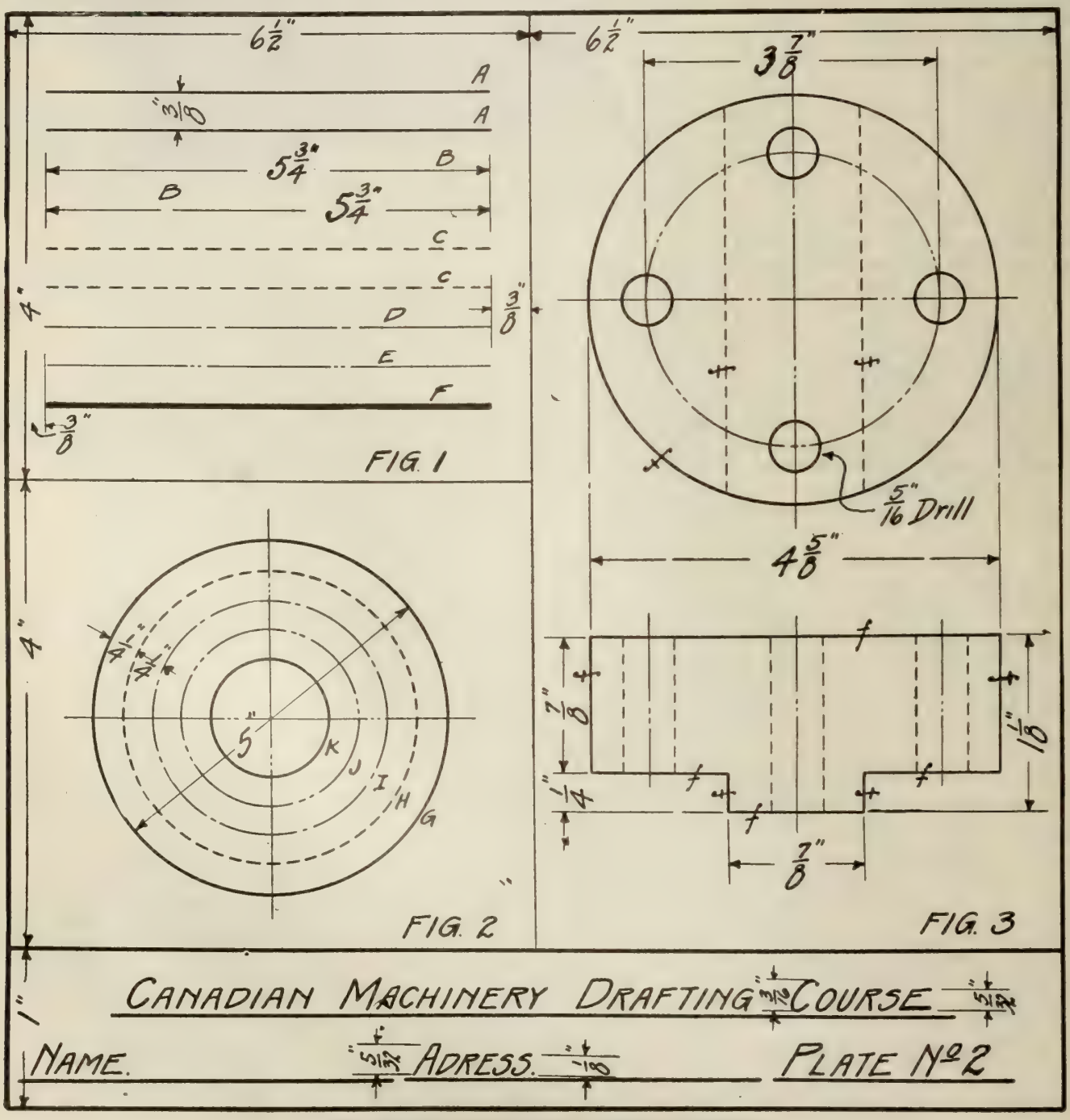


FIG. 15—VARIOUS STYLE LINES AS USUALLY ADOPTED.

Above all take care to make your plate as neat as possible. Remember we have three scales for the three best plates received. These scales retail at $1.25, so stick to it and send your work a'ong, so that you are in shape to tackle the next section and plate No. 3 in the next issue.

(See coupon to fill in on page 368)



LET US HAVE YOUR PLATE AS SOON AS POSSIBLE.

Is it Worth While Reading Technical Books

A Short Mythical Tale, Which All Should Read Regarding the Writer's Views on the Above Subject. Read, Digest, Then Act Upon, Would be Our Advice on the Matter

By I. M. TELLINGYOU

TO enter a subject of such a nature, we should, to be fair, show the two sides of the case, so for illustrative purposes, suppose we concoct two stories, which, while all imaginary, happen in a similar way every day in our daily grind.

We will first take the case of—well, let's say John Blank. We see him go through school fairly well. He never gives undue worry to his lessons. If they come all right—very well, then it's all jake as we would say. On the other hand, if he fails—well, he should worry.

John drifts along in this manner with no definite purpose in life, until time comes to leave school and go to work. "Now John," says his father, "what would you like to start at?" Ten chances to one John says, "I don't know, Dad, I never thought very much about it, etc., etc."

The upshot in quite a number of cases is that John either starts a trade which he does not like, or is not suited for, having no special preparation for the same, or on the other hand he does not start in a trade at all, but takes up some occupation easy to do (that is as far as brain power is concerned), and so he continues to drift.

Let us leave John for a while at this stage, and spend a little while studying Tom, his brother, who, by the way, is a year younger than John. Tom always was a joke in John's eyes, for when John would be out playing ball, or off to the show, Tom, like a ninny (using John's expression) stayed at home and read.

"What did he read?" you might be tempted to ask, when John would sneer and say, "Oh, some dry technical stuff, I don't know what it's all about, but Tom claims it will make him worth more money some day. Of course that's all bosh," was usually John's final thrust.

However, to continue with Tom. He goes to the same school as his brother, but passes in every class, owing to his earnest attention to lessons, combined with home study. Strange to say, Tom passes his classes faster than his older brother. And, when leaving school, is at the highest grade he can go in this type of day school.

In the meantime Tom has been reading "dry technical stuff" (as John expressed it) with a definite aim in view. He has also been going to manual training, and practically made up his mind what he wants to be.

His father does not ever have to ask him, "Well, Tom, when do you think you'll start in work?" for they have had many a little chat together on the subject, and it is all settled. Tom goes to work with the same earnest spirit in which he tackled his school, and results begin to show themselves as the years go on.

To get back to John. He makes enough to live on, and have a fairly good time. Of course he saves nothing, but then "you can't save and spend," as he puts it.

Tom has finished his apprenticeship, and gets at last some real money, where before he was the laughing-stock of his brother for the small salary he was receiving. The night that he comes home with a tradesman's pay is a happy one for Tom, but not so hilarious a time for John. Tom's salary now has John's wage looking like thirty cents, and yet the end is not in sight.

Years go on, John asks for a raise and does not get it. Tom never asks for increases, yet seems to get them periodically. He is accused of standing in with the foreman, etc., etc., but he merely smiles and keeps on reading technical books in his spare time.

One day the foreman gets sick, and Tom takes his place. He tells the story without boast when he comes home. John pooh pooh's the idea, yet underneath it all he knows it is the truth.

He gets his brother up in the room alone, and starts in this manner: "Say, Tom, I don't believe those books helped you a darn bit—but are they hard to read?" Tom sees his opoprtunity, and realizes his brother is waking up at last, so he gives him a good strong lecture.

To be brief, we will pass over quite a few years. Tom is now superintendent, but Jack is also coming strong. The good stuff was in him, all it needed was bringing out, so you see the idea and moral of my little mythical tale is this: "That it's never too late to start in and learn. You often get to an age when going to school is out of the question—but you have always got a school in your home, if you pick out real up-to-the-minute technical books."

As one fellow who knows what he is talking about remarked to the writer:

"The educated man will always command the respect of the community in which he resides and has been of the greatest service in the development of modern civilization. It was not so far back in history when education was difficult to obtain, and only the wealthy could acquire knowledge. The worker could secure an education only under almost insurmountable difficulties. Not only were the schools few and inaccessible to those who did not live in large communities, but, owing to limited mail service and unsuitable text books, the average citizen found it difficult to acquire anything but a limited knowledge of the three 'Rs,' reading, 'riting, and 'rithmetic, as the old-timers used to say, in the country or city school.

"To-day there is no excuse for any reasonably intelligent person remaining ignorant of any art or science in which he or she is interested. Numerous text books, written by experts, deal with technical subjects in simple, understandable English, and some treat of real scientific matters without using highe mathematics or 'dead' languages.

"If one compares the semi-technical or mechanical book of to-day with those published even a decade ago, a great improvement in the character of material, quality and number of illustrations and logical arrangement of subject matter will be evident. In modern books dealing with mechanics, simplicity of exposition and clarity of reasoning is aimed for rather than strictly literary merit as exemplified by complex phrases. The semi-technical or home study books are the most difficult of any to write, and there are comparatively few writers who can simplify technical facts without sacrifice of accuracy of description. Compared to stories and novels, technical and mechanical books are difficult to prepare. The former are usually the result of an active imagination, and are short-lived; the latter call for much study and research on the part of the writer and courage on the part of the publisher, because of the expense involved in their production and slower sale. Hundreds of costly special drawings and photographs must be used to illustrate the text, whereas the story books seldom have more than a dozen or so.

"Publishing good and really useful mechanical and technical text books calls for experience that can only come through a long and well-established business, because it takes time to gauge the public demand and prepare books to meet it. Naturally, the best books are those produced by the oldest houses, because they command the services of the best editors and writers, and can produce books of the greatest value to the mechanic or student desiring instruction.

"It is not generally known that any mechanic can secure a comprehensive review of the theory and practice of his trade, either in its broad entirety or in any of its specialized phases for about the price of the average theatre ticket, and a week's pay will buy a set of mechanical books that cost over a quarter of a million dollars to prepare and publish, and that embody the elements of a complete three or four years' college course, boiled down to solid facts and presented in interesting, understandable language.

"The ambitious man of to-day is seeking more education, not only in his own line but those related to it. Those who

learn more invariably earn more. A man who has the courage to study good books after working hours to increase his knowledge possesses the main quality to secure success. He is the one who is able to seize an opportunity when it presents itself, and home study is what makes the apprentice or journeyman of to-day the shop foreman, manager, or owner of to-morrow. One must read consistently to keep up with the marked progress in the mechanical field. Not only must he keep posted on current progress of his trade by studying trade papers, but he should have good books of reference constantly available to know what has been done and why, as well as the possible developments of the future."

The writer personally agrees with every word of this gentleman's opinion regarding technical books, and can only add: Study first the company from which you purchase your material. Make sure they are in a position to supply you with up-to-date material in order to keep you up-to-date.

"Where shall I write to, and what shall I write for?" some readers might inquire. Well, that is a difficult question to answer. We first of all would not state any particular house to write to, but leave that to your own discretion, and cannot advise you exactly what book to write for, as we do not know the subject which you wish a book upon. We can, however, advise you to write for catalogues, and pick out the subjects you wish to study.

This is the common sense way of doing things. First make up your mind what you want to study. Next pick from catalogues the books you want, and last but not least, when you get them, see that you study them closely and do both the books and yourself justice.

For readers' benefit, and through the courtesy of the Norman W. Henley Publishing Co., 2, 4, 6 West 45th Street, New York, we are able to conclude this article with a review on eight books, on eight entirely different subjects published by this firm. In this way we no doubt will appeal to all readers' taste in at least one of these books. Our reviews cannot be of undue length owing to lack of space, but we will give readers at least a list of contents, together with our views on these books.

First let us start with a book entitled,

"Compressed Air And Its Applications"
By G. D. Hiscox, M.E.

This book has 665 pages, 35 chapters, over 500 illustrations, and could be well called an encyclopedia on the subject of compressed air. It is written by a man who is an expert in his line. He has dealt with the subject very thoroughly. The physical properties of air; motion of air and its force; pressures below atmospheric; the flow of air under pressure from orifices into the atmosphere; the power of the wind; isotherms; compression and expansion of air; thermodynamics; adiabatic compression and expansion; the compressed air indicator card; actual work of compressor. Multi stage air compression; expansion of compressed air, and the work of the motor; transmission of power by compressed air; compressed air reheating and its work; the compressed air motor; efficiency of air compressors at high altitudes; air compressors; compressed air in mining and quarrying; pneumatic tools in all phases; compressed air in railway service; pneumatic work; pneumatic tube transmission; compressed air in warfare; compressed air work; refrigeration; the hygiene of compressed air; later developments in air work, and last but not least, a list of patents from 1875 to July 1, 1908. Readers can readily see that this book is a detailed study of the subject, and well worth the $6 which is the publisher's price. Anyone interested in compressed air can safely depend on this book.

"Punches, Dies and Tools, For Manufacturing in Presses"
By J. V. Woodworth, M.E.

Here is a book for all practical men interested in the working of sheet metal. It consists of 483 pages, is well illustrated with sketches, etc., and sells at the publisher's price of $4.50. The subjects of die making; punch making; die sinking; sheet metal working and making of special tools; devices and mechanical combinations for piercing, punching, cutting, bending, forming, drawing, compressing, embossing, forging, and assembling metal parts. It also includes articles of other materials in various machine tools. The making of cartridge shells; wire and bar steel drawing dies; tools for paint and chemical tablets; pens; pins and needles; jewelry; eye glass; spoon and fork making dies are also included. Subpress dies for watches, and clock dies also form part of this book, together with drop dies of various descriptions. In other words an ideal book for those interested in die work.

Books on Gearing

To those interested in gearing, we can safely recommend the following gear change devices by D. E. Perrizo, M.E. This book sells for $1.25, and describes and illustrates the development of the screw-cutting lathe, and the United States patents upon the methods for obtaining various pitches of screw threads. The engravings are made from the records of the United States Patent Office. The book contains 101 pages, and covers the subject very thoroughly. This book is especially adapted for draftsmen, designers, would-be inventors, in fact anyone interested in gearing.

The next gear book to be mentioned is "Bevel Gear Tables," by D. A. G. Engstrom. This book of 66 pages also sells at $1.25, and contains a collection of tables with necessary explanation to enable anyone to figure bevel gears without the use of trigonometry. Anyone interested in bevel gears should read this book. Of course the draftsman and designer will be specially interested, but machinists also will find much to their interest.

Inventors' Manual

To readers with the inventive mind, we can refer them to the "Inventors' Manual, And How to Make a Patent Pay." by G. M. Hopkins, and revised by A. A. Hopkins. There are 133 pages in this book, with examples of mechanical and design patents at the back, in addition to regular reading matter. The usual pitfalls are pointed out, which the unwary get into, and the book is really a guide for inventors in patenting, perfecting, and disposing of their ideas. This book also sells for $1.25, and to anyone contemplating placing an invention is a worth-while investment.

Mechanical Movements

As a summing up, we refer readers in general to two books by G. D. Hiscox, M.E., entitled, "Mechanical Movements, Powers and Devices," and "Mechanical Appliances, Movements and Novelties of Construction."

These two books need no introduction to some readers who are well aware of their contents, but to the readers not familiar with these works, let the writer state, that almost every believable movement is described and illustrated. Any inventor, designer of machinery, in fact anyone interested in mechanical movements, should have a copy of each of these books. The writer, who is a designer himself, found them invaluable for his work. Here are two volumes that go forward with the best words that I can possibly speak for them. They sell at $3 each, and are worth every cent of it.

It is to be hoped that readers, after reading this article, have become convinced that technical books do aid you to bigger and better things, and now, since the winter evenings are drawing nigh, what better resolution could one make than say to themselves: "Starting now, I'm going to look into the possibilities of technical literature."

Tear off and send with drawing

Name .....

Address .....

Position .....

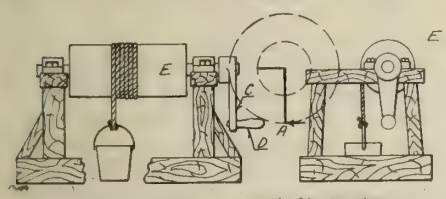
Firm's name.....

Shop Arithmetic—Wheel and Pulley Problems

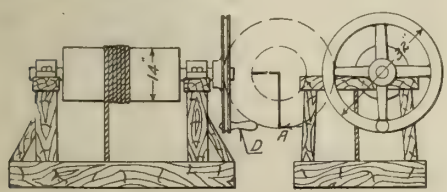
Part 12 of a Series in Practical Mathematics for the Mechanic and Those Learning the Machinist Trade. Calculations Dealing With Wheels and Pulleys Are Covered in the Present Lesson

By J. H. RODGERS, Associate Editor Canadian Machinery

IN a previous lesson it was stated that a large percentage of mechanical movements was based on the principle of the simple lever action, modified or adapted for specific purposes. This is clearly illustrated in the practical application of brake beams, rocker arms, trip hammers, safety valve levers, etc. The same is equally true in respect to wheels and pulleys, but the direct action is not so evident owing to the continuous movement in the one direction. To make the student more familiar with the evolution of the wheel and axle, and show the relative connection between it and the lever, the cut below is given.



The transition from the lever to the windlass is quite clear, and the mechanical advantage of the continuous movement is immediately recognized. The sketch in the centre shows the skeleton lever in the same position as the windlass. In raising the weight the force applied is exerted at the point A, or the extreme end of the lever, and is operating at maximum efficiency when at right angles to the direction of travel, or tangent to the circle through which the outer end of the lever moves. The crank C, is the power arm, the handle D being attached to facilitate the operation. The radius of the drum E is the length of the weight arm, but owing to the vertical pull of the rope or cable, the position of the lever may be considered as being always horizontal. Suppose now that the crank is removed and replaced with a wheel, as shown below, there is evidently no material change in the action of the mechanism.

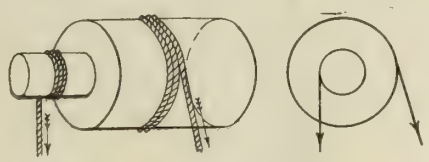


With the dimensions as given above, and neglecting the power required to overcome friction, what weight could be raised by an applied force on the handle of 100 lbs. ? Using the ratio of: the power applied is to the weight lifted, as the weight arm is to the power arm.

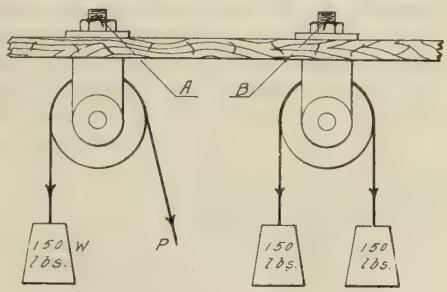
$$P : W = W_a : P_a \quad \text{or}$$

$$W = \frac{P \times P_a}{W_a} = \frac{100 \times 16}{7} = \frac{1600}{7} = 228.6 \text{ lbs.}$$

In the above example it was shown that the force required to raise the weight had to be exerted in a circular manner. With a man turning a crank of this description it is usually a very difficult task to maintain the applied force in a tangential direction, owing to the continual changing position of his arms and body, so that it will invariably be found that much of his strength is wasted, and the effective pull reduced. The one direction, steady pull, therefore, is the best where weights must be lifted through considerable distance. An arrangement of this kind is shown below, together with the leverage diagram from which the action is derived.



In the last lesson a few abstract examples were given to illustrate the connection between the lever and the pulley. We will now go into the subject more fully and demonstrate where the knowledge of figures is of considerable advantage in determining those factors underlying the practical use of such devices as pulleys and chain blocks, belting, gearing, etc. When a rope is passed over a single pulley riding in a bracket, secured to some overhead support, it has been shown that the pull required to balance the weight must be equal to it. This is quite clear from the sketch below.

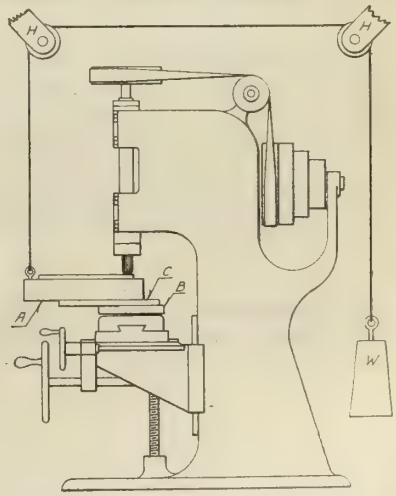


To some of the younger mechanics it might appear that the stress on the bolt supporting the pulley would equal the weight W, but a little study of the conditions will convince one that the sress will be equal to twice the weight; in other words, equal to the weight supported plus the pull required to balance the weight. This is quite evident from the right hand figure, where the pull is replaced by a weight sufficient to maintain equilibrium. The rope or cable in this case is under uniform tension of 150 lbs., but the tension on the bolts A and B is 300 lbs.

This question of rope strain is one that frequently occasions considerable controversy, among shop men, regarding the actual tension upon the rope when loaded. The difference of opinion invariably arises from lack of sufficient knowledge respecting the fundamental principles of forces in action.

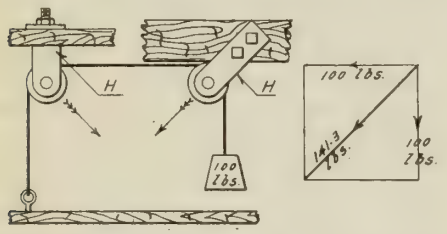
To fully understand the question of rope stresses it is necessary to become familiar with the third law of motion, namely, "action and reaction are equal and opposite"; that is to say, when a force is applied a corresponding force is extered in the opposite direction. Therefore, irrespective of how the reaction operates, it must be understood that the stress in the rope can only equal the force or power applied. This applies, not only to single ropes under direct pull, but to all individual or multiple systems. In the case of multiple block tackle, where the force applied is, say 100 lbs., this stress will be equal throughout the entire rope, with slight variation due to the additional strain resulting from friction of the moving parts.

A practical example of this character was experienced by the writer some years ago, which created considerable discussion at the time, as to the tension existing in different sections of the rope. A sketch of the problem is shown here.



This shows an arrangement provided to balance the overhanging weight of a large die, while the latter was being milled on a small vertical milling machine. Several problems presented themselves, which gave rise to no little discussion among them men in the shop; those pertaining to the strain upon the different sections of the rope, and also to the pull upon the hangers H, H, when the weight was supported in different ways. The operations on the casting A, were such that considerably over half of it would extend over the edge of the

circular table B. The auxiliary plate or table, C, was used to support the casting, which weighed approximately 300 lbs. When the work was secured in position, undue strain was placed upon the revolving table, and to overcome this, the counter-balancing arrangement was adopted, and located as shown in the sketch. The weight W, was arranged to balance the overhang of the work. The main interest in the foregoing hinged upon the strain in the rope, due to the hanging weight. It is quite clear, however, that the stress throughout the rope is uniform and equal to the suspended weight. Another point of discussion was the proper position of the hangers H, H. Opinion differed here also, but with the rope in the position shown below, the maximum pull on the hangers would be in the direction indicated by the arrow, or along the line bisecting the angle of the rope.

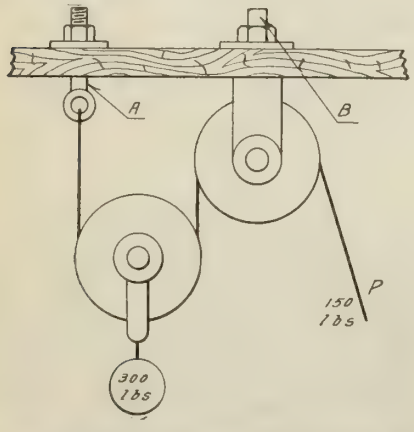


With the pull of 100 lbs. on the rope, the pull on the hanger in the direction of the arrow can be calculated from the diagram of forces shown to the right, and in this case would be equal to the hypotenuse of the right triangle, having sides representing 100 lbs. Then the pull at the bracket in line with the arrow would be:

$$\sqrt{100^2 + 100^2} = 141.3 \text{ lbs.}$$

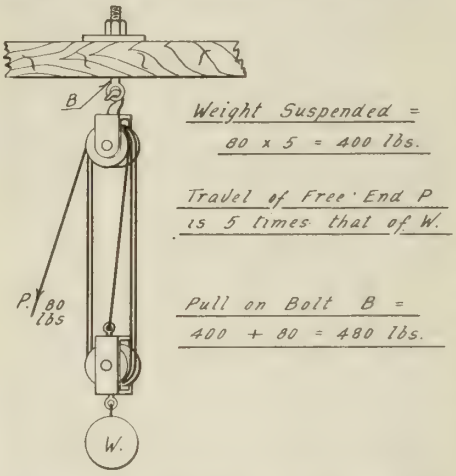
Maximum strength and rigidity would therefore be obtained by placing the brackets as shown to the right.

Suppose we have a tackle arrangement as shown below, where a force of 150 lbs. is exerted at P; what will be the weight supported, and the pull upon the two supporting eye-bolts?



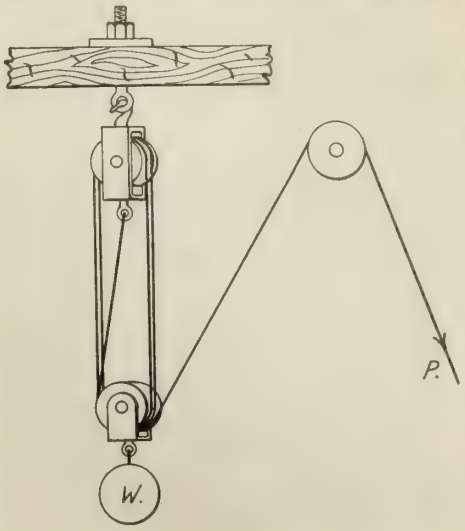
The tension throughout the entire rope will be equal to the pull at P, or 150 lbs. The weight suspended is supported by two portions of the rope, therefore, it will equal twice the force applied, or 300 lbs. The eye-bolt A, having the rope secured to it, is subjected to a tension equal to that of the rope—150 lbs., but as the down pull on the bolt B, is made by two sections of the rope, it will be under a tension of 300 lbs., and the combined pull downwards will be 450 lbs.

In any arrangement of multiple pulley blocks the calculations are virtually the same, as the principle is identical; that is, the weight supported is equal to the tension in the rope (the force applied), times the number of sections supporting the weight. The mechanical advantage is equal to the number of rope sections supporting the lower block and the load. In the arrangement here shown the mechanical advantage is 5.



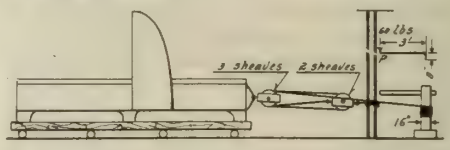
In the above instance the weight is supported by five sections, so that with a pull at P of 80 lbs., the weight W would be 400 lbs.

Whenever convenient it is advisable to place the movable block so that the pull on the power end of the rope will be in the same direction that the weight is to be moved. If the block above had been reversed, and the pull at P was upwards, the efficiency of the apparatus would have been increased, and the mechanical advantage would be 6, as there would be six sections of rope carrying the load. However, in the ordinary block and tackle this method has the disadvantage of the applied force acting above the weight to be lifted, so that to utilize the full advantage of a block arrangement, an idle pulley would have to be located to carry the free end of the rope, as shown below.



In the case of overhead cranes, where the power is located above, the pull in the upward direction can be utilized effectively, but with the power located on a level, or below the weight, the force exerted must act contrary to the moving weight.

When tackle of this kind is used to move heavy objects in a horizontal direction, as the transfer of a machine from one location to another, care should be taken when placing the blocks in position, so that the pull will be in the same direction in which the machine is to be moved.



If, in the arrangement above, a force of 60 lbs. was applied at the outer end of the lever A, and the vertical drum was 16 inches in diameter, what would be the resistance offered by the machine? It is seen that the drag comes upon six sections of rope, so that the mechanical advantage is 6. The tension in the rope is determined by solving the leverage at the windlass. The power applied multiplied by the length of the power arm (lever A) equals the weight (rope tension), multiplied by the length of the weight arm (radius of the drum B), or:

$$60 \times 36 = 8 \times x \quad \text{or} \quad 60 : x = 8 : 36$$

$$\text{then } x = \text{rope tension} = \frac{60 \times 36}{8} = 270 \text{ lbs.}$$

As the mechanical advantage of the device is 6, the resistance would be 270 × 6, equals 1,620 lbs.

In what has gone before no allowance has been made for the work required to overcome the friction of the moving blocks, which is present in all cases, particularly when operating under heavy loads. Suppose in the above case that the actual resistance of the machine to horizontal movement was 1,500 lbs., what percentage of power is utilized in overcoming the friction in the mechanism? 1,620 lbs. represents the theoretical efficiency of the apparatus, or 100 per cent., then the mechanical efficiency would be:

$$\begin{array}{r} 25 \\ 100 \\ 1620 \\ 54 \\ 28 \\ 7 \end{array} \times \frac{\begin{array}{r} 25 \\ 50 \end{array}}{1500} = \frac{625}{7} = 89.3\ \%$$

A new mineral has been discovered in Siberia. The discovery was made by a hunter on the shore of Lake Balkash, and the mineral has been named Balkashite. It has the appearance of dark-brown hard rubber, and when ignited it burns with a strong flame, leaving about 2 per cent. ash. When placed in water it becomes a mass very much like paraffine.

The Continued Supremacy of Cast Iron

By DONALD H. HAMPSON

WE hear a great deal these days about new metals and alloys, and we very nearly get the idea that the big five (cast iron, wrought iron, brass, bronze, and steel) of our fathers' days have been superseded. Twenty-five years ago, the metallurgist and the chemist and the mixers of metals had not come to the front with the bewildering variety that is offered to-day. From the reading of magazine articles and advertisements and from association with automobiles, the lay public has picked up considerable general information about materials—information which leads them to believe that every metal part that is worth while must be made of "alloys or special metals." And this is true to a lesser degree with many men in the mechanical branches—due largely to nicely worded statements of enthusiastic salesmen.

But to a greater extent than is realized at first thought, one of the "superseded" metals holds its own, in fact, is making new friends all the time. That metal is cast iron. Plain, ordinary grey iron—the cheapest of all the metals and the most adaptable. If you want a section only one-sixteenth thick or if you want a part that weighs twenty tons you can make it of cast iron and know pretty well beforehand that you can get it anywhere, any time, and that it will be just what you want.

"The bigger they come, the harder they fall," is a truism of the prize ring and it applies quite nicely to some of the vaunted substitutes for cast iron.

Take the aluminum piston for automobile engines, for example. It was going to revolutionize the business, but how many men who are in the class that has to look after their own cars will buy another car with aluminum pistons? There's an occasional exception, but it is back to the good old cast iron piston for theirs next time. Sold under various trade names, these men have found that the slight gain in weight and higher engine speed were accompanied by a loss of power unless the engine was over-hot and that the cylinder walls were saved at the expense of the pistons. Aside from the necessary sloppy fit in the bore, the wrist pins have a disagreeable habit of wearing or working loose so much sooner. It is back to the cast iron piston and a little slower speeded engine for these men who have tried.

The die casting gave poor old grey iron quite a shove to the wall. But recently, there has been a marked tendency to return to the sand cast product, especially for parts that are subject to any wear or pressure. Of course the iron casting does not begin to have the appearance of the accuracy that the die casting does. It is the permanentness of cast iron and its superior wearing quality that make it a more value than mere shape in the beginning.

Aluminum and die cast products made deep inroads in the printing business a few years ago when the market was flooded with the white metal "furniture" and plate mounting bases; these pieces were originally of wood or lead, but as the art progressed and modern machinery came in, cast iron replaced these two—to be followed by the die cast parts, that could be made of the required accuracy at a far lesser cost than cast iron. Actual usage throughout a period of years, however, showed that the white metal changed its size under printing pressures almost as easily as had the lead and that the boasted "stronger than cast iron" could not be realized. One supply house states that they would be half a million ahead to-day if they had left the other alone and stuck to the cast iron.

It is frequently stated that cast iron makes a good bearing surface for any shaft from the slowly revolving one up to a saw mandrel, yet we do not see many such because the average builder is wedded to the use of some bearing material. Two cases showing how good it is will be noted.

There are in a certain shop sixteen 2 in. milling machine spindles made of ordinary soft steel and running directly in cast iron of the headstock. These were made in 1902-1903 and were intended for using the carbon steel cutters of that day. With the general introduction of high speed steel, the machines were speeded up and as the steel bettered, more speeding up was done to keep the steel working right up to the "book speed." Just plain oil hole lubrication and ordinary operators—and not a case of refitting in all that time, though the work must always be "plus or minus, not over 0.000½ in." And the writer made and fitted a quantity of ¾ in. cast iron bearings over eleven years ago for which the factory has never had an enquiry for replacements in spite of the fact that the shafts in them run at 14,000 R. P. M.

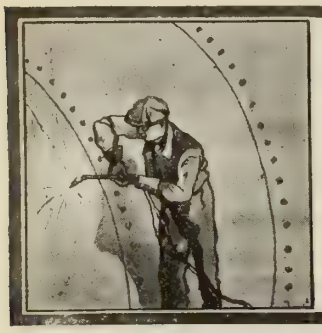
Then there is the case of the car wheel. At one time we were led to believe that the paper wheel was going to open up an era of silent, smooth running calculated to please the elect. Yet there are none of those paper wheels in use to-day and there are millions of the old-fashioned cast iron wheels rolling along smoothly and with a satisfactory degree of silence. Even the steel wheel has not made such deep inroads in the iron wheel business—not even when you can get cast iron chilled wheels that will do 80,000 miles or more and at a first cost of four cents a pound, even in these days of high prices.

Every factory has to use shafting, including pulleys and hangers. These latter items were once made exclusively of cast iron but the last two decades have witnessed the advent of pressed steel hangers and pulleys—parts which certainly are modern, light, neat, and almost indestructible. Yet if one circulates among the actual users of these products, there is found an undercurrent of reaction; one man tells you that a cast iron pulley or hanger "stays there" after it is made; another complains about the cast iron parts that are riveted or bolted in the steel structure and work loose; another machinist invites you to look at the "round" steel pulley he has in the lathe for boring, adding that if he took a cut ever it to make it round it would cut through at two points; and still another man beckons you to the scales to compare the weight of the steel product with well designed cast iron pulleys and hangers, pointing out triumphantly that the difference is hardly over five per cent.

In some automobiles we find gear cases of cast iron. The mechanic delights to work on such a car because he knows that the case isn't warped or sprung, that unless it has been cracked it is as accurate as on the day it was machined, that a touch with a hammer or a slip of a wrench will not bruise a surface to the point of inaccuracy that may escape the less trained eye of his helper.

All the metals used as substitutes for cast iron have their places—and the business could not get along now without them—but the selling talk that a competitor uses cast iron "because it is cheap, we use gold aluminum alloy" does not go as it once did and it seldom goes for re-orders. Grey iron has come out of the woods triumphant because it retains its size and shape, because it is one of the best wearing substances known, and because it can be given any reasonable form and at a cost that is not prohibitive.

Among the recent electro-therapeutical devices introduced to the public is an electric brush which, instead of being supplied current from a battery in the usual fashion, contains its own source of power. Leaving aside the therapeutical qualities of the electric brush, the present device is of immediate interest because of its electrical features. It contains a small generator which is capable of delivering currents of infinitesimal amperage, but at potentials of from 50 to 200 volts. The generator is driven by pressing a lever beside the handle, which lever operates through a chain of gears.



WELDING AND CUTTING

Oxy-Acetylene and the Safety First Movement

By A. CRESSY MORRISON, Sec. International Acetylene Association

An address delivered before the Western Pennsylvania Division of the National Safety Council.

MR. President and gentlemen of council:

Your president, with characteristic courtesy has, I fear, given you a somewhat too enthusiastic statement of my qualifications, in using the word "expert" and "authority." I must, therefore, as a preliminary, protest that I am neither an expert nor an authority, as these words will perhaps be interpreted by you in the light of your practical experience in the oxy-acetylene art.

I have, however, been closely associated with the safety rules and regulations governing the acetylene industry for many years, even before the first welding and cutting torches were used in this country. I have participated in the formulation of these regulations and have had an opportunity to observe the results of their application, but I have very much to learn from your practical experience in the actual use of the torch. I long ago became aware of the fact that it is impossible for anyone to be a real expert or an authority in any field without having personally undertaken practical work himself.

In approaching the subject which has been asigned to me, I am sure you will permit a moment's generalization. I am impressed by the fact that the Safety First Movement has become a factor in industry so late in the history of human endeavor. Our attention has recently been called to the interesting coincidence that the armistice became effective on the eleventh hour of the eleventh day of the eleventh month. Viewed in the light of the many thousand years during which human hands have wrought, it must be admitted that the Safety First movement, as expressed by such a splendid gathering of practical business men, is an eleventh hour movement. Eleventh hour movements, as instanced by the armistice, are sometimes exceedingly effective, and so, the safety first movement, as evidenced by gatherings such as this, promises to be equally so.

The growing recognition of the brotherhood of man has found expression in industry through a greater consideration for the life and limb of the employee and in a wider field in the recognition in a sociological sense of responsibility to those dependent on him.

Altruism in industry, while advancing with giant strides, has not yet reached the point where it will alone continuously sustain the very serious efforts which the members of this council are, with thousands of others, at the present moment putting forth for the benefit of the workers in their respective industries.

Fortunate, there is, supplemental to the idea of benevolence, but of vital importance in assuring permanence to the Safety First Movement, the growing recognition of the superb fact that effort put into this movement is highly profitable. Great as is the effort of the present, the Safety First Movement is therefore but in its beginning, but its permanence is further assured by the marvelous growth during the war of humanitarian ideas and a realization of mutual dependence coupled with a higher evaluation by the industries of the faithful employee.

The wise employer recognizes as a fundamental of complete success that the maintenance of the health, comfort and safety of the employees is of paramount importance. Permanent relations between the employer and the employee in good health means experienced service and highest efficiency for both. To me the Safety First Movement already presents a means of communication with the employee which has won his confidence and through which many of the problems of readjustment, which now cause anxiety, may be solved without the sometimes predicted industrial disturbances.

I have said these things to you, knowing you would pardon a slight digression from the subject of the hour that I might show you that knowledge of your great work is abroad in the land, and that those who observe your activities appreciate its importance and its sound philosophic basis.

In discussing the oxy-acetylene blowpipe, my subject naturally divides itself into two parts—one part dealing with safety in relation to the manufacture and transportation of material and apparatus used in connection with the art of welding and cutting, which, of course, includes the containers. The other part deals with the use of these substances and mechanisms.

If I deal with the first part of the subject and show the efforts which have been put forth to place in the hands of your workmen a safe apparatus and pure elements in safe containers, we can, when we come to the discussion of the rules governing actual use, see to what extent existing codes need to be supplemented in order to protect your employees and the whole industry adequately. This, of course, is our aim.

I will begin with the substances themselves—calcium carbide, acetylene and oxygen.

Calcium Carbide

Calcium carbide became a commercial fact because of the discoveries of L. Willson, an electrical engineer at Spray, N. C., who used an electric furnace for the production of metallic calcium. He secured a melted mass of dark color, which, on cooling, became solid and brittle. The substance was not the material for which he was searching, and some of it was thrown into a neighboring stream, when it was discovered that a gas was being evolved. This gas, when ignited, gave off quantities of soot, showing that it was not hydrogen, but a rich hydro-carbon gas. Upon investigation this was found to be acetylene. Thus calcium carbide was first manufactured during the experiments at Spray which took place in 1892. From this small beginning, such a short time ago, has grown the manufacture of calcium carbide which now girdles the world, the quantity produced running into the hundreds of thousands of tons, and its usefulness in many fields has proved to be of surprising importance.

Calcium carbide is manufactured in

the electric furnace at a temperature of about 7,000 degrees Fahrenheit, the raw materials being lime and coke. The resultant substance, calcium carbide, is a true chemical combination of calcium and carbon. It is tapped from the furnace and cools into ingots which are broken in stone crushers, screened to size, and packed in steel drums. It is then ready for shipment.

Calcium carbide is not an explosive, is not inflammable, and is not affected by concussion. These facts are shown by the crushing operations through which it is reduced to marketable sizes, and by the fact that it has already been subjected to the highest temperature man is able to produce. It, therefore, will not burn; nor is it affected by any heat other than the electric furnace itself.

Calcium carbide is unaffected by any of the elements with which it comes in contact, save water. It will slake if left exposed to the air because there is sufficient moisture in all normal air to produce its slow disintegration. There is never enough moisture in the air to produce enough acetylene from calcium carbide to form an inflammable mixture of air and acetylene, and under ordinary conditions of exposure to air there can be no accumulation of acetylene because the carbide exhausts all of the moisture from the air in its vicinity and cannot get any more until the dry air and acetylene has passed on and fresh air has taken its place.

Calcium carbide, if exposed to water, instantly produces acetylene. The amount of acetylene produced by commercial calcium carbide varies with the conditions, but is usually more than 4½ cubic feet and not more than 5 cubic feet to the pound.

Calcium carbide is packed in Government-regulated lapped seamed steel drums with a double cover. These drums in vast quantities have withstood for many years the vicissitudes of transit, both on land and overseas. The steel drums have been subject with the contents of calcium carbide to fire and flood under all possible conditions of exposure, and the record is excellent. So good is the record, indeed, that calcium carbide, which was at one time regarded with anxiety, is now shipped freely everywhere and has been removed from its list of dangerous articles by the Interstate Commerce Commission, and even from its list of articles which were at one time classed as doubtful. The underwriters, in their regulations, stipulate only that calcium carbide shall be kept in a dry place above the ground, and that where quantities in excess of 600 pounds are stored in one place it shall be stored in a building used exclusively for such storage, or in a specially constructed generator house. I think it is safe to say, therefore, that calcium carbide, as delivered to you for use is completely safeguarded, and that if the simple suggestions put forth by the underwriters are followed, it need not be regarded as a hazard by you.

Acetylene

Acetylene, which has it commercial origin solely in calcium carbide, is a hydro-carbon gas. It comes to you in two ways—one through its manufacture from calcium carbide by means of a mechanism known as an acetylene generator, and the other compressed into standard acetylene cylinders.

Acetylene found its first usefulness as a means of illumination. For this purpose acetylene generators were devised. From the beginning, the National Board of Fire Underwriters, the Underwriters' Laboratories, and upon its formation, the National Fire Protection Association, assumed jurisdiction. As experience developed, rules and regulations for the construction of acetylene generators were devised and revised. Inventive genius was called into play to evolve a proper burner by which acetylene, so rich in carbon, could be made to burn with a brilliant, steady flame.

Acetylene produced by means of an acetylene generator has most of the characteristics of other hydro-carbon gases. The mention of a few of these gases will be illustrative, for instance, coal gas, water gas, gasoline, etc. Acetylene, however, does not contain carbon-monoxide, which renders coal gas and water gas poisonous and may be breathed mixed with air without any detrimental physiological effect. Like the other hydro-carbon gases it burns to carbon-dioxide and water vapor so there are no fumes from acetylene and consequently no danger from the products of its combustion.

Acetylene will ignite when mixed with air, provided the acetylene reaches three per cent. and under normal conditions, does not exceed thirty-five or forty per cent. Its rather wide range of ignitability is sometimes emphasized, but the real question is how small a percentage mixed with air will ignite, and the question of how rich the mixture has to be before the flame will be extinguished may well be excluded.

The development of the use of acetylene for lighting is very extensive and increasing. Over 300,000 homes, especially those in isolated locations, are lighted with acetylene. Acetylene is the dominant means of illumination in the non-gaseous coal mines and metal mines of the United States. Perhaps 700,000 miners use acetylene, carrying individual miners' lamps on their caps whenever they enter the mines. A very extended use and one of great value is the illumination by acetylene of aids to navigation, beacons and buoys. Acetylene, with its brilliant rays literally covers the world where warning marine guides are necessary. Acetylene has a wide use in contractors' lights where high candle power is needed in outdoor work.

The knowledge of the production and the characteristics of acetylene acquired by the underwriters while the development and use of lighting mechanisms was taking place, laid the foundations for the properly safeguarded apparatus now used for the manufacture of acetylene for use in the oxy-acetylene blowpipe. Mechanisms which have passed the underwriters are known as permitted generators. The cost to the manufacturer of an acetylene generator who desires to submit his apparatus for approval by the underwriters is small, and experience has shown that the underwriters' standards are necessary. You need not be anxious regarding the generator provided you purchase of the several makes which have been passed upon by the underwriters, and then install it in accordance with the rules and regulations which have been very carefully developed from the long experience of the National Fire Protection Association and the better class of manufacturers. One of the best rules of safety engineers is to avoid any generator which has not been approved, although many cheap devices are being offered.

The simplicity of the reaction between carbide and water is such that a great many shop engineers feel confident that they can devise an acetylene generator. An engineer who is perfectly sure that an inexperienced theorist would be incapable of doing things which he does so well, often feels that he can undertake matters which perhaps require quite as much experience in another field, and that he will prove an exception. The expectation of the inexperienced engineer who thinks he can make an acetylene generator and avoid all hazards which experience has now properly safeguarded should not be relied upon by safety engineers. The manufacturer who will refuse to submit his generator to the impartial and very careful examination made by the underwriters should not be trusted by safety engineers. A man is properly safeguarded if he will purchase a first-class generator from a reputable manufacturer which is listed as having the approval of the underwriters.

Where acetylene is used from cylinders, the industry has, with the aid of the underwriters and the Interstate Commerce Commission, developed safety to an equally high degree. The acetylene cylinder which must be approved by the Interstate Commerce Commission and which has passed the rigid examination of the underwriters' laboratories, is something more than a steel enclosure in which the acetylene is confined. Many people do not understand that these cylinders are completely filled with a porous material, such as asbestos, which, when compressed into the cylinder vigorously still leaves a porosity equal to about 75 per cent. of the capacity of the cylinder. Acetylene could now be compressed into the cylinder, but the quantity which the cylinder would hold at the low pressure of 250 pounds, which is the limit fixed by the Interstate Commerce Commission would be very small. A means must, therefore, be devised to increase the capacity of the cylinder for acetylene, and this is accomplished in a most interesting way. Acetone, which is a liquid related to the wood alcohol family, has peculiar characteristics in relation to acetylene. It will, for each atmosphere of pressure, absorb twenty-five times its volume of acetylene. The asbestos in the cylinder is, therefore, saturated with acetone up to about 50 per cent. of its porosity, whereupon when acetylene is compressed into cylinders it is taken up by the acetone and this is

why 300 feet of acetylene is compressed into an acetylene cylinder at 250 pounds pressure, while the size of the cylinder would indicate that the quantity contained was very much less. The acetylene being both absorbed by the acetone and entangled in the interstices of the asbestos makes the progress of the explosive wave in the cylinder impossible, and this accounts for the fact that with the extremely extended use of acetylene cylinders, accidents from any cause are few.

In speaking of acetylene cylinders and the absence of hazard, it must be understood that I am confining my remarks regarding their safety strictly to those cylinders which meet the laws of the United States as expressed through the Interstate Commerce Commission and which have had the approval of the underwriters. If the use of acetylene from cylinders is confined to those which have met these requirements the user is properly safeguarded.

The reason for the difference between the methods of compressing acetylene and other gases has not likely been given consideration by you as it depends upon the peculiarity of acetylene in which it differs from other hydro-carbon gases and is indeed unique.

The very high temperature of the oxy-acetylene flame is due not only to the combustion of the acetylene which means a chemical combination of the hydrogen and the carbon of acetylene with the oxygen, but to another quality which raises the temperature from the 4,000 degrees which marks the apex of temperature in any other combination to 6,300 degrees which is approximately the temperature of the electric arc. This peculiarity of acetylene and the extra vigor of the flame which makes it the only available flame by which general welding can be accomplished is due to the fact that when acetylene is formed, during reaction between the carbide and the water, the molecules take up heat instead of giving it off. The amount of latent heat locked into the molecules of acetylene approximates 300 British thermal units. This latent heat is called endothermic energy. When acetylene burns, the moment the molecule enters the flame it breaks, releasing its endothermic energy, and instantly the hydrogen and carbon combine with the oxygen adding to the combustion, and the temperature of the whole is thus concentrated in an instantaneous dissociation and recombination which acetylene its unparalleled temperature and its far-reaching usefulness.

The endothermic energy of the latent heat of the acetylene molecule must of course be given consideration when acetylene is compressed, for with each added atmosphere of pressure the distance between the molecules is reduced. It is a well established fact that when acetylene is under ordinary conditions one molecule may break and release its energy without having any effect upon those surrounding it, but when the distance is reduced by pressure the releasing of heat of one molecule will affect the whole mass and instantaneous dissociation takes place. The possibilities of accidents from this source were early ascertained and the result has been that throughout the world laws have been passed which forbid the compression of acetylene above 15 pounds to the square inch unless the compression is done under well-known technical conditions and unless the compressed acetylene is immediately absorbed in cylinders containing asbestos, Kieselguhr or similar approved porous material, saturated with acetone or a similar approved solvent.

I have gone into the details of this subject so as to impress upon you as safety engineers the necessity of avoiding any attempt to compress acetylene into cylinders by any of the methods of compression used for other gases. I wish to warn you further against what appears to engineers to be a very simple method of securing acetylene under pressure by means of a generator so constructed that the carbide and water are brought together and the resulting gas accumulated until the desired pressure is attained. These generators are known as self-compression generators and at one time were constructed and held forth as safe by unscrupulous manufacturers with disastrous results. They are forbidden by the rules of the undewriters and by laws and ordinances in all countries, but occasionally even to-day I find foolhardy people who think they can disregard to world's experience. As this is a technical body I am sure that a moment's reflection will show that you should set your face against the use of unlawful generators. The approved generators limited to fifteen pounds pressure and the approved cylinders have been so well devised as to successfully safeguard the production and distribution of acetylene to the torch.

Oxygen

Oxygen is the only other element with which we are concerned at the moment. We are inclined to treat oxgen because it has been an article of commerce in notable quantities for but about ten years, as if it were something new or unusual, forgetting that one-fifth of the air we breathe is oxygen. Every fire that burns is an exquisite chemical experiment disclosing to us the combination of oxygen with some combustible substance. One-half of the earth's crust and one-fifth of the atmosphere, one molecule out of every three of the rolling ocean is oxygen. So far as man is concerned, oxygen is our most abundant and most active chemical element. One would suppose that it would have been separated from its combination and mixtures and utilized long before.

I never breathe a breath of fresh air feeling its vital necessity, or quench my thirst from the living spring, or see green nature changing carbon dioxide into trees, fruits and flowers, or warm my body before the hearth fire without an interior sub-conscious thankfulness to God for his greatest gift—oxygen.

Oxygen has for some years been produced for a medicinal purpose, giving a stimulating breath of life to tide over the most tragic and critical moments in the sick room, but it remained for acetylene, one of the later children of man's ingenuity, to bring into commercial being the most abundant and necessary element.

When acetylene and oxygen combine, the warmth of their affection seems to indicate a true affinity which the excessive and accentuated temperature demonstrates.

Oxygen may be produced by breaking up certain chemical combinations or by sifting the mixed molecules of oxygen form the nitrogen of the air. Many elements will absorb or combine with oxygen at one temperature releasing the oxygen at a higher temperature. In some cases the range is too extreme to be useful, but in some cases oxygen is absorbed at atmospheric temperature and given off at temperatures easily attained. Certain processes for the production of oxygen known as the chemical method were based upon this fact. At the present time, however, these processes have been abandoned, and therefore need not be considered.

Chemical combinations may be broken up by electricity, and in water we have a chemical combination which contains but two elements—oxygen and hydrogen. If an electric current under suitable conditions is passed through the water the molecules of water are broken up into one part oxygen and two parts hydrogen, the oxygen will collect at one pole and the hydrogen at the other. If the elements are kept separated we have, by means of the electric current a method of producing oxygen and hydrogen from an unlimited source of raw material—water. The amount of energy required, the method of its application and the means by which the oxygen and hydrogen are kept separate involve high engineering talent and experience. The hazards of a mixture of oxygen and hydrogen in the same cylinder while sufficiently obvious still call for a note of warning to those who would undertake the manufacture of oxygen by this process, that all necessary precautions must be taken. The use of oxygen from this source should not be undertaken until the Safety Engineer assures himself that the plant is backed by well regulated and carefui business organization in the hands of thoroughly experienced and conscientious people. If the production of oxygen by this process is to be undertaken by the user, experienced men should be in charge capable of making frequent accurate chemical analyses to check purity of both products in manufacture as well as in use.

The other source of supply of oxygen is the air itself. It has been discovered that if the air is cooled until it liquefies, by a delicate process of distillation nitrogen may be distilled off leaving the oxygen behind just as in the case of fermented mixtures the alcohol may be distilled leaving water behind. So successful has this process become that a very large percentage of oxygen now produced is made available by the liquid air process. The impurity in liquid air oxygen is the nitrogen of the air and the

resulting product is, therefore, without any hazard from the possibility of chemical recombination.

The production of oxygen is now a very large industry and plants and warehouses are widely distributed and adequate supplies are available everywhere. The question for the safety engineer is simply one of proper precaution as to the source of supply. If the oxygen is manufactured for use at the plant the serious considerations are the selection of high-class apparatus, its installation and securing the technical ability necessary to run, manage, and safeguard it.

Cylinders

On the question of cylinders, the Interstate Commerce Commission has spoken, and hazard from the cylinders as regards pressure explosions may be said to be eliminated. An oxygen cylinder contains oxygen compressed to 1,800 or 2,000 pounds to the square inch and has proved itself to have an adequate margin of safety to hold these pressures under all vicissitudes of transit and use. Literally millions of fillings and shipments have taken place each year, and accidents under ordinary conditions of use may be considered as negligible.

Apparatus

The apparatus used for combining oxygen and acetylene at the point of use which means the pressure gauges, regulating valves, hose and the blowpipe itself, are again under the jurisdiction of the underwriters' laboratories. Approved and permitted apparatus of high-class is built sturdily for use, is calculated to burn the gases with the greatest possible efficiency, both as to consumption and resultant available temperature. The user having selected his apparatus with these facts in mind attempting no short-cuts or false economies, will find himself protected at every turn by the co-operation of the best part of the industry with the underwriters, who happily, in anticipation of the development of the welding and cutting art in this country, laid down rules and regulations which have governed it ever since.

I have attempted to show that from the manufacture of the materials which you are called upon to use through the mechanisms of manufacture, transportation and use to the very tip of the torch in the hands of your workmen, the Government, the underwriters and the industry have co-operated with the idea of safety first being the basis of the widest possible use of an exceedingly valuable addition to the tools of industry.

As safety engineers you have but to adhere to the principles so carefully developed; buy good quality mechanisms and material, install your apparatus in accordance with the highest accepted practice, avoid experimental short-cuts, discourage false economies, and keep the welding and cutting torch in the hands of responsible people imbued with the spirit with which you are endeavoring to make a part of your employee's life, that is the spirit of safety first.

In expressing to you my appreciation for your patient hearing I respectfully suggest that as the oxy-acetylene cutting and welding torch is placed in the hands of your workmen properly safeguarded, we may now well discuss the rules and regulations proposed by your secretary which will properly safeguard its use.

STANDARDIZATION AN AID TO WORLD PEACE

At the dinner given in honor of Mr. Charles LeMaistre, Secretary of the British Engineering Standards Association, by the American Engineering Standards Committee, the guest of the evening, expressed the opinion that one of the strongest ties which can bind two or more nations together is engineering and industrial standardization.

This, the first function to be given by the American Engineering Standards Committee, took place at the Engineers' Club, New York city, Thursday evening, September 18th. It was attended by more than fifty engineers, representing practically every organization interested in the development of standards.

Responding to the invitation of Chairman Comfort A. Adams, who acted as toastmaster, Mr. LeMaistre said in part:

"Human language is but a very poor interpreter of the highest thoughts of the human mind, and I must plead with you and ask your indulgence as I can only be but a poor interpreter of the very high ideals which the British Engeering Standards Association has always set before it. The B. E. S. A. was formed in 1901 at the instance of Sir John Wolfe Barry, the doyen of our engineering profession, and it was through his able guidance during some sixteen years of the most important period of its existence that the association gradually gained the confidence of the people. We are now an organization of some three hundred committees and twelve hundred members who give their time fully to the work.

"Though much of the work of our committees is done in London, many of them meet in the centres where the particular standard under discussion is manufactured. This assures at the very outset that those people who are going to use the standards and who are in daily contact with the apparatus involved, and who have the closest knowledge of the details, shall put up the first proposals. This is not quite what we used to do, but we realize more and more that standardization is, shall I say, 15 per cent. technical and 85 per cent. human. Standardization is an industrial matter, and it is the industry that should put up the standards and get the help of the engineers and experts to support them.

"I hardly like to go into a discussion of the general principles of standardization, because I should feel that I was talking to my masters. However, we agree that standardization means efficient production. It can only be effective when overlapping is avoided. Overlapping can only be obviated by the operation of some central organization, which we have provided in Great Britain with wonderful effect. We find now that overlapping of effort is becoming less and less each year, and the B. E. S. A. is becoming more and more recognized as the central authority for drawing up standards for the engineering and allied industries.

"During the last year or two I have received at my office numbers of letters from America inviting co-operation, and I have always been in some difficulty to know how to reply. Take for instance, the Electrical Industry, which has in this country at least a dozen organizations doing standardizing work. A request from one of these could not be accepted as from all. My association feels that, at the present important stage of the development of the work and of the closer relationship with the United States, if only we could get co-ordination of standardization on both sides of the water, one central authority on each side, it would not only help our industries enormously, but we could work hand in hand on these technical problems which involve this complicated human factor. And in doing this big work we would surely be no mean influence in promoting the peace of the world.

Following Mr. LeMaistre's address, Chairman Adams called for responses from the representatives present. Dr. C. O. Mailloux spoke as the chairman of the American Committee of the International Electro-Technical Commission, and as a close friend and admirer of Mr. LeMaistre. Mr. Nelson P. Lewis, past president and representative of the American Society of Civil Engineers, pledged the support of his society of the contemplated development of the American committee. Professor Charles F. Scott reviewed the beginnings of electrical standardization in America, which he regarded as the basis of international electrical standardization accomplished so far. Mr. Edwin M. Herr represented the American Society of Mechanical Engineers, and also spoke for this society. Mr. Guilliaem Aertsen of the American Society for Testing Materials, introduced a pleasing analogy to emphasize the necessity for developing team work, which helps not only the team, but the individual as well.

Dr. S. W. Stratton, Director of the Bureau of Standardization, reiterated the readiness of the Government Departments to co-operate in the development of the committee's programme, and Mr. Charles M. Manly, President of the Society of Automotive Engineers, pledged his society. Mr. Ira H. Woolson represented the National Board of Fire Underwriters, Mr. A. Cressy Morrison spoke for the National Safety Council, Mr. G. H. Ramsdel told of the standardization work of the American Gas Association, Mr. B. F. Waterman represented the American Gear Manufacturers' Association, Mr. Charles W. Baker spoke for the Technical Press, and Mr. D. Knickerbocker Boyd told of the great need of standardization in building materials and design.

DEVELOPMENTS IN SHOP EQUIPMENT

HACK UNIVERSAL RELIEVING MACHINE

THE "Hack" high-power universal relieving machine is made in 6-, 10- and 16-inch sizes by the American Machine Tool Engineering Works, 4854-4858 W. Kinzie St., Chicago, Ill. This machine is constructed with the pan and legs cast integral, the pan being located close to the floor in order to afford space for a bed of ample width and depth. The bed is designed with two distinct sets of ways; the headstock and tailstock are carried on one set, and the carriage is supported by both sets. The second set of ways serves the additional purpose of supporting the side relieving attachment. The lead-screw is located between the rear set of ways on which the carriage travels, this location permitting of an exceptionally free movement for the carriage.

The headstock includes a number of new features of design, some of which are quite radical. Attention is called to the self-contained countershaft which forms a part of the head. Power is transmitted to this relieving machine directly from the lineshaft or jackshaft, through one forward and one reverse belt, without idlers or intermediates of any sort. The drive is carried from the pulleys to the head through a Carlisle-Johnson friction clutch, which is very sensitive and permits of instantaneous forward or reverse movement. Power is transmitted directly from the countershaft pulleys through spur gearing of various ratios to the spindle. Most of the gearing of the headstock is machined from 60-point carbon steel forgings, the bull gears having teeth of 4 diametral pitch in the 16-inch machine. Speed changes are obtained through sliding gears which are controlled by five levers, the gearing being as nearly fool-proof as possible and running in a bath of oil, which insures proper lubrication of all parts in the headstock. The spindle bearing and other bearings, regardless of how low the rate of rotation, are supplied by sight-feed oil-cups and tubes, making it readily apparent which bearings are obtaining the proper lubrication and which are not.

At the right end of the relieving machine there are two quadrants, one for change-gears for such leads as may be desired up to approximately 6 inches, and the other controlling the cam driving shaft which extends along the back of the machine. These change-gears correspond with the number of gashes or with the spiral of the gashes as the case may be. The rear cam driving shaft is driven through change-gears from a stud in the rear end of the headstock, this stud obtaining its power directly from the large bull gear, although it rotates at six times the speed of the spindle at all times. By means of a ratchet dog on the camshaft the cam movement is suspended while reversing the spindle, and is ready to continue its rotation at the proper point when the spindle is again run forward. This cam driving shaft extends the entire length of the machine and is supported in bearings at both ends. From it power is taken to rotate the cam arbor driving mechanism at the back of the carriage as well as the driving mechanism for the side relieving cam. Adjustments are provided to make it possible to time the two cams either in unison or independently, as may be desired. The side relieving attachment causes the entire carriage to move, while the regular relieving arrangement causes the cross-slide to move.

The carriage cross-slide and the compound slide are liberally proportioned to take the tremendous force which can be transmitted through the spindle. The tool-block, which in itself is a horizontal slide, is made of carburized cast steel, hardened and ground on all working surfaces, thus insuring a rigid, accurate tool-block. The design permits of making micrometer adjustments when required or the tool-block may be securely locked. A safety device within the headstock prevents the carriage from being run against the headstock by accident. Likewise, a safety device on the tailstock prevents running the carriage into the tailstock. The tailstock is made in one piece, permitting of absolute alignment with the spindle at all times. No provision is made for handling tapered work. When taper relieving becomes necessary, a special spindle with an offset centre may be furnished. The bolts and clamps for the tailstock are of such proportions as to make the tailstock as rigid as the headstock.

The carriage is actuated by means of a rack and pinion movement within the

HACK HIGH POWER UNIVERSAL RELIEVING MACHINE.

apron. A special mechanism is incorporated within the apron to provide for concave relieving, the purpose of which is to relieve the bulge or barrel effect which occurs in all hobs and cutters several inches in width, as the result of hardening. The arrangement of this feature is such that where three hobs or more of a kind are placed upon the

ANOTHER VIEW OF THE MACHINE.

relieving arbor, each hob can be produced with a concave contour corresponding exactly in curvature and depth with that of the other hob in that set; or where one large hob is being made, the curvature can be distributed in its proper form over the entire length of the long hob. This curvature is controlled entirely from the mechanism within the apron and can be readily adjusted and set up for any desired length or depth of curvature. This relieving machine is completely universal, and is capable of relieving spiral or straight-gashed hobs, plain formed cutters and right or left-hand counterbores, as well as performing internal relieving operations on special tools when such may be required. The weight of the 16-inch machine is approximately 8,000 pounds. Its capacity is such that it will take a cutter 14 inches in diameter or one 16 inches long. However, cutters of 6 inches in diameter or smaller can be successfully relieved upon this machine. For work varying in diameter from 6 to 10 inches, the 10-inch machine is recommended, and for work smaller than 6 inches in diameter the 6-inch machine is capable of answering all requirements.

FEDERAL SELF-OPENING DIE HEAD

The self-opening die head which is made by the Federal Products Corporation, 393 Harris Ave., Providence, R.I., is so arranged that ordinary button dies, procurable at almost any tool supply house, may be used instead of specially made chasers. These button dies are split and the rough edges ground off at a slight angle, after which they are ready to insert in the die head shown in Fig. 1. Fig. 2 shows another view of the die head, the parts in this view being disassembled.

The die head, as can be seen, is very simple in construction and can be cleaned in a minute or two without changing the adjustment. The die sectors are firmly held in the jaws and positively supported around their entire circumference so that they will cut a straight, full and accurate thread. Any thread within the range of button dies may be cut with this die head. The die may be closed by hand or by an automatic lever device when used in a turret lathe. The die holder may be used in the turrets of hand or automatic screw machines or in a lathe. All parts are made of alloy steel, carefully heat-treated and hardened.

FIG. 2—THE DIE HEAD DISASSEMBLED.

THE HANDLING OF CRUDE RUBBER

A rather important change in the manner of handling crude rubber in the Far East has been made in the new general custom in the trade to pack the product in bales for ocean shipment instead of in the comparatively loose packages in which it has been shipped heretofore. The practical effect of the new method is to reduce the bulk of the product packed for shipment by about half and on the average to cause its weight to approximate its bulk in ship's ton measurement, i.e., 2,000 pounds of rubber baled occupies substantially 40 cubic feet. In shipping this has the effect of classifying rubber as heavy cargo instead of light cargo and materially affects the nature of shiploads leaving the various Far East rubber exporting ports

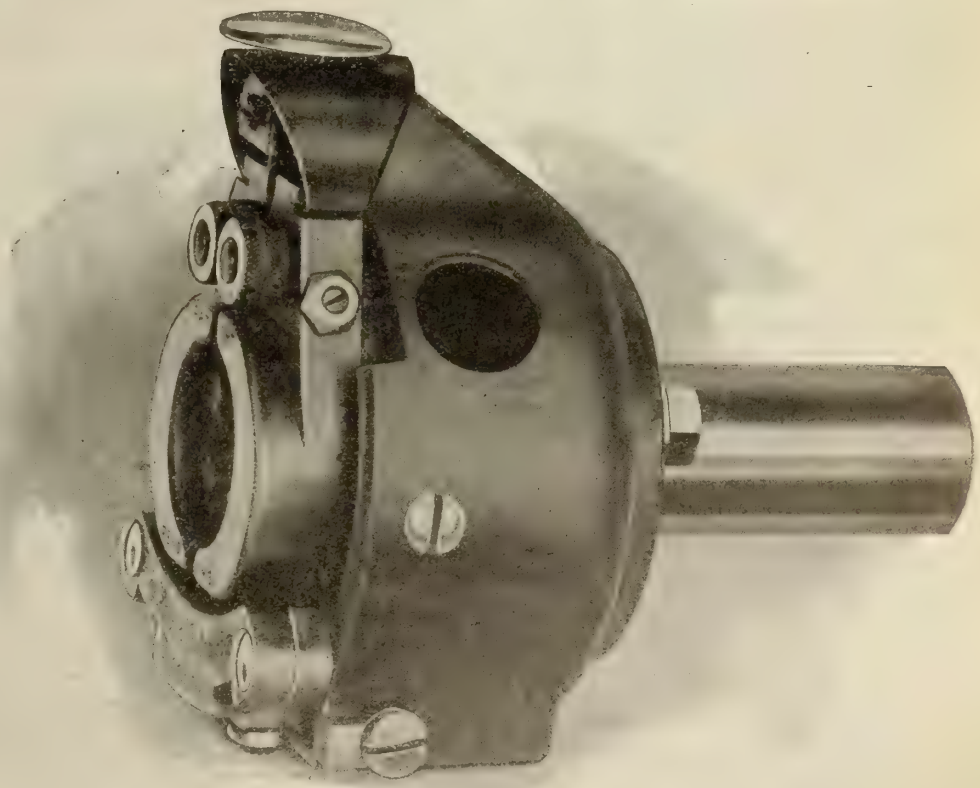


FIG. 1—FEDERAL SELF-OPENING DIE HEAD COMPLETE.

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Wasting Too Many Hours

CANADA has been facing a great chance ever since the close of the war. The world wanted everything that this country was in a position to make. Countries that had been at war for four years were at once customers, and big ones too, as soon as credit and terms were arranged.

Canada has, in a great big sense, been kicking this opportunity around ever since the war stopped.

The only thing most necessary has been production, and still more production.

The one thing that has been most outstanding in all our commercial blunders has been the manner in which production has been curtailed.

The mechanical world failed to grasp the big reason for high wages during the making of munitions. That big reason was PRODUCTION. Had production been stifled or output regulated according to "this much per day and no more," wages would not have been anything to compare with the pay envelopes that munition workers carried home during the war years.

During the month of July, Canadians, in strikes and lockouts, blazed away 561,010 working days. In August, they idled 316,187 working days. In two months 877,197 days. In another way, one man, could he live that long, wasted 2,923 years, counting 300 working days to the year.

Now, it is as plain as the nose on your face that this country cannot stand that.

Strikers can argue until they are black in the face that speedy production will soon fill the world's markets and in that way make more workers than jobs, but they cannot get one inch away from the economic fact—not theory—that lack of production and a great buying wave is keeping prices up on everything they have to purchase.

Canada should get to work. Britain is not in a position to export. United States has troubles that keep her factories strained in many lines to attend to domestic needs. Canada, rich in minerals, rich in forests, rich in water powers, rich in broad acres of good farming lands, can go in and produce and grow without any fear of forcing any man out of work.

Remember, by this we mean that a man going to work must become a worthy producer. We have now an excess of people who persist in camping on the necks of those whose business and work justifies their commercial existence.

We do not mean that we call upon men to go to work if their going is simply the means of jamming another raker in the line of those who have wedged in between producer and consumer.

But it's time serious-minded Canadian citizens, we care not whether members of unions or employers of labor, make this a chief matter of concern.

The only danger lies in the fact that industrial life has had such a gruelling in the matter of strikes and unrest, that it may not rally as quickly as the needs of the case call for.

It is not possible to let a certain line of goods go to the dogs for six months, and then expect, on resuming manufacture, to find marketing and production on a par with the day of cessation.

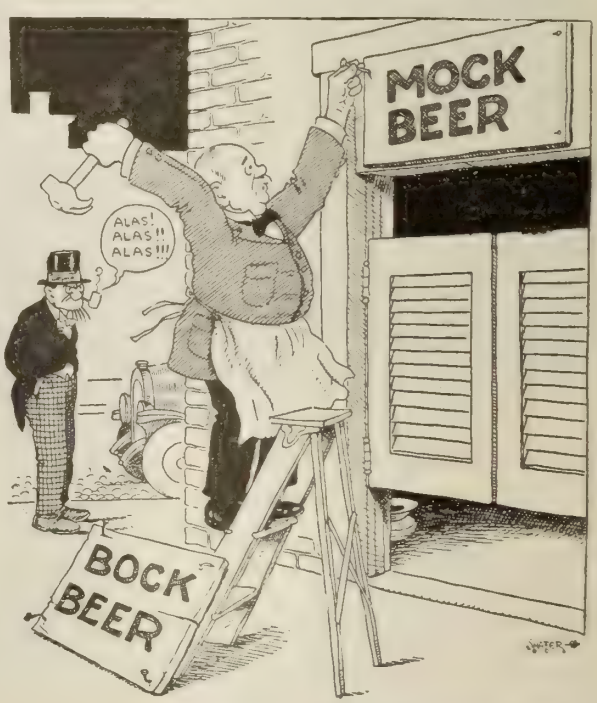
THE latest thing is shipping whiskey and marking it as castor oil. If Old John Barleycorn has to make a face like a mouthful of castor oil in order to get past, we feel sorry for him.

* * *

THERE are many striking things—and people—in this old world.

* * *

DURING the war one big British concern, the Manganese Bronze & Brass Co., turned out propellers for the largest British war vessels. The castings weighed 30 tons each, and were too large for rail transit, and, as it was considered too dangerous to risk despatch by sea, they were forwarded by road 450 miles from Glasgow. The propellers cost $25,000, and the haulage charges were $17,000.



Shafer in Cincinnati "Post."

Signs of the times.

Germany's Copper Shortage

ONE result of the Allied blockade of Germany was seen in the many expedients to which the Hun was forced in the obtaining of the 120,000 tons of copper necessary annually for military requirements. Home production was only about 23,000 tons per annum in pre-war days and this was reduced to about half owing to the mobilization of the miners.

The *Technical Review* in a translation of an article from *Technick und Wirtschaft* gives some further interesting data relative to the economies practised. During the first two years of the war the deficit was partially covered by booty from Belgium, France and Russia. Large quantities of scrap copper and brass were collected from munitions works and from fittings on naval and mercantile vessels, the scrap being smelted and refined.

Copper and iron-bearing slags were treated by the Dwight-Lloyd process, the roasted product with 30-80 per cent. Copper being refined to 89-90 per cent. and cast into cathodes. Brass scrap was smelted in basic Bessemer converters, in which by using a compressed air blast the refining process was shortened from several days to a few hours. The zinc fumes were cooled in a system of tubes to 50° C., and collected in bag filters, the contents of which were compressed into blocks and converted into metallic zinc by the electro-thermic process.

Bronze scrap with about 90 per cent. copper and 10 per cent. zinc was successfully treated by electrolysis, the metal being formed into cathodes which were electrolyzed in copper sulphate, several weeks being required for the deposition of the copper. The dried sludge from the process contained up to about 60 per cent. of tin which was recovered as pure metal.

To minimize the consumption for army purposes all brass and copper uniform badges were abolished and zinc replaced brass in munitions. In spite of rigid economy the consumption remained enormous, and by the end of 1916 stocks had become exhausted. This necessitated the substitution of iron in cartridge cases, caps and driving bands, all tubes and wires in electrical plant, torpedo tubes and propellers on small war vessels. For medium shells, zinc driving bands were used, and electrolytic iron for those of large calibre.

In the navy, cast brass (55-60 per cent.) replaced Admiralty bronze, the tendency of the former alloy to pipe and froth in casting hollow articles being counteracted by making the gate of equal capacity with the mould, and allowing time for the included oxides to rise to the surface before actually running the metal into the mould. The risers were also plugged and the imprisoned air only released when the mould was nearly full. These alloys failed to withstand friction and, therefore, parts exposed to heavy wear had still to be made of Admiralty bronze.

The Steel Strike

THE steel strike in United States gets short shrift from Rev. P. Molyneux, pastor of St. Brendan's Roman Catholic Church at Braddock, Pa.

His parish is right in the steel mill district. He said on a recent Sunday in his church: "This strike is not being brought about by intelligent or English-speaking workmen, but by men who have no interest in the community, and who do not have the welfare of the men at heart."

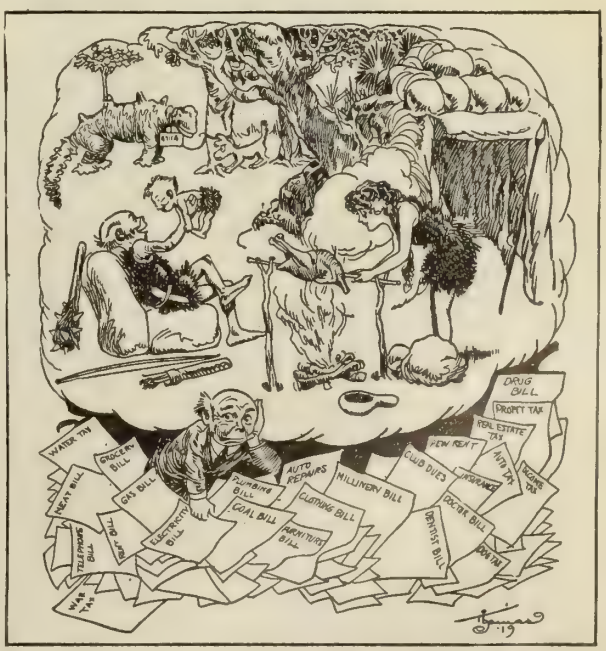
Father Molyneux said to his congregation that he held no brief for any mill or any company or any trust. Within the last two weeks, he said, he has talked with at least 200 mill workers with regard to the strike, all intelligent, English-speaking workmen, some from his own parish and some from outside. "I could not find one instance," he said, "among these 200 men where the man wanted to go on strike. They all stated positively and clearly, on the other hand, that they were well treated and satisfied with conditions.

"There is one thing I have noticed about these strike leaders," continued Father Molyneux, "and that is, with very few exceptions, if any at all, they never had on a workman's blouse in their lives, never went into a mill in a pair of overalls—these men were never seen with th honest sweat of toil on their brows. The tan of brawn is not on their hands. They are a lot of smooth, oily tongued talkers, with a kind of sympathetic whine appealing to you. They are royal gentlemen of leisure; they always wear fine clothes."

It has not been explained why Samuel Gompers tolerates the leadership of William Z. Foster in this strike, unless it is that Mr. Gompers has some special and unpublished reason for fighting the head of the U.S. Steel Corporation.

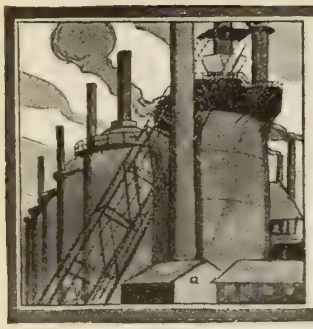
The strike bears the earmarks of agitation rather than of an abused people battling for better conditions.

On the other hand, it has been shown beyond successful contradiction that employees of the Steel Corporation are well paid, work reasonable hours and in the main are well satisfied with their work.



Thomas in Detroit "News."

Why did they civilize us when we were happy?



MAI
DEVELO

Shipments from Strike

Warehouses Are Better Off Tha
Rollers for Each Separate Orc
Machine Tools on Account of

SHIPMENTS are coming through to Canada from mills in the steel strike zone, but it must be admitted that these shipments are not as large or as frequent as the demands of the trade. It is a peculiar situation, but a true one, that the warehouses are better off than their customers in many cases. Warehouses deal almost entirely in standards, while their customers want as well orders rolled to specification. The warehouses can draw for some time on the accumulated stocks at the U.S. mills, but orders that must be rolled now are going to be slow in delivery.

A conservative estimate seems to place the men out on strike at forty per cent. It does not follow that production has only decreased forty per cent. It has decreased more than that, because there is no doubt that in some cases men are kept on for the moral effect rather than for their ability to turn out iron or steel. It cannot be said that Canadian trade is suffering yet. The Canadian mills are handling an increased tonnage in several lines. If the strike continues for several weeks yet there will be concerns on this side of the line hard pressed for their raw materials in manufacturing processes.

Machines tools houses are handling a nice volume of business. Deliveries are not improving, and business in some cases is booked now for February shipment. Prices are high, and they are going to stay high. War levels are quite common. This is creating quite a demand in some quarters for used machinery. Very often a customer wants a machine at once, and a used tool is all he can get. Then, again, there is a big spread in the price between the used and the new, although the price is not a determining factor in many sales.

The scrap yards are shipping little material now to United States points. The strike has tied up the yards there, and they are not taking shipments. Trade on that account is inclined to be a little dull, with coppers showing some weakness.

MONTREAL RELIEVED TO HEAR OF BRITISH STRIKE BEING SETTLED

Special to CANADIAN MACHINERY.

MONTREAL, Que., October 8.—The tension that was becoming more pronounced during the week, as a direct result of the industrial conditions in England, received a favorable reaction to-day, when it was learned that arrangements had been made whereby the men would return to work pending further adjustment of the differences between the men and the administration. The British situation was reflected here in the irregular activities in the harbor, and to some extent the export of produce and materials had been interfered with owing to the inability of shipping companies to guarantee unloading at the English destination, due to the congested state of the terminal docks. With this situation clearing attention is centered in the labor troubles in the States, but the serious nature of the American troubles is gradually fading, as the strike, so far, has had little direct effect in this district, although the influence is not conducive to expansion of activity.

While the general tendency is one of conservative trading, the business of the week has been quite normal. Some dealers have experienced a little difficulty in getting goods in from the States, but the reports for the past few days have been more encouraging. Steel business is not heavy, but a slight inconvenience is beginning to show itself in plates and tubes, the warehouse supplies in these lines having fallen off slightly during the past two weeks. One factor that prevents the situation becoming more serious is that the existing demand is below normal, and, so far, dealers have been in a position to fill all the requirements of the trade.

Lighter Tool Movement

Summing up the reports that are gathered from dealers it would seem that the movement in machine tools is not very brisk, and the demand is considerably less than for several weeks past. What little business is reported is going to a variety of industries and no special development appears in any direction. Circumstances combine to influence the buyer along conservative lines as existing conditions of labor and material costs are not those to induce cautious manufacturers to branch out into new or renewed activities. There are cases, however, that lead one to believe that many new enterprises would take on a larger sphere if industrial stability were more definitely assured. Inquiries seem to impress the trade in this connection. The supply market is one of nominal demand with little change in prices generally.

Listless Scrap Market

The movement of scrap is virtually at a standstill and the bulk of the trading is of a local character, foundries calling for regular supplies but in small quantities, the conservative nature of the buying indicating that little consideration is yet being given to other than immediate requirements. Old metals have developed a weakness but local quotations are maintained. Scrap iron and steels are quite firm but quiet. Cast iron is stronger, the quotation of $21 representing an advance of $1 per ton.

STRIKE EFFECT TO BE FELT HERE YET

Although, So Far Local Trade Has Been Able To Get Along With No Trouble

TORONTO—Trade generally does not like the continuation of the steel strike in United States. So far, nothing is suffering in this country, but it is only a matter of time until something will have to give. While it is true that probably sixty per cent. of the men employed at the steel mills are working—and that figure seems about right—it does not follow that production is sixty per cent. of what it was when the strike was called. There must be mills where men are kept on for the moral effect of keeping them on and there must be cases where production is away below the amount that might reasonably be expected from the number of hands on the premises.

In the Steel Trade

In a general way, it can be said that the steel trade is not suffering yet. It is a strange situation, but none the less a fact that the warehouses are better off than their customers. Warehouses take on standard sizes in everything, and in this way they can get more from the yards of the mills now than many of their customers who buy direct from the mills because their orders are all special and odd sizes. The factories, especially where much boiler and tank work is done, are in the same position as the man who gets his clothes made to order. Nearly every order they send out has to be made up for them, and now that capacity is away down it is only to be expected that there will be congestion and delay. As far as the warehouses are concerned it must be said that the American mills are making a brave attempt to give them service, as shipments of fair-sized tonnages are still coming over the line.

In a general way, sheet and plate are hard hit. This is especially in regard to sheets. There has been a big demand for sheets for some time back, and warehouses are not well supplied.

The tube mills in some cases are still shipping against recent orders and material is arriving this week. This is true of the lap weld, but the cold drawn are down for the most part. There is very seldom any stock at the mills. Tubes are sold nearly altogether through the jobbers, and the former protect the latter in nearly every case. Men generally buy tubes in small lots for repair jobs, etc. This country depends on United States for its supply, and that supply is in danger. Neither is there a good stock in the warehouses at present, while the demand is strong.

The Matter of Prices

As far as CANADIAN MACHINERY has heard, only one of the independent mills has intimated that it wanted an increase for delivery, and that was 20 cents per hundred premium on plates. None of the Steel Corporation mills want any higher prices than have been prevailing all along.

"Prices were due to stiffen in Canada, strike or not," stated one of the warehouse men to CANADIAN MACHINERY this morning. "For some time past there has been something close on to a stampede in certain places to get stock cleared out and turned into money. The end of the war left some firms with too big a stock and they were anxious to get out and turn it into ready cash. The way to do this was at a price. This at times took in sheets, and another time bars. These stocks have been reduced to the point where those warehouses must now follow the market. When they go in for more business they will first of all have to go into the market and they will then know exactly what they have to pay. This stampeded business has been pretty well cleared out, and stocks to draw from are low and may go lower if the strike lasts."

There were a good many rumors around for a while that plate could be secured, if one were to buy "hard" enough, for 2.50, rather than at the supposed price of 2.65. It may be that some plate did come to Canada at 2.50, but if so it was very small in tonnage, as dealers seem to have adhered all the way through to the 2.65 basis for quoting. Certain it is, that there is no chance for anything going across at 2.50 with the strike on.

September was a great month for some of the warehouses handling steel products, such as plate, sheets, tubes, shapes, etc. One of them told CANADIAN MACHINERY this morning that the month just closed was twice as large as anything that had been done this year, and from the looks of things the same firm expects that October will be quite as good, unless trouble at the mills gets at the point where no material can come through. Selling is not such a task as it was three months ago. In some respects it reminds one of the war days when all a salesman had to do was to intimate that he had certain lines of steel or machinery and he might be induced to dispose of them at a price.

The Machinery Market

There is a peculiar tendency in the machine tool market just now, and one that looks like more palmy days for the used machine. Deliveries on new tools are rather uncertain. Some that are booked no ware for February shipment, and very often a customer wants a machine right away. Well, when the price is considered and the chances of shipment, he naturally turns to the used machine market. There is business to be done here now, and it would be a good idea for those that have used machinery to advertise the fact, telling what they have.

The prevailing prices are high for new machinery, but salesmen say this does not interfere with sales at all. The big idea now in nearly every case is to get the machine suitable for the job that will turn out a lot of work and the price paid is not a great matter, because the buyer reckons he can get it out of the machine in production.

Supplies Are Brisk

Travelers for machine tools—small—are gathering in a lot of business just now from shops that are getting under way with production. The automobile business is responsible for a good bulk of the sales.

Many of the firms selling certain lines, such as cutters, claim that they are not getting the protection they should from the makers. In United States, they claim, customers can buy cutters at net, while the jobbers get ten per cent. off. Of course it is hard for the Canadian dealer to sell U.S. cutters, on account of the duty and other charges. But in Canada, cutters are now selling at ten off to consumers direct, and the jobber is practically wiped out, because it does not take long for purchasing agents to learn that a certain price is being quoted. It it all the more extraordinary that the Canadian consumer should buy at such a low figure when one considers that the market here is smaller than in the States, and duty must be paid on much of the material that is brought in to manufacture the articles in the first place.

POINTS IN WEEK'S MARKETING NOTES

The steel strike does not progress, neither is it broken. Production is not as large as might be expected from the number of men working.

—

In a general way the sheet situation threatens to become the worst by reason of the strike.

—

Warehouses are getting shipments of standard sizes from the mills, but firms wanting sizes rolled to order are not being served.

—

The demand for used machinery increases in some quarters. Reasons for this are deliveries on new tools too far distant for a man who wants a machine at once, and prices are at war levels, or even better.

—

Dealers in cutters claim they have "hard-going" under present conditions and terms of sale. U. S. buyers are paying more for cutters than Canadian purchasers.

—

Scrap sales are uncertain on account of the steel strike. No shipments are going across the border from Canadian yards.

—

Offices selling steel are certain there will be a great congestion of orders on the books, to be looked after when operations become normal.

Some of the representatives of Canadian plants were in session in Toronto a few days ago, concerning the matter of discounts, etc., but it is not known if anything definite was accomplished.

The Scrap Metal Market

Shipments from this side of the line are held up, as far as United States centres are concerned. Requests have been received not to send material on against contracts in some cases. This all tends to bring about a period of quietness in some sections of the scrap market, although there are some domestic sales being put through.

Coppers are not strong, although they have not been marked down. Still there is no marked desire on the part of buyers to take them on at present prices.

The item "shell turnings" has been dropped from the list of material quoted in this paper, as there is very little of this left in the country.

CANADIAN PLANTS NOT HURT YET BY THE UNITED STATES STEEL STRIKE

According to reports that have been received Canadian firms are getting along with no great inconvenience from the steel strike.

Fort William.—Locally, the United States steel strike is not making itself felt. At the Canadian Car and Foundry plant all the steel needed to keep things going is on hand, with the exception of one shipment, which is coming from Duluth and is now on its way here by boat. J. F. Paige, general manager of the Port Arthur Shipbuilding Company, says that they are feeling no effects from the strike as far as shipments of material are concerned. All the steel needed is now on hand and what is on order and is not yet received is from warehouse stock and will come forward, it is expected, in the regular way.

All Right in Sarnia

Sarnia. — The management of the Sarnia Bridge Company, probably the largest users of steel in the city, stated that they had a stock of steel on hand which would keep them going for at least six months. About ninety employees are at present engaged in bridge building, and from 500 to 600 tons of steel were used monthly. The company did not anticipate a shut-down and had no cause for alarm, and would continue to employ a full force.

C. H. Helby, of the Mueller Company, stated that he did not believe it would have any effort on their plant unless the strike continued a long time. The Mueller Company also had sufficient on hand to keep their plant in operation for some time. Mr. Helby said that the strike might cause a fluctuation in the price of material, but as far as the operation of their plant was concerned there was no cause for worry.

The Imperial Oil Limited purchase large quantities of steel, which is used in the construction of tanks and in various ways about the plant. With a large stock on hand, W. J. Gilchrist, the manager, stated that they could operate for a long time regardless of the steel strike. "It depends on the duration of the strike," said F. W. Gigax, of the Goodison Thresher Company. "We are well fortified and have enough steel in stock to last us until the first of February. Our company buys in large quantities and at present I see no cause for alarm." That the strike would not last very long was the opinion of Mr. Gigax.

The Doherty Stove Company, employing a staff of about sixty men, are fairly well fortified, and have sufficient steel to keep them going until about the middle of December, was the information given out by W. L. Doherty, of the Doherty Stove Company. "Fortunately we had some ordered and we received a shipment yesterday," said Doherty. "I do not anticipate any trouble as I am under the impression that the strike will be settled before our supply runs out," concluded Mr. Doherty.

Sherbrooke Conditions

Mr. A. G. Campbell, of the Sherbrooke Iron Works, took an optimistic view of the situation when questioned on the matter.

"At present," he said, "there will be no effect upon local industries, not at any rate on our plant. We have a sufficient supply of raw material to last us through a considerable period. If the strike should keep up for any great length of time I suppose it will have its effect, but I do not think the steel companies would have let the men go out unless they had on hand a large supply ready for shipment."

The McKinnon Steel Company said that they did not anticipate any trouble, at least for some time to come, and hardly thought that the strike would last for a sufficiently long period to have any great effect on conditions here.

"We have a large stock on hand which should last us through. If, however, the strike lasts for a long period, and our supply gives out, it will then result in the delaying of contracts, which will have a decided effect on industries here."

Mr. Newton, of the Canadian Ingersoll-Rand Company, said that no difficulty was to be expected, but that a continuation of the strike would have its effect in cutting down the supply of raw material.

ROLLS-ROYCE GOING TO BUILD THEIR CARS IN UNITED STATES

Special to CANADIAN MACHINERY.

NEW YORK, October 9—While the steel strike is holding up buying of machine tools in some lines of industrial activity, plans for industrial expansion, particularly in the automotive industries, go on without interruption. An interesting development is the prospective increase in automobile and tractor manufacturing in the East. The Willys Corporation, which recently purchased the plant of the Duesenberg Motors Corporation at Elizabeth, N. J., will more than triple the size of this plant, and within a few weeks will be in the market for considerable new equipment.

The Willys Corporation will manufacture at Elizabeth a new six-cylinder car, which, it is reported, will be sold at a price somewhere near $1,000. Production at the rate of 550 automobiles a day is being planned for.

Rolls-Royce in America

Another important automobile development is the plan of the Rolls-Royce Co. of England to build an American plant, which will in all probability be located in the East. Several plants used for war purposes are now under consideration and a selection will be made soon. The Rolls-Royce Co. has opened an office at 23 William Street, New York, and has bought used machine tools with which to begin initial manufacturing operations. Eventually its purchases of machine tools will run into large proportions.

Henry Ford & Son, of Detroit, manufacturers of tractors, have started work on a new plant on Green Island, in the Hudson River, near Albany, New York. This plant, when completed, will employ about 30,000 men and will turn out Fordson tractors for the export trade. Equipment probably will be bought at Detroit, although this has not definitely been made known yet. The expansion of the units of the General Motors Corporation will extend to the plant of the New Departure Mfg. Co., Bristol, Conn., which will be greatly enlarged. Quotations on several hundred machine tools are now being asked for. Total purchases for the New Departure plant will probably reach $1,000,000.

The Columbia Gramophone Co., Bridgeport, Conn., has plans for the construction of an additional manufacturing plant in the East, and will likely make an announcement soon.

The Export Business

In export trade there is a very fair amount of inquiry. It has been somewhat surprising that several large machine tools have been purchased for shipment to France, despite the disadvantage of about 60 per cent. in the exchange rate. The Cerro de Pasco Mining Co., New York, has purchased four cranes and is in the market for about 50 machine tools for shipment to its mines in South America. Another foreign inquiry is for an automobile

manufacturing plant in Japan, a list of about 100 tools having been put out by Shibakawa & Co., 120 Broadway, New York.

The National Machine Tool Builders Association will hold its annual fall convention at the Hotel Astor, New York, on October 15 and 16, and American machine tool export trade will probably come in for considerable discussion. One question agitating the trade is the extent to which foreign purchases should be financed here, and the methods of granting credits that should be adopted. It is stated that to secure much business in some of the European countries it will be necessary to grant one and two-year credits, and a plan may be discussed by which this can be done without overtaxing the financial resources of the machine tool companies.

SHEETS AND TUBES ARE THE MOST AFFECTED ITEMS BY STEEL STRIKE

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., October 9.—The iron and steel strike, now just in its third week, is running true to the form shown in the first four days, when, after increasing for a couple days, the strike began to lose ground slowly in the districts where idleness was in the minority and employment in the ascendency, while districts closed tight showed no disposition toward resumption.

It is a matter of intimidation, which means minority rule if the minority is of any size. Thus in Western Pennsylvania, where the strike did not get a good start, employment has been increasing so that the works that remained in some sort of operation are now running practically full, while of the few plants that closed entirely some have been resuming in the past few days. The Mahoning Valley, including Youngstown, also Cleveland, but not the nearby town, Lorain, remained closed tight during the first two weeks, as well as the Wheeling district, with the exception of a very few plants in that district.

There were predictions that this week some important resumptions would be begun in the Mahoning Valley, but full and authentic information is requisite before it can be accepted as positive that the district really is resuming. Men have been at work in some of the plants, doing odd jobs and being held as nuclei for such a general return of men as would permit of regular manufacturing operations being undertaken.

There is no question that the men have lost the strike, and in fact there was no question after the first three or four days of the strike. Too much capacity was left in operation for the idle districts to swing the active districts. It is a strike of common labor, chiefly ignorant foreign labor, ready for violence whenever and wherever there is an opportunity, and while no doubt the civil authorities are anxious to prevent disorder it is a difficult matter when mobs of hundreds or thousands may form. The common prediction is that general resumption can hardly occur in Ohio without the state militia having previously been called to the scene, but under the law the invoking of state aid cannot occur until there is an actual situation that the local authorities cannot handle, and the local authorities must admit the fact.

Production and Employment

The best estimate that can be made is that fully 40 per cent. of the workers in the iron and steel industry are idle. This is of the manufacturing industry proper, not including the Connellsville coke region, the lake or boats or the ore mines. The strike did not touch these activities at all and if they were included in the total the percentage of men idle would be a trifle lower.

Of the men idle it may be estimated that one-fourth desired beforehand to strike, that one-half, or double that number, really did go out as strikers when the time came, and that the other half comprise men who are idle because intimidated or because the strike was prevalent enough in the plants that employ them to make operation impossible. While the strike is distinctly a common labor or "hunky" strike it is not universally so. It is a fact that a few skilled and semi-skilled men did strike, and this was notably so in the case of one craft, the cranemen and electricians, who struck in considerable numbers.

Running or Closed

Geographically, as the strike was largely geographical and became wholly so during the first fortnight, the situation is as follows:

Eastern Pennsylvania is operating with scarcely an exception.

The large Cambria plant at Johnstown, at the western foot of the mountains, is closed entirely, as is the entire Lackawanna Steel Company property at Buffalo, together with part of the other operations there.

Western Pennsylvania is running nearly full, the chief exceptions being the Page and Pittsburgh steel and wire plants in Monessen, at the head of the Monongahela Valley manufacturing districts, a part of the city works of Jones & Laughlin and a few small plants here and there.

All plants in Cleveland, O., are down, but the Lorain pipe mill of National Tube Company is running very well.

The entire Mahoning Valley, in Ohio, is down, thus contrasting sharply with the other valley, the Shenango, just across the state line in Pennsylvania, which is running nearly full.

The Wheeling district, which has long been strong for strikes, is closed tight, except for two or three relatively minor plants.

In the Calumet district, Chicago and Gary, about one-third or thereabouts of the men are working, results being rather unsatisfactory.

Duluth, Minn., is reported working while the works of the Colorado Fuel & Iron Company at Pueblo are closed. Practically the whole south is working.

Production Suffers

While nearly, if not quite 60 per cent. of the men in the iron and steel industry are working, production, in point of tonnage, is not in altogether as high proportion, as there are works with light employment and still lighter production, operation being partly for moral effect. It being an issue upon which the manufacturers cannot possibly yield, the open shop versus domination by radical labor agitators and revolutionists, tonnage is not an item showing how the strike is going, employment being the item that furnishes the information.

The curtailment in output is more or less uniform in the different products, but there are variations. Plate capacity was so in excess of requirements that there is still an adequate or nearly adequate supply. There is nearly an adequate output of structural shapes. Tin plate production is less than half what it was averaging just before the strike, but as the canning season is over the restriction does not count for much. In wire products there is great restriction, but wire products are now largely out of season. In sheets the situation is very serious as sheets were scarce before the strike. The American Sheet and Tin Plate Company has been operating at least 72 per cent. of its sheet mills, seven of its plants being in full operation, but independents are averaging less than 50 per cent., so that sheet production as a whole is not over 60 per cent. of normal. On the whole, sheet plants making specialties, as for metal furniture and automobiles, are affected slightly less than mills making common sheets.

The Worst Item

By far the most unfortunate situation, from the standpoint of production and requirements, is that in pipe. While there was no abnormal demand, before the strike, for butt weld merchant pipe, there was a demand far beyond the supply for oil country goods, involving lap weld material, there being in fact an acute scarcity, so much so that many lessees, particularly in the Texas field, were likely to lose their leases through being unable to complete wells within the time limits they had injudiciously agreed to. The situation is, of course, greatly accentuated, for while the Steel Corporation is doing well in pipe, much more than half the independent capacity is down, including Youngstown Sheet

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$25 50	$26 25
Electro copper	25 00	26 00
Castings, copper	25 00	25 00
Tin	59 00	58 00
Spelter	9 50	10 00
Lead	7 25	7 00
Antimony	9 75	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	21 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 25
Sheets, black, No. 10	5 15	5 25
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 75
Premier, 10¾ oz.	....	8 05
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ¼ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

and Tube at Youngstown, La Belle at Steubenville, and Wheeling Steel and Iron at Wheeling. Mark at Chicago is producing little, while Spang, Chalfant and Company, Pittsburgh, were closed for a few days, though now operating moderately well. Of all the major independents, Jones & Laughlin alone have done well; National has its Riverside works; Wheeling, down tight, is operating full at Lorain, O., and moderately well at McKeesport, Pa., while one of its two Pittsburgh mills was down for a short time and is now operating only in part, the other city mill being reported in regular operation.

Steel mills report that their customers continue to show the greatest spirit of sympathy and co-operation and exhibit no tendency to bother them for deliveries, even though material may be badly needed.

PIG IRON TRADE

The strike has caused a demand for spot iron, and also the withdrawal of most of the offers of 1920 iron. The enquiry for iron for 1920 shipment is increasing steadily, and customers are asking for notification as soon as makers can supply them. Following are reports from various U. S. points:—

Boston. — New England conditions have been affected by the strike, a large falling off in sales having resulted. Offers of 1920 iron on this market have been almost entirely withdrawn. Furnaces in Eastern Pennsylvania have not been affected.

New York—While enquiry for 1920 delivery is increasing, furnaces are not taking any orders as yet. They are waiting until the strike has come to an end before committing themselves. Most of the business done has been in foundry iron for immediate delivery and nearby shipment.

Pittsburgh.—Foundry grades are supplying the only business in this district. Some of the steel makers whose stacks are banked through want of common labor are said to be looking round for basic and bessemer Enquiries for 5,000 tons foundry iron are reported by one maker.

Cleveland.—The strike has caused brisk demand for spot iron, and premiums have been paid for this class of business. Southern Ohio iron has been sold for the equivalent of $32.25, delivered, which represents a premium of $2 to $3.50 over the market. Car shortages are causing difficulty in delivery. There has been a small amount of 1920 business placed.

Cincinnati.—Foundry iron for immediate shipment to nearby points is finding a ready sale. Territory usually supplied by lake furnaces is being sold from here. Spot iron is commanding $28, and next year's iron seems to have been placed at a minimum of $30.

St. Louis.—Foundries and mills are operating pretty much as usual in this district, the strike not having affected them much. The demand for prompt shipment iron is better than has been the case for a long time. 1920 orders are not figuring in the business closed.

Birmingham.—Production in the south is increasing. The attempt at a strike of southern iron and steel workers proved abortive. Prices are firm on a basis of $28 for No. 2 foundry, and there is a steady demand.

Chicago.—Merchant stacks are completely tied up, and although melters are pretty well supplied for their immediate wants, prompt iron from east and south is being readily bought. This iron is bringing higher prices than has been paid for local iron, due to it being already on cars, ready for immediate movement.

U.S. SCRAP METAL

The scrap market is marking time, and while some districts report a better demand, in others buying is at a standstill. Following are reports from U. S. points:

Chicago.—While scrap suitable for open hearth mills is not moving, rerolling rails and rolling mill grades are in better demand. The strike having affected pig iron deliveries, foundries are taking all the cast iron scrap they can get. Railroad offerings are small.

Boston. — Although heavy melting prices are low, dealers are not buying. There is no demand from steel makers for grades used by them. Machinery No. 1 scrap has receded from the high level of last week but is still in strong demand.

New York.—With trading very light, the tone of the market is becoming a little firmer. The best demand is for borings, turnings and cast scrap. No. 1 heavy cast is quoted at $21.50 to $22, and No. 1 machinery cast at $22.50 to $23.

Philadelphia.—The strike has affected the scrap business, but demand for most grades is improving. Rolling mills have been looking for railroad wrought, but in heavy melting and similar grades there is little doing.

Pittsburgh.—There is little doing in any grades, and prices may be looked on as nominal. What movement there is is in foundry grades. Steel manufacturers are asking for suspension of shipments against contracts.

Buffalo.—Scrap dealers are sitting down and waiting for normal times to come again. Few mills are operating and these seem to have enough stock to carry them on. With all the handicaps, prices continue firm.

Cleveland. — There is practically a total cessation of activity in the scrap business here. Not for years have things been as dull as during the past week. Prices remain unchanged, for the reason that there has been no sale to change them.

Cincinnati.—There is in this district also the "nothing doing" sign displayed. A little foundry scrap has been moved, but otherwise the market is lifeless.

St. Louis.—No trading and a decidedly pessimistic feeling is prevalent in the market here. Mills have not been directly affected by the strike, but there is so much uncertainty that every one is waiting for developments.

SETTLEMENT OF CANCELLED CLAIMS IS NOT PROCEEDING VERY RAPIDLY

By Resident Correspondent.

OTTAWA.—Jos. Archambault, member for Chambly-Vercheres, had some interesting questions on the order paper this week, but he did not get a chance to put them. The Speaker appeared to be under the impression that they were not permissible as not being so much questions as statements. Mr. Archambault therefore temporarily withdrew them, though he protests that he does not see how they could be put in any other form to convey the data for the information he requires, and will consult an expert on procedure before returning to the endeavor to secure information.

The questions were as follows:

1. Is the Government aware that the War Secretary of the United States, Newton D. Baker, has appointed two American officers, called Assessors for the Canadian Contracts, to sit on the Imperial Board of Munitions and concur in the decisions of the said board in the settlement of the claims of Canadian contractors with the Government of the United States?

2. Is the Government aware of the predicament of the Canadian contractors by the fact that about $15,000,000 of these claims, consisting in disbursements and damages is not paid to them, although the Board of Imperial Munitions has declared and judged these claims to be just and reasonable, the recommendation of payment being stopped because the American officers do not concur in the award of the Imperial Board of Munitions, and would like to settle with the Canadian contractors at 50 per cent. discount?

3. Is the Government aware of the fact that, notwithstanding that the offer of the American officers is found unjust and unreasonable, the Imperial Board of Munitions refuses to come to the aid of the Canadian contractors in giving their decision to the Secretary of War of the United States, and for some unexplainable reason they advise the Canadian

Continued on page 60

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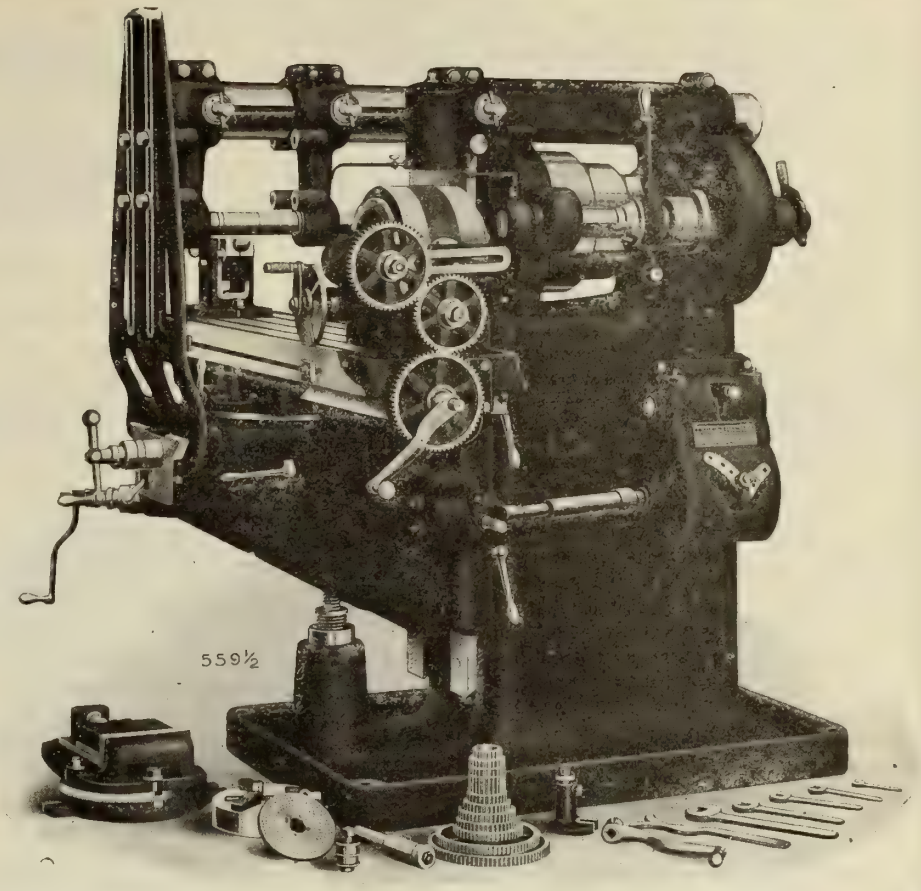

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SETTLEMENT OF CANCELLED CLAIMS

Continued from page 286

contractors to accept the offer of the American officers?

4. Is the Government aware that the large amount of $15,000,000 which is kept back since nearly 11 months is equivalent to a loan to the United States, and that its unjust retention threatens to ruin certain Canadian industries?

5. Is it the intention of the Government, in view of these facts, to leave their constituents at the mercy of these two American Officers, or are they not of the opinion that they should intervene immediately to the Imperial Board of Munitions to force them to protect the Canadian contractors and to report forthwith their decision to the Secretary of War, Baker?

The questions would form the basis for a speech in the House, in all probability, in which it is said Mr. Archambault would point out that Canadian munition manufacturers are being sacrificed by the Munitions Board, and it is more than likely that Sir Joseph Flavelle, of that board would be brought into the matter and have the blame laid at his door. The complaint voiced by the member for Chambly is that Sir Joseph Flavelle agrees that the claims of the Canadian manufacturers against the United States is just and reasonable, but that he refuses to become its active advocate and advises them to settle rather than go to law, whereas if he exerted his influence, as he might reasonably be expected to do, a settlement would easily be effected. It is also claimed that the American officers concerned do not represent the views of their Government, but are merely trying to secure little personal kudos by squeezing the Canadian manufacturer.

If Mr. Archambault can get past the Speaker with his question in some other form, the whole matter is likely to come up in the House.

Sir Joseph Flavelle does not care to speak for publication, beyond saying that he considers "substantial justice" is being done to the claims. There were some 330 of these, and but 25 remain. But in these 25 there is an amount involved greater than in the 305 that have been settled.

Having Some Difficulty

The statement has been made that in some cases the manufacturers are urged by their bankers to take what they can get, even a fifty per cent. settlement. CANADIAN MACHINERY discussed this with the financial man of one firm that had large contracts cancelled. He admitted that there had been considerable trouble from the start in the making out of the claims. This work had to be done over to meet certain requirements insisted on by the Ordnance Department. As to the work now, there is no fifty-fifty settlement basis. Items are either thrown out or conceded. "The trouble is," continued our informant, "the representatives of the U. S. Ordnance Department do not understand the situation as did the late Colonel Albee, who had charge of the U. S. office here during the period of manufacture. He knew just what was being done to speed up the production of munitions, and was thoroughly familiar with each plant that had a contract from Washington. His removal by death has been a serious matter for the Canadian manufacturer. The men in charge now know only the details of making a settlement, and little or nothing of the conditions that existed during the turning out of the material."

CANADIAN MANUFACTURERS ON A TRIP TO THE MARITIME PROVINCES

Special to CANADIAN MACHINERY.

ST. JOHN, N.B.—A party of members of the Canadian Manufacturers' Association has been visiting New Brunswick and has been well entertained in Fredericton, Moncton and St. John. They were received by civic officials and manufacturers and conducted on motor trips about the cities, visiting objects of interest and manufacturing plants, and being honored with banquets in different places. In the party were: T. P. Howard, of the Phoenix Bridge and Iron Works, Montreal, president; W. S. Fisher, Emerson and Fisher, Ltd., St. John; W. H. Shapley, Sterling Action and Keys Ltd., Toronto; J. T. Cumming, of Jas. W. Cumming & Son, New Glasgow, N. S.; A. D. Ganong, Ganong Bros., St. Stephen, N.B.; R. H. McKay, of McKay & Fraser, New Glasgow, N.S.; G. W. Fleming, Phoenix Foundry, St. John, N.B.; H. R. Thompson, secretary Maritime division, C.M.A., Amherst, N.S.; J. T. Stirrett, general secretary, C.M.A., Toronto; J. R. K. Bristol, manager tariff department, C. M. A., Toronto; J. E. Walsh, general manager, C.M.A., Toronto; Joseph Picard, of the Rock City Tobacco Co., Ltd., Quebec; F. W. Stewart, Cluett, Peabody & Co., Montreal; P. E. Joubert, Lamontagne Ltd., Montreal; G. W. McKinnon, McKinnon Steel Co., Sherbrooke; M. R. Meldrum, Herbert Morris, Crane and Hoist Co., Niagara Falls; G. H. Douglas, Thornton & Douglas, Hamilton; H. W. Fleury, J. Fleury's Sons, Aurora; H. A. Telfer, Telfer Mfg. Co., Toronto; S. Harris Lithographing Co., Toronto; A. L. Fowler, Fowler Milling Co., St. John; C. S. Christie, Christie Woodworking Co., St. John; R. A. McAvity, T. McAvity & Sons, St. John; Lewis Connors, Connors Bros., St. John; Cheslie Peters, C. H. Peters Sons, St. John; A. L. Foster, T. S. Simms & Co., St. John; J. D. Palmer, Hartt Boot & Shoe Co., Fredericton; W. F. Knoll, James Pender & Co., Ltd., St. John; Alex. Wilson, Wilson Box Co., St. John; W. A. Christie, Christie Bros. & Co., Amherst, N.S., and R. E. Dickie, Stewiacke, N.S. All these were present at a banquet tendered in the Union Club, St. John, during the visit of the outside members.

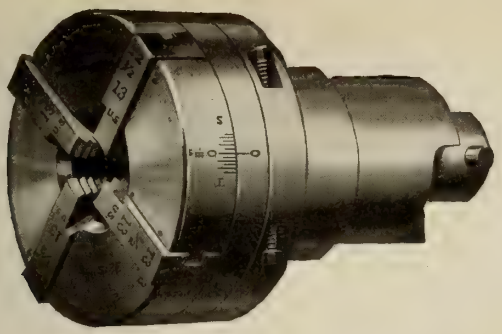
It is expected that much good will follow from a trading and industrial viewpoint from the visit of the Upper Canadian manufacturers to these provinces. At the first day's gathering in St. John, many matters of interest were discussed and among the keynotes sounded were that there was an awakening of a broader spirit of friendlines between the manufacturers of Canada, East and West, and that the people of Ontario and other provinces should visit the East more frequently with the idea of a fuller study of problems existing here in order that industry might benefit and the future expansion of the Dominion be promoted. One of the chief objects accomplished by the gatherings in Fredericton, Moncton and St. John, was that local representatives were brought in more intimate association with those from the head offices for the discussion of mutually important questions, previously done by mail. The gathering was so arranged as to time with the meeting of the Maritime Province division in St. John.

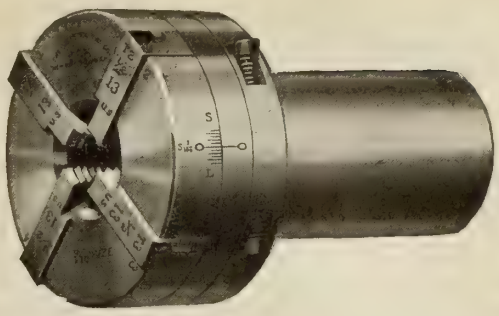
The delegates were welcomed to the city by Mayor Hayes and R. B. Emerson, president of the Board of Trade. In the afternoon they were taken for a cruise around the harbor in ideal weather, while in the evening the banquet already referred to was held at the Union Club, at which Mr. Fisher presided. He made an opening address in which he referred to the importance of the association from the viewpoint of the Canadian manufacturer, and urged the extension of its activities to promote Canadian business and to bring about a greater growth of industry.

The sessions of the Maritime Manufacturers' Association held in St. John, were presided over by R. H. McKay, New Glasgow, N.S. One of the chief features discussed was the development of power in New Brunswick and Nova Scotia. It was the general opinion that steps should be immediately taken in harnessing the water power of both provinces and conserving the coal supply. Committees were appointed to investigate the matter and take up with the respective legislatures the development of power.

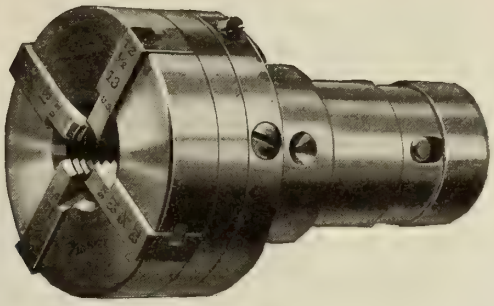
Lewis W. Simms, president of T. S. Simms & Co., St. John, returned home this week after a visit to Oklahoma, where he was buying stock.

Philadelphia.—Furnaces are still unwilling to quote on next year iron. Makers having iron on stock are due to the strike situation, are able to get from $29 to $30.25 for No. 2X iron. Fair business in foundry iron is being done. The basic situation has been changed due to large purchases of this grade by a large interest, which closed orders for 45,000 tons at an average rate of $27.50 delivered Pencoyd.





Geometric Solid Adjustable Die Heads



When one uses the word "ONLY," he needs to be sure of what he is talking about. With confidence we use the word in saying that a Geometric Solid Adjustable Die Head, fitted with a set of milled dies, is the only solid die head that will back off without stripping the thread.

Geometric Solid Adjustable Die Heads may be fitted with either a releasing shank, plain shank, or with special shank for the Gridley Automatics. The releasing shank permits the head to disengage from the shank upon completion of the thread. The plain shank fits the head for use on the turret of a lathe or on a live spindle, such as a drill press.

Apart from the fact that it is not equipped with the self-opening feature or the roughing and finishing attachment, the Geometric Solid Adjustable Die Head is the same in principle and construction and will do equally as accurate work as the other styles of Geometric Die Heads.

Whatever the requirements, there is a type of Geometric Die Head best adapted to the work.

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MONTREAL NOTES

At the October meeting of the Canadian Railway Club, which will be held at the Windsor Hotel on the evening of the 14th, the subject will be Competition, Combination, and Co-operation, and will take the form of a lecture by Major S. T. Robins, general manager of the Dearborn Chemical Company.

* * *

Following a shut-down of nearly a month, the Sydney plant of the Dominion Iron and Steel Co. has commenced operations on single shift, and it is anticipated that regular work will be resumed in the very near future. For some time prior to the closing down of these works the orders had been falling off, and economic operations of the plant was deemed impossible.

* * *

Preferential consideration in the high cost of living is granted to few. Owing to the increased cost of operation and maintenance the Montreal Chambre de Commerce has practically decided to amend the constitution, to raise the admission fee from $5 to $10, with a similar advance in the annual fee for active members, and to corresponding members the fee will be $5 in place of $2, as formerly.

* * *

Substantial gains have been made in the grain shipments through the Lachine Canal, for the month of September, over that for the corresponding month last year. The figures are 3,604,638 bushels, this representing an increase of over two millions over September of last year. Two-thirds of the grain shipped was in wheat, the total being 2,155,254 bushels. So far this year the grain passage through the Canal has been close to 18,000,000 bushels.

* * *

J. M. Rosevear, who has been general auditor of the Grand Trunk and Grand Trunk Pacific for the past year, has been appointed comptroller of the company, superseding W. H. Ardley, retired. Mr. Rosevear entered the services of the Grand Trunk in 1897 as a clerk in the office of the auditor of disbursements. He was appointed travelling accountant in 1904, and chief clerk in 1906. He was appointed auditor of disbursements for the entire system in 1908, retaining this position for ten years.

* * *

Winter regulations are now effective in the port of Montreal. On the first of October the "winter mark" ruling came into force, so that vessels will carry less cargo than during the summer months. This is necessary owing to the heavy weather that may be encountered from now on. On ocean-going vessels there are three marks, showing to what depth a vessel may be loaded; one for summer, one for fall and one for the winter season, the last allowing for the lighter cargoes.

While no definite announcement has been made, it is learned that P. Lyall and Son of Montreal will shortly engage in the manufacture of automobiles. For the past year the engineers of the company have been designing and experimenting on a new type of internal combustion engine, and, according to official statements, tests have been made that establish its superiority over similar engines now in service. The post-war activities of this company also include the perfection of a special chuck for general industrial purposes, a product that has been developed from those designed and constructed by the engineering staff during the war.

* * *

The practice of coaling Transatlantic steamers on this side, for the return trip, has become additionally pronounced during the past couple of weeks, owing to the serious character of the industrial situation in England. However, this condition will probably be remedied in the near future, as the latest reports are to the effect that an agreement has been reached between the striking railroad men and the Government, whereby they will return to work while negotiations are carried on. For some time past the congestion of the docks on the other side have become so great that restrictions in shipping have been very necessary. From now on it is expected that relief will be shown in this connection.

* * *

J. W. Norcross, president of the Canada Steamship Lines, has recently returned from Europe, and is very optimistic regarding the shipping activities, both of this and other countries. He states that British and French shipping interests anticipate a period of several years of continued favorable conditions as exist at the present time. Of his own direct interests Mr. Norcross stated, "Developments that have already occurred in the Atlantic business of the Canada Steamship Lines have more than justified this, and important extensions and improvements are now being contemplated." He looks for considerable emigration from the British Isles to Canada during the coming year, and appreciates the fact that shipbuilding and industry in general will greatly benefit by the additional skilled labor that will be available.

* * *

Some idea of the changing conditions that are taking place in world commerce may be gathered from the export of coal that has recently taken place from this country. While this state of affairs is largely due to the recent attitude of British labor, there is nevertheless a possibility that trade of this kind may be permanent in character. The steamer Ariant, recently arrived at Halifax with a general cargo, has been diverted from her regular activities and will take on a cargo of coal at Sydney for the United Kingdom. Another instance of coal trading is the shipments of fuel that are now going to Holland. Some time ago the Netherlands Government obtained some 90,000 tons of Canadian coal, and and it has been announced that the Dutch Government are so well pleased with the quality of the coal that a further order for upwards of 200,000 tons has been placed.

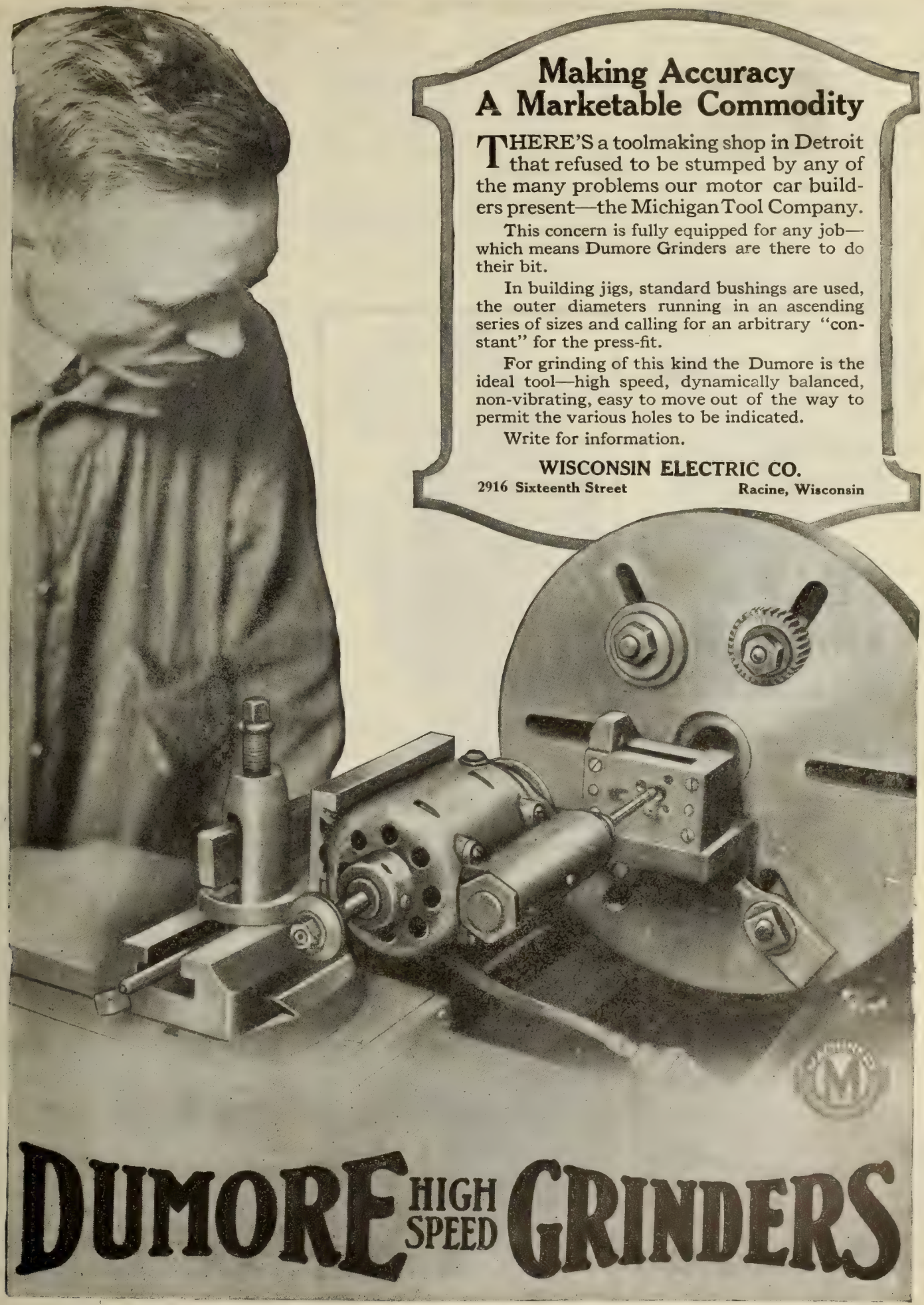
AMERICAN BUREAU OF SHIPPING APPROVES THERMIT WELDING FOR MARINE REPAIRS

An important development of Thermit welding in American shipyards is anticipated by the recent approval by the American Bureau of Shipping of the Thermit process for welding stern frames, rudder frames, and other heavy sections on ships registered under their classification. The only qualification is that this bureau be notified sufficiently in advance to have a surveyor in attendance during the welding operation as well as to inspect and test the weld when completed.

While the Thermit process has been used since 1903 for making marine repairs, and has had a great many successful welds of this nature to its credit, the process was never officially approved by the American Bureau of Shipping, and most of the repairs were made on vessels not classed by them. It is due entirely to the unbroken record of successful marine welds that the bureau now accords its official sanction to the process. According to a statement by the Metal & Thermit Corporation, there has never been a single failure of a Thermit marine weld so far as it has been able to ascertain in all the years that the process has been used under this company's jurisdiction.

Now that the United States promises to have one of the largest mercantile marines in the world, and as practically all of the ships which have recently been constructed, and which will be constructed in the future, will be registered with the American Bureau of Shipping, the recognition of the Thermit process by that bureau bids fair to result in many important Thermit marine welds from now on.

Fire at Ingersoll.—Damage was caused by fire to the roof of the moulding shop of the T. E. Bissell factory. The fire started near a small cupola, the roof of which, as well as the centre section of the moulding shop, was completely destroyed. There had been a heavy cast in the moulding shop in the morning, but the moulders had the afternoon off. The fire had evidently been smouldering for some time before it burst through the roof and was discovered. The loss will probably exceed $2,00, while the delay of several weeks which will necessarily follow will also be serious, as the firm has large orders which will keep the moulding shop running for several months. The building is owned by the John Morrow Company, and the loss is covered by insurance.



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This concern is fully equipped for any job—which means Dumore Grinders are there to do their bit.

In building jigs, standard bushings are used, the outer diameters running in an ascending series of sizes and calling for an arbitrary "constant" for the press-fit.

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INCORPORATIONS

The Abrasive Company of Canada, Limited, has been incorporated under the Ontario Companies Act with a capital stock of $250,000 divided into 2,500 shares of $100 each, to manufacture grinding wheels, bricks, sticks, and refractories, and to mine bauxite minerals and coal. The head office to be in Hamilton.

MARINE

Port Arthur.—The largest grain cargo ever carried on the Great Lakes was cleared for Port McNicoll in the W. Grant Morden, a Port Arthur-built vessel. The cargo consisted of 503,153½ bushels of wheat, the value of which was $1,150,000.

Vancouver.—The steamer "War Melody" has been purchased by the Robert Dollar Company and renamed Grace Dollar. She is now loading coal at Norfolk for San Francisco. She is expected to leave San Francisco for the Orient under command of Captain Abernethy about October 20.

Sault Ste. Marie.—The large Sabin lock on the Soo Canal was opened with appropriate ceremonies on Sept. 18th. The new lock cost $3,000,000, and was six years in building. The addition of this lock brings the total number up to five, four American and one Canadian, and these locks together are capable of handling any fleet that may assemble at the St. Mary's river.

St. Thomas.—A new steamship service has been inaugurated between Cleveland and Port Stanley, by the Pere Marquette No. 8, a combined passenger and freight steamer. She will be operated by the Cleveland Erieau Steamship Co. and will give a tri-weekly service. She has accommodation for 60 passengers and large freight capacity. The service will be continued until December 1.

New York.—The White Star line has been allotted the former North German Lloyd liner Prinz Frederich Wilhelm, and will use her on the New York, Cherbourg and Southampton route. She has been in use for repatriating American troops, and was blockaded in Hamburg during the war. The reparation committee of the Inter Allied council at Paris assigned the vessel to the British Government, who in turn advised the White Star line to take the vessel.

Watertown, N.Y.—The barge Hilda, owned by the Montreal Transportation Company, which parted company with the tug Thompson during a heavy gale in Lake Ontario Wednesday, the whereabouts of which has been a mystery since she separated from the tug, has been located ashore at Stony Point, four miles from Henderson Harbor. The Donnelly Wrecking Company of Kingston, Ontario, is to-day at work trying to release her. The Hilda has seven feet of water in her hold. She is loaded with 35,000 bushels of wheat, and was bound from Buffalo to Montreal.

TRADE GOSSIP

New Building for O. A. College.—P. H. Secord & Co., of Brantford, Toronto, Hamilton and Brantford, have secured the contract to erect the new apiary building at the Ontario Agricultural College. The building will be of brick with stone foundation and will cost $40,000.

Company Gets Notice to Move.—The Corporation of Windsor have served notice to vacate city property on the Lamb Railway Service Corporation. The ratepayers recently voted against granting the company a bonus, including the purchase of land in the factory district. The company, who expected a favorable vote, had already commenced the erection of the factory.

Tin Plate in Demand.—There is a large demand for tin plate in Japan and it is necessary to import the product as it cannot be produced profitably in that country. Most of the plate was imported from the United States, and in 1916 amounted to 65,000 pounds. It dropped in succeeding years to 45,000 pounds, but since the signing of the armistice the imports have not been sufficient to supply the demand.

Ferro-Chrome in France.—The following statement regarding the production of ferro-chrome in France has been received from the office of the Commissioner General of Canada in France. Having received a letter asking what market there would be in France for Canadian ferro-chrome, inquiry was made. The Ministere de la Reconstitution Industrielle (Direction des Matieres Premieres), 74 Avenue des Champs-Elysees, Paris, made the following statement: "I beg to inform you that France has always been an exporter of ferro-chrome, both ordinary and refined, the production of its factories greatly exceeding the national consumption. Our electro-metallurgical works also manufacture the other ferro-alloys (tungsten, molybdenum, nickel, etc), in sufficient quantities."

Machinery Requirements of Poland.—A recent bulletin of the Polish Commercial and Industrial Bureau in New York, contains some detailed data relative to the approximate quantities of agricultural machinery urgently needed in Poland. The Bureau hopes to arrange loans and credits to meet the purchases of raw and manufactured materials which Polish importers and the Polish Government expect to make in the United States. We print below the data referred to above: Tractors, 1,500, with repair parts and suitable repairing tools; ploughs, 150,000, suitable for a light soil; harrows, 3,000, complete, of iron, also iron parts for 15,000 more to be made of wood; rollers, 500, with discs, also sufficient iron rollers to be used for construction of wooden framed rollers; sowers, 3,000, complete (1,000 each for motor, horse, and hand operation); cultivators, dusters, rakes, diggers of all systems—3,000; hay mowers, 6,000; hay baling machines (150 motor and 900 hand driven); ordinary harvesters, 6,000; binders, 3,000; threshers, 750 (steam driven), 1,500 (gasoline driven), 3,000 (horse driven); separators and blowers, with sufficient number of reserve sieves, 3,000, also metal parts for the construction of 3,000 additional blowers, to be made in Poland; corn graders of various types, 1,000. Scythes, sickles, whetstones: Scythes, 300,000; sickles, 150,000; whetstones, 300,000. Small tools: Hoes, 300,000; picks, 150,000; shovels, 300,000; spades, 300,000; axes, 150,000; mattocks, 50,000. These should be of various sizes and without handles. Heavy wagons for oxen and horses; iron tires, etc., for 300,000 wagons and ready-made wheels for 30,000 wagons. Sprays, bellows, sulphur, copper and rafia: Sprays, 90,000; bellows, 15,000; sulphur, 700,000 pounds; copper sulphate, 1,200,000 pounds; raffia, 1,200,000 pounds. Axes of various sizes, 18,000. Handsaws (both rip and cross-cut saws): 55-inch, 300; 60-inch, 3,000; smaller, 3,000. Files of different sizes, 1,200 dozen; rasps of different sizes, 1,500 dozen; spike hammers (41-lb.), 1,500 units; hammers (8-lb.), 1,500; picks, 3,000; shovels, 400; spades, 900; hoes, 900; chains, 600; large chains with spike and hooks, 150.

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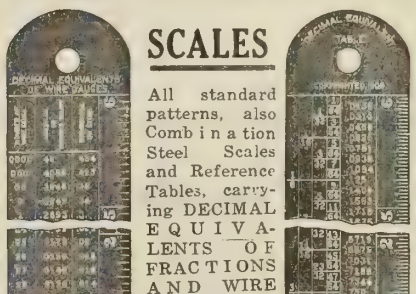
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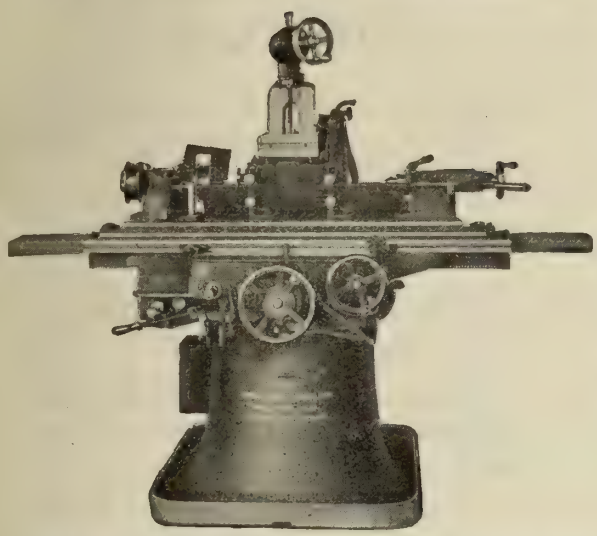

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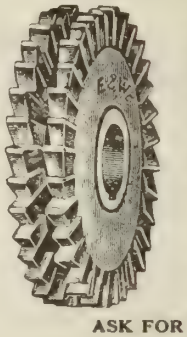
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Is the Alien a Menace?

IN the October issue of MACLEAN'S MAGAZINE a strong presentation is made of the reason why the people of the West are against further foreign immigration.

"The Menace of the Alien" depicts the foreign problem in the Canadian West as it exists to-day, and shows every one of us why we must Canadianize our Ruthenians, Austrians, Slovaks, and our fifty-seven other varieties before we allow any further "unrestricted" immigration.

This article is written by a member of MACLEAN'S MAGAZINE staff who has just returned from a careful, personal investigation of the situation. Shall we have a "White West?" Many Westerners are demanding it. Are the aliens to swing labor into the bosom of the O.B.U.? It is being done—and what must we do to stop it?

The "inside" story of the routing of the Drumheller miner aliens by returned Canadian war veterans is here told by MACLEAN'S for the first time. What leadership must be substituted for the O.B.U. leadership of these foreigners?

The October issue of MACLEAN'S is a Western number in the sense that it contains many articles and stories of distinctly Western interest. For instance:

X "Those Pesky Farmers Out West"

By Hopkins Moorhouse, Author of "Deep Furrows"

They have completely upset the old order of things. No longer will politics consist of the comfortable fight between the Ins and Outs with the old party lines maintained. The grain growers on the Prairies have upset the calculations of the professional politicians and completely changed the face of Dominion politics.

X "Fifty Years in the West"

By Professor W. T. Allison

A breezy and readable sketch of the business career of Winnipeg's veteran business man, James H. Ashdown.

"Further Discoveries of New Land"

By Vilhjalmur Stefansson

The final and most interesting instalment of Mr. Stefansson's story of his wonderful trip of five years' duration in the Canadian north in which he tells for the first time of finding new continents in the Arctic and hoisting there the Canadian flag.

X "The Banshee Bell"

By Edith G. Bayne

A bright love story laid in the mountains of British Columbia.

Other Splendid Features of October MacLean's

X "The Turmoil at Ottawa"

By J. K. Munro

A comprehensive survey of Dominion politics, written with complete impartiality and absolute candor. It is bright and breezy, with a knock in every line for the politicial opportunists. It plucks many tail feathers from our party leaders.

"Spanish Doubloons"

By Camilla Kenyon

The start of a bright and fascinating serial story by a brilliant young writer. It is the Spanish Main brought up-to-date, treasure hunting with a background of fun and romance.

"The Airy Prince"

By Arthur Beverley Baxter

A complete novelette in which is presented a bird's-eye view of England in time of war. It is one of the most brilliant stories that has been written of recent years.

"His Majesty's Well-Beloved"

By Baroness Orczy

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"Ebb and Flow"

By C. W. Stephens

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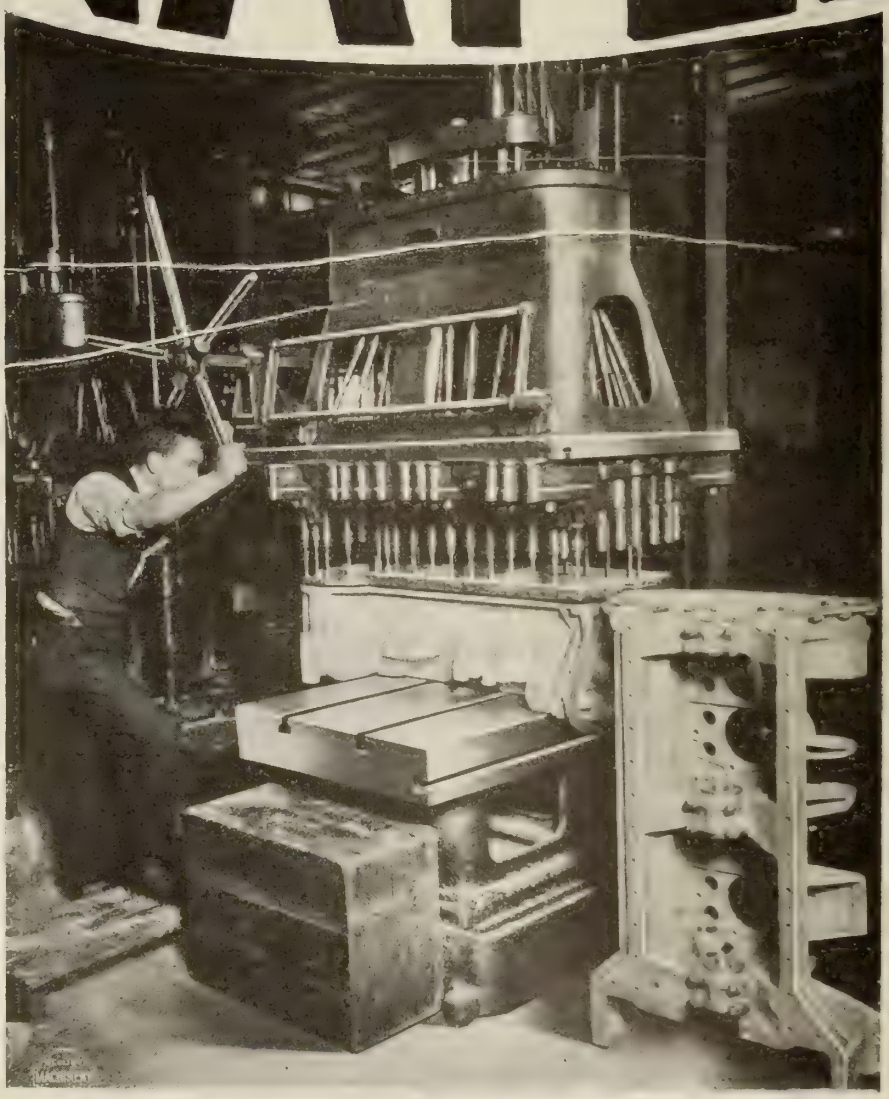
NATCO



DRILLING 38 HOLES OF DIFFERENT DIAMETERS IN ONE OPERATION

The above cut visualizes the great economical possibilities of NATCO Multi-Drillers.

This driller is one of many NATCOS installed in the plant of the Hinkley Motors Corp. It is drilling 38 holes of different diameters in one operation in the bottom of aluminum crank cases.

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NATCOS are built in 11 sizes, ranging from 2 to 72 spindles.

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drillers.

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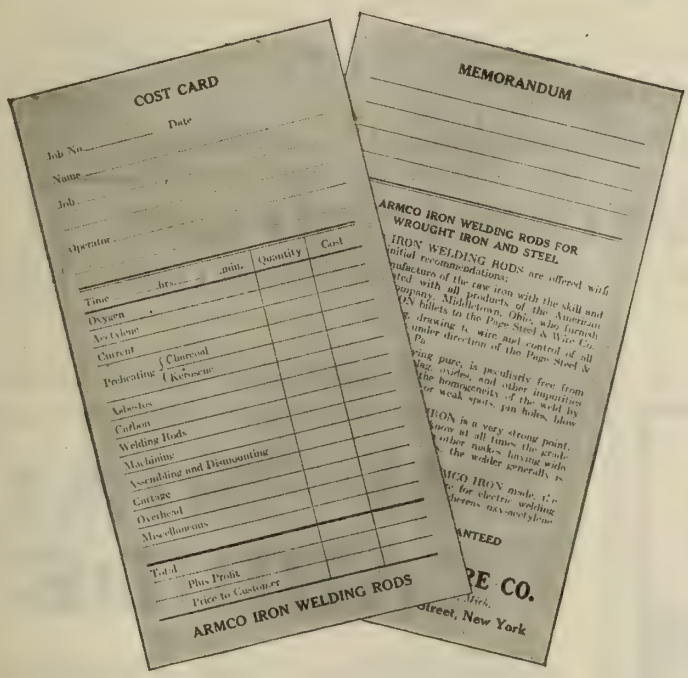

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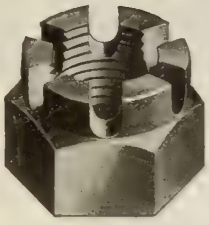

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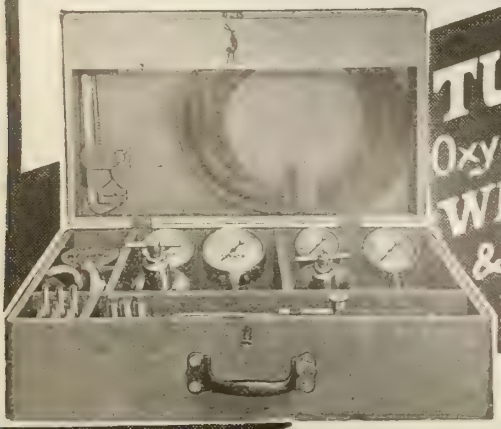

These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

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Six Post Readers in New Cabinet

FORMER Finance Minister Cashen, who, following the crisis which led to the resignation of Premier Lloyd, of Newfoundland, has been called upon to form a Ministry, has already selected nine members to act with him.

Six of these, including the Premier himself, have been regular readers of THE FINANCIAL POST for some time.

This does not only indicate the quality as well as the extent of our circulation, but indicates also that men who carry big responsibilities find THE POST of value to them. It indicates, therefore, the approval which is meeting the effort of our editors and the great importance and value of the business information to which subscribers have access through the columns of THE FINANCIAL POST.

When the Government of Newfoundland was recently arranging the flotation of a $5,000,000 bond issue THE POST'S opinion as regards some methods of marketing was quoted by members of the Cabinet.

The Financial Post at Ottawa

IN the Dominion House of Commons the other week the attention of the Government was drawn to an article in THE FINANCIAL POST containing a reference to the financing of Roumanian orders through an agency established in London by Sir Clifford Sifton. Sir Thomas White mentioned that in reading his FINANCIAL POST that week, he had formed the opinion that the reference was to private marketing of bonds.

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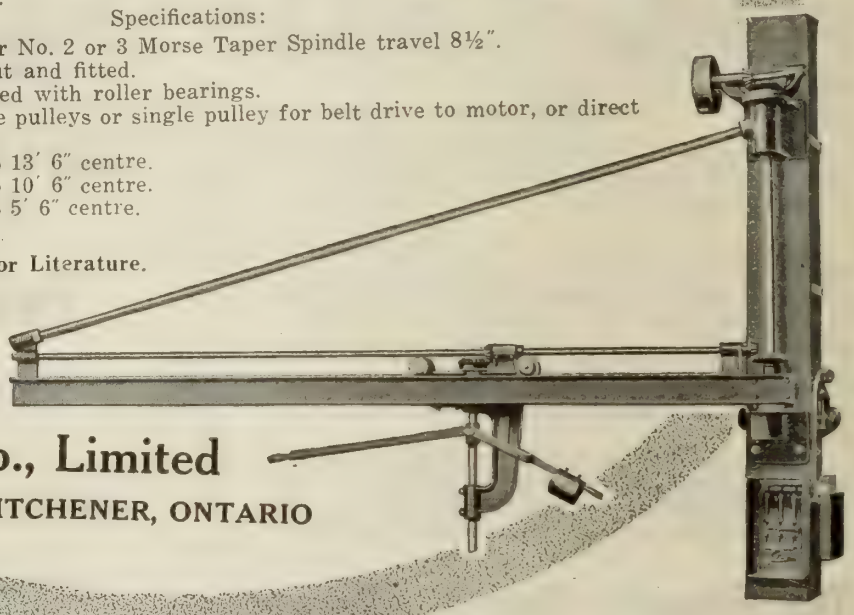

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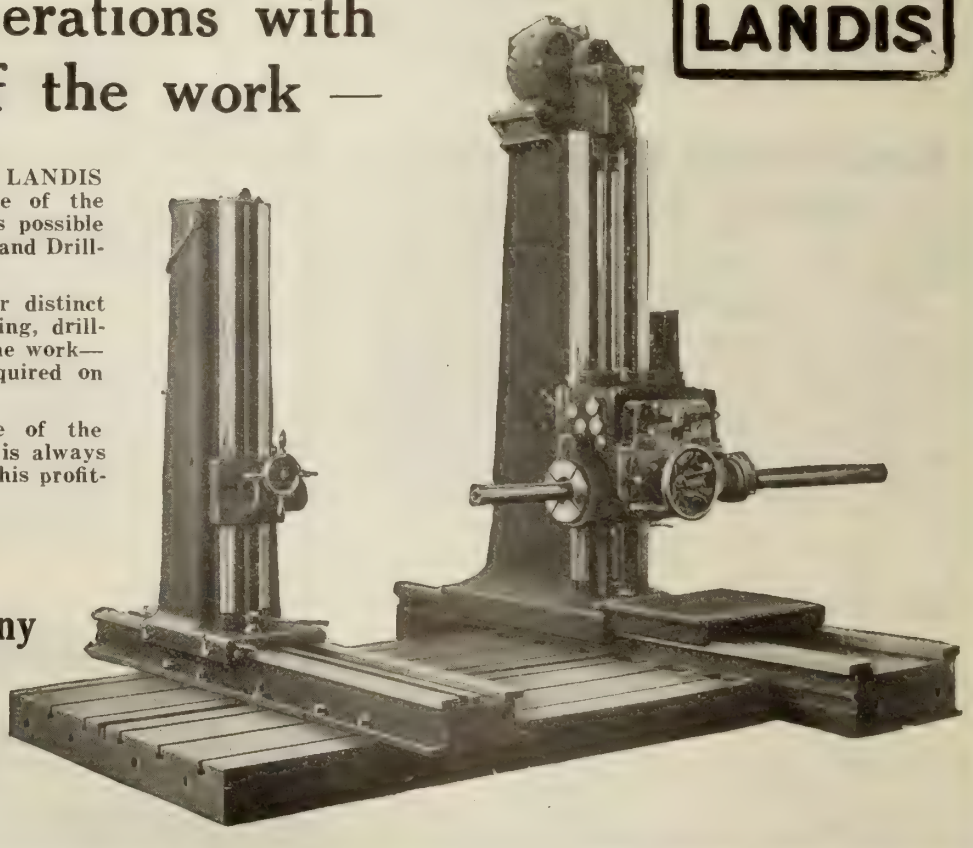

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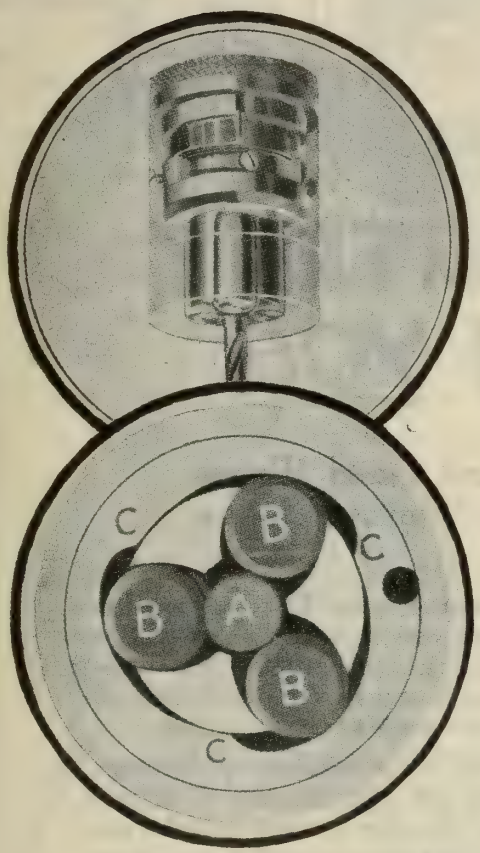
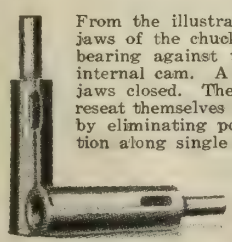
SKF AUTOMATIC-QUICK ACTING SELF CENTERING DRILL CHUCKS

Suggestion No. 1 →



A—*Drill Shank*
B—*Roller Jaws*
C—*Cam Surfaces*



Increase Size Range by using Adapters

From the illustration it will be seen that the jaws of the chuck are formed by three rollers bearing against the surfaces of a three-lobed internal cam. A coiled spring holds the roller jaws closed. The rollers are free to turn and reseat themselves with every drill release, thereby eliminating possibility of wear or indentation along single line of contact. The drilling resistance forces these rollers up the cam surfaces, causing them to close upon and grip the drill shank with a power always proportionate to the drilling stress, thereby precluding slipping of the drill under any conditions whatsoever.

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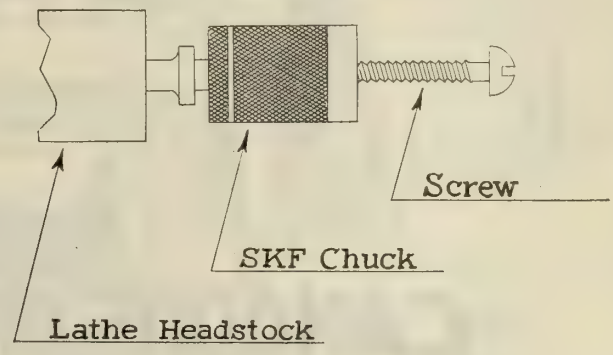

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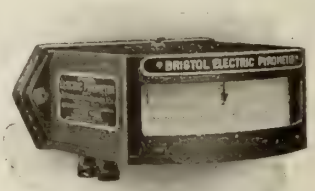

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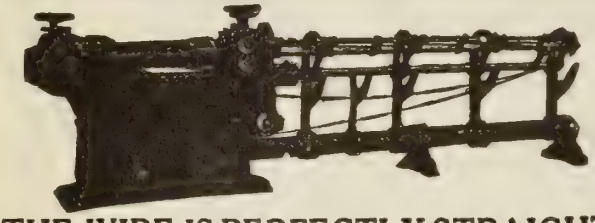

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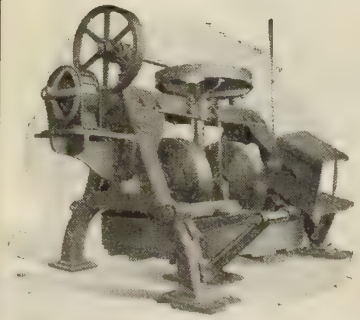

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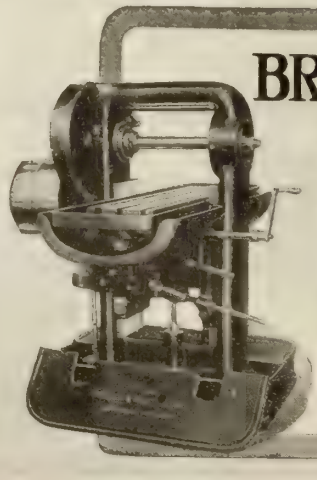

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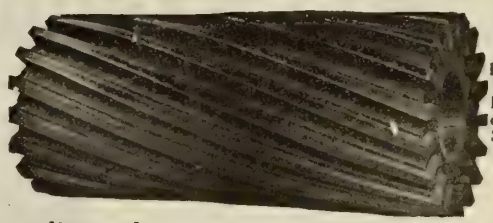

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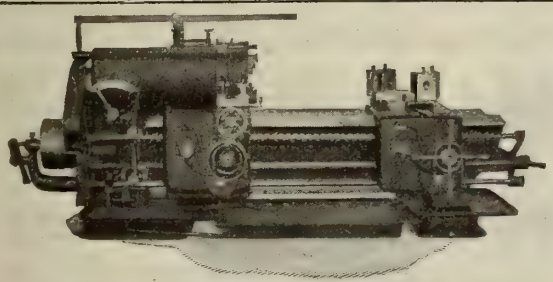

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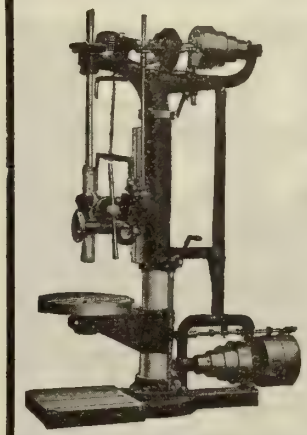

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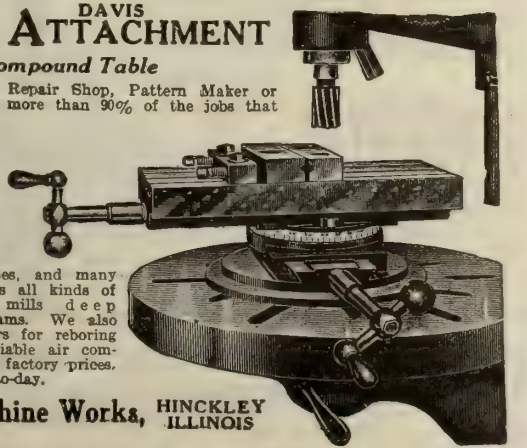

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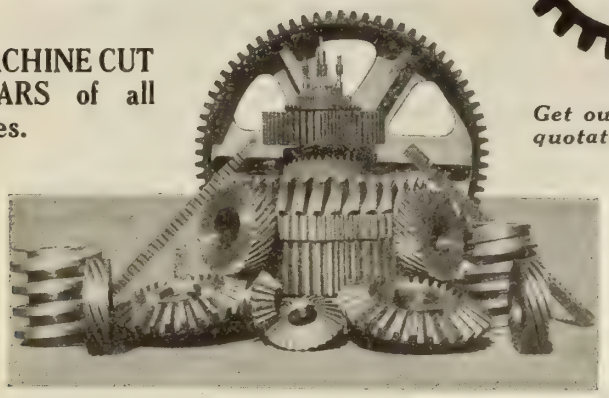

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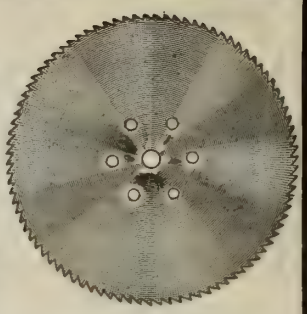

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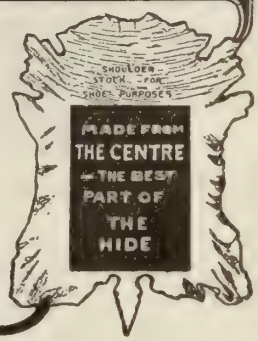

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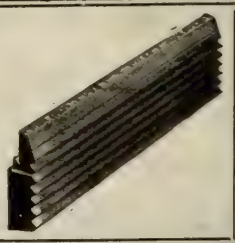

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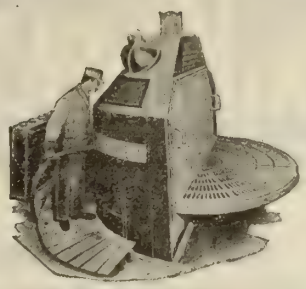

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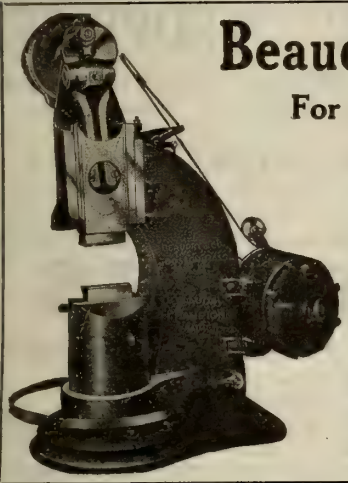

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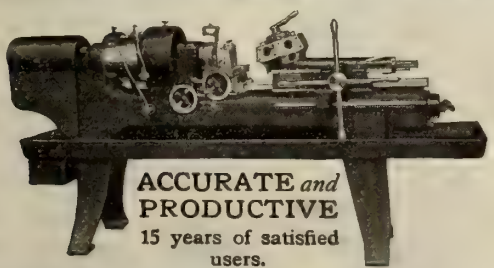

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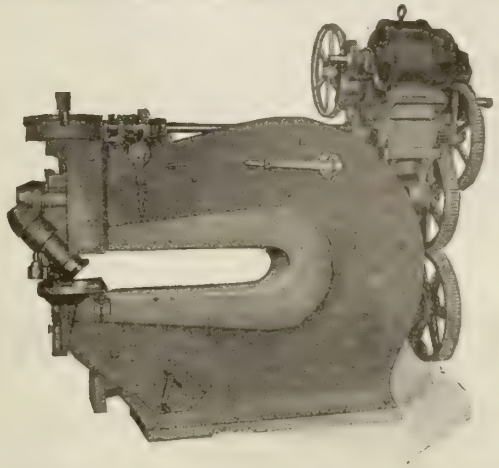

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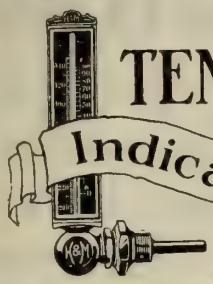

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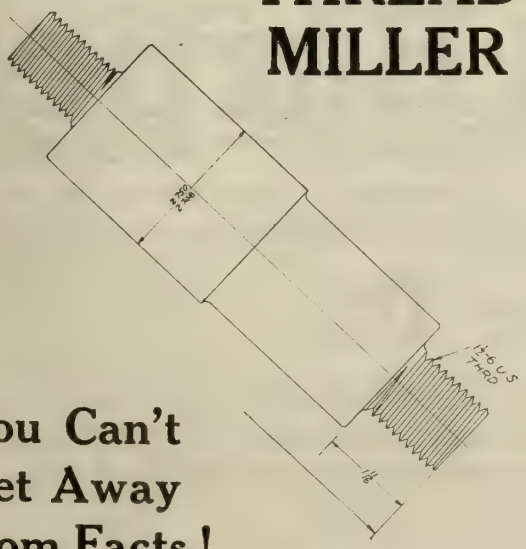

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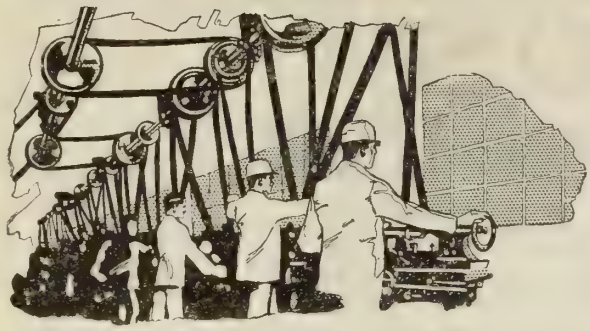

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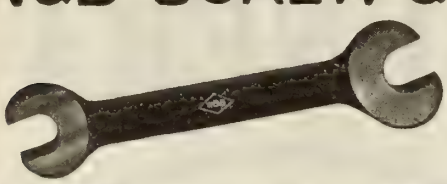

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Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
William Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.
Wickes Bros., Saginaw, Mich.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield, Mass

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOILER BREECHINGS
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.
Willliams & Wilson, Ltd., Montreal, Que.

BUYERS' DIRECTORY

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son. Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blanche Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

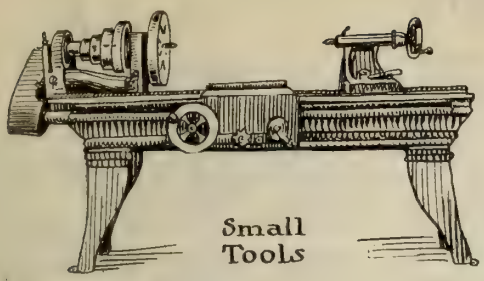
COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

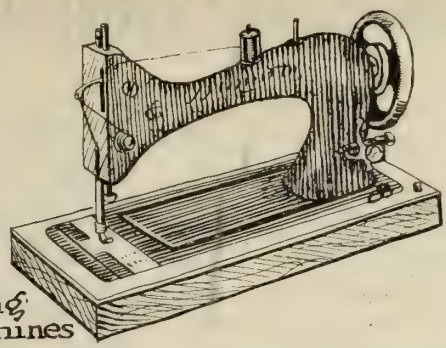
COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

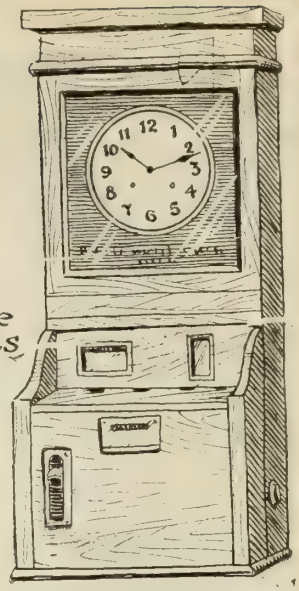
COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.


Small Tools


Sewing Machines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If production increase interests you, our circulars will make pleasant reading: better put in that request to-day.

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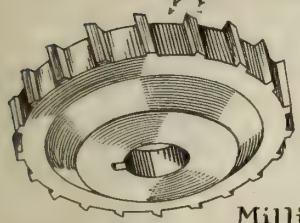
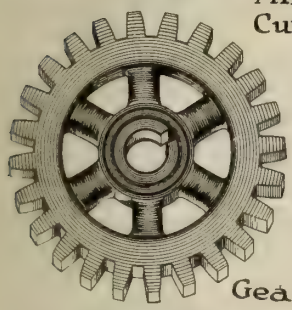
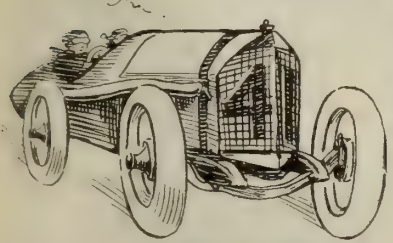
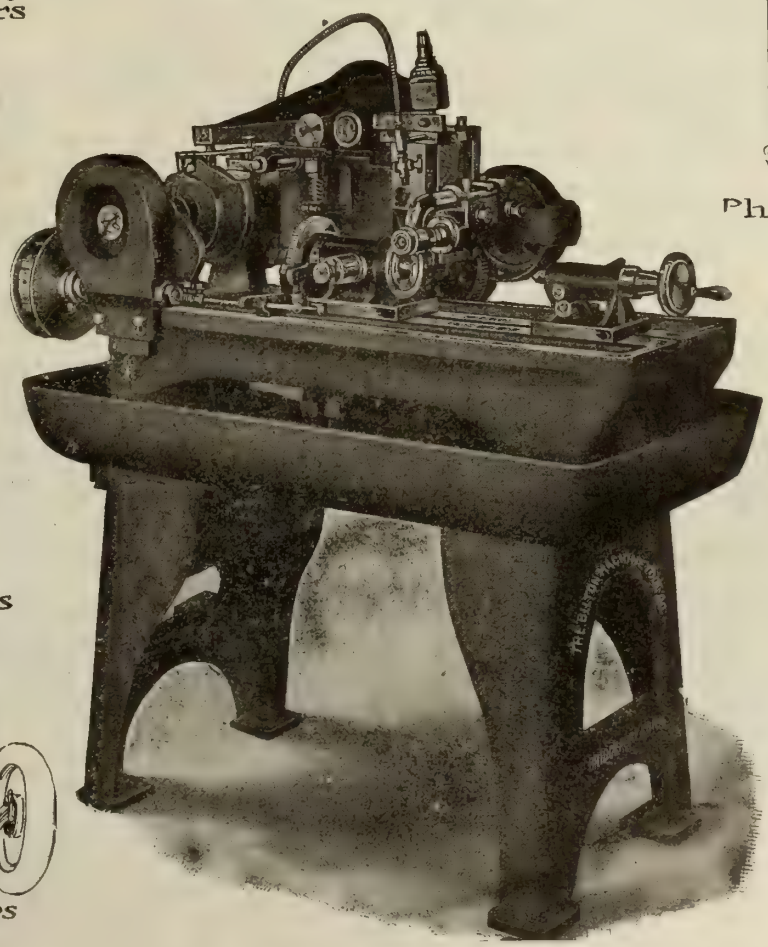
Typewriters

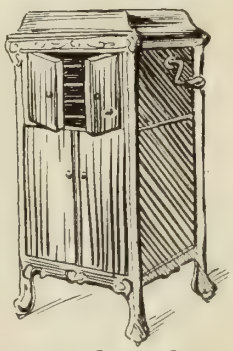

Milling Cutters


Gears

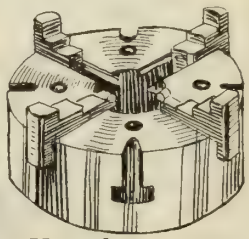
Speedometers


Automobiles




Locks

Phonographs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Motorcycles

BILTON MACHINE TOOL COMPANY

Housatonic Avenue, BRIDGEPORT, CONN.

If interested tear out this page and place with letters to be answered.

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Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

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Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found'g & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

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Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

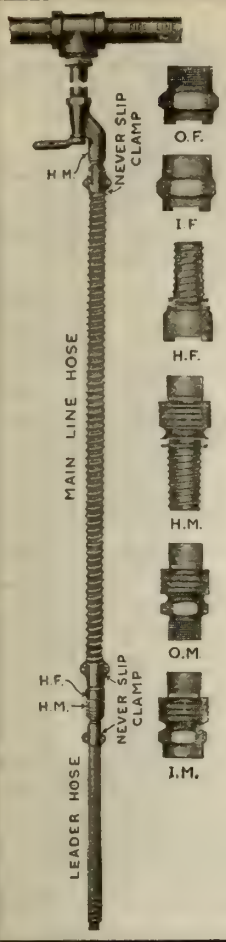
DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.



CLEVELAND HOSE SPECIALTIES

Bowes Automatic Air Hose Couplings

Standard Equipment Everywhere

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE O.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.
STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ¼-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-in.

The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.

CLECO GROOVED HOSE NIPPLE

Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Use Annealed Wire No. 14

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

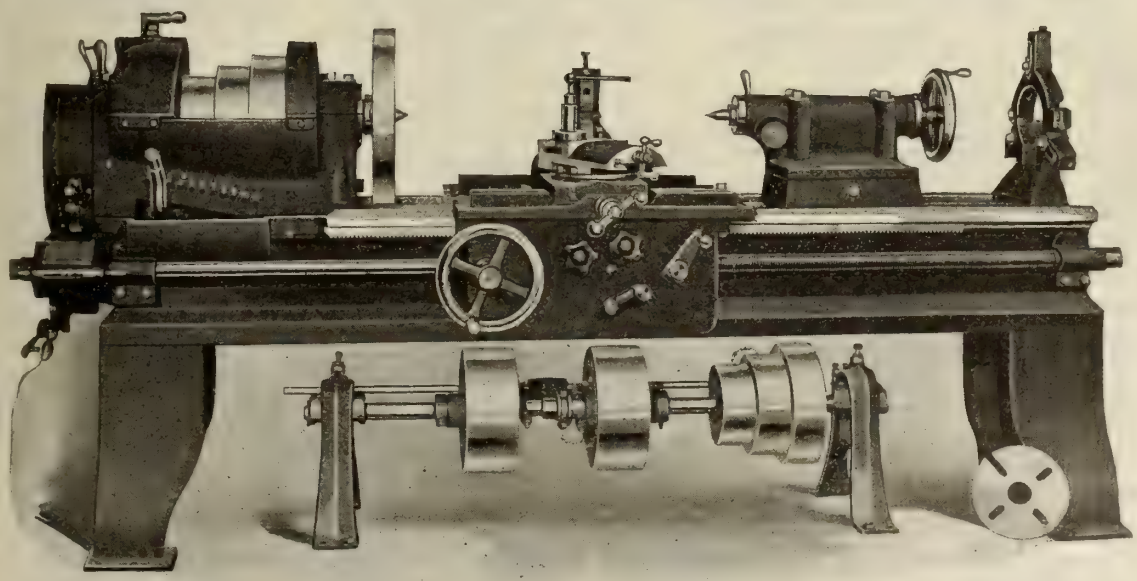
IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Bulletin 34A, 41 and 43.

CLEVELAND PNEUMATIC TOOL CO. OF CANADA LTD., 84 Chestnut St., TORONTO

A. R. WILLIAMS MACHINERY CO., TORONTO, 337 Craig St., W., MONTREAL. WILLIAMS & WILSON, MONTREAL

The "RAE" 18-inch Quick Change Double Back Geared Lathe



Users of this lathe will find it one of the most accurate and strongest on the market.

An investment in a "Rae" will pay you big dividends in quality of work and long, efficient service.

May we send full specifications?

Ask your dealer. If he cannot supply you, write us.

Rae Machine Tool Works
Hamilton
Canada

New Type of Webbed Headstock Insures Great Strength and Rigidity Under All Conditions

If interested tear out this page and place with letters to be answered.

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Can. Ingersoll-Rand Co., Montreal, Que.
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Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

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Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
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Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

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Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

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DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

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DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER. ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACES
Volta Manufacturing Co., Welland, Ont.

EECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co., Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.
Can. Driver-Harris Co., Walkerville, Ont.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Volta Manufacturing Co., Welland, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

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The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Trueing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

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Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

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Walton Co., The, Hartford, Conn.

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Strong, Kennard & Nutt Co., Cleveland.
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FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

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Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY
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Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

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Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I.

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Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

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Rice Lewis & Son, Toronto, Ont.

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Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

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FRICTION SURFACE BELTING
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Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
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GASOLINE TANKS
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Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
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Fellows Gear & Shaper Co., Springfield, V.
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Williams & Wilson, Ltd., Montreal, Que.

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Morse Chain Co., Ithaca, New York.

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Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
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Hamilton Gear & Machine Co., Toronto.
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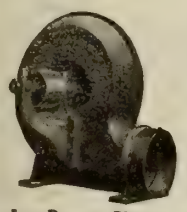

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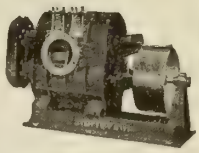

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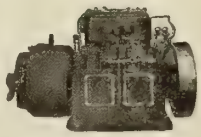

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Greenfield Tap & Die Corp., Greenfield.
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Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal.

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Northern Crane Works, Walkerville, Ont.
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Clipper Belt Lacer Co., Grand Rapids.

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Taylor Instrument Co., Rochester, N.Y.

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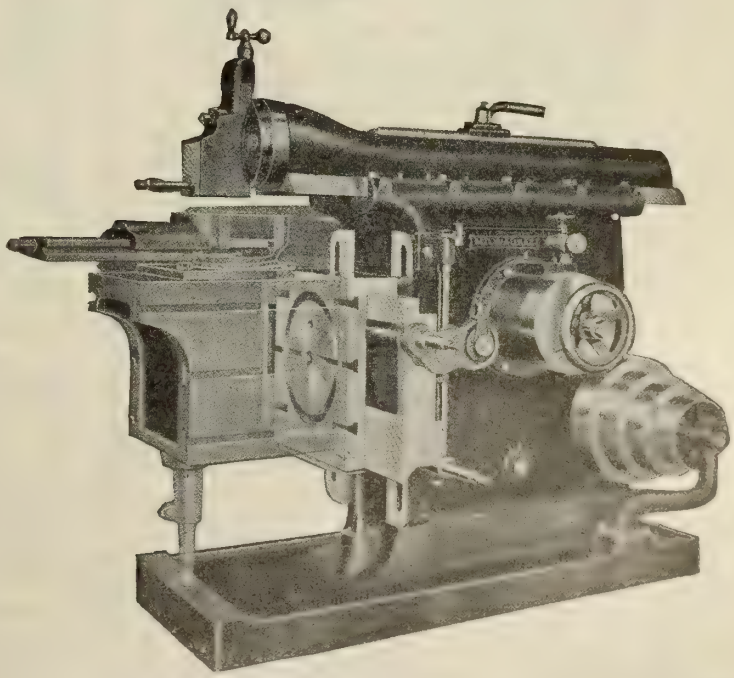

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Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
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Kennedy & Sons, Ltd., W., Owen Sound.
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Pratt & Whitney Co., Dundas, Ont.
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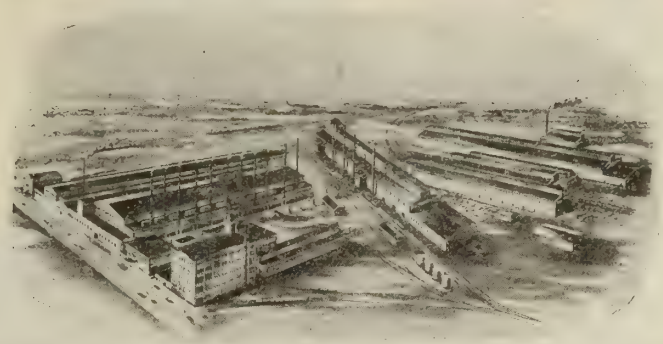

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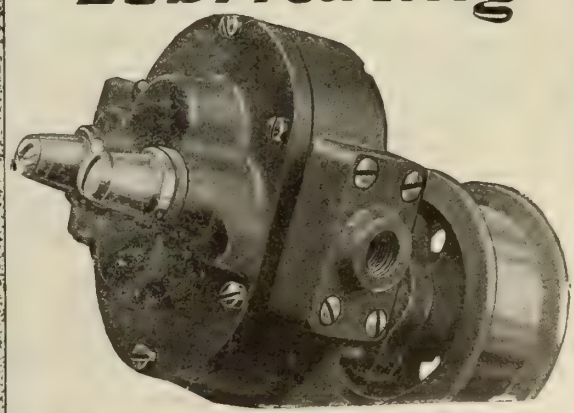

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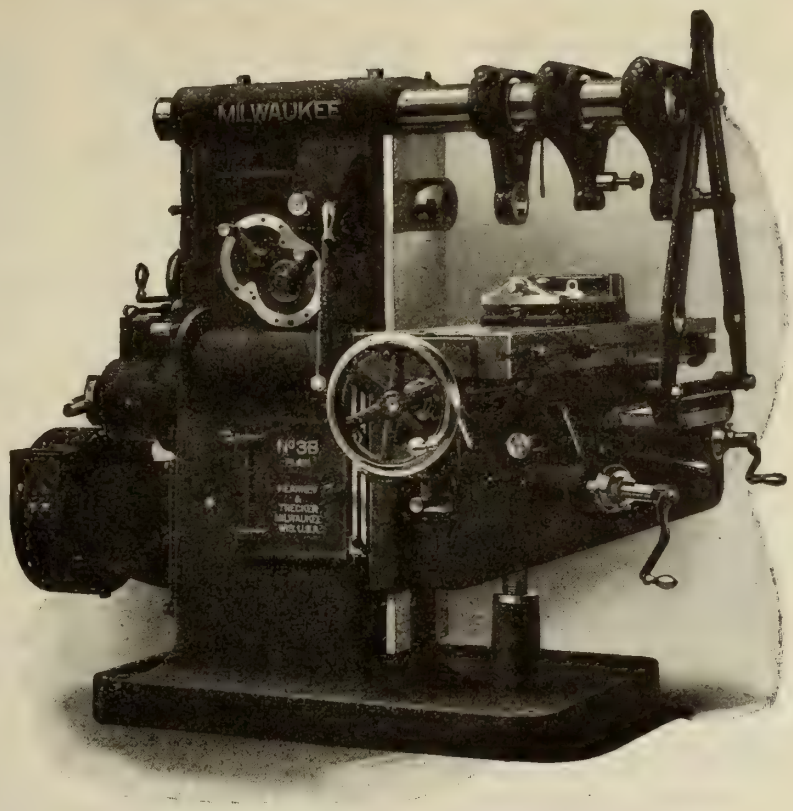

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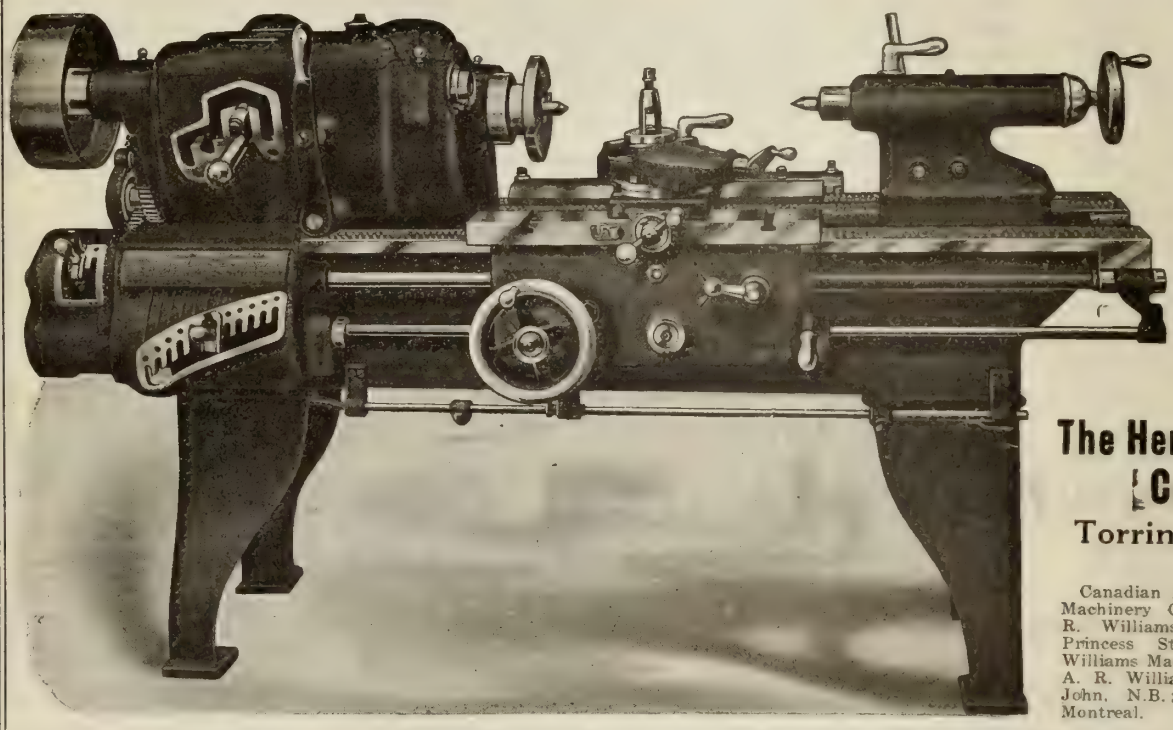

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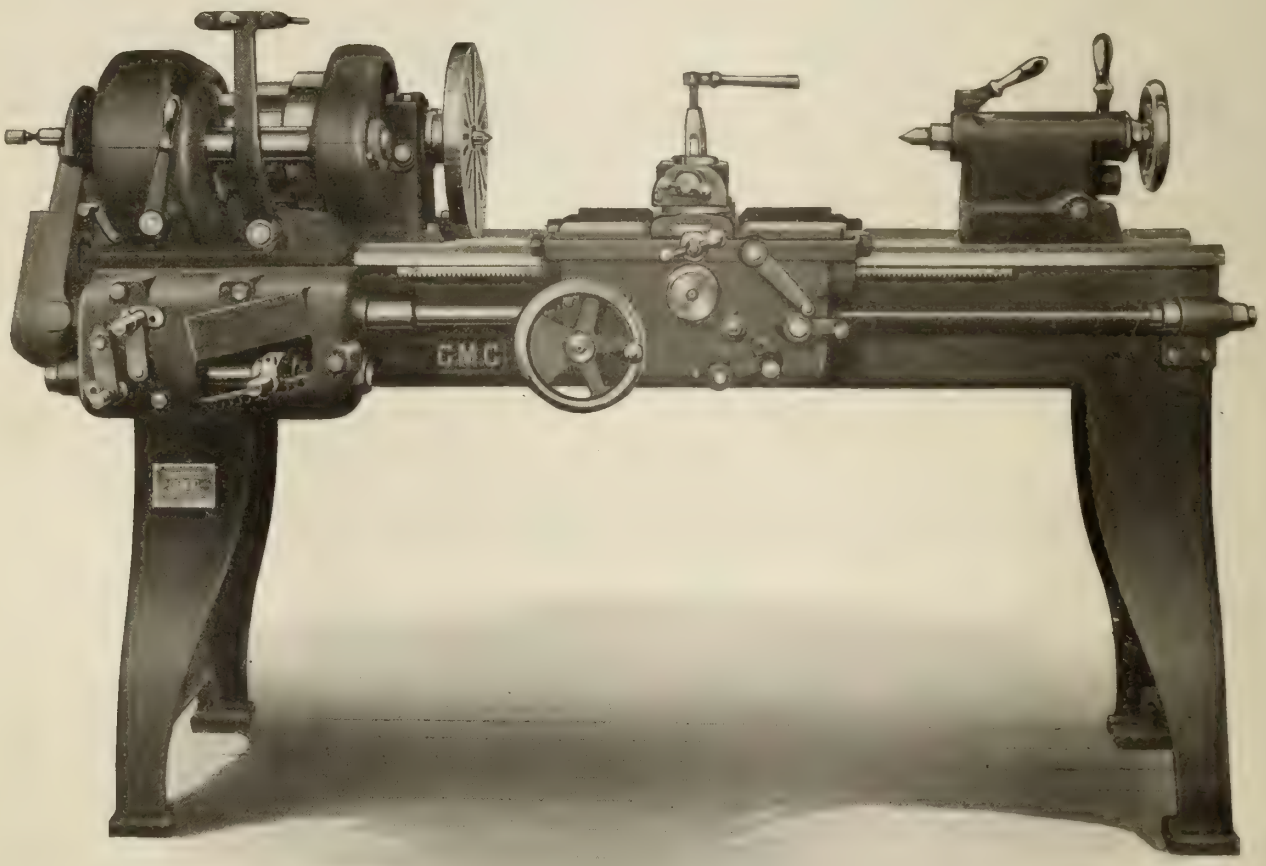

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII., No. 16 Publication Office: Toronto, October 16, 1919 Subscription Price $3.00 per year.

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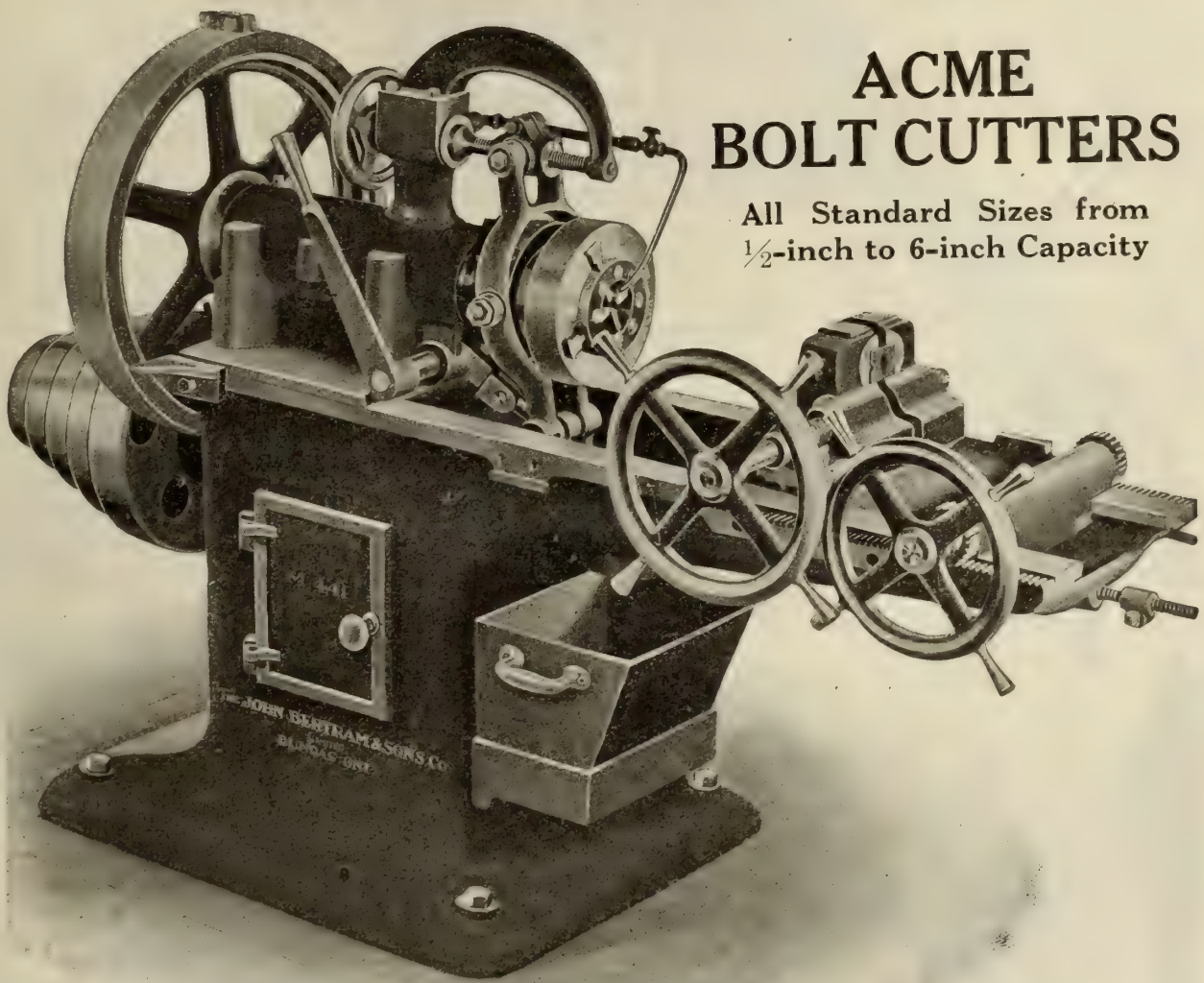

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Five Minutes To Eleven has not yet come for those who stayed at home

The gallant Canadian army kept right on fighting until five minutes before the Armistice was signed.

The last lap of the war for those men was indeed a smashing, glorious finish!

While the fighting ended at five minutes to eleven on the morning of the eleventh of November last year, the war has not yet ended for those of us who stayed at home.

Our "Five Minutes to Eleven" has not yet come. There is a great deal more for us to do, before our war job is finished.

There are still heavy demobilization expenses to clean up. In a few short months we have brought home the troops that were transported overseas during four years of war—four years' transportation expenses crowded into a few months.

Many millions are still required to complete payment of demobilization and for other purely military expenditures.

The Victory Loan, 1919, which is necessary to meet these war obligations is the great objective in the last lap for those who stayed at home.

The Canadian Corps, during the war, never lost a gun,—never once retreated and never failed to take an objective.

Keeping that glorious record in our minds, and carrying that "no surrender" fighting spirit into the new Victory Loan campaign, there can be only one result:—Success, overwhelming and triumphant.

When the figures for the Victory Loan, 1919, are totalled up, the result will show the world that those of us who stayed at home have taken another glorious objective on the road to our "Five Minutes to Eleven."

Victory Loan 1919

Issued by Canada's Victory Loan Committee
in co-operation with the Minister of Finance
of the Dominion of Canada

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5 x 3½″—5 x 3″—4½ x 3″
4 x 3½″—4 x 3″—3½ x 3″
3½ x 2½″—3 x 2½″—3 x 2″
2½ x 2″

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CHANNELS—
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3⅛ x 4 1/16 x 3⅛ x 5/16″
3 3/16 x 4⅛ x 3 3/16 x ⅜″
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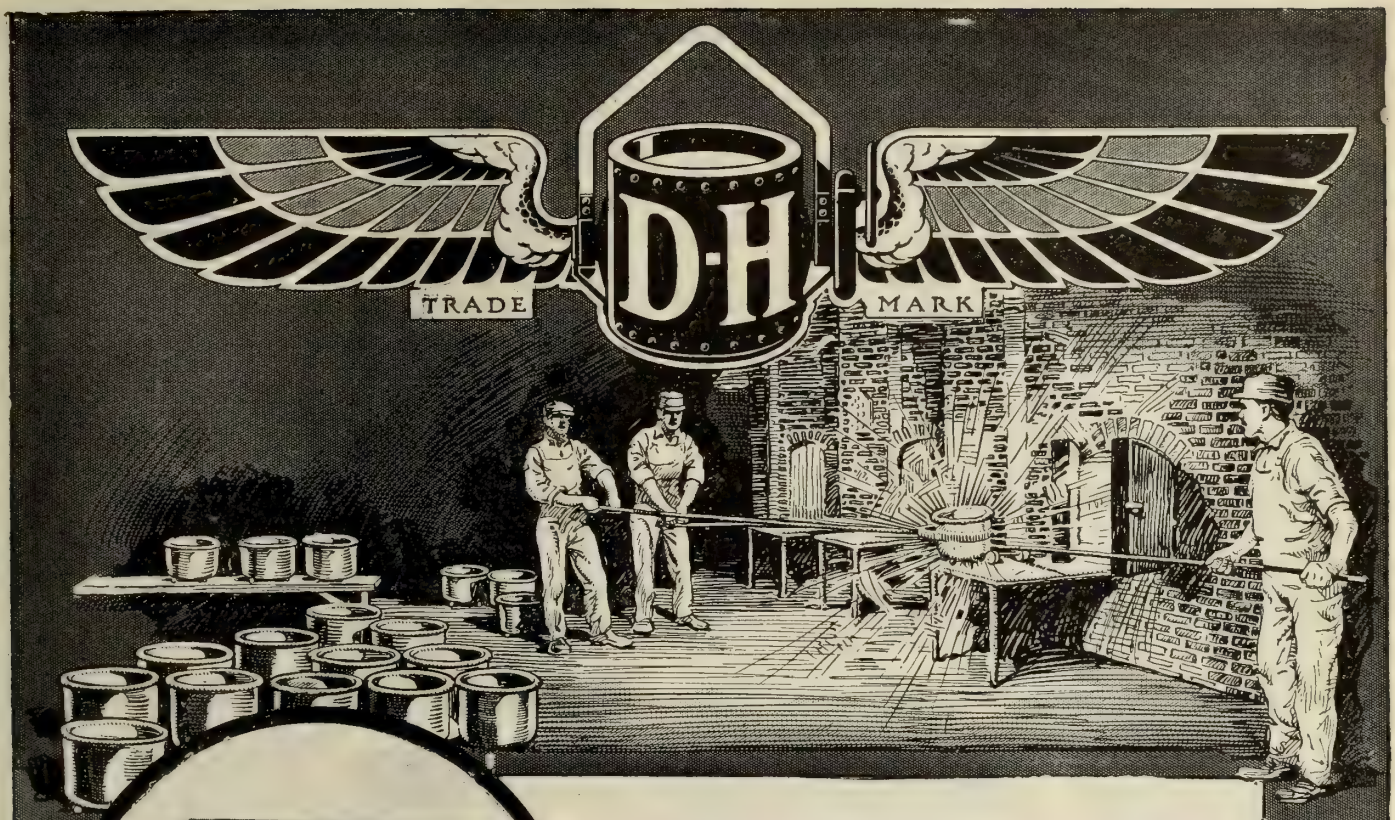
For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.
Your enquiries and business will be appreciated.

ALGOMA STEEL CORPORATION

SAULT STE. MARIE, ONTARIO

If interested tear out this page and place with letters to be answered.



Cast Nichrome Annealing Box

Cast "Nichrome" Heat Treating Containers

Carbonizing and annealing boxes and other heat treating containers must be durable to withstand the action of heat during operation.

Cast iron, cast steel, structural steel and wrought iron receptacles **crack, grow, scale** or **warp,** their use is inefficient, involving costly maintenance due to additional expenses for labor, fuel, material and constant replacement.

Cast Nichrome boxes, pots, tube and retorts guarantee uniform high quality of product, increase the capacity of the plant, and reduce the cost of heat treatment.

Write for further particulars.

Manufactured under Henderson Patents.

CANADIAN DRIVER-HARRIS CO., Ltd.

WESTERN OFFICE AND DEPOT CHICAGO 28 So JEFFERSON ST

WALKERVILLE, ONT. CANADA

AMERICAN OFFICE AND WORKS HARRISON, N J

BRITISH WORKS MANCHESTER ENGLAND

25

OUR AIR COMPRESSORS ARE ACCESSIBLE

One of the most important points about an air compressor is that it should be so built that inspection and cleaning can be done with the least amount of trouble. The horizontal type of construction which we have adopted is particularly handy—cylinder valves, etc., are readily accessible; crossheads and guides can be inspected and cleaned without unscrewing bolts and removing plates; and the crank, etc. are available for inspection simply by lifting off a cover.

Write for our compressor bulletins for further information.

Canadian Ingersoll-Rand Company Limited

SYDNEY SHERBROOKE MONTREAL TORONTO
COBALT WINNIPEG NELSON VANCOUVER

Swedish Steel & Importing Co., Limited

Montreal New York Toronto Denver

Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

TRADE MARK SS DOUBLE ESS

PROMPT SHIPMENTS from large stock

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium — make this a steel of truly remarkable cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.
LATROBE, PA.

High Speed Steel

Uranium

WILT

"Where there's a WILT—there's the Way"

HIGH SPEED AND CARBON TWIST DRILLS

Reamers and Milling Cutters

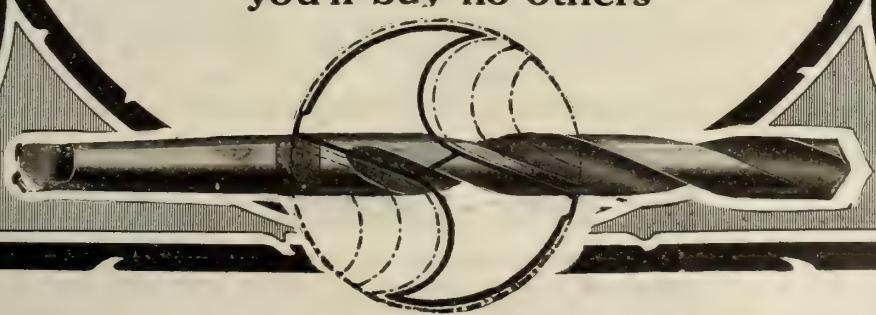
Unusual Drills Backed by Unusual Policies

Every superintendent should investigate the unusual qualities of

WILT Twist Drills, Reamers and Milling Cutters

The "WILT" has stood the test of all conditions—it is here to stay—its popularity among the mechanics makes that a certainty.

Investigate "WILT DRILLS" and you'll buy no others



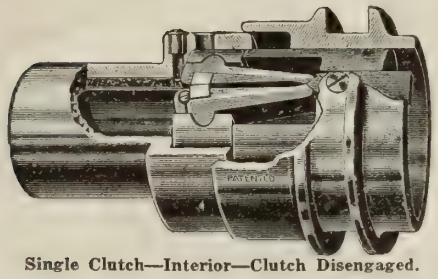
WILT TWIST DRILL CO.
OF CANADA LIMITED

WALKERVILLE - - - ONTARIO

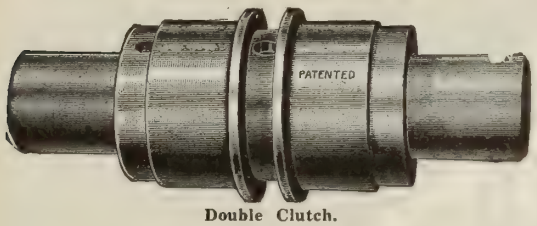
LONDON OFFICE: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, Eng.

THE JOHNSON FRICTION CLUTCH

The Clutch for Your Machine Made to Order



Single Clutch—Interior—Clutch Disengaged.



Double Clutch.

Where space is limited and conditions are exacting, the clutch problem presents difficulties—unless you know about Johnson clutches. We offer you an efficient clutch made in any size or form that your machine requires. When you are designing a new machine, it will be worth while to consult us. Our facilities are at your disposal without any obligation to you.

THE JOHNSON FRICTION CLUTCH

THE CLUTCH OF A THOUSAND USES

WRITE TO-DAY FOR OUR YELLOW DATA SHEETS

Canadian Agents:

WILLIAMS & WILSON, LIMITED, 84 Inspector Street, Montreal

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto and Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

SMELTERS **METALS** DEALERS

COPPER AND BRASS INGOTS

Made in Standard Mixtures or According to Specifications

Our guaranteed analysis Brass Ingot Metal will save you money in your metal purchases, also you have the positive assurance of exactness and accuracy of quality, and in casting the elimination of melting losses and defective castings.

"EVERY METAL THE BRASS FOUNDER NEEDS"

THE CANADA METAL CO., LIMITED

HAMILTON MONTREAL TORONTO WINNIPEG VANCOUVER

THE

TRADE K–T IE A MARK

FOUNDRY

GALT - ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

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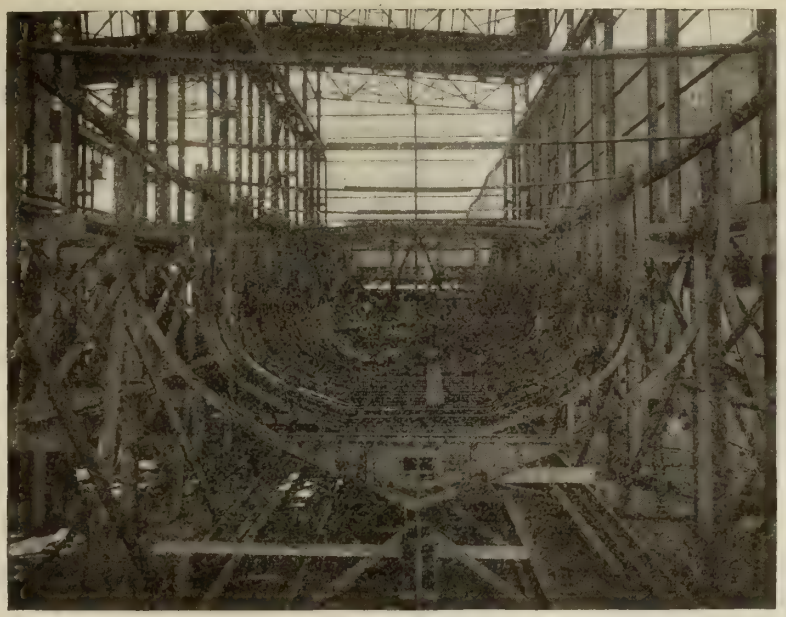


SHIP CASTINGS

IN STEEL

STERN and RUDDER FRAMES,
SHAFT BRACKETS, ANCHORS,
ETC.

CANADIAN
STEEL FOUNDRIES
LIMITED

Transportation Building, Montreal

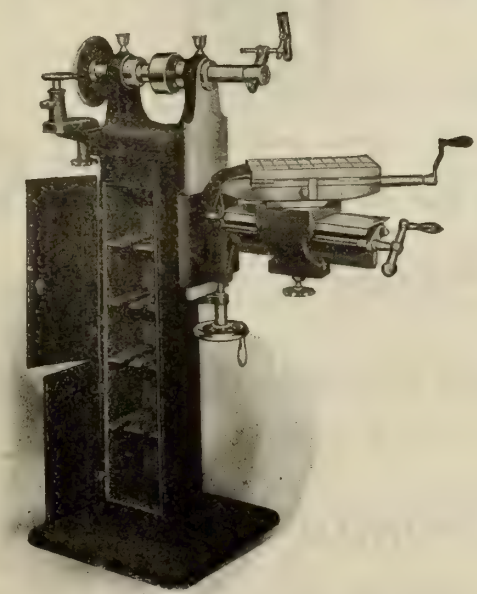
OBTAIN THE BEST RESULTS

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple **Light Running** **Accurate**



GARVIN No. 3, Universal Cutter
and Surface Grinder
Use Code—Banish

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

For Further Information ASK YOUR DEALER or WRITE US DIRECT

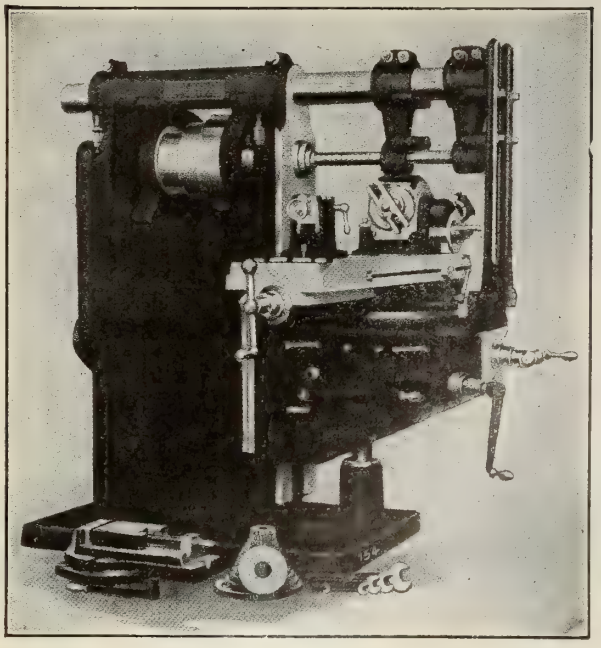
IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City



No. 2 Full Universal

FORD-SMITH MILLERS

The Miller of high-grade construction—fast, accurate and durable.

Adapted for Heavy Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.

The Ford-Smith Machine Co., Ltd.

Manufacturers of Milling Machines, Disc Grinders, Polishers and Special Machinery

Hamilton, Canada

NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY, LIMITED

332 St. James Street, Montreal

Sole Agents for

JONAS & COLVER, LIMITED
Novo and Continental Steel Works, Sheffield, Eng

H. BOKER & CO., Inc.
New York, N.Y.

E S&M

ELECTRIC

Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

Send us your drawings for estimates.

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED

WELLAND ONTARIO

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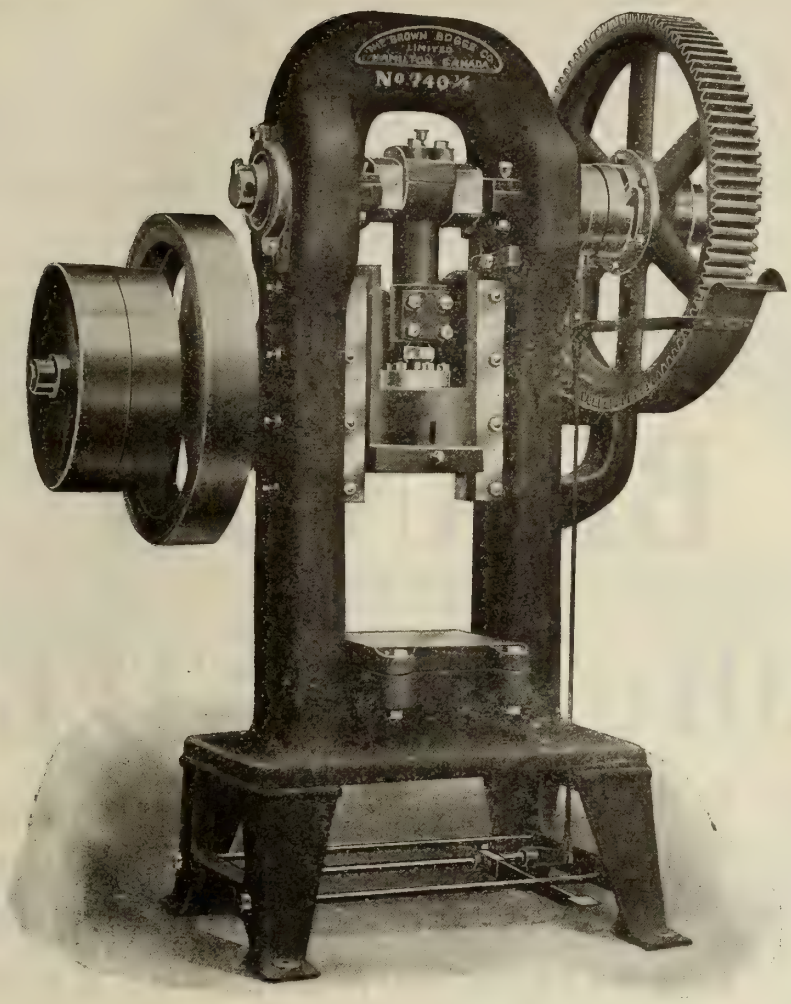

No. 740½ Geared Press

The Manufacturer's Guarantee

Something you do not get with second-hand equipment, yet in many cases it will offset the difference in price between the second-hand and new machine.

Play Safe, get our prices on new equipment before you close for the old.

A large stock of different sizes and styles of presses on hand for immediate shipment.

The Brown, Boggs Co., Limited
Hamilton, Canada

Manufacturers of Sheet Metal Working and Tinsmiths' Tools and Machinery, Presses, Shears, Rolls, etc.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

BRITAIN'S BEST

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BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and Cold Rolled Strips, Cold Drawn Cast Steel, Wire and Drill Rods

HIGH GRADE STEEL FOR ALL PURPOSES

Our Principal Trade Marks

KAYSER ELLISON & Co LTD

ESTABLISHED 1825 SHEFFIELD, ENG.

Complete Stock - Montreal Warehouse

RALPH B. NORTON

Agent

126 Craig St. West Montreal, Que.

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CANADA
FOUNDRIES & FORGINGS
LIMITED

ENDURANCE TOOLS
NEVER WEAR OUT

PIPE THE WRENCH—WRENCH THE PIPE

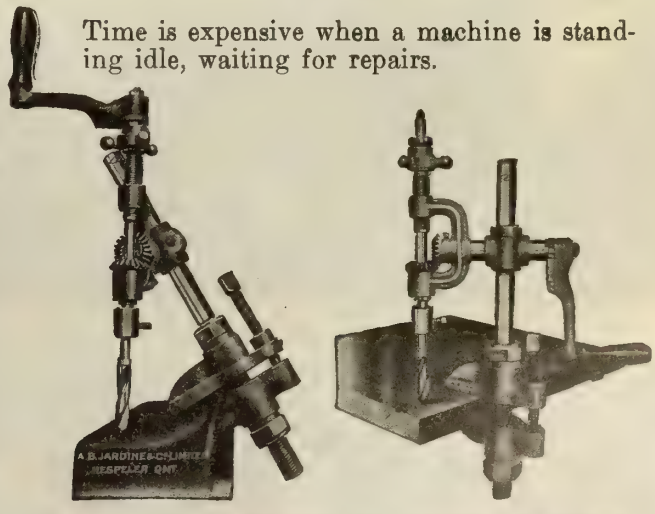
Canadian Billings & Spencer Plant
Welland, Ont.

Crucible
AND
Open Hearth Steel
Tool Steel
"ARGO" BRAND *HIGH-SPEED* STEEL

The John Illingworth Steel Co.
1856
Frankford, Phila.
New York Office 217 Broadway
RALPH B. NORTON, AGENT
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.
Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

"WACO"

HIGH SPEED STEEL

"WACO" TRADE MARK

"DOUBLE WACO" 18% Tungsten, for Railway and Tramway Tires and Hard Metals
"WACO" 14% Tungsten, for Turning, Planing and Slotting Tools, Milling Cutters, Taps, Rimers, Twist Drills

TRADE MARK

CARBON TOOL STEELS
for
Engineers', Railway, Boilermakers', Shipbuilders', Miners and Blacksmiths' purposes in various qualities
Diamond Special Extra Best Quality Best Warranted Warranted Ordinary
Each quality supplied in different tempers to suit tool required

DIE STEELS
for
Screwing Dies, Stamping Dies, Top and Bottom Nail Dies, Cartridge Dies, Mint Dies, Dies for Hot Stamping, Drawing Dies

COMBINED IRON AND STEEL
for
Beds, Dies, Machine Irons, Blades, etc.

MINERS' DRILL STEEL
In three qualities
Extra Special Special Ordinary

HOLLOW DRILL STEEL
Round or Octagon
Stainless Cutlery Steel Single or Double Shear Steel

SPECIAL MAGNET STEEL
Hammer and Wedge Steel, Scythe and Sickle Steel
"WACO" High Speed Twist Drills Carbon Twist Drills

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
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SHEFFIELD - - ENGLAND

PRICES ON APPLICATION FOR IMPORT OR STOCK ORDERS

Coal
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Pig Iron
Victoria FOUNDRY & MALLEABLE
Made by The Canadian Furnace Co.
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Sales Agents:
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FIRTH'S Speedicut HIGH SPEED Steel
Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England
CANADIAN WAREHOUSES 449 St. Paul St. West, MONTREAL
79 West Adelaide St., TORONTO
J. A. SHERWOOD
Canadian Manager

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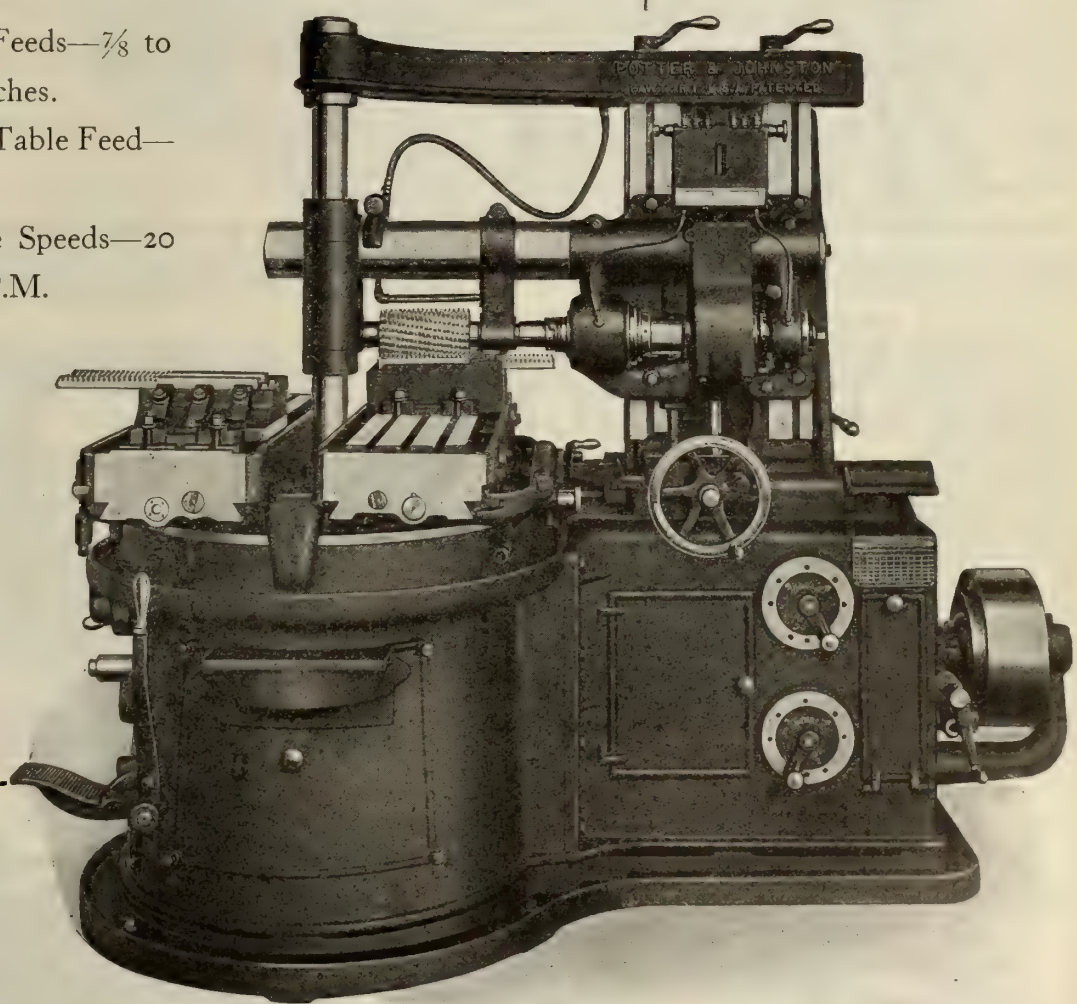
There Are Hundreds

of shops where the Automatic Miller ought to be producing and *will* be producing when the advantages are realized.

Cutter is milling the piece or pieces set up on one table while the operator is loading the fixture on the other table, thereby ELIMINATING MACHINE IDLENESS.

No marks on the milled surfaces as finished work is never returned under the cutters.

16 Table Feeds—7/8 to 12 5/16 inches.
Length of Table Feed—29 inches.
16 Spindle Speeds—20 to 180 R.P.M.



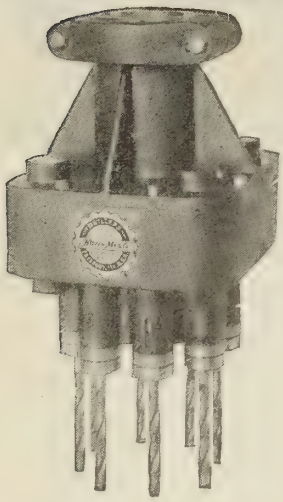
Send prints or samples for production estimate.

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

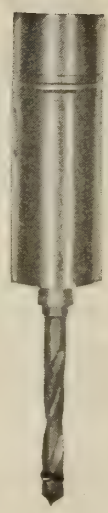
ROELOFSON MACHINE & TOOL CO., LTD.

HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA
WORKS AND WAREHOUSE: GALT, ONTARIO, CANADA

2 Minutes or 20?



This Is The Vital Question



Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.

THE HOEFER Mfg. Co., Freeport, Ill.

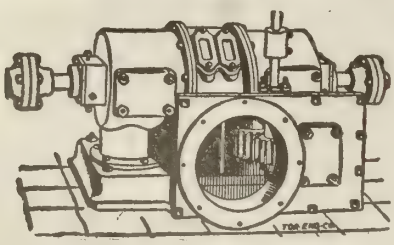
621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Building, Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House For Mechanical Goods"

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

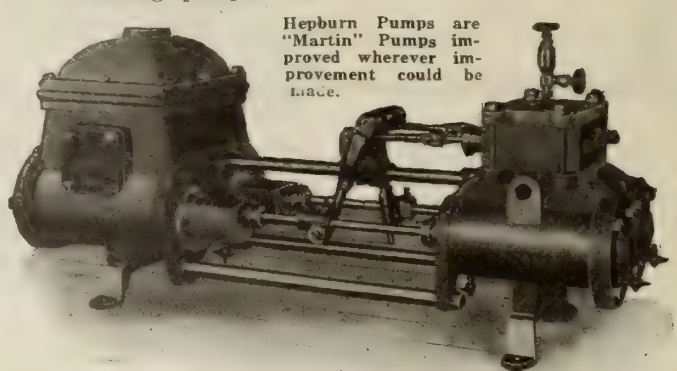
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

THE J. C. WILSON MFG. CO. LIMITED
BELLEVILLE, ONTARIO

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street Toronto, Ontario

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STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

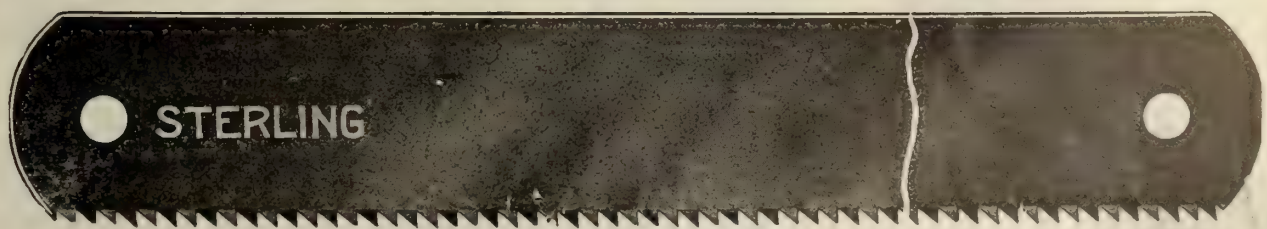
Western Sales Offices:
Room 14 WindsorHotel
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER

HACK "STERLING" SAWS



MANUFACTURED BY
DIAMOND SAW & STAMPING WORKS -:- BUFFALO, N.Y., U.S.A.

To cut down the cost per cut

250% More Work

In power hack sawing, compound acts more as a coolant than as a lubricant. Cutting heats the blade, and the purpose of the compound is to prevent the temper of the blade being drawn.

A few drops of oil or a scanty flow of compound simply tends to hold the chips in the cut and is frequently responsible for broken blades. Whatever you are using for a coolant, compound, or water, see to it that the work is flooded except when cutting iron castings. If you use compound, keep it thin and well agitated. Actual tests have proven that the use of compound will increase the amount of work accomplished by 250 per cent.

Get a copy of the Starrett Hack Saw Chart "3" pick the right blade, put on the weight, see to it your S. P. M. are right—and watch your cutting cost decrease.

THE L. S. STARRETT CO.

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

use compound

Use Starrett Hack Saw Blades

42-984

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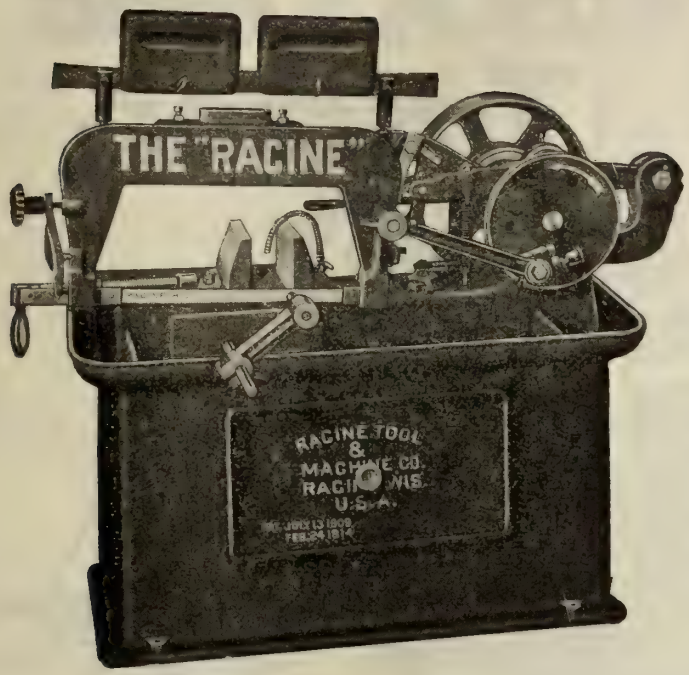
Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

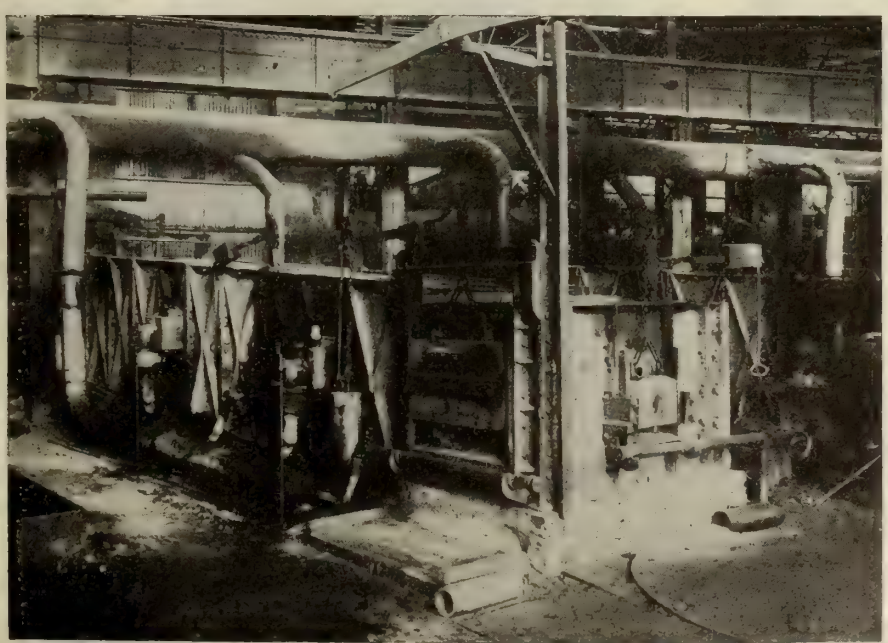
There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue, - RACINE WIS. U.S.A.

Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

Write

Mechanical Engineering
Company, Limited
Room 308, Bank of Toronto Bldg., Montreal
Three Rivers, Quebec, Canada

-And I Always Thought That Was A Good Tractor-

Some little part gave way and his Spring plowing was delayed for a couple of days. His good opinion of your tractor is gone forever; others will hear his tale and your distributor in that territory will fall two or three short of selling as many of your tractors as he would have sold if it hadn't been for that defective part, defective because it was improperly heat-treated.

It makes no difference whether you manufacture tractors or other machines or machine parts, unless you have the **right** heat-treating furnace the reputation of your product is in constant jeopardy.

You Cannot Afford to Take Such Chances

GILBERT & BARKER Heat-Treating Furnaces

insure uniform high quality of produce because they are designed right and built right. The combustion in a G. & B. Furnace is 100% efficient, temperature control is one of the big features, the heat is uniform **always**, the result is a finished product of maximum tensile strength which will stand up under the hardest usage.

The operating cost of G. & B. Furnaces is extremely low.

Send for Bulletin 24. Let our Engineers suggest the furnace that is best suited to your requirements.

To-day is a better day than to-morrow—write.

Gilbert & Barker Mfg. Co.

17 UNION STREET

SPRINGFIELD, MASS., U.S.A.

Established 1865

New York Office: 26 Broadway

Canadian Agents:

Williams & Wilson, Limited, Montreal, Que.

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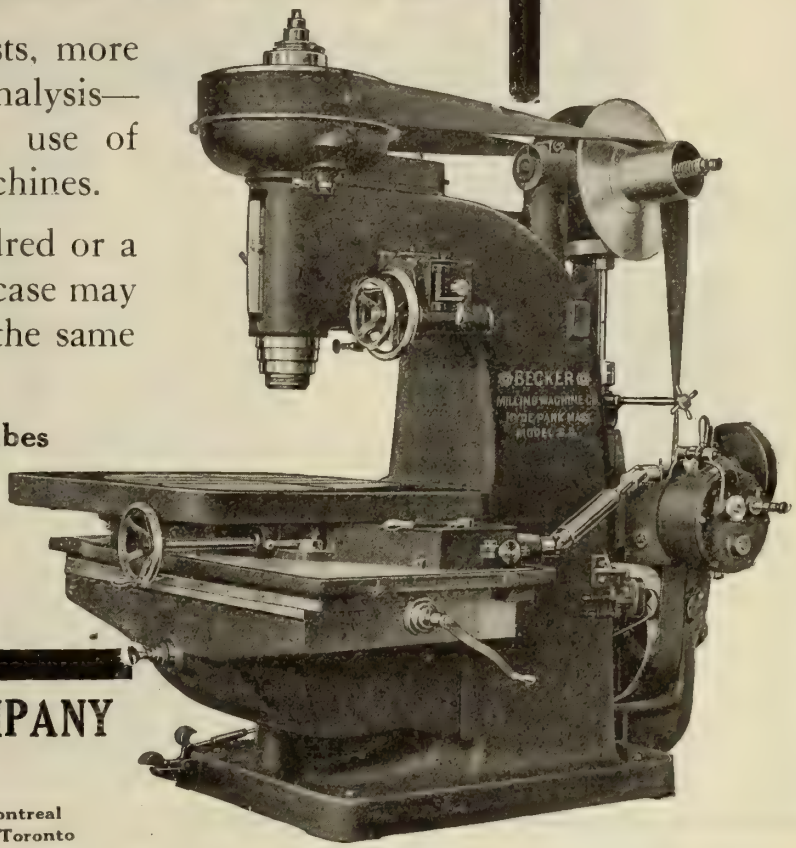
BECKER BELT DRIVEN CONTINUOUS MILLERS

Increased production, lower costs, more perfect parts—and in the last analysis—efficiency; are attained by the use of Becker Continuous Milling Machines.

One set-up does for fifty, a hundred or a thousand duplicate parts, as the case may be; and each will be finished to the same dimensions.

Write for circular 0-601, it describes

THE MACHINE THAT GIVES THE SMOOTH FINISH



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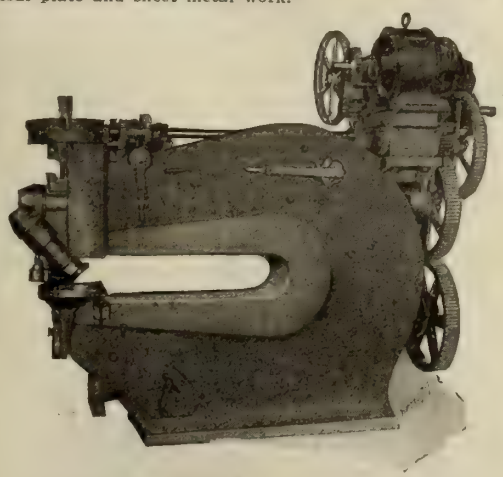
Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



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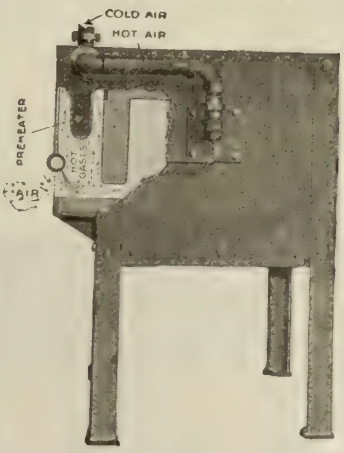

Showing deflection of hot gases, with induced air *toward* the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

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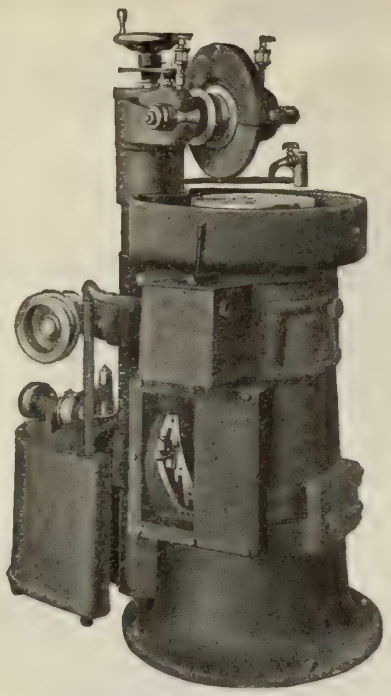

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Bristol 12-inch Rotary Precision Surface Grinder

Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

Bristol Rotary Surface Grinders are made in several types and sizes and are regularly equipped with 8-in., 12-in., and 16-in. magnetic chucks, either belt or motor driven and for dry or wet grinding.

Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

Grinds within .0004 in. of absolute Accuracy

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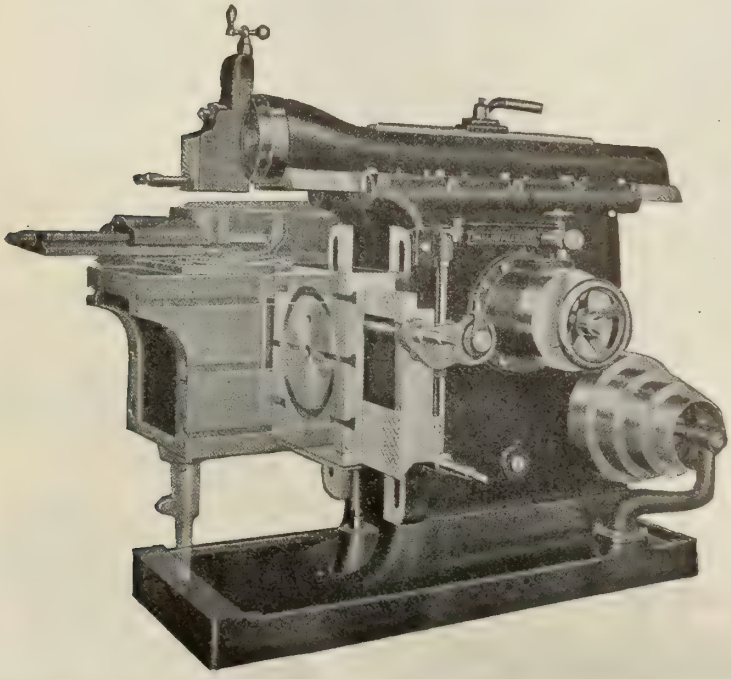

A line that is unexcelled in Rigidity, Accuracy, Power, Simplicity and **Production.**

Built in three sizes: 16 inch, 20 inch and 24 inch.

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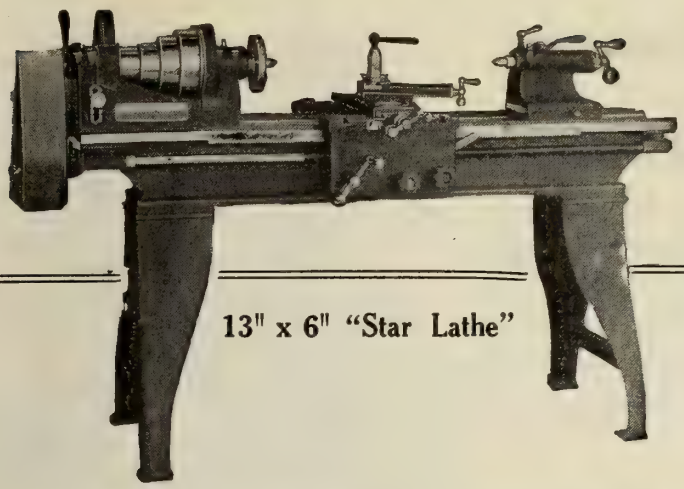

13" x 6" "Star Lathe"

The Tool that makes Garage Work and General Repair Work more Profitable

This is a remarkably sturdy lathe for its size, and its ease of operation, handiness, and accuracy all make it an invaluable tool. It does the work of larger and costly machines at a much lower cost.

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Customers Are Satisfied

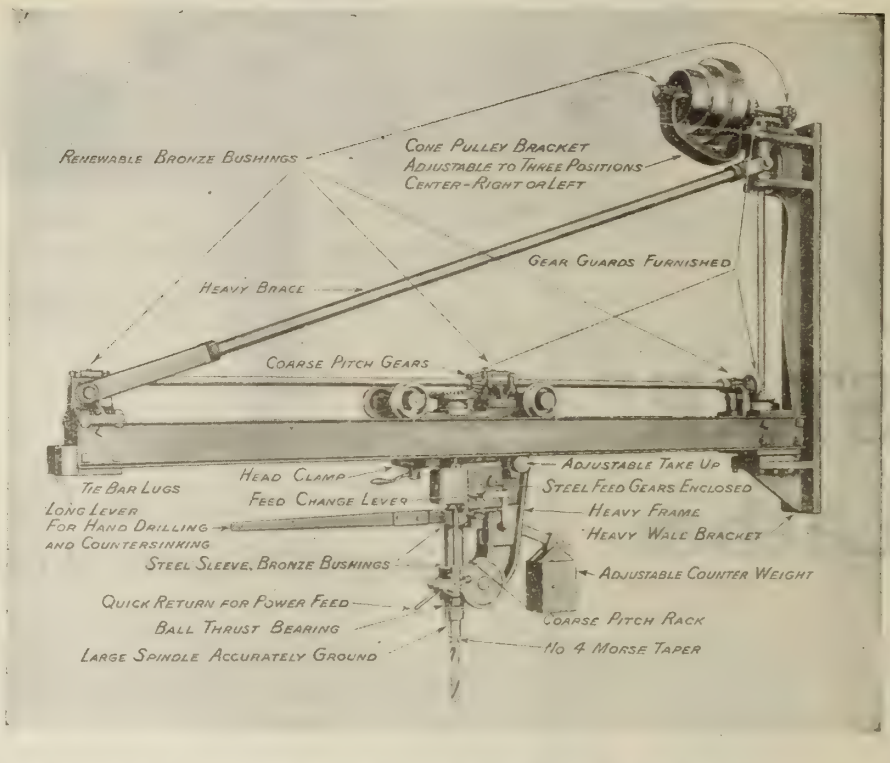
with the performance of this machine in their works. A recent letter to us states: "Regarding the WALL RADIAL DRILL, this is operating every day, and we are more than pleased with the results we are getting from the use of this tool. In all probability we will install additional ones later on." Our deliveries are getting further away each day. Better take advantage of the present conditions.

Want our detailed bulletin? You'll be interested in noting the construction of this machine, as given in same.

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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Complete line. 8-inch to 50-inch swing

Gang Drills.—Horizontal Drills.

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Production of Rare Quality at Lowest Labor Costs

There is unusual strength, accuracy, speed, convenience and range in

AURORA Drilling Machines

You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

Drop a line for full particulars and specifications.

Stationary Head Sizes 20"—21"

Sliding Head Sizes 22"—44"

The Aurora Tool Works

AURORA, INDIANA, U.S.A.

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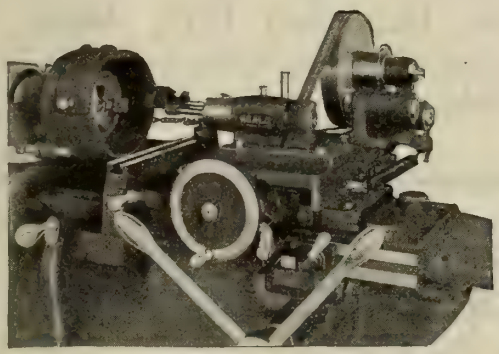
CAPACITY:

Grinds ¼″ to 2″ dia. x 4″ long.
Collet capacity ⅜″ to 3″ dia.
Swing 6″ dia. with water guard.
Swing 10″ dia. without water guard.
Diameter of workhead bearings 1⅝″ to 1⅜″ dia.
Net weight complete, 1,100 lbs.
Floor space 26″ x 50″.

FEATURES:

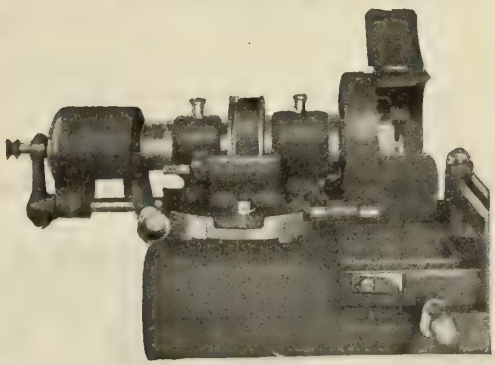
Automatic Brake for work.
Also stops flow of water.
Device for preventing distortion of work when chucking.
New Type 10 wheelhead.
Flexible idler — automatic wheel guard.
Positive stop for table.

FOR GRINDING SMALL SHORT WORK



New design type 10 wheel-head with flexible idler. This combination has proved unusually successful in giving finish and production.

NEW HEALD No. 85 INTERNAL GRINDER



Rigid workhead with massive bearings bolted directly to the base.

Lever which operates quick-acting collet.

A new, simple productive machine for small, short work. While it is simple to an extreme, the following features put it in a class by itself.

It is arranged so that movement of the pilot wheel to the right not only draws the wheel from the work, but automatically applies a brake, stopping the workhead and shutting off water supply.

The quick acting collet operated by a lever and which has a special adjustable compensating device against distortion of any thin work which is being held.

The table is provided with a positive stop accurately covering the travel, enabling the operator to grind up to a shoulder or any given point without danger of over-running. Lever for cross-feed of head is situated so it can be operated with the left hand while the right can still grasp the pilot wheel.

The machine is also equipped with flexible idler — automatic wheel guard — water attachments—and simple, single countershaft.

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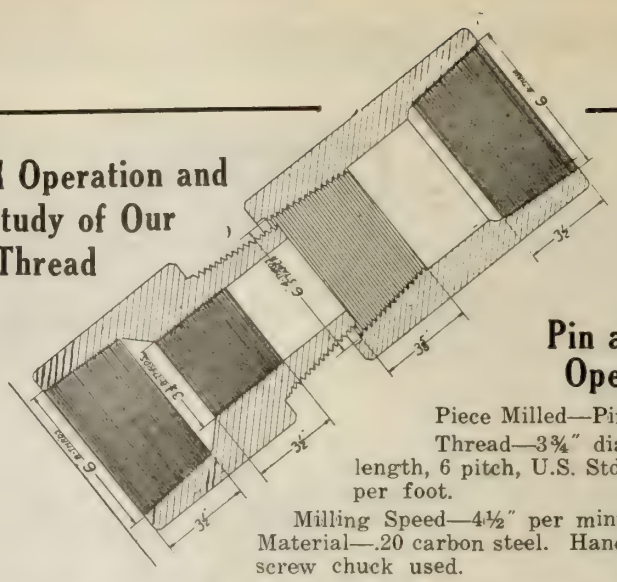
Read the Facts Showing the Great Productive Ability of this Machine

Typical Operation and Time Study of Our No. 1 Thread Miller



Pin and Box Operation

Piece Milled—Pin and box.

Thread—3¾″ diameter, 4″ length, 6 pitch, U.S. Std., 3″ taper per foot.

Milling Speed—4½″ per minute.

Material—.20 carbon steel. Hand-operated screw chuck used.

Time Study—Six minutes floor to floor for complete operation on each piece on a No. 2 machine. The No. 2 machine will mill a 4 pitch thread in the same time.

Note—Former time 1½ hours in a lathe. The surfaces where the pin and box come together may be turned at turning speed if desired so as to give the proper spacing for feeler and also to give a surface true with the thread.

Why not send us blue prints of a piece of work? Our engineers will give you a time study of it. Then you will readily see the advantage of using our Machine.

Smalley-General Co., Inc., Bay City, Mich.

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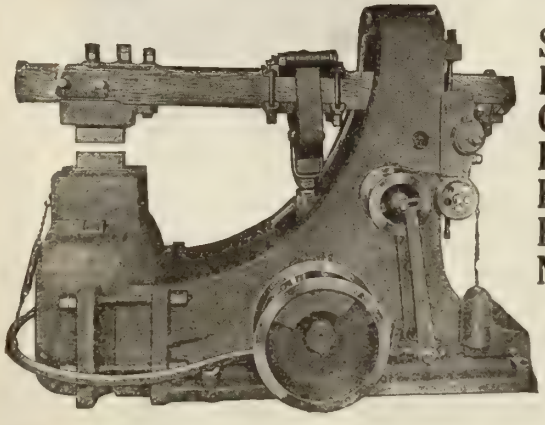
Strike While the Iron's Hot



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Any blow, long or short, fast or slow, heavy or light—any length, weight and force of blow instantly secured on the Rochester "Helve" while the machine is running. This feature alone saves so much time where there is a variety of small work to be forged, swaged or welded, that it recommends the tool without reference to its other distinctive features. Made in 6 sizes, 2 styles of frames; 25-lb. to 100-lb. heads. For Welding and General Forging the "Rochester" is peerless in efficiency. Get our Helve Hammer Book.

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Peerless HIGH SPEED

Machines do 50 to 100% more work

The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

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automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

The Peerless assures you the peak of production at very lowest cost. Write for full details.

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1607 RACINE STREET RACINE, WISCONSIN

Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

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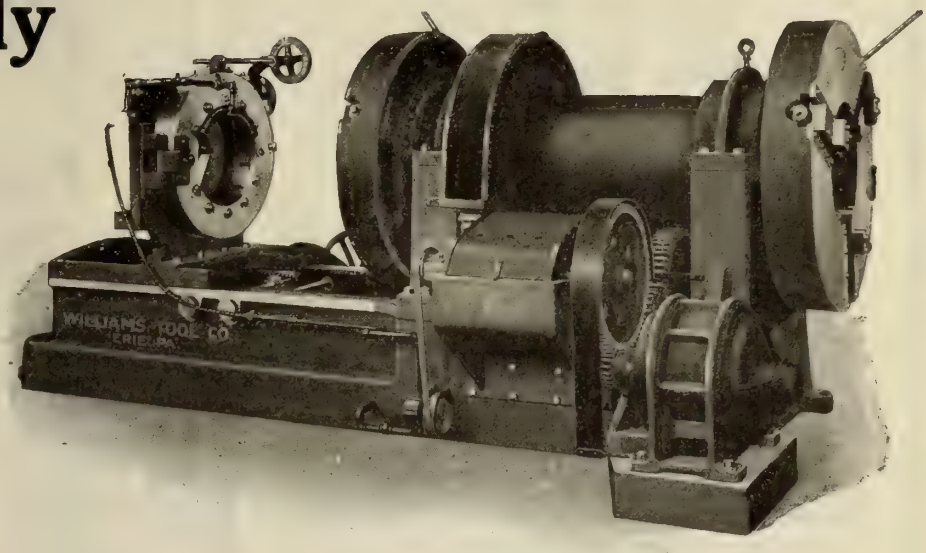
that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



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Williams Tool Company

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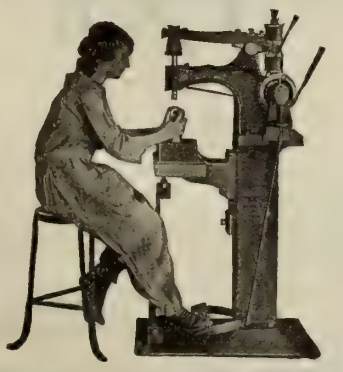
The Hammer With The Human Stroke



HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
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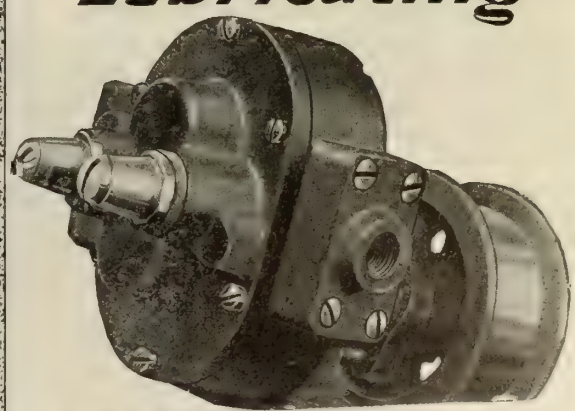
TRAHERN PUMPS

Lubricating



For efficient service and long life. They are built to stand the gaff—hard, continuous use, free from trouble. While running at 500 R.P.M. they will deliver 16½ gals. of coolant per minute or just a drop at will of the operator.

Free even flow—no pulsation. Operate in either direction and against pressure.

Write to-day for Cat. 44 and prices.

TRAHERN PUMP COMPANY
Rockford, Illinois

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Notes On Grinding
NORTON COMPANY WORCESTER, MASS.

No. 68A

A Few Facts for the Forge Shop

Because grinding wheels and machinery are used only occasionally and on a small scale in the average forge shop is no reason why fundamentals for correct usage should be completely ignored.

We advocate that some attention be paid the following details, not for any selfish reasons, but because it means dollars and cents in saving to the user:

1.—MACHINE CONDITIONS

Whether the machines be of the bench or floor type, they should be of heavy construction and anchored rigidly to the bench or floor. This is to prevent vibration—a source of wheel waste.

Keep the bearings properly taken up so that no undue vibration comes from loose boxes.

Remember, vibration means waste of abrasive.

2.—WHEEL SPEED

The correct speed for wheels used in the forge shop is between 5,000 and 6,000 surface feet per minute. If possible, the R.P.M. of the grinding machine spindle should be increased as the wheel wears down, so that this speed is maintained as nearly as possible.

Slow speeds make wheels act softer and hence wear faster.

Slow speeds cause wheels to get out of truth quickly—hence, out of balance. Often the wheel is accused of having hard and soft spots, when in reality it is not kept in truth.

3.—CORRECT GRAIN AND GRADE

Good wheels for the forge shop are 36-O or 30-P ALUNDUM for off-hand grinding of chisels and tools. For grinding forgings 24-Q ALUNDUM will usually give satisfactory results. For the flashes left in drop forging or for sharper contact, use 24-R ALUNDUM.

These are but general recommendations and it is usually better to specify for each particular class of work and set of conditions after they are known.

We make ALUNDUM wheels to suit every job in the forge shop.

No inquiry is too small to receive the most careful attention of trained engineers. This branch of NORTON service is free to the inquirer who has a difficult grinding problem and cannot solve it.

NORTON COMPANY

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec Que.

Grinding Wheel Plants, Worcester, Mass.

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F. & Sc. Co. Quality & Service

Forgings, Stampings or Pressed Steel Parts

An attractive catalogue showing the facilities this company has for producing Forgings, Stampings and Pressed Steel Parts—particularly in large quantities—sent on request.

Dominion Forge & Stamping Co., Ltd.
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TRADE MARK

Our contribution to the demand for increased production is a better file.

A trial of either P. H. or IMPERIAL Files will prove this.

We searched the continent until we found the best file steel procurable—Clay Crucible Cast Steel.

We employ only skilled workers.

Result: **"They cut faster and wear longer."**

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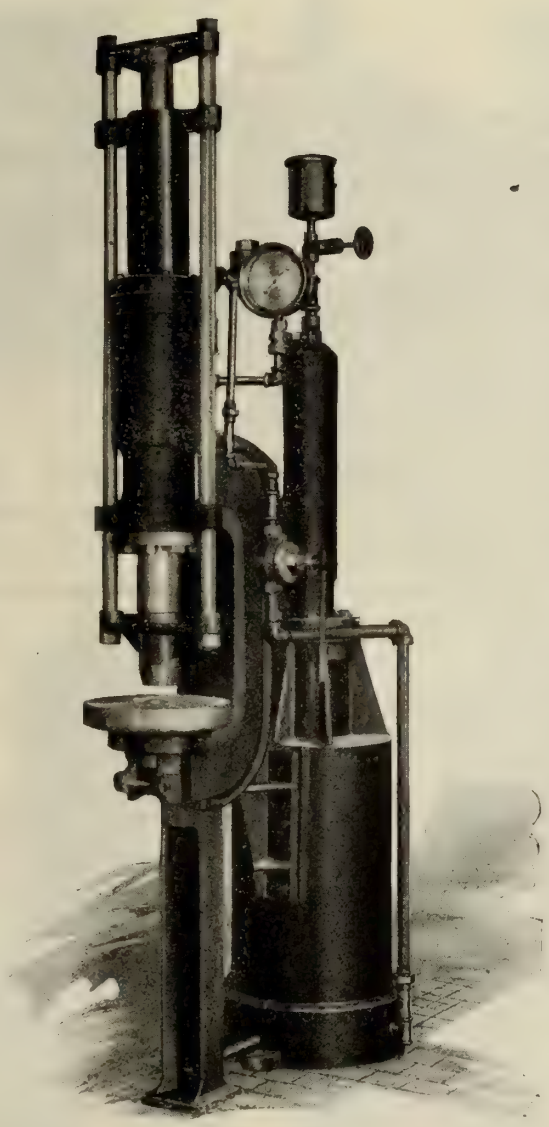
is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

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High Speed Hydraulic and Hydro-Pneumatic Machinery

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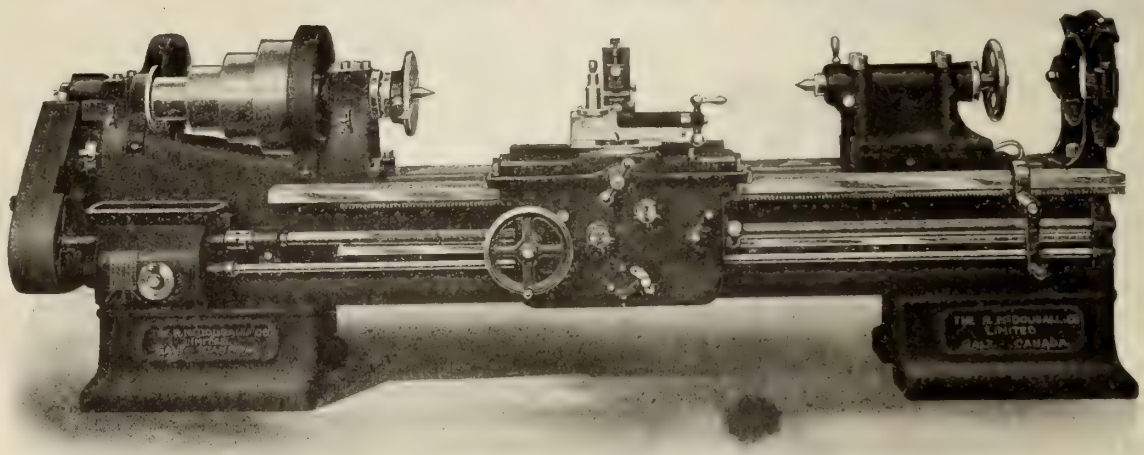
Every part of our Gap Lathes bears the "earmarks" of expert workmanship.

McDOUGALL GAP LATHES

And every feature is proof of our aim to produce a machine of unusual merit.



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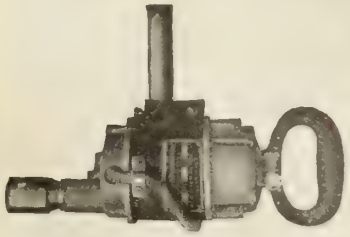

They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES
3-16 in., W.G.T., 6 lbs.
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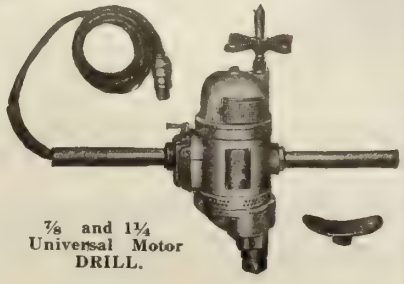
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅞ and 1¼ Universal Motor DRILL.

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Hand Made

Matthews' Letters and Figures are hand made from carefully selected tool steel. The characters are neatly formed, producing stamps that make easily read and durable marks on all classes of products. They reduce considerably the cost of high grade marking.

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Users of the Periodograph tell us it helped them—

Keep their machines busy
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Gives them the "True Costs" of their products.

This spells satisfied management.

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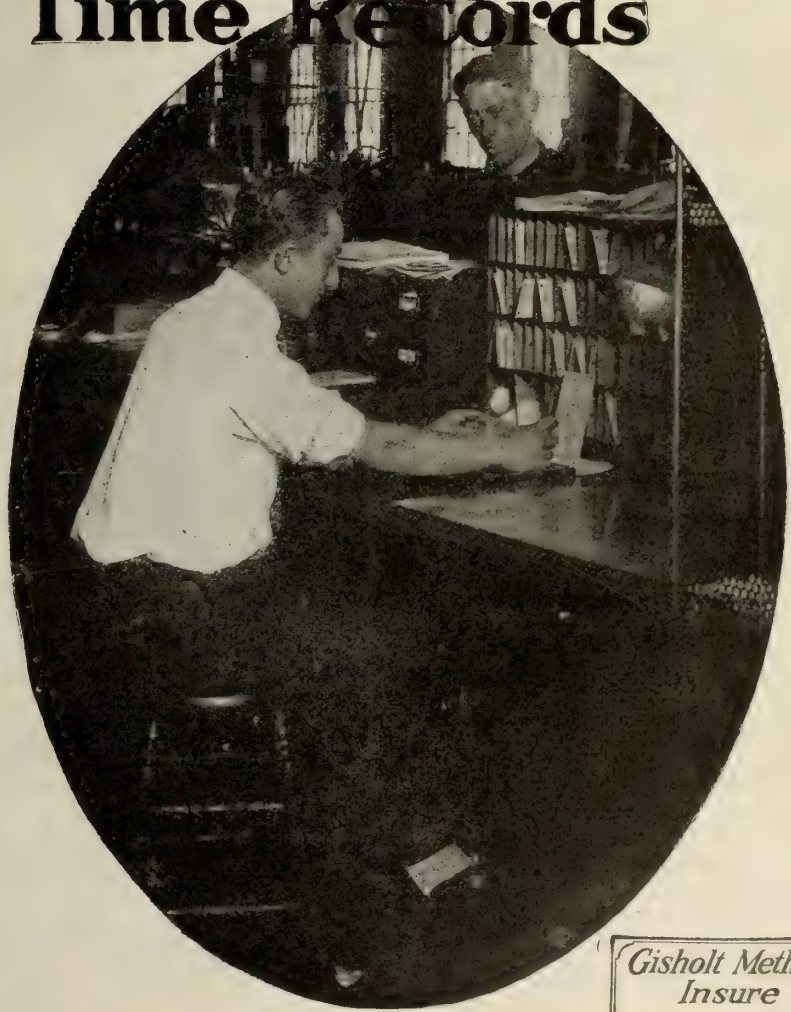

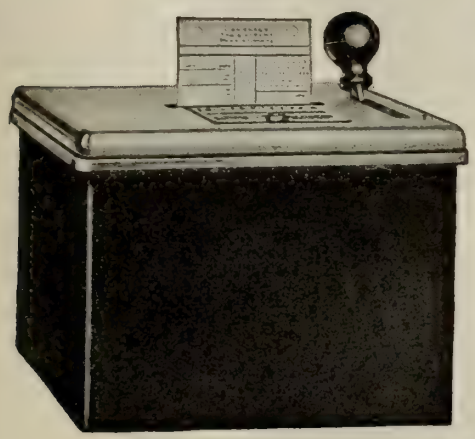

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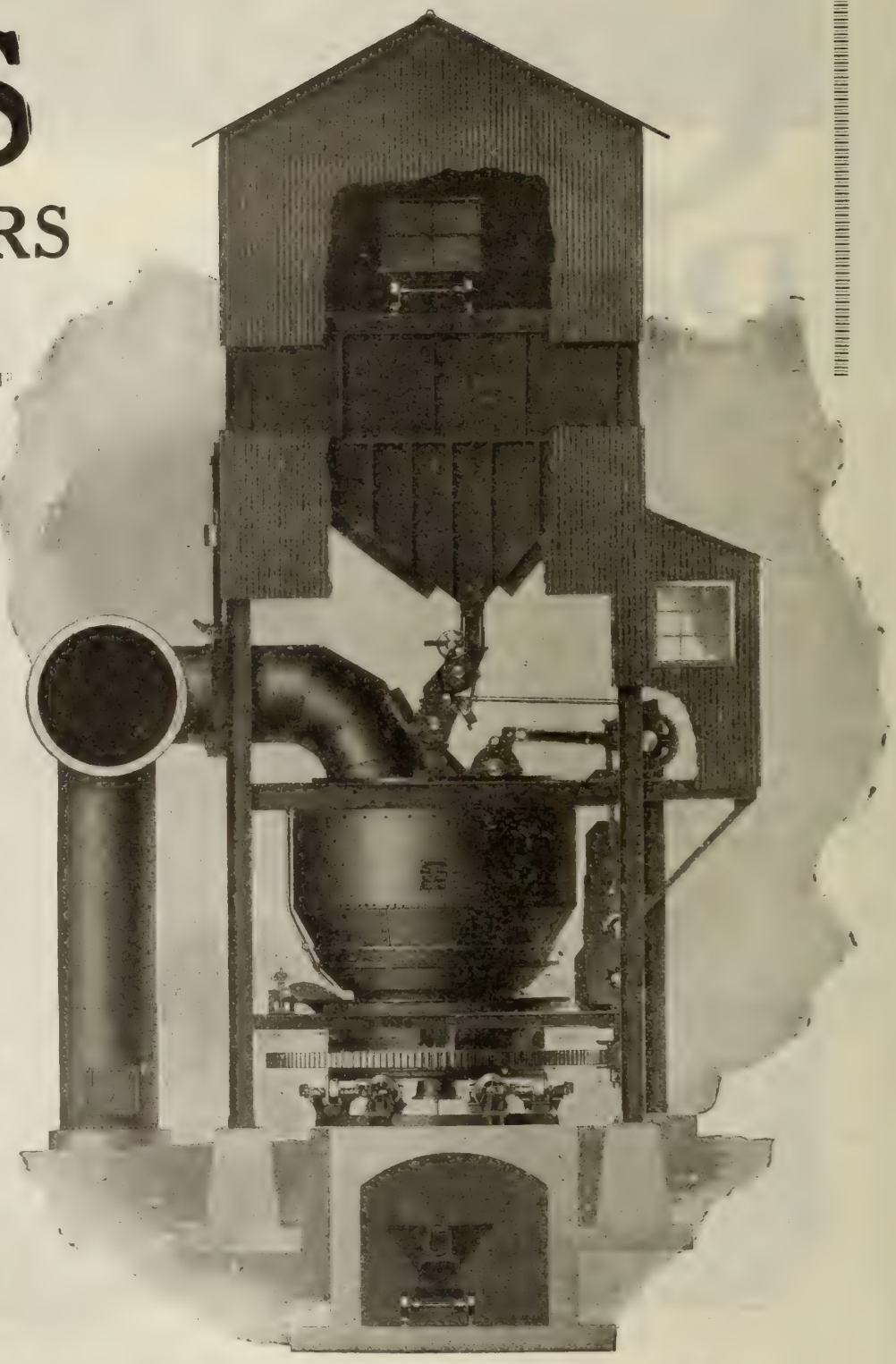

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CANADIAN MACHINERY
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MANUFACTURING NEWS

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A Discussion of the Various Types of Jigs

To Obtain Intensive Production, Together With Interchangeable Parts, Jigs Become a Necessity. There is Generally a Fundamental Principle Involved, Which is Varied to Suit Requirements. These Are Discussed Herein

By ROBERT MAWSON

IN these days of manufacturing, jigs are becoming more necessary every day, so that intensive production and interchangeable parts may be obtained. Almost any plant, no matter how large or small may be its output, can and should use jigs as a manufacturing medium.

The problems confronted by different shops or tool designers may be varied, yet there are certain principles, which may be called fundamental, that are applicable to all cases.

With this in mind, I have endeavored to analyze some leading features of the subject and illustrate them by actual shop practice.

The tools herein described are being used successfully and will help any shop in solving some of the problems which daily occur in their tooling operations. In passing, I might add a definition to two terms often used by the tool designer, namely, jig and fixture.

What is a jig, and what is a fixture?

A jig is a special contrivance to hold a part being machined (usually under a drilling machine, though not necessarily) the tool not being held in the machine tool.

A fixture, on the other hand, is a special device to hold a part being machined and is fastened or fixed to the machine during the machining operation.

There are, however, some cases where a jig is very large, and is also fastened on the machine table. Under such cases I personally would call such a tool a jig fixture. In this article I am taking up a brief study of jigs only.

In jig design, first the tool should be made as simple as possible. Second, it should be made light in weight and yet sufficiently strong. Third, the part being machined should be held rigidly. Fourth, chip clearance should be provided, or, better still, means for them to drop away entirely. Fifth, the tool should be made so that the part being machined may be placed into and removed from the jig easily, quickly and conveniently.

These fundamental principles should be applied to all jigs. Other features will be noted as we discuss the certain types of jigs.

Simple Plate Jig

Fig. 1 shows one of the simplest types of jigs used, known as a plate jig.

This tool is good for drilling parts which have had a hole machined in them, such as a pulley fly wheel, disc, etc.

The part is located on a pin A, which fits into the machined hole and the piece held against the surface of the jig by means of clamps.

Legs or feet B should be provided on the jig so that no surface of the piece being machined touches the drilling machine table during the operation.

The body of the jig may be either made of a cast iron or soft machine steel plate. With such construction hardened steel bushings accurately ground to size are placed in the jig plate to guide the drills or reamers. Sometimes the jig is made with the body of tool steel hardened and the holes lapped to size. The trouble with this construction is that first, there is danger of the plate changing its shape during hardening, so that the various holes are not in their desired positions. Second, should the holes wear by repeated use, the repairing of same is difficult, necessitating annealing of the jig plate and the insertion of bushings for the worn holes.

The decision whether to make the tool as shown, or as noted by the second method, depends largely on the contemplated number of parts which will be machined in the jig.

It is sometimes desired to machine a hole or holes in a plane at right angles to the bored hole. The illustration (Fig. 2) shows a jig designed for such an operation.

This tool may be called a simple angular jig.

The Casting

In this case a sprocket wheel is again located by a pin A. The pin is made with a turned shoulder, and after the part to be machined has been placed on to the pin, the horse shoe or open washer B is placed on the pin as shown.

The pin is then drawn back by means of a thumb nut at the rear of the jig, the washer is forced against the piece, thus holding it in position.

The hole to be drilled must be on a certain relation with the teeth, and to obtain this result one of the teeth is brought against the stop plate C.

The drill is guided through a bushing in the usual manner.

Simple Ring Jig

When a casting or piece requires a number of holes to be machined in a radial direction it may be performed by means of an indexing jig or a simple ring jig—the latter type of tool is shown in Fig. 3.

The casting is placed in the jig and slid around until a lug on the piece comes against a stop pin.

The two clamps A are then tightened against the casting to hold it securely in the jig.

The tool is afterwards placed on a right angle knee provided with a pin which fits into the hole B. The operator can then revolve the jig around on the pin so that the various bushings come in line with the drill or reamer, so that the holes will be machined in a vertical direction.

The question of when to use an index type of jig or when to design the simple ring type as illustrated is again a matter of quantity of parts to be machined.

The index jig is much more expensive to design and make, but usually produces parts quicker and more accurately. On the other hand, the simpler type shown will give satisfactory results after the operator has become accustomed to it.

It will usually be found an advantage to design jigs of as open a construction as possible. The advantages are low cost, ease to place the part into the tool,

chips readily fall away from the machined holes.

A simple type of open double right angle jig is shown for the next example at Fig. 4. The casting is located by a large circular plug A, which fits into a previously bored hole.

The piece is then swung around on the plug until it registers against the stop pin B. The open clamp C is next slid under the bolt as shown and the hook bolts D turned with their heads resting on the flange of the casting.

A feature of the clamp may be mentioned, namely, the providing of two hardened pins E, which come in contact with the casting. This construction ensures the strap setting properly on to the piece should it be (which is almost always the case) uneven on its surface.

The jig is then turned over to the position shown in Fig. 5 and the thumb nuts A and B tightened. This action draws down the hook bolts and strap against the casting, thus holding it firmly in the jig. The holes may then be machined in the usual manner.

The practice of using thumb nuts is a great advantage as the part may be placed into or removed from the jig much quicker than if the operator had to resort to the use of a wrench to tighten ordinary nuts on the bolts.

Left and Right Hand Jig

The designer sometimes has the problem of designing tools for both right and left hand elements. If the production be abnormally high the best practice would be to make a separate tool for each hand. With limited output one tool should be made to take care of both parts.

The illustration (Fig. 6) shows a tool designed to take care of both left and right hand pieces. The casting is placed on a pin A, which fits into a previously machined hole. The piece is then swung back against the stop pin B. The clamp C is next tightened against the casting by means of the thumbscrew D, thus holding it securely in position. The boss E rests on a height block so that the piece will set level in the jig during the drilling operations.

When machining the opposite hand, the clamp C is removed by taking out the thumbscrew and located in the slot F, the screw fitting in the tapped hole, which may be seen in the slot.

The casting is then located by means of the pin G and held in a manner similar to that described. The jig is reversed for the drilling operation, rest-

FIG. 1—SIMPLE PLATE JIG.
FIG. 2—SIMPLE ANGULAR JIG.
FIG. 3—OPEN ANGULAR PLATE JIG, TOP SIDE.
FIG. 4—OPEN ANGULAR PLATE JIG, BOTTOM.
FIG. 5—SIMPLE RING JIG.
FIG. 6—LEFT AND RIGHT HAND JIG.

ing with the four legs or feet on the machine table. Care should be taken in the design of tools of this type to make the legs sufficiently long so that no part of the piece being machined or clamping devices resting on the table as with such interference accurate holes cannot be obtained.

Two-Angle Jig

It is sometimes necessary to drill holes in a piece at different angles. The tool must then be designed so that the bases on which the jig rests on the machine table bring the guide bushings in perfect alignment with the drill or reamer.

The illustration (Fig. 7) shows a jig designed for machining holes, two of these being at different angles with each other.

The casting A is dropped into the jig and pushed against the locating pins shown at the rear by means of the knurled head screw B.

The block C is then pushed under the piece which forces it against the locating pins, the block also acting as a support for the casting. The knurled head screw is then tightened, this action holding the piece securely in the jig.

A hole is then drilled at D, the jig resting on the base E and another hole at E after the jig has been rocked over with the face G resting on the machine table. The two bases being at similar angles to the guide bushings the holes are drilled at the correct angles.

Sometimes holes are to be machined very close together so that there is not room enough for the walls of the bushings. To overcome this difficulty, tool steel plates may be used, made as shown at H, with the guide holes for the drill machined in them. The drill is then accurately guided for the machining operation. It is obvious that when drilling these last four holes the jig will set with its rear wall on the machine table.

The view (Fig. 8) shows another angular jig but of a box type. The casting is slid in from the end and located by resting on two machined ledges, one on each vertical wall. The pin-headed screws A are then tightened on to the casting, which forces it down on to the locating surfaces and also against the pin B. The setscrew C is then tightened to force the casting against the rear wall of the jig.

In passing, it might be said that it would have improved the efficiency of this jig if the screw C had been made of the pin-headed type or other style which does not require the use of a wrench. The poles are then drilled, one in the position shown and others with the jig resting on the rear wall.

It will be noticed that the bushing D is made very long, reaching almost to the casting at the rear. This is done so that the desired alignment may be obtained which would be almost impossible if a short bushing was used and a long distance away from the part being drilled.

A construction detail here used might be mentioned, namely, that the forward wall of the jig is made of a separate element. This was done so that the somewhat difficult operation of machining the locating ledge on the rear wall could be performed more easily.

Open Angular Jig

The illustration (Fig. 9) shows an open angular jig with an interesting method of locating the piece. The block A is first drawn back by means of screw-

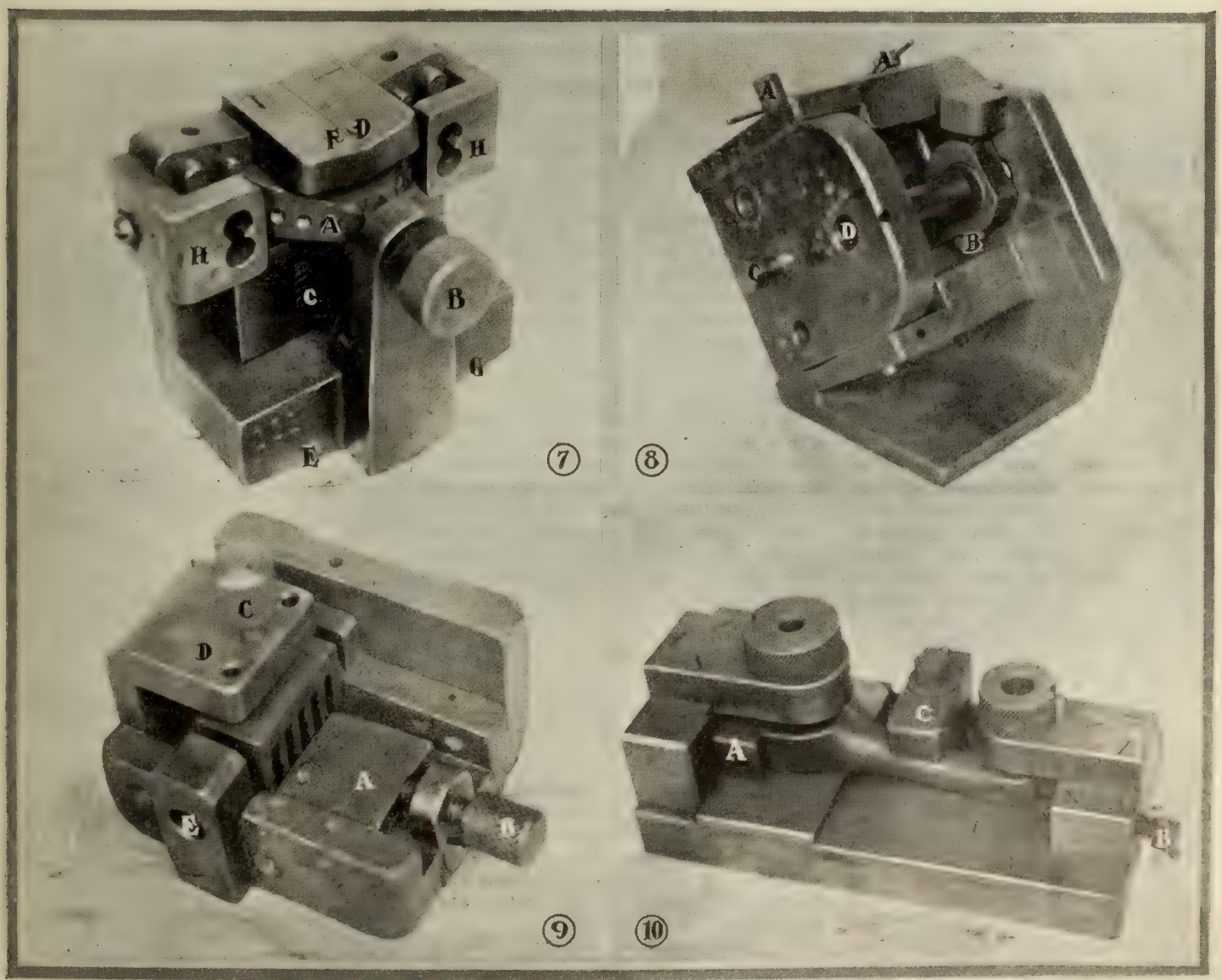


FIG. 7—TWO ANGLE JIG.
FIG. 9—OPEN RIGHT ANGLE JIG.

FIG. 8—BOX MULTIPLE TYPE OF JIG.
FG. 10—VEE LOCATION TYPE OF JIG.

ing the element B in a counter clockwise direction (which draws it back).

The piece is then placed in from the top of the jig and forced against a locating pin by screwing forward the block A. The knurled headscrew C is then tightened on to the piece to hold it down in the jig. The method of locating by means of the block is interesting, as it not only squares up the piece but holds it securely during the machining operation.

The knurled headscrews also tend to a quick operating tool. The two holes are drilled in the position shown, and a much larger hole with the jig resting on the rear face, the guide being through the hardened steel block E.

The jig shown in Fig. 10 is interesting in so far as it is of a built-up type. It is made of several steel blocks which are fastened together by means of screws and dowels. This method has some advantages as may be seen by studying the design. At the left side a steel block is fastened to the base of the jig, the block being of sufficient height to allow the casting being drilled to pass under the block.

In front of this block is another made in a V shape, and under this is a thin strip of hardened steel of sufficient thickness to permit the casting resting in a horizontal position in the jig. The first block also holds a guide bushing support, and this element is not only screwed and dowelled in place but also sets into a recess to insure its correct alignment.

At the right end of the jig is another height block, and fastened to it may be seen another bushing guide plate. The casting is slid in from the front and located by means of the V-block A.

The pin-headed setscrew B, which is placed at a slight angle, is then screwed in and forces the piece into the V-block and also against a stop pin at the rear right-hand end. The strap C is then tightened on to the casting by means of the setscrew shown. Changing of this hex-headed setscrew to a thumbscrew would seem to be an advantage, providing a quicker operating jig. Holes are then drilled in the casting, the tools being guided through the bushings shown. The advantage of a V-block for locating parts of this nature, having a circular contour as levers and the like, is that the machined hole will be central with the boss after the receiving angle has been correctly made and providing the castings or forgings do not change in size.

Another advantage is that the workman cannot change the setting which is sometimes done when adjustable locating points are provided.

A further discussion on this subject will follow at a later date.

An Explanation of the Construction of Formulae

A Formula is Not a Mysterious Creation of Higher Mathematics, But Merely a Convenient and Simply Remembered Way of Stating the Rules of Procedure for Every-Day Problems

By T. H. FENNER, Associate Editor

ONE would think that a formula was self-explanatory, but it is surprising how many men use these things daily, without having any clear conception of the principles involved. Machinists, power plant men, and sometimes even draughtsmen, are content to take a set of letters and apply figures to them in the solving of everyday problems, not having any idea of how these combinations of letters have been derived, or what they stand for.

To begin with, a formula is simply a convenient means of stating a rule, which would be long and clumsy to write or remember in its original form. The derivation of this rule may be lost in the realms of higher mathematics, where none but the highest of highbrows may soar. That, however, does not prevent the average man from having an intelligent idea of the various factors contained in the formula, and their relation to one another. If the aforesaid average man had this knowledge he would not look so puzzled when a formula is presented to him in a slightly different guise to that with which he is familiar.

We have said that a formula is an abbreviated form of a rule, or statement. It is that, but it is also something more. It is a statement that the multiplication or division, subtraction, addition, or, perhaps, all four operations, on one set of factors, produces a result which is the expression of another factor. For instance a man wishes to know the size of spanner necessary to slack off a 3-4 hexagon nut. There is a rule for getting the size of the spanner across the jaws. The width of the spanner across the jaw must be equal to the diameter of the nut over the flats. Now this width is 1¼ inches, which is arrived at by taking the diameter of the bolt = ¾, adding to it half the diameter, and adding ⅛ inch. This rule applies to all nuts, so should be remembered. So to make it convenient we put it in the form of a formula thus: $D + \frac{1}{2} D + \frac{1}{8} = W$, or else

$\frac{3D}{2} + \frac{1}{8} = W$, which is more convenient. Better still is $1\frac{1}{2} D + \frac{1}{8} = W$. All these three expressions give the same result, and mean that when the indicated operations are performed on one side; the resulting figure is the size or quantity required. Thus the diameter of the bolt being ¾, D = ¾, so $(\frac{3}{4} \times \frac{3}{2}) + \frac{1}{8} = 1\frac{1}{4}$.

The Use of Signs

Perhaps to begin with, it is well to get a clear understanding of the various signs employed, to denote the different operations. Many men look askance at formulae, on account of signs being present in them that they have never before encountered. There is nothing to be afraid of for anyone who has mastered the rudiments of arithmetic in any of these characters. However, it is important that the operations be performed in exact accordance with the instructions conveyed by these signs, or results will be materially affected.

The commonest signs, of course, are the plus +, and minus —. Plus before a number means that that number is a positive quantity. A minus sign means that the number following is a negative quantity. Where several numbers are involved with these signs between them it means that the sum of all the negative quantities must be deducted from the sum of all the positive quantities. The result may be either positive or negative, and here is where the man with no knowledge of algebra may be puzzled. However, if he just casts his mind to a very familiar phenomenon of our winter climate he will understand it easily. If he looks at the thermometer on his way to work he may find it reads 15 below zero, or as it is usually printed, —15. By eight o'clock it has gone up to —10, and by 9 it has reached zero. At 10 it reads 5 above, or +5, and stays there till 1 o'clock p.m. Then it comes down 5 degrees every hour, till at 5 o'clock p.m. it reads 20 below, or —20. Now, the average temperature for the 11 hours would be found by adding the reading at every hour and dividing by 11.

Now the sum will be $-15 + (-10) + 0 + 5 + 5 + 5 + 5 + 0 + (-5) + (-10) + (-15)$.

This will give $-55 + 20 = -35$

$\frac{-35}{11} = -3.18$, or an average temperature of slightly over 3 degrees below zero.

Now, if we imagine any other body or figure or scale beside the thermometer as having a positive value, a zero

point, and a negative value, there will be no difficulty with the plus or minus.

The multiplication sign is occasionally a stumbling block to the novice, as, instead of using invariably the $\times$, the sign is omitted altogether, or a small dot, something like a decimal point, is used. Where the signs are omitted altogether is when a literary formula is used, but the dots are used between numbers. A figure before a bracket as 3(6x9), means that the product of 6x9 must be taken 3 times. Letters denoting values when placed together, as PLAN in the well-known formula for horse power, are read as $P \times L \times A \times N$, and an expression like 323.4.64 would read $323 \times 4 \times 64$. However, this latter method is not used very generally, either the $\times$ sign being used, or the sign omitted altogether.

The division sign is written in a variety of ways. The best known, of course, is the $\div$ sign, which is the one we first become acquainted with. Then there is the line used as in fractional quantities, as $\frac{2}{4}$ which means that two is to be divided by four, or $\frac{8 \times 11}{6}$ which means that the product of 11×8 is to be divided by six. Again a line is sometimes used as 12/2, which means 12 is to be divided by 2.

These four are what might be called the cardinal signs. There are several others which must be made familiar to the eye, and their meaning to the memory, so that when they are encountered in formulae, there will be no difficulty in arriving at the correct solution.

Of these, the various forms of brackets are among the most important, and are often stumbling blocks to the tyro. Their meaning and the way in which they are used must be thoroughly understood, or correct solutions will be a matter of chance instead of certainty. Bracket signs are classified as follows: The parenthesis (), the bracket [], the brace $\left\{ \right.$ $\left. \right\}$, and the vinculum ——. The generic term covering them all is " signs of aggregation ", and the meaning conveyed by any of them is that the numbers enclosed between them are to be simplified before any other operation is performed.

Take an expression such as $A = \frac{1}{2}(h+b)$, substitute figures for the letters, say, $A = \frac{1}{2}(3+5)$. This means that the sum of 3 and 5 multiplied by ½ will give the value symbolized by A. Take another: $4 + 6(8 \times 4 + 5) - 2 = A$. Now, here is where a very important rule is illustrated, in connection with the multiplication sign. Two numbers connected together by a multiplication sign must be simplified before those connected by any other signs. In this case the solution step by step is, taking inside the brackets first, the product of 8 and 4, added to five, multiplied by 6, plus 4, —2.

The work is:

$4 + 6(8 \times 4 + 5) - 2 =$
$4 + 6(32 + 5) - 2 =$
$4 + 6 \times 37 - 2 =$
$4 + 222 - 2 =$
$226 - 2 = 224.$

Now, if the rule as to multiplying is not observed, the result will be entirely different. Suppose we were in simplifying the term in the brackets to add 4 and 5 before multiplying by 8, see what we should get.

The work would then be:

$4 + 6(8 \times 4 + 5) - 2 =$
$4 + 6(8 \times 9) - 2$
$4 + 6 \times 72 - 2$
$4 + 432 - 2$
$436 - 2 = 434.$

Now, when simplifying a formula in which several terms are bracketed, always simplify the terms in the inner brackets first.

Take the formula for finding the area of a segment of a circle, or rather one of the formulae, of which there are several.

$A = \frac{1}{2}[lr - c(r-h)]$

Substituting figures $A = \frac{1}{2}[8 \times 4 - 3(4-2)]$

Simplifying $A = \frac{1}{2}[8 + 4 - 3 \times 2]$
$= \frac{1}{2}[32 - 6]$
$= \frac{26}{2} = 13$

Take another a little more complicated, as follows:

$$x = 4\left\{3 + [6 \times 9 - (2 + 4 + 3 \div 3)]\right\}$$
$$x = 4\left\{+[6 \times 9 - 3]\right\}$$
$$= 4\left\{3 + [54 - 3]\right\}$$
$$= 4\left\{3 + 51\right\}$$
$$= 4 \times 54$$
$$= 216$$

The rule to observe always is to simplify the expression in the innermost bracket first of all and when simplifying any expression to perform the indicated multiplication first, and the addition and subtraction afterwards. We have not dealt with the last sign of aggregation, the vinculum, because it is not used as a rule except in connection with the root or radical signs. We will consider these, and the index signs, and then give some examples of the use of the vinculum.

The radical and index signs are used when a number is to be reduced to a primary number, or root, from a higher power, or to be raised from a root to the higher power. The radical sign $\surd$ before a number indicates that the square root of that number is to be extracted. The sign with a small figure on the side indicates that the root corresponding to the number is to be taken. Thus $\sqrt[3]{}$ indicates cube root, $\sqrt[4]{}$ indicates fourth root, $\sqrt[5]{}$ indicates fifth root and so on.

Conversely, the small or index figure placed above a number indicates that the number must be raised to the power indicated. Thus 2^2 indicates two taken two times, 2^3 indicates two taken three times, 2^4 means two taken four times, etc. Now sometimes an index may be seen like the following: $5^2/_3$. That means that the cube root of five squared is required, and could be written $\sqrt[3]{5^2}$.

There is no need to perform the actual arithmetical operations, for there are tables published which save all that labor. All one would need to do would be to turn up the table, see the square of 5=25, and the cube root of 25=2.924, etc. Now the vinculum is used when the root of several numbers is required. For instance $\sqrt[3]{(8x9) - 7x6}$ means that the cube root of the product of 8x9 minus the product of 7x6 is to be taken. Take the formula for the approximate operimeter of an ellipse, which is

$$P = \pi\frac{\sqrt{D^2 + d^2}}{2} - \frac{(D-d)^2}{8.8}$$

That is a good example of the use of the vinculum, the bracket, and the index figure, coupled with the use of a sign which is met with almost constantly. That is the Greek letter π, pronounced pi, and used to denote the figure with which the diameter of a circle must be multiplied in order to find the circumference. This is a constant quantity 3.14159, commonly written as 3.1416, or if expressed in fractions as $\frac{22}{7}$, which is not so accurate, and therefore less used. In a circle of diameter d, the circumference is πd, or $2\pi r$, where r is the radius.

There are several other Greek letters in common use by mathematicians, which cause the ordinary man to throw up his hands and retire when met with. However, there is no end of this. They are merely used as symbols and are no more mysterious than the ordinary Arabic figures.

For instance, there is the Greek letter Φ, pronounced theta. This is nearly always used to denote an angle. For instance, if we are engaged in solving some problem which involves an angle of 35 degrees, instead of writing this in full every time we came across it, the letter Φ would be employed. If we have more than one angle another Greek letter is employed for the second angle, the letter Θ, pronounced phi. Many other Greek letters are used, but probably these are sufficient for the time being. All the writer wants to show is that there is no need to look upon a formula as being unworkable because some of the signs are not familiar.

As to the derivation of formulae, the full understanding of these often entails a knowledge of first principles beyond the ken of the non-mathematical. However, many of the every-day formulae in use by machinists, power house men, etc., are easily traced back to their beginning, and it is useful practice to get in the way of doing this. It helps a man to known why a thing is, in addition to knowing that it is. The mental stimulus obtained by reasoning things out is also a benefit. For instance, many machinists

know that the speed of the last shaft on a train of gears is equal to the speed of the first shaft multiplied by the diameter of all the drivers and divided by all the followers. Why should it be? Suppose we have a line shaft running 240 revs. We have a 12-inch pulley driving a 24 on the second shaft, and a 10-inch from that driving a 25 on the third shaft, and a 6-inch driving a 12-inch on a fourth shaft. Let a, b, c represent drivers and d, e, f the followers. Then $\frac{a, b, c}{d, e, f} \times 240$ will be speed of the last shaft. That is $\frac{12x10x\ 6}{24x25x12} \times 240 = 24$.

That formula is simply a statement of the ratio of the first speed to the last as can be seen by taking each shaft separately. The first shaft goes 240 revs. The ratio of the gear on the first shaft to that on the second 12:24 or 1:2. The second shaft, therefore, goes $\frac{240}{2} = 120$. The second ratio is 10:25 or 1:2½. Therefore the third shaft goes $\frac{120}{2\frac{1}{2}} = \frac{240}{5}$ $= 48$. The last ratio is 6:12 or 1:2. That gives $\frac{48}{2} = 24$ as the final speed. Now the ratio is 24:240 or 1 to 10 for the whole range. The first ratio was 1:2, the second 1:2½ and the third 1:2. Multiply these together, 2x2½x2, gives 10. Is it plain now why all the followers divided into all the drivers give the required speed? The same rule applies to the change gears on the head of a lathe. The diameter of the gear on the driving spindle bears a certain relation to the driven gear on the stud. The driver on the stud bears a definite relation to the driven on the lead screw. How is this expressed? Let the spindle driver be called "A," the driven gear on stud "C," the driver on stud "F," the driven on lead screw "D". The lead screw has "G" threads to the inch. The number of threads to be cut are "N."

Clearly, the threads cut per inch will depend on the ratio of "A" to "C" and "F" to "D." The other factor will be the pitch of the lead screw. Now if we have a gear on the spindle with 21 teeth, and the driver "F" on the stud has 60 teeth, while the driven gear "C" on the stud has 42 teeth, the driven gear "D" on the lead screw 72 teeth, we can find the ratio of the lead screw speed to spindle speed. Thus $\frac{42x72}{21x60} = \frac{12}{5}$. That is a ratio of 2 2/5 to 1, so that for every five revolutions of the lead screw we get 12 revolutions of the job. Now if the lead screw has five threads to the inch the cutting tool will travel one inch along the job while the leading screw turns five times. But while this has taken place the job has turned 12 times, thus cutting 12 threads to the inch. All this is expressed by the formula $n = \frac{c \times h \times g}{a \times f}$.

The next time you have to cut a thread see if you can realize the relation of the spindle speed to the threads cut on the job.

Take the good old formula for horsepower, so familiar to most power house men. Horse-power is a rate of doing work. Work is force, multiplied by displacement. The steam pressure is the force and the piston speed is the displacement. Work is measured in foot pounds, horse-power in foot pounds per minute. Hence the piston speed per minute multiplied by average mean pressure is work in foot pounds and divided by 33,000 is horse-power. Thus we get the familiar $\frac{PLAN}{33,000} = H.P.$ Now if we saw it written C P = I.H.P. it might cause wonder, but just think. In an automatic cut-off stationary engine, the only variable is the pressure. If we take the stroke cylinder area and number of strokes and multiply them together, and divide by 33,000, we get a decimal quotient, which has only to be multiplied by the pressure to give the required horsepower. Surely, a time-saver.

There is nothing new in this article to many of us, but to quite a few who have been discouraged from pursuing a line of study through encountering a strange formula, it may serve to lighten an otherwise dark spot.

Canadian Machinery Drafting Course, Part III

In This Third Portion, We Discuss Lettering and Section Lining. Neat Lettering Always Helps the Appearance of a Drawing, So Our Advice Would Be, Study This Portion Well

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE entering this third portion of the course, let us commence with a good-natured warning to students in general: "Do not yield to the inclination of speed only, but be content to travel the road carefully and at a natural gait." We will try and touch only on the absolute essentials, but in this portion especially, where we intend speaking of lettering and section lining, undue haste would be a very bad mistake. For this reason we ask the reader to study this portion with extreme care, especially the section lining department, for once the principle of the idea is grasped the rest will come easily.

In regard to the lettering. There is a belief in certain circles that lettering is non-essential to a mechanical drawing; in fact the writer of this article, personally, heard a certain chief draftsman give instructions to one of his staff to use a fountain pen for lettering and dimension purposes. When asked his reason for such a command the reply was, "It saves so much valuable time." True, perhaps it saved a little time in the drafting department, but what about the shop end of it, where the workmen had to decipher the lettering and dimensions? A system such as spoken of is carrying the time-saving idea too far,

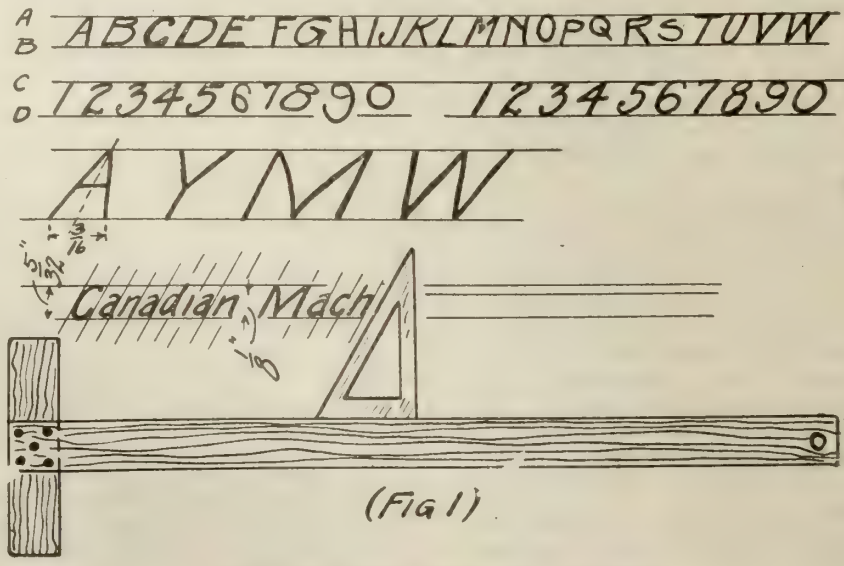


FIG. 1—A SHORT LESSON ON LETTERING.

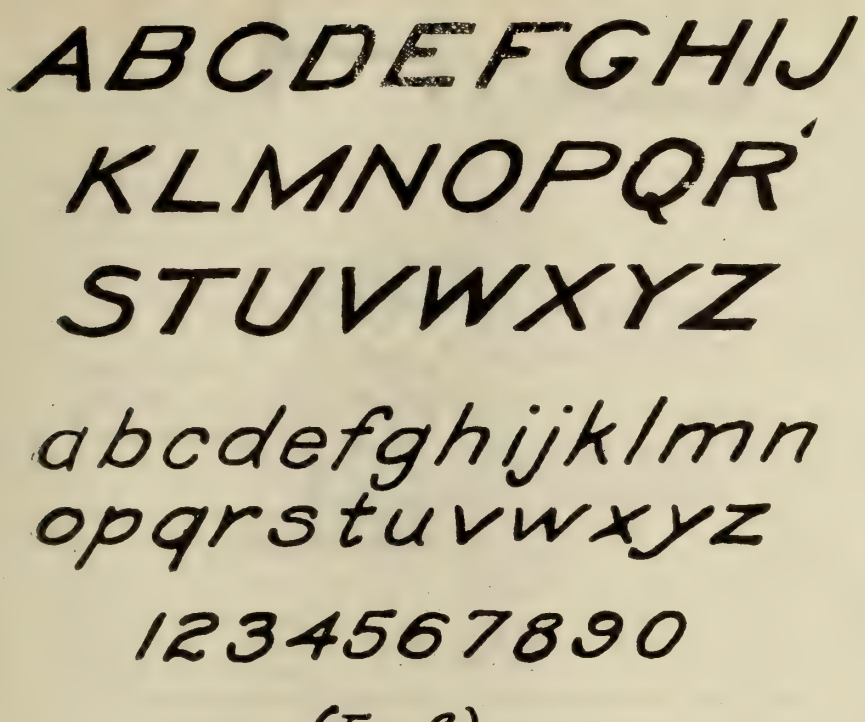


FIG. 2—THE STYLE OF LETTERING TO BE USED.

for a neatly executed drawing, with poor lettering, will never pass muster, in fact the effort spent in making the drawing neat was time wasted, if at the finish the dimensions are carelessly placed and undecipherable.

Still, there is another danger, just as glaring as the one already spoken of. How often we see a drawing, where all the time seems to have been spent on the lettering, while the drawing portion is left commonplace, and perhaps even shows lack of care, yet the lettering is not only perfect, but of the fanciest design possible to make, sometimes, in fact, work that a show-card writer would be proud of. It is therefore of the double danger that we would warn students. We do not wish to take up our readers' time carrying them through a long painstaking course in lettering, and yet, because we only intend mentioning two styles of lettering we do not wish them to run away with the idea that lettering is non-essential. If the two styles illustrated further in this portion are practised earnestly, students will be sufficiently equipped in the ground-work at least, and have ample knowledge for average conditions.

In the up-to-date drafting room of to-day, wherever possible rubber stamps are used to take the place of the lettering. This particularly applies to the title block, and as the type used is much better than the hand printing, such a method is not only an improvement, but a decided timesaver. For the purpose of our course, we will, as before stated, keep to two styles, namely the sloping Gothic letters, and the block type.

Fig. 1 illustrates how students may practise the Gothic style with the aid of T-square and triangle. To start with it is important that a good pen be used for the purpose. A Gillott's No. 303 pen is ideal for such work. For the purpose of our course we will set a standard to the height of the lettering. This height is clearly shown on the sketch Fig. 1, case letters as they are called, are to be 5-32 in. high, and the smaller, or lower-case letters as they are called, are to be ⅛ in. high. As regards the spacing horizontally, no real definite rule can be given, for it is simply a matter of the general appearance that counts. Students will become more proficient in this spacing the more they go on, and the more they practise the more their eye will discern uneven spacing. What would perhaps help the student more than anything else is to remember these points, that W is the widest letter, M and T the next widest, then A and B. The narrowest letters are I and J, after which all the rest are about equal. A short space of time memorizing these facts will help the student considerably.

Before beginning to letter, draw horizontal guide lines with your T-square to serve as a guide for the tops and bottoms of letters, see lines A, B, C, etc., on Fig. 1. The letters should be made to extend fully up to the top and down to the bottom. They should not fall short of the guide lines, for if they do the lettering will appear ragged and uneven.

It is also very important that the letters have the same inclination. For example letters A, B, C, D and E are shown at correct inclination, then F, G, H, etc., are alternately put at various angles to illustrate the point of irregular slope, also the importance of keeping to the proper guide lines is illustrated by purposely not reaching the proper lines, to show up the irregular and ragged effect.

To secure the regular slope, use T-square and 60 degrees triangle, as shown in the lower portion of Fig. 1. In lettering make the backs and sides of the letters parallel with these sloping guide lines. A few points regarding the construction of a few particular letters. On line 3, Fig. 1, enlarged twice the actual size, are shown letters A, Y, M and W. To print A draw the centre line at the regular slope; from the apex of the letter draw a line almost perpendicular as shown, and make the distance across the bottom of letter about 3-16 in. wide. Regarding the other letters illustrated, students, by studying the same, will easily grasp the style and principle of design involved. Our advice to the student is this: follow the copy closely, keep on practising, for one can learn more about the lettering subject by actual practice than by any written instruction. Fig. 2 illustrates the complete alphabet and numerals. We now leave the Gothic style and pass on to the block design.

Fig. 3 illustrates the block type, and while at first sight it looks a difficult style, it is in reality very simple, for it is a mechanically produced style of lettering, the T-square and triangle completing the entire letter. The letters are to be made 5-16 in. high and ¼ in. wide, except M, which is 5-16 in. wide, and

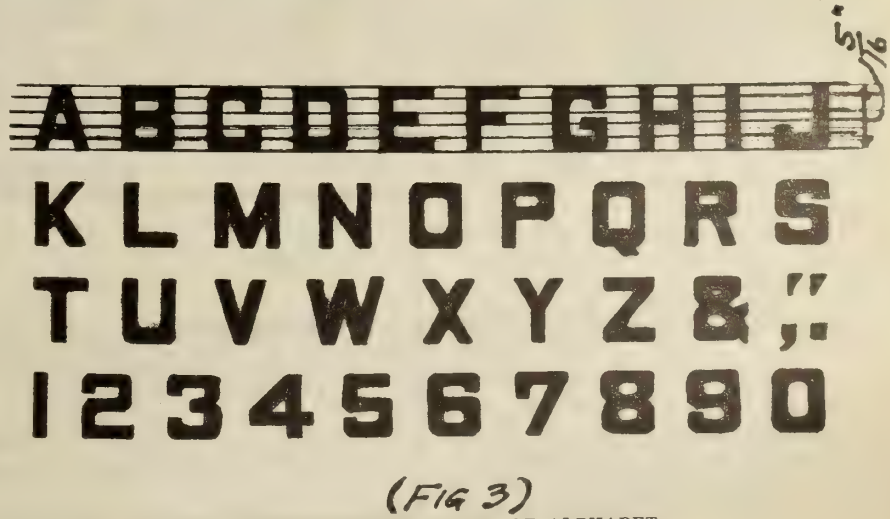


FIG. 3—THE COMPLETE BLOCK OF ALPHABET.

W, which is ⅜ in. wide. The thickness of all lines is to be 1-16 in. The distance between any two letters of a word is 1-16 inch, except where A follows P or F; where V, W or Y follows L, where I follows F, P, T, V, W or Y, where T and A are adjacent, or A and V, W or Y are adjacent. In this case the bottom extremity of A, and the top extremity of F, T, V and W are in the same vertical line, etc. In other words, as before stated, practice will allow the eye to discover proper spacing.

Since these letters are composed of straight lines they can be made with T-square and triangle throughout. The student should draw six horizontal lines 1-16 in. apart in lead pencil, to represent the thickness of the letters at the top, centre and bottom: then by use of the triangle he should next draw the letters and the spaces between them, also in lead pencil. Having the letters all laid out, he can then easily ink them in. Use the ruling pen for this purpose. Students had better ink in all vertical lines first, next the horizontal lines and lastly the oblique lines. By such a method he lessens the chances of blots, also follows the building up of the letters in their natural sequence. Once more the importance of practice work is impressed upon the student if he would become proficient in this work. Leaving the student at this point to practise these two styles of lettering at his leisure, we will go on to section lining, its principles and purposes.

Sections and Section Lining

When we speak of a section through a piece of work, exactly what do we mean? We mean simply this, that to show clearly what otherwise would all be hidden and represented on the drawing by dotted lines, we cut clean through the centre of things, or in fact through any portion of an object, or objects, to show its various details. To make these points even more plain than ever, we section line the various parts by certain lines which represent the material from which they are made. Unfortunately there is no universally adopted standard, thus a certain combination of lines in one drawing office may mean steel, but in another office they might use the same combination of lines to represent some other metal, for instance cast iron. However, in the majority of offices, the combination of lines are alike, and on our plate No. 3, are illustrated these various shadings or section lines, as they are called. Under each space is given a letter of the alphabet, and at the end of this article we have placed in table form the letters, and what each particular section represents. Students should familiarize themselves with these various sections, so that at once they can tell what material a part is made of by its section linings. Where lines are too thin to show section lines they are simply blackened in, as shown on one of the portions of Fig. 4. These blackened sections are most frequently employed for sectional views of structures composed of plates and rolled sections, such as I-beams, angle irons, rail bars, etc.

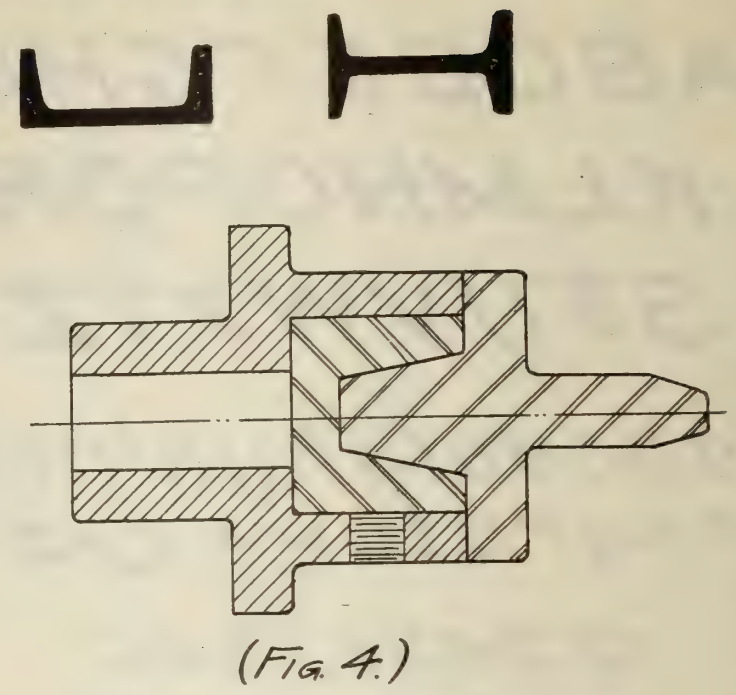


FIG. 4—THE PRINCIPLE OF SECTIONING ILLUSTRATED.

On going further into the drawing question, we will find that section lines do not always run in the same direction, for example refer to Fig. 4. This view shows that there is more than one piece to the section given. It is a general rule among draftsmen that each part of the same piece is section lined in the same direction, irrespective of its community of the section, so that by this means, after one has followed up the section method further, they can easily ascertain if at various parts of the section the same piece appears. In a later plate on this course, the student will have to make sectional views from straight sketches, but of course, before we expect him to do this, further information will be given him on this important subject. At the present time the chief idea is to familiarize students with the various lines used in section lining, and their meaning.

The next plate will go on to practical use of the instruments, as applied to geometrical drawing, and while two or three plates will be taken over in this branch of the subject, it is only because it is absolutely essential that the student get this groundwork before going further into the mechanical drawing question. As stated before, we will not attempt to make this a long, detailed course, but will carry the student along as fast as we possibly can, with the knowledge that he has a chance to follow us. It would be foolishness to proceed faster.

Might we close this portion of the course by asking some questions? Do you like this course? Do you believe it worth while? Is it doing you any good? If so tell us about it by letter. We would like to know that our intentions are being realized, namely, to provide an interesting course of use to the shop worker. Are there any points you would care to suggest? We should like to hear them. Last, but not least, keep sending on your work. We are busy receiving replies now, but we want still more. How about it? Do you want to earn one of the prizes? If so send your stuff along. It may be your plate will land the prize. Referring to plate No. 3: proceed to lay out the border lines as before. Then divide evenly into the sizes given on the plate. Draw up each section as near to the original as possible. The section of this plate devoted to the lettering is left blank for obvious reasons, namely that we wish to see your progress on this subject. To show us this progress proceed as follows: where

Tear off and send with drawing

Name .....

Address .....

Position .....

Firm's name.....

P is marked make two guide lines 5-16 in. apart, and draw in the words, Canadian Machinery, in block style lettering. Where Q and R is marked print in sloping Gothic capitals 5-32 in. high these words: Canadian Machinery has a motto well worth while. "To make their paper better this week than last week, advancing all the while." At S and T, make double guide lines, and place these words, in sloping Gothic, with capitals and lower case letters, "The price is $3.00 per year, let us have your subscription now."

Regarding the spacing, that is strictly up to the student. Make it as good as you know how. From your plate we will see how well you have read the instructions. Above all, send the plate in.

Table form illustrating what materials the various section lining represents:

A represents cast iron.
B represents cast steel.
C represents malleable iron.
D represents wrought iron.
E represents wrought steel.
F represents copper or zinc.
G represents brass or aluminum.
H represents composition.
I represents insulating material.
J represents water.
K represents wood.
L represents brick.
M represents fire brick.
N represents concrete blocks.
O represents concrete.

Fundamentals of Thread Milling

THE Smalley General Co., Inc., of Bay City, Mich., have a few things to say on the above subject, which, no doubt, will be of interest to readers in general. They comment as follows:

It is not generally known that thread milling is not a new process in industrial practice. Machines of this type were in use in this country as far back as the Civil War days. They were crude and light. It has only been within comparatively recent years that really successful thread millers have been developed.

Prior to the rapid growth of the automotive industry and the outbreak of the war in Europe in 1914 the use of thread millers was quite limited. For one reason, the machines were not as efficient as they should have been, and for another reason, industrial practice tended to move in the accepted groove. Manufacturers naturally enough did not care to break away from tried and accepted methods of cutting threads for a new process, which they then regarded as an experiment.

While the impetus given the machine tool trade by the growth of the automotive industry helped to perfect and make thread milling better known, it was really the European war which gave the big impetus to thread milling and put it on a solid and accepted footing in the machine tool trade.

The enormous demand for munitions, the cry for speed and more speed in manufacturing methods and the insistence upon accuracy and minimum scrap made the use of thread millers imperative in various lines of munition work which ranged all the way from threading artillery hub caps to threading sixteen-inch shells and base-plugs.

In the rigorous tests and trials to which thread millers have been put in the past five years on the heaviest and most exacting work, we believe that we can safely say that the machines have fulfilled the estimates of their makers and satisfactorily met the requirements of purchasers.

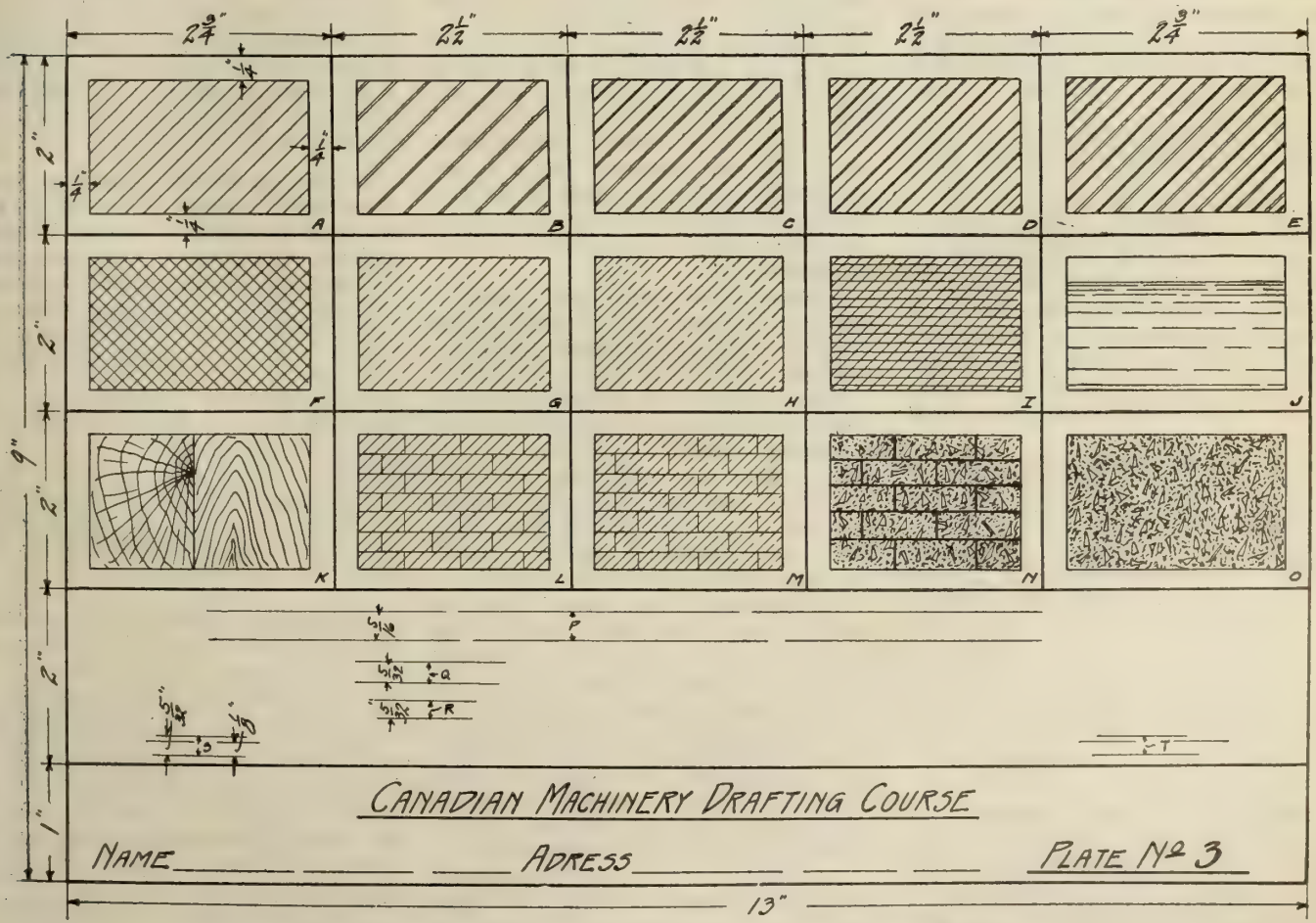
In describing a thread miller it will perhaps be best to begin with the single purpose machine designed for production work. This is the simplest type of machine. It is the bare machine reduced to its lowest terms.

The bed is of lathe type. The main head is cast solid with it. This insures great rigidity and perfect alignment.

The spindle in the main head is hollow. In a typical machine of medium size the spindle is 38 inches in length with an opening through the centre 6 inches in diameter.

Chucks for holding the work are bolted to the flange of the main spindle so that any type of chuck can be used.

Located on the ways of the machine



HERE WE HAVE PLATE NO. 3—SO GET BUSY AND SEND IN YOUR WORK PROMPTLY.

is the bottom slide, which in turn carries the top or cross slide. This cross slide is controlled in relation to the bottom slide by means of a micrometer screw by which the diameter of the thread is determined. The top slide carries the milling spindle. The milling hob is held on this spindle by means of a tapered arbor and a draw in bolt.

When a multiple tooth hob is used the thread is completed at one revolution of the work, but when a single cutter is used as many revolutions are necessary as there are threads.

During the milling operation, while the work held in the chuck makes one revolution, the milling head is moved back on the ways by the lead screw, a distance amounting to the pitch of the thread to be milled.

Either internal or external, right or left hand, straight or tapered threads can be milled. With a thread miller it is not possible to mill absolutely square threads. A very slight angle is necessary for clearance. Acme threads, for instance, can be milled.

In operations where internal threads are to be milled the diameter of the hob must, of course, be slightly less than the diameter of the part to be milled in order to allow for ingress and egress of the hob.

This, of course, is not to be taken as meaning that a large hob must necessarily be used if the diameter of the piece to be milled is large. While usually a hob of large diameter would be used for milling an internal thread of large diameter we want to make the point that there is of necessity no particular relation between the diameter of the thread and the diameter of hob used.

The single purpose machine just described is provided with milling speed only.

The general purpose type of machine is provided with turning speeds as well. The turning speed bears a constant relation to the milling feed, so that it is fast for small work and slow for large. This enables surfaces to be turned true with the thread and gives perfect alignment when screwed together. It also saves an extra operation on some other machine.

In the type of thread miller, which is designed for both milling and turning speeds, the changes of speed and also the shift from neutral to milling or turning speed are simply obtained by shift of levers. By a system of gears in combination with the three-step cone pulley as high as eighteen speeds can be instantly obtained. The only loose gears are those required for the lead screw to change the pitch of the thread to be milled. The lead screw is driven and changes of pitch are obtained as in a lathe.

Just beneath the main spindle is a combination of gears actuated through clutches which controls either the high or low speeds. The low speed is for milling and the high speed for lathe or turning speed. In order to govern the peripheral speed of the surface to be milled a system of sliding gears is located in a gear case base forming a box leg which supports one end of bed. These gears run in oil.

It should be noted that neither hob nor tool need be removed during operations.

Thread millers are either belt or motor driven, depending upon the circumstances of the case.

For threads of 12 per inch or more a direct driven spindle may be used. For coarser threads a back geared spindle is always used.

Milling speeds depend upon material milled, rigidity of machine, quality of hob and finish required. In steel and cast iron, hob manufacturers recommend a cutting speed of 80 feet per minute and .004 feed per revolution with a hob 2⅛ inches in diameter, which gives a milling feed of approximately 6 inches per minute. As a rule a properly constructed thread miller should run in such material about 9 inches per minute without distress

In thread milling it should be remembered that the finishing and roughing cut are taken at the same operation. It therefore follows that the slower the milling feed the better the finish. And so when a polished finish is required it is well to slow the machine down to 5 or 6 inches per minute, or else take a roughing cut and then a light finishing cut on second revolution. This is seldom necessary. With milling speeds running from 9 to 12 inches per minute the limits can be held to .001 or .002, depending upon circumstances.

In annealed high-speed or hard alloyed steels the usual milling feed is from 2 to 3 inches per minute with cutting speed of 35 to 45 feet.

The limit of a properly built thread miller with the requisite heft for the operation in hand is the limit of the hob. There is no excuse for distress or chatter in the machine at any speed the hob can stand.

Experience has shown that, given a sufficient volume of thread cutting along lines for which thread millers are designed, the installation of thread milling machines will reduce costs, increase production and improve accuracy of finished product.

It can be shown beyond the peradventure of a doubt that the use of thread mllers in many cases is more than justified on the ground of saving in scrap and elimination of tool room expense.

The advantage to be derived from the use of thread millers on the score of increased production because of greater speed than present methods varies. In certain types of operation thread milling will cut the time of operation by present methods enormously. In other types of operation the speed of thread milling is not much superior to present methods, but the quality of work is much better and the saving in scrap large.

It appears to us that manufacturers of thread millers have laid too much stress upon the advantage of speed. In many cases the real advantage of installing thread millers lies in the saving secured by accuracy of finished product. A milled thread is very accurate and so-called "drunken threads" never occur. Accuracy and little or no spoiled work coupled with minimum scrap and saving in tool room expense make thread milling superior to present methods without the benefit of greater speed.

A fair way to put it is this: Where accuracy is not required and most any old thread will do, the thread miller has not, in many cases, a production capacity superior to other methods. When accuracy is required the thread miller is far superior in both quality and quantity production.

It is usual practice for manufacturers to put the thread milling operation last, where possible, because it is the operation with the least scrap.

Thread millers are practically foolproof. Highly skilled mechanics are not needed to operate them. The labor used on other automatic or semi-automatic machines is quite competent to handle thread millers.

As rapidly as possible, all the unused shells in Germany are being converted into commodities more useful to peacetime pursuits. The procedure, carried out under orders from the Allies, is to extract the explosive, remove the copper rotating bands, and then turn the empty cases over to the foundry. There they are melted up by the open-hearth process. A huge electrically-driven charging machine picks up a charging box full of cases, carries it on the end of a beam to the furnace, thrusts it in and dumps the box by inverting it. Cast into ingots, the steel is then sent to the rolling mill.

The famous French aviatrix, Baroness de la Roche, recently flew to an altitude of 15,700 ft., driving the little Caudron biplane with which the late Jules Vedrines landed on a department store roof last January. The performance has been checked by a commission from the French Aero Club, giving the Baroness the women's altitude record. It was formerly held by Miss Ruth Law, of America, who climbed to 14,701 ft. at Peoria, Ill., in 1917.

Rich deposits of potash, discovered on the island of Sicily, are said to remove forever the world's dependence on Germany for that substance.

Sodium as a conductor for electricity was considered seriously by the Germans during the latter part of the war, due to the scarcity of copper and other metals commonly used for this purpose. On the basis of weight, sodium has three times the conductivity of copper, but because of its low melting point, is difficult to use for carrying electrical currents. To overcome this drawback, the Germans proposed to use it in hollow iron tubes. An almost inexhaustible supply of sodium is declared to exist in the salt beds of Germany.

WHAT OUR READERS THINK AND DO

ADJUSTABLE BORING BAR HOLDER

The accompanying sketch is an adjustable boring bar holder for milling machines, but is useful for other machines as well.

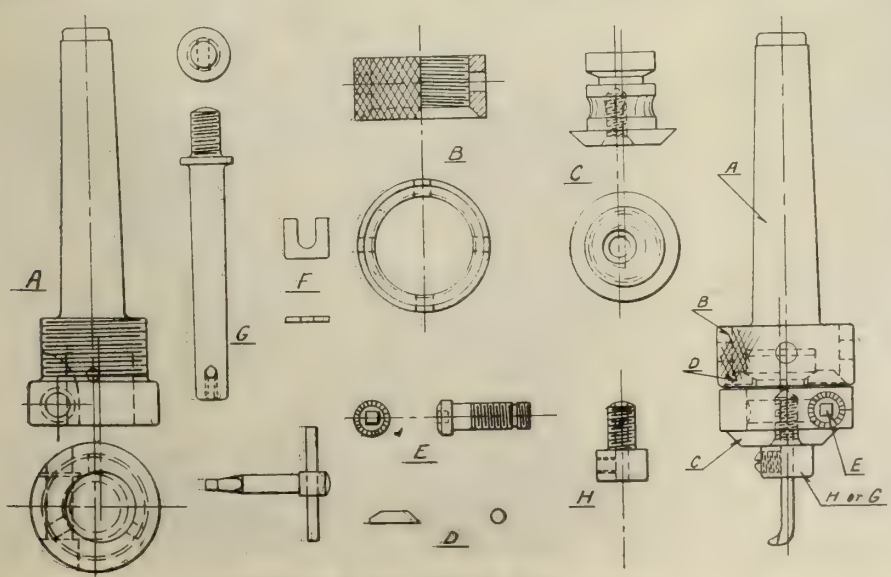
The part A is turned to fit a standard taper and threaded on the outside to take the collar B. This head is bored out a snug slip fit on part C, the boring bar holder. In part A, in line with the groove cut in part C, there are 3 holes drilled to take the lock pins D, which are 3 in number, and, as can be seen from the sketch, must be of different lengths. These may be fitted at assembly. Across the head on part A is drilled and countersunk the hole to take the adjusting screw E. Lengthwise of the head the ⅛ slot is cut to take the lock washer F. Around C in line with the adjusting screw hole in part A a thread is hobbed to mesh with the adjusting screw. In the end of C a hole is drilled and tapped to take the boring bar G or the small boring tool holder H. The part B is a knurled ring to lock C in place after adjusting.

To assemble this tool part C is slipped into part A and the pins D dropped through A into the groove in C, after which the lock collar B is screwed on A with its bevel face on the 45° bevel face of the pins D. Next screw in the adjusting screw E and insert the washer F in the slot cut in part A and around the groove cut in screw E, after which peen over the slot in A to hold the washer in place.

To operate the head the boring bar of the necessary size is screwed in part C and the wrench J is used to turn the screw E, which revolves part C in part A until the tool is boring the proper diameter, after which the part B is screwed forward, causing the 30° taper on the pins to draw part C back against part A, which acts as a lock for C.

The hole in part A has been bored ⅛ in. off centre and the hole in C has been drilled and tapped ⅛ in. off centre, giving an eccentric throw of ¼ in. to the boring tool. Any variety of boring bars can be used with this tool.

In our own case the thread on C was hobbed with a standard top, which gave a fairly serviceable job.



DETAILS OF THE BORING BAR HOLDER.

ARBOR FOR LOCOMOTIVE BRASSES

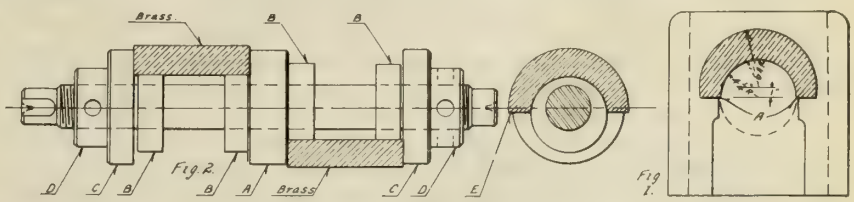
By G. Barrett

The arbor shown is used for turning brasses for locomotive boxes.

Readers will note by drawing of axle box (Fig. 1) that the brass has two different radii; this accounts for the special arbor.

The arbor (Fig. 2) is made from a 4 in. steel bar, with a cast iron collar A shrunk on the centre. There is also four cast iron eccentrics B (Fig. 2) which accommodate themselves to the inside radius of brass and supports same while being turned on the outside.

The brasses are clamped against the fixed collar in centre by two loose flanges C and tightened with units D.



SECTIONAL VIEW THROUGH ARBOR.

By having a locating mark on the fixed collar in centre it is unnecessary to remove the arbor from the lathe when removing finished brasses.

There is no need of heavy lifting as the machinist just puts the brasses in position one at a time and tightens the nuts with a large wrench or tommy bar.

The other view shows a sectional end and the reader will see that the brass projects by the centre at E. This is another claim for a special arbor and is also to allow for machining after turning so as to be a press fit between the webbs A (Fig. 1).

A ship-salvaging "camel" that is blown up like an automobile tire has been invented by a British naval officer, and is already doing good work among sunken vessels. Shaped like a small dirigible balloon, the camel is made of laminations of specially-prepared vulcanized canvas. It is protected by longitudinal rope fenders and provided with flat flexible-steel moving bands. Three air connections at different points make for convenience in handling, and a pressure regulator prevents overinflation. Deflated, the big bags are introduced through porthole or hatchway into the sunken ship, and then air is pumped in until the vessel rises. A special steel clip for fastening to a ship's side allows the external use of the camels if necessary, avoiding the difficult task of placing cable under the hull.

DEVELOPMENTS IN SHOP EQUIPMENT

DUPLEX UNIVERSAL MILLER AND SHAPER

THE Cochrane-Bly Co., Rochester, N.Y., who have been building a Duplex Universal Miller and Shaper for a number of years, have recently made several modifications of the machine, fitting it with single bends only.

The machine is now built as a Duplex Universal Vertical Miller and Shaper; Universal Vertical Miller only; Universal Vertical Shaper only, and a Plain Vertical Miller.

The Universal head on both duplex and single machines adjusts right to left, or left to right the full circle, and the shaper and milling heads adjust independently front and back 40 degrees, and are operative in any position.

The milling spindle has an adjustment of 3½″ with hand feed. A micrometer screw is provided on spindle housing to gauge depth of mill, drill, etc.

The spindle is hollow, and is furnished with draw bolts for holding milling cutters, split collets, etc. Drilling, milling, coring and slotting operations can be performed at any angle, and at one setting of the work.

The shaper arm is adjustable for stroke from 0 to 6″. The tool head is adjustable on the ram, the full circle, and clapper block is operated positively by means of a toggle-link and adjustable dogs. The crank arm or link is made of solid steel, and compensation is provided in the crank pin box to take up the wear on both crank pin and link.

The drive is through a friction clutch pulley, and double cone of gears running in a bath of oil. All gears in the machine are of steel, and the gears in driving train are hardened.

The direction of spindle can be reversed in the machine and it can also be disengaged and revolved freely by hand. A locking pin is provided to lock the spindle when changing cutters, etc.

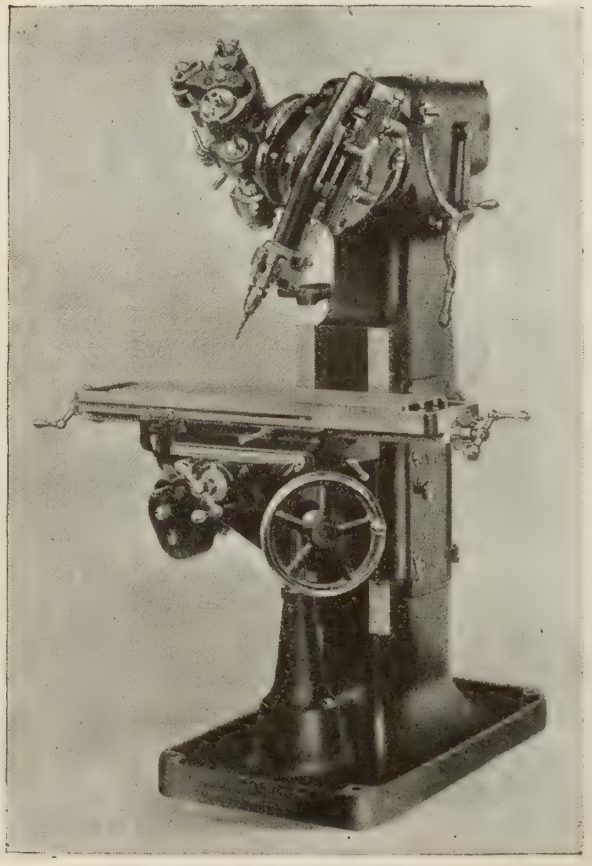
The clutch pulley has an oil reservoir, insuring thorough lubrication for long periods. A cone brake opposes the clutch and engages when clutch disengages, thus bringing the machine to an instant stop.

Five changes of speed are instantly obtained by shifting a lever within easy reach of the operator in working position.

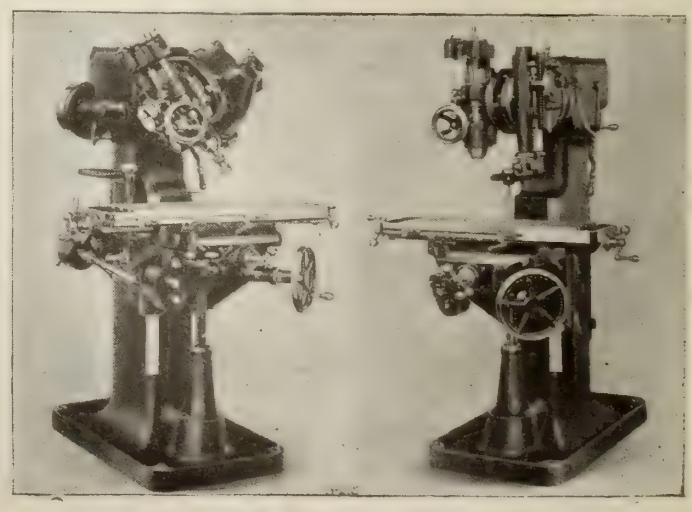
A very essential and important part of the outfit furnished in connection with these machines is the circular table with dividing attachment, and the compound circular table. With these attachments holes in jigs can be drilled and bored on five sides of a square at one setting of the work. Radial slots can be accurately spaced and planned at any angle from the horizontal to the vertical; key ways spaced any number of degrees and minutes and cut in either straight or taper holes or with any desired draft.

Die blocks can be accurately drilled, bored, machined with milling cutter, and slotting tool on all angles, and curves, and filed without removing the work from the machine. By using the circular and compound tables in combination dies and other parts can be machined from any number of centres, and two or more radii blended, and intricate forms and shapes developed with a high degree of precision.

Examples of such work are tools and templates for tire molds, molds for Bakelite and other insulating material. Dies for die casting metal, molds for glassware, battery connections. Dies for blanking and forming sheet metal, metal pattern work, etc. Provision is made on both longitudinal and transverse slides for standard



UNIVERSAL VERTICAL SHAPER.



TWO OTHER VIEWS OF THE MACHINE.

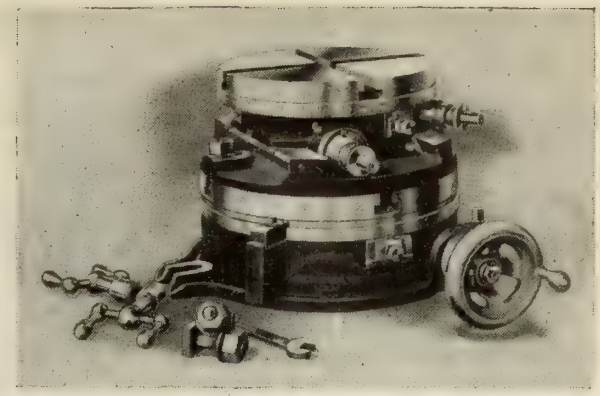
B. & S. Vernier Scale outfit, insuring accurate measurements.

The plain milling machine is provided with ten spindle speeds and twelve feed changes, and will take any of the standard attachments furnished for the Universal machines.

In addition to the circular and compound tables, a plain milling machine vise, drill chuck, spring chuck, collets, sleeves for Morse and B. & S. tapers, draw bolts, centres and expanding arbors can be furnished.

A simple motor drive can be applied to all of the machines.

Principal dimensions of these machines are as follows:
Table inside oil pockets, 9″ x 20″.
Table travel, longitudinal, 18½″.
Table travel, transverse, 9″.
Table travel, vertical, 18″.
Size of tee slots (3), ⅝″.
Adjustment of centre head, 360 degrees.
Adjustment of milling head B. & S., 45 degrees.
Adjustment of shaper head F. & B., 40 degrees.
Speeds of milling spindle, R.P.M., 55 to 330.
Maximum speed of high speed milling attachment, 1,400.
Maximum distance table to spindle, 20″.
Maximum distance table to tool, 18″.
Distance centre of spindle to column, 13″.
Speeds of shaper (strokes per minute), 35 to 150.



CIRCULAR AND COMPOUND TABLE USED WITH THIS MACHINE

Taper hole in spindle, B. & S. No. 9.
Hole through spindle, 17/32.
Feeds per rev. milling spindle, .003″, .004″, .006″, .008″, .016″ and .034″.
Feeds per stroke of shaper ram, .0025″ to .080″.
Speed of drive pulley R.P.M., 500.
Size of drive pulley, diameter and face, 10″ x 3″.
Net weight, standard machine, 2,100 lbs.
Floor space, 57″ x 66″.

"VOLYUM" CENTRIFUGAL PUMP

The Volyum Pump Co., 419 West Liberty St., Cincinnati, Ohio, have brought out a new vertical centrifugal pump, known by the trade name of "Volyum" and intended especially for supplying the coolant for machine or cutting tools. Fig. 1 shows an outside view of the device, while Fig. 2 is a sectional view showing the construction. The impeller is of the open type, mounted on the lower end of the vertical shaft and extending the full depth of the semi-spherical body, there being no contact between the impeller and the body casting. The bearings for the impeller shaft are both above the water line; one of these bearings is formed by the stuffing-box gland that is located just above the impeller, while the second one is in the cap. The drive from the pulley is through two spiral gears, placed at right angles and having a 3 to 1 ratio. The large gear is mounted on the driving shaft and runs in oil in the chamber formed by the cover, this oil serving to lubricate both the shafts and the thrust bearings, as well as the gear teeth themselves. A 3-in. flanged pulley is standard equipment, although a gear or sprocket wheel can be substituted if desired. The pump can be mounted on either the side or end of a machine, as desired, various angles of drive being obtained by swiveling the cover in relation to the body and by reversing the position of the pulley. In order to eliminate the loss of the liquid necessary for priming, the suction pipe is located above the delivery box and the body thus retains a full supply of liquid. The pump is at present made for ¾-in. pipe connections, and has a capacity of from 5 to 22 gal. per minute, depending upon the speed.

The Independent Pneumatic Tool Co. have placed on the market a new improved Thor perfect hose coupling. This style of coupling is disconnected instantly by a straight pull on the knurled sliding sleeves, with which it is equipped.

A full description is given of this fixture in the pamphlet issued by this firm, and those interested should write for one, as this is a decided innovation.

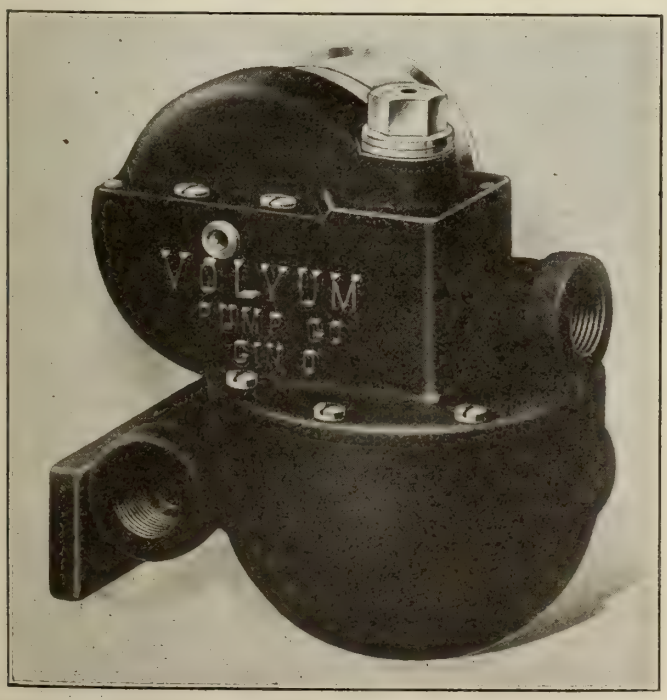


FIG. 1—OUTSIDE APPEARANCE OF PUMP.

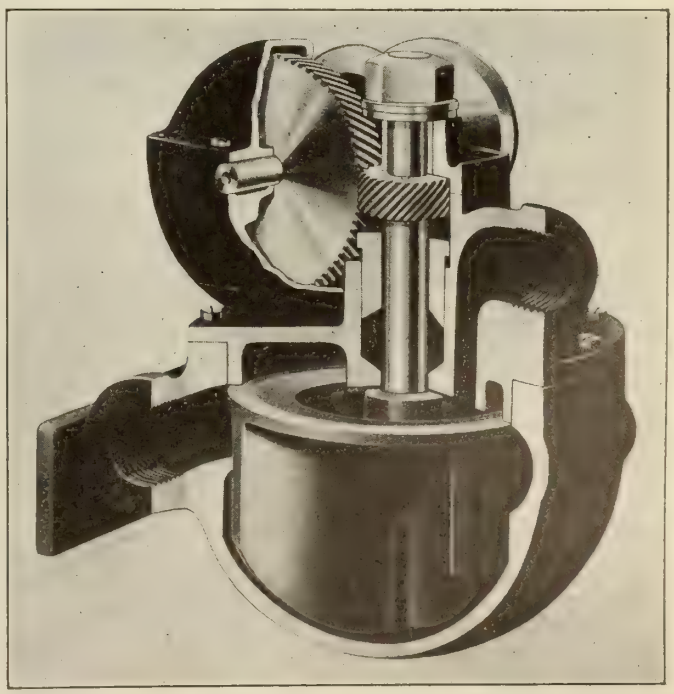


FIG. 2—SECTIONAL VIEW OF PUMP

The MacLean Publishing Company
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JOHN BAYNE MACLEAN, President. H. T. HUNTER, Vice-President
H. V. TYRRELL, General Manager.
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The Problem of the Foreigner

NEWSPAPERS take various views of the struggle going on in the steel industry of the United States. It is all very well for stock brokers to say that the strike is dwindling to an end—to pooh-pooh the whole thing as a half-baked upheaval amongst what they term the "bohunks," and, in short, to tell these "hunkies" if they don't like things here they had better clear out.

The fact is that any movement that can, on short organization effort, pull hundreds of thousands of men from work on a given day, has got to be noticed. It cannot be dismissed with a wave of the hand unless we wish to move across and dwell in a real honest-to-goodness fools' paradise.

Get back to facts. These hunkies were brought to this country by the big concerns that are now fighting them. The steel mills of United States wanted cheap foreign labor, and they scoured Europe for it.

They imported human beings in quantities. They were out to gather up human industrial wheels, not future American citizens.

And so they raked these chaps together—the rag-tag and bob-tail of the continent, and turned them loose on this continent.

They brought with them their racial hatreds and loves, their nightmares of oppression for years gone by, their wild dreams of the day when they would rise up and take possession—for mark you, these hunkies are steeped in the words of Marx and stewed in the teachings of anarchy.

Well, what happens? In this country they find the agitator here. It pays him to agitate better than to work. It is a thousand times easier to earn his bread by the sweat of other men's brows than to have anything approaching moisture decorating his own head.

That influence goes after the foreigner. It is more insistent than anything else. He meets it in the mill. He comes in contact with it when off the premises.

And what do we do for the foreigner? Well, we herd him, regulate him and fine him, and if this fails, lock him up.

We don't want him living on our street, eating in our pet restaurant, going to our club, sending his children to our school. Not much! We herd these fellows, and then our splendidly-made law seeks to regulate them.

Do we do nothing for them? Surely we do. We send officers to search their homes for booze, to inspect their back yards and occasionally we fatten our police court revenues by fining them!

The foreigner is in United States and in Canada. He was, in many cases, urged and asked to come. He is here to stay, and he can be either a decent citizen or a nuisance and a danger. He is not thinking for himself. It is the law of the mob all over again, and unless some mighty big influence is turned loose he will increasingly shuffle off to the nuisance class.

BUT what is the outlook for the foreigner who thinks? Well, here's a true case:—

He was a cobbler—not in a particularly large way. The staff consisted of himself. He bought the stock, cobbled the shoes and collected the cash.

He had come from Italy ten years before and was making his way by hard work. But this cobbler did more than cobble shoes. As I sat there one night waiting for him to finish an odd job, he wanted to know how the British railway strike had been settled—he asked if Asquith had any chance of getting back the ground that Lloyd George had cut from under him—he talked of the lack of interest in the Ontario elections, and had a solution for the world's unrest, in the simple life. And as he hammered and stitched, he reasoned about the folly of our ways—"My wife buys a coat and wears it on cold days. At the end of the winter she puts it away. Next winter she takes it out, looks at it and sees that the cloth is good, lining good—but the men who make the styles have spoiled that coat. It is out of style. By this system they are able to make people go into the market and buy things they do not need. They are able to make people spend money that should go for other necessary things."

And so he talked and worked. That Italian cobbler was, in his way, doing more real thinking than thousands of native Canadians who never seem to have or take time to let their brains settle down to perform the function for which they were created—some real, solid reasoning and thinking.

THE foreigner is in United States to stay, and he is in Canada to stay. He is not going to take a sudden or a violent notion over-night to pick up and clear out.

Canada need not imagine that the problem of the foreigner belongs exclusively to United States. It does not. It exists here. We have it in Ontario and we have it all the way across to British Columbia.

It was strong enough during the stress of war to tie up Alberta coal mining properties, and it was defiant enough to create conditions that would have forced, if possible, Canada's war effort to drift to the dogs.

It is not possible to road-roller the foreign population in North America into a harmless mass that will do a lot of slugging and dirty work and not ask too many questions. It is not possible to keep out the agitator. Root out one to-day and a new one has sprouted for the morrow.

What then?

The best first step is to shut the gate that lets him in. In other words, hand-pick our immigrants. That will at least prevent the problem from becoming more serious. That may be a negative virtue, but it is a **move.**

Then to Americanize and Canadianize them. Big job? Yes. Tremendous!

Well, why bother with it?

For the very simple yet very forcible reason that we've got to or else house a menace and a danger for years to come.

This work must be done by cities, towns, factories, and every other agency we can turn loose upon the foreigner. Play square and firm with him. Remember, we have got to "get him," or he will be a big power in the force that aims to "get us."

Cutting Out the Typo

THE *Literary Digest* has come out with pages on which there has been no typesetting. The pages are photographed from typewritten copy.

Years ago the old printer, when the matter of typesetting machines was mentioned, simply scowled, and if he came down from his scorn far enough to say anything, it was simply, "It can't be done!"

So that settled it. What more was needed than that the old-timer should pronounce it a failure?

But the typesetting machines came, the old Thorn, typograph, monoline, linotype, monotype, and what not. And to-day they are clattering away in offices where the old-timer had counted them out years before.

And now the next move is to get along without them. There has long been a feeling that there was too much repetition work in getting out a paper or magazine. The editors and reporters write or typewrite all their copy, and the machine operators in reality perform the same function all over again to put the matter in type.

The next big step will probably be some method whereby a reporter operating a typewriter keyboard will set in motion the mechanism to make type out of this copy.

On going at it from another angle, some publishers in small places have solved this dual operation long ago. The editor makes his rounds, attends meetings, etc., and then comes in, and instead of writing his copy, operates the keyboard of his own typesetting machine, and at once turns his notes into type. But, of course, these dual-purpose individuals are rather few and far between.

The Joys of Autumn

The autumn is a wondrous time, its glories poets sing; they say it's fifty times as good as winter or as spring. By heck, they rave about the skies, about the tinted trees, and write six miles of silly stuff about the autumn breeze.

They speak about the falling leaves, their many tinted hues, about the colors in the clouds—the greys, the greens, the blues. They write a yard about each gust that sweeps across the map, and throw a fit 'bout flowers and frogs that take a winter's nap.

Of course, the poets sell their stuff, they get the ready cash to buy a suit of underwear, some turnips and some hash. But why should we believe their lines, or weep big tearful sobs, because the poet's got to write or be bounced from his job? Ah, let us have the naked truth, begone poetic fire—we yearn for facts in every case—skidoo poetic lyre!

We got 'bout seven tons of coal—we owe most ninety 'bones, which causes us to loosen up a cloud of sighs and groans. We view that pile of diamonds black, we count 'em peck by peck—they'll warm our systems when the snow is campin' on your neck.

The furnace is—you bet she is—a peach for burning coal—she has an appetite immense—she is an ardent soul. We fondly rattle at the works, we whack the pipes for soot, and swear she's ready for the blast, our jolly old galoot. It is with air of calm repose we view the autumn's march, our spirits rise within our smocks as stiff as Monday's starch.

But woe is mine, we shake again, and then in grief we shout: "Ding bust our luck—just look at that—the bottom grate's burned out!"—ARK.

SHEETS are coming in very slowly now owing to the strike. Serious business, too, with cold weather coming on, and all sorts of bedding very scarce.

IT'S powerful hard to get most mechanics to line up to vote for any 65-cent-a-pound-butter farmer candidate.

* * *

WEATHER man is being most powerful kind to one Mr. Coal Bin.

* * *

THANKSGIVING DAY is a great thing. Most people cleaned up the yard, the furnace, the chicken house, the cellar, put on the storm windows, took off the fly doors, painted the strip round the spare room rug and enjoyed themselves generally.

* * *

THIS is an age of production along special lines. New machines are constantly coming on the market. The mechanical papers are your best chance for keeping up to the times.

* * *

WHEN Old John Barleycorn tries to look over your shoulder when you are voting on the 20th, kick the old beggar in the shins. Better still, hit him in the "no's."

Just a Few Sermons

By THE PARSON

While the up-to-date office keeps a checker or inspector to look for mistakes and errors, still it is good policy not to make these errors through mere love of seeing Mr. Inspector kept busy, and gloating over his find.

Some folks claim accuracy is a mere detail. If this is so—see that you keep well up in the detail feature.

Home study is supposed to be only for the highbrows. You will find it pays to be a highbrow—if studying at home means you have joined such an association.

The time clock is a horrible nuisance in some people's opinion. Very well, punch the nuisance—but punch him on time.

When the chief says "Rush"—don't wink your eye at your next pencil-pusher—but give him credit that he may actually be in a hurry for this work—then get it out—in a hurry. It pays.

If being a toady means getting out a little more work than you actually have to, then by all means be a toady.

Your employers may be, in your opinion, a lot of dubs—but, it pays to keep such opinions to yourself. You might be wrong.

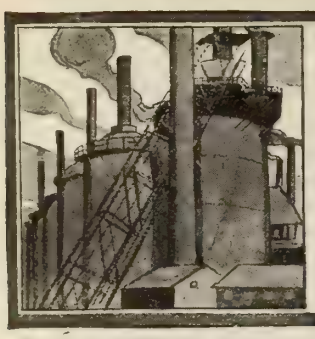
Holidays are all very well—in their place, but—the place is not in the middle of a rush job.

System is something you may have no use for—but—your employers may like to see you interested in such, and you may get to like it in time.

When you are responsible for some error—do not continually pass the buck; stand up like a man and take your medicine.

If you want a raise in salary, deliver the goods and you'll be surprised how soon the raise will come. If it don't, you can always get out to a real company who will appreciate your work. That's one advantage of living in a free country.

Last, but not least, don't get too large an opinion of yourself. You are only laughed at, and besides you don't fool anybody but yourself.



MARKET DEVELOPMENTS

Shipments from Strike Zone Are No Better

Material Much Wanted Not Getting Through on Schedule— Some Concerns That Work From Semi-Finished Are In Poor Way —Machine Tools Sold Well Into 1920

WHILE in a general way, Canadian industry has not been seriously interfered with by the steel strike in United States mills, it is a fact that shipments of much-wanted material are badly delayed, and in some lines are almost "off" altogether. Sheets, tubes and plates, in the order named, are the lines being most affected, and in some cases where firms depend on black sheets for their raw product, things are looking serious.

The machine tool business is coming to be somewhat like the days of the war, when there was such an unprecedented demand for everything in this line. The fact that nearly all the machine tool builders are booked well into 1920 is pretty good evidence that business has been brisk.

There are some real efforts being put forth now to get certain of the Old Country lines on the Canadian market again. Wire rope gives an illustration of this. In prewar days this make of rope had a big sale here, namely, the Scotch output, but it was impossible to send any here during the war. Canadian mills are now turning out a lot of this material, and several United States firms have established a very desirable connection. Unless it be for sentimental reasons in some cases, the Old Country material will have to fight for its re-appearance here.

The steel strike also keeps the scrap metal trade in Canada rather dull. No shipments are being sent out. There is a marked scarcity of stove plate. Agricultural scrap is also in demand and scarce. Prices remain the same.

HARD TO KEEP LIST BECAUSE TOOL PRICES HAVE CHANGED QUICKLY

Special to CANADIAN MACHINERY.

MONTREAL, October 15. — Apart from the passive interest that dealers and manufacturers here are taking in the strike situation in the States, the local conditions have been affected very little by the disturbances that have curtailed the output in the American steel mills. As the days go by the tension becomes less pronounced and normal operations are slowly but surely returning. It would appear that the steel requirements of the past few months, with the probable exception of sheets and plates, has not been sufficient to demand anything like capacity production of the mills, and as many plants have been gradually accumulating surplus stocks, frequently with the object of keeping the men employed, they have been in a fairly good position to stand the temporary inconvenience caused by the men leaving the plants. One local firm, which is a fairly large user of plates and tubes, stated that they had not suffered greatly from the steel strike as their present requirements were comparatively light, and that they were able to obtain all the material they were in need of, although at times the delivery was a little slower than usual. While there is optimism expressed as to the early ending of the strike, no heavy buying demand has developed here, and it is not likely that such will take place this year, but with the improbability of any further labor troubles arising to obstruct industrial enterprise, it will open the way for permanent activity of a reconstructive character. While no price changes have gone into effect here, dealers have been expecting a stronger market to develop in plates and sheets, and also tubes, but the clearing situation in the States has somewhat removed this impression, and the possibilities of advanced quotations are less likely.

Slight Strength in Metals

While the strength of the market is, on the whole, a little improved over the previous week, the demand for metal on the aggregate is about the same. The market here has been affected somewhat by the strike in the States as the production and shipment of metal has been interfered with by the steel men being away from their work. The situation, however, has taken on a better tone, and it is expected that the early market will show a settled tendency. There have been slight advances noted in the local quotation, copper has advanced ½ cent per pound, the prices being 26 cents for lake and 25½ for electro and castings. Spelter shows a rise of ¼ cent over last week's quotation, the current price being 9¾ cents per pound. Other metals have remained unchanged.

Slight Increase in Tool Inquiry

The movement in machine tools shows a slight improvement over the previous week, but as last week was below the normal for this period of the year, the present sales are not considered as any indication that the demand is increasing. There is, however, less delay noted between the inquiry and the sale. This hesitating action has caused considerable inconvenience of late owing to the fluctuating condition of prices and exchange. One firm here who are large distributors of engineering instruments, has not had a fixed price list for four years, as they claim that the changes have often followed each other so rapidly that any quotations would only be misleading. An inquiry some months ago resulted in a recent order coming through at the figure quoted at the time of inquiry. When the customer was advised that the price now would be about 25 per cent. advance on the previous one, it was necessary to give some detailed explanation on the cause of the higher price; and so it goes all along the line. However, all quotations on inquiries, where there is the slightest possibility of any change, are made for immediate delivery,

or subject to revision at the time the order is filled. Early in the year many dealers who had supplies in stock—that had been specially made for shell or fuse work, and which could not be returned to the manufacturers—scratched such materials completely off the books, not figuring of disposing of them unless as scrap. In some cases small jobbers have bought up large quantities of such tools as special taps, reamers, etc., as a speculation. One broker here has on hand some 800 pieces, taps and reamers, that he purchased in bulk for a little over $70, approximately 10c a piece. When new, one of these alone would have cost about $8 or $9. Some use might be found for such tools, but the cost of reconstruction would almost be prohibitive.

DELIVERY DATES ARE FARTHER OFF

TORONTO, October 14.—Canadian shops are doing well, considering that their source of supply is largely interfered with, that is, if they are depending largely on the U. S. mills for steel and iron and all that means. Some of the plants are getting pretty close to the boards, especially those that use a lot of semi-finished material as their raw stock. Shipments are coming forward, to be sure, but there is an increasing time between the date of delivery and order.

The Matter of Delivery

Delivery, as in war days, is coming once more to be one of the great considerations in the machine tool business. There is quite a difference in the policies of several of the houses regarding promises and deliveries. In some of the large shops, where business is done on schedule, the customer is told straight that he cannot expect his machine until February or March, as the case may be. The firm then tries to improve on that delivery as much as possible. In other cases, the idea seems to book the orders and then fight it out about delivery, on the general assumption that every person loves a fight. Some of the best known machine tool makers lose business by this direct way of dealing, but it is very doubtful if they lose in the long run.

There is a good sized volume of business moving in supplies. Dealers seem to be expecting that there will be some arrangement arrived at whereby the giving of special discounts will be done away with. They claim that they are not making money handling many of the lines of taps, dies, reamers, cutters, etc. In fact, one dealer stated to CANADIAN MACHINERY that he knew for a fact that in some cases small shops that would not buy over $100 in small tools in a year were getting as good a figure as his firm, that handled a large volume of business.

POINTS IN WEEK'S MARKETING NOTES

There has been very little change in the strike situation in the U. S. steel mills. Some gains are made in employment, but they are small and hardly affect the output, which is curtailed seriously.

—

Merchant furnaces turning out pig iron in Buffalo and Cleveland are entirely down.

—

Shortage of sheet bars is felt in some of the mills that work from the semi-finished article.

—

Scrap markets in Canada are short of stove plate and agricultural scrap.

—

U. S. mills are hardly booking any business for export.

—

Efforts are being made to get Scotch wire rope on the Canadian market. A lot of American goods come in at present and Canadian mills are also well employed.

—

Mills in the steel business have not advanced prices on account of the strike, but in most cases stock is going out at warehouse prices.

—

Machine-tool salesmen are selling for deliveries well into 1920. Shipment dates seem to have a habit of getting shoved still farther into the future.

The Effect of the Strike

The average warehouse man and machine tool dealer will tell you, "Oh, we are getting along all right," when you ask about the strike conditions and how they are working out on this side of the line.

Plate comes through slowly, and there is quite a time now between the date of order and delivery. One car came to Toronto this morning from Philadelphia, addressed to a local warehouse. It was flooring material, and was actually ahead of the regular schedule maintained by this company.

It can be said, and we believe the experience of purchasing agents who have had occasion to go into the market that will bear this out, that sheets are about the worst hit of any line. There is quite an accumulation of business already. "There is hardly any limit on the tonnage of sheets that could be sold in this country right now if we could get the material," is the way one dealer stated the case to-day.

Black sheets, galvanized sheets, etc., are almost off as far as delivery is concerned. Were this condition to last for any length of time it would hurt stove concerns and kindred lines. Stocks in the country at the present time appear to be low—abnormally so in many cases, so there is very little in the way of reserve from which to draw.

There may have been some shipments of tubes through during the week, but if so they were small and not frequent. It is believed now, though, that shipments will be better. Some shipments of skelp for Canadian pipe mills have come across the border in the last few days, and this is looked upon as a hopeful and significant development.

One warehouse got word a day or so ago that a car of sheets had come over the border to its address, and the firm has been deluged with queries for a part of this stock. It happens to be special automobile stock and much in demand. Prices remain firm. There seems to be no tendency to take advantage of the strike situation to boost the selling prices here, although there are always some cases coming up where a fair premium has been paid for some much-wanted stock.

The Scrap Metal Market

About the only feature in the scrap metal market just now is the shortage of stove plate, although dealers are not yet offering any higher prices for this line. Some of the yards state that there is an acute shortage of plate and very little in sight.

Agricultural scrap iron is also short, and it is in demand just now. There was a great quantity of this and similar irons used during the war, and no accumulations are reported.

The yards on this side of the line are feeling the effects of the strike in United States steel mills, and shipments are interrupted with, and sellers here know there is little use looking to United States buyers as outlets for their stocks. In fact, there is not a very large volume of business moving in any department this week.

Coppers are holding fairly firm, with no change in the prices offered by the dealers.

CANADIAN MACHINERY would again draw the attention of readers to the fact that prices quoted on another page are "Dealers' Buying Prices." That is, one of the largest firms in the Dominion correct the list every Monday, and will pay the prices stated. There may be many deals put through at prices above the list, but for local and particular reasons. It is not possible to publish, as far as we can see, a list of scrap metal prices, showing what the customer will have to pay if he comes into the market. No doubt if firms wanting to secure scrap material would insert a line in the advertising columns stating that they were in the market for certain grades and quantities, or had these to dispose of, they would find a better market than at present, either buying or selling.

U.S. TOOL BUILDERS ARE BOOKED WELL ON INTO THE 1920 BUSINESS

Special to CANADIAN MACHINERY.

NEW YORK, October 16.—Practically all of the leading machine-tool builders have enough business on hand to carry them over the remainder of the year, and some have enough to run them well into 1920. One large Cincinnati concern has orders on its books for five months, and this is not an unusual situation in the machine-tool trade. Buying goes on at a good rate. The bulk of the business is still coming from the Central West, but the East is now holding up its end, and particularly in New England is the demand for machine tools brisk. The largest enquiry now pending covers several hundred tools which the New Departure Mfg. Co., Bristol, Conn., a unit of the General Motors Corporation, will purchase. About $1,000,000 will be expended for new equipment for the New Departure plant, which produces bearings. The Rolls-Royce Co., 27 William Street, New York, has issued an inquiry for about fifty tools for a new plant, which will probably be located somewhere in the East. The General Motors Corporation, which recently acquired the war plant of the International Arms & Fuse Corporation, Bloomfield, N.J., has turned this over to one of its units, the Spalding Chain Co., which will use it for the manufacture of chain. The Duesenberg plant at Elizabeth, N.J., recently acquired by the Willys Corporation, is buying equipment for the manufacture of the new Willys car. It is expected that a large list of equipment will be inquired for in a few weeks as the capacity of the plant will be more than tripled. Other companies which are connected with the automobile industry have been buying, particularly John Thomson Press Co., Long Island City, N.Y., manufacturer of truck axles, whose purchases total about $50,000, and the Hart Roller Bearing Co., East Orange, N.J., which has bought both new and used tools. The Parker Axle & Products Corporation, 19 West 44th Street, New York, has inquired for machine tools for the machining of truck axles.

In New England the companies which have been particularly active include the Gilbert & Barker Mfg. Co., Springfield, Mass., which has purchased a good sized list; the Hemphill Mfg. Co., Providence, R.I., manufacturer of knitting machines, which has bought a quantity of planers and milling machines; the Northway Motor Co., Natick, Mass., which is buying tools for the manufacture of passenger automobiles, and the Lewis-Shepard Co., Boston, manufacturers of elevating trucks, which has bought some new tools.

One of the most active buyers in the New York territory is the E. W. Bliss Co., Brooklyn, which is now inquiring for several very large planers.

There is a falling off in demand for cranes. One inquiry of interest is for thirty-four freight-handling cranes for a new pier and warehouse at Stapleton, Staten Island, N.Y., to be built by the Pan-American Terminal & Dock Corporation, Woolworth Building, New York. American crane builders are reported to have sold cranes for shipment to Canada in successful competition with Canadian builders.

Export trade is not active, but there is a fairly good inquiry from the Far East. Several large tools, costing about $50,000, have been bought here by a Japanese electrical company.

The director of sales of the War Department is offering for sale a large quantity of construction equipment, including steam engines, derricks, generator sets, gas engines, steam boilers and gas pumps, worth about $900,000. Public auctions are to be held all this week at several plants in the Detroit territory and large quantities of machine tools will be offered. The plants include those of the Ford, Briscoe and Harrour motor companies, and the Detroit Shell Co. The absorption of second-hand tools has been quite surprising, and in most instances very good prices have been obtained.

GETTING THE STEEL MILLS GOING AGAIN IS VERY SLOW PIECE OF WORK

Special to CANADIAN MACHINERY.

PITTSBURGH, Pa., October 16.—The geographic distribution of the iron and steel strike is the same as a week ago, when this report gave a complete representation, except that there have been slight increases in employment, so that the strike is a trifle less strong than a week ago. It has been losing ground since about the end of the third day, three weeks ago, but it loses ground very slowly. The strike was obviously lost for the men after the experience of the first three days, showing that a large part of the iron and steel industry, more than one-half, as a matter of fact, could operate. Why the strike continues, in such circumstances, is not altogether clearly apparent. One reason, no doubt, is that almost all the real strikers are ignorant foreigners and do not know that the strike is hopeless from the standpoint of winning any concessions, while undoubtedly another reason is that the American Federation of Labor officials are indisposed to make an effort to stop the strike as long as the labor conference at Washington is in session. The calling of the strike just before this labor conference did not help the union cause by any means, but with the strike once started it is better to keep it up than to acknowledge its failure. As to the radicals, who really produced the strike, chiefly Fitzpatrick and Foster, they have no interest in calling off the strike if they see it is lost, as they have nothing to save out of the wreck. The case is different from that of an ordinary strike of a union, when, if the strike is lost, it is to the advantage of the leaders to get the men back to work so that they can be reorganized for further attempts in future. An incidental reason why the strike wanes so slowly is that the manufacturers are not making anything like strenuous efforts to resume. They think haste would result in clashes, probably serious, by men desiring to return to work and those who wish to prolong the strike, and they prefer to let the men get thoroughly tired of striking.

Gains in Employment

There have been further gains in employment in the past week in some regions, but in hardly more than half the entire territory affected more or less by the strike. Thus there has been no gain in the Wheeling district, and indeed the 24-mill tin plate plant at Yorkville, O., went down last Thursday, together with the Southern Ohio plant at Portsmouth, comprising seven open-hearth steel furnaces, two jobbing mills and ten sheet mills. The closing of these two plants represents the only spread of the strike since the first few days, and is, of course, more than balanced by the gains in employment made elsewhere. In Cleveland there has been no gain whatever in employment, Cleveland being down tight, as was the case at the beginning of the strike. In Buffalo there may be a slight amount of employment in plants previously closed tight, but if so the gain amounts to practically nothing. The curious situation remains of the Seneca Iron & Steel Company, a sheet interest, operating comfortably, while the entire Lackawanna Steel Company outfit, immediately adjoining, is closed tightly.

In the Monongahela Valley there have been gains in employment, both as to the Homestead and Edgar Thomson plants of the Carnegie Steel Company and the McKeesport plant of the National Tube Company, which averaged about 75 per cent. operation at the low point, but are now nearer 90 per cent., and also as to plants at the head of the Valley, at Monessen, formerly closed tight and now showing a little operation. In the Shenango Valley there is a slight improvement, whereby that valley is running very nearly full. In the Mahoning Valley, formerly closed tight, there have been slight gains, as the Trumbull Steel Company, at the head of the Valley district, resumed practically in full this week. The men had been brought out the second day of the strike, largely by intimidation. Also, the small nuclei of men that were at work in some large

Youngstown steel plants the first week, and were kept at odd jobs, there being no production, have increased very considerably, so that in the past week or so a little production has been quietly attempted.

The gains in employment and production, however, only change by a few per cent. the condition of the industry as a whole, from the situation obtaining at the end of the first week, the strike being now in its fourth week. Production is probably still well under 60 per cent. of normal, probably about 55 per cent., while employment is but little if any about 60 per cent.

Pig Iron

On the whole the production of merchant pig iron has not been affected as much as the production of pig iron by steel interests, or the production of steel. All the merchant furnaces in Cleveland are down, and most of those in the Buffalo district, but the scattered furnaces are scarcely affected, and the Shenango Valley is running nearly full. The Mahoning Valley is closed practically tight, but it now contains only one blast furnace that is purely a merchant stack. In the Shenango Valley there are nine merchant furnaces, there being six at Sharpsville, two at West Middlesex and one at Sharon. Five of these have been running for ten days or more, one is out for relining, and three have either just resumed or are about to do so.

The demand for sheets before the strike was particularly good and thus it is fortunate that the production of sheets is less affected than that of several other finished products. Last week the American Sheet & Tin Plate Company operated an average of fully 82 per cent. of its sheet mills and is expecting to average better this week, while the independents operated 60 per cent. of the number operated in the week before the strike, though this meant only about 43 per cent. of the number in existence. Future operation will depend not so much upon conditions at the sheet mills as upon the supply of sheet bars, as it does not seem that enough tonnage of sheet bars is being made to carry the sheet mills that are in operation. The sheet mills had some stocks of sheet bars when the strike started.

Hardly any new business is being done in steel products, though some mills are entering occasional orders from regular customers, for delivery at mill convenience. The occasional or chance buyer, who has no regular mill connection, could hardly place any orders with mills, and some of these buyers are looking around for material in stock, on which, of course, they must pay a retail price. The mills are not going to advance prices against any shortage occasioned by the strike. Export inquiry is fairly good, but hardly any of the business offered is being accepted.

The Steel Corporation's unfilled obligations amounted to 6,284,638 tons at the end of September, showing an increase of 175,435 tons during the month, thus comparing with an average increase of 609,000 tons a month in the three months preceding. The increase was equivalent to about 13 per cent. of the month's capacity, while shipments may be estimated at 70 per cent. of capacity, against 81 per cent. in August, and thus the September bookings would seem to be 70 per cent., the shipments, plus 13 per cent., the increase in unfilled tonnage, or 83 per cent. of the month's capacity. Thus, while the Steel Corporation was very reserved throughout September in the matter of selling it did enter a large tonnage.

PIG IRON TRADE

Inquiries for export iron for the Orient have appeared. There is a good demand for spot iron and premiums have been paid for this material. Southern sales are increasing. Following are reports from various U. S. points:

Pittsburgh.—There is a brisk demand for foundry iron, and No. 2 has been quoted at $29 to $31 for prompt delivery. Steel companies have been making good-sized purchases of steel-making grades. About 15,000 tons basic and a smaller quantity Bessemer has been bought, the basic at the full market price.

Boston.—Iron for 1920 of the No. 2X grade has been sold by Eastern Pennsylvania Furnace at $32 furnace. One order of 400 tons and several smaller orders are reported. There is a continually increasing demand for next year iron, but a good many furnaces are still refusing this class of business. Out of 7,000 tons closed during the week, 3,000 tons was for next year.

New York.—A moderate demand with prices firm, covers the market situation here for domestic business. Some furnaces are quoting for next year delivery but most of them are keeping out. For this business $33 eastern furnace is quoted. There is a heavy enquiry for basic and foundry grades from Japanese interests, one enquiry being for 15,000 tons basic. One lot of 5,000 tons was closed but there are no details.

Buffalo.—There is a considerable enquiry, both for domestic and export business, but little business is being done. Furnaces are mostly sold up in this district, and, in addition, there is the strike. No new business for 1920 is being taken.

Cleveland.—There is a pretty steady demand for prompt iron for consumers who are running short on their requirements. Sales on this business has reached very respectable proportions. Plants that have been affected by the strike are asking furnaces to hold up shipments of steel-making iron.

Birmingham.—The lessening of production in the North and West is helping business in the South, and a number of orders for lots of 300 to 1,000 tons have been booked. Furnaces are not taking any 1920 business. Low phosphorus was sold by a Tennessee maker at $38 to $40 furnace.

St. Louis.—Business is mostly in small lots for prompt shipment. Some steel plants are running short of basic, and Southern furnaces will be asked to manufacture basic iron to supply their wants, about 15,000 tons.

U.S. SCRAP METAL

With the exception of the East, where buying by steel works has stiffened the market, conditions are dull. Following are reports from U. S. centres:

Philadelphia.—Buying of around 20,000 tons heavy melting steel by various interests has strengthened the market considerably. This tonnage was sold at from $19 to $20 delivered and quotations now are at the higher figure. All grades are strong with the exception of wrought pipe, for which there is no demand.

Boston.—The market is very dull here, trading being at a standstill. One enquiry developed for a fairly large tonnage from an Eastern steel mill, but nothing was closed. Most people are awaiting events.

Pittsburgh.—The tone of the market is steadier, and some sales of heavy melting have been made at $20 delivered. Foundry grades are in better demand.

New York.—Prices are remaining steady, though business is very dull, new enquiries being almost entirely absent. Deliveries against old contracts furnish all the movement there is.

Buffalo.—Nominal prices and absence of trading is the situation here, mills being mostly out of the market. Some scrap is being shipped against old contracts.

Chicago.—The strike has made the demand for rolling mill scrap and rerolling rails better, and cast scrap is also in good demand by foundries. Prices remain about the same as the last few weeks, with a slight advance in some cases.

Cleveland.—Prices here are easing off some, with yard stocks up, and trading light. Heavy melting steel is quoted at $18 to $18.25, and machine shop turnings $8.25 to $8.50. Prices are expected to stiffen when melters resume operations.

Cincinnati.—Foundries have found it necessary to buy additional scrap to finish their year's business, which has made business better than would have been the case ordinarily. Steel scrap is firmer.

St. Louis.—The market is holding steady, not through any trading, but because dealers refuse to sell except at their own figures, in spite of the fact that they have large stocks on hand. Melters are using up their stocks and will be compelled to come into the market shortly.

Birmingham.—There is no change in quoted prices, and demand for steel and iron scrap is improving.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$25 50	$26 25
Electro copper	25 00	26 00
Castings, copper	25 00	25 00
Tin	59 00	58 00
Spelter	9 50	10 00
Lead	7 25	7 00
Antimony	9 75	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	21 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

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HEAVY DUTY
Universal Millers

Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control.

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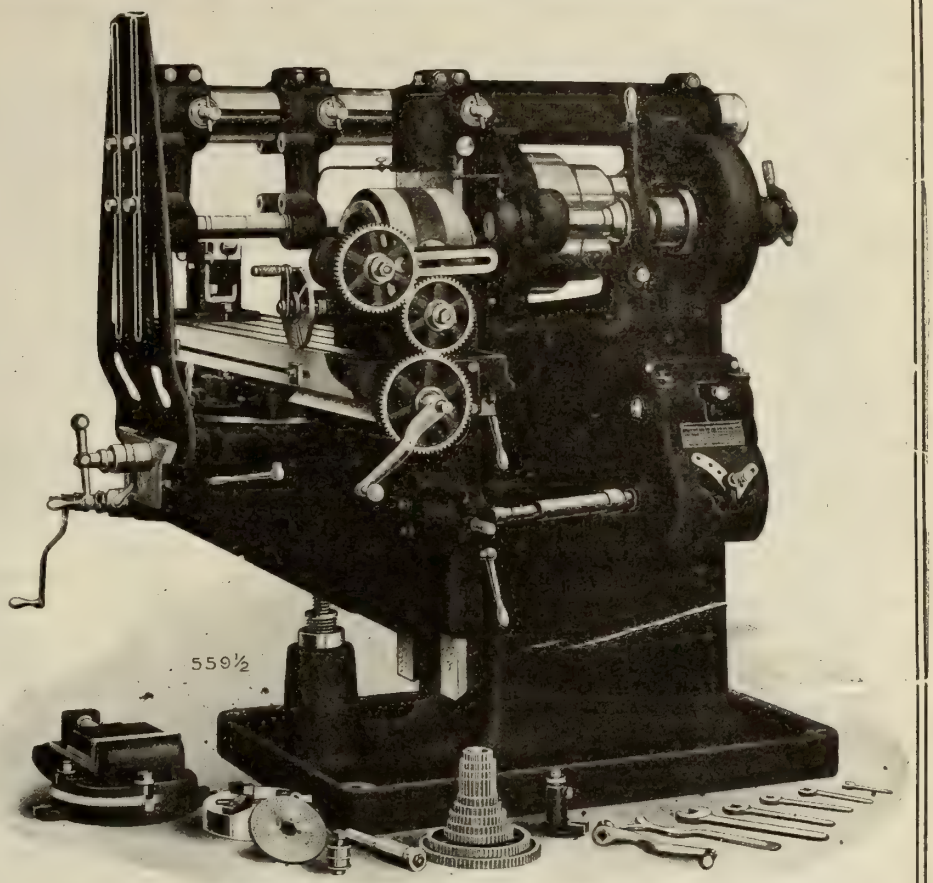

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Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

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Phone Victoria 1492

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MORROW NUTS MORROW

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Why should you buy inferior Drills or Cap and Set Screws, Semi-Nuts or Files when you can have **MORROW'S** by asking your jobber for this better kind? They may cost the jobber more, but the extra value is in every article or tool made by **Morrow's** at Ingersoll.

Will you please insist on Morrow's and get better service?

John Morrow Screw & Nut Company, Limited
Ingersoll - Canada

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 25
Sheets, black, No. 10	5 15	5 25
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 75
Premier, 10¾ oz.	....	8 05
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08¼**
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	**0 34**
Brass sheets, 24 gauge and heavier, base	**$0 42**
Brass tubing, seamless	**0 46**
Copper tubing, seamless	**0 48**

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide. 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

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CONTROVERSY OVER LOCATION OF THE HURON STEEL PLANT AT GODERICH

Things are not going well in connection with the establishment of the proposed Lake Huron Steel Corporation at Goderich. In fact negotiations at present have taken the form of an abusive campaign by B. H. McCreath against E. R. Wigle, mayor of Goderich, because the latter cannot see his way clear to go ahead and favor the annexation of a large block of property to the town.

In a recent issue of the Goderich "Signal" there appeared an open letter from Mr. McCreath to the mayor of Goderich. It sets forth Mr. McCreath's side of the trouble as follows:

"There has come to my notice through the press and otherwise, the remarks which were made by yourself and certain other members of the council in connection with the proposed annexation of the land to the south of the town. Let me say frankly, such pessimistic piffle is what has been the trouble with this community for many years.

"The by-law which you were asked to vote upon was merely to show your good faith. On condition that the company would guarantee—and that guarantee had to be acceptable to the town—that they would spend here $2,000,000 during the next eighteen months, the town would agree to annex the land to the south of the town and give freedom from taxation on the industrial area. Surely no fairer offer was ever made to any community.

The reason for your stand on the matter is not clear, for, since the very inception of the proposition, you have never given it the support it should have received, and in fact your attitude has been worse than if you had been an out-and-out opponent of the scheme. When one is in the vicinity of a mule it is not necessary to wait until he kicks; his ears are sufficient warning for most people.

"Let me make a resume of the course that you have taken during the past few months:

"You were one of those who stood sponsor for the delegation which went to Ottawa, yet you very carefully sidestepped the trip yourself and later acknowledged to me that you had no desire to go.

"Not once, but many times during the summer when we were endeavoring to close up the options on the property, different owners questioned me as to why you took the attitude of knocking the whole proposition. No doubt you will now say that this did not happen, but, as stated above, your every action has been one of opposition.

"Two days before certain directors of the company arrived here, I asked you to meet them and discuss certain phases of the situation. What was your answer? 'I have many things to do this week and do not think I can find time to see them.' And these men where here representing a company that, if located here, would make Goderich a city in two years.

"I might have overlooked your attitude in the first few weeks when these negotiations were in progress, if you had taken any steps at a later date to give the citizens of the town any leadership in finding out the standing of the men behind the company. Mr. Warren and myself went to your office and gave you a list of the directors and the names of two additional men not made public, and asked you to investigate their financial and business standing. Three weeks went by and you can imagine my amazement when, two days before your council was to consider the by-law, you told me in your office that you had not a single line with reference to any man in the company.

"You were really a manager of a huge stock company of some 5,000 shareholders. When a proposition such as this was placed before you, it was your duty to immediately make every effort to ascertain the standing of the men behind the company so that you would be able to give some leadership to the community. Rather than that you took the opposite course and took no personal action in investigating any member of the company and at the end of three weeks had absolutely no information as to any one of them. Had you been alive to your duties you would have personally visited Detroit, Cleveland and Newark to have a personal conference with the men mentioned and to get a line on their financial stability.

You chose the other course, and from reports in the press you apparently adopted your usual method of sneering criticism and a desire not to meet facts but to throw in our path every possible obstacle.

"This community has been offered, without obligation, the biggest industry any Ontario town has ever had the privilege of negotiating with. When the formal meeting is held next week and the names of the officers are made public, you will perhaps be the first to realize the position in which you have been placed. Your proper course then will be to tender your resignation for the miserable failure you have made of a big opportunity.

"The very night that you were asking, 'What is the financial standing of the company?' representatives of one of the largest Canadian banks were in Detroit negotiating for the underwriting of $4,000,000 of the preferred stock of the company. That bank had no more information as to our plans than had you; the very difference in the action of yourself and the managers of that bank is indicative of the size and mental calibre of those concerned.

"If, for any reason this company locates in this district, but not at Goderich, the cause can be laid to the door of a pessimistic community, lacking leadership at the most critical time in its municipal career.

"Yours for a Greater Goderich,
"B. H. McCREATH."

The Feeling in Goderich

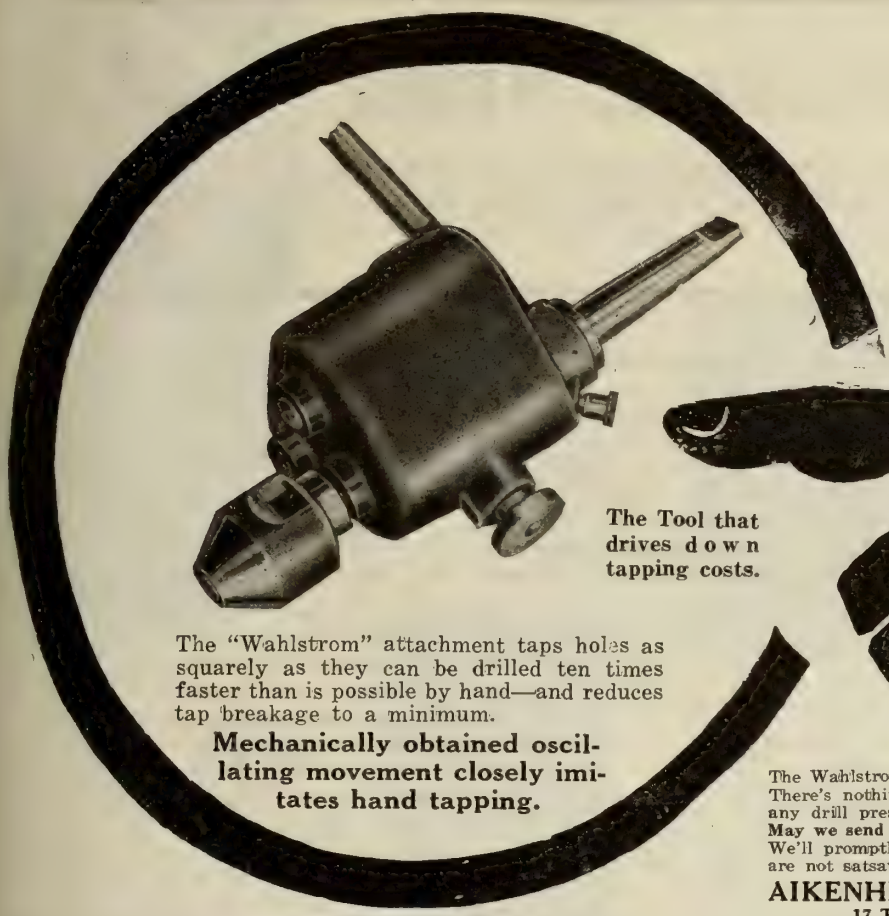
According to the Goderich "Signal," public opinion is with, rather than against Mayor Wigle. An editorial expression of opinion, in the same issue of the "Signal," has the following:

"It is exceedingly unfortunate that the negotiations between the town council and the Steel Corporation as represented by Mr. McCreath have reached a condition of deadlock. Mr. McCreath appears to lay the responsibility upon Mayor Wigle, but if the "Signal" is any judge of public opinion, from seventy-five to ninety per cent. of the people of the town share the Mayor's views, or at any rate are in serious doubt as to the safety of the course upon which the municipality is invited to enter. It would be better, we believe, to delay the submitting of the by-law to the people than to risk its defeat, and in the meantime the proper steps might be taken to remove the unfavorable impression that has gained such headway among the citizens. Frankly, the trouble is that the land-holding company comes in between the council and the steel concern and prevents the "get together" that is desirable. If this difficulty could be removed there should be no further trouble, as the town wants the steel plant and is willing to make any reasonable concession to secure it. Surely there is some way of arriving at a fair agreement, if all parties show a candid and reasonable spirit."— Editor "Signal."

As CANADIAN MACHINERY understands the case, the mayor objected to Mr. McCreath, the promoter of the Land Co., and the Land Co. in turn promoting the Steel Co., wanting the town to annex 1,008 acres to the town. The mayor's claim is that there is now enough land inside the town limits for a population of from 25 to 30 thousand people. Another feature is that the mayor and others were not sure of securing the Steel Co., and found it difficult to separate the Land Co. from the Steel Co. in the negotiations that had been carried on.

A. G. Gibbons, formerly superintendent of tools and supplies of Winslow Bros., Co., Chicago, which company had a contract for a million shells for the Government, has affiliated with the Wetmore Reamer Co., Milwaukee, in the capacity of production engineer. Mr. Gibbons was also formerly with the Cadillac Company and Brown & Sharpe for many years. The Wetmore plant has been rearranged and additional equipment installed under Mr. Gibbons' direction, and the weekly production of Wetmore expanding reamers considerably increased.

Chemical Plant Operates.—Production of soda ash is now being carried on in three shifts at the plant of Brunner Mond Canada, Ltd., at Amherstburg, after several months' idleness.



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INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Getting New Plant.—The Acme Roofing Co., Walkerville, Ont., have sold their factory, and it is their intention to erect a new plant and install the most up-to-date roofing machinery and equipment. They are now receiving tenders on new machinery. Information as to the location of the new factory will be given out later.

Portable Plant.—The Electric Welding Company, 178 Bleury St., Montreal, which has been in business since the beginning of June, has now in service a portable plant mounted on a 2-ton truck that can be taken to any point for immediate repair work. The plant consists of a 30 h.p. Matthews gasoline engine, connected to a 250 ampere Lincoln generator. H. H. Getz and F. Alcott, both experienced men, are associated with the company.

In Barton Tp.—Firestone Rubber Co. will probably locate in Barton Township, just outside the eastern limits of Hamilton. A large tract of land has been secured, part for industrial purposes, and the balance for employees' homes. The Barton Township ratepayers are voting on a tax exemption proposition. In the meantime the Firestone Co. have leased the old Canadian Cartridge plant, Hamilton, and will start building the machinery there for the new rubber plant. Mr. Cook, formerly superintendent of Canadian Cartridge Co., is to have charge of the machine building.

Canadian Patents.—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 156 Yonge Street, Toronto, from whom further particulars may be obtained: Ewart McLaughlin, sockets for automobile curtain rods; Charles Taylor, dinner carry-alls; Gutta Percha & Rubber, Ltd., process for forming rubber fabrics; Henry P. Fletcher, means for the conversion of water pastes into oil pastes by chemical and mechanical action; Thos. W. S. Hutchins, the manufacture of lamp black; Jabez Muskett, hose couplings and hose attaching devices; Diaphone Signal Co., Ltd., metal bending and forming machine; Nils Testrup, methods of conducting high temperature reactions; John Forsyth, Ltd., reversible cuffs; E. O. Williams, slipways for the construction of reinforced concrete ships, barges, floating structures and the like.

Less Space Requisitioned.—The British Shipping Controller has announced that in the future the space controlled by him on steamers to Canada will be reduced. It is at present 50 per cent., but it will be eased off monthly until all space is free for private shipments.

Granby Starts By-Product Plant.—The Granby Consolidated Mining Company at Anyox, B.C., have now put their by-product plant in full operation. Toluol, benzol, sulphate of ammonia, and coal tar are among them. The coal tar will be shipped to Vancouver and resolved into pitch and creosote, and will be sufficient for all B. C. requirements in these lines.

Secure Power Supply.—The International Paper Company has just recently entered into contract with the Shawinigan Power Company to supply all the power requirements for the large new development at Three Rivers, Quebec. It was first thought that the Paper Company would undertake the exploitation of power generation on their own initiative, but after a thorough survey of the power situation, it was decided that it would be more successful and economical to purchase their power from outside sources. The ultimate horse power that will be required is problematical, as this will be augmented from time to time as the needs become greater. The initial output of the mill will be about 200 tons of newsprint per day, and this will call for about 20,000 h.p. The plant, when in operation, will employ about 1,500 men.

St. John, N.B.—Angus McLean, general manager of the Bathurst Lumber Co., and Major V. J. Hughes, of Montreal, manager of the Canada Iron Corporation, appeared before a meeting of the Provincial Government this week in connection with the plans for the development of water power on the Nipisquit River. The contract, Mr. McLean said, is to be carried out by Morrow & Beatty of Peterborough, Ont., under direction of Wm. Kennedy, Jr., hydraulic engineer. It is proposed to build a dam at Grand Falls on this river to develop 10,000 horse power, to be transmitted to Bathurst, N.B., for the operation of the pulp and saw mills and other industries controlled by the Bathurst Lumber Co. Two generators will be installed at once and arrangements made for the installation of a third, if necessary. The transmission line will carry from 50,000 to 55,000 volts and will be erected on steel poles.

W. T. Hamilton has applied to the city council of Fredericton in behalf of the Plumbers' Exact Supplies, Ltd., for a site in Argyle street with certain tax exemptions, to erect plant to employ from fifteen to forty men.

Provincial capital is now being interested in the development of the antimony mines at Lake George, N.B., and plans being completed for the new project which includes manufacturing the by-products of the mines in New Brunswick. Plans call for an investment of about $150,000 in connection with the plant and for the duplication at St. John, N.B., of a plant now in New York. W. H. Irvine, of Fredericton, N.B., is interested in the scheme and is receiving encouragement. With the new Valley Railway having started extra transportation facilities are afforded.

TENDERS

The erection of the new dry dock at Esquimalt by the Provincial Government has been decided on. Tenders will be called for very shortly for the construction work.

Improvements of the harbor at Glace Bay, N.S., will be undertaken by the Dominion Government in the near future. This includes dredging of channels, etc., and will cost approximately $50,000.

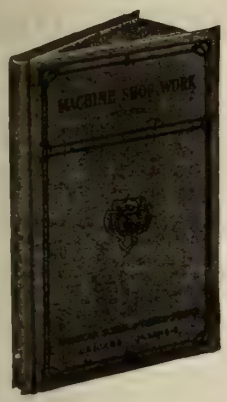
The Department of Public Works is calling for tenders to be in by October 21 for renewing the floor of Shellmouth Bridge, Shellmouth, Man. Plans and specifications can be obtained at the Department, Ottawa; office of the District Engineer, Winnipeg, Man., and at the post office, Shellmouth, Man.

Department of Railways and Canals are calling for tenders to be in by October 20 for reconstruction of the east pier at Port Maitland, Ont. Plans and specifications can be obtained at the Department, Ottawa, or the office of the superintending engineer, St. Catharines, Ont.

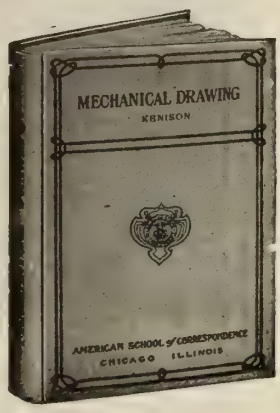
The Department of Public Works of Ontario is asking for tenders, which must be received by October 17, for the excavation of foundations and building foundation walls of the new main building at the Ontario School for the Deaf, Belleville. Plans and specifications can be obtained from the bursar of the school or from the Department.

Mechanical Engineering Books

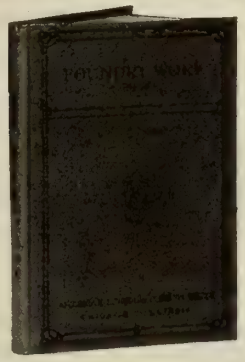
If you are desirous of improving yourself in your trade and so putting yourself in the position of making more money, these Mechanical Engineering Books will be found helpful.



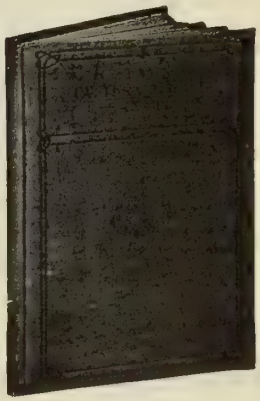
MACHINE-SHOP WORK. By Frederick W. Turner, Instructor in Machine-Shop Work, Mechanics Arts High School, Boston. 208 pp., 241 illus. Cloth binding. The use of various hand tools is explained, followed by a comprehensive discussion of the lathe and lathe tools, with the methods of screw cutting, taper and eccentric turning, etc. The way to figure compound gears for screw cutting; drilling; boring; planers; shapers; slotters; milling machines and cutters; how to cut spirals, gears, cams, etc.; grinding; the operation of automatic machines. Price $2.00



MECHANICAL DRAWING. By Ervin Kenison, S.B., Assistant Professor of Mechanical Drawing, Massachusetts Institute of Technology. 176 pp., 120 illus. Cloth binding. Gives a course of practical instruction in the art of Mechanical Drawing, based on methods that have stood the test of years of experience. Includes orthographic, isometric and oblique projections, shade lines, intersections and developments, lettering, etc., with abundant exercises and plates. Price $1.25



FOUNDRY WORK. Revised by Burton L. Gray, instructor in Foundry Practice, Worcester Polytechnic Institute. 224 pp., 191 illus. Cloth binding. A practical handbook on standard foundry practice, including hand and machine molding, cast iron, malleable iron, steel and brass casting, foundry management, etc. Includes use of various types of molding machines. Price, $1.25



PATTERN MAKING. By James Ritchey, Instructor in Wood Working, Armour Institute of Technology. 160 pp., 250 illus. Cloth binding. Shows the reader how to take the pattern for any kind of casting under any condition. The allowances for shrinkage, draft, and finish are explained. Simple and built-up patterns of all kinds are clearly treated. Various special cases are taken up, such as pulleys, cranks, pipe connections, valves, etc. Price.....$1.75

MACHINE DESIGN. By Charles L. Griffin, S.B., Assistant Engineer, the Solvay-Process Co., American Society of Mechanical Engineers. 208 pp., 82 designs. Cloth binding. Explains in detail how to make the entire design of all kinds of machinery, how to lay out gears, etc., with complete specimen designs of numerous machines. Price ... $1.75

FORGING. By John Lord Bacon, Eng. and Supt. of Construction, with R. P. Shields & Son, San Diego, Cal., American Society Mechanical Engineers. Author of "Forge Practice." 128 pp., 180 illus. Cloth binding. A working handbook of practical instruction in hammering, working, forming, and tempering of wrought iron, machine steel, and tool steel, including the important modern development of electric welding. Price $1.25

TOOL MAKING. By Edward R. Markham, Consulting Mechanical Engineer, formerly Superintendent of the Waltham Watch Tool Co., American Society of Mechanical Engineers. Author of "The American Steel Worker." 224 pp., 325 illus. Cloth binding. Takes up the methods of treating tool steels—annealing, tempering, spring tempering, hardening, case-hardening, etc.; how to make drills and reamers of all kinds; the making of arbors and mandrels, taps, hobs, reamer and tapholders, jigs, gauges, dies and die-holders of all kinds, counterbores, facing tools, milling cutters, hollow mills, and forming tools. Gives all necessary information for tool making in all its branches. Price $1.75

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BLACK DIAMOND OVENS

The Canadian Northern Quebec Railway is asking for tenders for boring at the Jacques Cartier River, and tenders will be received till October 14. Boring must be done with a core drill and the core preserved. For further information apply A. F. Stewart, Chief Engineer Eastern Lines, 27 Wellington Street E., Toronto, Ont.

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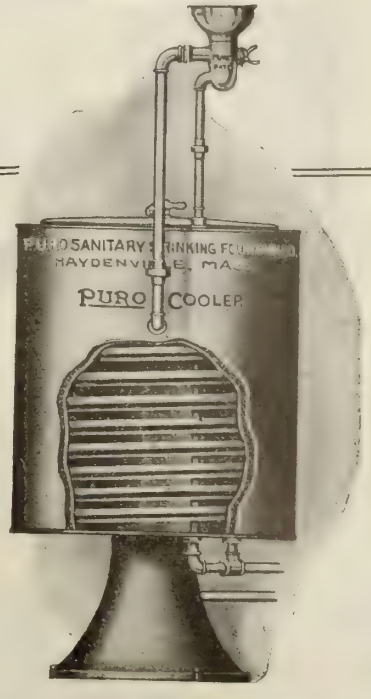


The Department of Public Works, Ottawa, require tenders for grain conveyor equipment for St.. John Harbor, N.B., which will be received up to October 23.. The equipment is for Berth 15, and plans and forms of contracts can be obtained from the office of the Engineer-in-Charge, St. John, N.B., or from the District Engineer, Shaughnessy Building, Quebec, Que., and Equity Building, Toronto, Ont.

INCORPORATIONS

Ottawa Civic Hospital.—The plans for the proposed civic hospital, which is to cost $1,400,000, will be drawn up by Messrs. Stevens & Lee, of Toronto and Boston. This firm specialize in hospital architecture. The architects' fees will be 7 per cent. of the cost, paid in instalments as the work progresses.

Rushing Work on New Plant.—The contractors for the new plant of Porritts & Spencer, at Hamilton have been promised a substantial bonus if they complete the buildings ready for the installation of machinery by December 1. President Spencer is on his way from England to Canada, and is very anxious for the company to get into its Canadian headquarters.

To Start January 1.—The plant at Brantford of the Robbins & Myers Company will be ready for operation on January 1, 1920, according to a statement by Mr. R. B. Booth, general manager of the company, who has arrived in the city. One large building, 150 by 360 feet, is all that is contemplated at present, and H. K. Ferguson, of Cleveland, has the contract for that. The only possibility of a delay will be in case of a hold up of the structural steel. The brick supply has been assured.

Ottawa.—Incorporation of the following companies is announced in the "Canada Gazette": Dominion Oilcloth & Linoleum, Ltd., Montreal, $5,000,000; Whitehead, Winans, Ltd., Montreal, $50,000; Ames-Holden Felt Company, Ltd., Montreal, $500,000; Associated British Industries (of Canada), Ltd., $100,000; Levant-American Mercantile Co., Ltd., $25,000; General Iron & Metal Co., Ltd., $19,000; Emile Lacas, Ltd., $500,000; Edmonton Lumber Exchange, Ltd., $200,000; Pacific Metals Transportation Co., Ltd., Montreal, $15,000; Rock City Tobacco Co., Ltd., Quebec, $2,500,000; Canadian Consolidated Corporation, Ltd., Toronto, $110,000; Salem Oil & Grease Co., of Canada, Ltd., $45,000; Canadian Steel Tire & Wheel Co., Ltd., $1,000,000; James Robinson Co., Ltd., $600,000; French Clasp Co., Ltd., Montreal, $50,000; Chemical Products Corporation, Ltd., Toronto, $3,000,000; Dominion Stores, Ltd., Toronto, $575,000; The Colonial Glass Co., Ltd., Lakefield, Ont., $50,000; Rideau Iron & Metal Co., Ltd., $25,000; Edwin E. Bell, Ltd., Hamilton, $50,000; Canada Brass Products, Ltd., Montreal, $50,000; The Automobile Exchange of Canada, Ltd., Montreal, $100,000; Blackburn's, Ltd., Toronto, $40,000; Canada Bitulithic, Ltd., $1,500,000.

Montreal.—The visit of David Rogers, the general works manager of the Skinner-Eddy Shipbuilding Corporation, Seattle, has given rise to some interesting rumors relative to the forming of a great shipbuilding syndicate. According to these tales, several prominent shipbuilders in the States and Canada would amalgamate and lay down yards in the most suitable locations, notably Montreal. Work to the amount of $400,000,000 is said to be already pledged. Old Country builders would be included in the merger.

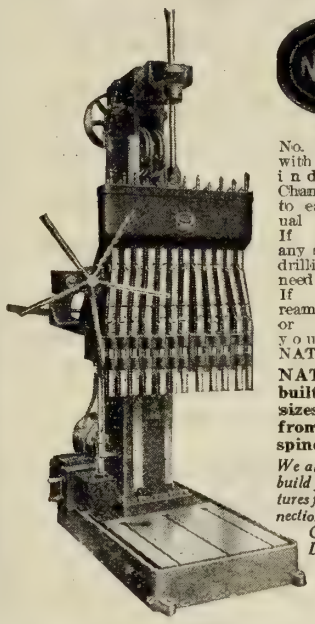
Belleville.—Bound from Belleville to Oswego, the schooner Grace M. Filer was dismantled in a squall in the Bay of Quinte recently. The mizzenmast went by the board, the main topmast carried away, and several of the head sails. The skipper was standing near the rail, about three feet from where the mizzenmast struck in its fall, and had a narrow escape of being killed. The vessel will be laid up after being repaired.

Brockville.—The steamer Richard W, bound for Ogdensburg, went ashore in Lake St. Louis. Tugs from Montreal endeavored to refloat her without success, and the Donnelly Wrecking Fleet from Kingston was appealed to. The vessel will be taken to Ogdensburg for dry docking after being refloated.

Brockville.—The steamer Keynor, belonging to the Montreal Light, Heat & Power Company, went ashore at Annasette Light, Lake St. Francis, while on a voyage to Montreal. She is expected to float shortly. The steamer Adrian Iselin, which had an accident in the Cornwall Canal a few days ago, has been hauled out at the Ogdensburg Shipyard for repairs.

Sacketts Harbor.—The Donnelly Salvage Company, which is engaged in salvaging the cargo of the barge Hilda, wrecked on Stony Point, is making good progress. So far about 5,000 bushels have been removed from the wreck. The Hilda is exposed to the full sweep of the lake with a south-west wind, and this makes salvage operations difficult. She is lying head on to the shore, and is in about 9½ feet forward and 10 feet inches aft. Capt. Donnelly has no doubt that he can get her off after lightening.

Negotiations are now pending between Lewis J. Seidensticker, manager of the plant of the Atlantic Sugar Refineries here, and their employees regarding increased wages and shorter hours. The manager went to Montreal this week to confer with headquarters regarding the matter.



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One Oliver Tool Room Lathe, 16 in. by 7 ft. bed, complete with taper attachment, relieving attachment, chuck, etc., hollow spindle, double back gear, large and small face plate and steady rest, in perfect condition.

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Two Davenport, 22 in. by 10 ft., quick change gear Lathes, like new, very cheap.

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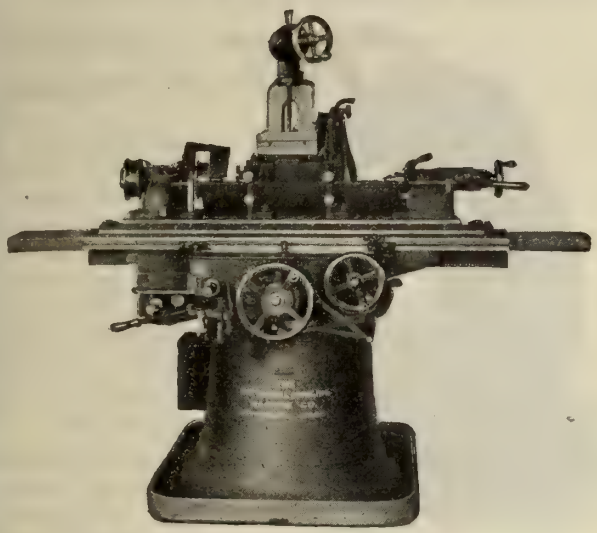

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All machines grind inserted tooth mills up to 20 in. diameter.

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5—No. 0 Steptoe Hand Millers
13″ x 5′ 6″ New Carroll-Jamieson Quick-Change Lathe
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15″ x 6′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
15″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 17″
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3—17″ x 8′ New Sidney D.B.G. Quick-Change Lathe, swing 19″
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Toronto, Canada

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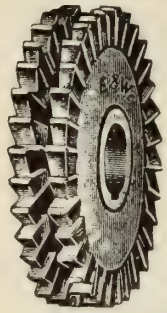

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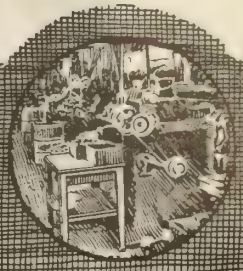

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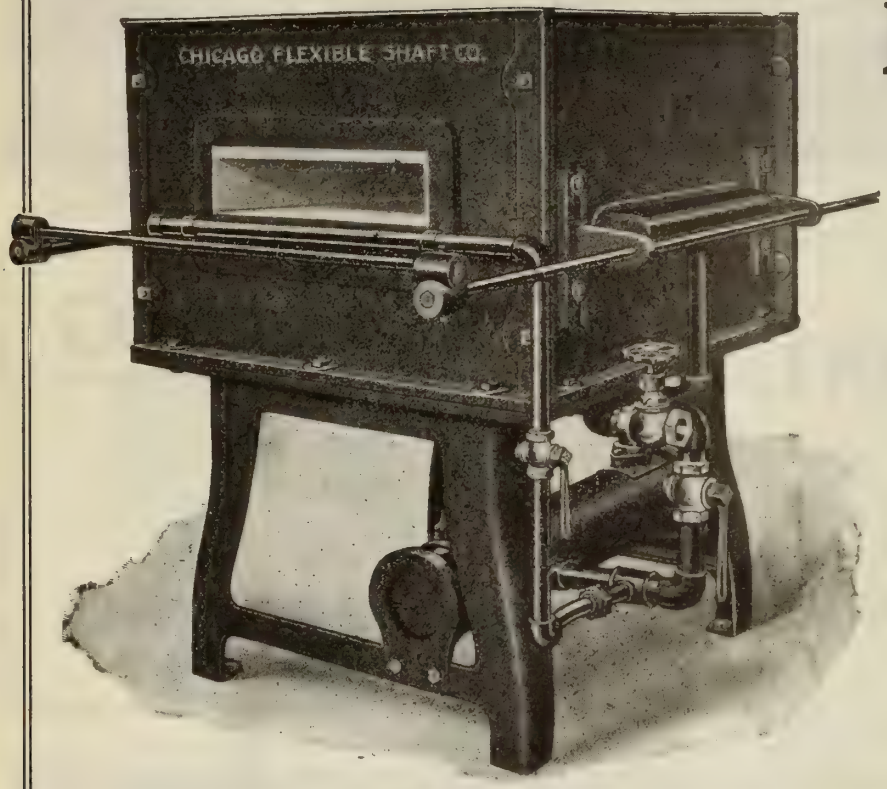

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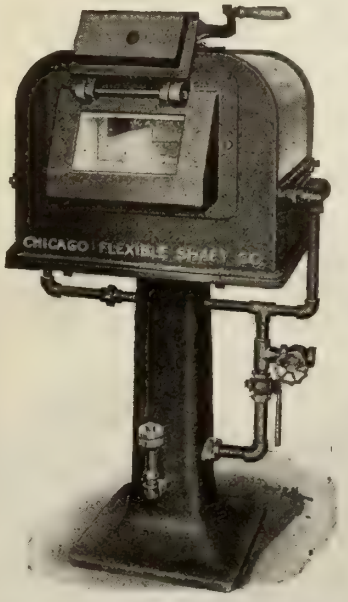

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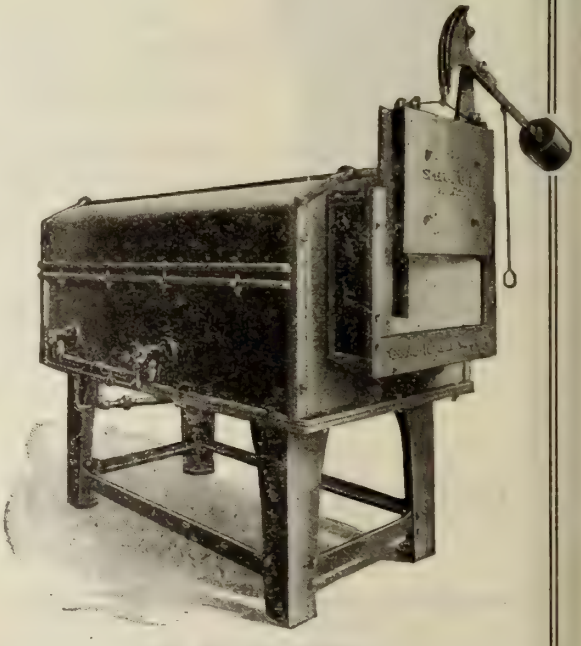

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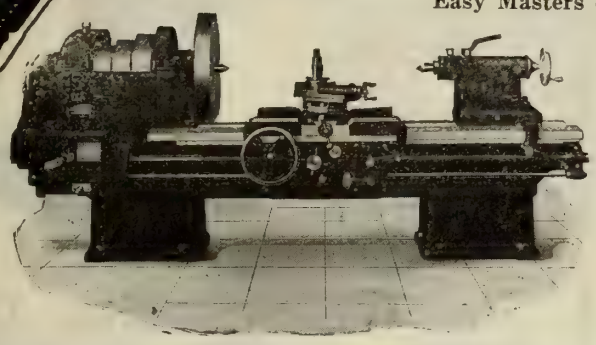

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SIDNEY, OHIO

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Either in Cone or Geared Head Type

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A Cisco geared head is the most powerful lathe made.

WE CAN SUPPLY PROMPTLY

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THE LATHES WITH THE PULL
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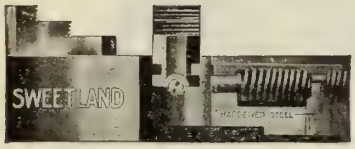
Our Independent Lathe Chuck which stands for three-score years of mechanical endeavors. The gripping and gearing surfaces, both of hardened steel, are ground perfectly true. The large screws of special grade steel are flush with the body of this Sweetland Independent Lathe Chuck. The strong jaws are high-grade steel, properly hardened. Sweetland Chucks, whether they are Independent Geared, Scroll, Universal or Combination, increase production.



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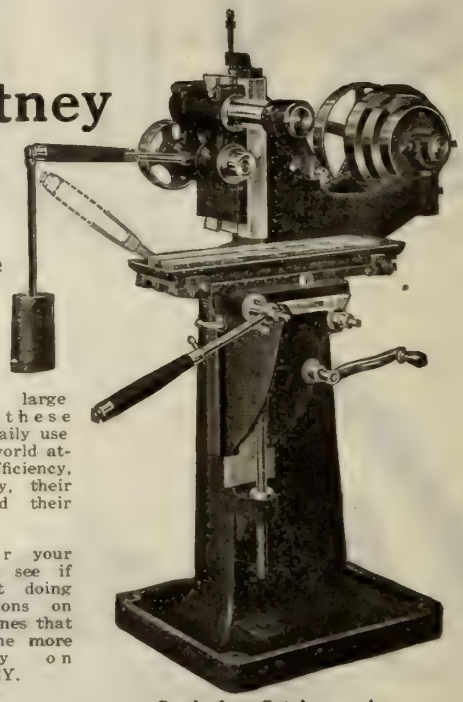

The very large quantity of these machines in daily use all over the world attests their efficiency, their economy, their accuracy, and their durability.

Look over your methods and see if you are not doing some operations on heavier machines that might be done more advantageously on the WHITNEY.

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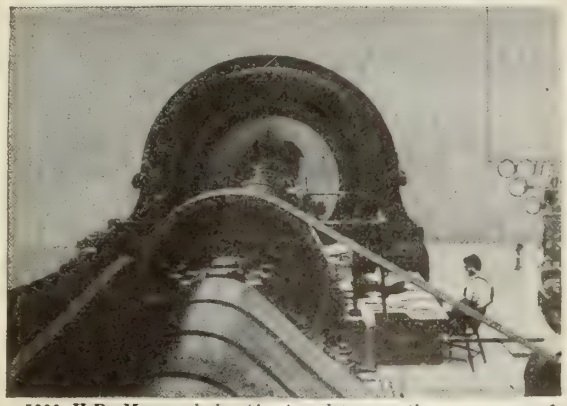
Hartford Conn. U.S.A.
Chains—Keys—Hand Milling Machines.



5000 H.P. Morse chain (4 strands) operating generator from water wheel.

"Renold" or "Morse"
Silent Chains

are employed throughout Canada on **Main Drives, Municipal Fire Pumps, etc., Evidencing Absolute Reliability.**

Jones & Glassco, Regd.
Canadian Agents
Toronto - Montreal

STEEL TANKS

THE
TORONTO IRON WORKS
LIMITED

HEAD OFFICE: ROYAL BANK BLDG. TORONTO WORKS: CHERRY STREET

Oil Storage, Gasoline Tanks, Air Receivers, Pneumatic Water Supply Tanks, Smoke Stacks, Boiler Breeching, Riveted Steel Pipe, Bins and Hoppers. Heavy and light steel plate construction erected anywhere.

Mr. Safety Engineer, don't wait for an eye accident before ordering STOCO SAFETY GOGGLES "CELOGLAS"

SHATTER-PROOF LENS

The proverb anent a stitch in time—not to mention the one about an ounce of prevention—is very applicable to the prevention of eye accidents. The protection afforded by Stoco Safety Goggles is fast becoming proverbial in industrial fields.

PRICE

(With either easy cable earbows or black elastic headband) Per 100

With Clear Glass Lenses $115.00

With Celoglas "Shatter-Proof" Lenses..... $150.00

A sample of the Stoco Safety Goggle will be sent without charge to Safety Engineers, Purchasing Agents and Superintendents on receipt of request on letterhead.

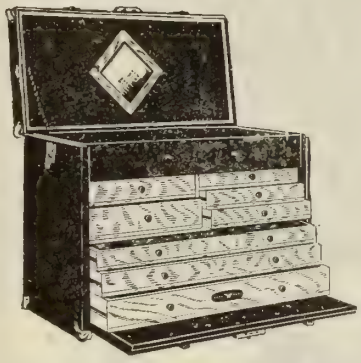
STANDARD OPTICAL CO.

GENEVA, N. Y.

Ask for Quotations on Iron and Steel

We have in stock for immediate shipment the highest grade Bar Iron, Black and Galvanized Sheet Iron, Machine Steel, Cast Steel, High Speed Steel, Cold Rolled Steel, etc.

Machinist's Tool Chests

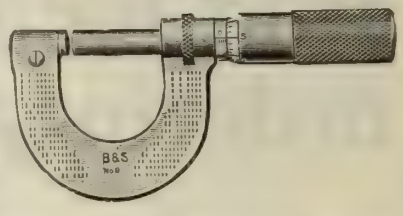


Time and again skilled machinists have remarked on the strength of construction and compact design of our Tool Chests. Have us give you full particulars.

CRESCENT BELT FASTENERS

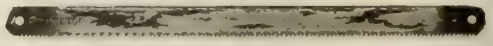
Clinch beneath the surface of the belt on the pulley side—no part in contact with the pulley. They maintain uniform grip the entire width of belt and never weaken from wear.

Micrometer and other fine tools



Select from such wholly dependable makes as Starrett or Brown & Sharpe, or from other makes you have proven in your own shop to be most durable and efficient. Our stocks are complete.

"Victor" Hack Saw Blades for Tough Metal



Durable, fast-cutting blades that you can rely upon to cut true through toughest metals. Users have found that these blades increase every day's output and serve much longer than ordinary blades.

Write us about your requirements

RICE LEWIS & SON, LIMITED

Established 1847 **TORONTO, ONT.** **19 Victoria Street**

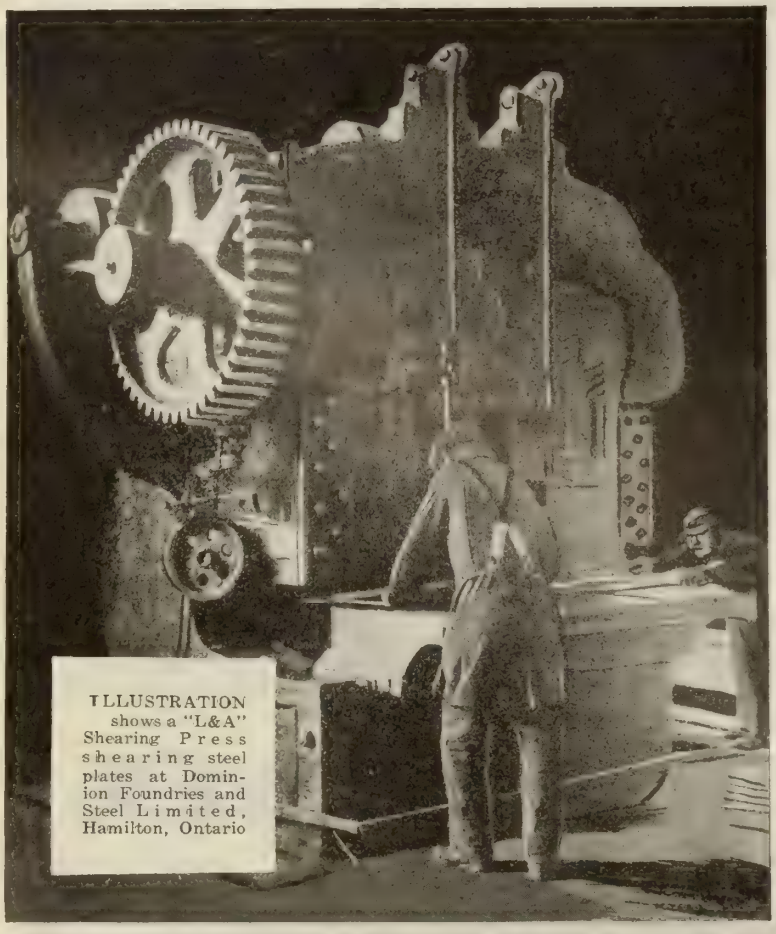


ILLUSTRATION shows a "L&A" Shearing Press shearing steel plates at Dominion Foundries and Steel Limited, Hamilton, Ontario

"The Quality Line"

PUNCHING and SHEARING MACHINERY

We manufacture "The Quality Line" machinery equipment for Rolling Mills, Bridge and Structural Works, Steel Car Plants and Shipyards. All machines are built of the same high grade workmanship and material that have given the "L & A" product a recognized standard of quality of over 50 years.

Send for our big catalogue.

The Long & Allstatter Co.

American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

Canadian Agents :
RUDEL-BELNAP MACHINERY CO., LIMITED
Toronto, Montreal.

Try it Yourself

The best argument in favor of throwing away files the moment they become dull is to try filing a job yourself with a dull file.

If it makes you irritable, think what effect it must have on a man who has to file all day long.

Don't let your men work with dull files. Tell them to turn them in when they become dull.

When buying, specify Famous Five Files. You get a good run of sharp service from them because each file is accurately cut, well balanced and properly hardened.

Thor Chipping, Calking and Beading Hammer

Thor punch has helped put across many a job

Time is one of the most important items involved in every contract job.

The speed with Thor Hammers, Drills and other Tools work has pulled many a contract through on time.

Write for our Thor Catalog No. 10

Independent Pneumatic Tool Company

334 St. James St. - Montreal

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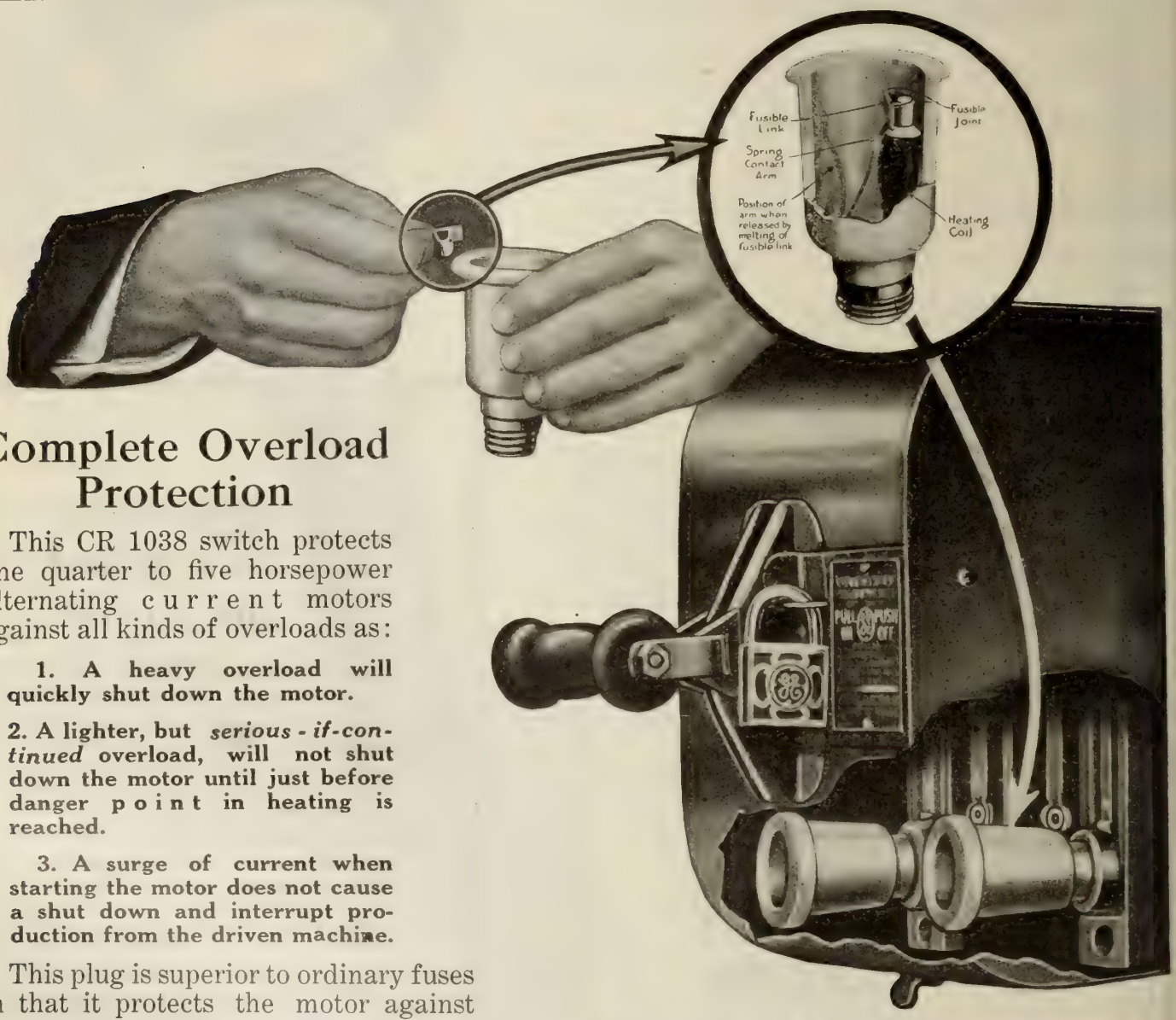
32 Front Street W.

WINNIPEG
123 Bannatyne Ave. E.

VANCOUVER
1142 Homer Street

Thor

Important motor driven productive machinery must be kept going. Interruptions are practically eliminated where motors are automatically protected against only the overloads that injure.



Complete Overload Protection

This CR 1038 switch protects one quarter to five horsepower alternating current motors against all kinds of overloads as:

1. A heavy overload will quickly shut down the motor.

2. A lighter, but *serious - if-continued* overload, will not shut down the motor until just before danger point in heating is reached.

3. A surge of current when starting the motor does not cause a shut down and interrupt production from the driven machine.

This plug is superior to ordinary fuses in that it protects the motor against overloads, which are serious because continued, while the former protected only against peak overloads.

Ask our nearest office for descriptive sheet No. 68327A

A small spring switch in the poreclain protective plug shown is held shut by slipping a little link over its end. If a current large enough to injure the motor flows through the plug the fusible joint of the link is melted by the heating coil. For the cost of a postage stamp the link can be renewed and plug made operative again.

Canadian General Electric Company

Limited

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BRANCH OFFICES: Montreal, Quebec, Halifax, Sydney, St. John, Ottawa, Hamilton, London, Windsor, Cobalt, South Porcupine, Winnipeg, Calgary, Edmonton, Nelson, Vancouver and Victoria.

General Office and Works of the Mesta Machine Company, Pittsburgh, Pa., U. S. A.

GAS AND STEAM ENGINES

for

Blast Furnaces—Rolling Mills—Power Plants—Gear Drives—Rope Drives

Condensers

Air Compressors Vacuum Pumps

ROLLING MILL MACHINERY

Blooming Mills	Tin Plate Mills
Slabbing Mills	Doubling Shears
Structural Mills	Squaring Shears
Bar Mills	Plate Shears
Continuous Mills	Bloom Shears
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CASTINGS

Carbon Steel—Alloy Steel—Bronze

Air Furnace Iron Castings

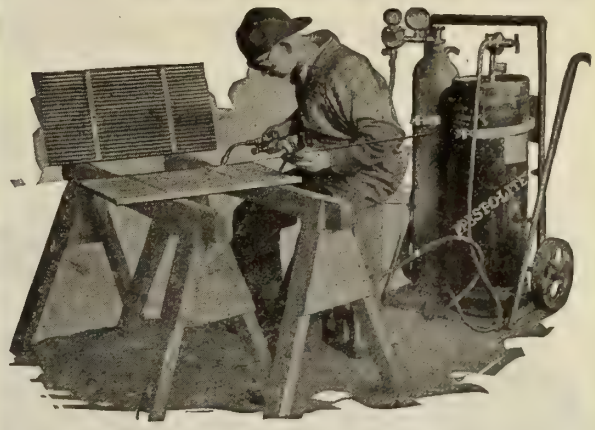
Carbon and Alloy Steel Forging Ingots

Write for a Bulletin

Mesta Machine Company

Pittsburgh, Pa. U. S. A.

Oxy-Acetylene Welding and Cutting



Prest-O-Lite Welding Has Proved Its Value

In nearly every line of metal manufacture, from the making of delicate jewelry to massive locomotives, the Prest-O-Lite Process of Oxy-Acetylene Welding has firmly established itself. Where two pieces of metal are to be joined, it is supplanting the bolt, rivet and threaded joint in hundreds of factories and repair shops.

The above illustration shows a Prest-O-Lite operator reinforcing corrugated iron sheets, saving the time and expense of boring and rivetting, simplifying the work, and producing a neater, stronger job.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones; provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe automatic regulators and gauges and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it.

Address Department C—107

Prest-O-Lite Company of Canada, Limited

PREST-O-LITE BUILDING

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TORONTO

Plants at: Toronto, Ont., Merritton, Ont. Shawinigan Falls, P.Q., St. Boniface, Man.

World's Largest Makers of Dissolved Acetylene

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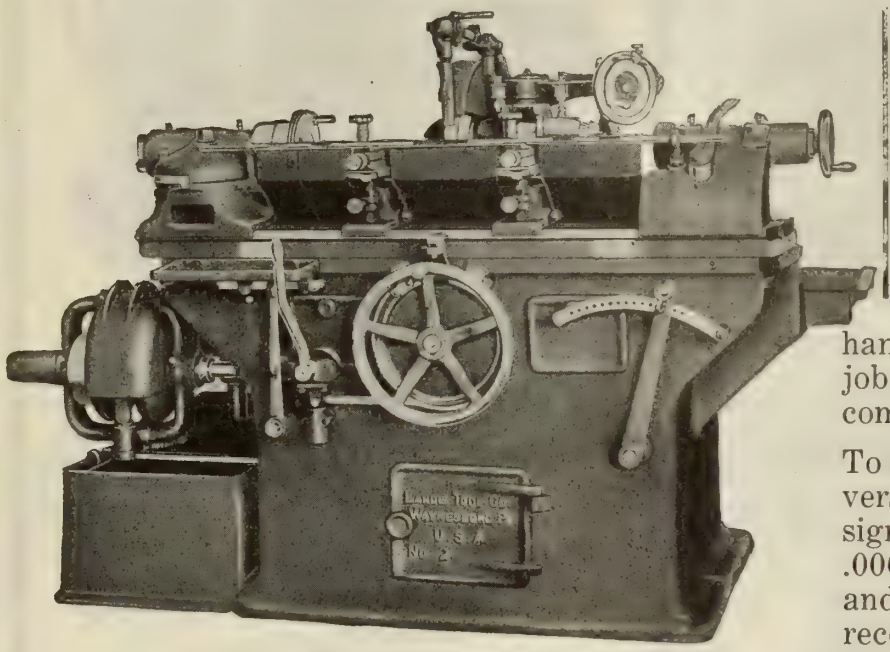
The Productive Landis Universal

WILL COMPLETE YOUR TOOL-ROOM GRINDING EQUIPMENT



These are "High Pressure" times that require "High Pressure" methods and equipment.

Unless your **Tool Room** is equipped for "High Pressure" work, your capacity is lowered; and unless you have the machines to handle the varied and difficult jobs, your **Tool Room cannot** compete.

To this end, the LANDIS Universal Grinding Machine is designed to work accurately to .00025″ in handling varied lines and yet establish production records.

Send for our catalog.

LANDIS TOOL COMPANY

WAYNESBORO, PA.

NEW YORK : 50 CHURCH STREET

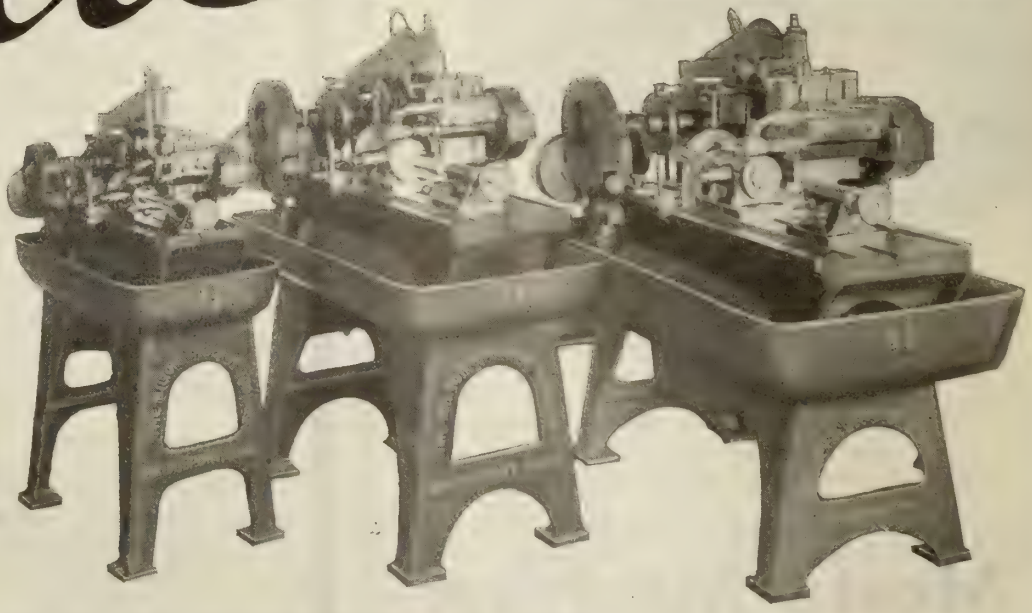
Bilton GEAR MILLERS

Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver—as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog 30-6



Over 500 leading manufacturers now use the Bilton for high production on accurate work.

Bilton Machine Tool Co. Housatonic Avenue Bridgeport, Conn., U.S.A.

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co. Ltd.

When You Lift the Cat—

Do you carry her near the ground so that her claws catch in the carpet, or do you lift her clear?

—When material is moved from place to place in your factory or warehouse, is it lifted clear of the ground—as you would lift a cat—or is it carried in Trucks?

Every obstruction on the ground, every uneven patch in the floor, all the other traffic in passage ways blocks a truck. It is impossible to carry much of a load at a time. A piled-up truck is hard to steer and manage. There is every chance for a truck to collide with corners, machinery or other trucks—resulting in lost time.

How small castings can be carried overhead.

BT Overhead Conveyors

With BT Overhead Conveyors, material is moved quickly and with a minimum of handling. The obstructions on the ground do not matter. For running between buildings or out into the yards, they are ideal. The cost is trifling compared to the money they save. Our experience in designing conveyors for different industries is at your disposal. We have equipped steel plants, coal sheds, ice houses, leather tanneries, lime kilns, brick yards, pickle factories and a number of others. Our conveyors can be installed in any building.

An opportunity to give you further particulars would be greatly appreciated. An expression of your interest will bring full details. Your written request for further information will place you under no obligation whatever.

How a fruit company uses a BT overhead conveyer to unload freight cars.

BEATTY BROS., LIMITED. Head Office: FERGUS, ONT.

***Branches at*—Winnipeg, Man., Edmonton, Alta., Montreal, Que., St. John, N.B.**

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No Element of Chance in "HISCO" Products

Every process that enters into the production of a steel casting must count upon the final factor of responsibility.

Hisco Steel Castings represent the highest possible standards of quality, having in view the purpose required—and whether the weight be in pounds or tons. Every heat of steel that is poured has behind it a laboratory test.

Hisco plant is equipped to produce any definite grade of steel casting in any alloy or process from one pound to 20 tons.

Send us your specifications.

Over 30 years of rapid growth.

MACHINE MOULDED GEARS

in sizes up to 18 feet, without patterns.

Hull Iron & Steel Foundries, Limited

HULL, CANADA

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

Clothing Protection as Necessary as Machine Guards

PROTEXAL CLOTHING

is safe and comfortable. Extra patented fasteners at wrists and ankles permit garments being more tightly fastened and safeguard the wearer from being caught in machinery; this feature alone helped make Protexal clothing popular.

No Clothing like it Marketed

Made of high-grade, closely woven, especially treated duck material to **resist fire, water or acid**; will outwear overall or other work-cloth.

GARMENTS STAMPED "PROTEXAL"

are backed by our guarantee. A garment for every industrial need. This clothing is as popular as our

ADJUSTOGLASS PROTECTION GOGGLES

for chippers, grinders and welders.

Protexal Booklet and Goggle Catalog No. 2 now ready. We carry a complete line of safety appliances.

The Strong-Kennard & Nutt Co.

Safety, First-Aid and Welfare Equipment
2044 E. 9th St. Cleveland, O.

Jobbers and Dealers Wanted. Write Early. Advertising Campaign.

EXHIBITORS AT SAFETY CONVENTION, GRAYS ARMORY, CLEVELAND, OHIO, OCTOBER 1-4, BOOTHS 1-3-5B.

Whitcomb-Blaisdell Planers

WHITCOMB-BLAISDELL LATHES AND PLANERS PLAY SOME PART IN THE MOST OF THE HIGH-GRADE MACHINE TOOLS MADE ON THE CONTINENT.

ALL-ROUND machines for high grade work, they are equipped with special labor-saving attachments that add to their convenience and enable the operator to "speed up" without endangering accuracy.

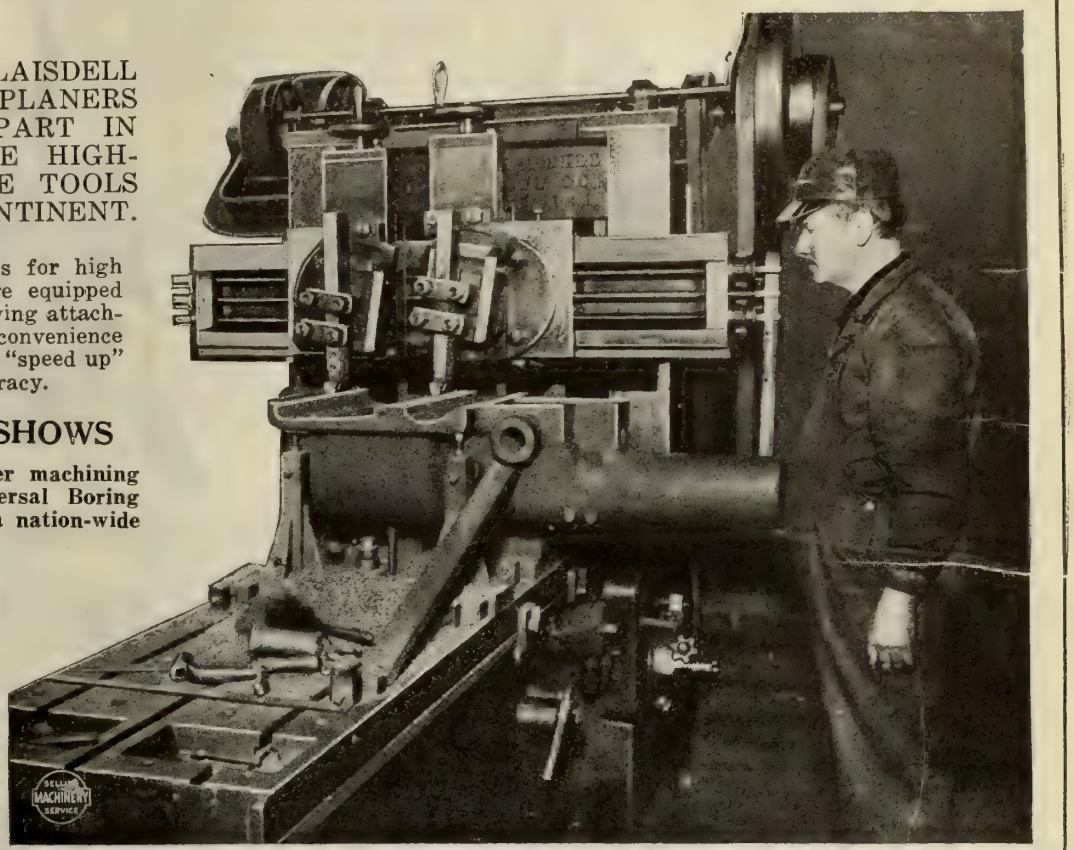
ILLUSTRATION SHOWS

a Whitcomb-Blaisdell Planer machining the head post of a Universal Boring Machine—a machine with a nation-wide reputation for accuracy.

May we send you our catalogue giving full particulars?

Whitcomb-Blaisdell Machine Tool Co.

WORCESTER, MASS. U.S.A.



Perfect Riveting

Provided its cost is the lowest possible, riveting so well done that it can't be improved upon, is perfect riveting.

Boys on Grant Riveters accomplish two and three times as much perfect riveting as an equal number of men using ordinary machines.
With the

GRANT
ROTARY
VIBRATING RIVETER

rivets placed close up to the shoulder of the work are as rapidly spun perfectly smooth as are rivets in easy-to-reach spots.

The Grant Mfg. and Machine Company
Holland Ave.
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Send for "Perfect Riveting"

STEEL PLATE WORK

BOILER BREECHINGS
SMOKESTACKS, STAND PIPES
TANKS, BINS, HOPPERS
RIVETTED STEEL PIPES
FLUMES AND PENSTOCKS

STRUCTURAL STEEL WORK

Machine work of all descriptions. Send us your specifications.

WILLIAM HAMILTON CO.
LIMITED
Peterboro, Ontario, Canada

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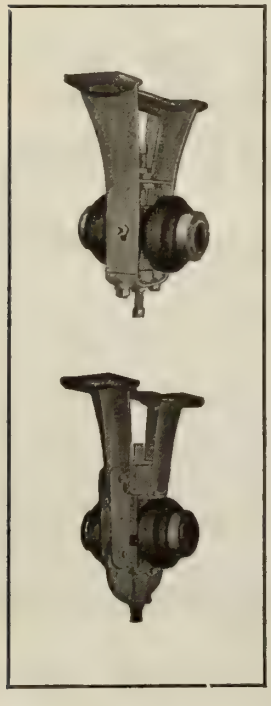
Think of It!

YOU PAY FOR THEM

Whether

YOU BUY THEM OR NOT



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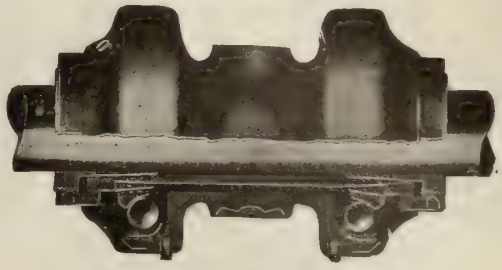
15 to 40% saving of your total power cost. 95% saving lubrication.

Eliminates hot boxes and rebabbitting expenses. Are Dirt, Dust and Drip Proof.

WILL FIT YOUR PRESENT HANGER FRAMES.



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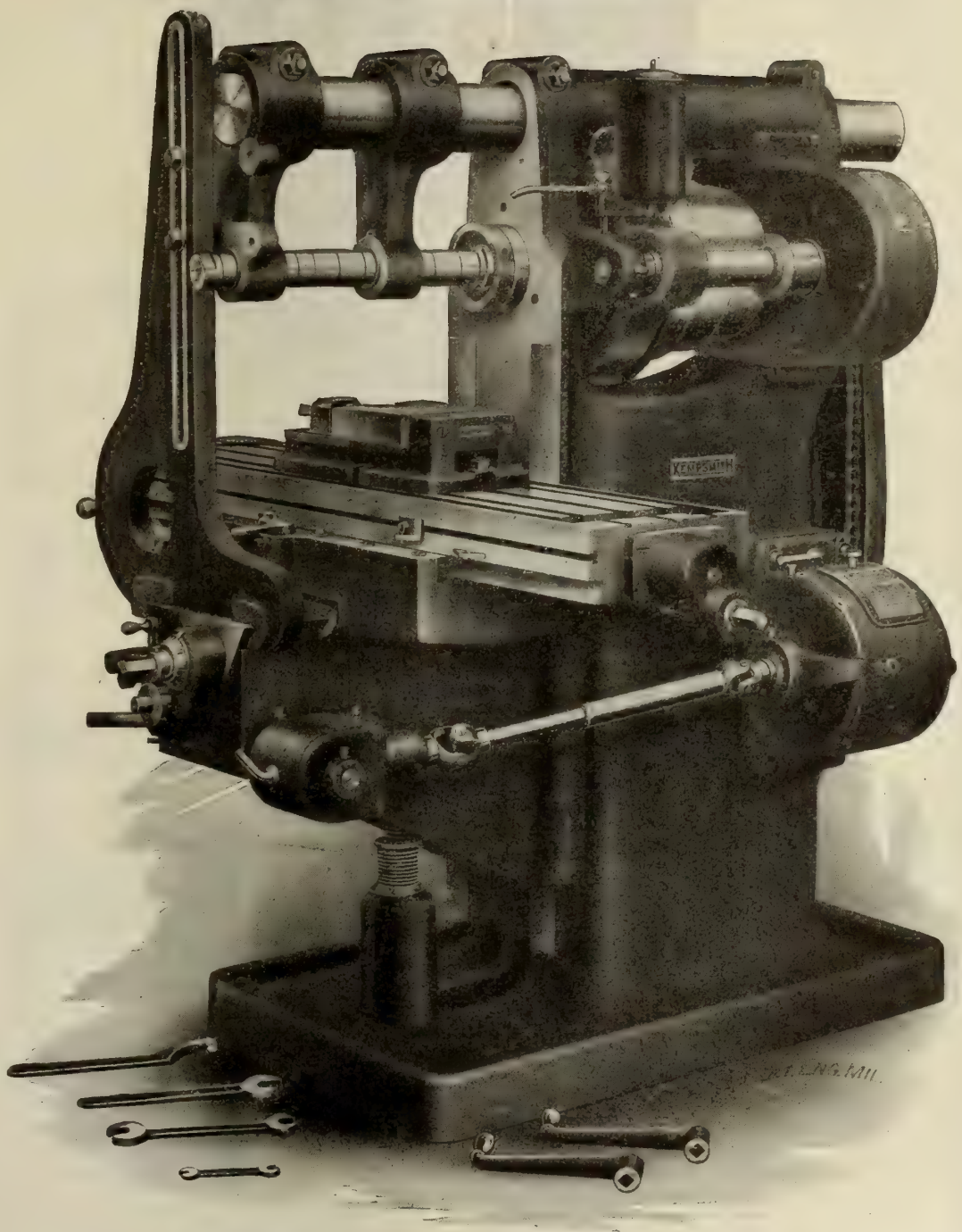
The Chapman Double Ball Bearing Company

OF CANADA, LIMITED 339 Sorauren Ave. TORONTO, CANADA

TRANSMISSION BALL BEARING CO., Inc., 1050 Military Rd., Buffalo, N.Y.

KEMPSMITH



KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared.

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

THE KEMPSMITH MANUFACTURING CO.

MILWAUKEE, WIS., U.S.A.

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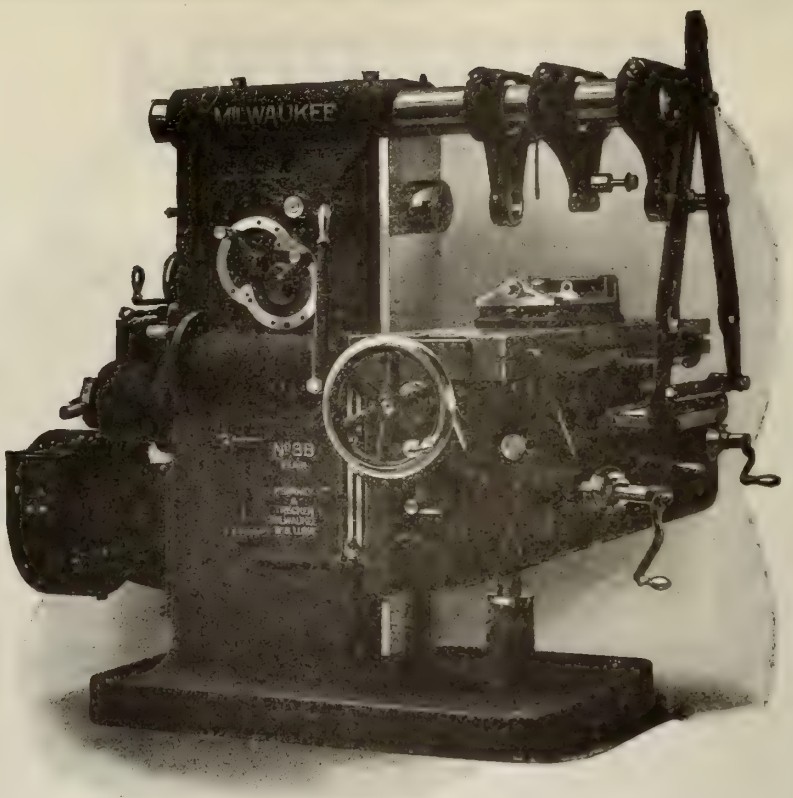

MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

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A Plant Equipped in Every Detail to Suit Your Every Need

STEEL PRODUCTS

Open Hearth, Basic and Acid, Electric and Alloy Steels.

CASTINGS

For Ships, Railways, Rolling Mills, Gears, Machinery and Ingots to 35 tons.

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Penn Couplers, Bolsters, Truck Side Frames, Draft Gears.

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Heavy Ship Forgings, Locomotive and Car Axles, Miscellaneous Forgings.

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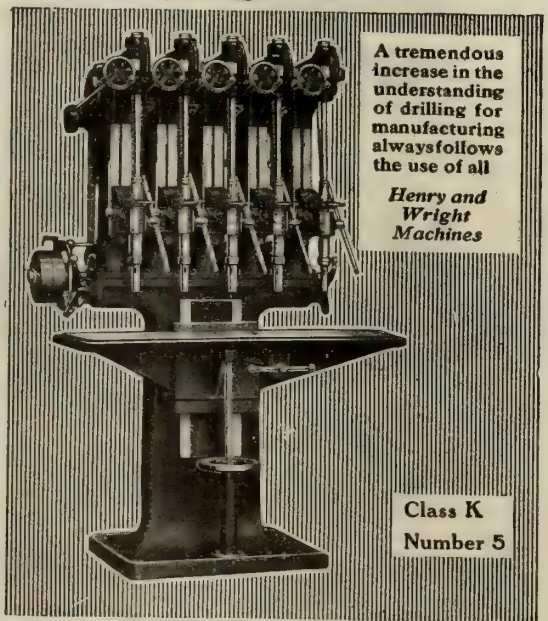
Plates and Heavy Sheets to 30 inches wide, Soft and High Carbon, Automobile Plates and Sheets.

AGRICULTURAL STEEL

Soft Centre and Solid Plow Steel, Harrow Discs, Shovel Steel, Cultivator Blades.

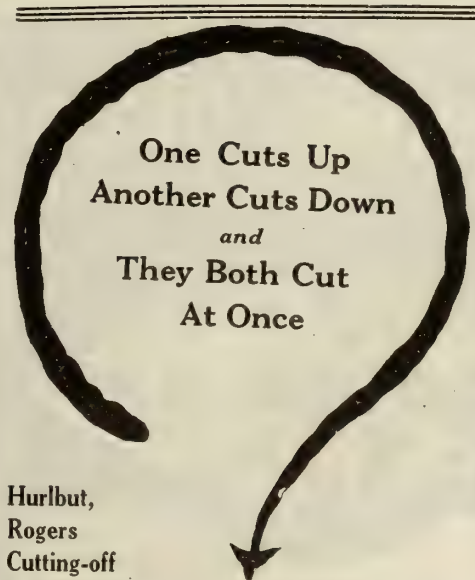
DOMINION FOUNDRIES AND STEEL, LIMITED
HAMILTON, CANADA

HENRY & WRIGHT
Drilling Machines



The Henry & Wright Mfg. Co.
Hartford, Conn.

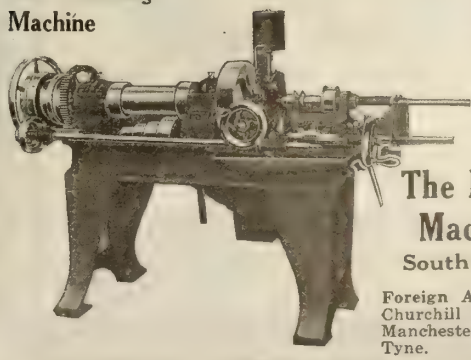
Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.



Here's Real Economy

This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools—one cutting up and the other cutting down; each holding the work against the other. What is the result?—**the production is doubled and the cost is cut in half.** Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

Hurlbut, Rogers Cutting-off and Centering Machine



Let us hear from you and we will give you the full story of its ability.

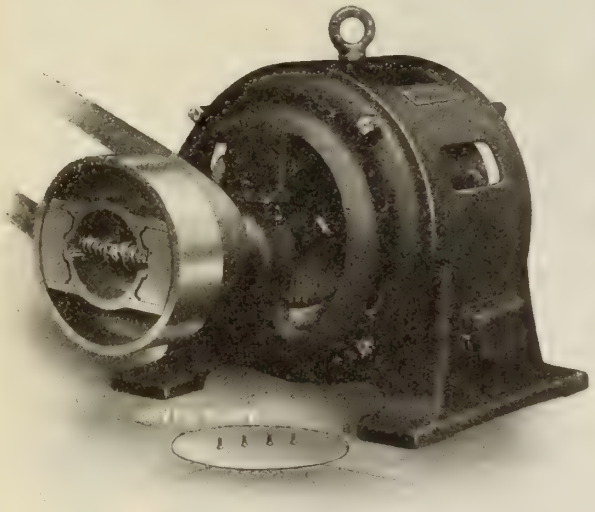
The Hurlbut, Rogers Machine Company
South Sudbury Mass.

Foreign Agents — England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow, Newcastle-on-Tyne.

Centrifugal Friction Clutches

To Ensure the Easy Starting of A.C. & Squirrel Cage Motors

½ H.P. to 1500 H.P.



No Motor Should be Without This Simple and Unique Device.

Entirely Dispenses With all Starting Difficulties

The Clutch also Effects a Great Saving in Current Consumption and Reduces the Initial Cost of Motor and Switchgear.

Please Mention Speed and H.P. of Motor When Sending Enquiries and State the Current Supply.

Write for Catalogues and Full Particulars

Thomas Broadbent & Sons, Limited

HUDDERSFIELD, ENGLAND

DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

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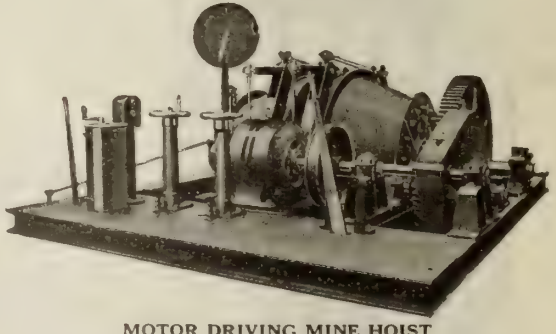

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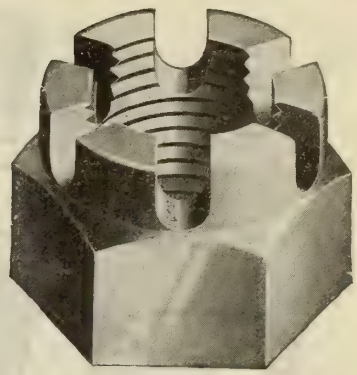

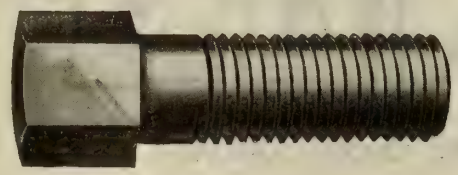

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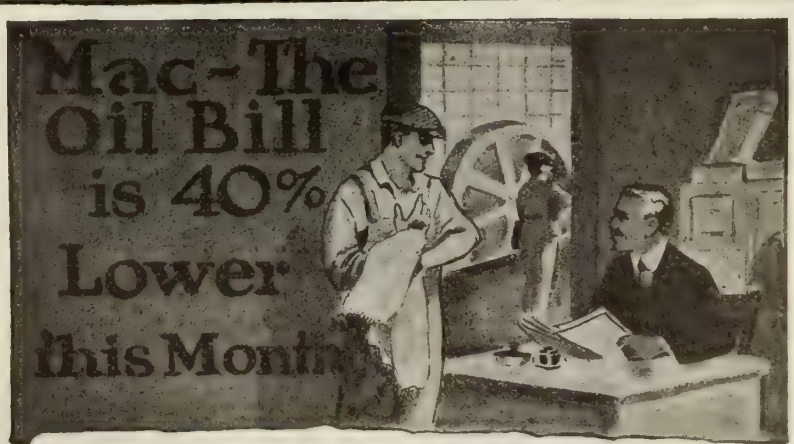

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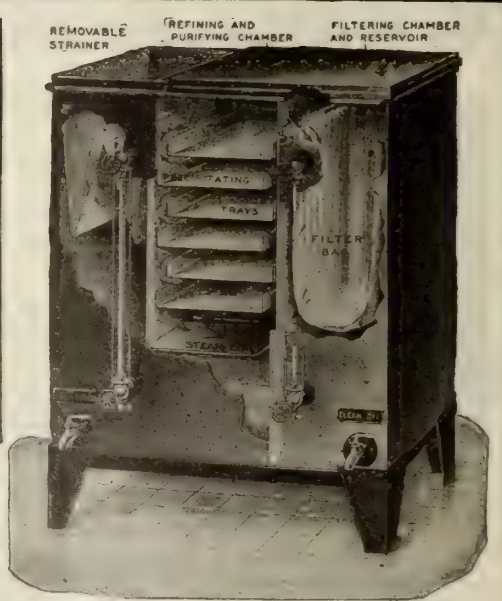

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Is the Alien a Menace?

IN the October issue of MACLEAN'S MAGAZINE a strong presentation is made of the reason why the people of the West are against further foreign immigration.

"The Menace of the Alien" depicts the foreign problem in the Canadian West as it exists to-day, and shows every one of us why we must Canadianize our Ruthenians, Austrians, Slovaks, and our fifty-seven other varieties before we allow any further "unrestricted" immigration.

This article is written by a member of MACLEAN'S MAGAZINE staff who has just returned from a careful, personal investigation of the situation. Shall we have a "White West?" Many Westerners are demanding it. Are the aliens to swing labor into the bosom of the O.B.U.? It is being done—and what must we do to stop it?

The "inside" story of the routing of the Drumheller miner aliens by returned Canadian war veterans is here told by MACLEAN'S for the first time. What leadership must be substituted for the O.B.U. leadership of these foreigners?

The October issue of MACLEAN'S is a Western number in the sense that it contains many articles and stories of distinctly Western interest. For instance:

X "Those Pesky Farmers Out West"

By Hopkins Moorhouse, Author of "Deep Furrows"

They have completely upset the old order of things. No longer will politics consist of the comfortable fight between the Ins and Outs with the old party lines maintained. The grain growers on the Prairies have upset the calculations of the professional politicians and completely changed the face of Dominion politics.

X "Fifty Years in the West"

By Professor W. T. Allison

A breezy and readable sketch of the business career of Winnipeg's veteran business man, James H. Ashdown.

"Further Discoveries of New Land"

By Vilhjalmur Stefansson

The final and most interesting instalment of Mr. Stefansson's story of his wonderful trip of five years' duration in the Canadian north in which he tells for the first time of finding new continents in the Arctic and hoisting there the Canadian flag.

X "The Banshee Bell"

By Edith G. Bayne

A bright love story laid in the mountains of British Columbia.

Other Splendid Features of October MacLean's

X "The Turmoil at Ottawa"

By J. K. Munro

A comprehensive survey of Dominion politics, written with complete impartiality and absolute candor. It is bright and breezy, with a knock in every line for the politicial opportunists. It plucks many tail feathers from our party leaders.

"Spanish Doubloons"

By Camilla Kenyon

The start of a bright and fascinating serial story by a brilliant young writer. It is the Spanish Main brought up-to-date, treasure hunting with a background of fun and romance.

"The Airy Prince"

By Arthur Beverley Baxter

A complete novelette in which is presented a bird's-eye view of England in time of war. It is one of the most brilliant stories that has been written of recent years.

"His Majesty's Well-Beloved"

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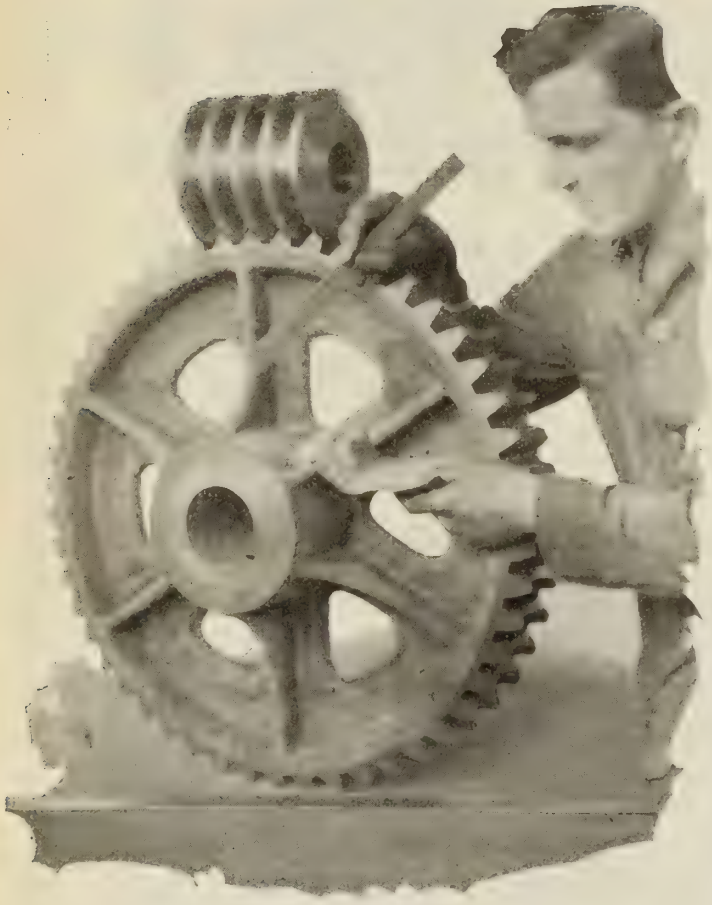

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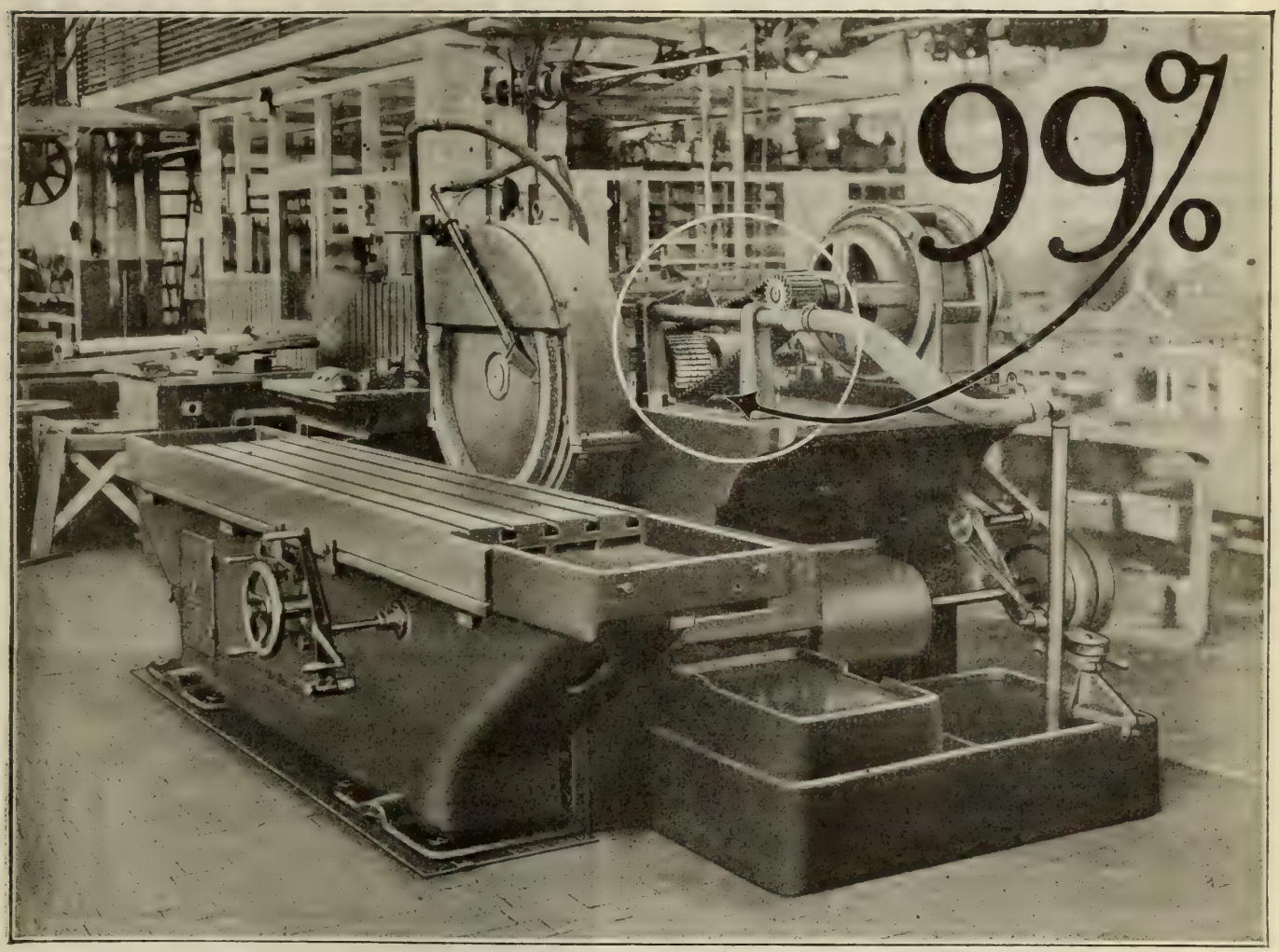

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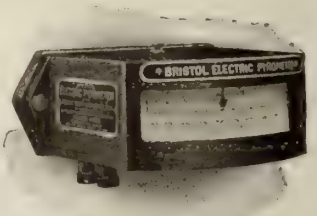

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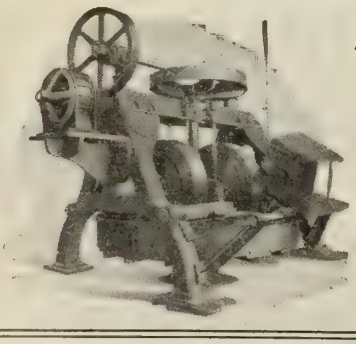

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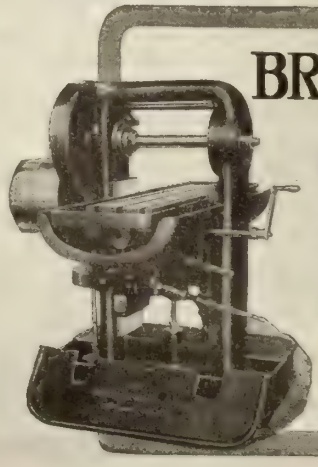

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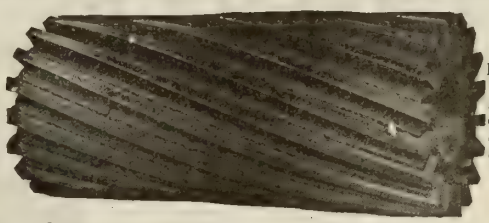

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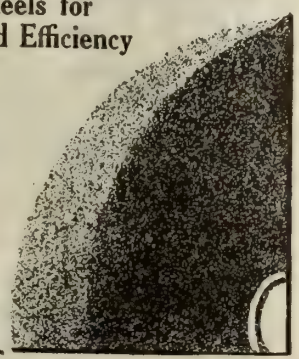

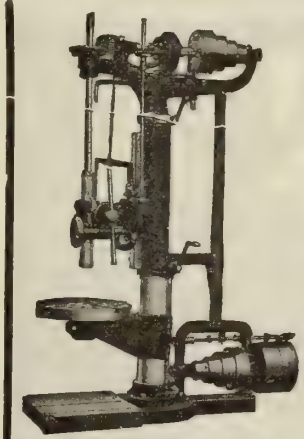

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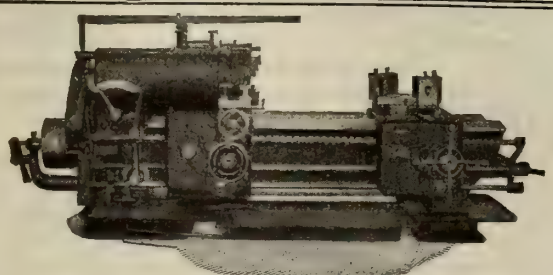

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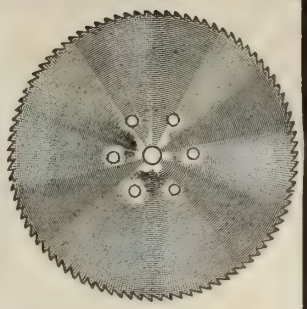

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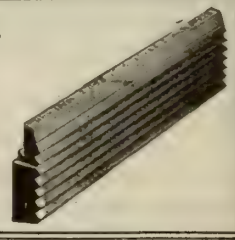

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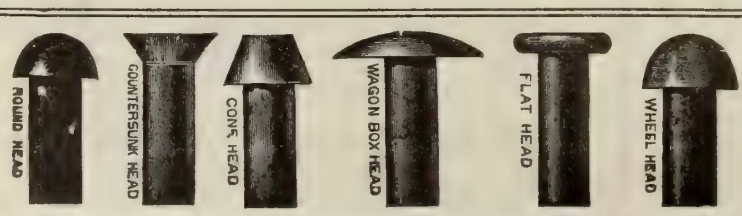

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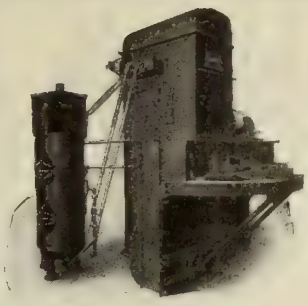

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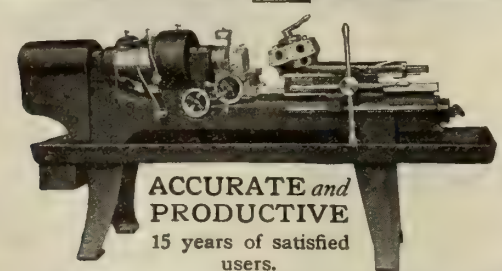

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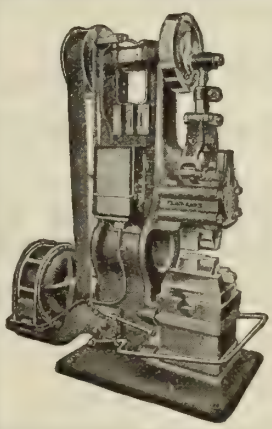

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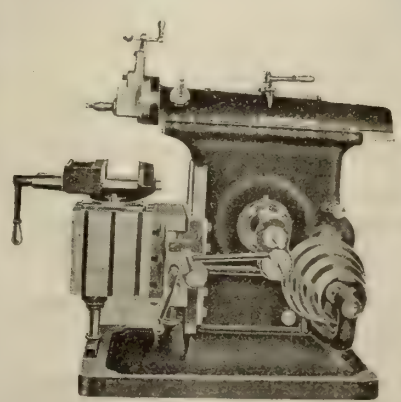

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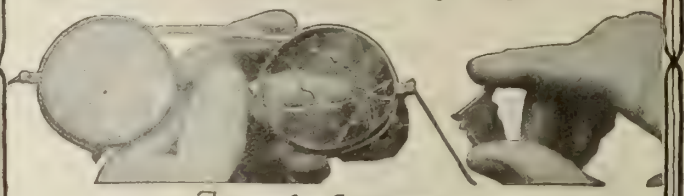

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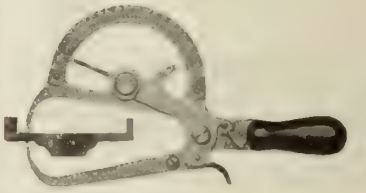

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Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

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Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blancke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

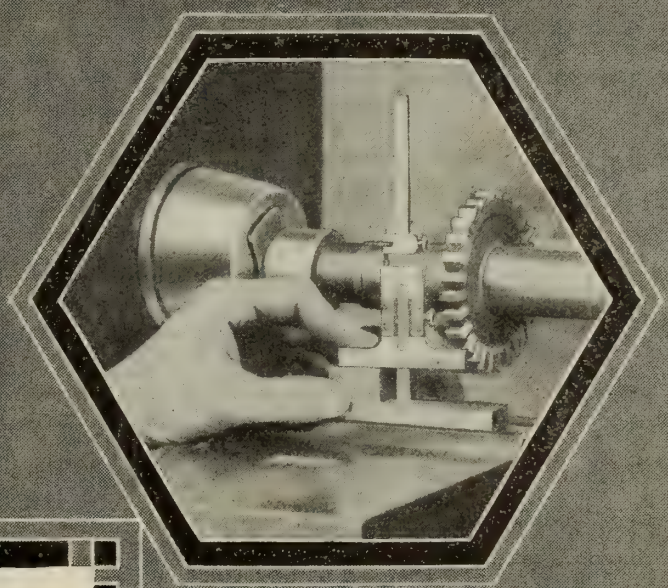
COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.

BS

Is The Tool Room Complete?



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Brown & Sharpe Mfg. Company
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If interested tear out this page and place with letters to be answered.

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Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found'g & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

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Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

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Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

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W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
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Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

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John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

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Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
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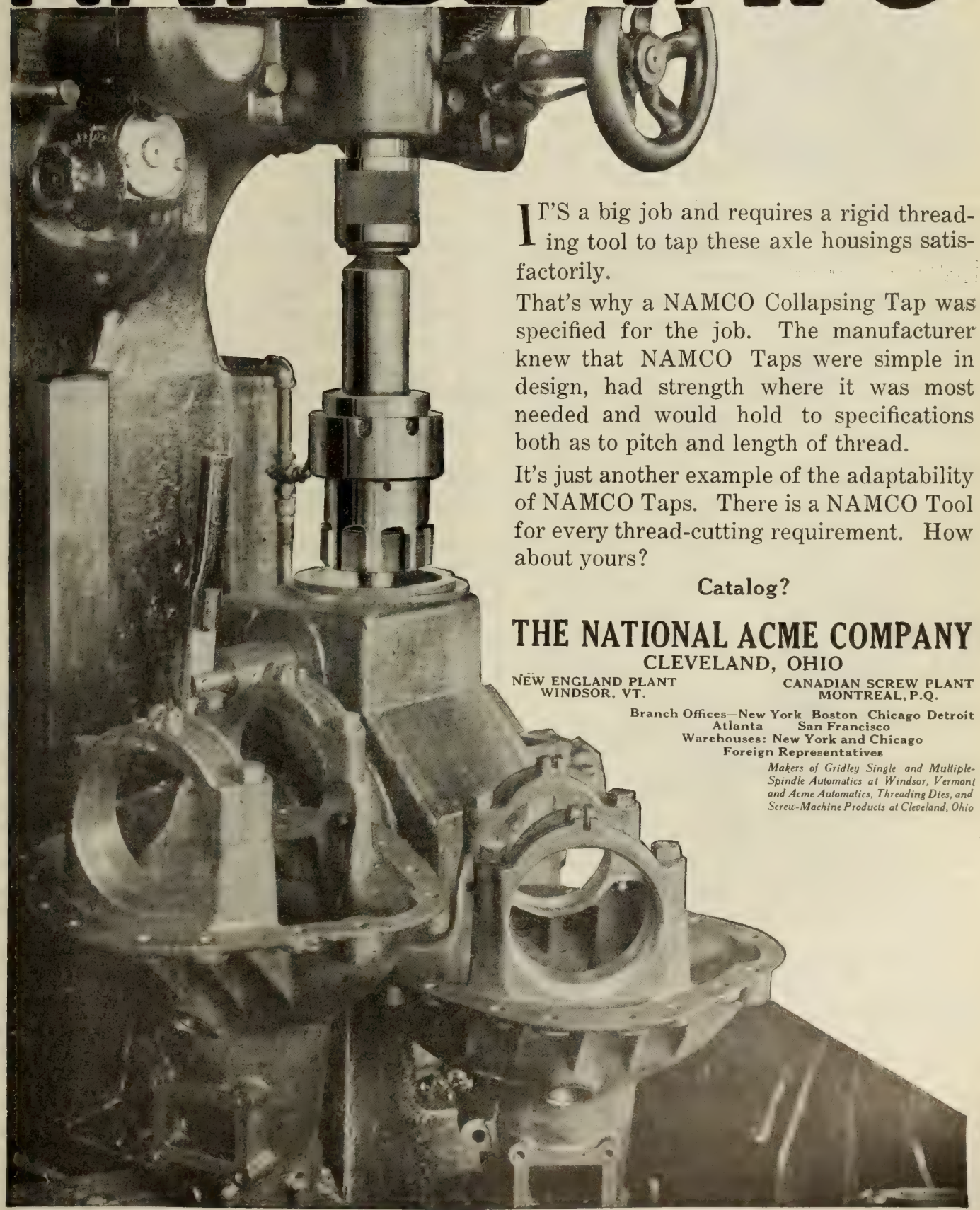

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Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

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Garvin Machine Co., New York City.
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Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal.

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Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.

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Whitman & Barnes Co., St. Catharines.

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Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

HAMMERS, HELVE POWER

Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal.

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Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

HAMMERS, MARKING

Matthews & Co., Jas. H., Pittsburgh, Pa.

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Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

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Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

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Oliver Mchry. Co., Grand Rapids, Mich.

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Graton & Knight Mfg. Co., Montreal.

HANGERS

Brown & Sharpe Mfg. Co., Providence, R.I.

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Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Standard Pressed Steel Co., Philadelphia.
Williams & Wilson, Limited, Montreal.

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HEAT TREATMENT OF STEEL

Gray Ball Bearing Co., Ltd., Toronto.

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Shore Instrument & Mfg. Co., New York.

HELMETS, SANDBLAST, AMMONIA

Strong, Kennard & Nutt Co., Cleveland.

HIGH SPEED STEEL

See Steel.

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Illinois Tool Works, Chicago, Ill.

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Butterfield & Co., Inc., Rock Island, Que.
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Wells Bros. of Canada, Galt, Ont.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal.

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Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland.
Kennedy & Sons, Owen Sound, Ont.
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Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

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Taylor Instrument Co., Rochester, N.Y.

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Starrett Co., L. S., Athol, Mass.

INDEX CENTRES

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Garvin Machine Co., New York.
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A. R. Williams Machy. Co., Toronto.
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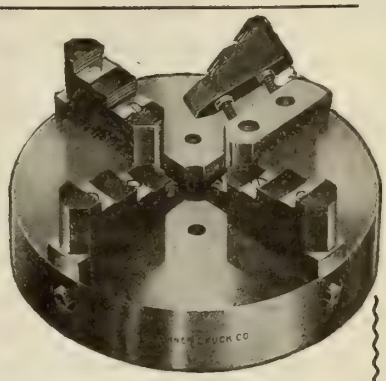

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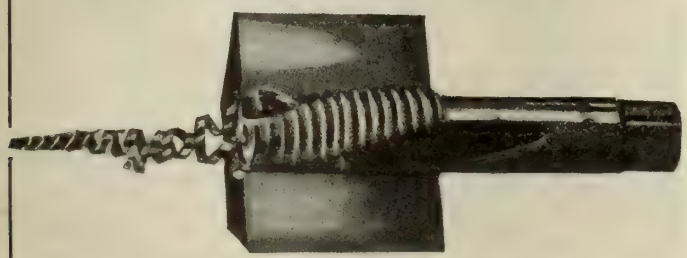

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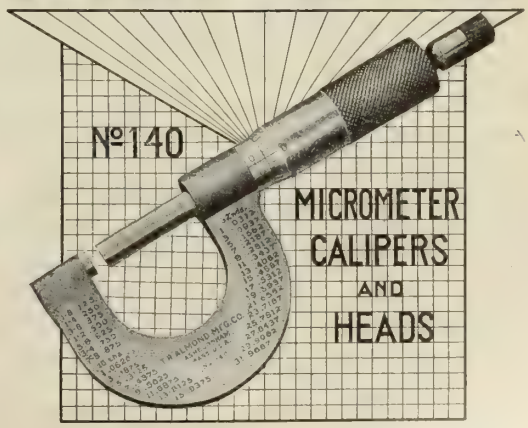

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Niles-Bement-Pond Co., New York.
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MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co., Toronto.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY.
Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL
Brown's Copper & Brass Roller Mills, New Toronto, Ont.

MUSIC WIRE
Blancke Co., L. C., New York City.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Boker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
See Steel.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

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Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

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Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

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Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbrooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

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Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.
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Hartford, Conn.

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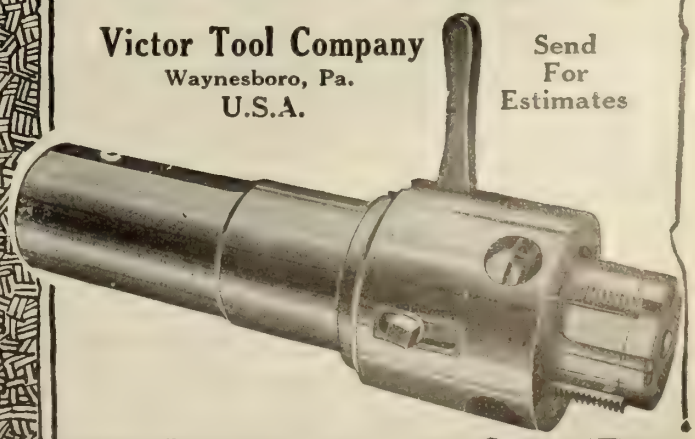

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Perrin, Ltd., William, Toronto.

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Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
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Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

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MacKinnon Steel Co., Sherbrooke, Que.

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Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES
See Lathes.

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Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
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Williams Tool Co., Erie, Pa.
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PIERCING
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Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS AND DIES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
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PIPE TAPS AND VISES
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Canada Machinery Corp., Galt, Ont.
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Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
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Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Co., St. Catharines.

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Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

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MacKinnon Steel Co., Sherbrooke, Que.

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Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Perrin, Ltd., William R., Toronto.
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Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

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Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
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Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
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Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL
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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

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PUMPS, HIGH PRESSURE
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PUMPS, RUBBER CEMENT
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PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

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Fry's (London), Ltd., London, England.

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Boker & Co., Inc., H, Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Whitman & Barnes Co., St. Catharines.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

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Niles-Bement-Pond Co., New York.

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Niles-Bement-Pond Co., New York.

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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

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Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
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Keystone Mfg. Co., Buffalo, N.Y.
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Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
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Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
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Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
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Atkins & Co., Ltd., Wm., Sheffield, Eng.
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Blancke Co., L. C., New York City.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, HAND
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
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All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
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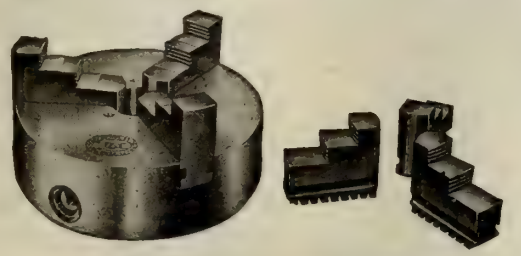

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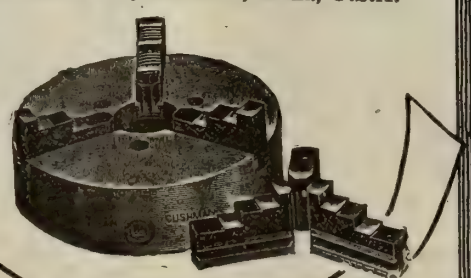

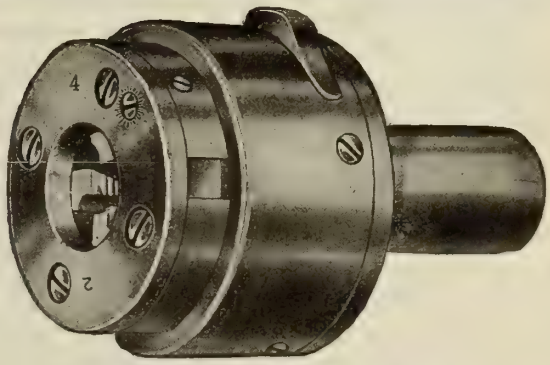

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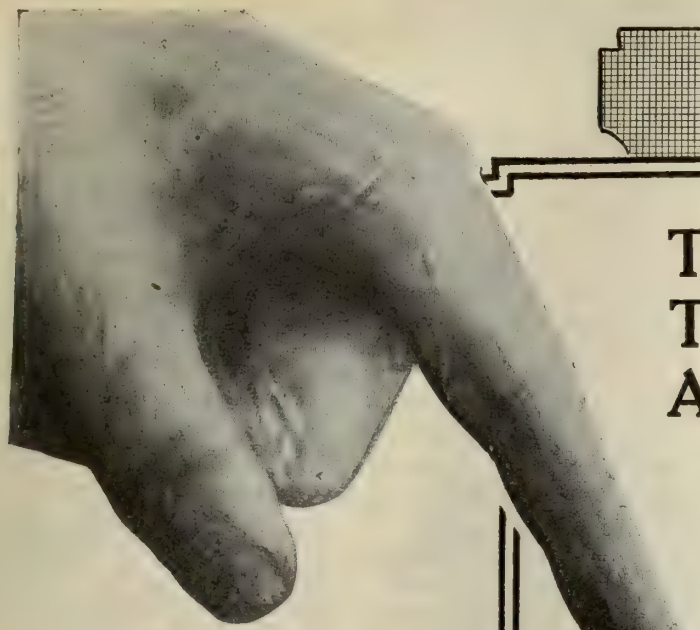

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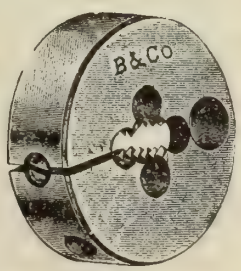

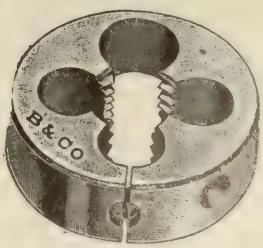

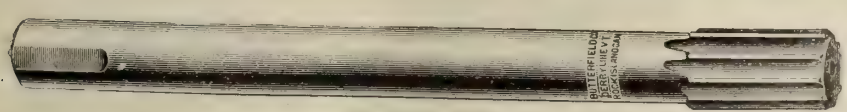

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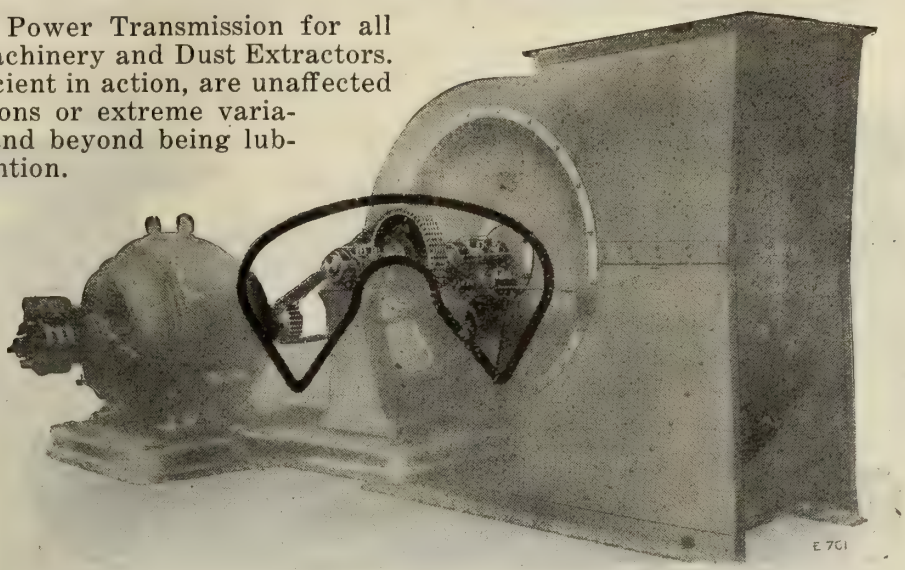

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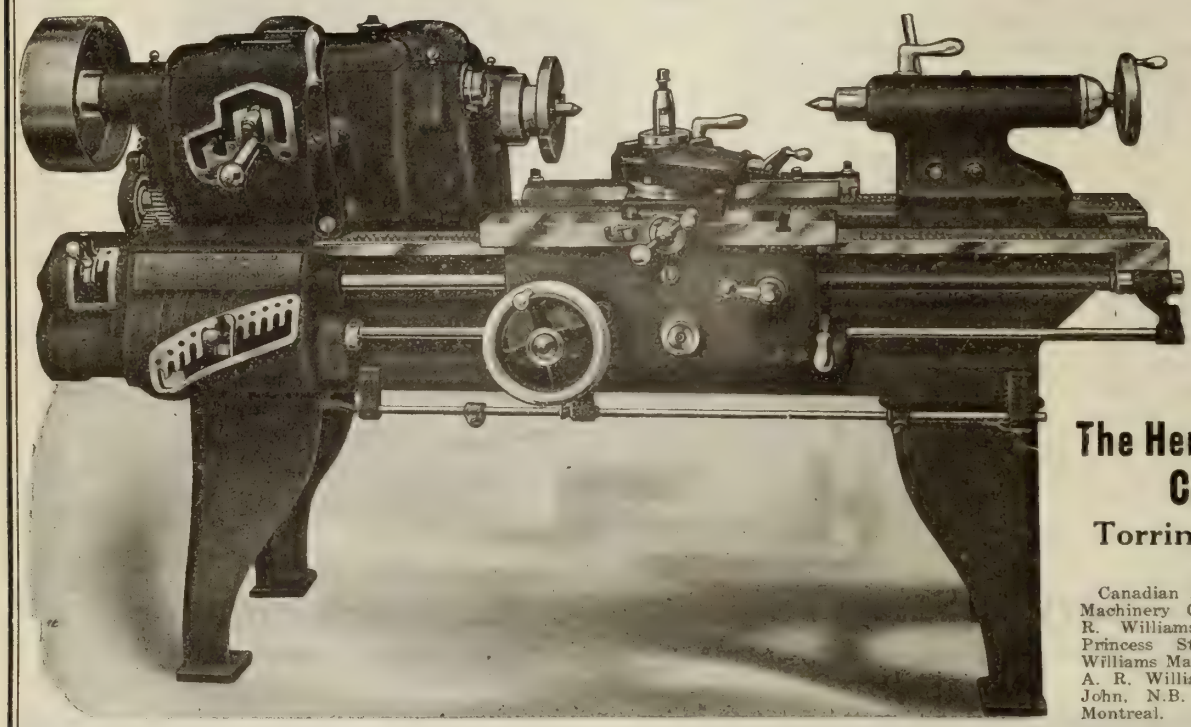

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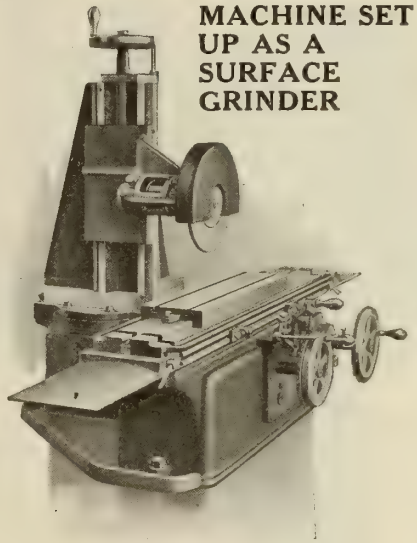
FRASER No. 1 Universal Convertible Grinder

(Patented May 28, 1918)

MACHINE SET UP AS AN INTERNAL GRINDER

MACHINE SET UP AS A SURFACE GRINDER



By the change of heads the machine can be converted into an efficient high-speed internal grinder; also a surface grinder of considerable range.

PATENTED APRON CONSTRUCTION. All the springs on this machine are enclosed and can be removed or replaced without disturbing any other part of the machine.

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Superior Grinding Wheels

The Geo. F. Foss Machinery & Supply Co., Limited

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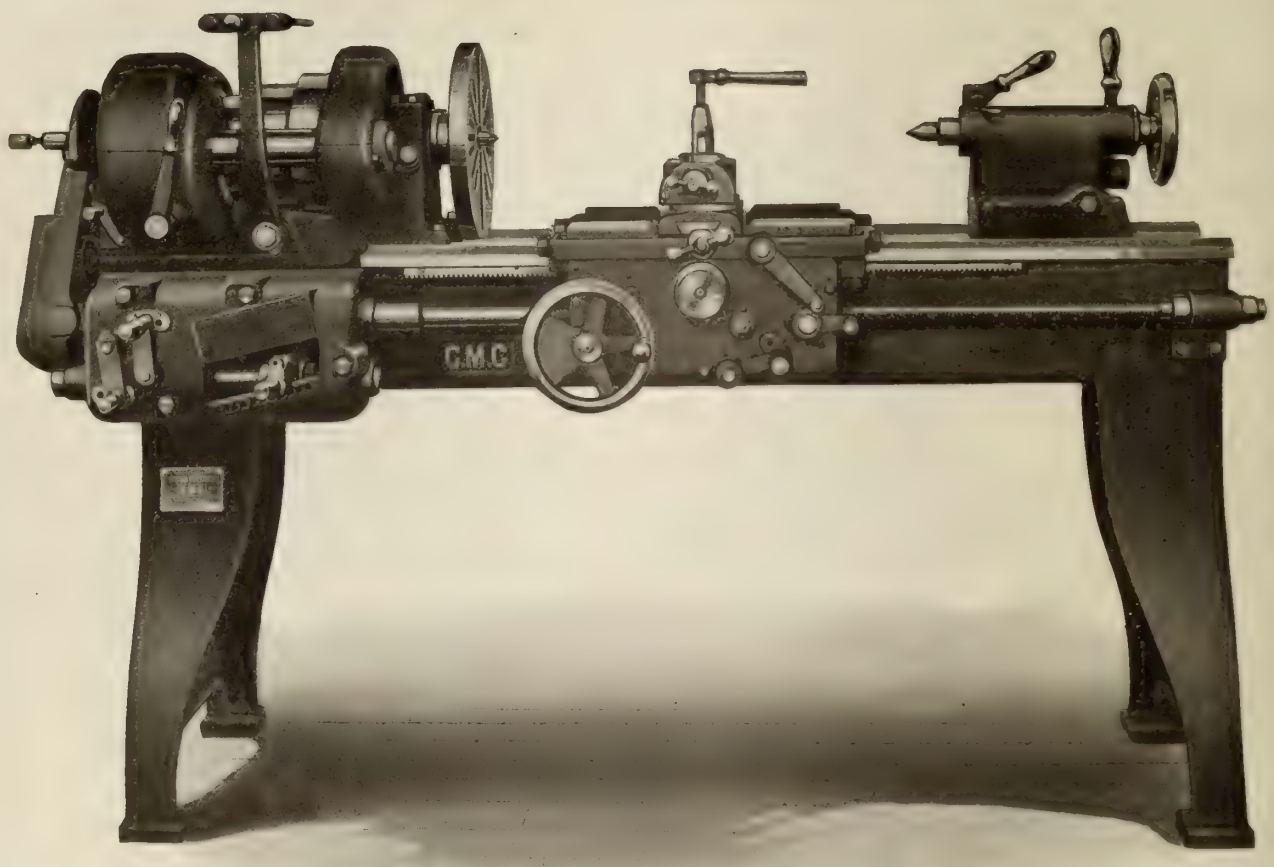
C.M.C.

14" TOOL ROOM LATHE



Our new 14" TOOL ROOM LATHE besides embodying original and distinctive features possesses that convenience and accuracy for which all C.M.C. lathes are justly noted.

Notice that the "back gear" is at the front of the headstock. This saves wear on the spindle bearings and does away with the operator reaching through or around the belt.

There are other features just as novel and important that we would like the opportunity of demonstrating to you. Better let us send you a special bulletin telling you all about it.

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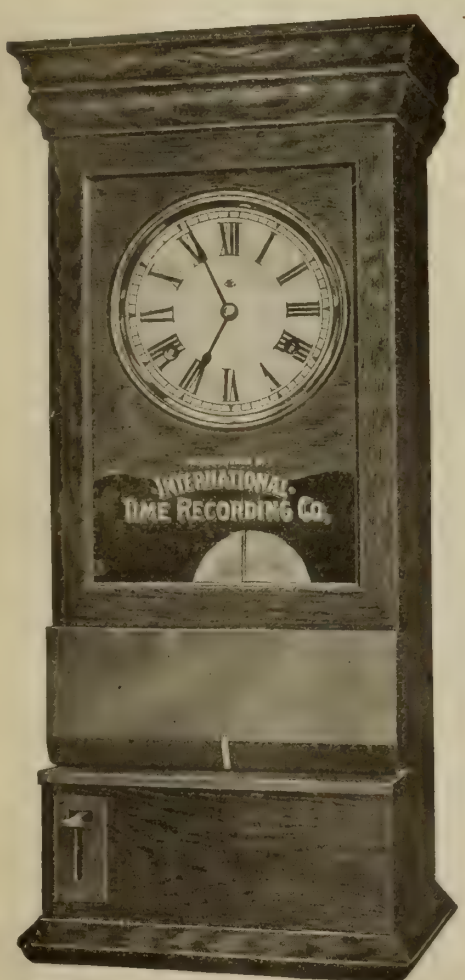
Toronto Office and Warerooms ***Brock Avenue Subway***

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII., No. 17 Publication Office: Toronto, October 23, 1919 Subscription Price $3.00 per year.

"..... not worth the paper they are written on"



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"Made in Canada"

We refer to Production Cost Figures that depend on pencil records.

What pencil records?

The time-cards on job work that your workmen or foreman now fill out in pencil.

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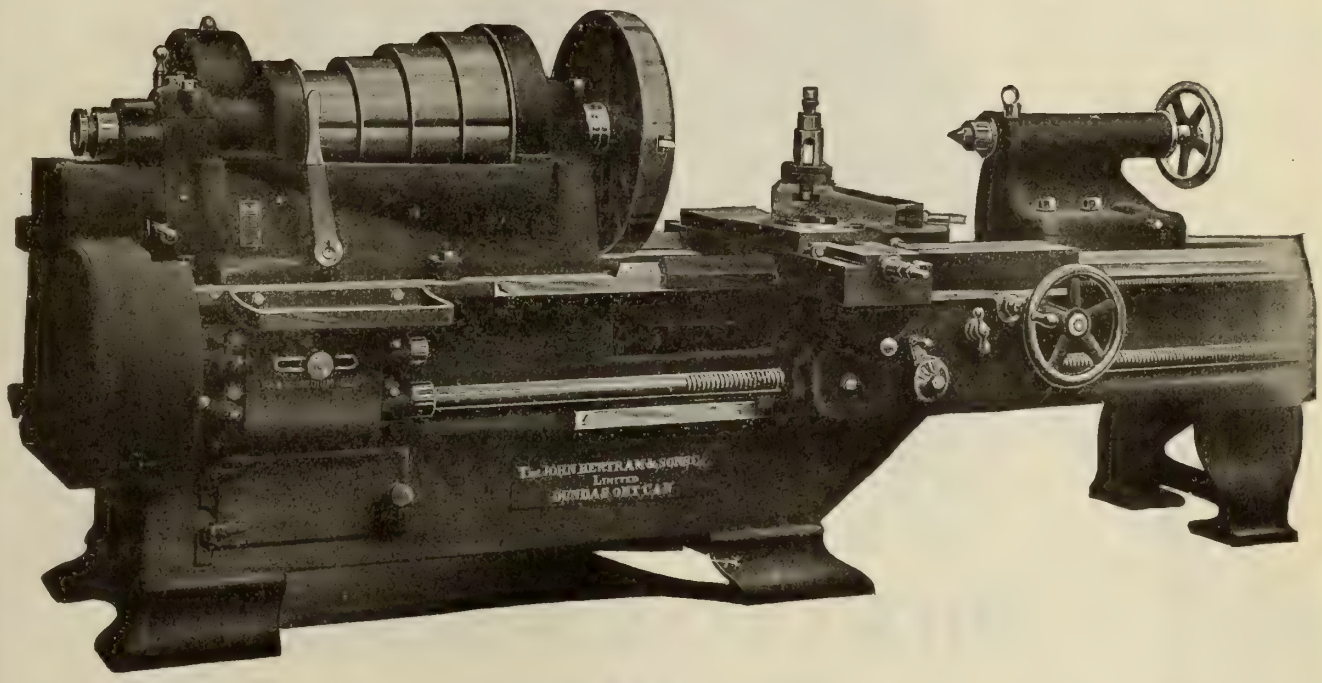

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26-inch x 42-inch Swing

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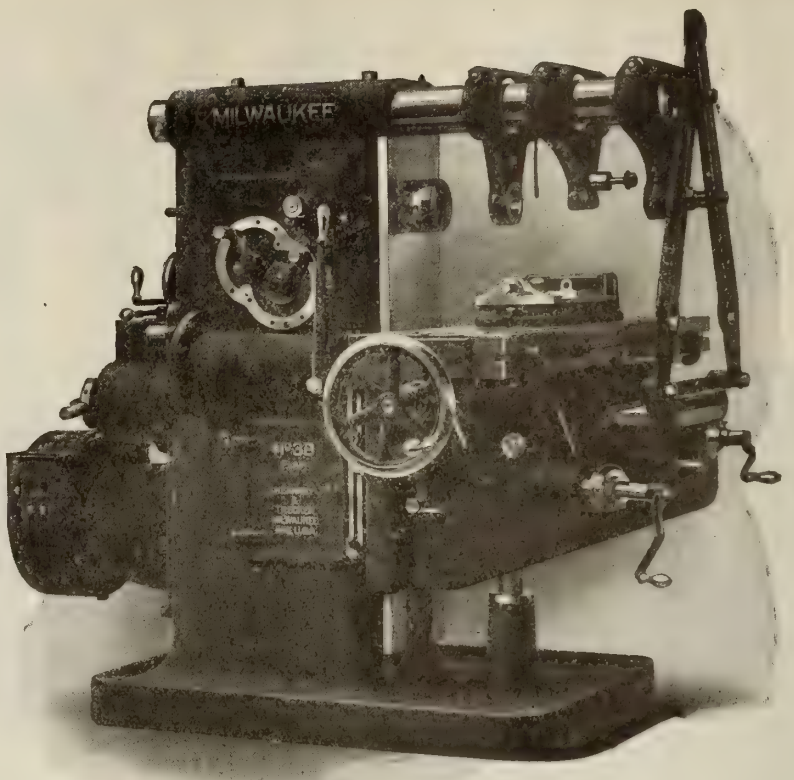

MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

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General View of the Plant of the Algoma Steel Corporation from the Waterfront.

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼" x 1¼", ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14" wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process. and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

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ANGLES—Equal Leg—
6 x 6"—5 x 5"—4 x 4"
3½ x 3½"—3 x 3"
2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

CHANNELS—
15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
2 11/16 x 3 x 2 11/16 x ¼"
2¾ x 3 1/16 x 2¾ x 5/16"

ROUNDS—
All sizes from ½" up to and including 4".

SQUARES—
All sizes from ½" up to and including 3".

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All sizes from 1 x ¼" up to and including 14" wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

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Machine cast FOUNDRY MALLEABLE and BASIC.

SULPHATE OF AMMONIA.
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ALGOMA STEEL CORPORATION

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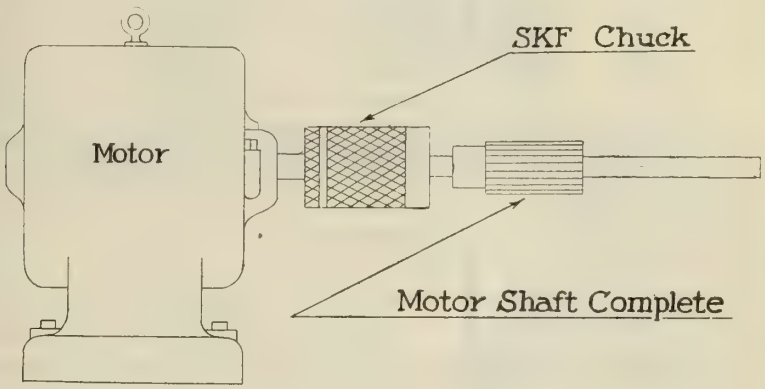
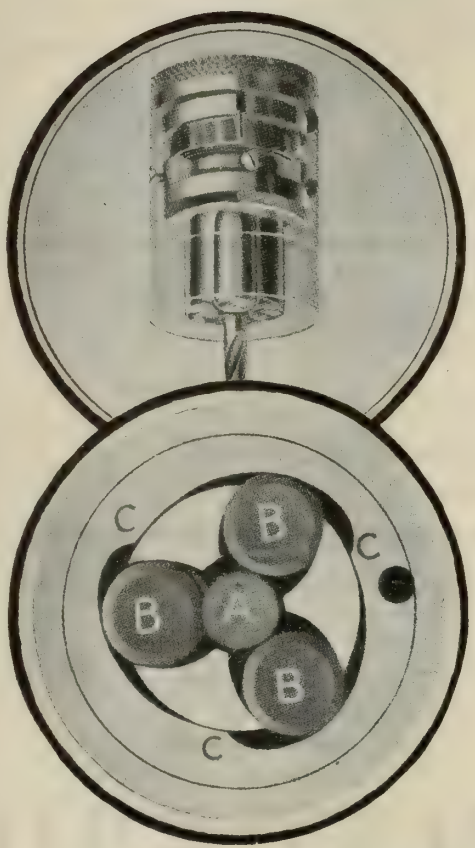
SKF AUTOMATIC-QUICK ACTING SELF CENTERING DRILL CHUCKS

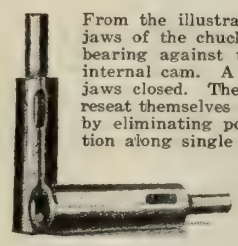
Suggestion No. 2 →

For Polishing Small Motor Commutator





A—*Drill Shank*
B—*Roller Jaws*
C—*Cam Surfaces*



Increase Size Range by using Adapters

From the illustration it will be seen that the jaws of the chuck are formed by three rollers bearing against the surfaces of a three-lobed internal cam. A coiled spring holds the roller jaws closed. The rollers are free to turn and reseat themselves with every drill release, thereby eliminating possibility of wear or indentation along single line of contact. The drilling resistance forces these rollers up the cam surfaces, causing them to close upon and grip the drill shank with a power always proportionate to the drilling stress, thereby precluding slipping of the drill under any conditions whatsoever.

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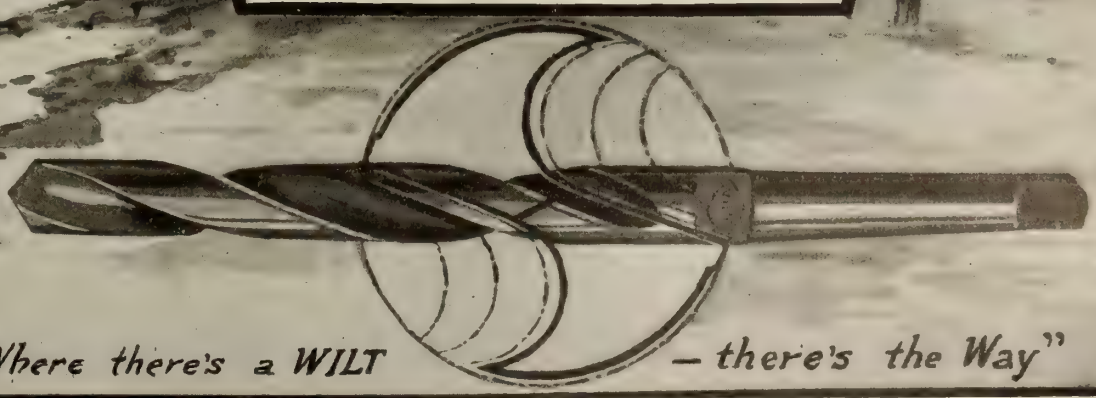

"Where there's a WILT — there's the Way"

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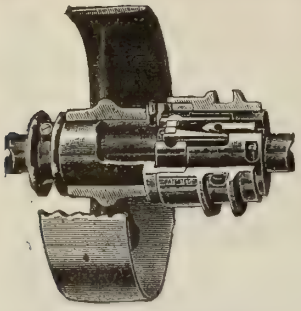
THE JOHNSON FRICTION CLUTCH



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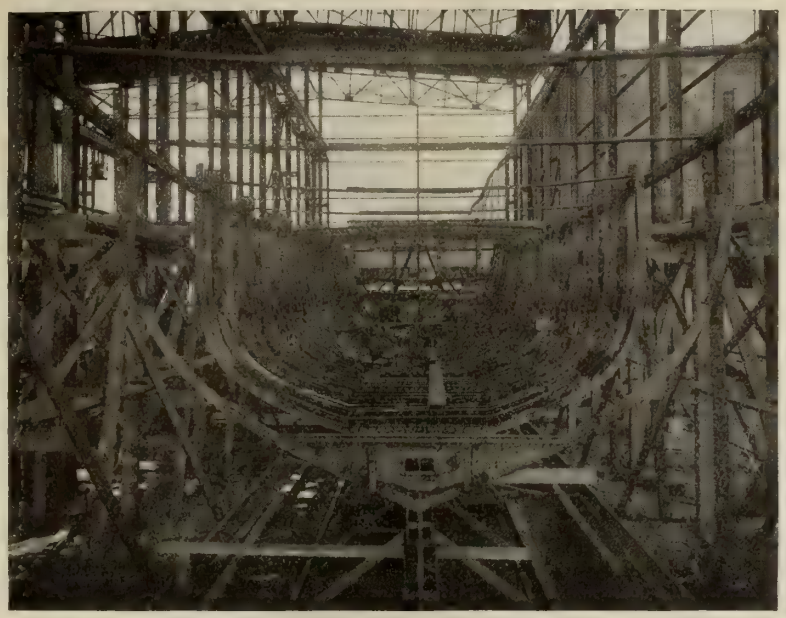

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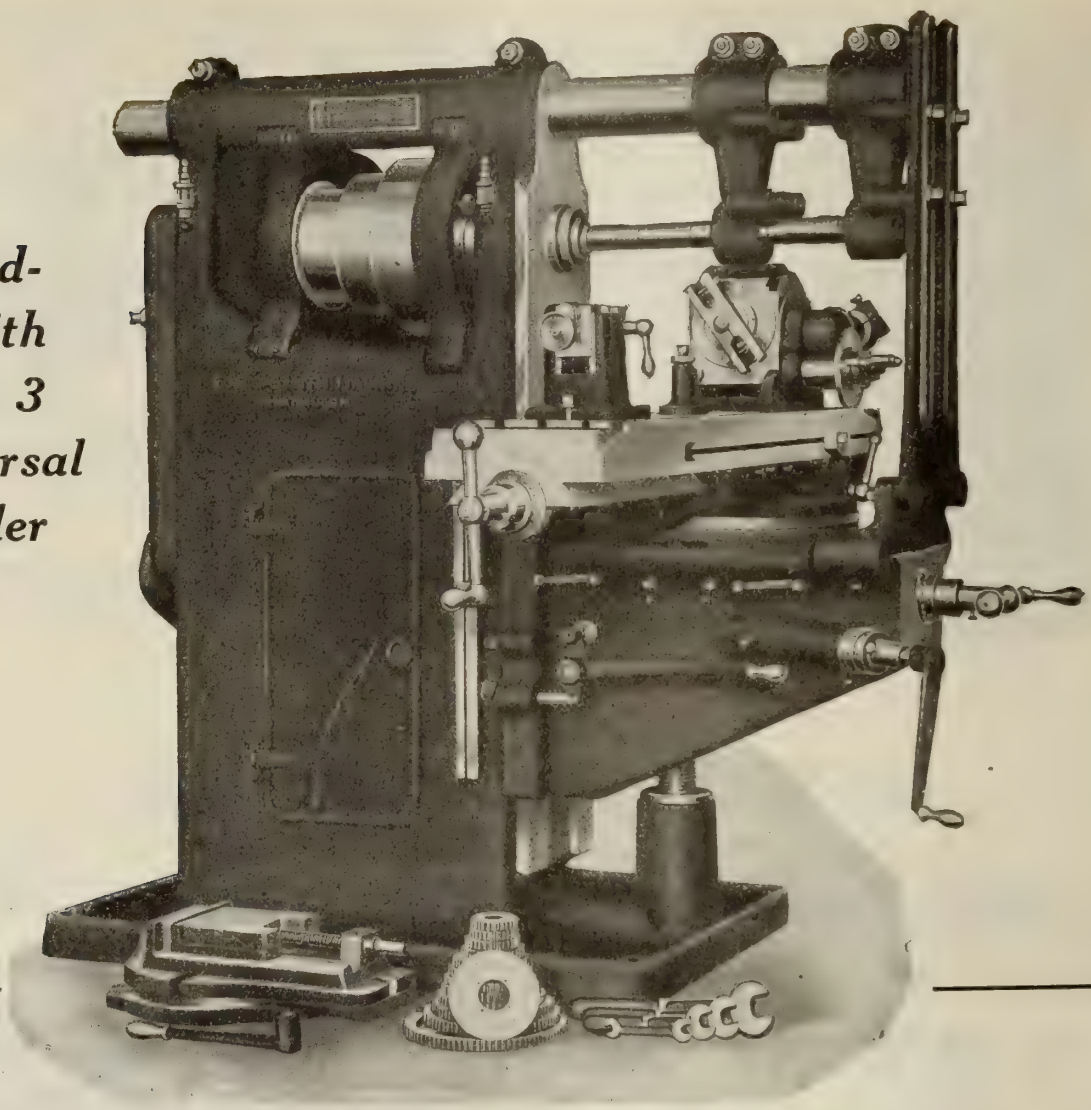

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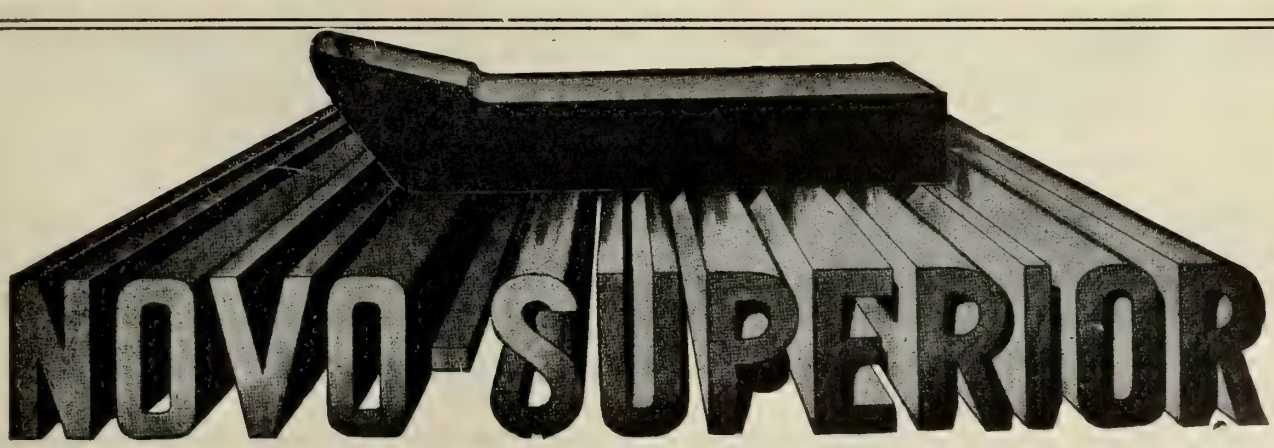

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FOUNDRY
GALT - ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.
We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

CANADA
FOUNDRIES & FORGINGS
LIMITED

ENDURANCE TOOLS
NEVER WEAR OUT

PIPE THE WRENCH—WRENCH THE PIPE

Canadian Billings & Spencer Plant
Welland, Ont.

LOCOMOTIVE AND CAR WHEEL TYRES

HIGH-SPEED AND CARBON
TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE IN CANADA

ARMSTRONG WHITWORTH
OF CANADA, LIMITED

Head Office :
298-300 St. James Street,
Montreal

Works :
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Branches:
126 Wellington St. W. TORONTO
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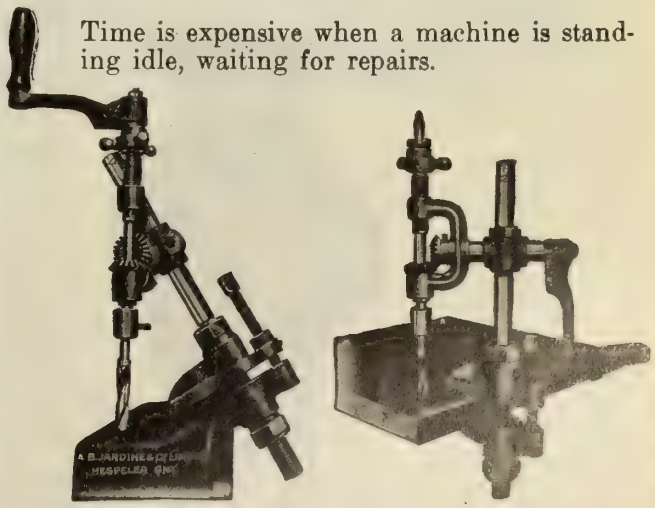
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

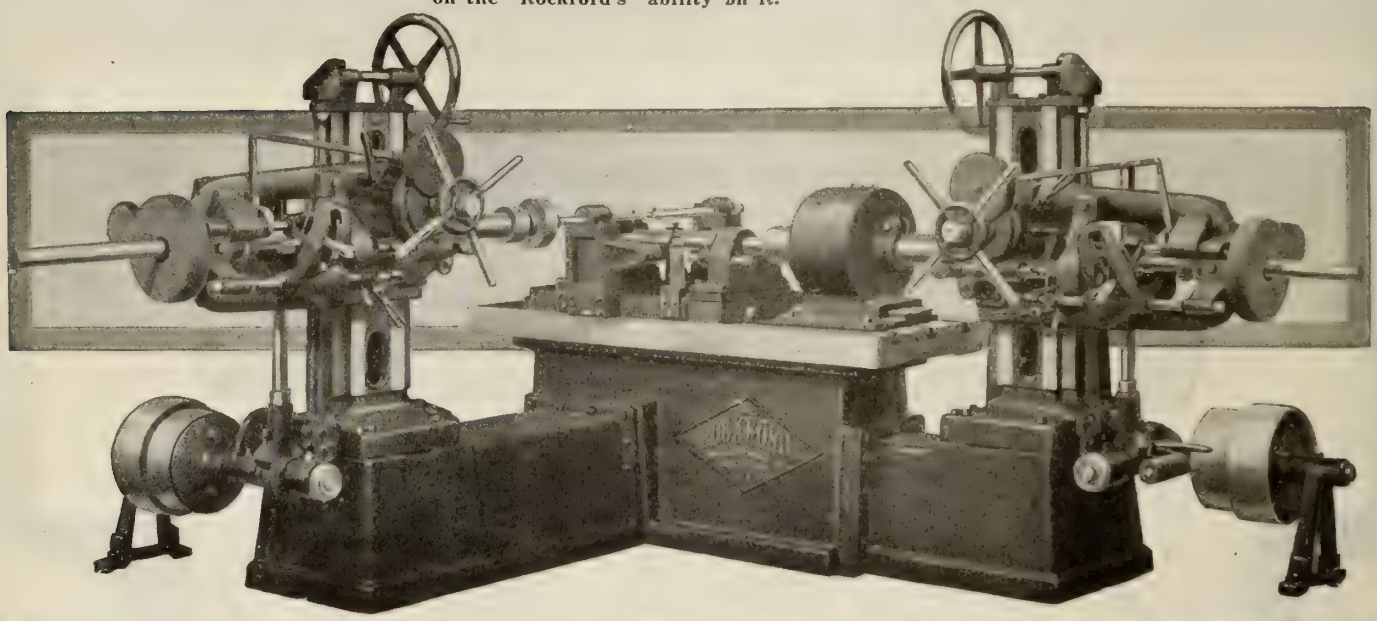
If interested tear out this page and place with letters to be answered.

Rockford Horizontal Boring Machine

For Automobile Manufacture

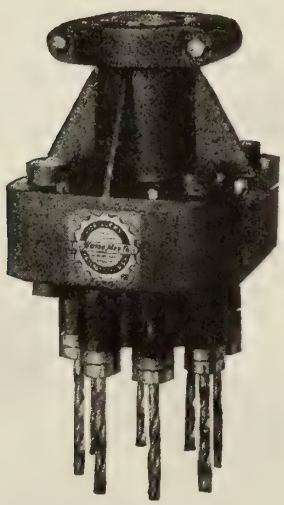
This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



The Rockford Drilling Machine Co., Rockford, Ill.

2 Minutes or 20?



This Is The Vital Question

Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.

THE HŒFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 708 Empire Building, Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio; John M. Howett, 18 W. Second St., Dayton, Ohio.

The Canadian Fairbanks-Morse Co., Limited

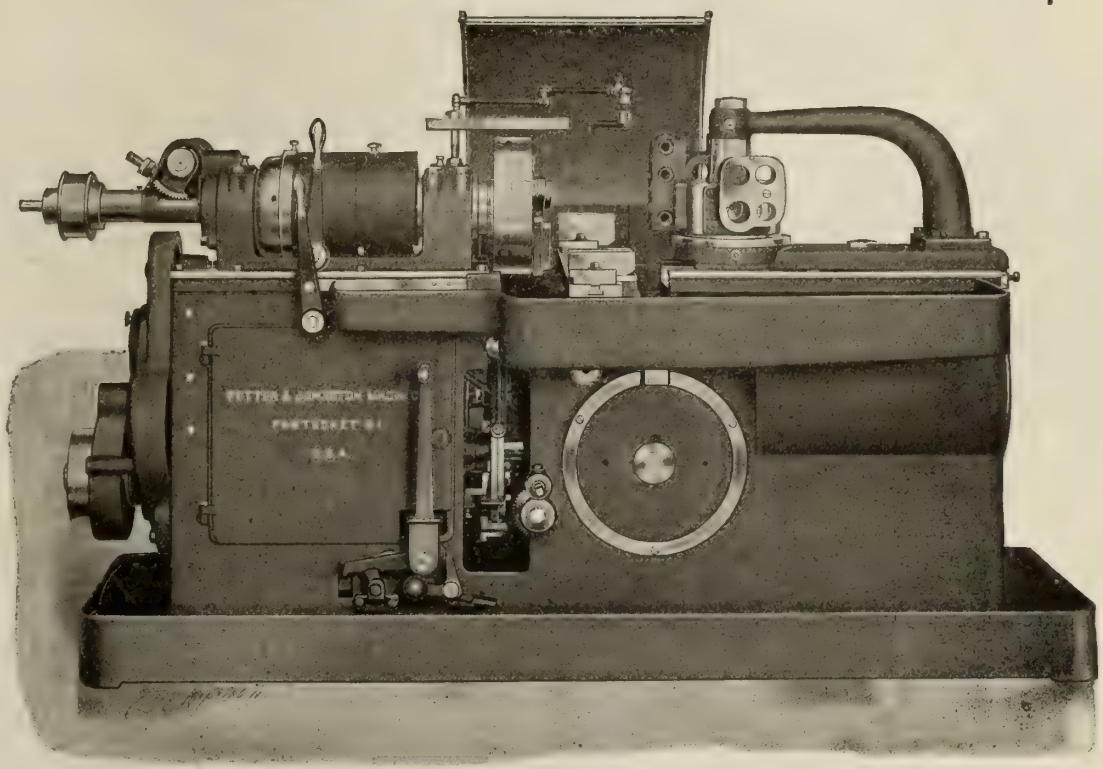
"Canada's Departmental House For Mechanical Goods"

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

P&J AUTOMATICS

For Every Service

Built in three sizes: 5-A, 6-A, 7-A Models, for automatically turning, forming, boring, threading and facing duplicate parts up to 40 inches diameter and 15 inches long.



5A MANUFACTURING AUTOMATIC

One attendant operating two to six machines means lowest possible labor costs.

Boring and turning tools piloted insures accurate results.

Send drawings or samples for estimate which will show you the way to economical production through the use of Manufacturing Automatics.

Bulletin No. 39

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LTD.

HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA

WORKS AND WAREHOUSE: GALT, ONTARIO, CANADA

If interested tear out this page and place with letters to be answered.

Built For a Long

Because Robertson Process Metal does not need paint, because it is rust proof, because it will withstand the most severe weather exposure and because it is unaffected by strong acid and alkali fumes, it is a permanent, economical building material. By offsetting depreciation and protecting plant investments it has saved plant owners many thousands of dollars.

To know how Robertson Process Metal is made is to understand why it is so enduring. It is made in sheets, and bars. Its body or core, of specially prepared steel, is thoroughly cleansed and covered with three impervious coatings, (1) Asphalt, (2) Asbestos, (3) Water-proofing.

The steel is heated to a uniform and definite temperature and immersed in the asphaltic bath. While the asphalt is still hot it is completely covered with a sheet of asbestos felt and subjected to pressure which thoroughly binds the two protective coats. A coating of water-proofing, forced into the surface by pressure completes the process of protection.

Robertson Process Metal finds its most ready use in sheet form for the roofing and siding of industrial buildings. It is produced in various standard forms and shapes for building trim. Robertson Skylights and Robertson Ventilators are two building products which owe their long life to Robertson Process Metal.

A special bulletin containing descriptions of this product and illustrations of plants where it has been in use for many years will be sent upon request. A general book covering the three basic materials: Robertson Process Metal, Robertson Process Gypsum and Robertson Process Asphalt is also available.

H. H. ROBERTSON COMPANY, Limited
Sarnia, Ontario
Branch Offices: Toronto, Montreal, Vancouver

ROBERTSON
BUILDING PRODUCTS

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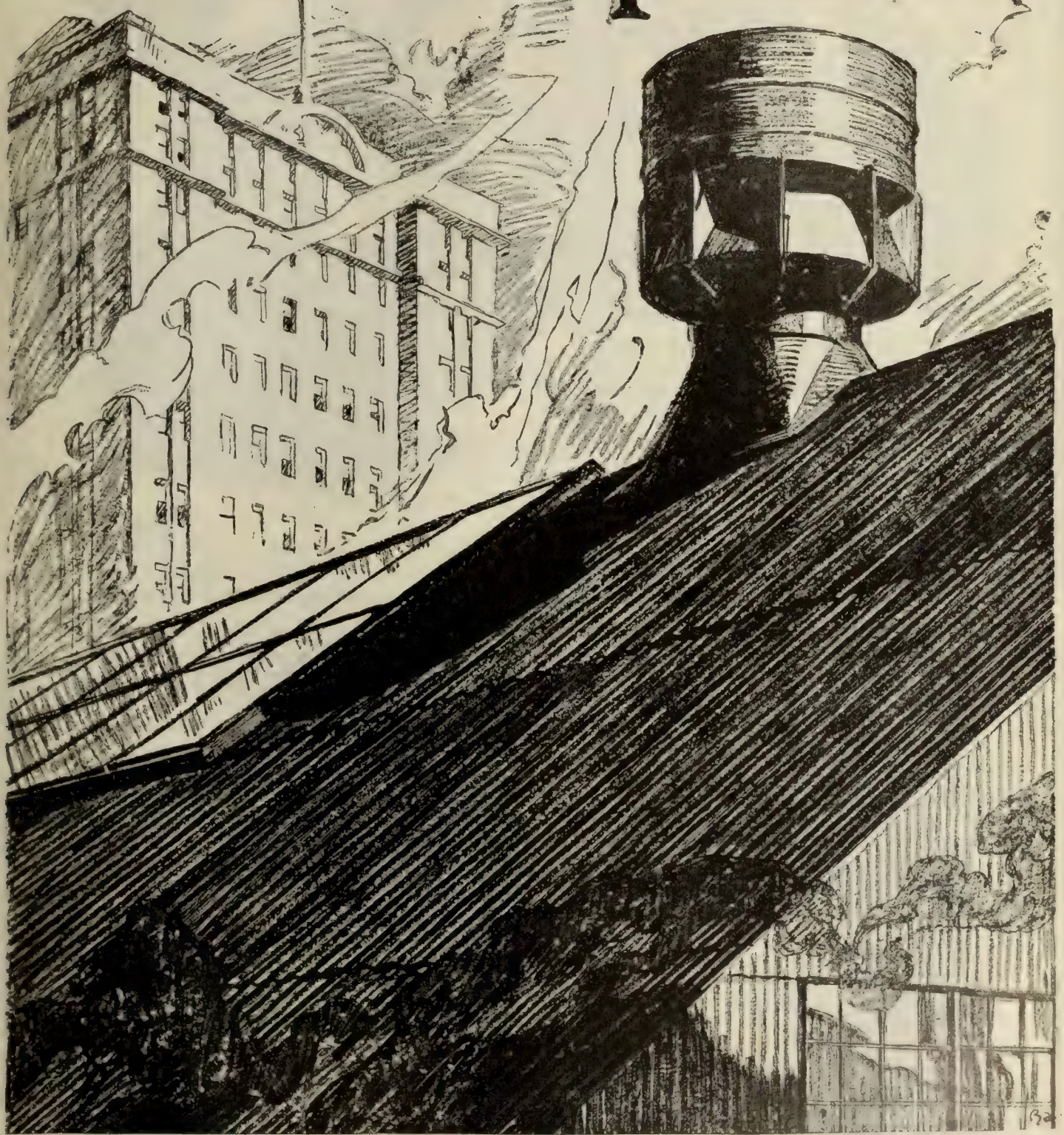
Life of Exposure



PROCESS
HIGHWAY MATERIALS

TRADE MARK REG. U. S. PAT. OFF.

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BECKER BELT-DRIVEN MILLERS

for

GREATER PRODUCTION because they work continuously—every hour of operation is a production hour—

ECONOMY OF OPERATION because they are power savers; the internal belt drive forms an elastic drive to the spindle that prolongs the life of the cutter by eliminating chatter and vibration.

ACCURACY because the machines have exceptionally fine feeds and are equipped with micrometer dials and stop gauges. The Patent Becker Gibbing keeps the work permanently aligned with the spindle.

Becker Milling Machine Company
HYDE PARK, BOSTON, MASS.

A. R. WILLIAMS MACHINERY COMPANY, LIMITED, - 64 FRONT STREET WEST, TORONTO
RUDEL-BELNAP MACHINERY COMPANY, LIMITED, - - 137 McGILL STREET, MONTREAL

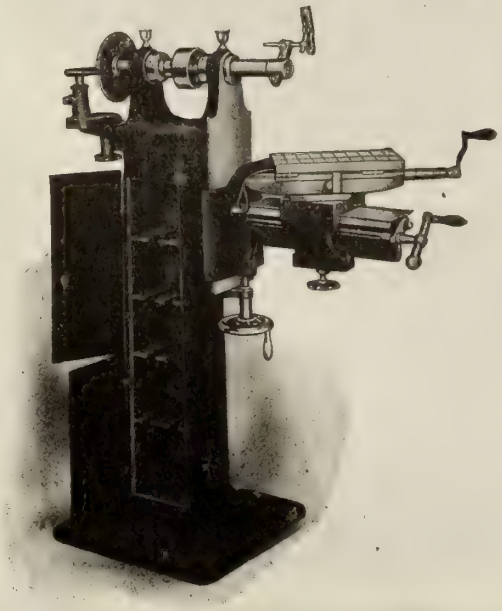
OBTAIN THE BEST RESULTS

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate



GARVIN No. 3, Universal Cutter and Surface Grinder
Use Code—Banish

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

Tires Led the way to Better Hose

THE hose industry stretches back into the early days of rubber history.

For year after year rubber hose had been built upon the immature principles of those early days.

But Goodyear has developed new and higher standards of hose efficiency.

Just as broad-visioned Goodyear chemists and engineers cut loose from tradition and built tires in a better way, so have they built industrial hose.

Old processes—obsolete methods have been forgotten. Only those processes, formulae and methods proved by service tests and experiment to be best enter into the manufacture of Goodyear Industrial Hose.

Hose linings which do not crack or harden have been developed.

Outer covers with an exceptional degree of toughness to withstand the wear of severe industrial service—another distinctly Goodyear feature.

In a word, Goodyear has built better hose. Original cost did not count if greater final economy and increased efficiency were a sure result.

You cannot know how far short of complete satisfaction ordinary hose falls until you experience the greater perfection of Goodyear Industrial Hose.

Give Goodyear Hose a trial now. There is a particular Goodyear Hose for every industrial purpose—water, steam, pneumatic tool, air drill, railway, fire, suction, etc.

Phone, wire or write to the nearest branch for a man trained in hose problems to study your needs. No obligation.

The Goodyear Tire & Rubber Co. of Canada, Limited

Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton London, Winnipeg, Regina, Calgary, Edmonton, Vancouver.

GOODYEAR
MADE IN CANADA
INDUSTRIAL HOSE

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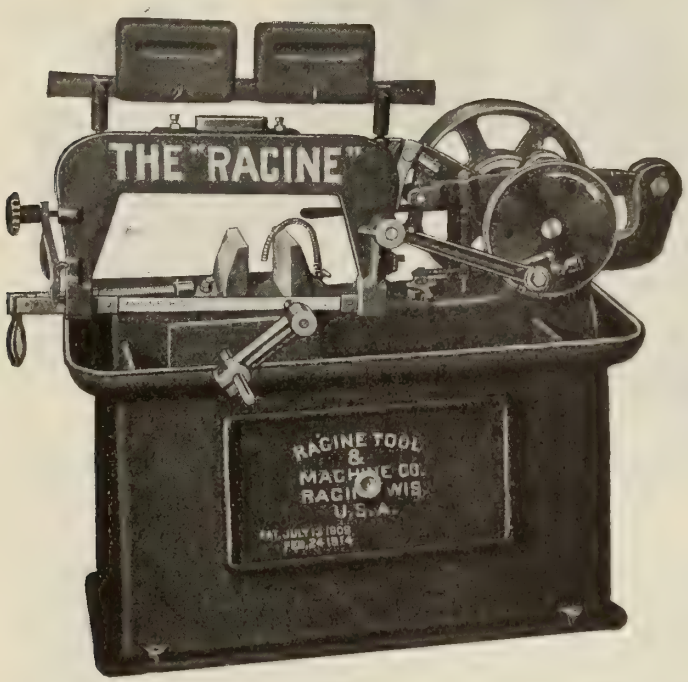
Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue, - RACINE WIS. U.S.A.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
Annual sales over $5,000,000.

Hoyt Metal Co., Toronto
New York, N.Y. London, Eng. St. Louis, Mo.

HACK SAWS AND GUMPTION

Every box of Starrett Hack Saws has everything in it that means economical work, except common sense or gumption. It's up to the man who uses the blades to supply that.

If he'll follow the Starrett Hack Saw Chart he's sure to use the right blade for each material—and that's a big step in the right direction. But to get everything out of a Starrett Blade that we put into it, he's got to use common sense.

Hack Saws won't cut economically without pressure or weight. They won't keep on cutting economically unless the weight is increased as the saw becomes dull. A blade won't keep its temper without the use of plenty of lubricant to cool it and it won't do its best if the work is cornered wrongly in the vise. But any Starrett Hack Saw, used according to the recommendation of the Starrett Hack Saw Chart, plus the common sense that every good machinist has, will prove what most users say of Starrett blades—"They cut quicker and last longer." Ask for Catalog No. 21-3 sent free.

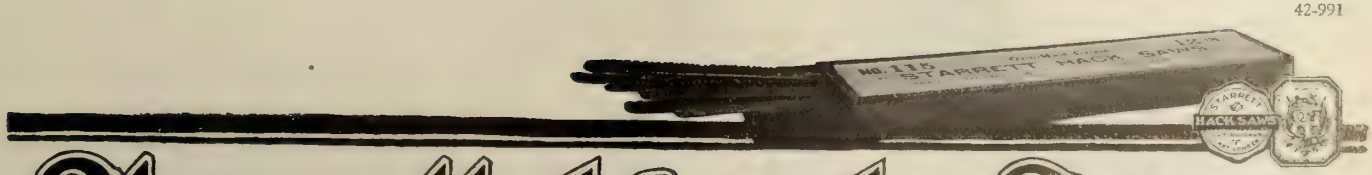
THE L. S. STARRETT CO.

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

ATHOL, MASSACHUSETTS

NEW YORK LONDON CHICAGO

42-991



Starrett Hack Saws

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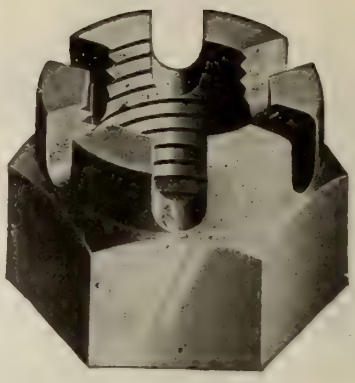
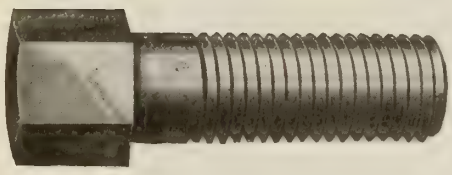
Ready for Delivery

SCREWS—Cap—V.—U.S.S.—S.A.E.
Set—U.S.S.—V.

NUTS—Plain—S.A.E.
Castellated—S.A.E.
Semi-Finished—V.—U.S.S.





MADE TO SPECIFICATIONS

Special Screw Machine Work in Sizes up to 2¼" diam. 10½" long.

THE NATIONAL ACME COMPANY

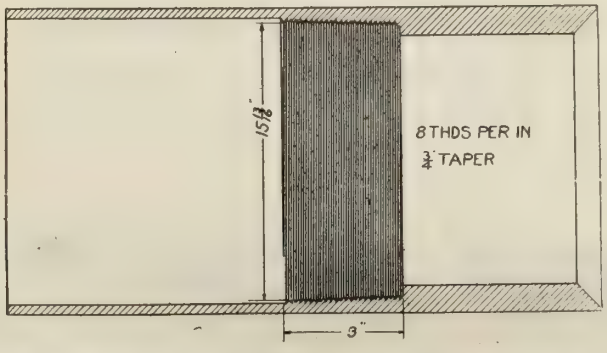
DE COURCELLES & G.T.R. MONTREAL, P.Q.

SMALLEY-GENERAL

THREAD MILLING MACHINE

Cost-Cutter :: Time-Saver

Saved 29 Minutes on This Job



Typical Operation and Time Study

Machine—No. 1 Thread Miller.
Piece Milled—Drive Shoe.
Thread—16¼ inches diameter, 3 inches length, 8 pitch, Briggs std., tapered thread.
Milling Feed—7 inches per minute.
Material—.55 carbon steel; air collet chuck used.
Time Study—Seven minutes floor to floor for complete operation.
Note—Former time, 36 minutes chasing in a lathe.

Are you not convinced that Smalley-General Thread Millers can save you time and expense? Let us have blueprints for time study of your work.

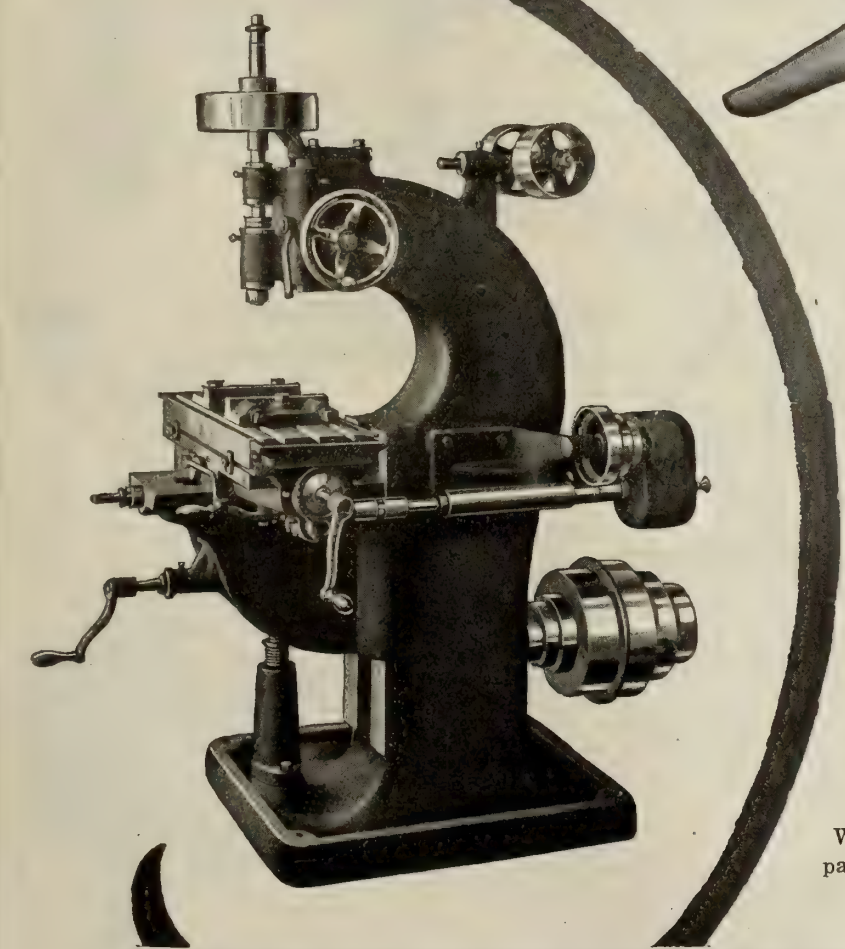
SMALLEY-GENERAL, Inc., BAY CITY, Mich.

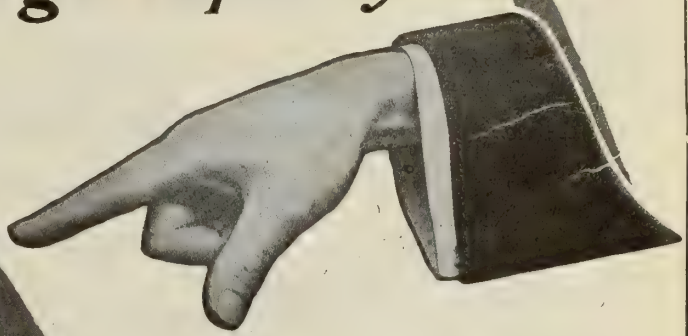
Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

BRISTOOL

Bristol Vertical Milling Machine

A Tool of Large Capacity





Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

If interested tear out this page and place with letters to be answered.

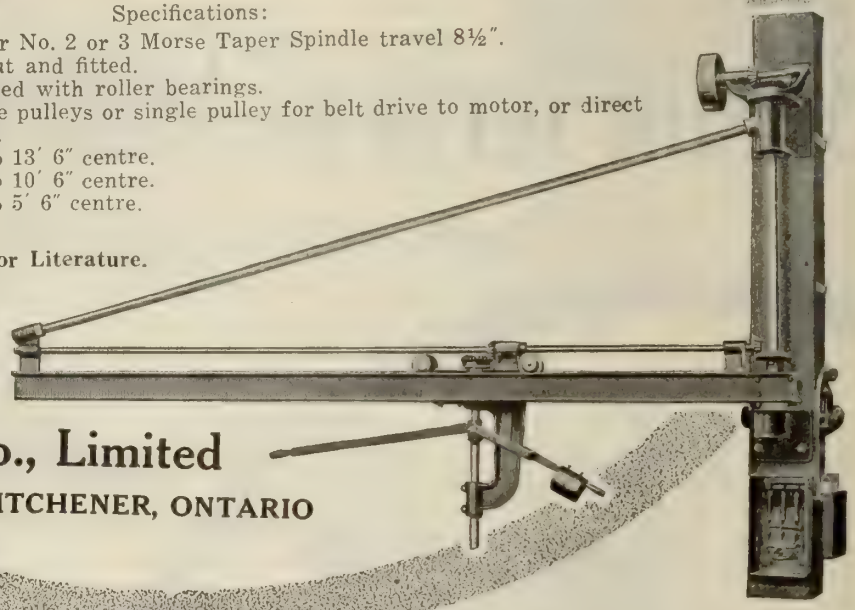
Built for Service

The Canadian Radial Drill is designed particularly for work in structural shops. For seaming and countersinking large surfaces such as structural shapes, boiler plates, long beams, etc.

Specifications:

Spindle 2 3/16″ diameter No. 2 or 3 Morse Taper Spindle travel 8½″.
All gears accurately cut and fitted.
Carriage wheels equipped with roller bearings.
14″ x 14″ tight and loose pulleys or single pulley for belt drive to motor, or direct connected to motor.
15 ft. Beam will drill to 13′ 6″ centre.
12 ft. Beam will drill to 10′ 6″ centre.
7 ft. Beam will drill to 5′ 6″ centre.

Write Dept. 16 for Literature.



Canadian Blower & Forge Co., Limited

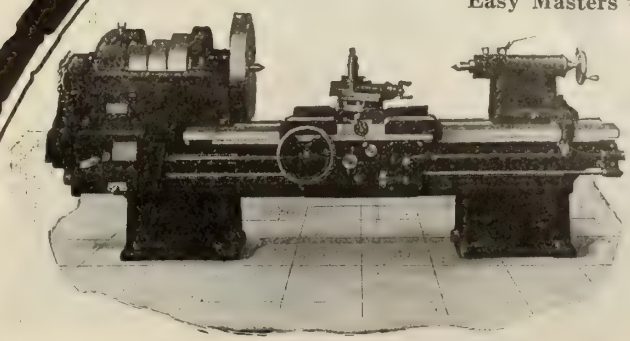
KITCHENER, ONTARIO

SIDNEY

Heavy Duty Lathes

The 25-inch Heavy Duty Quick Change Sidney shown below is the last word in lathe construction. Every possible improvement will be found in this late model. Bed lengths available are 10, 12, 14, 16, 18 and 20 feet. Also built with a 27-inch swing.

Easy Masters of Big Jobs



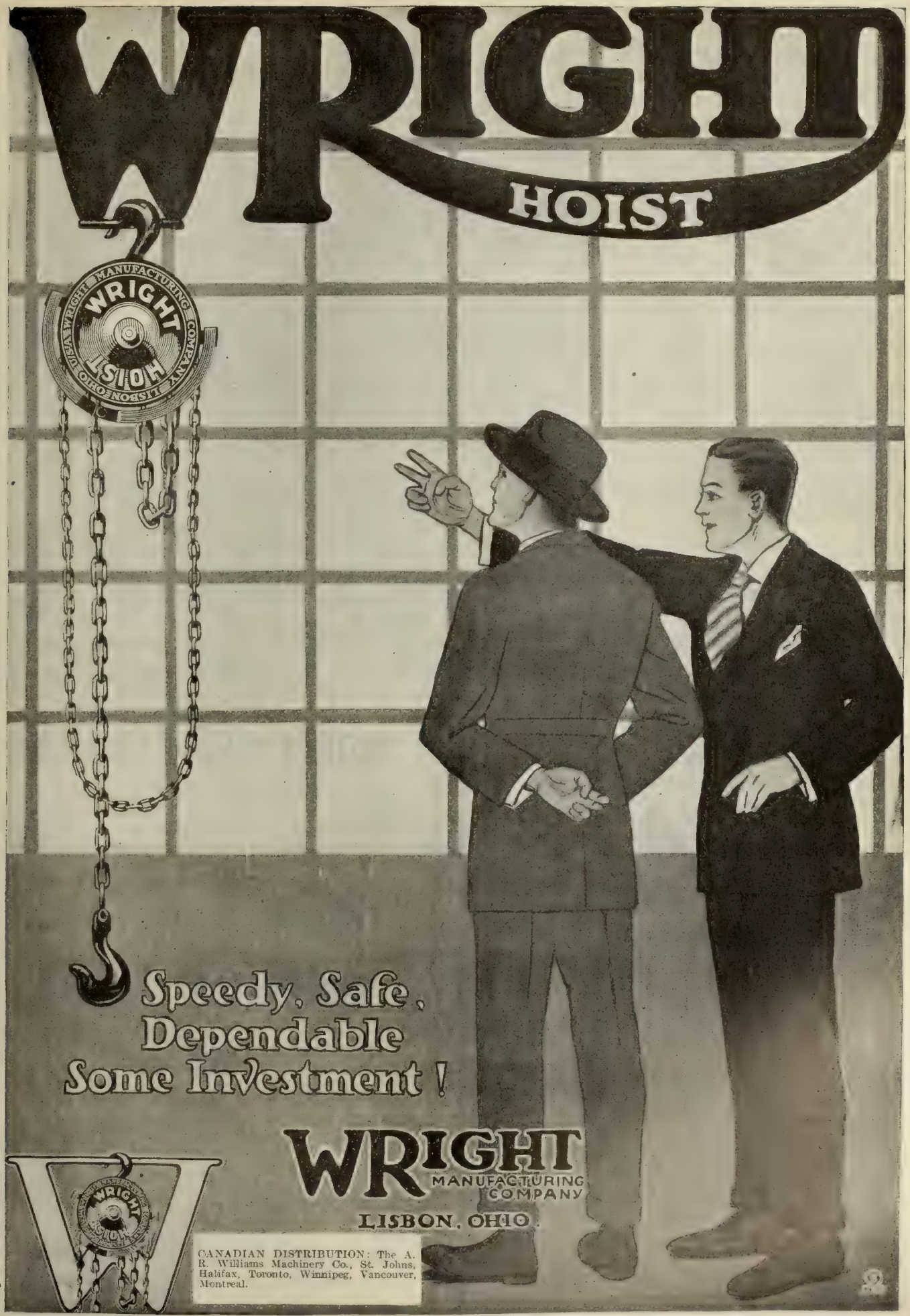
Regardless of the severity of work, dependence put on Sidney Lathes has never been misplaced. The Sidney line has made good—with a vengeance. New Bulletin just issued on 25-inch machine. Write to-day!

For SERVICE

The Sidney Tool Company

SIDNEY, OHIO

CANADIAN AGENTS:
Yeates Machinery & Supply Co., Montreal, Que.
H. W. Petrie, Limited, Toronto, Ontario



If interested tear out this page and place with letters to be answered.

Customers Are Satisfied

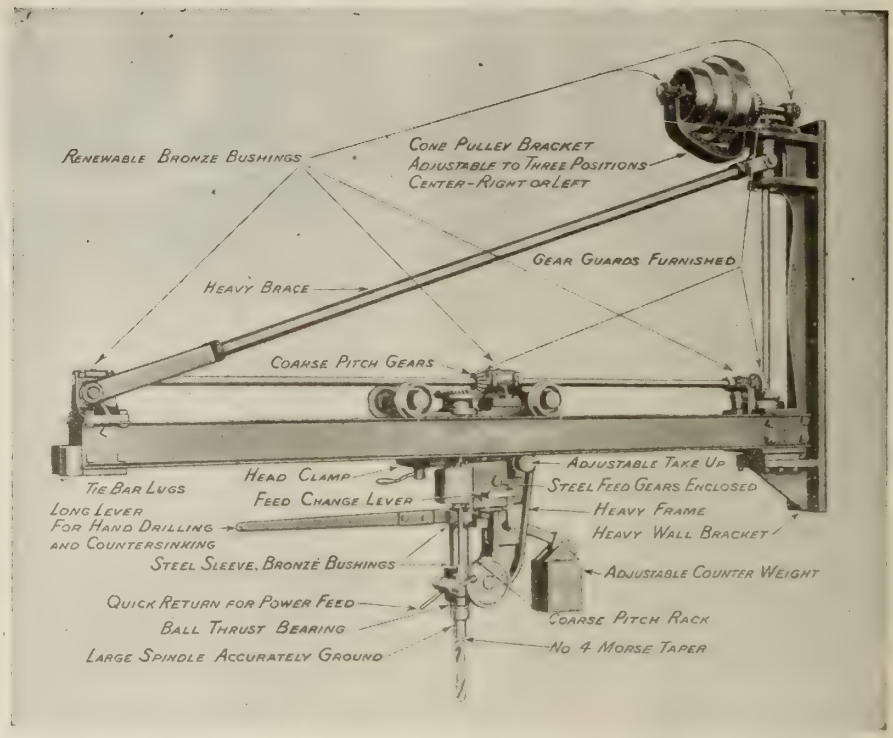
with the performance of this machine in their works. A recent letter to us states: "Regarding the WALL RADIAL DRILL, this is operating every day, and we are more than pleased with the results we are getting from the use of this tool. In all probability we will install additional ones later on." Our deliveries are getting further away each day. Better take advantage of the present conditions.

Want our detailed bulletin? You'll be interested in noting the construction of this machine, as given in same.

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

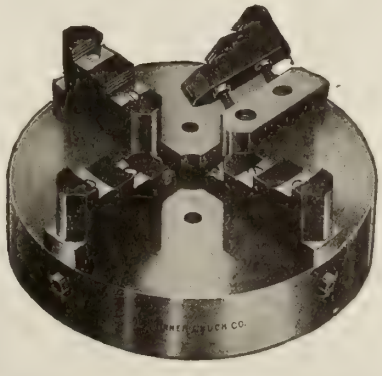
F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue Dept. B **BOSTON, MASS.**

SKINNER
Geared Screw Chucks
3 or 4 Jaws as Preferred



These chucks can be operated either independently or universally as desired. The jaws are easily reversed by simply loosening the jaw screws—turning the upper section and tightening the screws again.
Powerful, accurate, easy to operate and adjust, these chucks are adaptable to many classes of work.

The Skinner Chuck Company
New Britain, Conn.

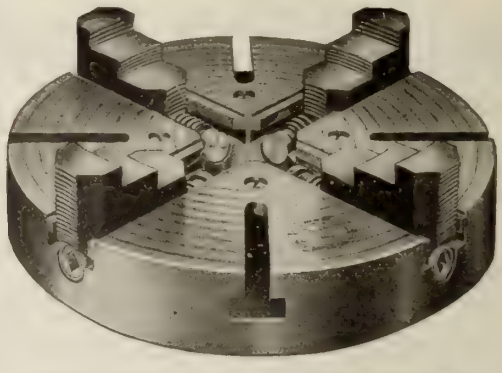
N. Y. Office
94 Reade St.

San Francisco Office
Rialto Building

London Office
139 Queen Victoria St., London, E.C. 4

ALL STEEL
INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



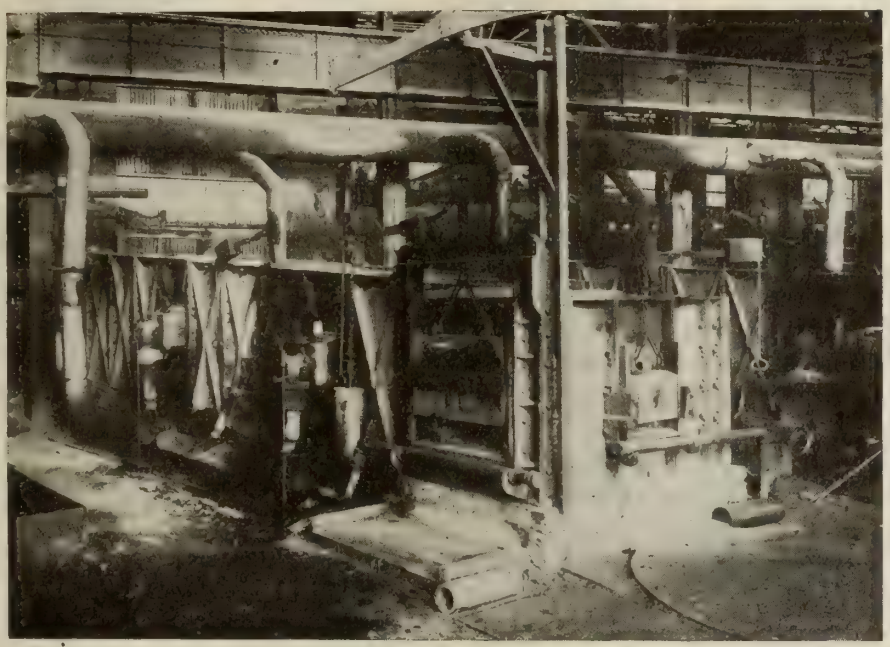
THE UNION STEEL BODY CHUCKS
are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY
New York Office:
26 Cortland Street, New Britain, Conn.
Makers of a complete line of chucks

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

Write

Mechanical Engineering
Company, Limited
Room 308, Bank of Toronto Bldg., Montreal
Three Rivers, Quebec, Canada

H & G

Die Head Cuts
Perfect Threads

The H. & G. Die Head illustrated is only 3⅝" outside diameter, yet it will cut from the smallest up to 1" standard thread and up to 1⅛" fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or areoplane plant for certainty.

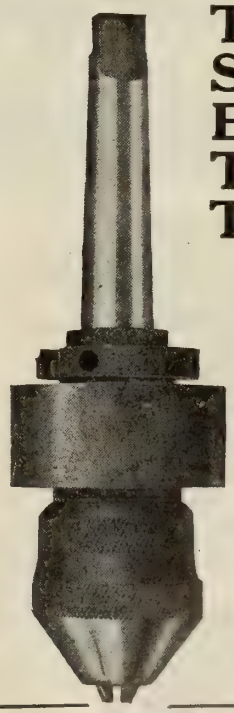
on Nickel Steel

Made in 9/16", 1", 1½" and 2" sizes.

No stronger, more durable, more accurate Die Head was ever made.

Ask for Catalog

Eastern Machine Screw Corp.
New Haven - Conn.



The Saving Slip of the Bicknell-Thomas Tap Chuck

is its most important feature. Powerful enough to drive the tap under all ordinary conditions, the friction slips before enough strain can develop to break it. Compact — invaluable on multiple spindle machines. Adaptable — ideal for tapping blind holes.

Made in four sizes—from ⅛ to 1 inch taps. Straight or Morse taper shanks.

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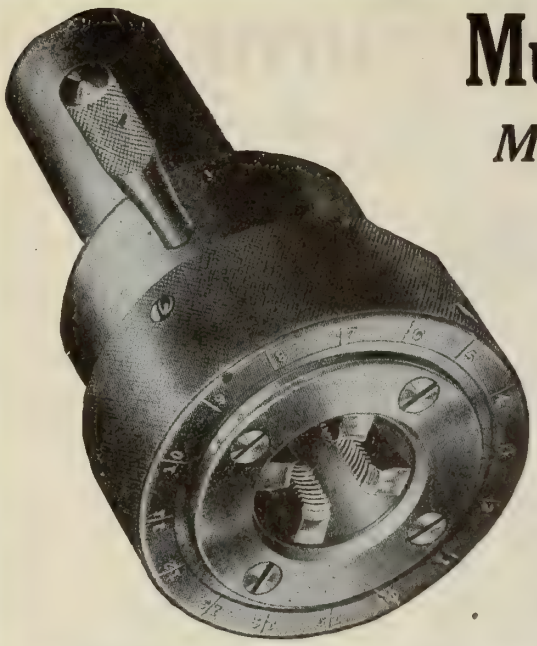

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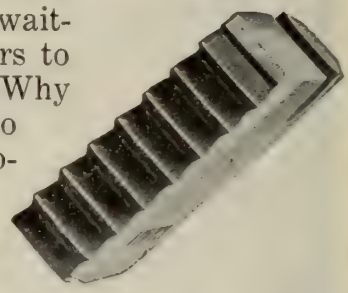

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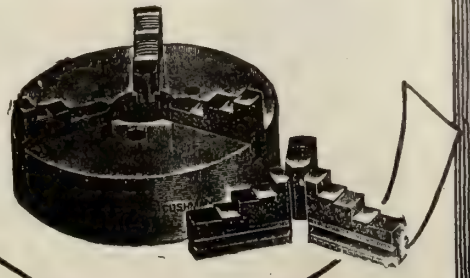

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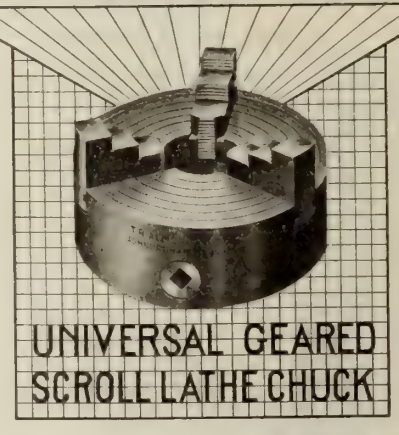

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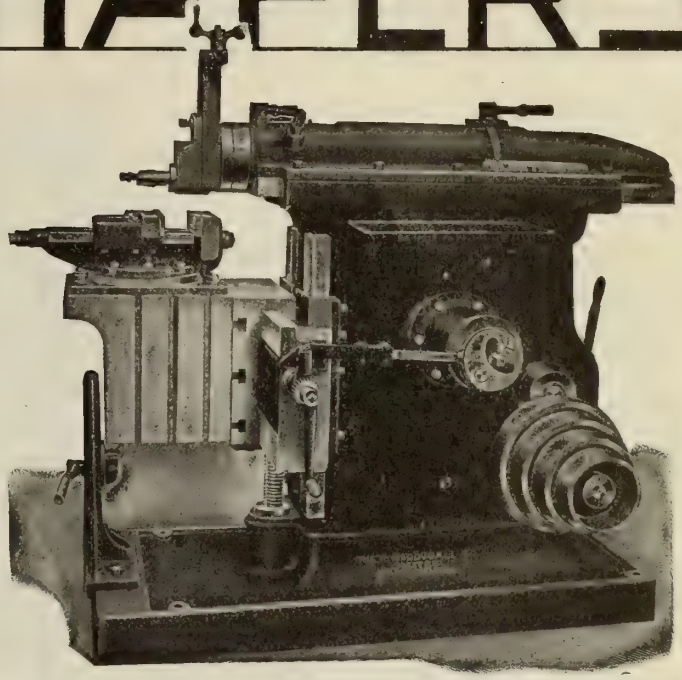

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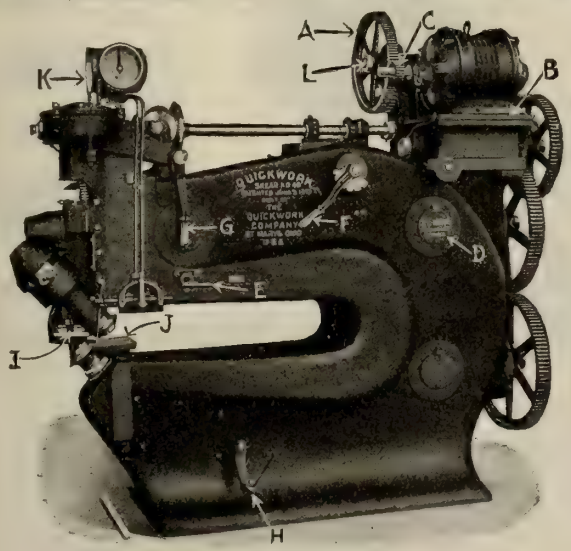

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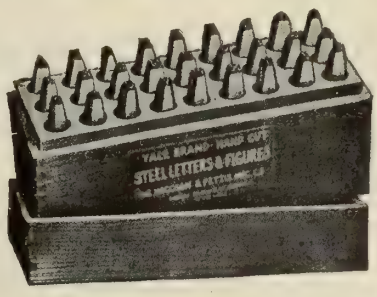

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From the above illustrations and many others of a similar nature it is noted that in the majority of cases where trials were conducted on grinding of this kind the operator discovered that he was using a wheel that was too soft and in some instances too fine. From these observations, if you are doing this kind of grinding and the results are not what you think they should be, if you will write to the Norton Sales Engineering Departments stating the kind of grinding and conditions surrounding your work they will be glad to render what assistance they can in helping to solve your problems.

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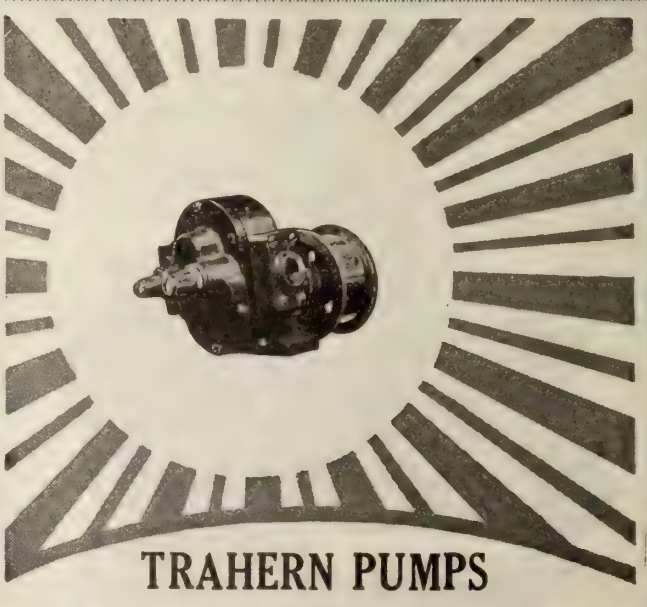

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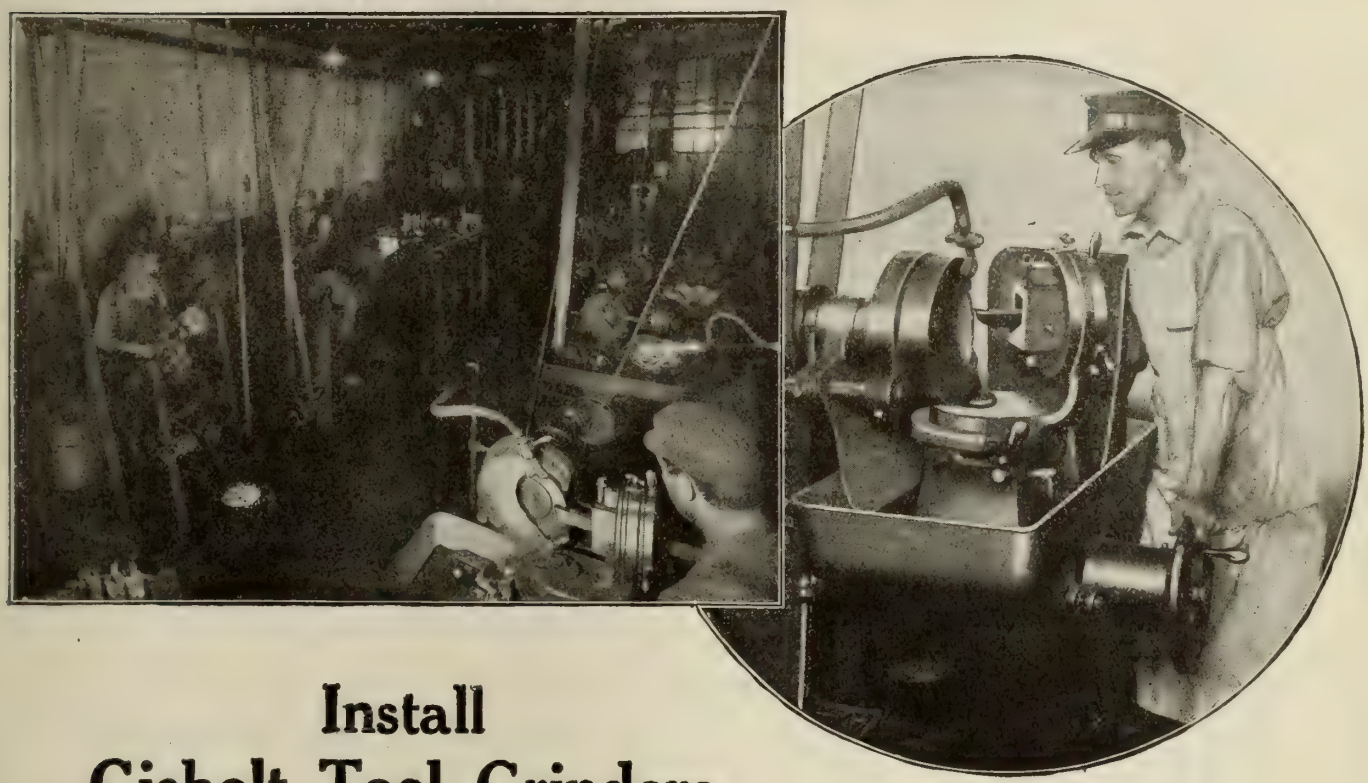

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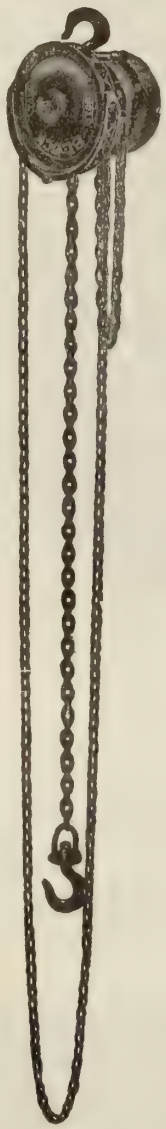

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CANADIAN MACHINERY
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MANUFACTURING NEWS

Vol. XXI No. 16 October 23, 1919

A Discussion of the Various Types of Jigs

The Second and Last Portion on This Subject. As Before Stated, There is Generally a Fundamental Principle Involved in Jig Design, Which is Varied to Suit the Requirements

By ROBERT MAWSON

THE illustration, Fig. 1, shows a type of simple, single clamp jig.

The knurled head pin A is made with a thread which screws into the body of the jig. When placing the part to be machined in the jig the screw is therefore first removed. After this has been done the clamp B may be removed.

The part C is then placed into the tool, being located by the pin, as shown. The clamp is next placed over the piece, being located for position by means of the pin D.

The other edge of the clamp rests against the steel block E.

The piece then sets between the front edge of the clamp and the wall F.

The screw A being then tightened forces the clamp down, and this action holds the part between the two surfaces noted. It will be noticed that the rear —left end—of the clamp is made with a raised portion or heel, and as the forward end is made slightly tapered in a vertical direction, the simple action of tightening the screw forces it down and therefore the clamp performs the dual purpose of positioning the piece and also holding it securely in the jig.

It is obvious that the hole in the clamp must be made slightly larger than the body size of the screw to allow the clamp to rock.

Three holes are then drilled in the element, the drill being guided through the holes shown at G, the tool resting with its rear vertical surface on the machine table.

Positive Location Type

It will be readily conceded that when positive locations for the piece can be used there is less chance of error than where the locating depends on the operator. The photo, Fig. 2, shows an open type-positive location jig.

The casting machined in the tool has been previously bored and a slot milled in the centre of a machined face.

The piece is therefore placed on a plug A, which accurately fits the bored hole and is also located by a tongue B, which also fits the machined keyway.

The four hook bolts C are then turned with their heads over the casting and the jig reversed to the position shown in Fig. 3.

The thumb nuts A are then tightened by the operator, which pulls up the casting securely into the jig.

The various holes may be then machined, the tools being guided through the various bushings shown in the usual manner. Legs are provided, the purpose of which has been previously noted.

This type of jig gives excellent results, as it is quick acting, positive and therefore produces accurate, interchangeable parts.

The next illustration, Fig. 7, shows another positive location jig of a somewhat different design.

This casting is again located by a circular plug A and key B, these elements fitting into surfaces which have been accurately machined in previous operations. The open washer C is then slid over the screw, as shown, which is then tightened down.

The small clamp D is then turned to the position it occupies in the photo and the small screw being tightened against the clamp assists in holding the casting.

Holes are then machined in the piece, the jig being turned into four positions, the one shown, the front face on the table, the left side resting on the machine table for the third position, and the right side for the fourth drilling operation.

Simple Holding Jigs

It is sometimes advisable to provide a medium for simply holding a part to be drilled.

This may be the case where a casting is somewhat fragile or of awkward shape.

In Fig. 4 is shown such a holding device, the tool being not provided with guide bushings for the drilling operations. The casting is located on a pin which fits into a reamed hole A, which has been previously machined.

The casting is then revolved on this stud until the piece comes in contact with the pin B. The strap C, which is of the open-ended type, is then fastened onto the casting by means of the long setscrew shown.

It will be noticed that when the casting has been located and held in the manner described, all the various bosses rest on supports.

The operator then centre-punches these bosses and drills a hole in each.

By the use of such a simple holding device the casting is held rigidly for the drilling operation, which may therefore be performed more quickly and satisfactorily.

The next tool, Fig. 11, is also a holding jig, but is provided with guide bushings. In reality it is the second operation on the casting previously shown.

The piece is again located on a pin A. The screws B are then tightened until the casting is central between the guide bushings.

This can be readily done, as by tightening one more than the other the casting will oscillate on the pin until the desired position is obtained. The open washer is then fastened against the casting by means of the screw in the pin A, which holds the piece securely in the jig.

The various holes are then drilled and the guide bushings may be observed immediately above the bosses.

Tools of this nature, where no guide bushings are used, or where the casting may be revolved to suit the condition of the casting, are permissible where the holes machined are of an independent nature, or in other words, when their position is not relative to other elements on the machine or design.

Jig With Holding Handle

The illustration, Fig. 5, shows a handy type of jig, fitted with a handle

which affords a convenient medium for holding during the machining operation.

When placing the piece in the jig, the cover A is first raised, the projection at the end providing a handy hold for the fingers. To raise the cover the knurled head pin B is first pulled out.

The casting is located by means of pins, the knurled headscrew C forcing the piece back against the locating pins. The screw is placed at a slight angle, so that the pressure forces the piece both into the jig and also back against the pins.

The cover is afterwards dropped down and held with the knurled head pin A. Holes are then drilled in the piece, the jig being placed in the position shown and then turned over with the rear face resting on the machine table.

It will be noticed that the jig is provided with narrow bearing surfaces on both faces, which rest on the machine table.

This is an advantage, as it reduces the possibility of dirt or chips getting under the faces, which would thus prevent accurate drilling.

The interesting feature of this tool is the machine steel handle E, which is forced into the body of the jig.

This attachment provides a handy medium for manipulating the tool to the various drilling positions.

The photo, Fig. 8, shows a jig with a wedge pin for locating the piece.

To use the tool the knurled head pin A is first slid out, and the piece pushed in from the front.

The casting then rests on the height pin B, which also acts as fulcrum.

The knurled head pin is then inserted again, fitting into a reamed hole in the arm C. It will be observed that the upper surface of the pin is machined with a flat surface, this being also made at a slight angle. As the operator therefore pushes in the pin the inclined surface acts as a wedge and raises the casting into the locating vee block D.

This simple angle device not only raises the casting, but its position or distance which it may be pushed in accommodates any slight discrepancy on the outside diameter of the piece.

The jig is made with an inserted steel guide plate E, which permits the making of the tool to be much simplified.

The guide hole for the drill on the upper surface on guide plate may be noticed by referring to the illustration.

A Triple Angle Jig

The next example, Fig. 9, shows a triple angle jig with a positive location. The casting is placed into the jig after the latch A has been raised.

The piece is located by a tongue B, which accurately fits into a slot which has been previously machined. The latch is then dropped down and the screw C

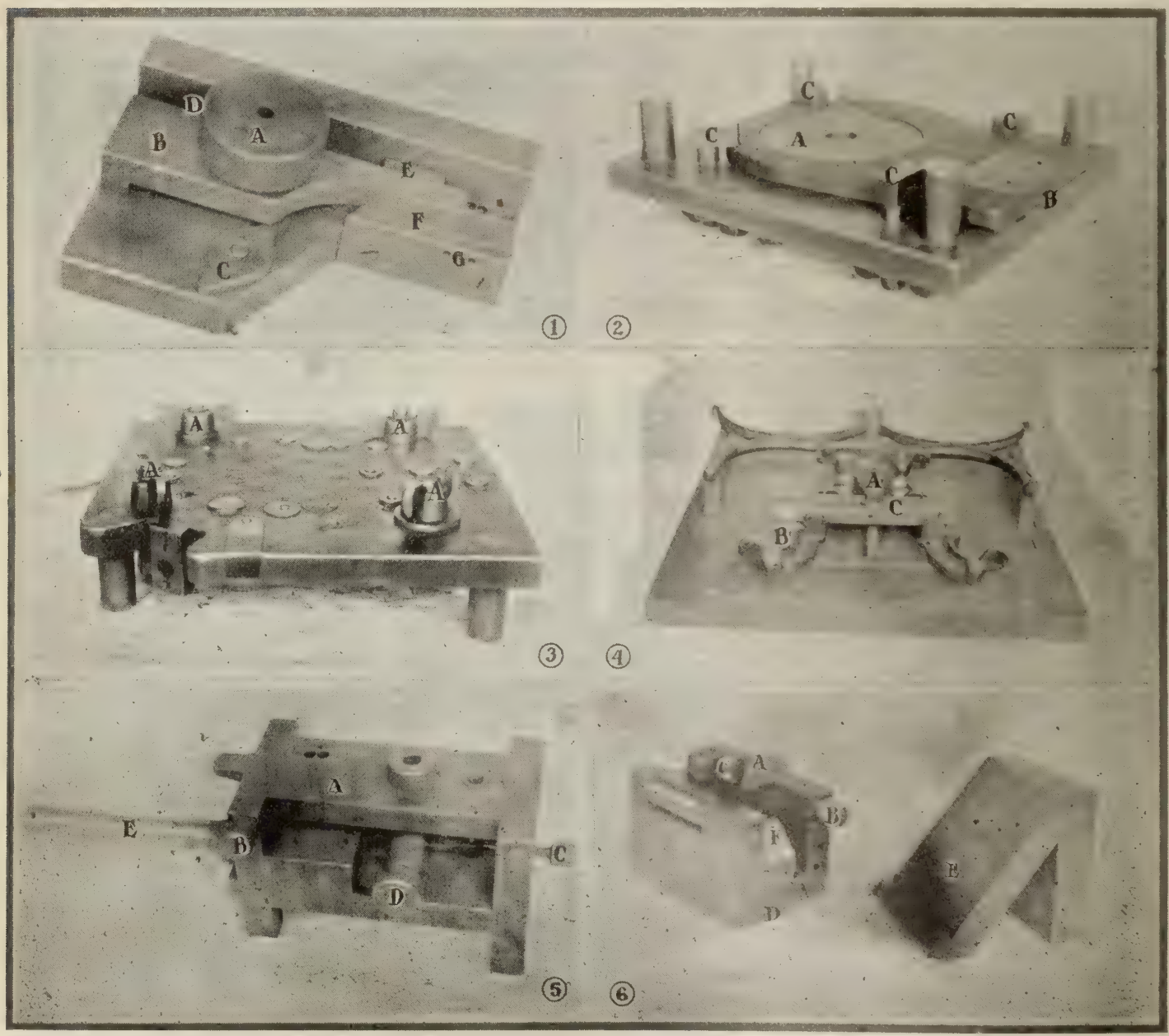


FIG. 1.—SIMPLE CLAMP JIG.
FIG. 2.—OPEN TYPE POSITIVE LOCATION JIG, BOTTOM VIEW.
FIG. 3.—OPEN TYPE POSITIVE LOCATION JIG, TOP VIEW.
FIG. 4.—SIMPLE HOLDING JIG.
FIG. 5.—JIG FOR HOLDING HANDLE.
FIG. 6.—JIG WTH SEPARATE ANGLE BLOCK.

tightened against the piece, either by using a wrench or screwdriver.

It will be seen that this screw is placed at an angle with the base of the casting and when tightened the pressure both forces the piece back to a stop pin and also down onto the locating key.

In this tool holes are to be drilled at three different angles, the three surfaces D are therefore made with similar angles to obtain this result, these surfaces or bases resting on the machine table when drilling the holes in the guide plate opposite.

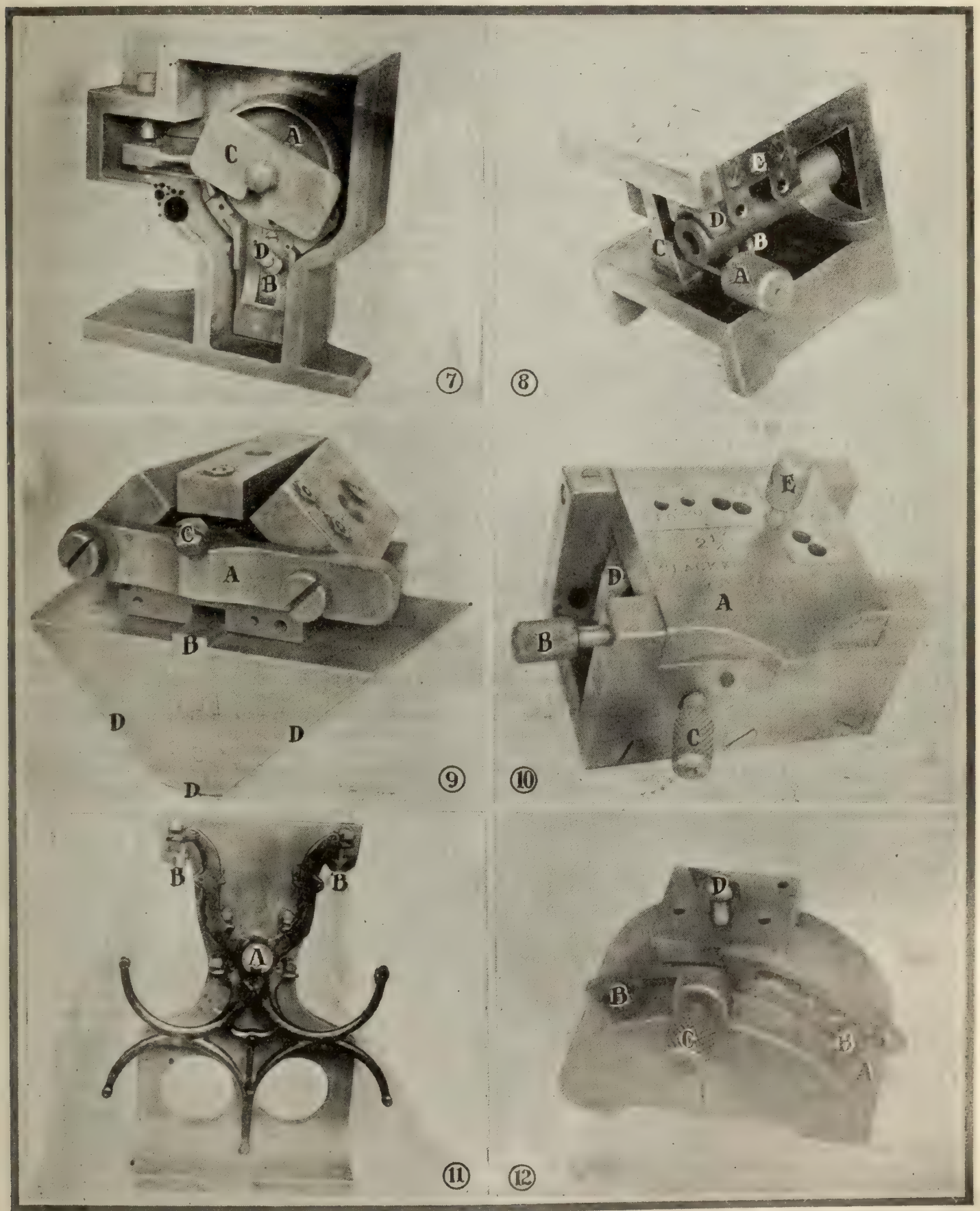


FIG. 7.—POSITIVE LOCATION JIG.
FIG. 9—TRIPLE ANGLE JIG.
FIG. 11.—HOLDING JIG WITH BUSHINGS.

FIG. 8.—WEDGE OPERATED JIG.
FIG. 10.—BOX TYPE OF JIG.
FIG. 12 PROFILE TYPE OF JIG

The illustration, Fig. 10, shows a box type of jig.

To place the piece into the jig the cover A is first raised by sliding out the knurled head pin B.

The piece is then put in the jig and the cover dropped down and fastened with the pin.

The knurled headscrew C is then tightened against the piece which pushes it against the stop plate D.

The screw E is next tightened onto the piece to hold it securely in the jig and also against the drill pressure.

The various holes are then machined in the usual manner.

A few words might be added about box jigs. It is advisable not to use them whenever possible for the following reasons:

They are usually more expensive to make, they are also much more difficult to keep clear of chips, and again, owing to the fact that the piece being drilled is out of sight, it is easier to make a mistake during the machining operation as the man cannot observe the progress of the work. When it is found absolutely necessary to make this type of tool, the question of expense must be controlled by the best design.

Chips may be removed in a small jig by plunging it after each drilling into a pail of kerosene, and mistakes in drilling can be only avoided by vigilance of the operator.

On a large jig holes to permit the chips and dirt to fall away from the locating surfaces should be always provided.

Jig With Separate Angle Block

When designing a jig for machining holes which are not in the same plane, it is often a problem to the designer whether to make the bases at the desired angle (as has been already illustrated) or use a separate angular block.

The practice of making a separate block will be usually found to be cheaper, as the main jig can be designed much simpler. The illustration, Fig. 11, shows a jig which has been made with a separate block or angle.

The casting is dropped into the jig after the cover A has been raised, and located against stop pins.

The cover is then fastened down by means of the knurled head pin B.

Holes are afterwards drilled in the piece, the drill being guided through the bushings C. The jig is then placed with the surface D resting on the face E of the angular block. It will be observed that this element is made with a ledge at the lower edge to prevent the jig sliding away from the block.

When the jig is in this position, the surface F is horizontal, so that a hole may be drilled in the casting, the bushing may be seen in the surface noted.

Fig. 12 shows a jig made with a profile surface to suit the contour of the piece to be machined.

This profile slot is made only part way around the jig, the blind end acting as a stop.

The piece is slid in from the left-hand end until it comes against the end A. The upper part of the piece also rests against the two pins B. The knurled headscrew C and wingscrew D are then tightened onto the piece to hold it securely in the jig. Holes are then drilled in the usual manner.

In this article I have endeavored to show some of the leading types of jigs used and analyze their features. I can only hope that it will be useful for not only the designer, but also the small shop, where tools are just made, often without any idea as to why things are done one way and not by a different method.

The Fundamental Principles of Safeguarding

A Paper Presented Before the A.B.C. Session, Eighth Annual Safety Congress, Cleveland, on the Subject of What Shall I Guard and How Shall I Guard It

By SIDNEY J. WILLIAMS, Secretary and Chief Engineer of the National Safety Council, Chicago

THE first half of our subject is, What shall I guard? The second half is, How shall I guard it?

If you want your plant to be 100 per cent. safe, the answer to the first question is, Guard every moving part, wherever located, on which a workman might be injured if he came in contact with it in any way, or from any cause whatsoever. If the moving part is in a place "where nobody ever goes," remember that someone is likely to go there sooner or later, in connection with the repair or maintenance or alteration of the machinery itself or of the building, or for some other reason which you cannot anticipate. You probably have heard the classic story—a perfectly true story—of the man whose heel was cut off by an unguarded gear 14 inches below the ceiling. The man was standing on a scaffold, working on another shaft nearby; to brace himself he placed his foot against the shaft on which the unguarded gear was located, his foot slipped, and was caught in the gear. Many similar examples could be quoted of accidents occurring in out-of-the-way places. Recognizing this fact, the Illinois Steel Company rule book, to mention only one example, requires that all gears, wherever located, must be enclosed.

You may be puzzled by attempting to apply this principle to the guarding of overhead shafting and belts. Many shafts contain miles of overhead shafting, which it is almost a physical impossibility to guard. On the other hand, oilers and repairmen are frequently injured, sometimes fatally, on unguarded overhead shafting or belts. The only solution is, if the shafting positively cannot be guarded, to prohibit absolutely any work on such overhead transmission while it is in motion. Repair work, shortening of belts, etc., can be done during the noon hour or at night; oiling likewise—or, better still, install automatic oilers or oilers which can be filled from the floor by using a special oil can with long spout.

A gear or belt or other dangerous moving part which happens to be located below a table, or in some other place where it is partially hidden, is not thereby made safe. Someone occasionally must reach under the table to sweep or repair the floor or oil or repair the machine. Someone may slip or stumble so that his arm comes in contact with a gear or belt which would be safe for the workman standing in his normal position. The immigrant totally ignorant of machinery—and it is hard for us to realize the completeness of the ignorance on this subject, on the part of foreigners brought up in farming districts—may deliberately put his hand or his finger into an opening that looks interesting, just to see what it is. If he finds that "it" is an unguarded gear, it is easy to say that the accident is his own fault—but that does not relieve our obligation to pay his compensation, nor does it restore him to his vacant place in the gang.

What I have said of gears and belts applies equally to any moving part on which a man might be injured—counterweights, cranks, reciprocating parts such as a planer bed, and so on; also, of course, to the operating point of machines.

The second half of the problem is, as already stated, "How shall I guard it?" Here are a few points to remember:

1. A safeguard should be so designed and constructed that it will prevent all accidents on the part guarded—not only accidents to the operator while at his regular work, but also to the operator or passers-by in case they slip or fall, or carelessly touch the machine.

2. The guard should not interfere with production. If it does, it is liable to be taken off. In designing a guard it is generally wise to consult the man who will use it.

3. In general, the guard should be attached to the machine and not to the floor; if attached to the floor, use a connection which will interfere as little as possible.

4. The guarded part must be accessible for oiling, inspection, and repair. The door or removable section provided for this purpose should be hinged or otherwise attached to the remainder of the guard, or to the machine. If not, it is likely to be left off permanently.

5. The guard should not interfere with cleaning and sweeping around the machine. It should, therefore, be kept generally about six inches above the floor.

6. The guard should be strong enough to resist injury and keep its shape. A light, flimsy guard soon becomes bent and is discarded. A substantial guard is cheaper in the end.

7. Incombustible guards are preferred. Wooden guards, soaked with oil, may become a serious fire hazard. Metal guards are neater and wear much better. "Metal guards look as if you wanted to; wooden guards look as if you had to." Guards may be made of cast iron, sheet metal, wire mesh, expanded or perforated metal, or slats. Where subjected to acid or fumes, wooden guards may be necessary.

8. It is desirable to interlock the guard with the operating mechanism, where possible, so the machine cannot be operated unless the guard is in place.

9. A safeguard can often be so designed that it will also serve to prevent wear on the parts guarded—for example, a solid gear enclosure.

Let us consider the application of these suggestions to the design of gear guards. Cast iron guards are preferred because they may be made to fit more snugly, present a better appearance, and protect the gears from dust and injury. In shops having similar gears on several machines, the cost of patterns and cast iron guards will be no greater than the cost of "built-up" guards. A cast guard of one machine may be used as a pattern for making guards for similar machines.

Guards for a variety of machines, and in many sizes, may be more cheaply made of sheet metal. In large guards, an angle iron is used to make the joint between the flat sides and the curved part of the guard. In smaller guards this joint may be made by cutting projections (like saw teeth) on each side piece and bending these over to form a smooth curve. The joint may then be made either by spot welding or by riveting. Short pieces of angle iron may also be used to form the joint—about ¾ in. x ¾ in. x ⅛ in. angles, one inch long, 3 in. or 4 in. apart.

Gears should be completely encased; or where this is impracticable, should have a band guard with side flanges extending inward beyond the root of the teeth. If there is a spoke hazard, the gear should be completely enclosed, or filled in between the spokes.

Bolts, flywheels, shafting, and large gears are often guarded by an open-work, rather than a solid enclosure. Such guards should be so designed that no one can get his hand or his finger into the danger point even if he tries. If the guard comes within four inches of any danger point the opening should not be greater than one-half inch square, which is small enough to exclude fingers. If more than four inches away—which is about the maximum length of a man's finger—the openings may be larger than one-half inch, but not larger than two inches square, this being small enough to keep out a man's hand. If a slatted construction is used, the slats should not be more than one inch apart.

The safety engineer's greatest difficulty is in guarding machines on which men are working. Let me repeat that it is very important not to attempt to guard machines in a way which will interfere with production. The great majority of both foremen and workmen will seriously object to such a guard, will use it under protest, and when the opportunity arises they will take it off and not put it back. I have time to mention only two examples—the circular saw and the punch press.

A guard is not the only essential for safety in operating a circular saw. For ripping, it is very important that the saw be provided with a splitter. Keeping the saw sharp and properly set will greatly decrease the danger of throwbacks. The floor where the operator stands should have a nonslip surface.

Many shop men say that it is impossible to guard a circular saw without interfering seriously with operation. The safety rule book of a large company contains a similar statement. In a great majority of the woodworking shops which I have visited, some, at least, of the saws have not been guarded, or some of the guards have not been in use.

I remember, however, two woodworking shops where every saw was guarded and every guard was in use—the Westinghouse Electric and Manufacturing Company, at Pittsburgh, and the Commonwealth Steel Company at Granite City. There doubtless are others, but I do not happen to have seen them. In each of these two shops every circular saw was provided with a guard which completely covered it when not in use and which rose automatically from the table as the stock was inserted. I watched men operating these saws and the guards did not seem to introduce the slightest difficulty. They were of very light construction and when the stock was shoved in they rose without apparent effort—the larger ones, at least, being counterweighted. The men in charge of these departments told me that the guards did not interfere at all with production, and, in fact, that the men now would not work without them because they felt that they were so much safer. I do not blame the workman or the foreman who objects to using a cumbersome, heavy, non-adjustable guard.

Special work on circular saws sometimes is difficult to guard. In some cases these difficulties may be overcome by careful study. In a few cases they probably can not, and the guard must be temporarily laid aside, being hinged or pivoted for that purpose. Where this must be done, another safeguard can often be introduced. For example, in grooving the edge of a board, provide an auxiliary guide or fence, so that there will be a guard on each side of the saw, thus keeping hands away from contact with it.

The punch press—using that common term to include all kinds of power presses—has, with the circular saw, the doubtful honor of causing more injuries, and especially more permanent injuries, than any other kind of machine. Where possible, the best guard is an enclosure around the plunger, which makes it impossible to get one's fingers underneath. Often, however, this is impossible. In such a case, let me suggest that instead of buying a dozen or a hundred of some so-called safety device, and putting it on every punch press in the shop, you start with one individual press and study the operation carefully in co-operation with the superintendent, foreman, master mechanic, and operator of the machine. Ask yourself the question—why do accidents happen or why may they happen on this particular press? The answer will be that, for one reason or another, the operator finds it necessary or convenient to put his hand under the plunger—either regularly or occasionally. The way to make the operation safe, then, is to arrange it so that the operator need not and will not put his hand under the plunger. Some times this may be done by cutting away a portion of the dies, so that the operator can keep hold of a part of the piece being formed and still not be injured. Often it may be accomplished by introducing an automatic or a foot-operated kick out. This almost always increases production as well as safety. Sometimes it is found practicable and advantageous to interchange the upper and lower dies. Sometimes the method of operation may be altered; I have in mind one case where, in riveting the handle socket onto a kettle, the operator laid the rivets in position after the kettle was in the machine and sometimes the plunger came down and caught her finger. After a good deal of study the superintendent arranged to have another girl place the rivets in position and hand the kettle to the operator, who then placed it in the press and completed the operation, obviously without danger and obviously with a great saving in time as well. In a great many cases, where the same operation is continued for a long time on one press ,it will be found economical to provide some sort of automatic or semi-automatic feed; this also always increases production as well as remov-

Continued on page 415

Canadian Machinery Drafting Course, Part IV

In This, the Fourth Portion, We Start in on Six Problems on Geometrical Drawing. This Branch Will Not be Touched on More Than is Absolutely Necessary

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE going into this subject of geometrical drawing let us say that a groundwork on this subject is absolutely necessary, otherwise we would not take it up. We shall, however, confine the work to three plates, so that only the most important geometrical problems will be taken up. By this means the student will not tire of the subject, for the writer of this series knows from personal experience that the average machine shop apprentice hates the very name or look of this subject. Still in due justice to the course these points should be at least touched upon, so students in general must not forget the necessity of getting in this groundwork of three plates, after which a more interesting section will follow though not more important than this the first of the geometrical series. Above all keep up the good work. We are receiving replies galore so keep sending in your work and secure one of the three prizes given in each part of this course.

Geometrical Drawing

Geometrical drawing is the art of becoming acquainted with the various lines and figures, what particular properties these figures have, and what bearing they have on mechanical drawing. A working knowledge of the problem to be presented in this course is absolutely necessary to a good draftsman, and is of course supplementary to the main idea, namely, mechanical drawing. As the main idea of geometrical drawing is accuracy, students must be sure to have all their drawings neat and accurate, otherwise the purpose of this section is lost.

In geometrical drawings we speak of definitions, which of course means an explanation of the various lines and figures involved in the study.

Geometrical Definitions

Let us see what these definitions are:

A point is used to mark a position and has neither length, breadth, nor thickness.

A line has length only. It is produced by the motion of a point.

A straight line is one that has the same direction throughout. In other words it is the shortest distance between any two points.

A curved line is one that constantly changes its direction. Sometimes it is termed a curve.

A broken line is one made up of several straight lines.

A horizontal line is one that has the direction of a line drawn upon the surface of water which is at rest. In other words a line parallel to the horizon.

Parallel lines are lines which lie in the same plane, and are equally distant from each other at all points.

A vertical line is one that lies in the direction of a cord suspended from its upper end, having a weight at its lower end. It is a line which is perpendicular to the horizon.

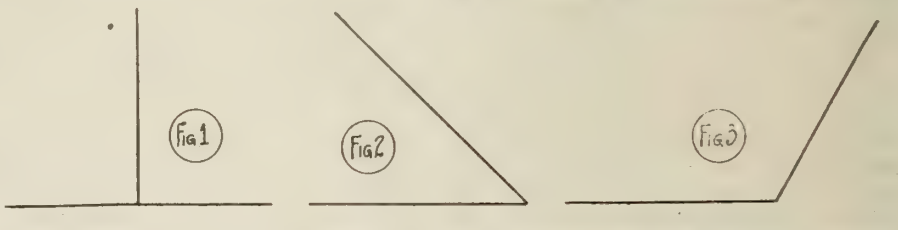
An oblique line is one that neither conforms to the vertical nor horizontal.

Examples of lines already spoken of are as follows:

Lines drawn with the T-square are all parallel to each other. A line drawn by means of the triangle on its straight side, together with the aid of T-square is a vertical line. A line drawn with the sloped side of triangle with same conditions as above will be an oblique line.

If two lines cut each other they are called intersecting lines, and the point where they cut is called the point of intersection.

An angle is the measure of the difference in direction of two lines. The lines are called sides and the point of meeting the vortex. The size of an angle is independent of the length of the lines.



If one straight line meets another, as in Fig. 1, so that the two angles thus formed are equal, the lines are termed perpendicular to each other, and the angles formed are known as right angles.

Should the angle be less than a right angle it looks like Fig. 2, and is termed an acute angle.

Should the angle be greater than a right angle it is termed an obtuse angle and appears as shown at Fig. 3.

Before going further into the other various definitions let us consider these already given as sufficient for the first portion on geometrical drawing. In this way the student will not have to carry in his head too many definitions at once, but will be able to concentrate on the particular ones he requires, so now to Fig. No. 4, and the instructions for the completion of the same.

Instructions

As usual commence by making the border lines 9 in. by 13 in., and the trimming lines 9½ in. by 13½ in. Divide this space into the seven parts as shown in the plate. As per usual, place the title, etc., in the lower space, then place problems 1 to 3 consecutively as illustrated. We will explain the working out of each problem as we go along.

Problem No. 1 (To Bisect a Straight Line)

To construct: First draw a straight line AB 3¾ inches long. With A as a centre, and a radius greater than one-half of the length of the line, describe an arc of a circle on each side of this line AB. With B as a centre and the same radius, describe arcs as before, intersecting the first two at the points C and D. Join C and D by the line CD, when the point E, when it intersects AB, will be the required point. In other words, AE=EB, as E is the middle point of AB.

This problem could also be termed erecting a perpendicular line to a straight line from its middle point, for the line CD is in the middle of AB and is perpendicular to it.

The next problems Nos. 2 and 3 can be classed under the one heading, namely to erect a perpendicular to a given line from a point in that line. We will take up two cases. First in Problem 2 we will take up the problem when the point is near the centre of the line.

Draw AB 3¾ inches long. Let C be the given point on the line. With C as a centre and any radius, such as CD, describe two short arcs cutting AB at the point D and E. With D and E as centres, and any convenient radius greater than CD, describe two arcs intersecting at F. Draw CF and that line will be perpendicular to AB at the point C.

In Problem 3 we take up a case where the point is near the end of the line.

Draw AB 3¾ inches long. Suppose C about ½ inch from the end of the line as shown. With any point D as a centre and a radius DC, describe an arc cutting AB at C and E. Draw ED and produce it until it intersects the arc at the point F. A line drawn through F and C will be perpendicular to AB at the point C.

Problem 4 (Through a Given Point, to Draw a Straight Line Parallel to a Given Straight Line)

First let AB be the given line 3 inches long. Let C be the given point

With C as a centre and any convenient radius, describe an arc DE intersecting AB at E. With E as a centre, and the same radius, describe the arc CF intersecting AB at F. With E as a centre and a radius equal to the chord of the arc CF, describe an arc intersecting DE at D. A straight line drawn through D and C will be parallel to AB.

Problem 5 (To Bisect a Given Angle Where the Sides Intersect Within the Limits of the Drawing

To construct. Let ABC be the angle to be bisected.

Draw the sides AB and BC 3¾ inches long. With B as a centre and any convenient radius describe the arc DE intersecting AB at D and BC at E. With D and E as centres, and a radius greater than the chord of half the arc DE, describe two arcs intersecting at F. A line drawn through F and B wil bisect the angle. In other words ABF will equal FBC.

Problem 6 (To Contruct an Angle Equal to a Given Angle)

Draw AB 2½ inches long, and the line BC 2½ inches long. The angle formed by these lines may be any convenient size; in this case we will call for 45 degrees. This angle ABC is the given angle.

Now draw DE a horizontal line 2½ inches long, and let D, the left-hand extremity, be the vortex of the angle to be constructed. With B as a centre for any convenient radius, say about 1½ inches, describe the arc FG, cutting both AB and BC. With D as a centre, and the same radius, draw the indefinite arc HJ. Now set the compass so that the distance equals the chord FG. With H as a centre and a radius equal to FG, draw an arc, cutting HJ at J. Through D and J draw a straight line. The angle JDE will now be equal to the angle ABC.

This completes the plate. Draw all these problems very carefully with a 4 or 6H pencil, making sure that the pencil is good and sharp. Draw your lines lightly, then, after completion, ink them in as shown on the plate. Students will do well to study and memorize these problems if possible. Above all get busy with this plate and send us along your work for inspection. Have you landed one of those scales yet? If not, this may be your lucky plate.

Tear off and send with drawing

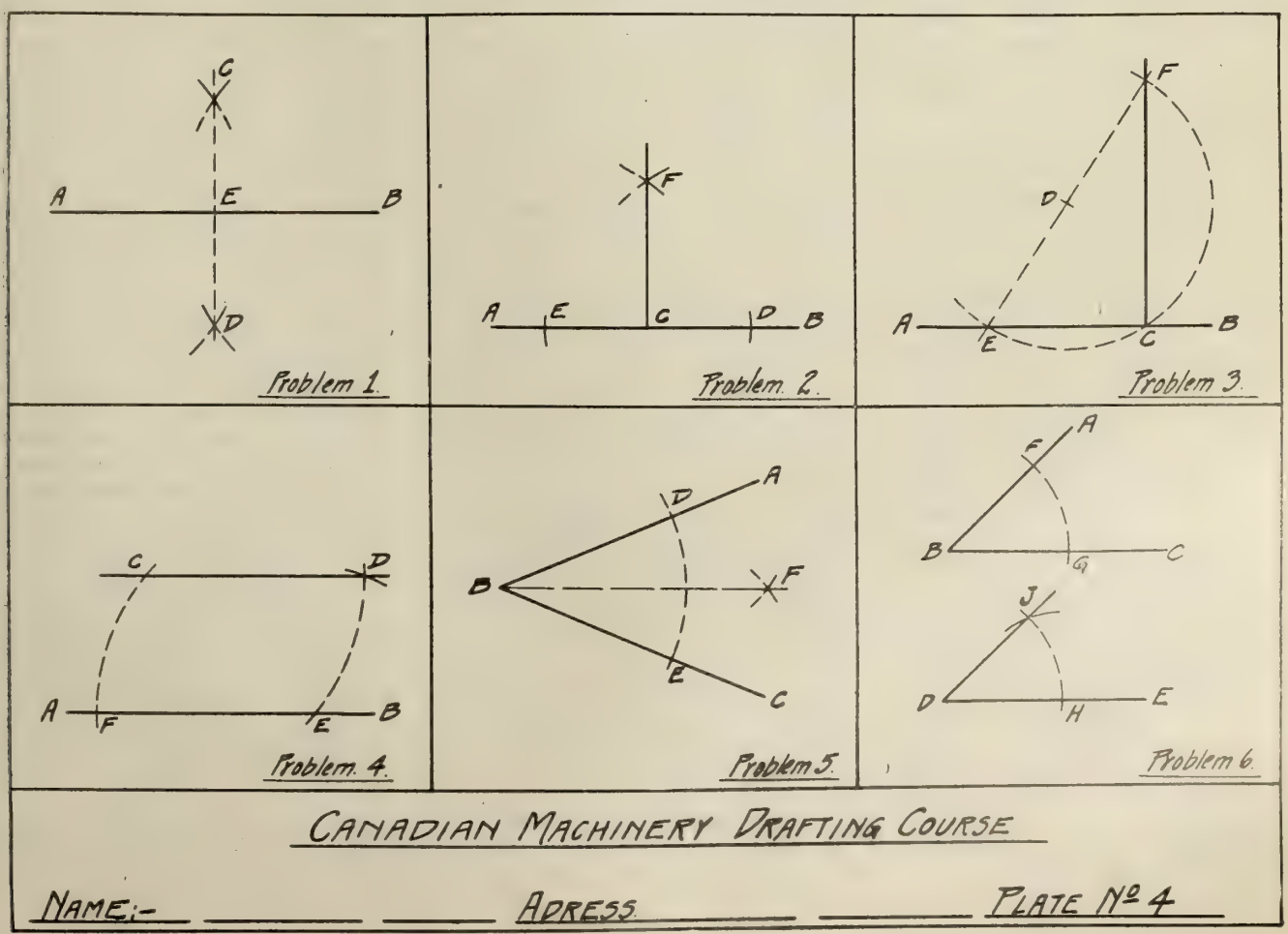
Name .....

Address .....

Position .....

Firm's name.....

Arsenical poisoning by coal and coal products was recently discussed before the French Academy of Science by Charles Richet in a paper. There had been an outbreak of serious symptoms at a briquette works. The name given to the disorder was the pitch disease. In many cases there was cutaneous cancer of a grave form, which even proved fatal; about 30% of all the employees were affected in this way. A chemical analysis was made of the pitch, and arsenic was clearly found in it, and traces were also discovered in the dust at the works, in the hair of the workingmen (and that in considerable quantities) and in the blood of most of them. It was evident, therefore, that they were under the influence of arsenic. It was ascertained that similar results have been met among tar distillers, road asphalters, tarred paper makers, and lampblack makers. The origin of this arsenic is to be sought in the coal. It has been long known that certain varieties of coal contain notable quantities of arsenical pyrites; but it is a new thing to find that arsenic is so widely to be found in coal.



WELDING AND CUTTING

WELDING SCHOOLS, MOTOR TRANSPORT CORPS, U.S. ARMY†

By C. K. Bryce*

UNDER the expanded program of the Army one of the very noticeable shortages in the personnel of the Motor Transport Corps was that of oxy-acetylene welders. Welders were required in the Maintenance Divisions of this corps. In this division were two units that included welders—the Base Repair Shop units and the Machine Shop Truck units.

The Base Repair Shops were large shops of about 250,000 square feet of floor space, in which every operation in the rebuilding or repair of a motor vehicle could be carried on. Naturally, an important department was the welding shop. This was completely equipped with an acetylene generator, blowpipes, regulators and auxiliary devices, in accordance with latest practice. These shops were permanently erected and located in proportion to the motor vehicle requirements of the territory or troops to which they were attached.

The Machine Shop Truck units were essentially small machine shops on wheels. The principal truck had mounted on it a lathe, drill press, grinder and other tools for automobile repair and upkeep. In the equipment was included a complete oxy-acetylene welding and cutting outfit. Attached to the underside of the truck body were two oxygen cylinders and one acetylene cylinder. These mobile shops were used for minor or emergency repairs, which it was not practicable to put through the Base Repair Shops. Each army had a certain number of these units assigned to it.

On surveying the welding talent necessary to fill these units less than 100 welders were available. From the tables of organization it was estimated that between 1,500 and 2,000 would be required in six or eight months' time. The usual channels of draft, induction, enlistment and transfer from other Corps being discontinued, it was apparent a new source must be created.

In May, 1918, after considerable activity on the part of Col. J. W. Furlough, Deputy Chief, Motor Transport Corps, the organization of a welding school was started. This school was divided into three sections, to be located at each of the three Base Repairs Shops, then in process of erection in this country—namely, Camp Holabird, Md.; Camp Jessup, Ga., and Camp Normoyle, Texas.

Each school was laid out to accommodate a class of 100 welders, with provisions to increase this to 150. The buildings consisted of a school building proper, and an oxygen and acetylene house. The main building was divided into a welding room, lecture room, offices, stockroom, and repair shop.

The welding room consisted of rows of stations, piped with oxygen and acetylene from a central source. Each station occupied 7½ x 6½ feet of floor space, and consisted of a cast iron welding table, blowpipe, oxygen and acetylene regulators, hose, etc. The oxygen and acetylene were piped in headers between the rows of tables. Oxygen was distributed from a 30-cylinder manifold; acetylene was generated in a non-automatic generator at low pressure, and delivered to a 1,000-cu. ft. gas holder; from there it was compressed in a single stage compressor to about 10 lbs. pressure. After passing through suitable regulating and relieving devices the gas entered the station headers.

The course of training was from six to eight weeks' duration. The actual welding time averaged about 60 hours. In addition to this, there were about 30 hours of lectures and talks. A course of 60 standard problems, selected to cover the motor truck welding field, was selected. These problems covered steel, cast iron, malleable iron, aluminum, brass, bronze, copper, brazing and lead burning.

The students were compelled to perform each problem satisfactorily before progressing to the next. Every morning he was given a short talk on technical factors involved. On Saturday morning he was questioned on the week's work.

The training progressed by weekly grading, which allowed a flexible and continuous scheme of instruction. At the beginning of each week a green squad of from ten to fourteen men entered the school. At the end of each week a finished squad was graduated. The new men would be taken in charge by the instructor supervising the first week's training. At the end of this time, provided their work was satisfactory, they would be advanced to the next grade under the instructor in charge of the second week's training.

This arrangement proved satisfactory, since it was possible for a student to advance more rapidly than his squad should his skill warrant it, or in case he were backward, to progress at a slower rate. Also, another important feature which had to be considered was that of instructors. In this scheme the instructors were specialized on a limited section of the training only. They could, therefore, be developed faster and more efficiently than if they were given a more or less general training for the entire course.

After a student had completed a problem, it was inspected by the instructor, and where required, the weld broken and the fracture examined. The student was graded accordingly. These grades were recorded and averaged with the grades given in the lecture room. If, at the end of four weeks, a student who had entered as a private was above a certain average, he was recommended for promotion to Private, First Class. During the last week of the training the student was placed on practical jobs without any assistance from the instructors. This was in order that he attain confidence in his own ability to overcome difficulties that might confront him.

When he had satisfactorily completed his practical work he was given a written quizz, to refresh his mind on essential points. He was then awarded a certificate and relieved from the welding school detail, and held ready for assignment to duty. In active service the Motor Transport Corps graded the welders from Sergeants, senior grade, to Corporals, the average grade being Sergeant. The Sergeants, senior grade, were foreman welders connected with the welding department of the Base Repair Shops. The Corporals were helpers.

At the time of the signing of the Armistice only one of the three schools was in full operation. Due to delays in building appropriations the other school buildings were just being started. These were finally abandoned.

The Camp Holabird school, which was in operation, was housed in a three-storey distillery building already erected

†Paper read before International Acetylene Association, New York.

*Formerly Major M.T.C., U.S.A.

and because of this had several months' start on the others.

It was shown, in this method of training, that the difficulty connected with the production of welders was more or less imaginary. Of the men received—and these were not selected because of any particular qualifications — there were only about 8 per cent. rejections. In practically all cases this was due to disinclination rather than inability to absorb the training.

In proportioning the course, 3½ weeks were spent on steel 2 weeks on cast iron, 1 week on aluminum and the remainder on miscellaneous metals. Steel being the first metal tackled by the student, more time was spent on this, in order that he thoroughly master the fundamentals. Aluminum welding was grasped quite readily, as was also cast iron.

The welding school has become a permanent institution in the Motor Transport Corps. Originally conceived for emergency training it now fits in nicely with the educational plans that have been adopted for peace-time service. Recruits are given the opportunity of learning one or more of the trades connected with motor truck operation and maintenance. Oxy-acetylene welding has met with its share of popularity and it is believed that the school will be filled to its capacity at all times.

Worth-While Information From Many Points

A very effective agent for moisture-proofing wood has been found in an aluminum leaf coating. This coating practically insulates the wood against any change in atmospheric conditions, and is particularly valuable for use where accurate form and balance must be maintained, as would be necessary in an airplane propeller.

* * *

A statement issued by the British War Office gives the following interesting data regarding the comparative number of bombs dropped by aviators on both sides during a single month. In the area occupied by British troops in France during that period German aviators dropped 1,482 bombs, while British airmen let loose 7,653 bombs into German-occupied areas in the same month.

* * *

It is not generally known that the American Federal Board for Vocational Education maintains a course designed to prepare disabled soldiers for civil service positions. There are 32 men now studying to qualify themselves for positions under the civil service, and the Board will undertake to prepare any student who so desires, provided he can qualify as physically competent to do the work. Of course there are some regulations regarding these positions and men obviously handicapped cannot expect to hold down jobs where their physical disqualifications are such as to prevent the proper discharge of the duties. But on April 16 the President authorized an amendment to the civil service rules which permits the civil service commission to exempt from the physical requirements established for any position, a disabled and honorably discharged soldier or sailor or marine upon the certification of the Federal Board for Vocational Education that he has been specially trained for and has passed a practical test, demonstrating his physical ability to perform the work sought. Under the law a disabled soldier has a preference on the civil service list.

* * *

Mariners who frequent the coast of Peru are familiar with a curious phenomenon that occasionally prevails there —notably in the harbor of Calloa—commonly known as the "painter." The water becomes discolored and emits a nauseous smell, apparently due to sulphuretted hydrogen. The white paint of vessels becomes coated with a chocolate-colored slime; especially when the wet fog, known as the garua, prevails at the time. Presumably both the discoloration and the smell are due to the decomposition of marine organisms. In a paper recently presented to the Geographical Society of Lima, Senor J. A. de Lavalle y Garcia discusses this phenomenon (which he calls "aguaje") and concludes that the primary cause is the seasonal shift of ocean currents. The "painter" prevails during the months December to April, at which time the warm equatorial countercurrent displaces the cool Peruvian current. The resulting change in temperature of the ocean water would, he thinks, kill quantities of plankton, and the decay of this organic matter would give rise to the phenomena observed.

* * *

The inactivity of the Russian platinum mines has caused a corresponding increase in activity in Colombia. A large company has recently been formed to operate in Colombia, which is reported to hold 10,000 acres of land as well as 50 miles of river bottom. The operations of this company should materially increase the output of platinum from Colombia. It is announced that the War Department, through the Chief of Division of Sales of Munitions will dispose of 19,000 ounces of platinum at a minimum cost of $105 an ounce. A substitute for platinum in electrical apparatus has been the object of some private investigations. One satisfactory substitute for cathodes was found to be 90 per cent. gold and 10 per cent. copper.

* * *

According to an article in the London "Times" of recent date, the manufacture of laboratory glass started at Sheffield since the war has made substantial progress, though much remains to be done if the industry is to be commercially sound and able to compete in the world's markets. Prior to the war there was no manufacture of laboratory glass in Great Britain, and the whole process, hitherto confined to Germany, had to be discovered and workers specially trained. With this object, a department of glass technology was opened at Sheffield University with the support of the Government, and to-day the department is turning out work said to equal anything Germany ever produced. The experimental nature of the work has made the cost of production heavier than the German article, and to help this a glass research association is being formed. The British Government has been asked to provide $364,987 over a period of five years, and the manufacturers will contribute a further sum of $121,662. It is said that the first attention of the association will be directed to problems of machinery and labor-saving devices.

THE FUNDAMENTAL PRINCIPLES

Continued from page 411

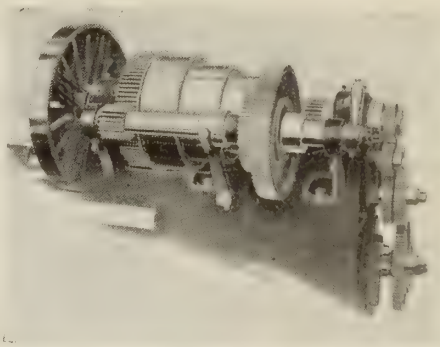
ing the hazard. Gate guards and two-handed operations are sometimes necessary, but should be used only as a last resort. The methods above are more efficient because they go to the root of the matter and remove the hazard, rather than merely guarding it. When you remove the hazard you simplify the operation and therefore increase production. When you merely guard the hazard you may decrease production.

What I have said of the punch press is typical of many machines. Safety engineering does not consist in simply building wire mesh guards, nor in buying safety devices which look pretty in a catalogue, and putting them on the machine without regard to the wishes, the convenience, or the efficiency of the operator. The real safety engineer will, where necessary, study the operation of a machine until he understands it as well or better than the operator himself —as well as the foreman, the superintendent, the master mechanic; and then he will apply their brains and his own in working out either a guard, or a change in the machine, or a change in the operation, which will remove the underlying hazard and make the operation intrinsically safe.

DEVELOPMENTS IN SHOP EQUIPMENT

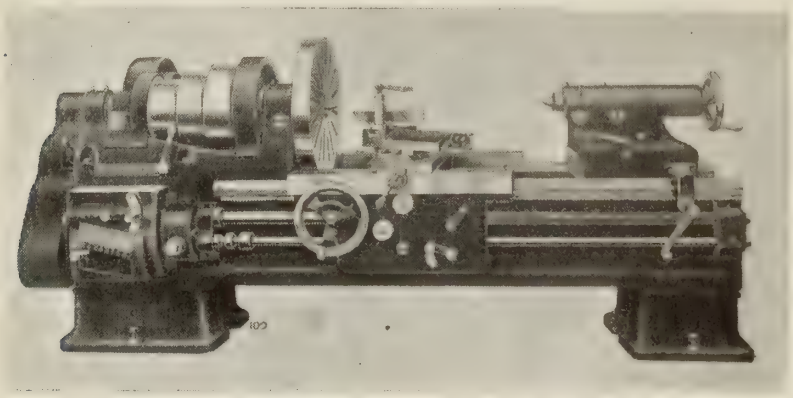
CINCINNATI 28-INCH SEVERE-DUTY LATHE

In Fig. 1 is shown a general view of the 28-in. "severe duty" lathe built by the Cincinnati Lathe and Tool Co., Cincinnati, Ohio. This machine is a larger edition of the 15- and 16-in. lathes manufactured by the same company for the last 15 years and includes the same features. Designed for heavy duty, the construction is neither complicated nor such as to make the parts cumbersome to handle. Fig. 2 shows the sliding double back gears from the rear.



SLIDING DOUBLE BACK GEARS AS SEEN FROM REAR.

The bed is 18¼ in. in depth and 23⅛ in. wide and is heavily braced with box-section girders to minimize twisting strains. Bed lengths from 10 to 30 ft. can be supplied, each size being 2 ft. longer than the preceding one. The cabinet legs are provided with two screws in the centre of each so that each end may be regulated to make the bed perfectly true. This arrangement makes wedges unnecessary.



Front bearing, 4½ in. x 7¾ in.; back bearing, 3⅜ in. x 5⅜ in.; width of belt, 5½ in.; hole through spindle, 2⅛ in., cutting tool size, ⅞ in. x 1¾ in.; diameter nose of spindle, 4 in.; diameter of tailstock spindle, 3⅜ in.; length of carriage bearing on bed, 36 in.; ratio of back gears, 12¼ and 3 3-5 to 1; diameter of countershaft pulleys, 16 in. x 5½ in.; speed of countershaft, 185 to 225 r.p.m.; lengths of bed, 10 ft. to 30 ft.; distance between centers, 10-ft. bed, 60 in.; weight (net) 10-ft. lathe, 7,100 lb.; weight per extra 2 ft., 520 lbs.

The equipment supplied with the lathe includes the cabinet legs, a box-type apron, a chasing dial, an automatic stop, plain or compound rest, large and small faceplates, a steadyrest, a self-oiling two-speed friction pulley countershaft, a quick-change gear box giving a wide range of threads and feeds and the necessary wrenches.

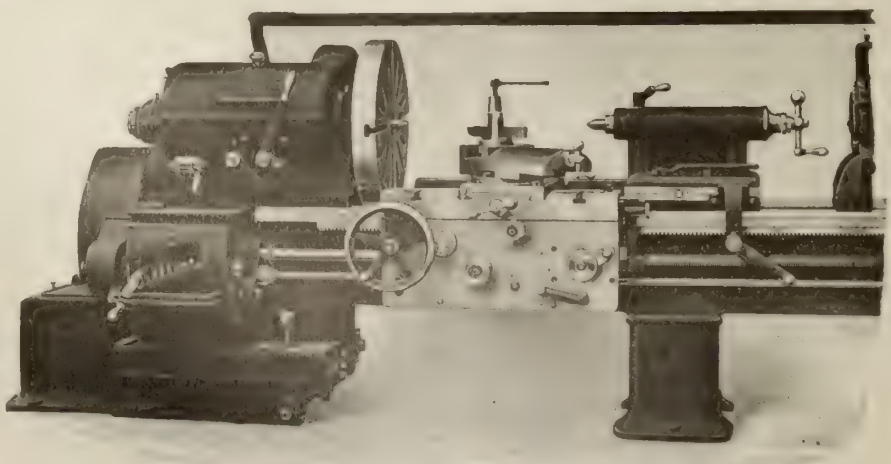
The following extra equipment can be furnished: turrets on carriage or bed, oil pan and pump, taper, relieving and draw-in attachments, chucks, etc. This machine may also be obtained with geared head for belt or motor drive.

Above are the principal specifications.

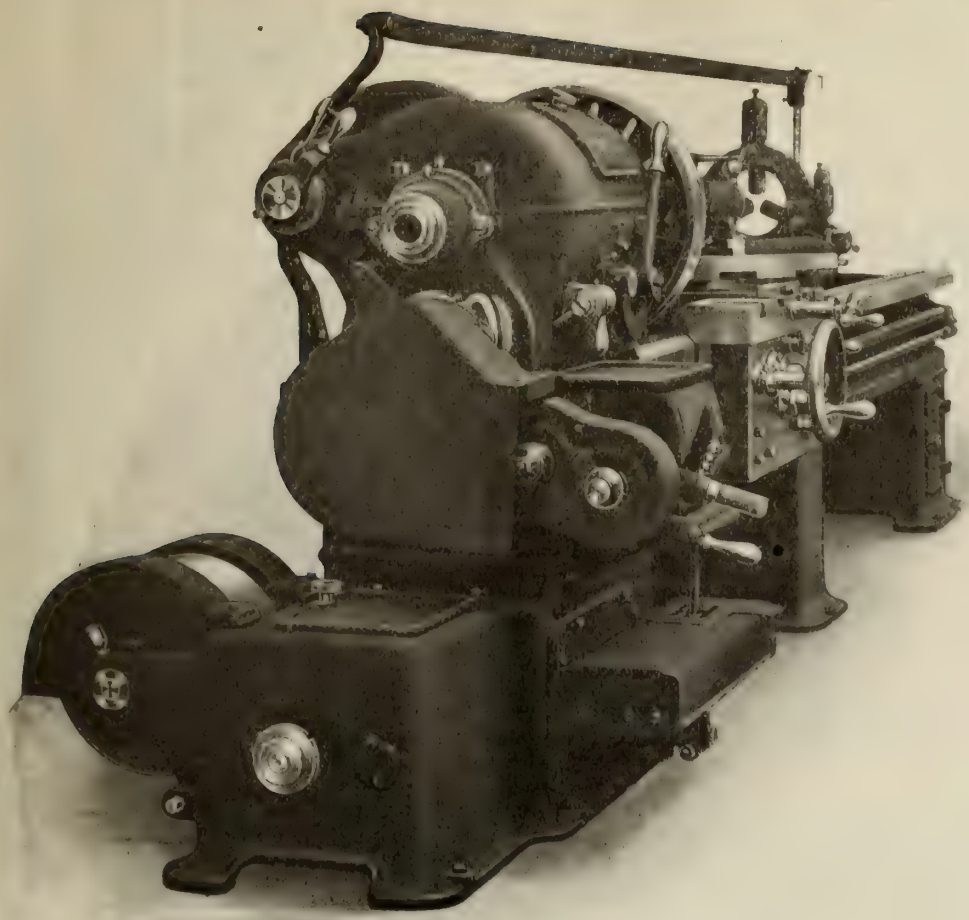
BRADFORD GEARED-HEAD LATHES

The Bradford Machine Tool Co., Eighth and Evans Sts., Cincinnati, Ohio, is now building a line of geared-head lathes in sizes ranging from 14 to 32 inches, inclusive. These machines may be equipped with either an individual electric motor drive or a single-pulley drive, according to the requirements of the purchaser. It will be apparent to those who are familiar with the cone pulley driven lathes of this company's manufacture, that the design of the new machine is essentially the same, with the exception of the driving arrangement. The dimensions of the cone-head or geared-head lathes are also the same, except that the available distance between centres is usually greater for machines with the geared head.

A feature of the new type of Bradford lathe equipped with an individual motor drive is the low mounting of the motor. The driving mechanism is placed beneath the bed and operates through a selective-speed gear-box which transmits power up to the spindle. Attention is called to the fact that the single-pulley drive for lathes of this type is interchangeable with the motor drive, and is similarly featured by the low mounting of the driving pulley. A machine so equipped requires only a single fixed pulley on the lineshaft, or a suitably located short shaft which is driven from the lineshaft, it being unnecessary to use a friction clutch operated countershaft. A selective-speed gear-box similar to that used with motor-driven lathes, is employed in the case of machines equipped with single-pulley drives. These machines can be installed



GENERAL VIEW OF THE LATHE.

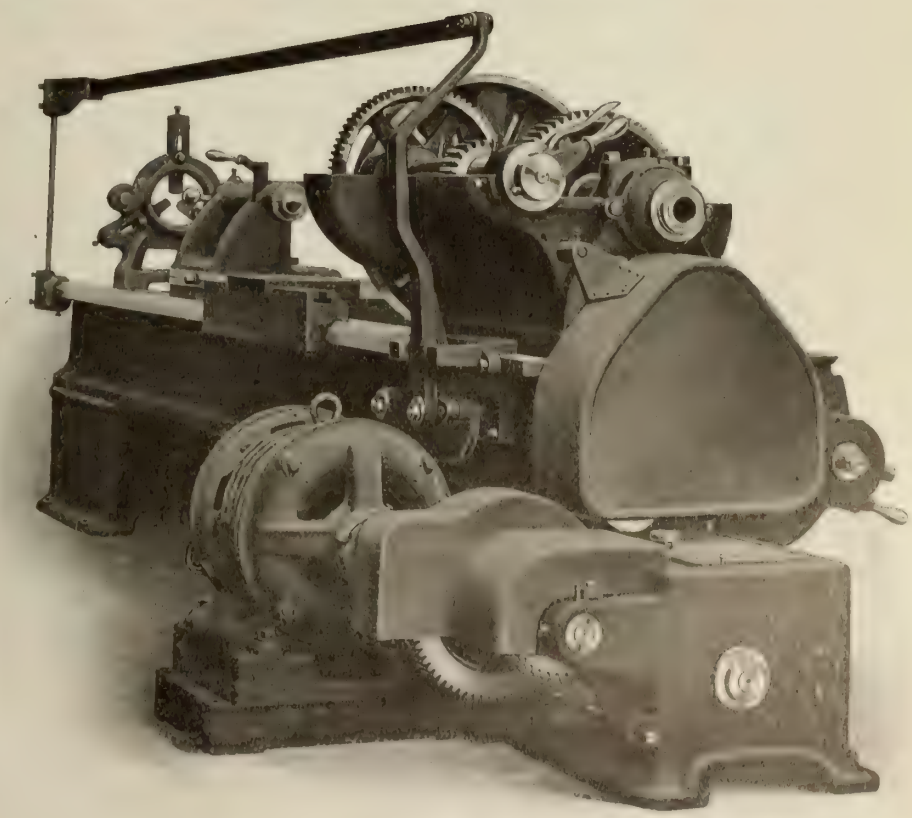


BRADFORD GEARED HEAD LATHE, PULLEY DRIVE.

with either independent or group motor drive. In cases where a group drive is employed, a single motor-driven overhead shaft is used to carry the driving pulleys.

Regardless of whether these lathes are equipped with an individual motor drive or a single-pulley drive, the means furnished for the transmission of power is essentially the same. It consists of an arrangement of driving shafts and gears, as illustrated in Fig. 3. Six gears on shaft A afford six independent driving speeds for shaft B, which through intermediate shafts C and D, and the connecting chain E drives the lathe spindle. The drive is direct when clutch F engages gear G or power is transmitted through a back-gear shaft H when the positive clutch I engages gear J. Twelve spindle speeds are thus obtained, and corresponding reverse spindle speeds are obtained when the lower clutch K engages the chain drive L, automatically disengaging the clutch and driving gear M used for the forward drive. The operating arrangement on this machine includes an ordinary pole and speed-box lever that are in such operative connection with each other that gear shifts in the speed-box cannot be made unless the initial driving power clutch is moved by the shifter pole to its central, or disengaged, position. By this arrangement, which is effective through an interlocking device, no abuse of mating gears in the speed-box is possible because they can only be engaged after the driving power is disengaged by the shifter pole.

Mechanical speeds through the speed-box are selective and instantly obtained by sequential movements of the shifter pole and speed-box lever. Provision is made for starting, stopping, or reversing the lathe by means of the shifter pole.



BRADFORD GEARED HEAD LATHE WITH INDIVIDUAL MOTOR DRIVE.

BOWSER OIL STORAGE SYSTEMS

The S. F. Bowser Company, Ltd., Toronto, Ontario, Canada, have issued a very interesting little booklet entitled "How Bowser equipment saves oil, time, money. In this they state various points of interest and value to those in need of such equipment, and readers interested can procure a copy by writing for the same.

The Chain Products Co., of Cleveland, Ohio, have issued a very attractive and useful catalogue, which is especially useful to anyone interested in chain products of any nature.

This book, known as their catalogue 330, consists of 111 pages, and is divided into three sections. The first is devoted to coil chain, the second to chain specialties, and the third to miscellaneous attachments. Several wire and chain tables form a closing part of this book, which should be in the hands of those interested in weldless chain.

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Ontario Votes to Stay Dry

AT this writing it becomes increasingly apparent that booze has been voted out of Ontario. The ballot was rather a confused affair, for either wets or drys, but that did not keep the people of this good province from coming out with a death wallop to the most damnable traffic it ever housed.

When they were at it they should have hit harder.

John Barleycorn used to hit hard. He never showed quarter. When his man showed signs of going under he never quit.

John Barleycorn stayed with his victim until his health, his home, his money, his all was gone. It left him only when the undertaker came along to clean up the mess.

The liquor traffic is not entitled to sympathy. It gave none and should expect none.

The next move should be to have prohibition for those who have a private grog shop in their cellars.

The little chap who had only ten cents or a quarter to spend at the bar has had his schooling, his feelings have been hurt and his long dry thirst has not been cured except as he takes it to the tap.

The man who was afraid to face the drought, and who stocked his cellar, was not big enough to take his trimming along with the little chap who used to pound the brass rail at the corner hotel.

He has still to learn what it means to curb an appetite or control a passion. It is up to him, if he wants to demonstrate that he is as good a citizen and law-keeper as the little fellow, to come across and keep the spirit of the law rather than to glory in the ability of the secrecy of his cellar to defy and break the real meaning and purpose of prohibitory legislation.

Industrial Ontario has done well. She now faces an era of sobriety and development. She will never live to regret the vote she gave on October 20th.

SPEAKING of wages, one writer pauses to remark that the laborer feels worthy of his "higher."

Why Not Talk Plain English?

ON the 25th of September the Ontario Government desired to inform the people that an election was going to be held. Not much of a trick to do this. The people would hear of it quickly through the papers, but it must be officially said so in the Ontario *Gazette*.

Never heard of the Ontario *Gazette*?

Well, that's not strange. But let's get back to this question of holding an election. The people must be told that the present House is through, that nominations and elections were coming, one on the 13th and other on the 20th. Nothing much in that—but hold!

The chant runs thusly in an extra edition of the aforesaid and unknown *Gazette*:—

PROCLAMATION.

John S. Hendrie.

Canada.

Province of Ontario.

George the Fifth by the Grace of God of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India.

To all to whom these presents shall come or to whom the same may concern:— Greetings:

W. H. Hearst,
For Attorney-General,

Proclamation.

Whereas we have thought fit, with the advice and consent of the Executive Council of our Province of Ontario, to dissolve the present Legislative Assembly, and to forthwith call a new Legislative Assembly;

Now know ye that we do hereby make known Our Royal will and pleasure to dissolve the present Legislative Assembly, and to call a new Legislative Assembly of our said province, and we do further declare that by the advice of our said Executive Council we have this day given orders for issuing our writs in due form for calling a new Legislative Assembly of our said province as aforesaid, the said writs to bear date the twenty-third day of September, A.D. 1919, and to be returnable forthwith after the execution thereof.

". . . Of all which premises all our loving subjects and all others whom it doth or may in anywise concern are hereby required to take notice and govern themselves accordingly.

"In testimony whereof we have caused these our Letters to be made Patent and the Great Seal of our Province of Ontario to be hereunto affixed.

"Witness:—

"His Honor Sir John Strathearn Hendrie, Knight Commander of Our Most Distinguished Order of St. Michael and St. George, Commander of our Royal Victorian Order, a Colonel in Our Militia of Canada, etc., etc., Lieutenant-Governor of our Province of Ontario, at our Government House, in Our City of Toronto, in our Said Province, the twenty-third day of September, in the year of our Lord, 1919, and in the tenth year of Our Reign."

Why not put the pruning hook into about 90 per cent. of that junk? All that is necessary is to state that nominations are on the 13th and elections on the 20th.

It is not necessary to drag all the other individuals and organizations and orders and whereases into the case at all.

The Ontario *Gazette* is due for a shave and a hair-cut all at the one sitting.

CANADA is soon going to have 20,000 miles of Government-owned and operated railroads. This is a much greater mileage than the Government is now muddling with. But—the greater the mileage the greater the muddle.

* * *

A CAMPAIGN to stop smoking makes no headway. It's impossible to control the crop of tobacco, cabbages, mullin leaves, cedar bark, smoking cane and whip handles.

* * *

THERE'S many a four-flusher discussing with his friends the location of the Rolls-Royce plant in America, and at the same time reading the sale ads. for a mussed-up flivver.

State of Mind of the Foreigner in this Land

SOME of the members of the committee investigating conditions in the steel mills of United States seemed to be surprised that they should find notices to the foreign employees printed in five different languages.

The surprise should not have been at such a thing, but at the members of the committee, public men, supposedly in touch with what is happening in their country, being ignorant of this condition.

This particular condition is not exclusively the property of the United States. Its duplicate can be found in several lines in Canada.

For years it has been a hard matter to call attention to the real foreign problem. When it was brought up by labor interests the cry was raised that labor wanted to shut them out to keep the price of labor at a higher mark. And it might be added right here that if the only aim of bringing foreigners to this country is to bring them here to compete with our own labor, and force down the standard of living, then the time is ripe to slam the national front door in a mighty emphatic manner.

On this page we show a reproduction of a picture that was found in several places in the homes of foreigners employed in the U. S. steel mills. It is the conception that some of the foreigners have of the way they are being treated and exploited under the capitalist system.

Look at the thing, and then imagine the state of mind of the ignorant foreigner who has been brought up in such an atmosphere.

Look at the thing and you can see there the passions and the hatred that the agitator calls into play when he wants to sand-bag industrial life on this continent.

For the purpose of this article, CANADIAN MACHINERY eliminates the international boundary between Canada and United States, for the very good reason that their problems in dealing with the foreigner are our problems. The history of the strikes of 1919 prove that beyond the chance of successful contradiction.

The talk of Americanization and Canadianization in relation to these people is folly unless we are prepared to realize that they can make or break our national happiness and prosperity.

On election day in Toronto, in the foreign districts, one could see these men in hundreds after hundreds, pouring into the polling booths, voting on what manner of laws we shall have in this land.

Do they fully understand the things about which they vote?

They do not.

Have they any good idea of what the things they vote for mean to the land?

None at all.

Do they understand or appreciate what a prohibitory law has worked for Ontario in the way of the reduction of crime, and the increased bank deposits of hundreds of people?

No, they do not. Nor do they care a whit. They were out, every man jack of them, voting for the repeal of the O.T.A.

The skilful politician makes all sorts of appeals to their fancies and their prejudices, and their votes are counted to kill the expression of opinion of men and women whose every interest is tied up in the development of this Canada of ours.

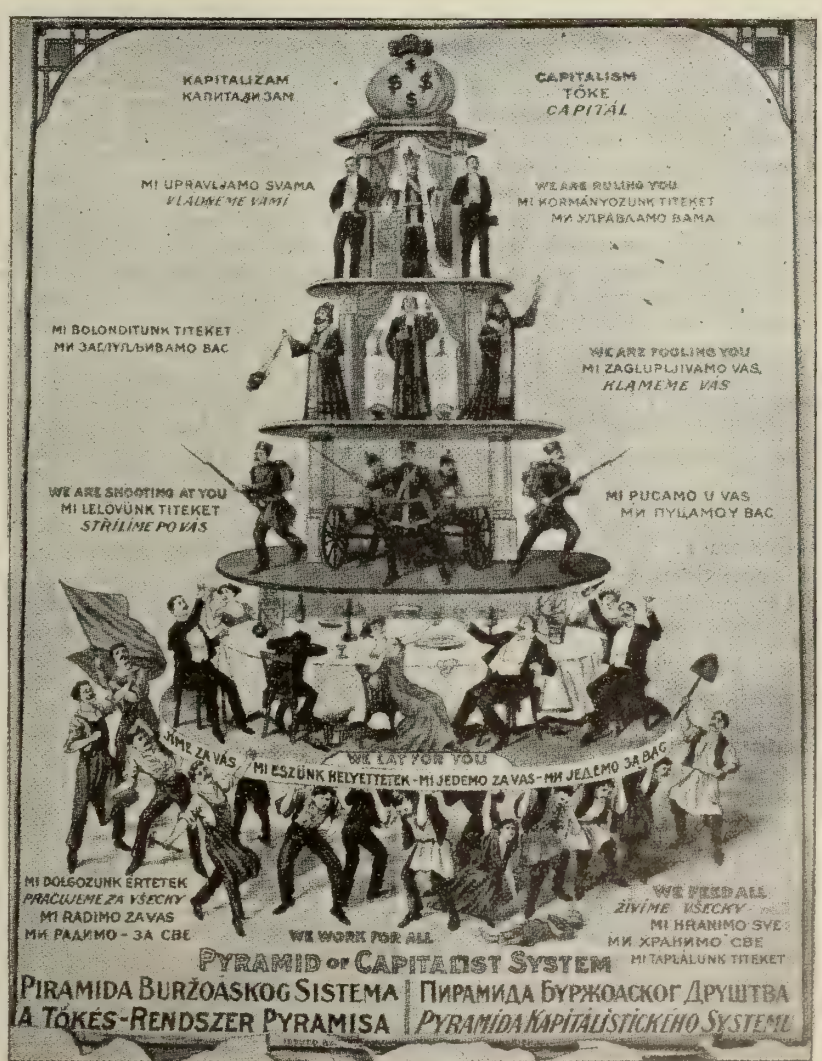
But to return to the picture on this page. Is it possible to make a good Canadian or a good American out of a man who is cherishing the thought that the system of Government, the church, the militia are all framed and brought into existence for the sole purpose of becoming a millstone around his neck, to grind him down and to keep him down?

The only answer to such a query is a plain and emphatic NO!

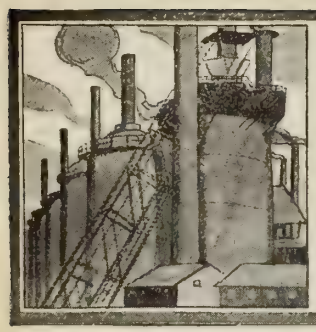
The man who has this picture burned into his mind will look upon almost every move that is made for his betterment as a move on the part of the capitalist class to further draw the cord around him. He cannot be approached as a man with an open mind. The agitator keeps this picture before him. He has been doing it for years in Canada and he has been doing it for years in United Sates. And all the while he has been more or less unmolested in his damnable occupation.

That same doctrine has been shouted up and down the coal mining areas of Western Canada for years. Men from the Old Country — not foreigners — have been the leaders in the movement in many cases. It has

(Cont. on page 56)



HOW THE AGITATOR WORKS ON THE FOREIGN MIND



MARKET DEVELOPMENTS

Automobile Business Buys Many Machine Tools

This Industry is Probably Leading All Others in Being a Consistent Customer—Motors Are a Month to Six Weeks Off in Delivery—Scrap Buying Better in Canada

THE "A" industries are still doing the bulk of the buying as far as machine tools and supplies generally are concerned. In this case the "A" industries take in the automobile and agricultural shops. There must be a very large market for cars in this country now, and prospects of tremendous sales in the spring, as the matter of selling takes very secondary consideration to the problem of production now. Plants that have been in existence only a short time are already planning to what extent they will build their extensions, and all this means that there will be a big market for tools and supplies.

The steel strike in United States has had the effect of slowing down the deliveries of material to this country, until at present it can be estimated as about thirty-five per cent. of normal, and slower in proportion. In some cases, though, material comes through well, as one of the shipbuilding concerns got a nice tonnage of plate across that only went to the mills in the middle of September. But the recovery of production at the mills themselves is slow, and business is piling up at the mills, although it must be said that the trade in general is giving every leniency to the mills in the matter of deliveries.

The general development that is taking place all over the country is reflected in many ways. For instance, the sale of motors—small sizes, from one to thirty horsepower—is very brisk, the demand coming from small shops all over the country in a diversified line of business. Deliveries used to be made almost at once out of stock for any of these motors, but now it is a matter of four to six weeks before deliveries can be made. In used motors, attention should again be drawn to the advisability of care in buying these. The best plan is to get them, if necessary at all, through a reliable dealer, or else to have an expert of the customer's choosing look over the proposition.

The scrap metal market shows some firmness, buying for domestic causes being better, although sales to United States are not being put through now. Prices are strong in some lines, especially heavy melting steel, and prices may be marked up a little later on.

BETTER CONDITIONS ARE EVIDENT IN THE SHIPPING CIRCLES AT MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, Que., Oct. 23.—The settlement of the English strike has been reflected here in the better conditions that are evident in and about the harbor. Congestion of freight is less pronounced and arrivals and sailings are more regular, although some time must elapse before things are again normal. During the past week or so lake boats loaded with grain have been laid up in port for some time before they could discharge their cargoes, as no ocean boats were on hand to take the grain from the elevators that have often been filled to capacity. Relief is now in sight and it is being felt in general business throughout the district. Many American concerns are locating branch factories in the district, and some Canadian enterprises are being developed, all of which will add to the coming season's activities.

Strike Has Little Effect Here

The experience of dealers and consumers seems to be that little difficulty has arisen as a consequence of the disturbances in the American steel districts. At times the shipment of material has been somewhat delayed and has resulted in temporary inconvenience, but on the whole the industrial activities, that are dependent on steel commodities, have not suffered very heavily by the steel strike in the States. One large dealer states that they are receiving regular shipments of material from the Carnegie plants at Pittsburgh, and with few exceptions the material has been delivered on schedule time. It might be mentioned, however, that the present demands are only normal, and it is generally believed that mill supplies are still ample for current needs, and that steel production, in the aggregate, is little below what it was when the strike became effective. Existing demands have not been pressing, and in most instances, dealers have been able to supply all the needs of the trade, unless the inquiry is for special shapes or sizes, and while some trouble has been experienced in getting these through promptly, they invariably come to hand after a short delay.

Canadian mills are quite busy, and where the product is similar to American mills affected by the strike, the volume of business has shown a fair increase. Dealers here believe that price quotations will continue firm for some time, but would not be surprised to see advances when conditions are more settled. While it is difficult to get accurate record of conditions as they exist in the affected steel centres in the States, it is believed that production is much lower than before the strike, but it is anticipated that a steady improvement will be shown from now on, as many of the mills are gradually resuming normal operations. Some districts are about back to capacity and others are slowly progressing.

Metals Generally Firm

The metal situation has been quite active during the past week, and the demand in general has been good, particularly in lead, the sales in this metal

having been above normal. Copper is moving freely but has been somewhat affected by the steel strike as the demand has fallen off. As a result the market is weaker and prices have declined ½ cent per pound. Quotations on the market here are 25 cents for lake and 24½ cents for electro and castings. Tin is steady but slightly easier, the quotation of 58 cents being a decline of 1 cent per pound. Spelter is ½ cent stronger at 10 cents per pound. Lead is active on an advance of ½ cent, the price quoted being 7¾ cents per pound. Antimony has also improved, the price asked being 10 cents, an advance of ¼ cent per pound.

Gradual Increased Tool Demand

Reports from dealers on machine tool activity would indicate that the volume of business passing is comparatively steady and quite normal. Some report very good business, while others report a quiet week, but the general impression is one of steady increase. Large single sales are not the order of the day, although some good business has been done in this respect. The bulk of the present demand is well distributed, and when the total is compiled the relative turnover compares favorably with prewar business. An encouraging factor at the present time is in the inquiries that are coming in from agents here, who are looking over the ground with a view of establishing branches of American industries. Two of these enterprises are associated with railroad requirements, and machine tool dealers here have had inquiries regarding the necessary equipment; some good business is anticipated. The volume of supply business seems to be good, and dealers are apparently satisfied with the present demand, and while it may not be up to war requirements, it compares favorably with the demand of 1914. Some difficulty has developed in obtaining delivery of tools and supplies, and this condition is frequently felt by manufacturers, as the gradual freeing of the market of used equipment makes it harder to secure tools of this character. This feature of present activities sends a note of encouragement through the trade as it was fully expected that second-hand tools would become a drug on the market. A firm making air compressors says that the better inquiry for new machines is a result of the absorption of the greater number of the used tools, which, for a time after the war, were quite plentiful.

Quiet Business in Scrap

There is not sufficient offering in the scrap market to create any special interest at the present time. There is very little scrap of any kind going into the States, as the curtailment of the production, as a result of the strike in the steel mills, has affected the situation here. One American dealer has sent out notices to the Canadian trade that he is in the market for considerable quantities of machine shop turnings, but the price offered (f.o.b. delivery point) is little inducement to local dealers, as it is much lower than that which the material should demand, with freight, etc., added to the prevailing quotation here. The local demand for this class of scrap is almost equal to the supply, so that dealers would not be interested unless the American consideration was worth while. There is a steady demand for machine cast iron, but the volume is seldom large as consumers are content to operate on the basis of present requirements. The general listless character of the market has dulled the interest of the dealer, and he, like the trade, is calmly waiting further developments. Quotations are unchanged with a weak tendency.

POINTS IN WEEK'S MARKETING NOTES

Deliveries of material from the strike zone in United States are coming through rather slowly. A fair tonnage of plates and skelp arrived at the first of the week.

—

Canadian mills and foundries are buying fairly large quantities of scrap just now, and there is somewhat of a shortage in heavy melting steel.

—

A revision of classes for the purpose of simplicity has been made in the lists of carbon cutters, reamers and drills, and the discounts announced show a slight increase in prices.

—

There is a brisk demand for motors just now, especially in the smaller sizes, from one to thirty horsepower. Delivery of most of these is now from four to six weeks.

—

Makers of some of the better lines of machine tools have sent out word that they are now sold out until next May.

—

Although more men are returning to work in the steel mills of United States, production is increasing very slowly, and some of the mills are still operating at a very low percentage of their normal capacity.

MATERIAL SLOW IN GETTING ACROSS LINE

But Industries Not Suffering Much Yet From the Steel Strike in United States

TORONTO.—Conditions in the machinery lines seem to differ just now according to location. In some sections there is a good demand for some lines, while in other places the same lines are away off. But for all that, there is a nice line of business moving, although the distance between orders and delivery schedule is becoming greater and greater. Nearly all the business now is for delivery well on into 1920.

The Machinery Business

There seems to be a big market opening up for machine tools in Canada. There are firms that have not closed big business recently, but they are willing to admit that the situation is good. There seems to be a revival of the small shop all over Ontario. By this we do not necessarily mean the small machine shop, but the small shop in many lines, such as wood working of various kinds, building contractors, etc. This is reflected in the sale of motors, and there is something very closely akin to a shortage of the small motor at the moment. As a general thing motors are to be had on very short notice from either the makers or the jobbers, but such is not the case now. The best that can be done in the way of deliveries now is from three to six weeks.

According to information reaching CANADIAN MACHINERY, there have been several sales of used motors put through recently that have not given satisfactory service. It has been pointed out in these columns before, and it should be repeated: Do not buy motors unless you know what you are getting. If you get a used motor, get it through a responsible machinery dealer who will stand behind it, or have some of your own men who understand motors, to go over it.

As mentioned above, it is the small shop that is buying motors in Ontario now. These places did not go ahead during the war. They were tied up in many ways, and are now getting under way again. Where they are buying motors it goes without saying that they will be buying other things, so it all means more business for the machinery dealers.

The lumbering business is going to be better in the next few months than for some time past, from the standpoint of the men who sell machinery and supplies to the mills. There is a very heavy demand in British Columbia for lumber for export, and for many of the markets in United States. There is not a very large amount of B. C. lumber reaching the prairies just now. The export business is nicer to handle and seems to have the call on the available supply.

The automobile business continues to buy a lot of equipment. There is undoubtedly a very good market for automobiles in this country at the present moment, particularly for the medium priced car. The official of one of the large Canadian companies informed this paper only a few days ago that selling cars just now hardly entered into the question at all. It was purely a matter of production.

The agricultural implement places are also doing a fair amount of general buying.

The Effect of the Strike

The shipments of steel and iron from the strike zone are not improving. The strike is still on, and although it is claimed that it is practically lost to the men, it must be admitted that the production of the mills has suffered a very severe

setback, from which it seems hard work to recover. A large importer stated to CANADIAN MACHINERY this week that he would put the amount of material coming through at the present time at about thirty-five per cent. of the normal business, while the delivery dates were also suffering in proportion. Some of the shipyards have received a very fair amount of plate during the last few days, and it is also noted that there have been further shipments of skelp for the tube mills.

Tubes are in demand, but they are coming across poorly. Mills that were counted upon to stand up under strike conditions, are badly crippled, and are not making anything like the progress that was counted upon. One Toronto dealer was informed by a U.S. mill in the strike zone that they were doing little better than ten per cent. capacity, which is far below the rate at which this or any other mill can run and turn out material at overhead prices.

Although some plate has come through in a month from the date of shipment, it is feeling the strike in many quarters. Plate shipments, as a rule, are off by many weeks, although, fortunately, there has been no serious inconvenience so far.

Bars and shapes are not keeping pace with the demands on them. Especially is it true that the demand for shapes, which is a very large class, is away ahead of any possibility of shipment.

Cutting Off the Jobber?

Some of the jobbing houses here state that they have been placed in a position where they get no protection from the makers of Canadian cutters, reamers and drills. That is, the makers will quote a consumer as good a price as he can get from the jobber. Of course, the jobbers are none too well pleased with this arrangement, but it is a fact that it is the same condition that has existed for some time. Prices and discounts have been such as to bring selling figures down to the point where the makers felt that they must have the entire revenue. "Of course, the jobbers," stated one dealer to-day, "will continue to carry the stock, but they will sell as a matter of convenience to their trade."

One of the representatives of the drill makers stated that they had their own men in the principal cities, and they would cover the territory in this way.

There has been a slight increase in the selling price of carbon drills and also in the method of classifying. Formerly there were a large number of prices, but this has been brought down to three as follows:

Half-inch and down.
Half-inch to inch.
Inch and over.

In regard to the discount on these lines, it is now half-inch and down list, plus 20 per cent.; half to one inch, list plus 30 per cent.; over one inch, 35 per cent.

The Scrap Metal Market

The strike situation in United States has for the time being blocked shipments that might otherwise have gone over the border. Dealers on this side have been informed—warned is a better word—that shipments had better be held back, and that if made they will be at the risk of the sender for any costs that may be incurred in non-delivery or acceptance. The Canadian mills and shops are the best customers just now for the scrap yards, and a nice amount of business is moving.

Prices have not been changed at all, although the tendency is certainly for higher values in heavy melting steel. There is not a great deal of this in the country just now. All the scrap shell steel has been disposed of and little else has been coming into the market.

Some of the yards reported that they had received inquiries from New York for copper at 19¼, the first unsolicited inquiry that had come through for weeks.

Apparently some of the U. S. yards have reckoned that Canadian sellers would be unable to sell in their regular places. The Hofmann-Sproul Co., Widener Building, Philadelphia, are offering to take a big tonnage for the next 30 days of machine shop turnings. They offer $14.50 gross ton, f.o.b. cars Norristown, Pa. Dealers here are offering about six or seven dollars for this material, but of course, the freight and other charges must be added, which would bring the figure up around $13 or $13.50.

GREAT QUANTITIES OF USED MACHINES WILL BE PLACED ON U.S. MARKET

Special to CANADIAN MACHINERY.

NEW YORK, Oct. 23.—Business continues at a good rate, the number of inquiries and orders for machine tools keeping up about the same as during recent weeks. Most of the orders placed are for domestic shipment, export trade being rather quiet, due mainly to the continued unfavorable rates of exchange between the United States and European countries.

Among the more important inquiries of the past week is one from the General Electric Co., Schenectady, N.Y., for about 50 miscellaneous tools. The E. W. Bliss Co., Brooklyn, N.Y., continues as a large buyer, most of its requirements being heavy tools.

There has been a good general inquiry. One company has bought a small list of tools for the manufacture of talking machine motors; a linotype company has bought several tools and there are scattered orders and inquiries from industries in many lines.

The United States Aluminum Company of Pittsburgh has let a contract to the Turner Construction Co., New York, for a new factory building at Edgewater, N.J. Six cranes of this plant have been bought from the Morgan Engineering Co., Alliance, Ohio.

Looking For Export

The National Machine Tool Builders' Association held its fall meeting at the Hotel Astor, New York, on Wednesday and Thursday, October 15 and 16. Among the subjects discussed was the advisability of publishing a co-operative export catalogue of machine tools in several languages for world-wide distribution. Committees were appointed to look into the matter and bring in a definite report at the next convention, which will be held at the Hotel Traymore, Atlantic City, N.J., in the spring. A resolution was adopted opposing the adoption of the metric system in the United States. Charles E. Hildreth, general manager of the association, who was appointed by the War Department to assist in planning for the sale of surplus Government stocks of machinery, reported that his task was completed and that $60,000,000 to $70,000,000 of new and used tools will be put on the market within a few weeks. Selling prices have been established, based on the prevailing market prices minus adequate reductions to cover usage and depreciation. The tools will not be sold on sealed proposals, as was at first considered, but will be offered in very much the same way that dealers in second-hand machinery make their sales. Of the surplus about $20,000,000 worth are special machines and the remainder are standard tools.

PRODUCTION IMPROVES, BUT IT IS AT A VERY SLOW RATE IN STEEL MILLS

Special to CANADIAN MACHINERY.

PITTSBURGH, PA., Oct. 23.—The iron and steel strike continues to wane and employment and production at the blast furnaces and steel mills continue to increase, but the rate of change continues to be a very slow one. Production even now is only about 60 per cent. of normal, taking the iron and steel industry as a whole.

When the manufacturers as well as all, or nearly all, outside observers have felt since the first few days that the strike could not possibly win, it seems strange that after four weeks of strike men should be returning to employment so slowly. The common if not universal theory is that the strike leaders have been bolstering up the strike by promising their representatives in the field, and the strikers themselves, that something favorable to the cause of the strike is going to come from the labor confer-

ence at Washington, which assembled when the strike had been in progress for two weeks.

It is altogether improbable, however, that there will be any action of that sort at Washington. The resolution introduced by the labor representatives, for an investigation of the steel strike by a committee of six, is probably buried. The resolution recognizing collective bargaining has had an irregular course, but it adopted it would not help the steel strike particularly.

Just how the strike leaders themselves view the strike is not known. Their claims from day to day are usually that they "are holding their own," which is not a strong claim to make, since holding their own would be quite insufficient to enable them to win the strike when they have considerably less than half the industry tied up. If they believe the reports sent them from the field they consider the strike stronger than it is, for some of the reports that the manufacturers have seen are absurd exaggerations, but it is not probable that the leaders really believe these reports. The leaders seem to be concentrating their energy in efforts to hold meetings in the Pittsburgh district. They approached Pittsburgh city council to investigate the Mayor's refusal to sanction meetings in the strike districts, but council would not take the matter up. The city administration allows meetings in certain portions of the city, where there are no strikes, but refuses to permit meetings near mills that are affected by strikes, on the ground that disorder would likely result. Through their attorney, Rubin, they approached the Sheriff of Allegheny County, who made a very vigorous reply, charging the strike leaders with preaching revolution and with being outsiders who came into the country to make trouble, and whose departure will prove very welcome.

Employment and Production

In the general Pittsburgh district in the past week each day has seen a little more employment, on the whole, at mills affected by the strike. Of men employed the great majority now are new men, there being only a few strikers. The result will be that of the mills being fully manned with some of the former employees left out. It is thought that many of the new men taking employment in the Pittsburgh district are from Youngstown and other points that are closed, or nearly closed, by the strike.

Donora and Monessen, at the head of the Monongahela Valley, the most important part of the Pittsburgh district, were closed entirely in the early part of the strike. For two weeks the mills have been open and men have been returning to work, but at a very slow rate. The large mills near the foot of the valley ran fairly well even at the height of the strike, and are doing better from week to week, but of the four largest steel mills only one is fully manned even now. The others are short by perhaps 15 per cent. on an average. Nearly all the blast furnaces attached are operating, but are not producing full tonnages. Nine Edgar Thomson blast furnaces are operating, against eight just before the strike, and three on the third day of the strike.

A fortnight ago this report gave a summary of the strike from the geographic standpoint. The strike was strong at certain detached points, including Buffalo, N.Y.; Johnstown, Pa., and Pueblo, Colo., and then there was a sharply defined strike belt dividing Western Pennsylvania, which has been running moderately well from, the west, which has been running at various rates. This belt comprised the Wheeling district, the Mahoning valley and Cleveland, making almost a continuous line north and south. There was speculation as to where in this strike belt the first marked break would occur, as everything in it was closed, blast furnaces, steel works and finishing mills. That question has been answered in the past ten days, the break occurring at Youngstown, the centre of the Mahoning Valley. The break, however, has not proved to be a sharp one by any means. There is nothing like a stampede. After the first blast furnace resumed it was fully a week before there were five operating, although there are 27 in the Mahoning Valley, and 22 of them were operating just before the strike. These furnaces operating are two of the Youngstown Sheet and Tube Company, and one each of the Republic Iron and Steel Company, Carnegie Steel Company and Brier Hill Steel Company. Each of these concerns is operating a few open-hearth furnaces in a more or less limping way, while one has a Bessemer converter in operation, and all the mills are doing a little rolling. Altogether, the production is too small to make it worth while to attempt a guess at the percentage of normal represented, but at any rate, there is a start, and the start has not been accompanied by any disorder to speak of. If there had been stronger forces available to the civic authorities for protection the return of the men would doubtless have been more rapid. As the principal works of the Carnegie Steel Company are located elsewhere, that company has trailed behind in the matter of attempting to resume, feeling that the local interests should take the lead.

Production of steel in the industry as a whole is between 55 and 60 per cent. of normal, representing a gain of only a few per cent. from the low point, probably not more than about 5 per cent. gain. Employment is somewhat greater, in point of percentage, than production, as the working forces are not well organized or balanced in the mills that are subject to strike.

CUSTOMS ARE CHANGING IN THE OLD COUNTRY MACHINE TOOL PLANTS

RALPH Williams, who has been in the machine tool department of the A. R. Williams Co., for a number of years, has just returned from an extended visit to his old home in England. He also made trips to Paris and other points on the continent.

"The machine tool builders of the Old Country are busy," stated Mr. Williams to a representative of CANADIAN MACHINERY. "I was in a large number of the shops in Birmingham, Coventry, Halifax and Wakefield, and in nearly every case they are booked up from six to twelve months in advance. In these shops they are turning out such lines as presses, turret lathes, standard lathes, radial drills, etc. Heavy machinery for shipbuilders is also greatly in demand, such as plate planers, shears, etc.

"Costs have gone up in the Old Country production the same as they have here, and in many cases more so, and there have been considerable changes made in the methods of shop practice. Many of the plants are making use of the bonus system, while it is not at all uncommon to find large English shops organized now along the same lines as the shops in United States. The unit system of construction is quite common.

"Labor conditions are not good, and production is not nearly what it should be, and for that reason the costs of machine tools are higher in England, in proportion to what they used to be, than they are in this country or United States.

"Another matter that has been taken up by the English machine tool builder is the cutting out off odd sizes and lines, and bringing his whole business down to a standard. In one shop where they used to make up around twenty classes, they are down to two. In this way they are able to re-arrange their whole works so they can get ahead on the basis of quantity production. In former times every machine that was turned out was more or less of a special proposition. This is having another effect, and that is the doing away with the general mechanic. It has been the custom in the Old Country for a long time that a mechanic should have a general knowledge of the whole field in which he worked. He could go ahead on any machine in the place and do a day's work there, and next day, if necessary, he could come in just as handy on a bench job. But that is all changing, and you find the Old Country shop specializing, so that the all-round mechanic becomes a specialist on a grinding machine, on a planer, lathe, etc."

According to Mr. Williams some of the British machine tool builders were busy now finishing up pre-war contracts at pre-war prices, on which they were sure to lose a goodly sum of money. Apparently they considered that these contracts were binding, as he instanced one case where a firm was sending out one hundred big lathes to a Japanese consignment, at a price that could not possibly represent anything like the present-day value of the tools.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$25 50	$26 25
Electro copper	25 00	26 00
Castings, copper	25 00	25 00
Tin	59 00	58 00
Spelter	9 50	10 00
Lead	7 25	7 00
Antimony	9 75	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	21 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 25
Sheets, black, No. 10	5 15	5 25
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 75
Premier, 10¾ oz.	....	8 05
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ¼ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08¼**
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

The Week's Events in Montreal Industry

Roderic J. McLean, of Montreal, is expected home this week after a two months' business trip to England and Scotland.

* * *

The Hofmann-Sproul Company, of Philadelphia, Pa., are in the market for the purchase of considerable tonnage of machine shop turnings from Canadian sources.

* * *

The Canadian Ingersoll-Rand Com-Company, of Sherbrooke, P.Q., has secured the sole Canadian manufacturing and selling rights for the Wellman-Seaver-Morgan Company of Cleveland, Ohio, makers of large turbines for hydro-electric development. Machines for the Canadian market will now be made at the Sherbrooke plant.

* * *

If present plans materialize the amateur athletes among the employees of the Canadian Vickers Company of Montreal will form an organization and construct a large club house that will be provided with every modern convenience for the comfort of the members. A location as close as possible to the works will be acquired.

* * *

One of the recent enterprises for developing Canadian export trade is the formation of a corporation in London, England, known as Shawinigan Ltd. The chairman of the newly-organized company is H. T. Meldrum, of Montreal, and the vice-chairman is S. Ray Marshall, of London Howard Murray, of Montreal, is one of the directors.

* * *

The A. Bernard Industrial Company, of Fortierville, Que., have established a warehouse and service station at 36 Youville Square, Montreal, where a large stock of Bernard wood split pulleys and other power transmission supplies will be carried in stock for immediate delivery. B. Trudel & Co. will have charge of this branch and will be the authorized agents for the district.

* * *

The 1919-20 season of the Montreal branch of the Engineering Institute of Canada was opened on the evening of the 16th, at which a talk on malleable iron was given by W. G. Dauncey, C.E. The subject was ably treated by the speaker, and the fact was impressed upon the hearers that malleable iron had a distinct place in metallurgy, and should not be regarded as a rival of wrought iron, cast iron, or steel.

* * *

On Saturday of last week the "Canadian Navigator" was successfully launched from the yard of the Canadian Vickers Company. This vessel has a deadweight capacity of about 4,350 tons, and is the sixth vessel built by this company for the Canadian Government. The boat will have a length between perpendiculars of 320 feet, a beam of 44 feet, and a moulded depth of 25 feet. When the vessel has been fitted out she will take on a cargo for Liverpool.

* * *

Considerable congestion has taken place during the past few weeks in the harbor of Montreal owing to the inability of transferring the grain from the lake boats to the elevators, the latter being filled to capacity. The British labor situation has prevented regular ocean shipments, so that many vessels coming down the lakes with grain had to lie some time in port before they could get a chance to discharge their cargoes. Better conditions are looked for from now on.

* * *

A large Canadian manufacturer of air compressors states that the demand for this class of equipment at the present time is quite heavy. They state that during two weeks of September they disposed of fourteen machines, and the demand continues active. It is just recently that the inquiries for new compressors have been of any volume, as for the past year or more the trading in second-hand equipment has prevented an active market in new machines.

* * *

Unless something develops to upset the present plans for stable reconstruction work next year we can look for considerable progress in the expansion of Inter-British trade between the Mother Country and the various Dominions. Already several of these have established associations of manufacturers, to further this trade, and all the others are falling into line. One factor of after-the-war trading that is of special interest is the business of approximately $40,000,000 that Canada has done with Greece.

* * *

That steps are being taken to relieve the shortage of ocean tonnage is shown in the recent announcement of A. G. Henderson, one of the Glasgow directors of the Cunard and Anchor lines, when he stated that quite a number of vessels were now under construction for the Atlantic trade of his company. In addition to providing increased tonnage for old trade routes, the companies are preparing for other new routes as post-war requirements demand. Mr. Henderson intimated that some of these new boats would probably be ready for the Montreal route for the opening of the season of 1920.

* * *

Owing to the fact that Place D'Armes, in the heart of the business district of Montreal, is the chief transfer point of the Montreal Tramways system and frequently occasions long waits for cars, the building of a kiosk on the square is under construction. This is for the protection of the public from the inclement weather—not from the increased fares. As a matter of fact the company propose using it as a depot where the public (at least those who can afford to ride) will be able to buy tickets and get change, as the new basic rate of a 7-cent cash fare will require considerable more mental bookkeeping on the part of the tram officials.

* * *

That Canada will benefit in some of the rehabilitation of world commerce may be gathered from the activities of Timber Operators and Contractors, Ltd., a company which was organized some months ago in England by a number of officers and men of the Canadian Forestry Corps. In addition to acting as agents for Canadian timber firms, this company has acquired the Priddy and Hale plant at Rotherhithe, Surrey Docks, and are erecting a creosoting plant, and will likely erect a sash and door factory. The company is also anticipating operations in Siberia and other portions of Europe. The capital invested is two and a half million dollars, and Major Alex. McDougal, formerly general officer in command of the Canadian Forestry Corps, is president of the company.

* * *

The importance of the engineering fraternity as a national asset to the country was impressed upon the members of the Montreal Rotary Club, at their luncheon last week, when Rotarian F. S. Keith was the principal speaker. Mr. Keith dwelt on the good work that had been accomplished by the Canadian Engineers during the war, and expressed the belief that their training would enable them, if opportunity offered, to solve many problems now facing the country. In speaking of the labor unrest, he said: "The problem of capital and labor would never be solved by either one of them, nor by lawyers, because they lacked the constructive trend of mind. Nor would it be solved by the average politician, because he lacked the creative ability. The type of mind that could successfully cope with the situation was the engineer's who always worked back to first principles."

* * *

Further impetus is given to the activities of Canadian interests in the incorporation of the International Corporation of Canada, with head offices at 112 St. Francois Xavier St., Montreal, with a capital of $2,000,000. While the primary object of the company is to trade in products made by Canadian manufacturers, the scope of their activities will be world-wide, as it is their intention to establish agencies in all the principal countries of the world, not only to look after the interests of Canada but likewise to develop trade in all parts of the Empire, backed entirely by Canadian capital. The gentlemen associated with the enterprise are prominent in Canadian financial and industrial activities, and is is expected shortly that a further announcement of the names of the directors will be made. It is understood that H. B. Thomson, formerly Canadian Food Controller, will occupy an executive position with the new company.

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U.S. SCRAP METAL

Western dealers are coming into the Eastern market, offering machine shop turnings at low prices. While in some parts the demand is active, in other business is quiet. Prices are generally firm. Following are reports from U. S. points:

Chicago.—Cast scrap, and iron and steel scrap of rolling mill grades are in good demand, and prices have shown an advance. Dealers are unable to ship stock sold on contracts owing to embargoes on shipments. Railroads are offering about 5,000 tons.

Boston.—Heavy melting steel has been bought pretty widely, and the price has advanced and continues on the up grade. Rerolling rails, stove plate, No. 1 machinery, and borings have shared in the movement. Pipe scrap shows the only drop, being quoted at $14 to dealers in Boston.

New York.—The market is quiet, though there has been some activity in heavy melting steel. Prices remain about the same, with the exception of clean cast borings, which have been advanced $1.

Philadelphia.—Western dealers who are unable to sell to their regular customers, are offering machine shop turnings at low prices in the East. A large tonnage was sold to an Eastern interest at 75 cents under the market. Wrought pipe is weak, there being no demand. Other grades are firm.

Pittsburgh.—Demand for scrap iron and steel is weak, and embargoes are preventing dealers from shipping material against contract. Dealers are looking for a better market as soon as the strike is settled.

Buffalo.—Sales are not numerous, and what there are for small lots. Prices are nominal, and there are few changes. Cast and stove plate are in good demand, and demands for borings particularly good.

Cleveland.—Trading is expected to remain quiet for some little time. There is a large amount of scrap on tracks, which will take some time to clear away when mills resume normal operations.

Cincinnati.—There is a large amount of material on stock in yards, and car shortages are operating against shipments. Steel scrap quotations are nominal, the market being very weak.

St. Louis.—Mills and foundries in this district are busy, and demand for scrap is steady. Rolling mill grades are strong. Cast scrap is about 50 cents higher.

"We're saving fuel," remarked the lady. "I just left my husband stamping on the floor to keep his feet warm."

"Thrift stamps, eh?" said her waggish friend.—Boston Transcript.

PIG IRON TRADE

Most Eastern furnaces are booked up for this year, and demand for spot iron is strong. This has led to a rise in price in some districts. Good enquiry for export iron is in evidence:

Philadelphia.—There is a good demand for prompt tonnages, a good deal of which is from New England consumers who cannot procure iron in their own district. Prices are strong, No. 2X being offered at $31 to $32 Eastern Pennsylvania furnace.

Boston.—With Buffalo furnaces practically sold up for this year's delivery, spot iron has stiffened. One or two furnaces are offering iron for first quarter, but this is the exception, and prices on this iron have advanced $1. Sales have averaged about the same as last week.

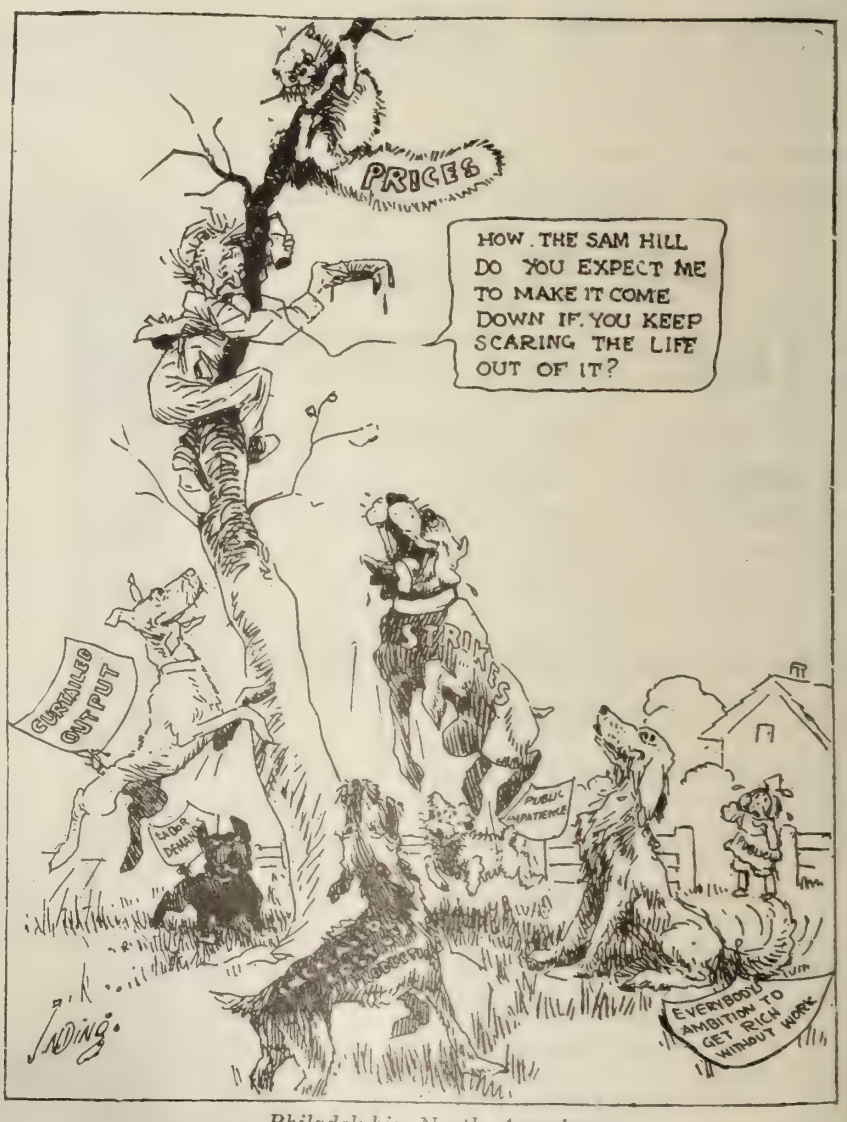
New York.—Big orders and enquiries for both basic and foundry iron for Japan have been in evidence during the week. One order for 5,000 tons basic brought up the total sales of this grade to Japanese interests in the past ten days to 10,000 tons. England, Belgium and Scandinavia are also in the market.

Pittsburgh. — Following large purchases of basic and bessemer by the Steel Corporation, amounting to probably 60,000 tons, a number of stocks have been blown in by Steel Corporation subsidiaries. Business has been small and in small lots the last few days. Carnegie has now 35 furnaces in blast, as compared with 20 during the early part of the strike.

Buffalo.—There is good enquiry in this district, but furnaces are not rushing to take orders. Some tonnage for 1920 has been booked. Prices are expected to rise after the strike is settled.

Cleveland.—The demand for spot iron from melters who are running short has resulted in stiffening prices. $30 furnace for 2.25 to 2.75 silicon has been offered, and a sale of 1,000 tons malleable at $28 Buffalo made. Steel making iron is not moving.

Call Off the Dogs



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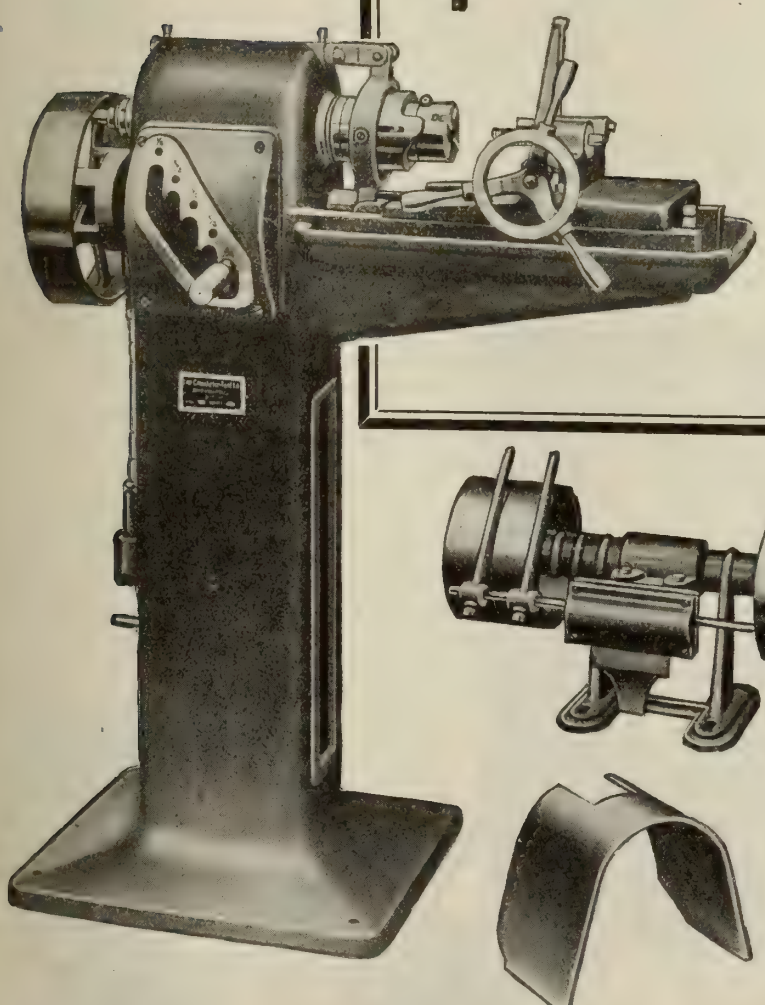
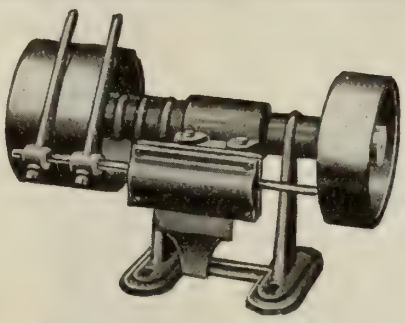
Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut 1/8 to 1/2 inch, 1/4 to 3/4 inch, and 3/4 to 1 1/2 inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.





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THE MIND OF THE FOREIGNER

(Continued from page 419)

been possible for the last twenty years to hear the doctrine of capitalistic exploitation preached openly in its most vicious form, with nothing done to meet the campaign.

The politicians wanted the votes of those men wherever they could get them, and they were not going to do anything that should alienate this support.

The strikes of foreigners this year may work out for lasting good if they have the effect of making the men in charge of affairs in this country and United States get seriously to work to find out what is back of it all, and what must be done in the way of corrective propaganda.

There must be something more than mere opposition to the agitator. There must be something that will cut the ground from under his feet. Rooting out the agitator is of little use in itself, as it simply places the halo of martyrdom on his miserable head, and leaves room for another to follow in his wake.

Foreigners who are in this country have a good chance to reach a better plane of living than was ever possible for them in the land they left. In return, all that is asked is that they mind their own business and cease trying to apply Marxian nonsense to a field where conditions do not call for it. Industry has a perfect right to insist that in return for decent working and living conditions, for the absence of the sweatshop, that it be placed in a position where it can go ahead with reasonable and definite assurance that it is not going to be sand-bagged and gassed at the say-so of the agitator, whose pockets bulge with teachings of anarchy, and the easy pickings he extracts from the hard-earned surplus of his victims.

Just by Way of Suggestion

IF the farmers are going to govern Ontario, let us give them a few good suggestions. Here they be, free of charge and guaranteed strictly fresh laid:—

1. That O'Connor be banished for trying to stick a peg in the price of eggs.

2. That any person selling butter for less than $1.50 a pound be shot at sunrise.

3. That any person from the city driving a car through the country shall not exceed a speed limit of three miles an hour, and that he shall be preceded by a herald with a trumpet, a red flag and a drum.

4. That people from the farms be given the freedom of their Toronto relatives' spare bedrooms during Exhibition time, and that the custom of taking a basket of butter, eggs and chickens to such relatives be immediately done away with.

5. That the great question of "Where shall the hired man wash his feet?" be referred to the special committee on drainage and ventilation.

6. That there shall be at once added to the curriculum of all schools a course showing how to make a calf drink out of a tin pail.

Last week a note on this page told of the usual things done on Thanksgiving Day. This week a reader embellishes the page with a more elaborate diary of his day's journey:—

Got up 6 a.m.
Shaved—ate.
Took wife to station.
Went to office.
Man came in unexpectedly.
Morning work shot to pieces.
Went home.
Put up blinds.
Dug up shrubs.
Bluffed neighbor into fixing the line fence.
Moved garden swing.
Piled lumber.
Tore down fence.
Dug up post.
Filled in post hole.
Cleaned up cellar.
Played with the kids.
Ate supper.
Went four miles for junk.
Took home load of junk.
Unloaded load of junk.
Put kids to bed.
Took housekeeper and cousin for ride.
Smoked.
Yawned.
Retired tired but THANKFUL.

When Hallowe'en Comes Round

I CAN mind in days what's gone and never to return, when Hallowe'en come 'round each year our childish mind would burn, when we was told about the ride of famous Tam O'Shanter, a-tryin' to speed his old grey mare from out its Sunday canter. And we would sit with gapin' mouth—ah, yes, that tale is rich—about old Tam escapin' from the grabbin' of the witch.

But, then, in years that came along we turned to worser tricks, that savored much of cabbages, of night raids and of bricks.

And in them days we turned that night into one awful spree—in lookin' back to them there nights we'd swear it could not be. Why, I can hear John Cameron yet let out one awful roar, as we took his choicest cabbages and chucked 'em at his door.

But many of them things has passed and gone to be no more, when we was wicked youngsters in days what's gone before. And nowadays the youngsters' sport looks powerful meek and tame, the date's all right for Hallowe'en, but it hardly seems the same.

Imagine us wild-eyed galloots, when we was two-by-four, contented just to take a trip and ring at someone's door, or else to go and take a tub and duck for apples there, or gettin' taffy stuck, by gum, like glue into your hair.

Be gone the Hallowe'en that is, wheel back the good old kind, the sort that told of darin' deeds, of wild and woolly mind—when we was terrors for a night, when we shot up the block, when it took 'most a week of time to come back from the shock.

Yes, let me grab the hands of time, and grind 'em back a spell—for just pure joy at such a thing I'd bust right out an' yell. Oh, how I'd like to gather up them cabbages once more, and wave 'em up around my head, then slam 'em at the door. Old Cameron, yellin' after us, would be a joyful thing, 'twould make my heart and liver jump, and cause my bones to sing.

Of course, it's well that lots of folks don't think the same as me, but Hallowe'en, she aint the same as what she used to be.—ARK.

FROM a recent report on the subject we glean the interesting bit of information that "pseudowollastonite is the alpha form of calcium metascilicate." For our own part we'd never known before that any person could stay under water for such a long time.

A DIFFICULT PROPOSITION

Customer—"I'd like to see a suit that would fit me."

Salesman—(absently)—"So would I."

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

MARINE

Buffalo.—The longshoremen's strike in New York is making itself felt at Lake ports, embargoes being placed on flour and other merchandise for export at the head of the lakes. Ore shipments down the lake to Buffalo have fallen off considerably, and little grain is being shipped.

Midland.—The Midland Shipbuilding Company have launched their third steamer for the Imperial Munition Board from their yard at Midland. The vessel launched recently was called the "War Fury," and was a full canal sized vessel of 3,400 tons, 261 feet by 46 feet 6 inches and 23 feet depth.

Detroit.—There is considerable congestion at Detroit owing to lack of unloading facilities at other ports due to strikes and threats of strikes. Approximately 4,065,000 tons of ore were detained in the river 24 hours or more, and this week 15 big ore carriers have been held up.

The "Canadian Seigneur," of the Canadian Government Merchant Marine, sailed last Friday on her maiden trip from Montreal to Liverpool, with a full cargo of grain, pulp, newsprint, sugar, meats and lumber. The "Canadian Seigneur" was launched at Vickers on May 17 last.

Halifax.—A message from the coast of Labrador speaks of the loss of the new tern schooner, "Team 16." The vessel was recently sold by A. Moulton & Company to Hon. P. Templeman, Newfoundland. She was launched from the yard at Conquerall Bank on August 27. The crew of six were all saved, and the value is fully covered by insurance.

New Glasgow. — The "Canadian Sealer" was launched from the yards of the Nova Scotia Steel & Coal Company recently. The vessel is of the 2,800 ton class, and has an overall length of 238 feet, and 35 feet beam. A sister vessel is on the ways, and another keel was laid immediately after the "Canadian Sealer" had vacated the berth.

Sydney, N.S.—The concrete schooner being built at North Sydney by Ivan Buyley and W. N. McDonald, has now progressed to the stage where the moulds are all complete and ready for pouring. Mr. Jones, Lloyd's inspector of steamships from New Glasgow, has arrived at North Sydney for the purpose of inspecting the work done so far on the vessel.

Work May Start Again.—Work on the Welland Canal, which has been stopped for several weeks, owing to labor disputes, may be resumed in the near future. The Minister of Labor is in favor of the work being resumed this winter on account of the probable amount of unemployment, and Dr. Reid, the Minister of Railways and Canals, is going to bring the matter before the Cabinet. The decision of the Cabinet will be accepted as final.

Belleville. — The schooner "Bertha Calkins" of Picton, commanded by Captain Van Dusen and bound for Belleville from Oswego with coal, foundered near Player's Cove in a heavy gale on Sunday night. The vessel opened a seam through straining in the heavy sea. The captain brought his vessel as close as possible to the shore before she sank, and the crew all reached the land in the ship's boat. She sank in 25 feet of water, and there is not thought to be much difficulty in raising her.

New Canadian Steamship Service.—The Marine Navigation of Canada is about to establish a direct service between Canada and Brazilian ports. They are having five steamers built in Holland for the service, and these vessels will be under the Canadian flag when completed. In order to foster Canadian trade with South America a subsidiary company is being formed under the name of the Canada Import and Export Company, with offices in the Coristine Building, Montreal. The first sailing from Montreal is expected to take place before navigation closes, and sailings will be made from St. John, N.B., during the winter. The company have a service between Montreal and St. Nazaire, France, which has been in existence for some years, with two steamers.

It is announced that Mr. F. J. Buller, the popular treasurer of the Canadian National Railways at Toronto, is resigning on the 15th of the month to accept the position of vice-president and manager of the Canadian Steel Tire & Wheel Co.

This company is associated with interests that occupy a very strong position in the railway equipment field and is constructing a plant of considerable magnitude at Montreal to manufacture steel tires for locomotives and passenger equipment. This means the creation of a new and important industry for Canada. So far all steel tires have been imported.

MR. F. J. BULLER.

Mr. Buller is a well-known figure in the railway and business world. He has been in the service of the Canadian Northern and Canadian National Railways Finance Department for nearly twenty years, where he has acquired a wide connection, which will prove valuable to him in the important position to which he now succeeds.

PERSONALS

Mr. T. A. Russell, of the Willys-Overland plant, is in the Canadian West at present.

Mr. F. C. Brunke, manager of the United States Steel Products Co., Toronto, leaves this week for New York to attend the meeting of the Iron and Steel Institute, in session there.

Mr. T. A. Hollinrake, president and general manager of the A. R. Williams Machinery Co., has returned to Toronto from an extended trip through Western Canada, as far as the Pacific Coast. Mr. Hollinrake called on a number of business houses, and on his return trip came

through via Fort George and Edmonton. Taken on the whole, conditions in Western Canada are sound and satisfactory, and Mr. Hollinrake believes that there is good busiess to be done there.

Mr. M. J. Butler, a well-known figure in engineering circles in Canada, and for some years managing director of Armstrong-Whitworth of Canada, has resigned that position. From 1905 to 1910 Mr. Butler was Deputy Minister and chief engineer of the Department of Railways and Canals, when he took up the duties of general manager with the Dominion Iron and Steel Co. and Dominion Coal Co. He severed his connection with these firms in 1912 when the Canadian branch of the famous Armstrong-Whitworth Co. was formed, organizing and becoming the managing director of the new firm.

TENDERS

The Department of Public Works of Canada is asking for tenders for the reconstruction of the breakwater at Collingwood, Ont., and tenders must be delivered before November 6, 1919. Plans and form of specifications can be obtained at the office of the District Engineers Equity Building, Toronto, and at the Post Office, Collingwood, and the Department, Ottawa.

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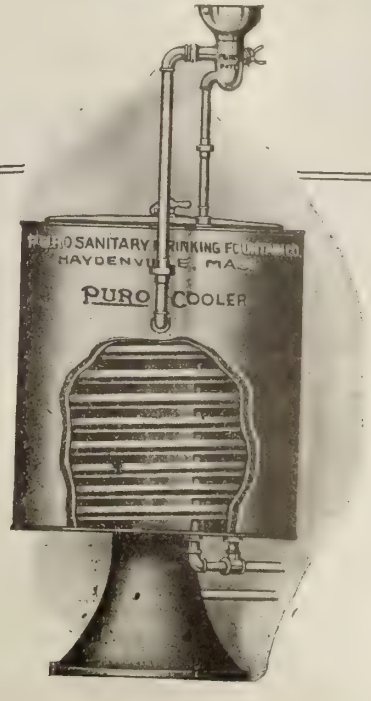

TRADE GOSSIP

The Pennsylvania Crusher Company, Philadelphia, have issued bulletin No. 1004, descriptive of their hammer crushers adapted for the fine crushing of bituminous coal.

Railway Material. — The following cablegram, dated October 7, has been received from the Canadian High Commissioner in London, England: "Egyptian State railways in market for large quantities rails, fish-plates and steel ties." The Dept. of Trade and Commerce at Ottawa may be able to furnish the particulars required.

Making Automatics.—C. R. Burt, who was for some time in charge of the Russell Motor Co. works at King and Dufferin, during the early days of making munitions, has formed a partnership with Mr. Davenport, the inventor of a number of automatic machines. Together they have purchased a plant in Rochester for the manufacture of these machines. After leaving Toronto, Mr. Burt went to the Buffalo plant of the Russell Motor Co., being very successful in carrying out the work there, and getting the contract cleaned up to the satisfaction of the Government and the company.

Holding Up Building.—The steel situation in the United States is stated to be responsible for holding up the erection of the additions to the Holmes foundry on Exmouth street, Sarnia, this fall. Construction on the addition will not begin until the spring. This will have no effect with the opening of the plant now nearing completion, which will be ready to commence work within three weeks, according to Mr. Earl, superintendent at the plant at present.

The present building has, it is estimated, two hundred tons of structural steel in its construction. The plant will extend westward as far as the railway tracks when the different buildings are completed.

New Catalogue Out.—Butterfield and Company, of Rock Island, Quebec, have just issued two new catalogues, one on twist drills, gear and milling cutters, and the other on their line of taps, dies, screw plates, and various types of reamers. In addition to the general descriptive matter on the many lines of the company, each book contains an appendix that gives many rules, formulae and tables, relating to tap and drill sizes, cutting speeds, different thread types and dimensions, and other useful information.

ST. JOHN, N.B., NOTES

The plant of the Corona Company, Ltd., chocolate manufacturers, is to be doubled in capacity. Work is now going on in connection with the enlargement.

Machinery is now being installed in the premises of the Peerless Laundry Co., Ltd., 132 City Road, which has taken over the place formerly occupied by the Maritime Glass Works.

Two large steel tanks, 42 feet in diameter, 29 feet high, each with a capacity of 280,000 gallons, are to be erected by the Crosby Molasses Co., Ltd., at their plant here. The concrete foundations are now being laid by Grant & Horne, who have the contract.

A new hardwood last factory is being completed at Mullins' Brook, N.B., near McGivney Junction, owned by an English firm, with R. T. Baird, New Brunswick, manager. A mill plant is being moved from Napadogan to carry on the manufacturing and some 200 hands will be employed to engage in the industry.

St. John, N.B., Oct. 20, 1919. — The plant of the Provincial Line Co., Ltd., near Brockville, is being rapidly restored and the company is again carrying on its production. The plant was a heavy loser by fire a few months ago. When the new work has been completed, the plant will have a capacity of some 25,000 tons.

ONTARIO INCORPORATIONS

The Industrial Financial Corporation of Canada, Limited, has been incorporated under the Ontario Act, with a capitalization of $40,000 in 8,000 shares of $5 each, to carry on the business of financial brokers, auditors, registrars, etc. The head office will be in Toronto.

Dolomite Products, Limited, has been incorporated under the Provincial Act with a capital of $100,000 in 100,000 shares of $1 each. They will carry on the business of mining, smelting and manufacturing. The head offiice to be in Toronto.

Other Incorporations Are:—Greater Hamilton Development Co., Ltd., McLagan Furniture Co., Ltd., Sky Bros., Ltd., Turner Warehouse Co., Ltd., Sudsmen's Lithographic Co., Ltd., British Saskatchewan Gold Mines Limited, Gold Centre Mines, Ltd., Hudson Parker Sales Corporation, Ltd., Hamilton Hosiery Company, Ltd, The World Mining and Reduction Co., Ltd., H. Cooke & Co., Ltd., Rapid Electrotype Ltd., Ewart, Jacob & Byam Ltd., Albion Knitting Co., Ltd., Maple Leaf Milling Co., Ltd., Bruce Mines Trap Rock Co., Ltd., Wakinda Mines Ltd., Buckham Limited.

Alice: "It's quite a secret, but I was married last week to Dick Gray."

Jane: "Indeed, I should have thought you'd be the last person in the world to marry him."

Alice: "Well, I hope I am."—Edinburgh Scotsman.

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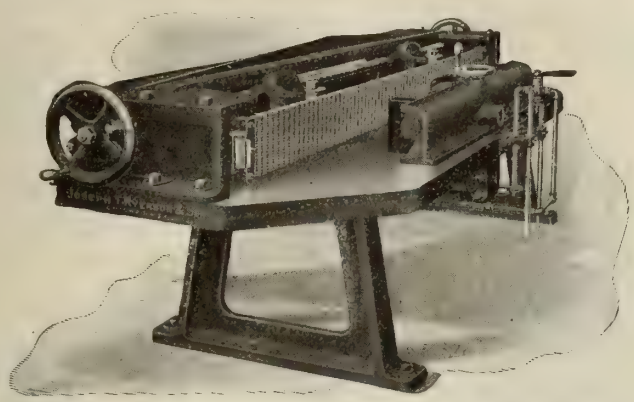

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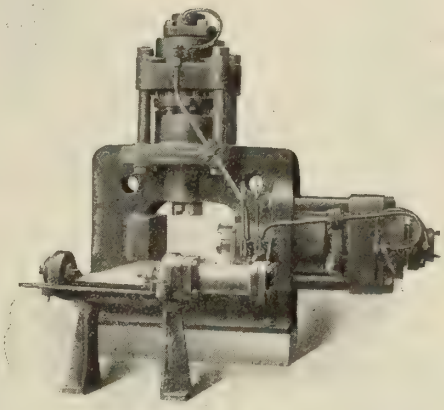

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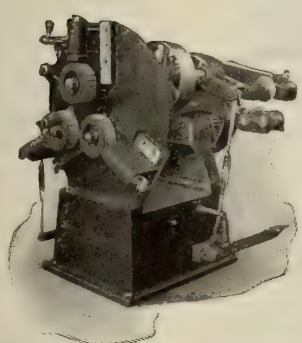

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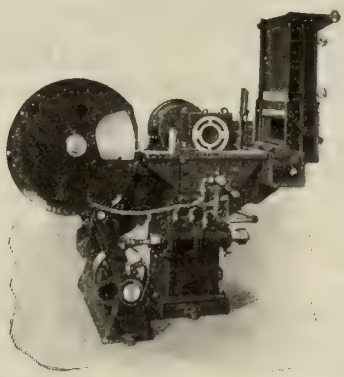

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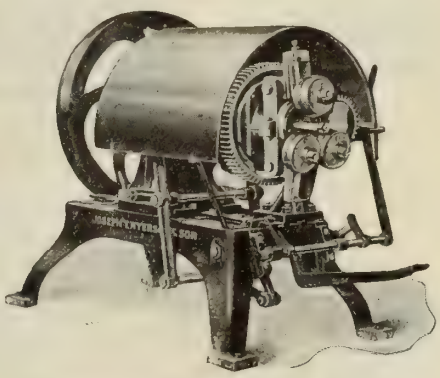

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3	10		GEN. ELEC.	4000-2000/240-120
1	10		CAN. GEN. ELEC.	2200-110/220
1		10	WESTINGHOUSE	6600-110/220
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2		15	WESTINGHOUSE	11000/575
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1		15	FT. WAYNE	1100/2200-110/220
		15	GEN. ELEC.	1040/2080
1		15	GEN. ELEC.	2200-1980/110/220
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1		15	WESTINGHOUSE	2200/1100-220/110
3		15	GEN. ELEC.	6600-550
2		15		2080-115/230
		15		2080-115/230
1	15		GEN. ELEC.	2080-230
13		25	WESTINGHOUSE	11000-575
3	25			12000/2200
10		30	WESTINGHOUSE	11000/575
1		30	GEN. ELEC.	1040/2080-104/208
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2		100	WESTINGHOUSE	22040-11000
3		100	GEN. ELEC.	6600-1150/109
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2		100	WESTINGHOUSE	2420
3	100		MOLONEY	2200/550
3		100		1000-2200
2		150	WESTINGHOUSE	2300-382
6		150		11000-2200
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3	200		GEN. ELEC.	13200-2300
6		250	CAN. GEN. ELEC.	22000/11000-2200/1100
12	250			11500/6600-2300
		250	ALLIS CHALMERS	2200-480/240
3		300	CAN. GEN. ELEC.	12000/110/220/440
3		300	GEN. ELEC.	25000/2200
		250	GEN. ELEC.	33000/13200
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12	500			12500/2200
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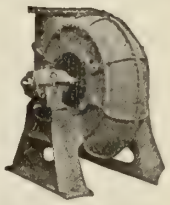
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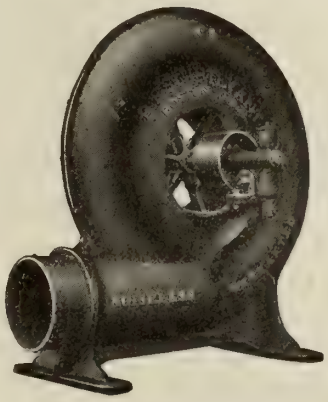

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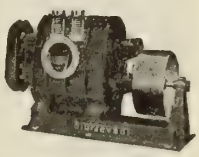
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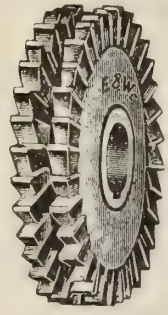

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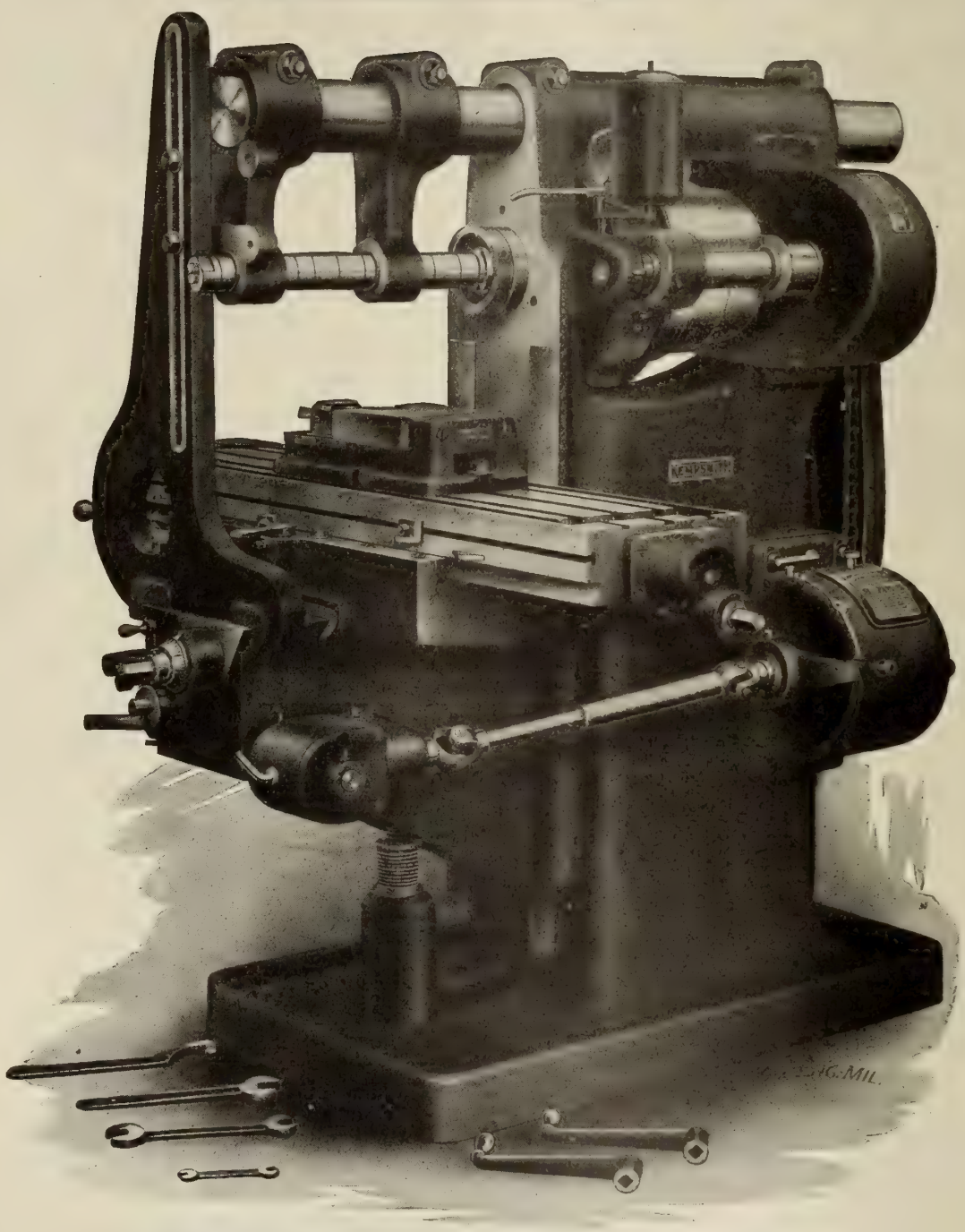

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Is the Alien a Menace?

IN the October issue of MACLEAN'S MAGAZINE a strong presentation is made of the reason why the people of the West are against further foreign immigration.

"The Menace of the Alien" depicts the foreign problem in the Canadian West as it exists to-day, and shows every one of us why we must Canadianize our Ruthenians, Austrians, Slovaks, and our fifty-seven other varieties before we allow any further "unrestricted" immigration.

This article is written by a member of MACLEAN'S MAGAZINE staff who has just returned from a careful, personal investigation of the situation. Shall we have a "White West?" Many Westerners are demanding it. Are the aliens to swing labor into the bosom of the O.B.U.? It is being done—and what must we do to stop it?

The "inside" story of the routing of the Drumheller miner aliens by returned Canadian war veterans is here told by MACLEAN'S for the first time. What leadership must be substituted for the O.B.U. leadership of these foreigners?

The October issue of MACLEAN'S is a Western number in the sense that it contains many articles and stories of distinctly Western interest. For instance:

X "Those Pesky Farmers Out West"

By Hopkins Moorhouse, Author of "Deep Furrows"

They have completely upset the old order of things. No longer will politics consist of the comfortable fight between the Ins and Outs with the old party lines maintained. The grain growers on the Prairies have upset the calculations of the professional politicians and completely changed the face of Dominion politics.

X "Fifty Years in the West"

By Professor W. T. Allison

A breezy and readable sketch of the business career of Winnipeg's veteran business man, James H. Ashdown.

"Further Discoveries of New Land"

By Vilhjalmur Stefansson

The final and most interesting instalment of Mr. Stefansson's story of his wonderful trip of five years' duration in the Canadian north in which he tells for the first time of finding new continents in the Arctic and hoisting there the Canadian flag.

X "The Banshee Bell"

By Edith G. Bayne

A bright love story laid in the mountains of British Columbia.

Other Splendid Features of October MacLean's

X "The Turmoil at Ottawa"

By J. K. Munro

A comprehensive survey of Dominion politics, written with complete impartiality and absolute candor. It is bright and breezy, with a knock in every line for the politicial opportunists. It plucks many tail feathers from our party leaders.

"Spanish Doubloons"

By Camilla Kenyon

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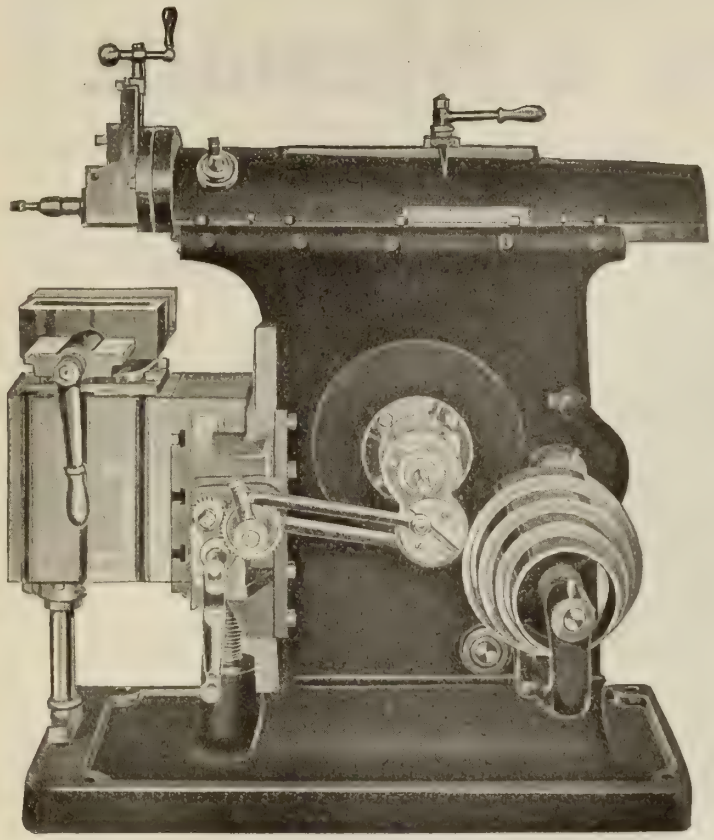

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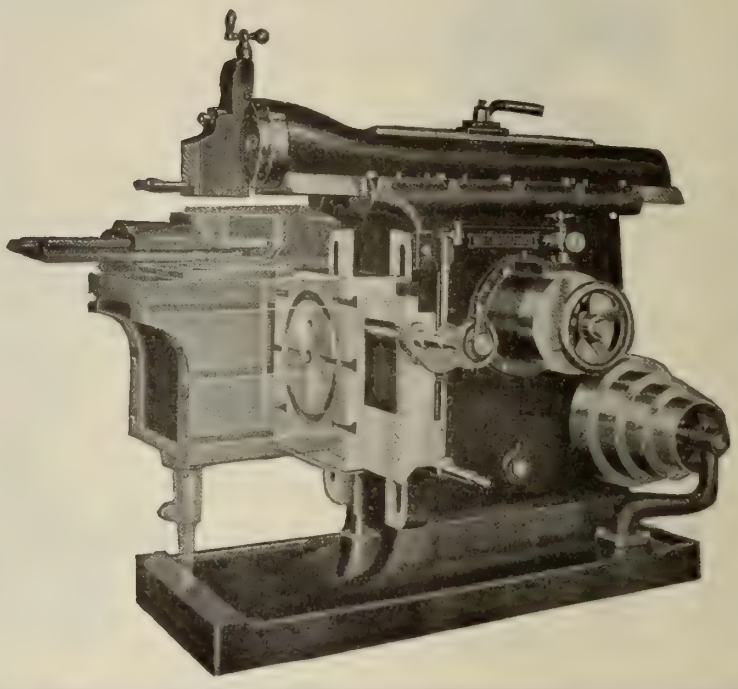

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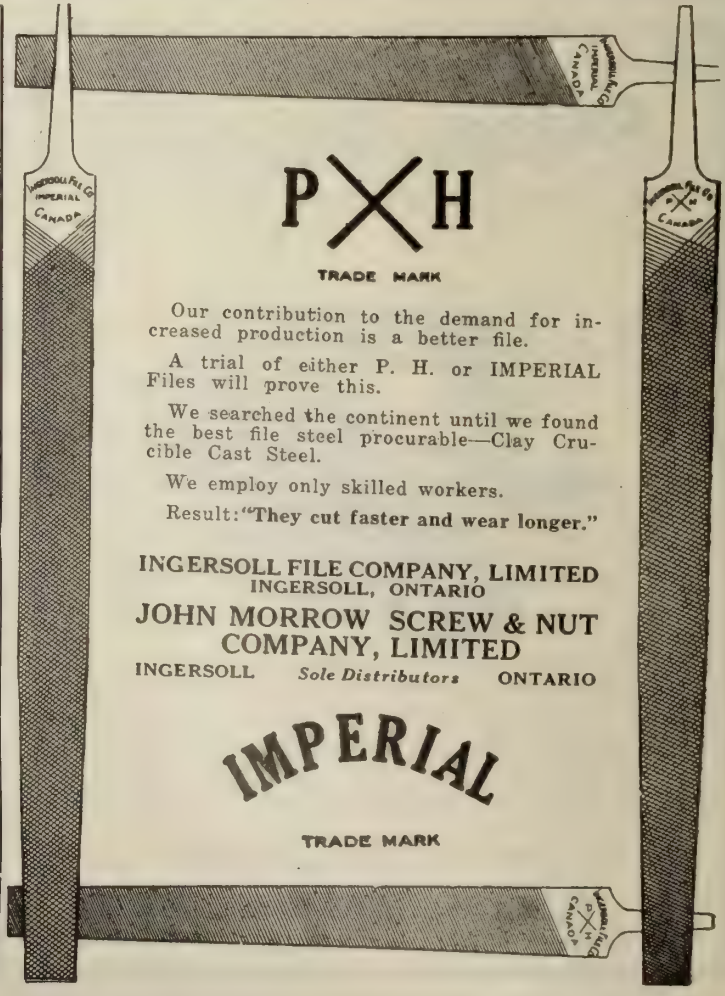

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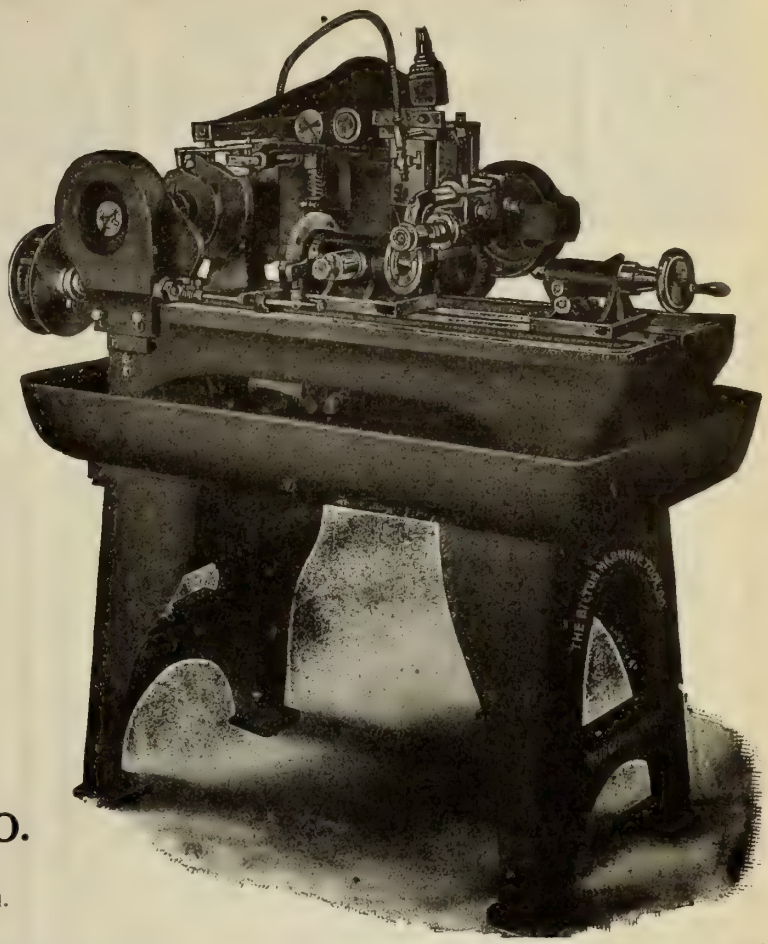

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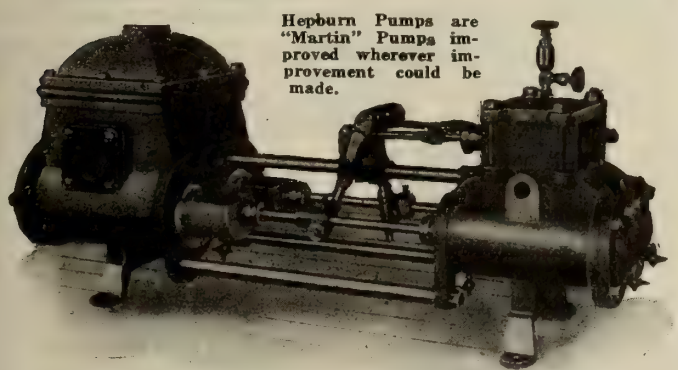

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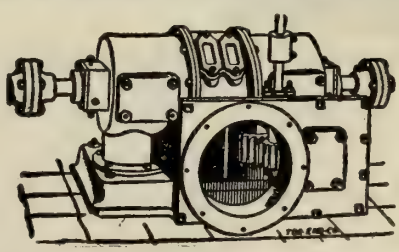

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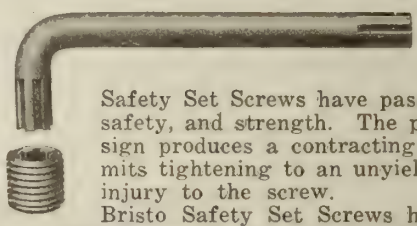

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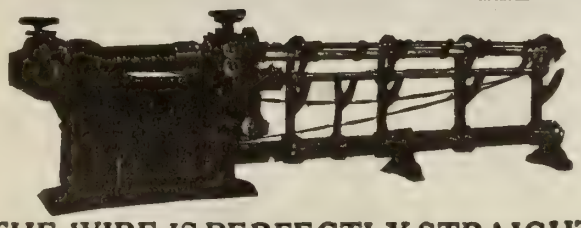

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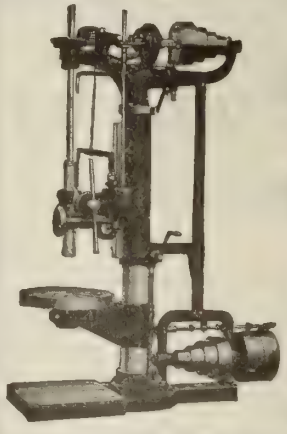

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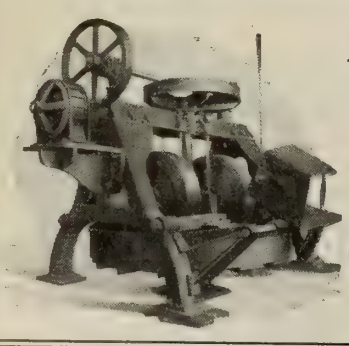

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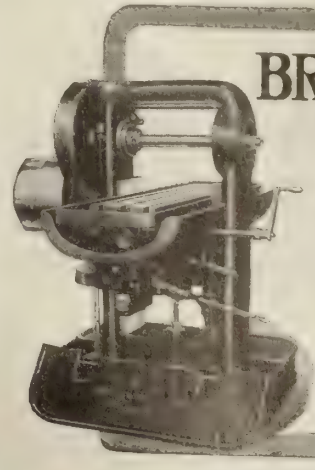

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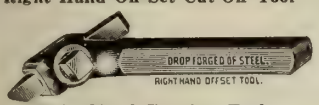

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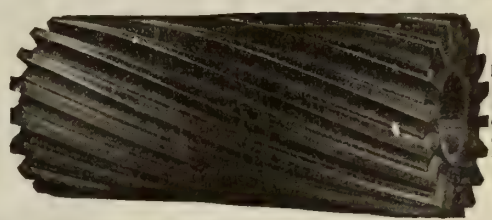

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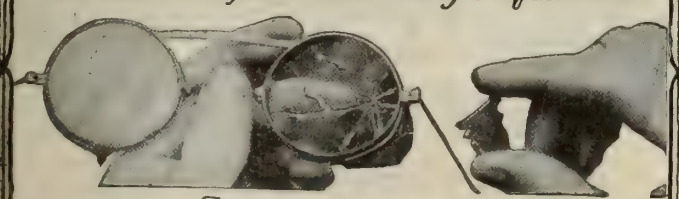

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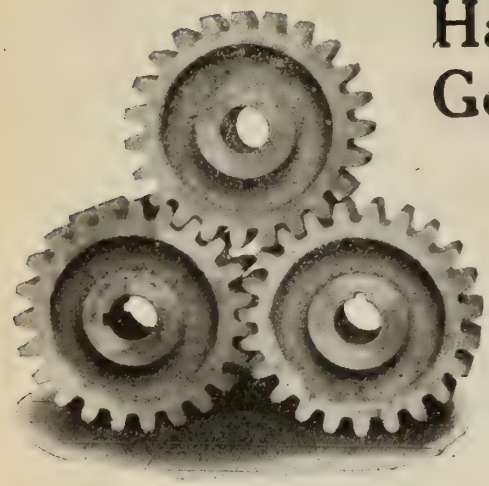

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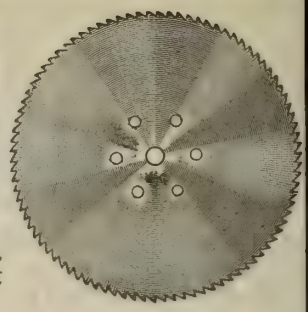

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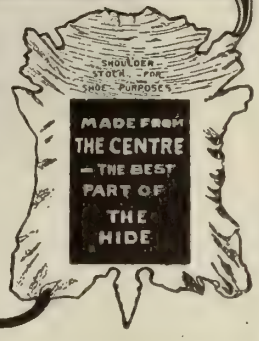

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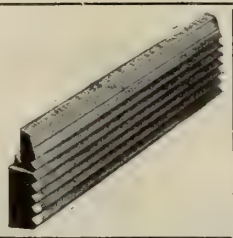

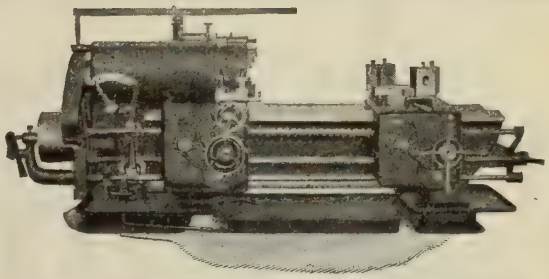

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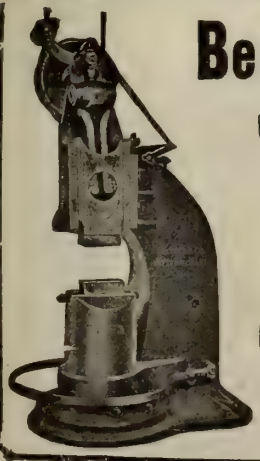

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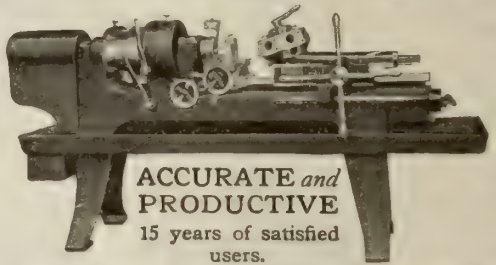

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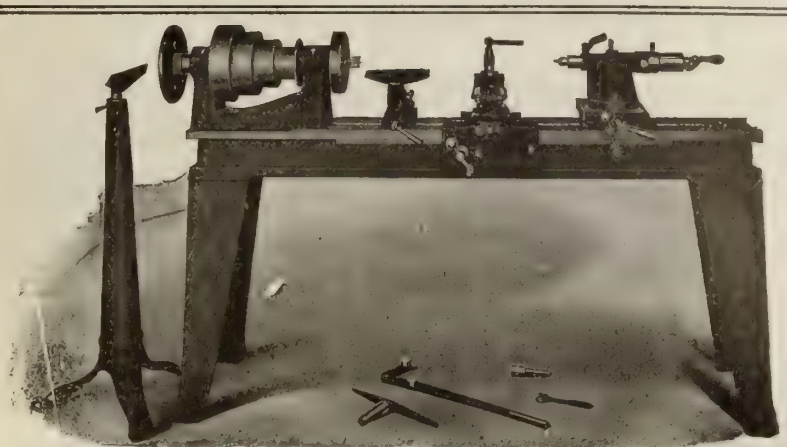

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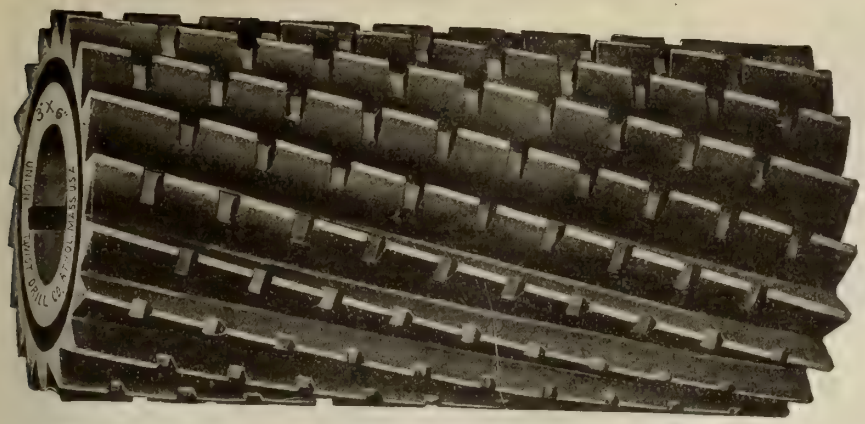

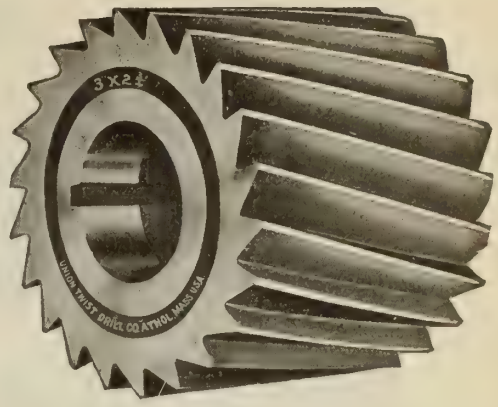

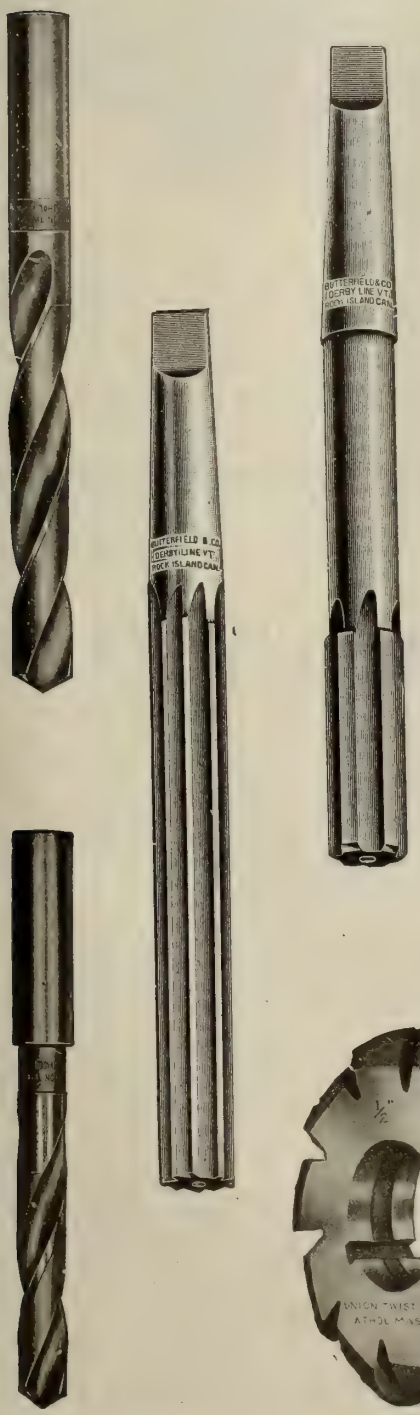

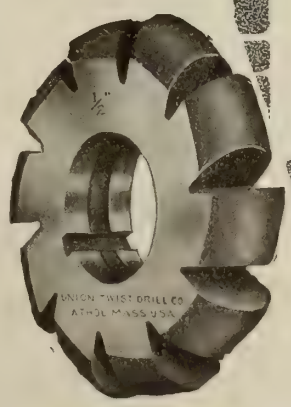

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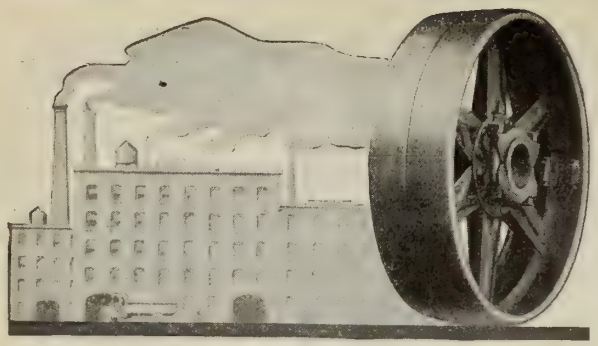

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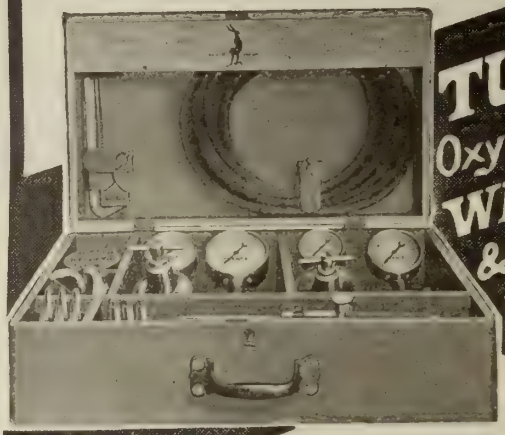

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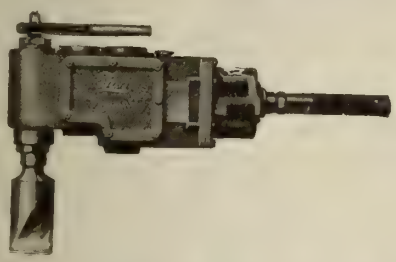

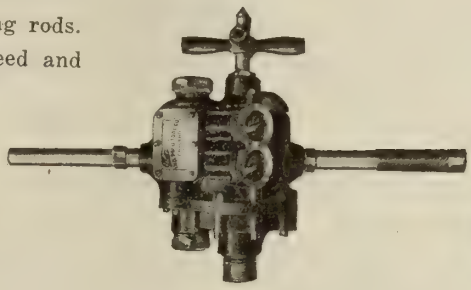

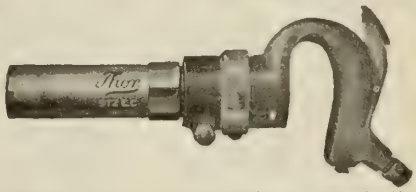

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Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
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Canadian Fairbanks-Morse Co., Montreal
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

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John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

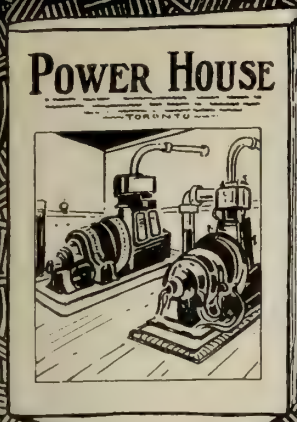
DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.



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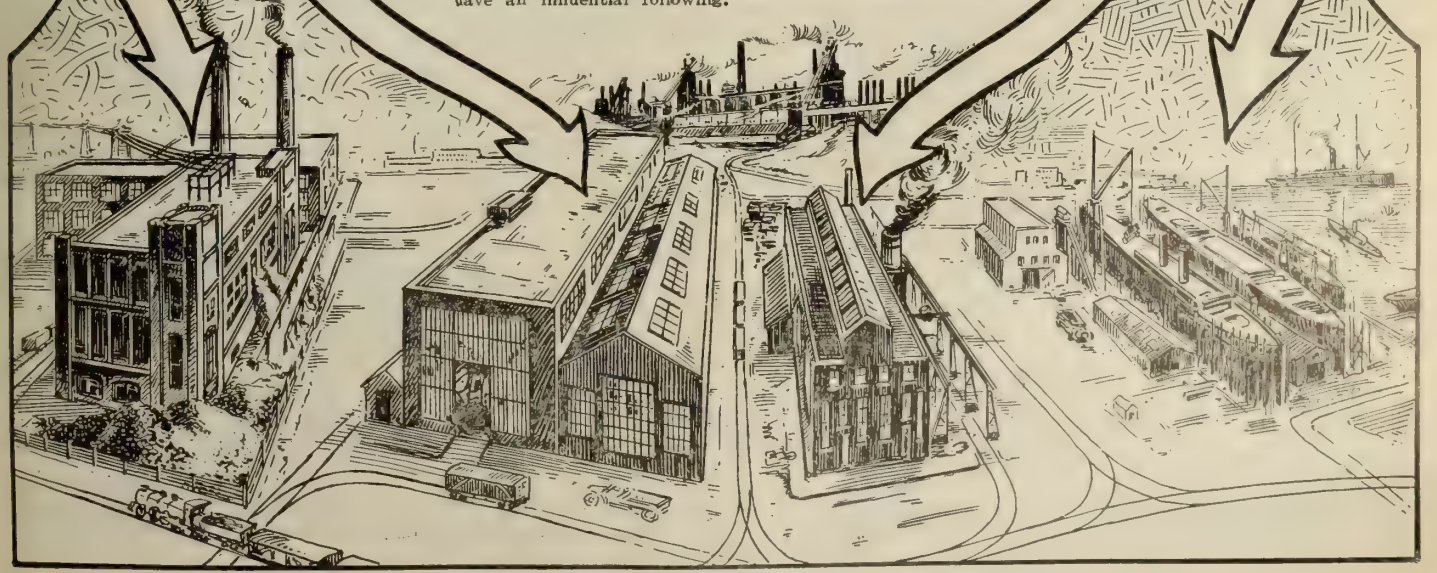

If interested tear out this page and place with letters to be answered.

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.

DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER. ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACES
Volta Manufacturing Co., Welland, Ont.

EECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co., Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.
Can. Driver-Harris Co., Walkerville, Ont.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Volta Manufacturing Co., Welland, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Truing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
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Can. Wire & Iron Goods, Hamilton, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I.

FIRST AID CABINETS
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FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

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Illinois Tool Works, Chicago, Ill.
Marben Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

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FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

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FLUMES
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FORGINGS
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Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Armstrong-Whitworth of Can., Montreal.
Blancke Co., L. C., New York City.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal.

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Gilbert & Barker Mfg. Co., Springfield.

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Bellevue Furnace Co., Detroit, Mich.
Brown & Sharpe Mfg. Co., Providence, R.I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GAS AND STEAM ENGINES
Mesta Machine Co., Pittsburgh, Pa.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE TANKS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE PUMPS, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

GAUGES
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GAUGERS, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, THREAD
Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochester

GEAR BOXES, REDUCTION
Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN
Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM
Barter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

GEARS, SILENT CHAIN GENERATORS, STEAM TURBO
Can. General Electric Co., Toronto, Ont.

GENERATORS AND CONVERTORS
Can. General Electric Co., Toronto, Ont.

GENERATORS, MOTOR
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

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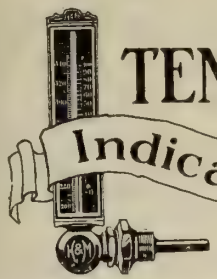

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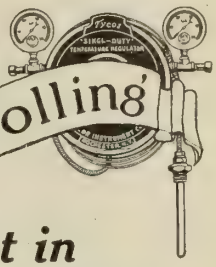

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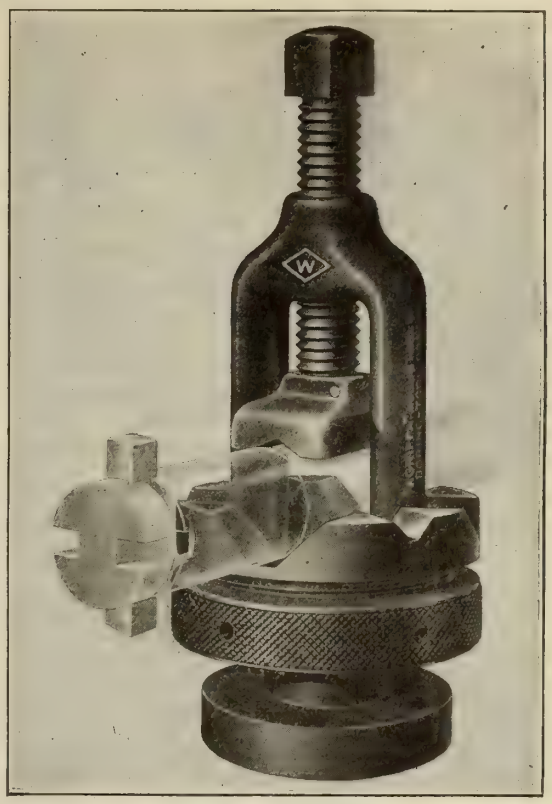

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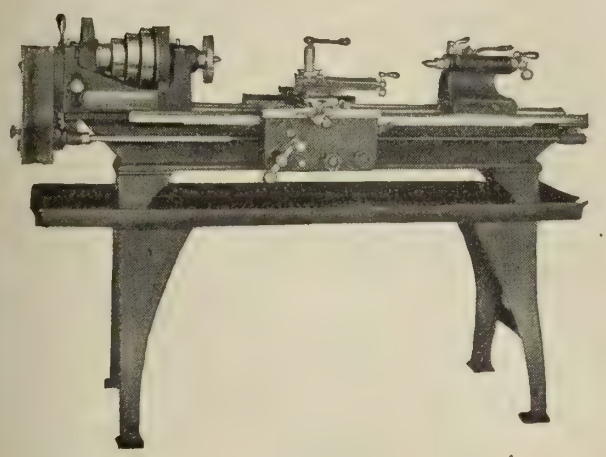

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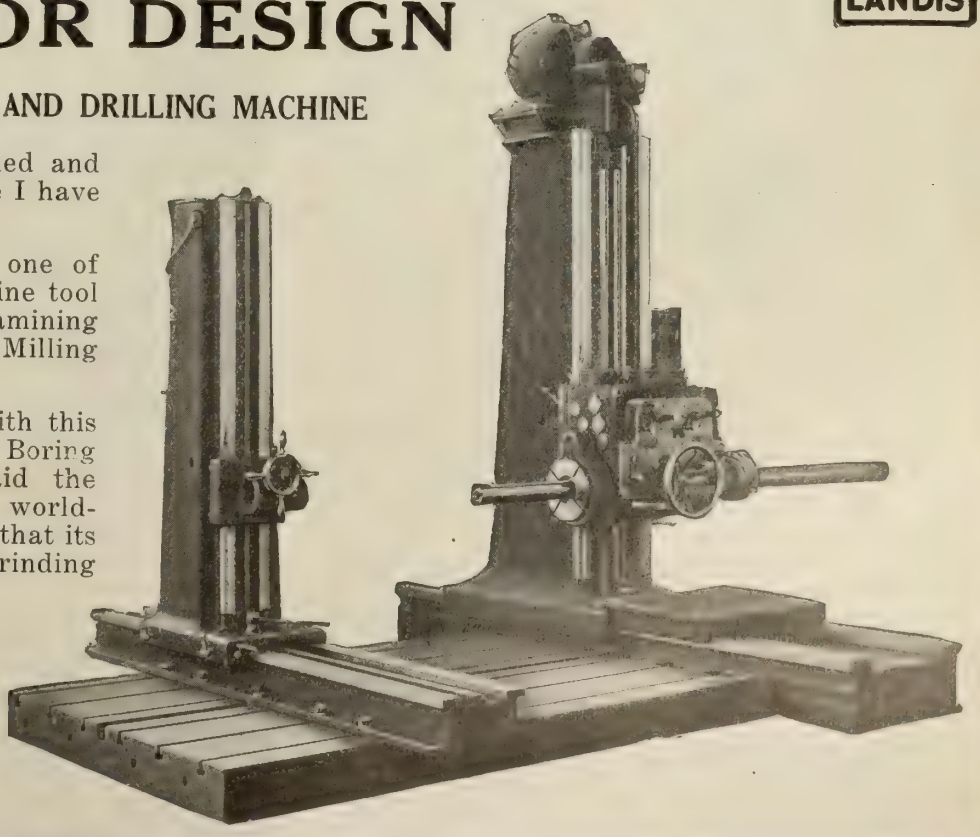
Users invariably agree with this opinion. The LANDIS Boring Machine has already laid the foundation for the same world-wide reputation for merit that its brother, the LANDIS Grinding Machine, enjoys.



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If interested tear out this page and place with letters to be answered.

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Whitman & Barnes Co., St. Catharines.

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Bicknell-Thomas Co., Greenfield, Mass.
Rudel-Belnap Mach. Co., Ltd., Montreal.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
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Steel Co. of Canada, Ltd., Hamilton, Ont.

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WELDING GOGGLES
Strong, Kennard & Nutt Co., Cleveland.

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Welding & Supplies Co., Montreal, Que.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
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WIRE FENCING

WIRE, COPPER, CLAD STEEL

WIRE, LINK FABRIC
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Shuster Co., F. B., New Haven, Conn.

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Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

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Page Steel & Wire Co., New York, N.Y.

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Steel Co. of Canada, Ltd., Hamilton, On.

WIRE, TELEPHONE, TELEGRAPH, GALVANIZED AND ELECTRICAL
Page Steel & Wire Co., Adrian, Mich.

WIRE, WEAVING, MONEL METAL, BRASS, COPPER, GOLDEN BRONZE, HIGH BRASS, LOW BRASS, NICKEL
Can. Driver-Harris Co., Ltd., Walkerville.

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Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd, Montreal, Que.

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Brown, Boggs Co., Ltd., Hamilton, Can.
Shuster Co., F. B., New Haven, Conn.

WOODWORKING MACHINERY
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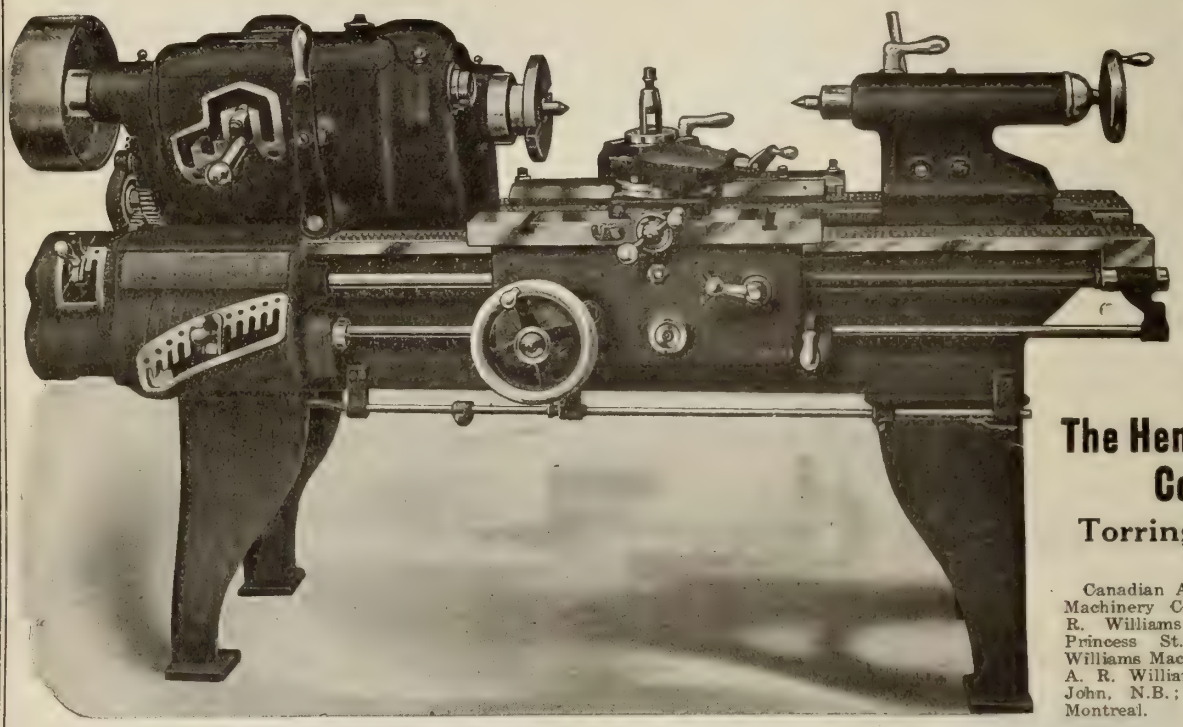

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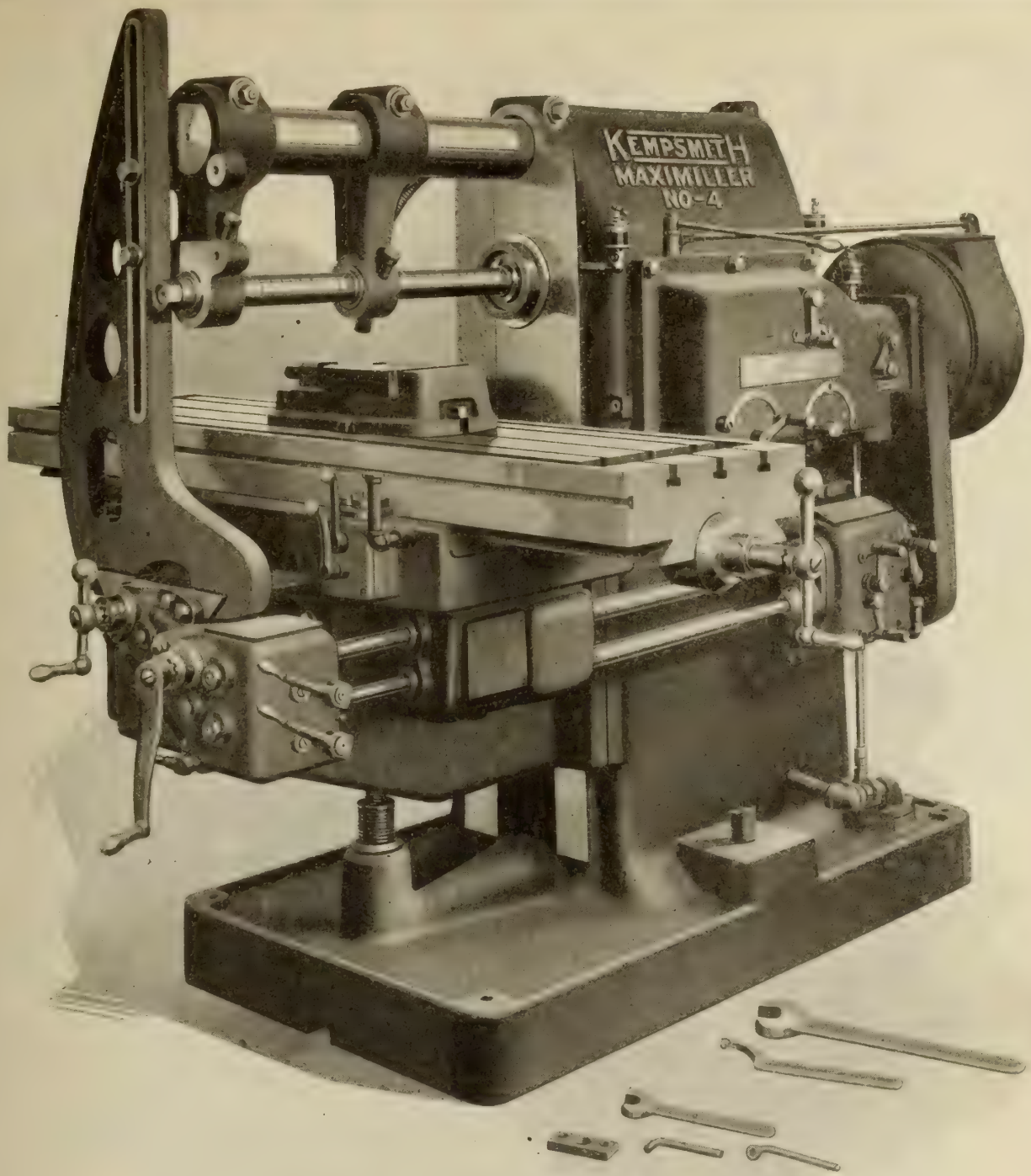

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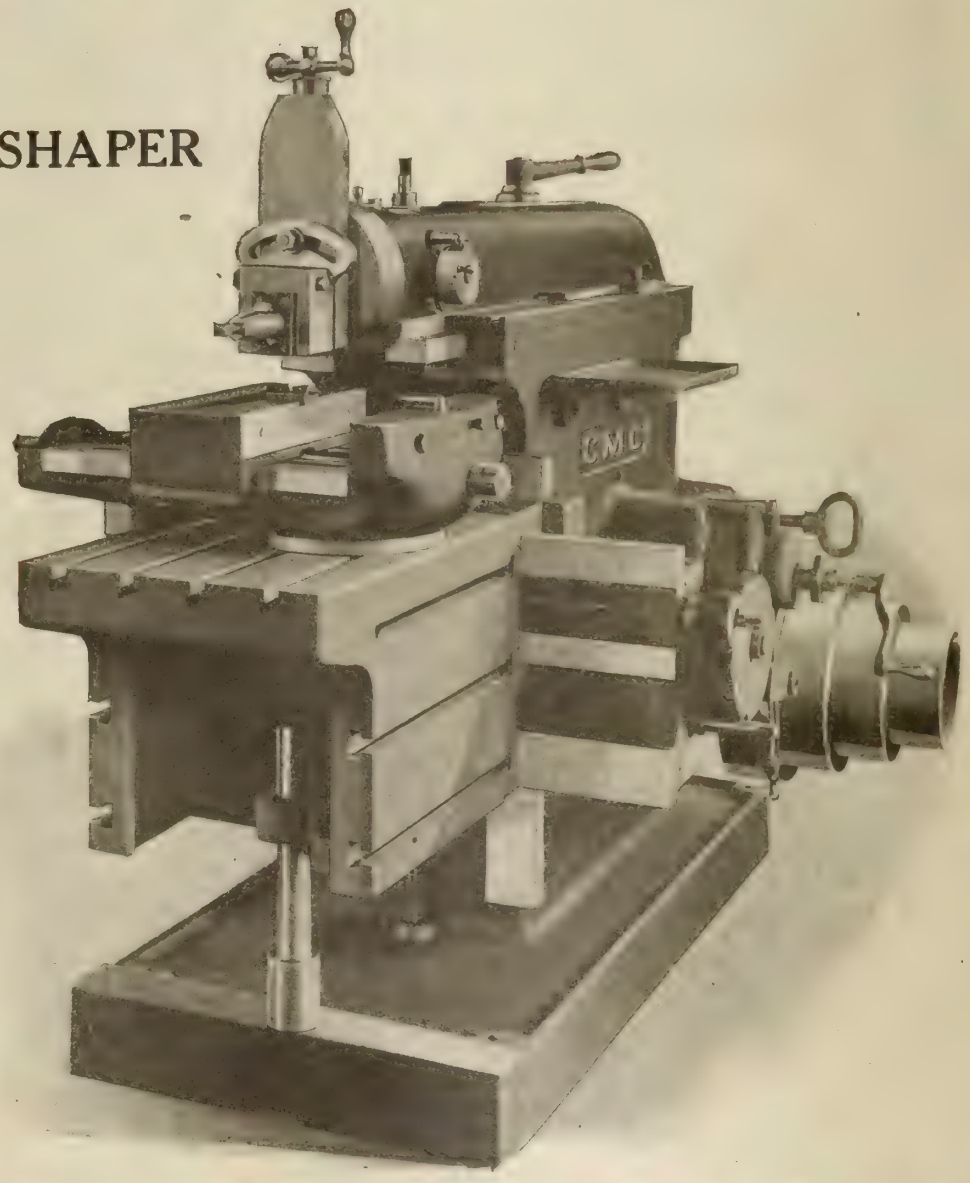

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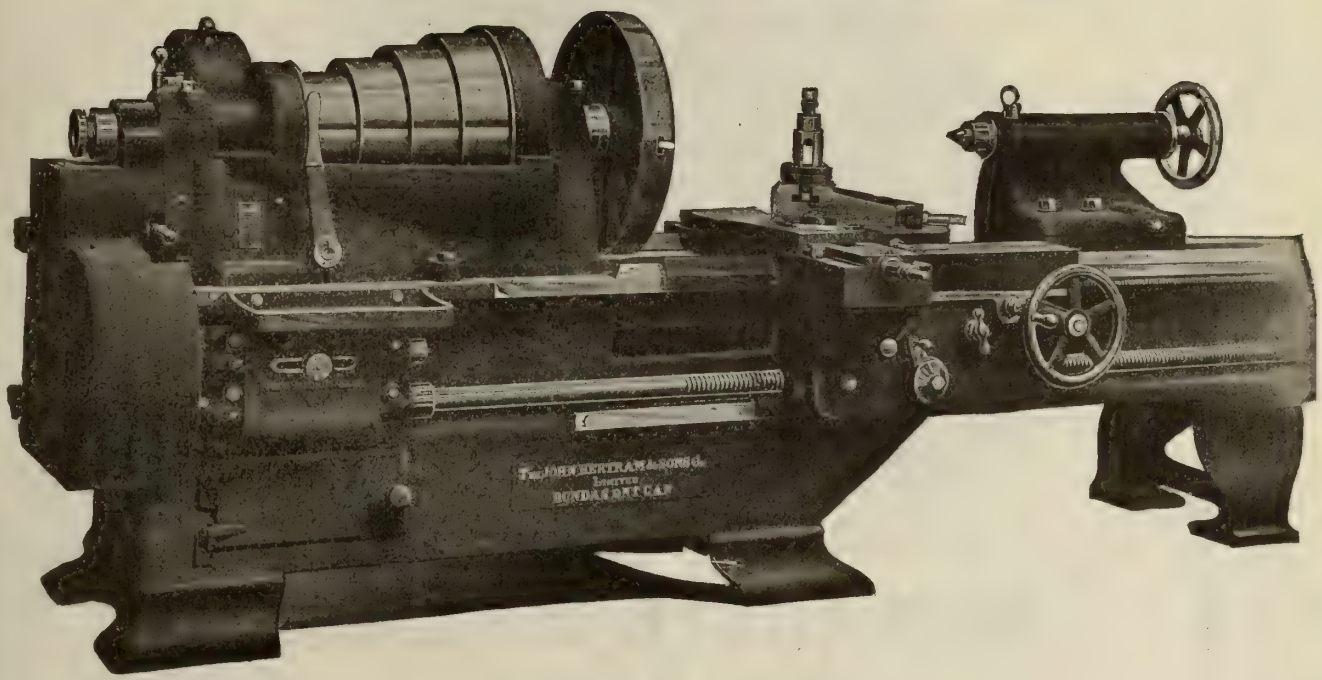

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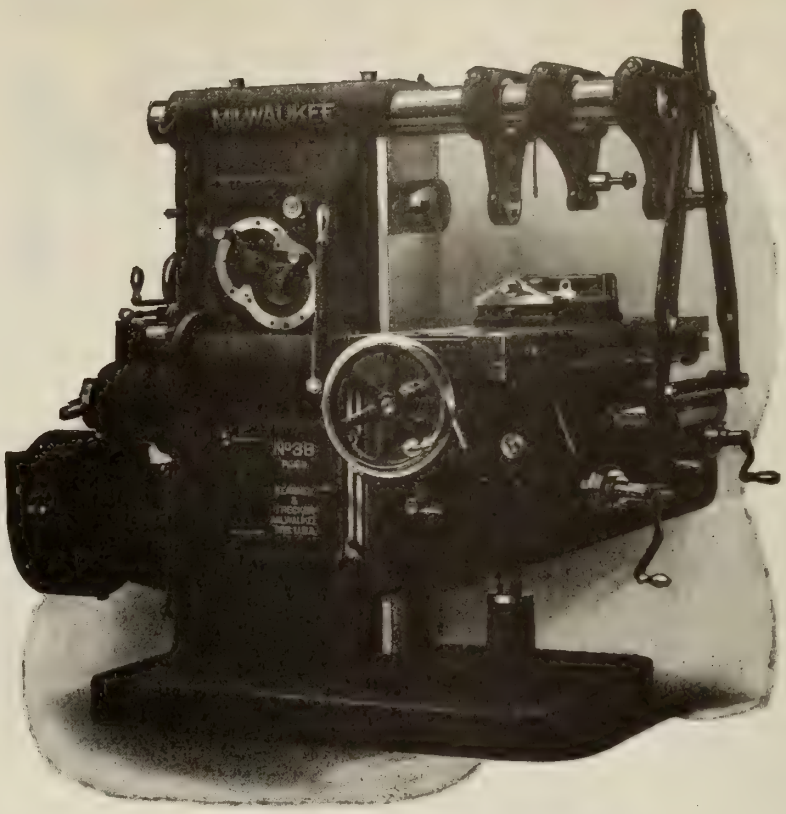

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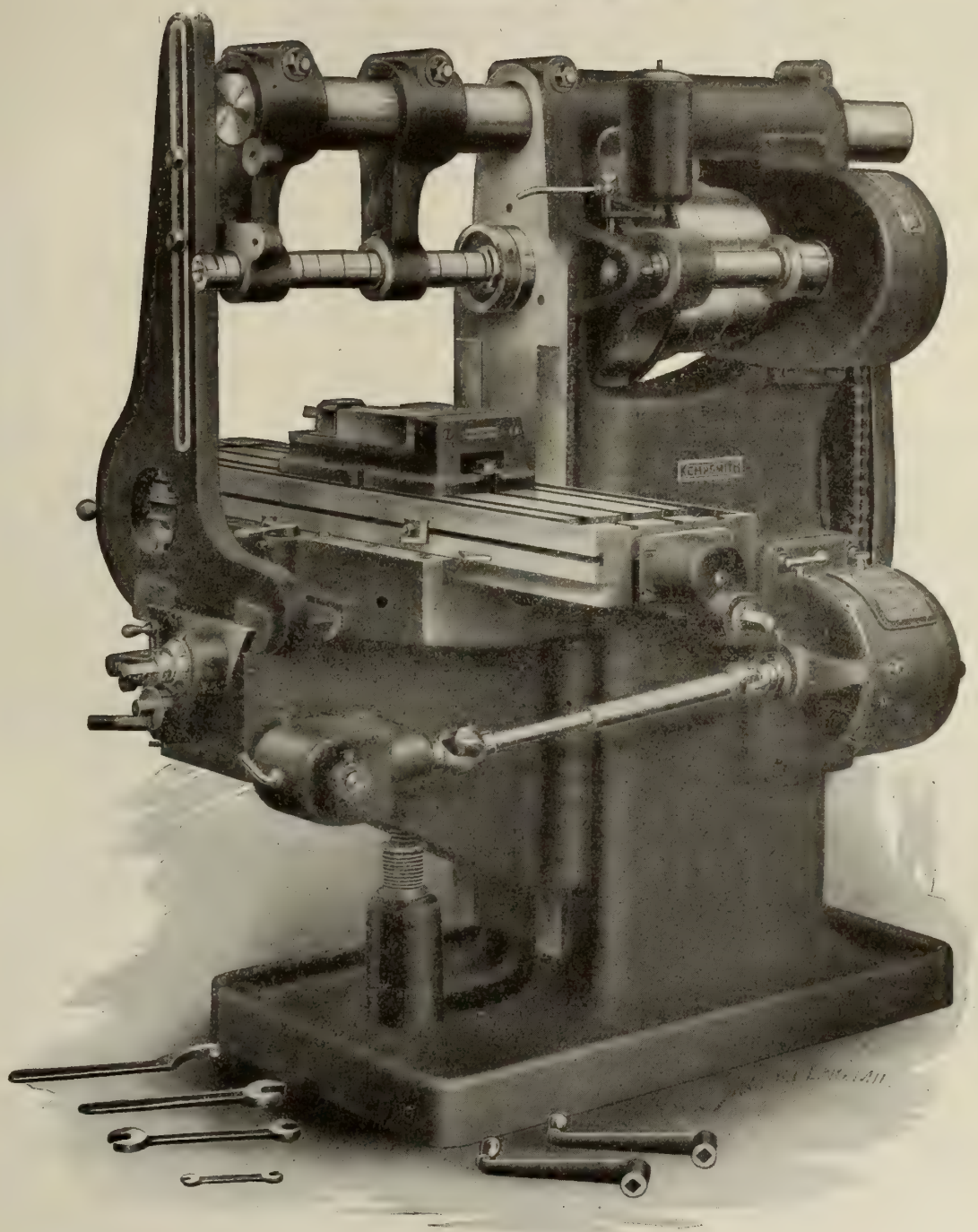

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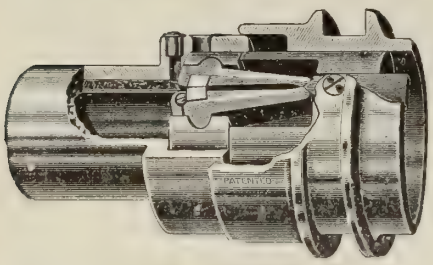

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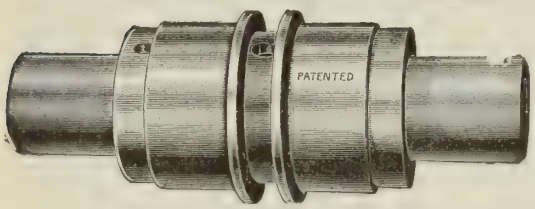

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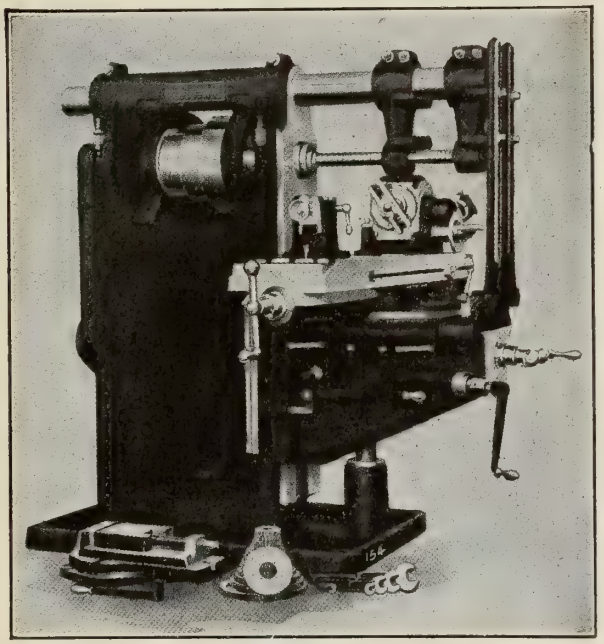

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We know "Electrite" cannot be bettered — and stand ready to prove it to you.

LATROBE ELECTRIC STEEL CO.

LATROBE, PA.

High Speed Steel

Uranium

STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Western Sales Offices:
Room 14 Windsor Hotel
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process

TRADE MARK

MAGNOLIA ANTIFRICTION METAL

TRADE MARK

STEAMSHIP BEARINGS

UNITED STATES FOOD ADMINISTRATION
Columbia River Packers' Association
Astoria, Oregon

10/16/18

Magnolia Metal Co.

Gentlemen:—Engines, Line Shaft Bearings, Thrust Collars, Thrust Shaft Bearings, Stern Bearings and general equipment of our Alaska Fleet of Fishing Vessels are regularly inspected and repaired at this port. We have been using your MAGNOLIA METAL for this work with entirely satisfactory results.

Yours respectfully,
COLUMBIA RIVER PACKERS' ASSOCIATION,
J. A. BERG, Foreman, Machine Shop.

Sold by Leading Dealers Everywhere, or

MAGNOLIA METAL CO.

OFFICE and FACTORY: 225 St. Ambroise Street, MONTREAL

If interested tear out this page and place with letters to be answered.

Cast Nichrome Cyanide Pot.

Cast "Nichrome" Heat Treating Containers

Carbonizing and annealing boxes and other heat treating containers must be durable to withstand the action of heat during operation.

Cast iron, cast steel, structural steel and wrought iron receptacles **crack, grow, scale** or **warp,** their use is inefficient, involving costly maintenance due to additional expenses for labor, fuel, material and constant replacement.

Cast Nichrome boxes, pots, tube and retorts guarantee uniform high quality of product, increase the capacity of the plant, and reduce the cost of heat treatment.

Write for further particulars.

Manufactured under Henderson Patents.

CANADIAN DRIVER-HARRIS CO., Ltd.

WESTERN OFFICE AND DEPOT
CHICAGO
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AMERICAN OFFICE AND WORKS
HARRISON, N J

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MANCHESTER
ENGLAND

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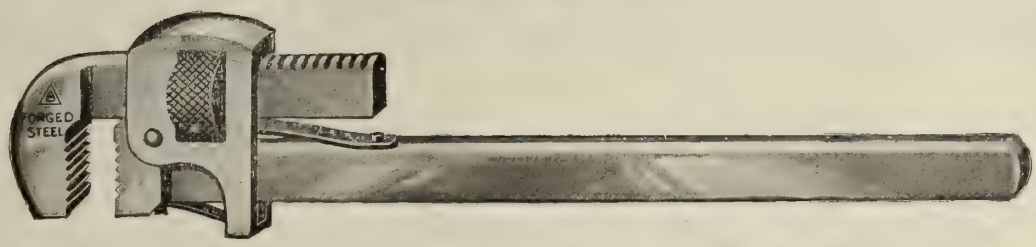
CANADA
FOUNDRIES & FORGINGS
LIMITED

ENDURANCE TOOLS
NEVER WEAR OUT



PIPE THE WRENCH—WRENCH THE PIPE

Canadian Billings & Spencer Plant
Welland, Ont.

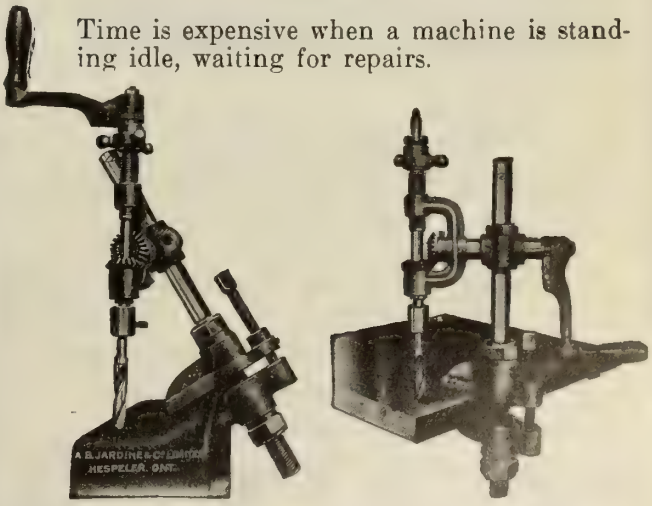
Crucible
AND
Open Hearth Steel
Tool Steel
"ARGO" BRAND *HIGH-SPEED* STEEL

The John Illingworth Steel Co.
1856
Frankford, Phila.
New York Office 217 Broadway

RALPH B. NORTON, AGENT
Montreal, Canada

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

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"WACO"

THE HIGH SPEED STEEL

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
WM. ATKINS & CO., LIMITED
SHEFFIELD - - ENGLAND

ALL SIZES
IN STOCK

NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters,
Files, Etc., Music Wire for Springs, Steel Balls.
Cold Rolled Tool Steel in Strips and Sheets
Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY,
LIMITED
332 St. James Street, Montreal

Sole Agents for
JONAS & COLVER, LIMITED
Novo and Continental Steel Works,
Sheffield, Eng

H. BOKER & CO., Inc.
New York, N.Y.

The Canadian Disc Sander is 90% Dustless

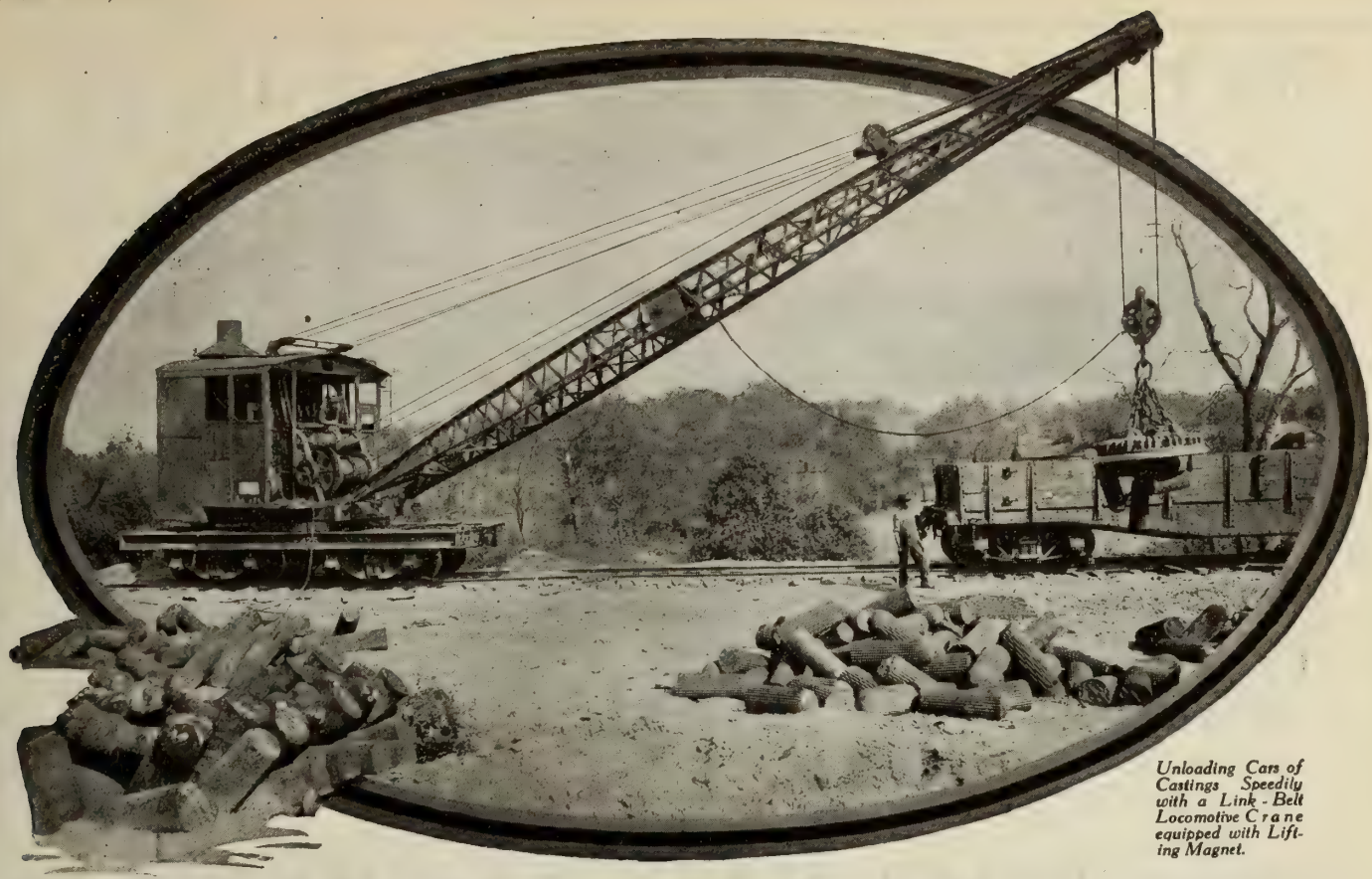
Think what a godsend that is to the pattern shop! Hundreds of prominent concerns are profiting immensely by using these sanders.

Two types of Canadian sanders are built—the Disc Sander and the Oscillating Spindle Sander. Both machines are equipped with New Departure ball bearings and General Electric motor. The table in each case can be tilted by a hand adjustment, 45 degrees down or 15 degrees up. Power is obtained by plugging into a lamp socket. Canadian Sanders are extraordinarily well built and are guaranteed against all defects.

Ask for Bulletin and Prices

Canadian Sander Mfg. Co.,
Incorporated
Brockville, Ont.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



Unloading Cars of Castings Speedily with a Link-Belt Locomotive Crane equipped with Lifting Magnet.

Speed Up Your Unloading with a Link-Belt Locomotive Crane

NO matter what kind of materials or products you load and unload, or handle around your yard, a Link-Belt Locomotive Crane will do the work quickly and at a low cost.

A crane is a great labor-saver. It is a reliable machine which can be kept on the job every day, and can be depended upon for reliable service.

Equipped with a grab bucket it will unload and store coal; fitted with a hook block it can handle miscellaneous loads of any kind, and with the electric lifting magnet attachment as shown in the illustration it can handle iron and steel, scrap, etc.

Let our experienced engineers look over your present handling methods and make recommendations. Catalog No. 370 on request.

CANADIAN LINK-BELT COMPANY

LIMITED

WELLINGTON AND PETER STREETS, TORONTO

LINK-BELT

LOCOMOTIVE CRANES

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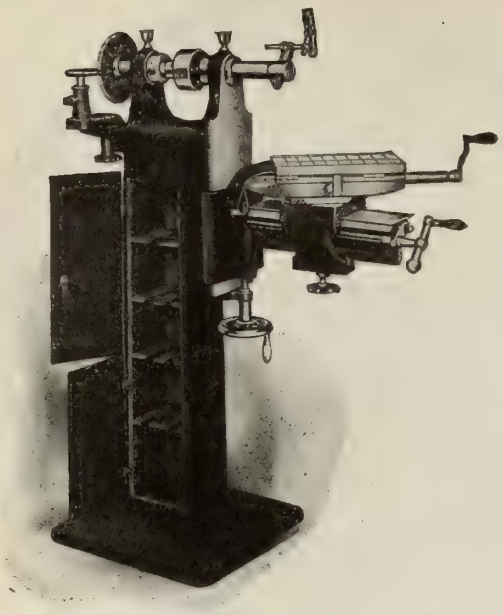
OBTAIN THE BEST RESULTS

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate



GARVIN No. 3, Universal Cutter and Surface Grinder
Use Code—Banish

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

For Further Information ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

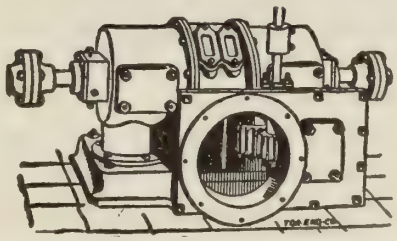
Send for Complete Catalog

Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

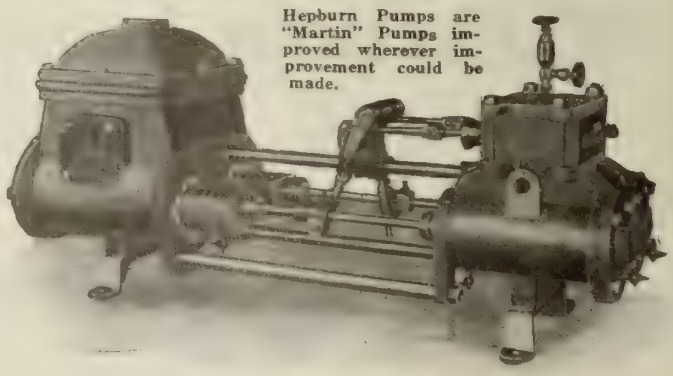
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

THE J. C. WILSON MFG. CO.
LIMITED
BELLEVILLE, ONTARIO

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street Toronto, Ontario

P&J AUTOMATICS

For Every Service

Built in three sizes: 5-A, 6-A, 7-A Models, for automatically turning, boring, forming, threading and facing duplicate parts up to 40 inches diameter and 15 inches long.

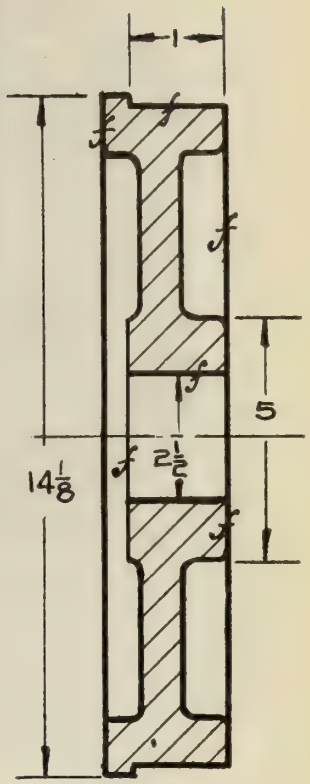
Here we have illustrated a gear centre machined where marked "f." Two operations are necessary for finishing this piece.

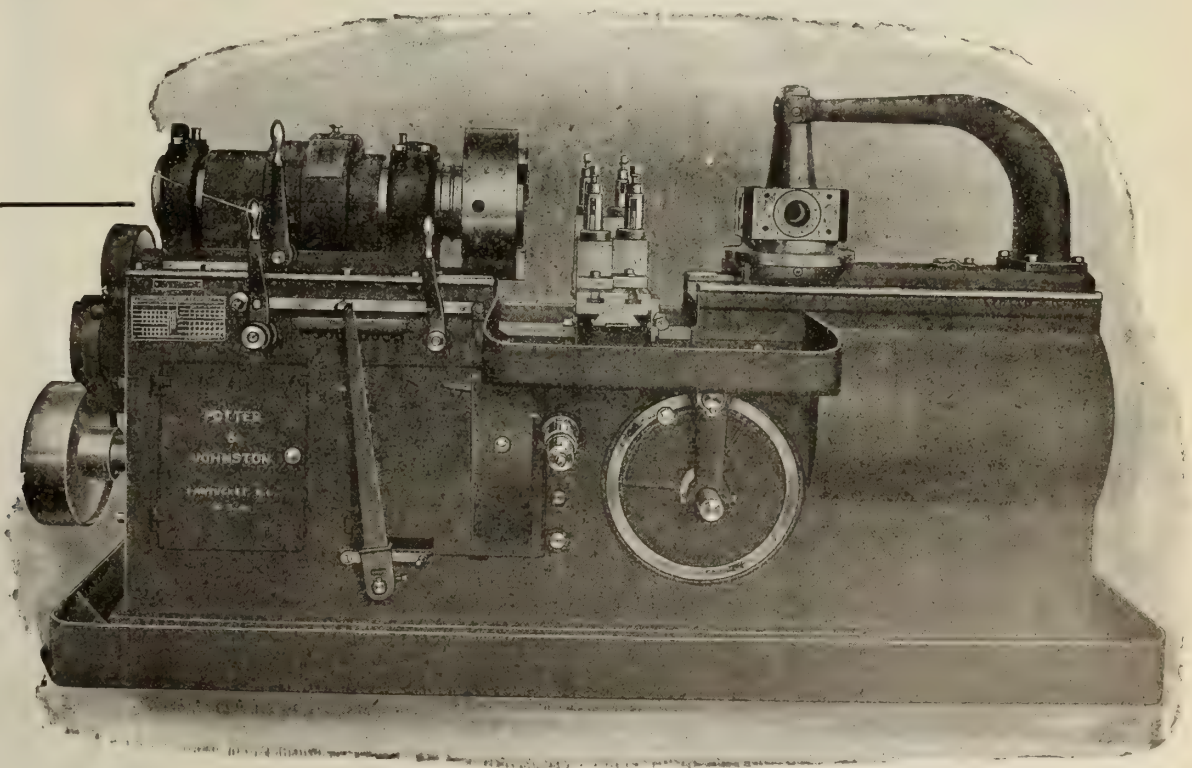
This is the class of work where one attendant operates from two to six machines.

This means increased production.

Investigate.

Bulletin No. 39.





6A Manufacturing Automatic

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LTD.

HEAD OFFICE: 1501 ROYAL BANK BUILDING, TORONTO, CANADA
WORKS AND WAREHOUSE: GALT, ONTARIO, CANADA

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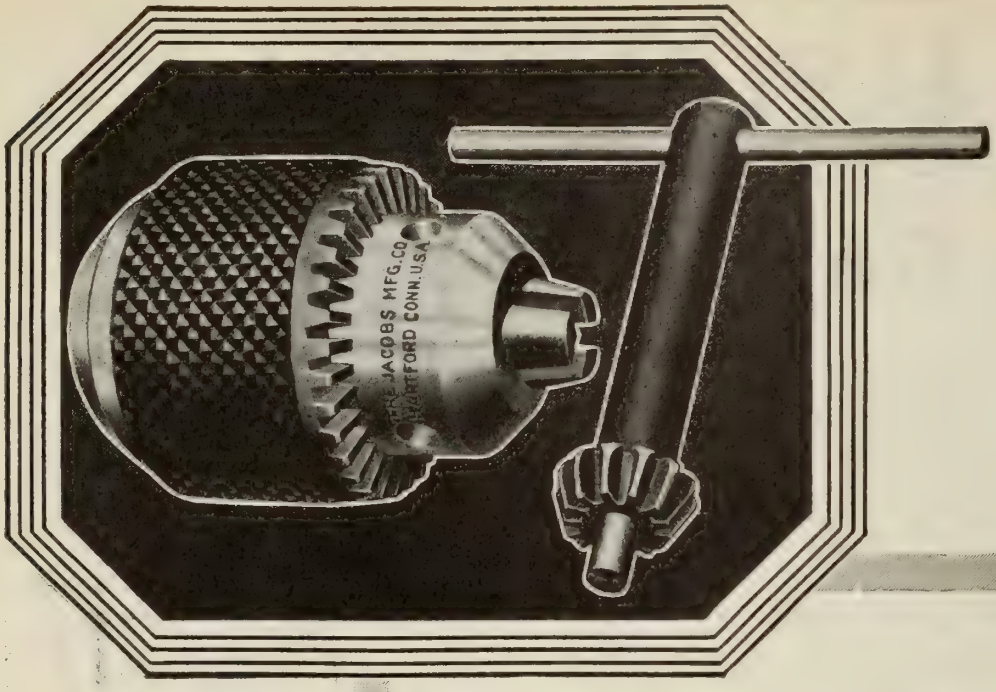


The Man That Does The Work

Employers of labor are giving more time and sympathy to the mechanic's view of the job.

Men enjoy working with up-to-date, "no fuss" tools and equipment.

The largest, prosperous, most efficient factories in the world have installed Jacobs Improved Drill Chucks to aid their workmen and conserve their energy, time and temper.

Their 16 years of continuous and ever-growing service have made them the dominant chucks where reputation must be built on operation.

Made in 6 different models in 12 styles ranging from 13/64″ to 1″.

THE JACOBS MFG. CO.
Dept. C.M.
HARTFORD — CONN.

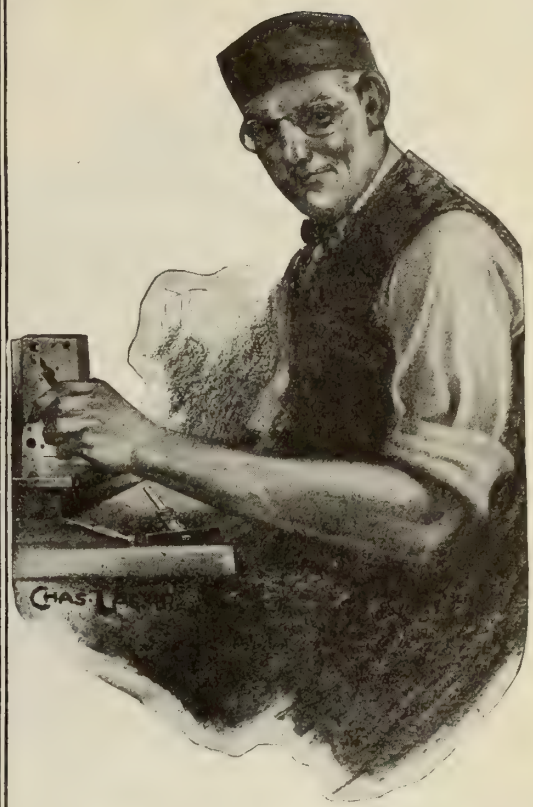
Jacobs Chucks

The toolmaker says:

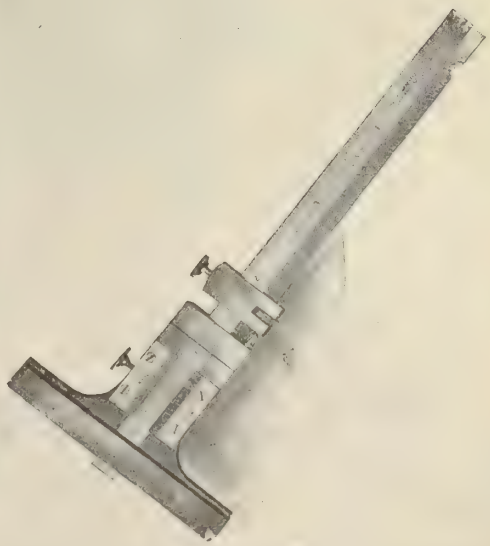
"Yes, I've got quite a number. No more, probably, than most toolmakers, but quite a number just the same. But then, I ought to have a lot of 'em. I've been buying Starrett Tools ever since I was an apprentice.

"You know my work calls for pretty close limits, and some way or other I've got a feeling of confidence in Starrett Tools that makes it easier for me to do good work.

"When did I get my first Starrett Tool? Oh, somewhere back in the 80's. In fact, it must have been pretty soon after the Starrett factory started. There's one thing that always impressed me. Right from the start, Starrett Tools have been designed and made by men who knew machine shop practice. You know, practical men. And somehow it shows in the quality of the tools."



Starrett Tools



The L. S. STARRETT COMPANY

THE WORLD'S GREATEST TOOLMAKERS

Manufacturers of Hack Saws Unexcelled

ATHOL, MASS.

Accuracy, utility, and quality are built into every Starrett Tool. Write for Catalog No. 21 3

42-988

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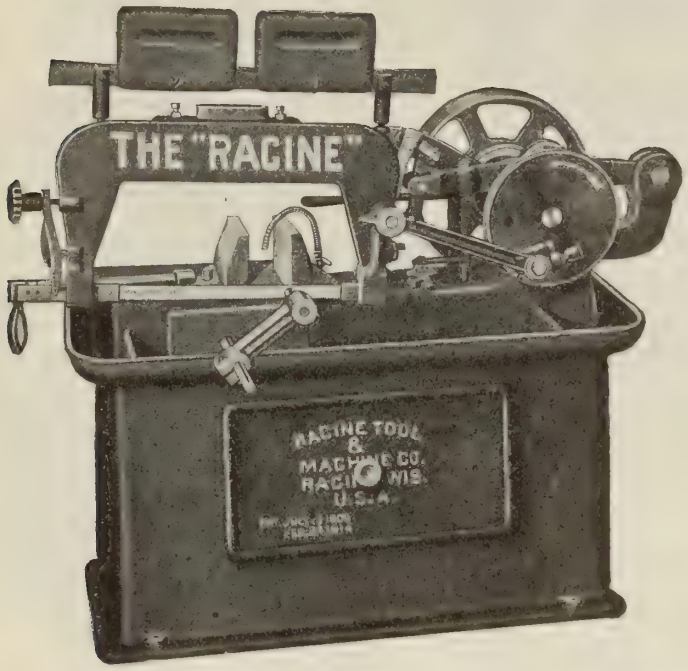
Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

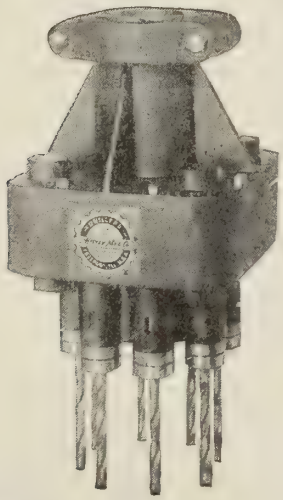
Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue, - RACINE, WIS. U.S.A.

2 Minutes or 20?



This Is The Vital Question

Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.

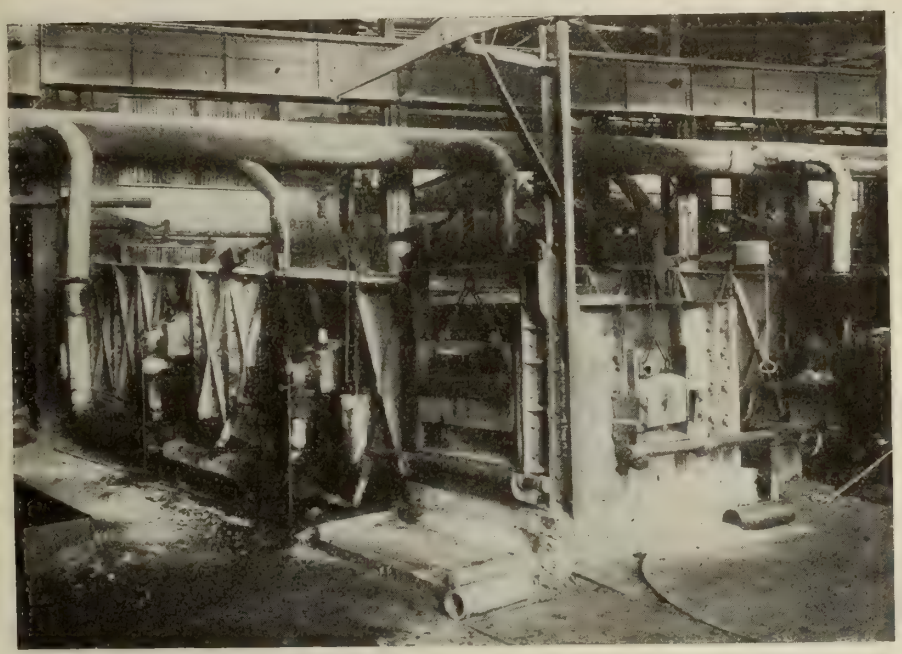
THE HOEFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 217 Stanwix St., Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio; John M. Howett, 18 W. Second St., Dayton, Ohio; 881 Ellicott Sq., Phone Seneca 2033, Buffalo, N.Y.

The Canadian Fairbanks-Morse Co., Limited
"Canada's Departmental House For Mechanical Goods"
Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

Another MECOL Furnace

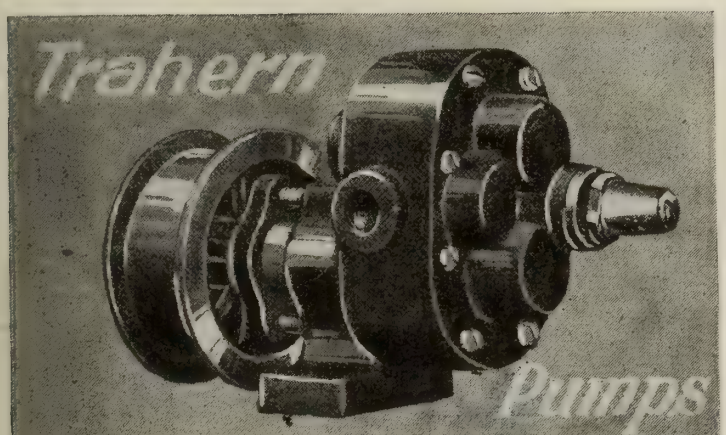
demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

Write

Mechanical Engineering
Company, Limited
Room 308, Bank of Toronto Bldg., Montreal
Three Rivers, Quebec, Canada



TRAHERN LUBRICATING PUMPS are for use on metal working machines of all kinds: planers, milling machines, gear hobbers, lathes, drill presses, saws, etc.

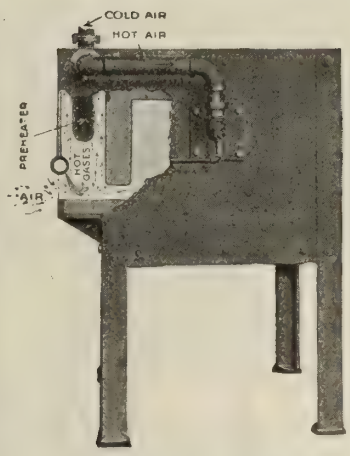
TRAHERN PUMPS are known to machine tool manufacturers the world over. Our customers are satisfied customers and install Trahern Lubricating Pumps on their machines as a regular equipment before leaving their factories.

Write for list of firms using TRAHERN PUMPS, then you will not have mere assertions but PROOF.

Try us and see that we have not overstated the facts.

Trahern Pump Co. Rockford, Illinois

ECONOMIZER FORGE



Showing deflection of hot gases, with induced air *toward* the furnace, and the preheating of air for combustion.

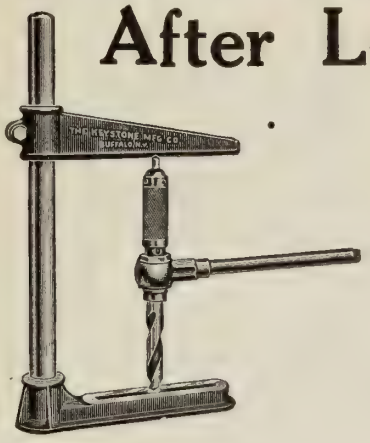
It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

Write to-day for catalogue 34-T

Canadian Representative:
R. J. McLEAN
128 Bleury St., Montreal, Canada

W. S. ROCKWELL CO. INDUSTRIAL ESTABLISHED 1888 FURNACES NEW YORK

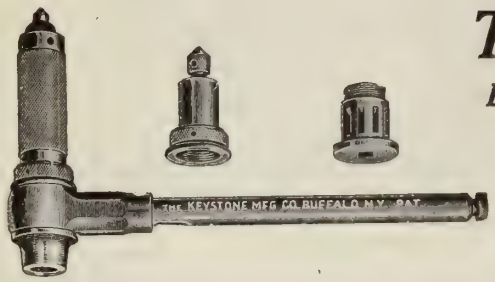
"Keystone Quality" Will Still be There After Long Use Has Worn Away The Name



We like to think of that.

We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

Write for name of nearest dealer.



The Keystone Mfg. Company

Buffalo, N.Y., U.S.A.

HOYT METALS

"Frost King"
"Trojan"
"Nickle Genuine"
BABBITTS

Hoyt Metals have been used with great success for many years.
Put them to the test and you'll soon see a difference in your babbitt cost.
All elements entering into our mixtures are carefully refined and put together in such proportions and in such relation to each other that the best possible alloy is secured for the work for which it is designed.
Annual sales over $5,000,000.

Hoyt Metal Co., Toronto
New York, N.Y. London, Eng. St. Louis, Mo.

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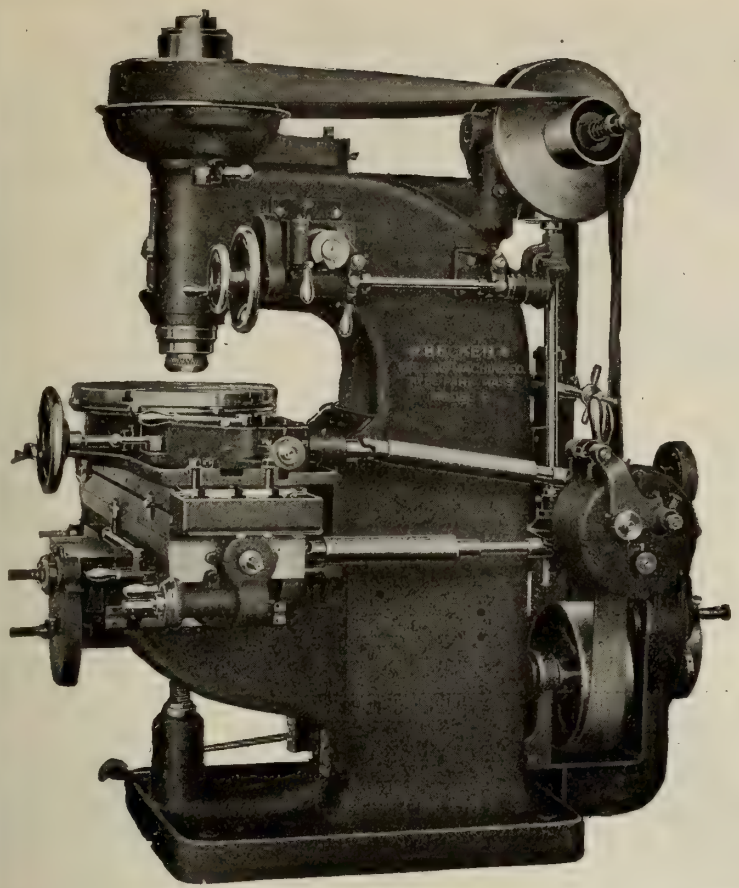


BECKER
BELT DRIVEN
MILLERS

"THE MACHINE THAT GIVES THE SMOOTH FINISH"

All gear driven spindles lack flexibility and induce vibration through the unavoidable progressive development of back lash between gears resulting in vibration and hammer action which has a crumbling effect upon the cutter teeth and leaves chatter marks on the finished work.

With the Becker Elastic Belt Drive this gearing is eliminated.

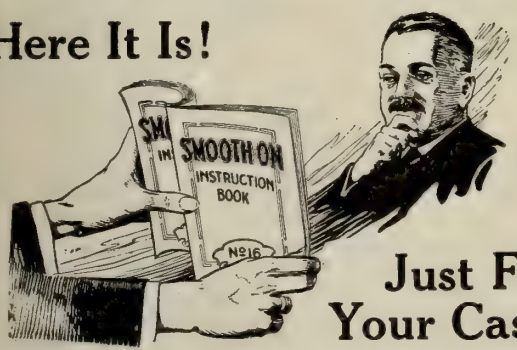
Write for Circular 0-702.

Becker Milling Machine Co.
HYDE PARK, BOSTON, MASS.

A. R. Williams Machinery Co., Ltd., 64 Front St. W., Toronto
Rudel-Belnap Machinery Co., Ltd., - 137 McGill St., Montreal

SMOOTH-ON IRON CEMENTS

Here It Is!



Just Fits Your Case!

Many engineers have learned by experience not to say, "That will have to come down for repairs," until after they have tried SMOOTH-ON IRON CEMENT. For SMOOTH-ON saves dismantling in a large proportion of cases.

Smooth-On Instruction Book No. 16

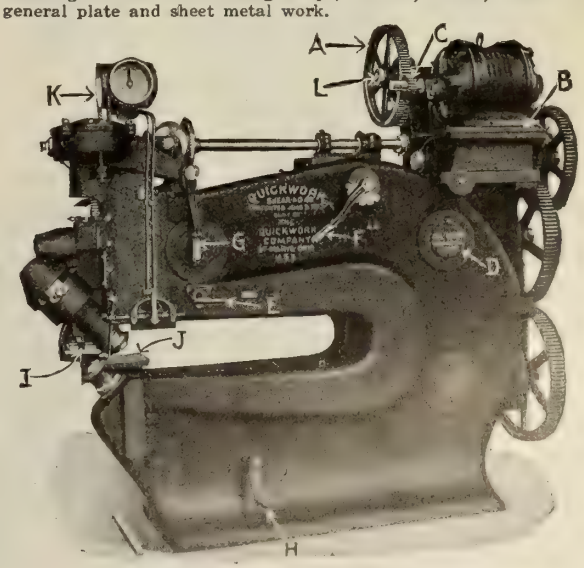
Its 144 pages contain descriptions of many instances of time and money saved in this way. It shows you "how it is done"—**quickly and economically**—without dismantling machine or piping.

Write today for your copy.

SMOOTH-ON MANUFACTURING CO.
ESTABLISHED 1895
570-574 COMMUNIPAW AVE., JERSEY CITY, N.J. U.S.A.
CHICAGO OFFICE — 221 N. Jefferson Street
SAN FRANCISCO OFFICE — 56 Sacramento Street

"QUICKWORK"
Registered in U.S. and Foreign Countries.
ROTARY SHEARS
MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3r ' 1913

SAVES 50% TO 90%
Eliminates Oxyacetylene Cutting and Plate Planing.
Write for Catalogue No. 60.

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.
Cable address: "QUICKWORK."
Codes: W. U. and General.

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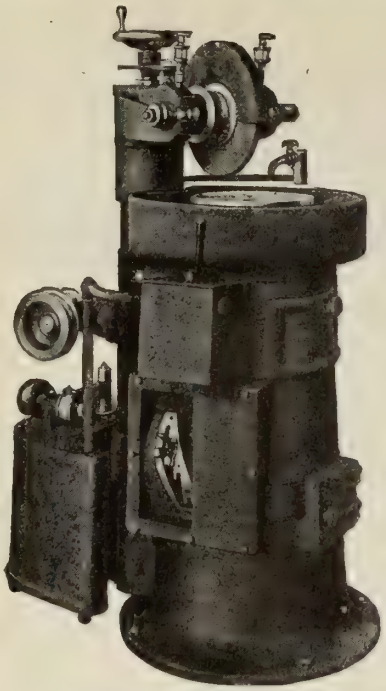

BRISTOOL

Bristol 12-inch Rotary Precision Surface Grinder

Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

Bristol Rotary Surface Grinders are made in several types and sizes and are regularly equipped with 8-in., 12-in., and 16-in. magnetic chucks, either belt or motor driven and for dry or wet grinding.

Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

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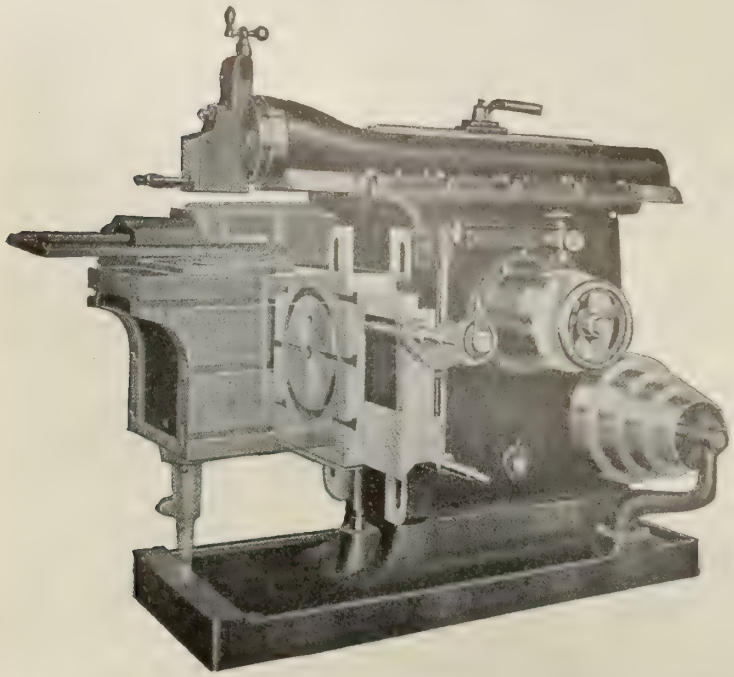

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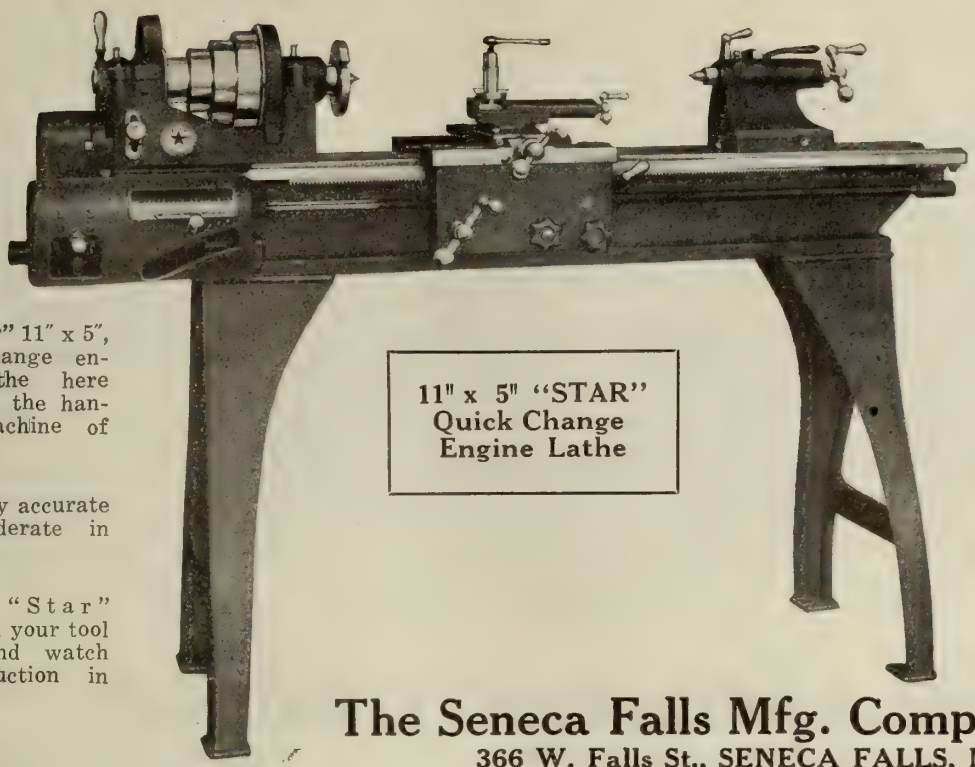

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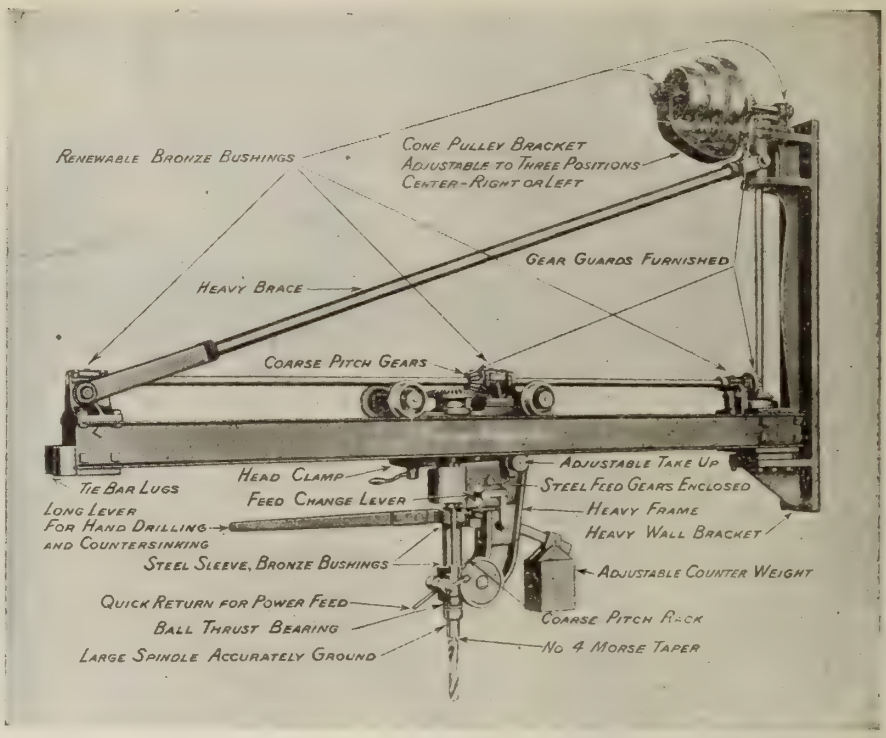

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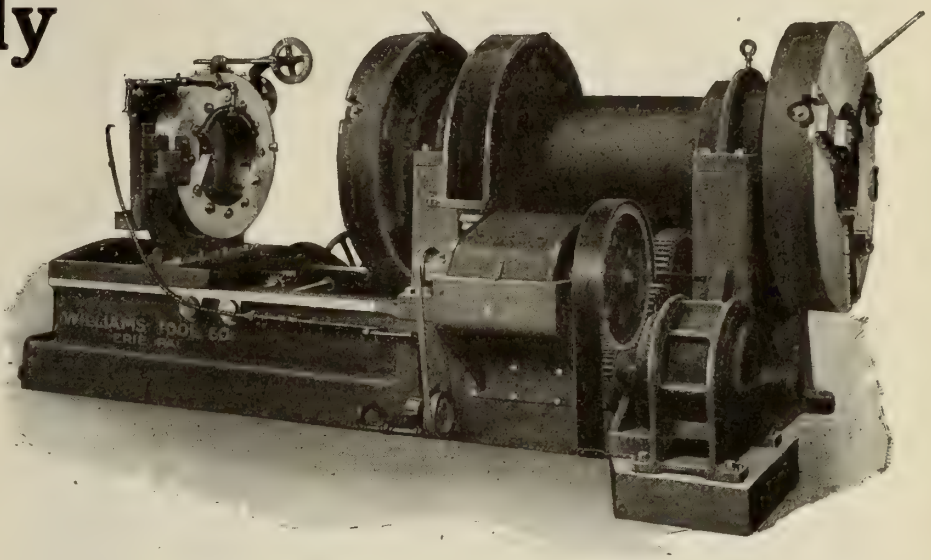

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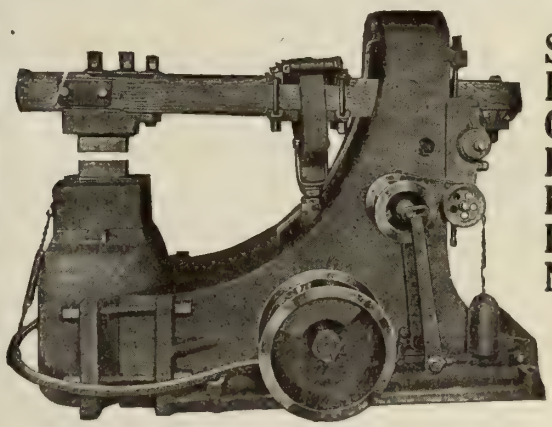

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Notes On Grinding
NORTON COMPANY. WORCESTER, MASS.

No. 72A

Grinding Wheels Versus Steel Wheels in Cleaning Cast Iron Gears

CLEANING sand and metal irregularities from between the teeth of cast iron gears is an operation of considerable importance for manufacturers of certain types of machinery. In the past and at the present time in some plants, a steel wheel running at high speed is used for this work. By this method the sand is removed nicely, but the irregularities in the gear itself cannot be removed. Instead they must be filed out, and this is a slow hand operation.

A test has recently been completed in which a 12 x ⅛ x 1", grain 46 Crystolon rubber wheel was used. The Crystolon wheel of course not only removed the sand, but also ground out the metal irregularities and produced an excellently finished gear, much more satisfactory than the filed gear.

The wheel was mounted on a Norton bench machine and the speed maintained at 3,000 r.p.m., or a little more than 9,000 surface feet per minute. Four-inch flanges were used. The operator using the steel wheel received a weekly wage of $20, whereas it was necessary with the rubber wheel to have a better and more careful man, who was paid $22. The filers worked on a piece work basis and received four cents per 100 teeth.

In using the grinding wheel, the filing was entirely eliminated and the operation was not as hard on the operator, inasmuch as he did not have to use as great pressure as with the steel wheel. Besides, the grinding wheel turned out over 40% more gears in a given period than could be taken care of with the steel wheel, not considering the time used for filing. The cost was reduced from 99 cents per 1,000 teeth to 48 cents, the chief saving being the expense of filing.

The cost per 1,000 teeth only included wages and cost of the grinding wheels. The steel wheel, file, and overhead expense were not considered. A very considerable additional saving would no doubt have been noted, had these been taken into consideration.

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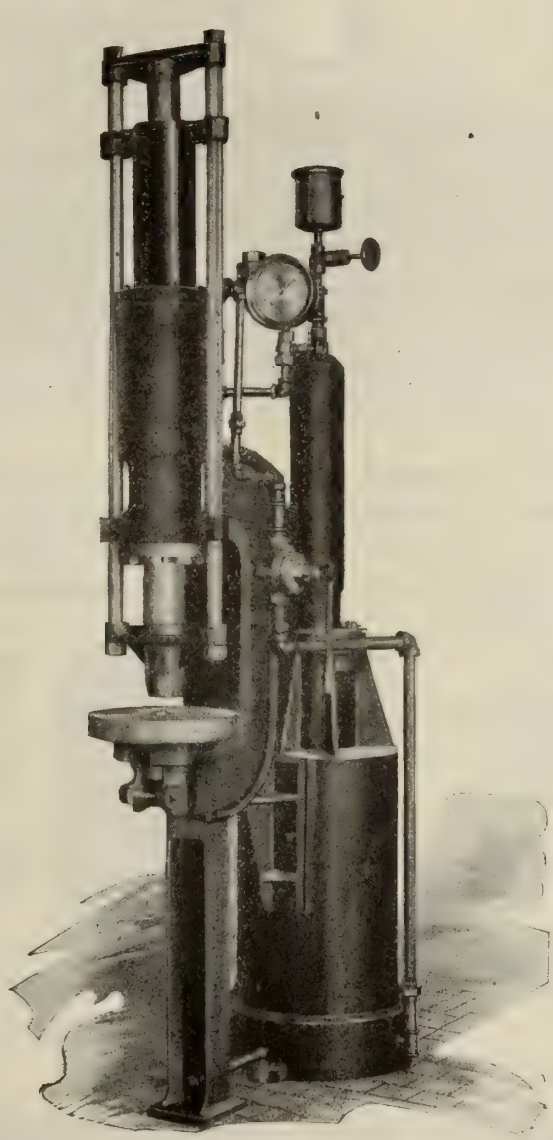

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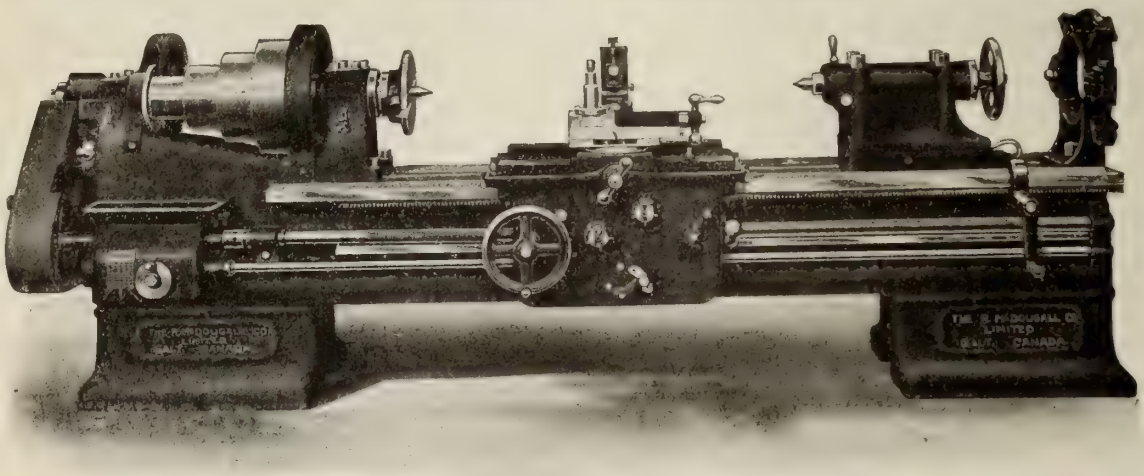

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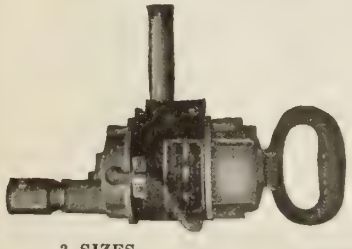

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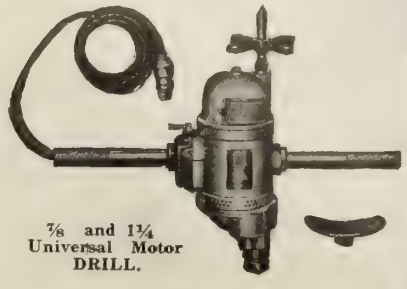

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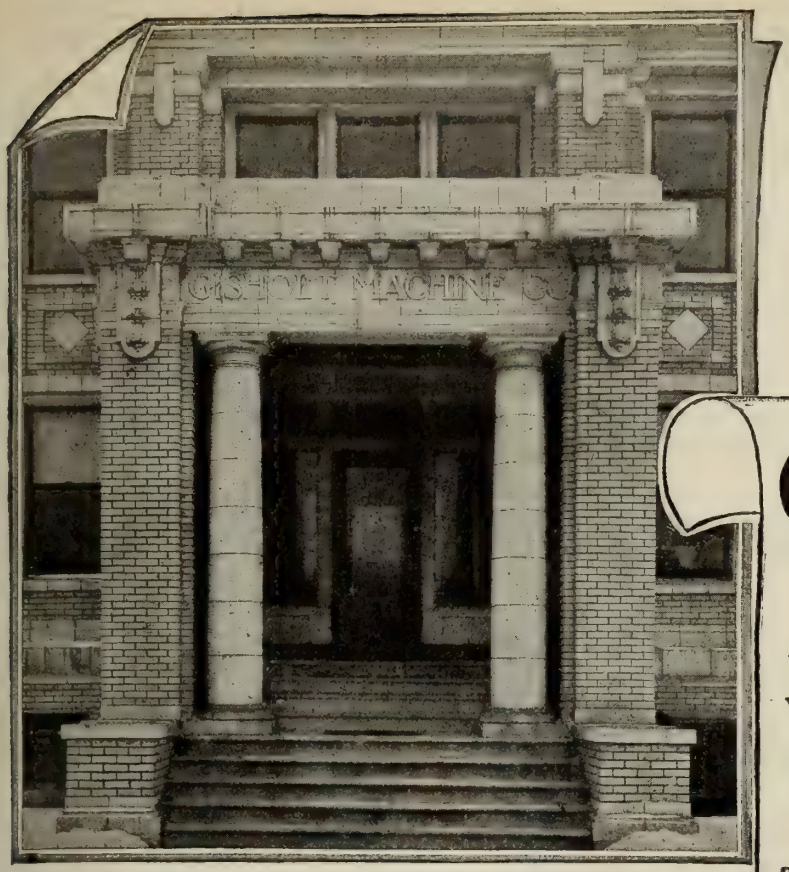

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 17 October 30, 1919

Do You Believe That the File is a Fine Tool?

Judging by the Various Steps in Its Manufacture We Would Say Yes. Herein is Described How **Ingersoll Files** Are Made, Right From the Rough Blank to the Finished Product

By J. H. MOORE, Associate Editor, Canadian Machinery

SUPPOSE we were to ask some type of machinists the question: "What is a file?" could you safely prophesy their answer? Ten chances to one they would hum and haw, and say that it was a—a thing to take off metal with.

This above statement may sound exaggerated, but it is unfortunately more truth than jest, for supposing we were to further question them regarding the care of a file, they would more than likely look at us in surprise, wonder at our ignorance, and remark: "Why a file don't need any special care."

Fortunately, however, this state of affairs is becoming less common, and the trend is pointing in the right direction, namely, that users of files are beginning to realize unthought of possibilities in this machine tool.

Is the File a Fine Tool?

We call the file a machine tool purposely, as it is as much a tool as any other cutting tool used on a planer, shaper, miller, etc. The machinist and tool maker at last is waking up to the fact that with proper care a file will last longer, and cut faster, than it would if handled in the ordinary careless style. Did you ever see the following incidents happen in your experience?

A tradesman has just completed the task of filing a piece to size, and feels that for the time at least he is through with his file. He opens the bench drawer, slams in the file amongst chisels, hammers and other miscellaneous tools. On next going to use the file he will soon remark to his next workman at the bench: "These files are absolutely no good. Last time I used this one it worked fine, but now look at it, the teeth are all shot, and it won't cut worth a hoot."

Has the writer overdrawn the picture? He thinks not, for this incident has also been observed in his experience.

He has noticed a workman use one file handle for three or four files. Every time he changed from one file to another, the following procedure would be gone through: Bang went the handle of the file, at the ferrule end, up against the vise, and out would come the handle. Next the other file would be placed tang in, on the handle. The vise was again resorted to, and bang went the file against the vise. Another very pretty and clever? trick is to bang the file against the vise sidewise, to knock the cuttings out of the teeth. Of course, all this helps to soon make the workman declare that these files are no good, etc., etc. He never seems to remember that there is such a thing as a file cleaning brush specially made for such purpose.

As we already commented, however, the outlook for a happier existence for the file is becoming apparent, and soon we hope to be able to report that the file wrecker is an oddity of the past.

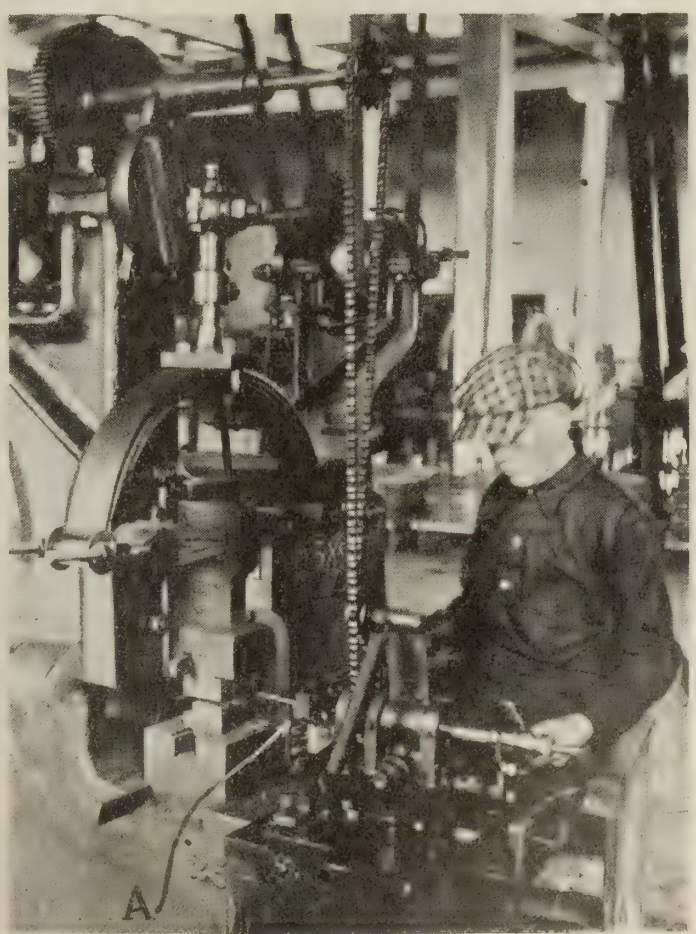


FIG. 1—AUTOMATIC TANGING HAMMER.

The Actual Manufacture

Leaving the care of the file for the present, and going into the actual manufacture of the file, may we ask the question: "How many readers know how a file is made?"

Not a great many, we will venture, so let us enter on a descriptive tour of the making of an Ingersoll File, from the rough stock, right up to the finished product ready for shipment.

To begin with, the material used is a high-grade crucible file steel specially made for the purpose. As readers are well aware, a file is either good or bad. There is no middle course. If the quality of steel is not there in the first place, no amount of workmanship will make it a good file. To stand up to the work, a file must first be made of the proper material. The firm whose product we are now about to describe, make it a special point to see that only

the highest grade of clay crucible steel is used. Open Hearth Steel is used extensively in the manufacture of files, but the **Ingersoll File Company** maintain that Clay Crucible Cast Steel is the only steel which can give real results in files. All tests have conclusively proven this, according to them.

The stock is stored in racks of the usual design. This storeroom is located directly in connection with the forging department, so that the least possible handling is done to the raw product before it actually starts on its various operations.

Forging Operations

The first operation on entering the forge shop is that of cutting off the

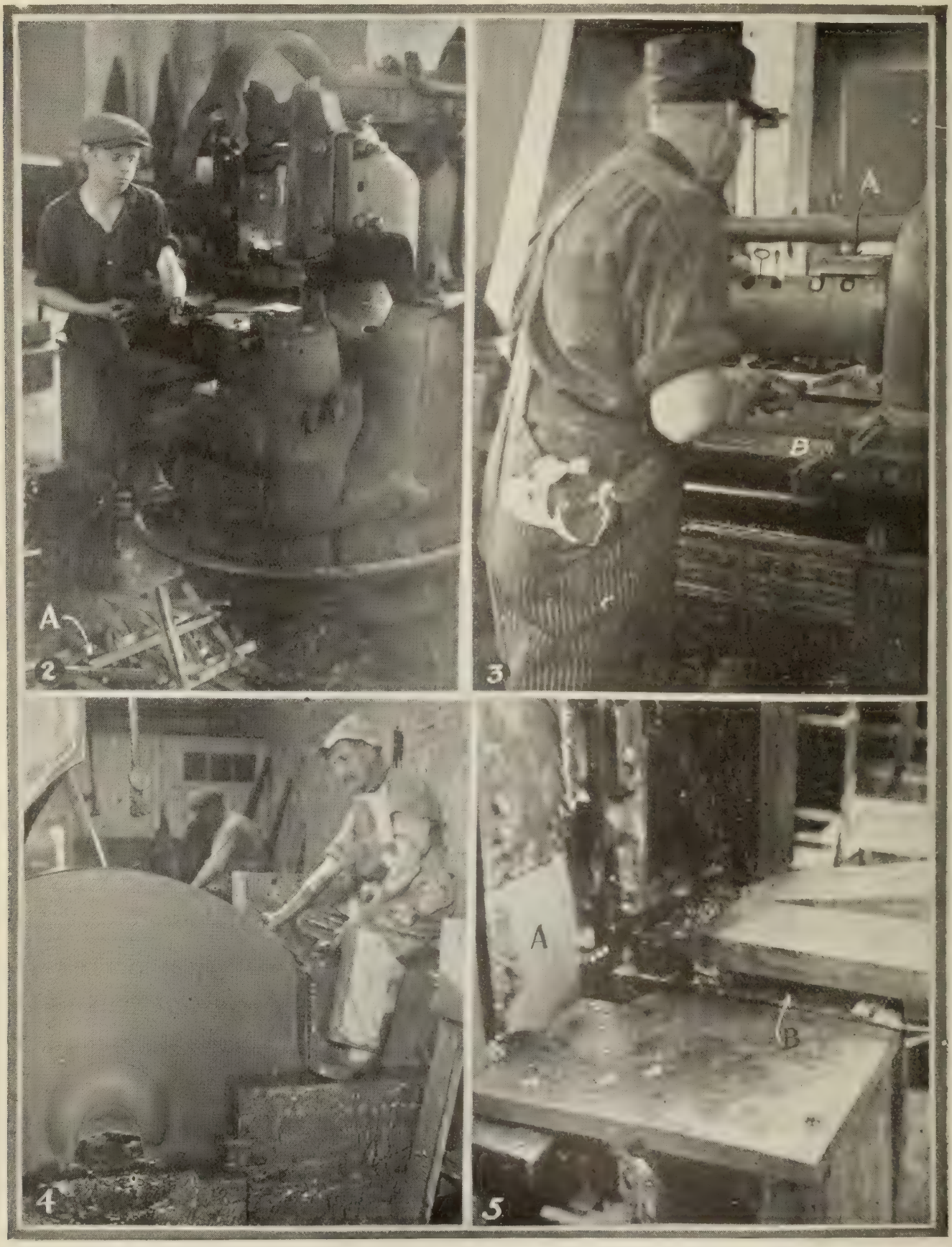


FIG. 2—POINTING FILE BLANKS ON BRADLEY HAMMER.
FIG. 4—THE OLD STYLE OF GRINDING.

FIG. 3—ROLLING SQUARE FILE BLANKS.
FIG. 5—NEW METHOD OF ACCOMPLISHING THE GRINDING.

stock in shears to the proper lengths to suit the various size files.

The next operation is that of forming, or blanking the file tangs. Of course, readers are all well aware what the tang of a file is, and by memory can picture the shape of this portion, on which the file handle goes.

On the smaller size files and up to the 8 in. size, these tangs are punched out on power presses, but on the larger size they are forged out on a Bradley helve hammer. Another method of producing these tangs is by rolling them out on a special rolling machine for the purpose.

These methods described are suitable for most shapes of files, but when triangular files are made, the procedure is somewhat different.

The file blanks are placed in a special chuck, A, as shown at Fig. 1, and the tangs are forged out by means of a special automatic hammer. The chuck already spoken of is driven by mechanism direct from the ram of hammer, by means of gears and chain, which can be plainly seen on the photograph. In this way the file blank revolves at the proper speed and produces an even and standard tang. The chuck is equipped with special ejector which shoots out the blank when finished without the operator touching it at all. This method of producing tangs has proved very efficient, and production figures are very encouraging.

The next operation is that of pointing the blank. By pointing, we refer to that portion of the file which is slightly tapered at its point. This work is accomplished in two ways, either by power hammer or rolls.

Fig. 2 illustrates the former spoken of method, the work being done on a Bradley hammer. Boys can readily do this work successfully. Some of the pointed blanks can be seen at A on this photograph. It will be noticed that these blanks are for flat files.

At Fig. 3 we show the workman pointing square file blanks on the rolls. The die A comes round at proper time and accomplishes the operation. There are also shaping and sizing dies which come in from the side at portion marked B, but we do not show these in the picture. The work is being done on Coulter and McKenzie Rolling machine.

While these various operations have been going on the blanks have become hard through forging, so that it is now necessary that they be annealed.

The Annealing Process

This concern has made a special study of the annealing process and have installed a battery of six annealing furnaces of special design. As the manager, Mr. Swallow, remarked to the writer: "We secured the services of an Old Country brick setter for this work, not just an ordinary bricklayer, and explained our wishes to him. The result is that we have furnaces in a class by themselves. The fuel (which is oil) goes through special burners built by the company, which have proved so efficient that no other type is used."

A remarkable figure of economy was given to the writer in fuel consumption, and he passes it along for readers to likewise read. Twenty burners are used throughout this plant at the low cost of less than $5 per day for fuel on all burners. The writer personally saw the bills, and other details, so can vouch for these figures.

To proceed with the annealing process, we will first mention that inside these furnaces the brickwork is so arranged that the flame is continuous in its action, a feature which will be easily understood. The blanks are all placed in annealing boxes and the flame never touches the blanks themselves. The work is heated up to temperatures around 1450 deg. Fah., according to the size of the file. Pyrometer is used, of course, to ascertain this heat.

The heat is now shut off and the work allowed to remain in ovens for at least two to three days, in order that they may be properly cooled.

After annealing they are straightened before going to the grinding operation.

Grinding Operations

It might be best to explain to readers not familiar with the peculiarities of steel, that, after annealing, there is a skin of considerable depth around the annealed blank which is decarbonized. This carbonless metal must be ground off entirely, as of course the decarbonized metal will not harden. This explains why the grinding operation is so important.

Roaks, and other surface defects, which, particularly in round files, might cause them to split on hardening, are also noticed after grinding, when the blanks can be rejected, but as a general rule the steel is of such uniform quality that very few blanks are turned back.

The grinding work is accomplished in two ways; the first of these being the old hand method. This style of grinding is illustrated at Fig. 4. Here we see the operator holding the round file blank to the grindstone by means of a special shaped hook. The blank is now ground until all the decarbonized material is taken off.

These huge stones range from 6 to 7 feet in diameter, and up to 11½ in. in width. This grinding operation is a costly one, as the stones do not last for any great length of time.

The second, and up-to-date method of grinding is shown at Fig. 5. Here the wheel is enclosed in suitable guard, all but the working portion A. The file blanks are held in a special plate B, which has rubber cushions attached to the same. This plate is placed in a sliding ram and traversed up and down the stone at a regular rate of speed. In addition to this, the wheel itself has a side motion, travelling sidewise while the ram carries the blanks up and down over the stone. This makes the wear on the stone even, and not only on one spot, which guarantees the blanks being ground perfectly true.

Other shaped files are ground by the same method, with holding plates of special shape to suit the file blanks.

Special Stripping Operation

The next operation to be performed is that of stripping the blank, or to use a more common expression, draw filing the blank. This work is accomplished on a machine specially built for the purpose.

Speaking of special machinery, it might be just as well to call readers' attention to the fact that this firm make whatever machinery they desire or require, as the file-making industry is something which is distinct in itself, and demands special equipment. They are well equipped to build up these various machines, as the next photograph will show.

At Fig. 6 we see a stripping machine practically completed and ready for work. To explain the action of this machine we would first call readers' attention to the crank A, which receives its motion from the tight and loose pulley seen to the left of this crank. The ram B in turn is driven backward and forward, from which the name draw filing comes. There are two holders for the file blanks C and D, which travel slowly back and forth with a sidewise motion, while underneath the ram B, at points directly above these holders, are placed finished files which accomplish the operation.

The operator rubs chalk on the blank being stripped from time to time in order to help the operation. After leaving these machines, the files are accurate in every detail, and ready for cutting.

The Cutting Operation

According to the size of the file they are cut on a small or large machine, and first for illustrative purposes we show Fig. 7. Here we see the girl operator about to feed the table A into the cutting chisel B. Depending on the size of file, width, etc., one or two files are cut at one time. In the case shown, two are being cut. We will make no special mention on this picture, but refer the reader to the next illustration, Fig. 8, which shows a larger machine from a different viewpoint.

We are looking from the working side in this case, and can see in detail the general construction of the machine. Two blanks are also being cut in this case, and can be easily seen in the photograph. A once more represents the travelling carriage. B the holder or cutting bed for the blanks. These beds are, of course, easily taken off or put on the travelling carriage, as the style of file blanks are changed. Each file machine has a set of these various sized beds.

The method of feeding carriage A is very simple. The handle D controls a nut, which in turn meshes with feed-screw E. On desiring the carriage to feed in, the operator places nut on screw; when on proceeding far enough he merely lifts the handle D, and brings the carriage back at once to its former and outside position. The rubber pressure block F is what gives the proper pressure and blow to the cutters. Of course the pressure is really controlled from the hand-wheel G, but the blow and rebound is taken up through the rubber block. It

takes considerable experience to make a first-class file cutter, as he must learn the art of knowing just when he has the proper pressure, angle, etc., on his cutter.

On looking at a properly cut file (that is by the ordinary eye method) it should appear an even dark shade. Should it be improperly cut, light patches will show up at various spots, showing that the file is not up to standard. Such files are scrap, and are not sent out.

In addition to this eye test, the files are tested under a microscope, when even cutting, proper shaped teeth, and so on are all checked up.

The round file is cut in one operation by means of a special fixture, which revolves at the proper speed, while the table feeds in. A special feature on these round files is the broken teeth as they are termed. These teeth are so arranged that proper clearance for file cuttings is made, and no clogging of the file results, but the cuttings drop away at once.

After cutting, the files are once more straightened before going into the hardening room.

The Hardening Process

On entering this room they are first washed in oakite, dipped in water, and lastly dipped in a special paste, and then dried.

The reason for applying this paste is as follows: These files are hardened in a lead bath, and if no protection was made for the teeth of the file, the lead would of course fill them up and render the file of little use. This paste fills the teeth up before they are sent to the hardening pot.

They are now heated as shown at Fig. 9, being first heated in a lead bath, then dipped and tempered in brine water. This brine water system is always kept cool and fresh by a continuous-action pump system, which ensures a fresh supply at all times. The writer had the pleasure of watching the temperer at work on half round files, and had occasion to realize that tempering is indeed an art in itself.

The workman, for illustrative purposes, demonstrated the correct and the wrong method, each file being heated to a similar temperature. First he explained the way it should not be done. Taking the file from the lead bath, he dipped it into the brine, when it came out some-

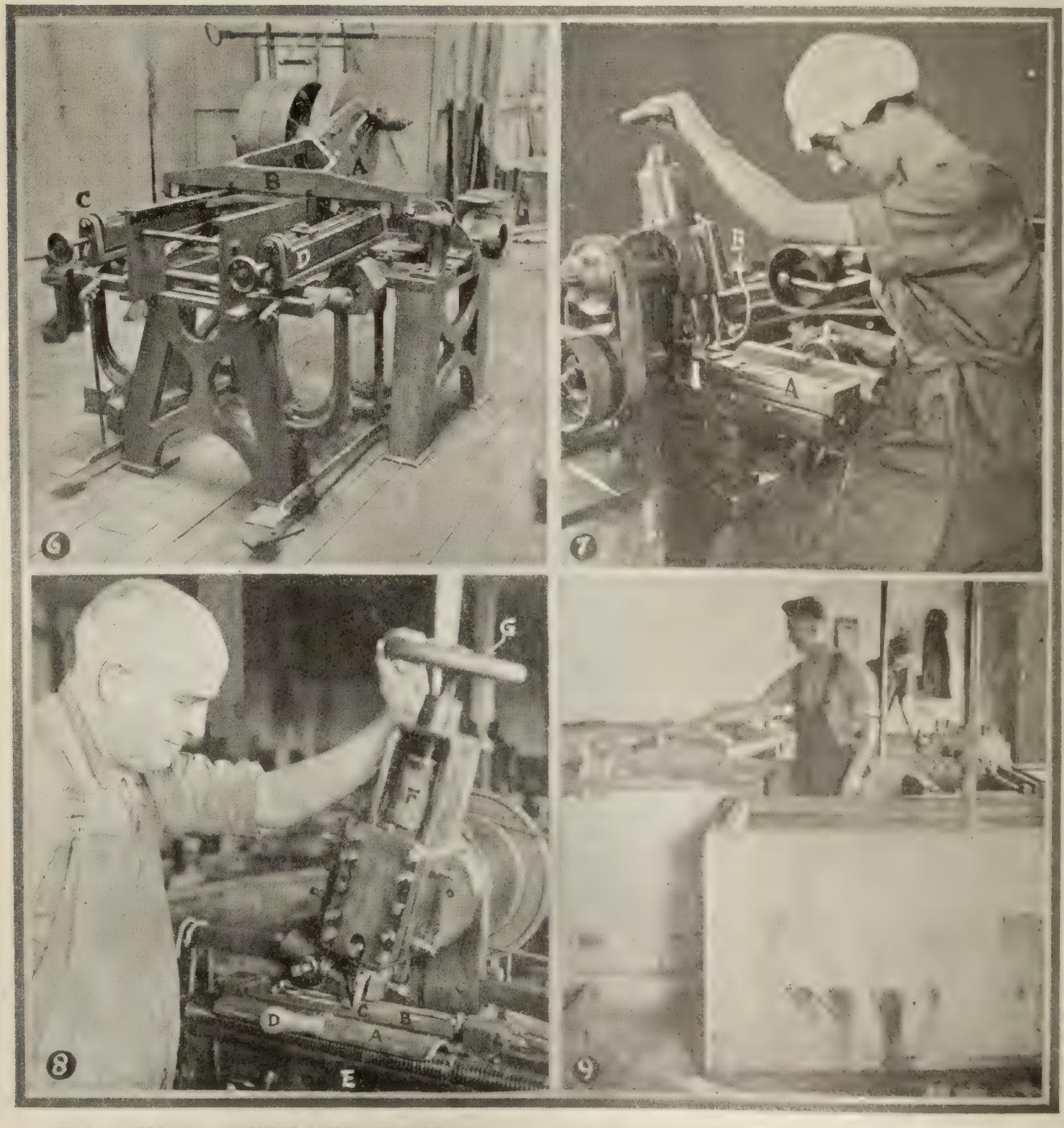


FIG. 6—A STRIPPING MACHINE ALMOST COMPLETED.
FIG. 7—CUTTING THE SMALLER SIZES OF FILES.
FIG. 8—CUTTING THE LARGE SIZE FILES.
FIG. 9—TEMPERING THE FILES.

what like the shape of a figure C. He next took another file of similar heat, dipped it into the brine apparently the same way, but the file came out straight as a die. More careful inspection proved that the worker gets so accustomed to the appearance of the blank as it leaves the lead bath that he knows just how to draw it through the brine to make it come out perfectly straight. In other words, tempering is not by any means learned in a day.

The files are now sand-blasted, as shown at Fig. 10. Readers will note the compact arrangement of this sand-blast chute. It is placed centrally on the hardening room floor, takes up little space and allows three workmen to work at the same time. Sandblasting being a process very well known, we will make no comment, except to say that this operation thoroughly cleans the files and removes all paste which may be still in the teeth.

Last, but not least, the files now go to the testing department, where a hardened prover is run over every file. These tools are named provers, because that is actually what they do—prove whether the file will stand up to the work. The provers are much harder than any steel which a file is likely to be used on.

The tester can easily tell if a file is not of sufficient hardness, for the prover will run over, and not grip on the teeth as it should. Every file must stand this test before passing inspection.

Now comes the actual packing and shipping. The files are wrapped carefully and packed in suitable sized boxes, then shipped in the regulation manner.

We have travelled the road from the blank to the finished product, so let us consider a few points of interest in this firm itself.

First and foremost, they believe in supplying the workers with a well lighted factory, and have done so to the limit, even to painting certain portions of the windows to prevent sun glare. All aisles are kept clear, and the plant in its entirety presents a very neat appearance. They employ from 80 to 90, and have a plant covering 90,000 square feet. Every year they turn out around a million and a half of files. Some imposing figure for 90 employees? They have in their employ certain men who have been in the file-making business from twenty years up. The writer made arrangements with the manager, Mr. Swallow, to interview one of the oldest of these men, with the result that we are able as a sort of conclusion, to mention this old-timer's views on the subject of files.

Files Then and Now

This gentleman, whose name is Gideon Nantel, has been with the file business for over forty years. He was good enough to relate his experiences, which we had best mention as he told them to us.

"I suppose you realize we had no machines in those days, but cut files by hand," he started. I nodded, and he went on.

"In those days we had no such things as oil furnaces, and used to do our forging with the aid of a sledge and open fire. When it came to grinding, we did this all by hand. All our draw filing, or stripping as it is called, was also hand work. To cut files in those days was some job. Have you ever seen a set of old-time file cutting tools?" he suddenly enquired, and on our replying in the negative, off he went and brought back the instruments of torture shown at Fig. 11. I call these instruments of torture advisedly, as you will soon learn.

"Well, now," Mr. Nantel continued, "cutting files in those days was a tiresome task. The small hammer A was used for the smaller sized files, and the small cutter B was what cut them. You held the chisel B on the blank, brought down the hammer with the proper force, then up and down until the file was completed, moving the chisel a little bit along each time.

"Of course it took considerable practice before you could work with any speed to speak of, and besides it often happened that you slipped and hit your hand instead of your chisel." (N.B.—Editor's note) We agree that this is quite possible, in fact more probable than otherwise for hitting a chisel with such a narrow head is to our idea some job.

"What was the young sledge C used for?" we asked. "That's not a heavy hammer," was the answer, "it only weighs 5 pounds; we had them as heavy as 10 pounds for certain sizes of files." "But what about your wrist?" we asked. "Oh, you didn't work it that way," was the reply. "You notice the peculiar shape and how the nose takes a sudden curve, well, you used it in this way. First you sat directly over your work, held the chisel D in proper position, and brought the hammer C down, more like a drop hammer than as an ordinary hammer. In other words, you used a straight up and down motion. Of course I will ad-

FIG. 10—THE SAND-BLASTING OPERATION.

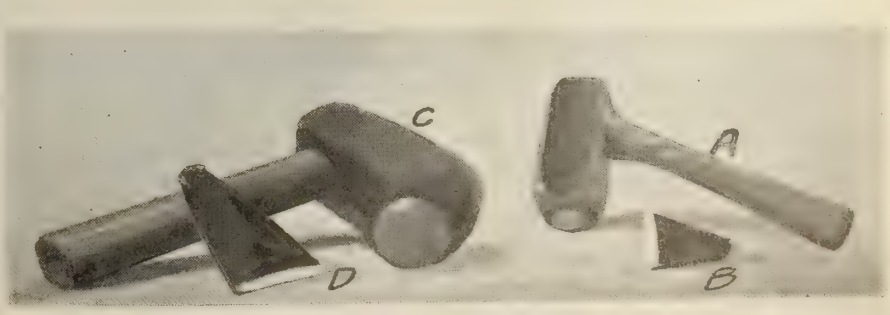


FIG. 11—HERE WE SEE THE OLD TIME HAMMERS AND CUTTING CHISELS.

mit your arms were a wee bit tired at the end of the day."

"What production did you obtain?" we asked. "Each man turned out two and a half dozen a day," he replied. "And by the modern method you turn out?" "30 to 40 dozen" was the answer. "Some difference," we replied, and he agreed with us. On the smaller sizes of files up to 120 dozen are cut every day by a skilled operator. So here is still greater production difference.

"There were thirteen to the dozen in those days," commented Mr. Nantel; "the extra one paid the manufacturer for the scrap. I guess that was the idea; it's the only one I know of. Our annealing was done in wood fires, and our hardening in charcoal. Twelve hours was employed in annealing, and thirty-six hours in cooling. The hammers I have shown you are over forty years old," finished the old-timer in this very interesting industry.

An article of this nature would hardly be complete without a final word on the care of the file. We have tried to show that a file is as much a fine tool as any other cutting tool, and therefore should be taken care of. In conjunction with this article we show in panel form a set of suggestions which this firm has issued and sends out with its product. These suggestions are well worth keeping and paying attention to, so, with the suggestion that readers study this panel carefully, we close by stating once more: "Remember the File is a Fine Tool."

A FILE IS A FINE TOOL

The point of each tooth on it is as beautifully sharp as the edge of a good chisel. If carelessly handled, some of these teeth are broken, with the result that the next time the file is used it seems dull and makes furrows or ridges in the work.

DON'T throw files carelessly into the drawer with cold chisels, hammers, etc.

DON'T leave files lying around on the bench or lathe where they are liable to be swept on to the floor and broken. Hardened steel is necessarily brittle, and we take a pride in making our product as highly tempered as we know how.

DON'T keep files in a damp place. Rust will ruin the best tooth ever cut on a file.

DON'T use a file for any other job than that for which it was made. Because it is "Only a File" is no reason why it should be made the "Handy Man" of the shop.

May we suggest that you provide a rack for your files as you do for your drills, etc., so that they may be properly stored when not in use?

If these suggestions are acted on, we think you will find the life of your files materially lengthened, and that they will keep their cutting edge; in which case you will be better satisfied as users and we as producers.

ALWAYS REMEMBER, A FILE IS A FINE TOOL.

INGERSOLL FILE COMPANY, LIMITED, INGERSOLL, ONTARIO

Speeding Up Machine Tools With Compressed Air

Production Depends Largely on What Facilities You Have for Handling Your Product. Herein is Discussed How the Work Can be Accelerated by Means of Compressed Air

By F. A. McLEAN

QUANTITY production on an efficient basis is largely dependent on the facilities provided for handling the product during the course of manufacture and in order that maximum production be maintained it is necessary to make the physical requirements called for on the part of the operator as light as possible. When this is done a workman should be able to accomplish practically the same amount of work towards the close of the day as in the beginning. If this is not done, no matter how strong the man may be, he is bound to feel the strain from his continual exertion, and his efficiency and value to his employer is lowered as the day advances.

Any arrangement which will minimize this fatigue on the part of the worker is worthy of attention from the standpoint of higher efficiency, as the conservation of physical energy so often spent in non-productive labor is of primary importance. Aside from the process of moving the work to and from the machine, the operation of the latter generally calls for considerable exertion on the part of the worker, especially in the case of heavy machine tools. This is in time bound to affect his ability to maintain a uniform output throughout the day.

One of the most flagrant offenders in this respect is the ordinary lathe, especially in the larger sizes, which require the expenditure of considerable energy in backing off the carriage after a cut has been made. In the case of quantity production, this often consumes a larger amount of time and labor which could be more profitably applied in other ways. Many of the more progressive manufacturers who realized this fact have applied a direct lift air hoist cylinder to the task with a view to relieving the operator and speeding up the output from the tool. During the war devices of this nature were quite a common sight in the large munitions plants of the United States and Canada, but with the close of the shell contracts, many of these contrivances have gone to the scrap heap, which is unfortunate, as many shops could apply them to the manufacture of their regular products with excellent results.

An arrangement of this kind applied to a 24 in. x 20 ft. lathe used for drilling holes in submarine drill pistons in the plant of the Canadian Ingersoll-Rand Company, Limited, Sherbrooke, Quebec,

VIEW FROM TAILSTOCK END OF LATHE SHOWING METHOD OF SUPPORTING AIR HOIST CYLINDER AND THREE WAY VALVE.

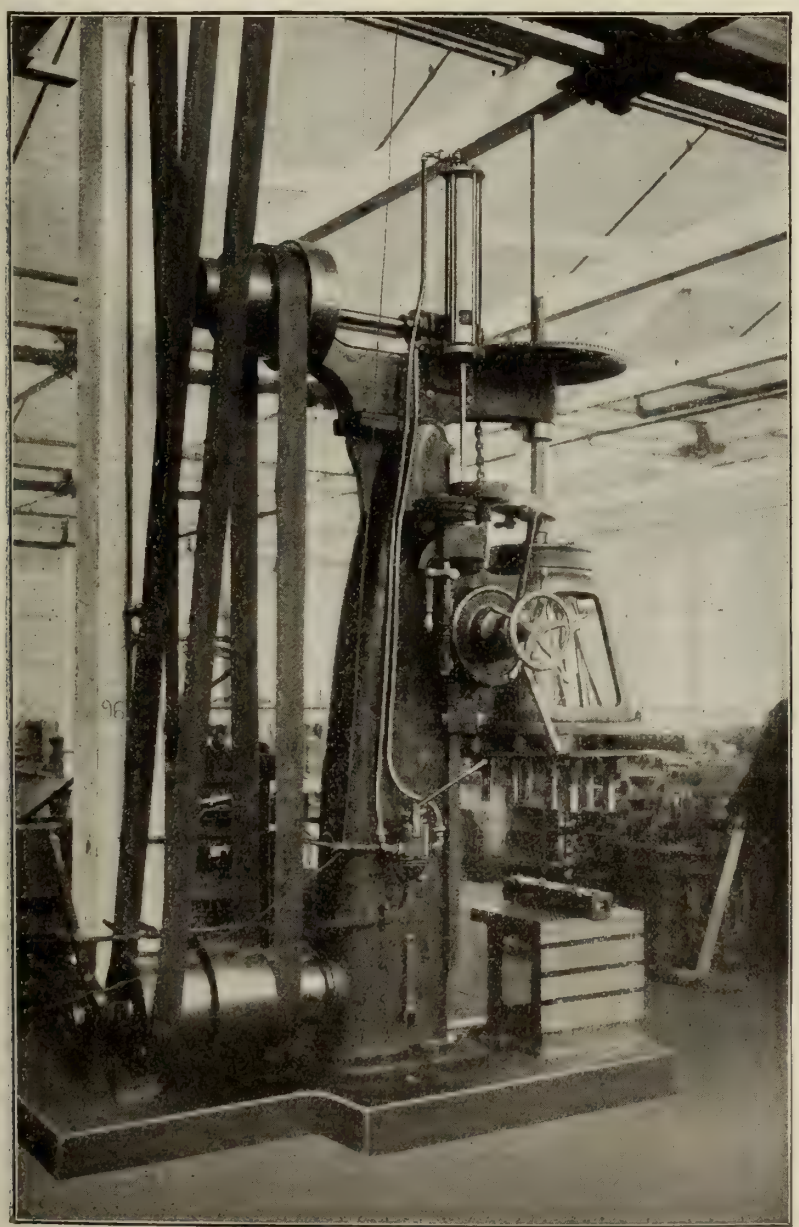
is shown in figures one and two. From an examination of these illustrations it will be seen that the air hoist cylinder, which is 3 in. in diameter by 4 feet long, is placed between the shears of the lathe and supported at each end by rectangular pieces of iron, which are re-clamped to the lathe bed by tightening four bolts. A hole is bored in the lower [illegible] of the lathe carriage into which is fitted the end of the hoist piston rod, from which the hook has been removed. Lock nuts prevent the rod from shifting.

This arrangement allows the cylinder to be moved to the most convenient point on the bed, or even removed altogether and applied to another machine in a few minutes, if desired.

The hoist cylinder is of the double acting type and is controlled by a very simple three-way valve located within convenient reach of the operator. Pushing the handle of this valve to the left causes the carriage to travel towards the headstock and vice versa, while moving it to a central position cuts off the air supply and allows the air in the cylinder to exhaust. A globe valve is placed between this three way valve and the supply hose to take the strain off the three-way valve when the device is not in use. It is perhaps of interest to note that the pistons drilled on this lathe are used in the largest water tube rock drills ever made in Canada.

These submarine drill pistons are about five feet long, and to drill a small hole through them from end to end with a twist drill is quite a nice job. It was accomplished with little or no trouble by the lathe illustrated. The drill was held in a fixture bolted to the carriage and a stream of cutting compound under pressure was used to keep the drill cool and wash out the chips.

Some of the more modern multiple spindle drill presses are provided with means for raising as well as lowering the head by power, but in many shops there are machines in use which do not have this feature, and when these are of large size it is very tiresome for the operator to have to raise the heads by hand. A simple way of using compressed air to do this work, which has proved very satisfactory, is illustrated in figure 3, and consists of a small double-acting direct lift hoist attached to the top of the drill press by a cast iron bracket. The lower end of the piston rod is screwed into a hole bored in the top of the saddle or head of the machine. Supply pipes run from the upper and lower end of the hoist cylinder are bent to conform to the contour of the machine and terminate in an adjustable valve or speed box located near the belt and feed controls of the drill. With a drill press fitted up in this way it is possible for an apprentice boy to turn out a larger production than a fully grown man could when moving the drill head by hand.



RAISING AND LOWERING HEAD OF 8-SPINDLE DRILL BY AIR.

A minister living in "a country district" of the Hawaiian Islands had great difficulty in making his parishioners feel they were properly married until he devised the following service:

To the man: "You savvy this woman?"

"Yes."

"You likee?"

"Yes."

"By and by you no kick out?"

"No."

To the woman: "You savvy this man?"

"Yes."

"You likee?"

"Yes."

"By and by you no kick out?"

"No."

"Pau (done). Let us pray."—San Francisco Chronicle.

Sad, But True

There was a man who fancied
That by driving good and fast
He'd get his car across the track
Before the train came past.
He'd miss the engine by an inch,
And make the train hands sore;
There was a man who fancied this—
There isn't any more.

There was a wise old trainman,
Expert at coupling cars,
He used his feet to push in place
The knuckles and drawbars.
He did it thus for many years,
And thought it was great fun;
He had two feet to push them with,
He now has only one.

Bill Jones on the repair track,
Imagined he could do
A moment's work beneath a car
Without the flag so blue.
Well, yes—he did it many times,
In spite of rule and warning;
One day an engine bumped the car
Bill's wife is now in mourning.

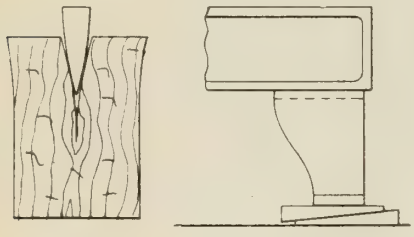
Between the rails of the northward track
Mike smoked his pipe of clay,
As "55" with time freight south
Sped noisily on her way.
'Twould take four steps to clear both tracks,
These steps Mike did not take,
Then Number 2 approached unheard,
Result—"An Irish Wake."

Shop Arithmetic, Inclined Plane, Wedge, Screw

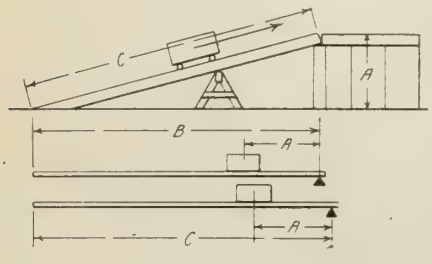
Thirteenth of a Series in Practical Mathematics for the Mechanic and Those Learning the Machinist Trade—The Present Article Takes Up Some Problems in the Three Above Subjects Mentioned

By J. H. RODGERS

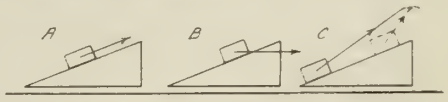
CLOSELY associated to problems involving the practical application of the simple and compound lever, is the inclined plane (wedge) and screw, examples of which are to be seen in everyday shop practice. As the name implies, the inclined plane is a surface that is inclined at an angle to the horizontal, and while this definition specially refers to inclined surfaces in general, the theory and the calculations, in some respects, are identical to the wedge and the screw principle. The most simple form of the wedge may be seen in the splitting of wood, in the alignment of machine tools, or other heavy objects.



The theory of the work performed by means of the wedge is quite similar to that of the block and tackle, and is merely the energy that is required to raise the weight in the vertical direction, plus that necessary to overcome friction. Suppose a large case is to be skidded up an incline of 30 degrees on to a truck or platform, the work performed would be the same as if the weight were raised vertically, although the object had been moved through a greater distance. The action may be compared in some respects to that of a lever where the force applied is less than the weight raised, but moving through a greater distance. This will be more clear by referring to the following sketch:

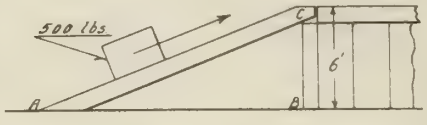


From this it will be seen that the mechanical advantage is increased by decreasing the angle of the inclined plane. In moving a weight up an incline there are three distinct methods that may be followed, namely; where the force applied acts parallel to the inclined plane; where the force acts parallel to the horizontal plane, and where the force is applied at a constantly changing angle, as shown in the sketches A, B, and C.



As the third case involves the use of advanced arithmetic, it will be dealt with later on, so that we can confine our present calculations to the first two cases. A little thought will show that the first method will be the most efficient as the mechanical advantage is greater. The force applied acts through a distance equal to the length of the inclined plane, and from the rules previously given for such work the power multiplied by the distance through which it moves, will equal the weight multiplied by the vertical distance through which it is raised.

For the above case, suppose a weight of 500 pounds is raised to a platform 6 feet above the floor, using a skid at an angle of 25 degrees, what force would be required, figuring the power necessary to overcome friction at 25 pounds?



With an angle of 25 degrees and a raise of 6 feet, the length of the incline would equal the hypotenuse of the right triangle A B C. In order to find this length we must use the principle of trigonometry, as outlined in the ninth lesson. The rule would be:

$$Hypot = \frac{Side\ Opp.}{Sine} = \frac{6}{.42262} = 14'\ 2"$$

To find the power required, use the rule as stated above, which as a formula would be:

$$P \times (A-C) \qquad W \times (B-C) \quad or$$

$$P = \frac{W \times (B-C)}{A-C} = \frac{500 \times 6}{14.2} = 211 + lbs$$

With 25 pounds necessary to overcome friction, the total force required would equal 211 + 25 = 236 pounds.

If, on the other hand, the power had been applied in a direction parallel to the ground, or horizontally, the force would have acted through a distance equal to the base of the triangle. This distance and the resultant force required to advance the weight up the incline, would be as follows:

$$Side\ Adj. = Cotan \times Side\ Opp. \quad or$$

$$Base\ (A-B) = 2.14451 \times (B-C) =$$

$$2.14451 \times 6 = 12.86706\ feet$$

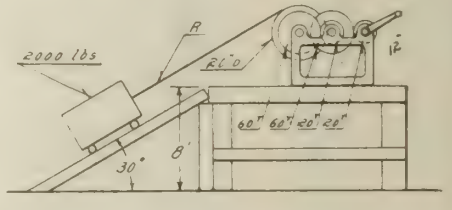
$$Then\ P \times 12.87 = W \times 6 \quad or$$

$$P = \frac{500 \times 6}{12.87} = 233.1\ lbs$$

$$and\ 233.1 + 25 = 258\ lbs$$

as the total power necessary.

In the two examples given above, the force required was practically one-half of the weight being raised, so that for heavy weights some mechanical combination would be adopted to increase the mechanical advantage. This could be done as shown in the last lesson, or a small windlass could be utilized for the purpose. In the sketch below, what power would be required to move the weight of 2,000 pounds up the incline, friction being neglected?



The length of the inclined plane would be:

$$Hypot = \frac{Side\ Opp.}{Sine} = \frac{8}{.5} = 16\ feet$$

The tension in the rope R would then be:

$$P = \frac{2000 \times 8}{16} = 1000\ lbs$$

The advantage in the windlass is in the compound arrangement of the gearing, and to find the power required on the hand lever, we proceed on the basis that the power applied, multiplied by the length of the power arms, equals the weight times the weight arms, so the solutions of the above would be as follows:

$$P \times 12 \times 60 \times 60 = W \times 10 \times 20 \times 20 \quad or$$

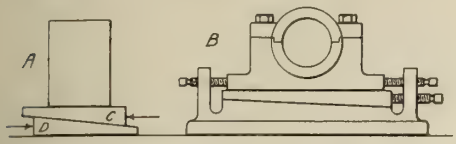
$$P = \frac{W \times 10 \times 20 \times 20}{12 \times 60 \times 60} =$$

$$\frac{\overset{500}{2000} \times 10 \times \cancel{20} \times \cancel{20}}{\cancel{12} \times \cancel{60} \times \cancel{60}} = \frac{5000}{27} = 185\ lbs$$

$$3 \quad 3 \quad 3$$

An application of the wedge that will be recognized as frequent shop practice, is shown below at A. The force applied may take one of several forms. Ham-

mers or sledges may be used, or common jacks used to provide the necessary power to raise the weight. The same principle is adopted in the pillow block shown at B, and here it is used more for adjustment to position than for weight raising.



Suppose in the case A, the wedges had a taper of one inch per foot, and the weight of 1,500 pounds had to be raised half an inch, what power would be required to be exerted on the wedge C, and what distance would it have to move, the wedge D remaining stationary? With a taper of one inch to the foot, the wedge C would have to move forward 12 divided by .5, equals 6 inches. If the force is applied in a horizontal direction the power would be:

$$P = \frac{W \times .5}{6} = \frac{1500 \times .5}{6} = 125 \text{ lbs.}$$

In the case of the pillow block shown at B, the centre line of the bearing has to be raised 1-32 of an inch and moved ⅛ of an inch to the left; how many turns would be required on the adjusting bolts it the pitch was 1-10th of an inch for the lower adjusting, and 1-12th of an inch for the upper locking screws, the taper of the wedge being ¼ of an inch per foot?

With a taper of ¼ inch per foot the movement of the wedge for a 1-32 inch lift would be:

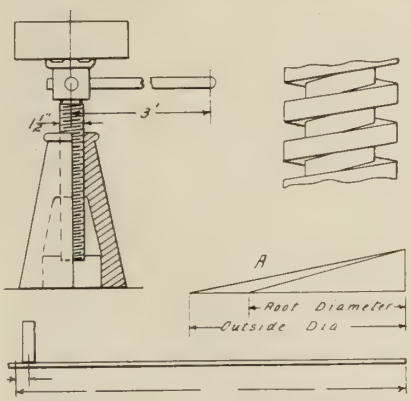
$$\frac{1}{4} : \frac{1}{32} = 12 : x \quad \text{or}$$

$$x = \frac{12}{1} \times \frac{1}{32} \times \frac{4}{1} = \frac{3}{2} = 1\frac{1}{2} \text{ inches.}$$

With a pitch of 1-10 inch the adjusting screw would be given 1.5 x 10, equals 15 turns. The lateral or side movement of ⅛ inch would require:

$$\frac{1}{8} \div \frac{1}{12} \quad \text{or} \quad \frac{1}{8} \times \frac{12}{1} = 1\frac{1}{2} \text{ turns.}$$

What might be classed as a continuous wedge or inclined plane is illustrated in the sketch of the screw-jack herewith:



Suppose the screw has 6 threads per inch and the lever is 3 feet long, what pressure would have to be used to raise a weight of 2 tons, friction being neglected? The angle of the inclined plane formed by the screw would be found by calculating the circumference and by "trig."; the development of one turn is shown at A, and at B is seen an enlarged section of the thread. By referring to the sketch A it will be seen that the angle of advance in a screw thread is not uniform owing to the difference in the diameter between the outside and the root. When calculations are made in connection with screws, the angle adopted will depend on the prevailing conditions, but in general, the use of a mean would serve most purposes.

The screw-jack problem, simplified, is shown in the lever diagram at C, and the solution would be:

$$P \times 36 = W \times \frac{1}{6} \quad \text{or}$$

$$P = \frac{4000 \times \frac{1}{6}}{36} = \frac{4000 \times 1}{36 \times 6} = 18.5 \text{ lbs.}$$

One day, many years ago, the telephone in the office of the chief of police rang. Chief Speers answered. The call was from a new policeman on the Union Avenue beat. He said:

"A mon has been robbed down here, and I've got one of thim!"

"Which one have you?" asked the chief.

The reply came back: "The mon that was robbed!"

Does the Crane Receive Consideration it Deserves

A Paper Delivered Before the Metals Section of the Eighth Annual Safety Congress of the National Safety Council at Cleveland, Ohio, Under the Heading of "Consider the Crane"

By CHESTER C. RAUSCH, Assistant Director, Safety Institute of America, New York City

EVER since Noah handled lumber while constructing the Ark, and the Egyptians stones while building the Pyramids, the problem of handling material has been present in industrial work of whatever sort or kind. It is not improbable that one of the earliest methods of handling material was by the use of some form of rope manufactured of hide or woven barks passed over the limb of a tree. Later some means was found to use parts of trees that had been blown over, or that had in some way been felled, to construct the simpler forms of derricks. As we know them to-day, derricks and cranes are the result of a development extending through centuries and representing the solution of many problems one after another. Of late years various forms of power have placed at the disposal of man a ready means for adapting his machines to types of work that were formerly done by the laborious efforts of man and beast.

In no particular field has greater development been made than in that of handling and conveying materials in connection with the processes of construction, manufacture, and transportation. More recently the fact that electric current furnishes such a flexible source of power has greatly accelerated this development and in the past decade the enormous increase in the use of steel and iron for the fabrication of structures and objects formerly made of wood has called for a further development of machinery to handle the greater unit weights involved. During the last three or four years particularly the production of cranes of all sorts has increased unbelievably and not only is their lifting capacity greater but their flexibility of operation and their safety of manipulation as well. Where we formerly saw a braced pole derrick superseding a single stick or gin-pole, we now find locomotive cranes, tower derricks, overhead travelling cranes, gantry cranes, floating derricks, wall cranes, gib cranes, and a variety of combinations of these devices that enable almost any conditions where material must be handled to be met by the selection of a type of crane to do the work and that will, at the same time, consume the least power, offer the greatest flexibility, and afford the greatest safety during operation.

During the last ten years the writer has had opportunity to observe the operation of cranes of all types used in manufacturing processes and in construction work, as well as in those fields that generally are considered under the head of transportation. In spite of the developments that have been made, both from the point of efficiency and safety, there appear to be still a large number of hazards that are reproduced repeatedly in the construction of later models or that result from the manner of their installation or the method of using them. It is to call attention to some of these points and to offer some suggestions by which these recurring hazards may be eliminated that the present paper is prepared.

The locomotive crane is coming to be one of the most common types in use, both in shops and in yards. Unlike the overhead travelling crane, it is not confined to definite limits of operation within a building or over a given yard space but, because of its mobility, it operates equally well within a shop or about a yard. This flexibility of operation considerably eliminates the number of times that a piece of equipment must be handled when it is taken from one location to another. Moreover, the boom forming part of its construction enables it to reach places an overhead crane could not approach. This one feature, probably more than any other, has brought about its introduction in many plants to perform a great variety of work formerly done with the use of rollers, skids, and various sorts of lifting tackle. The locomotive crane is a rather recent development, and while its hazards are more or less obvious, there are not as many men available who are skilful in handling this type of crane as there are of other types. The greater skill required in their operation, and their mobility, has resulted in a greater number of accidents from their use.

One of the main sources of hazard consists in the failure to keep the road-bed over which the crane must travel in the best condition. Frequently, in an effort at economy, light weight or partly decayed sleepers and second-hand, defective, or light rails have been used, resulting in an inconvenient and unsafe road-bed. The failure to keep the road-bed properly tamped and drained allows it to settle and become uneven, so that the crane does not travel steadily and is far more liable to overturn. The use of improper frogs, cross-overs and switches, and the failure to keep them in repair, increase this hazard. Such a road-bed throws numerous strains into the structure of a moving crane by the swinging motion imparted to the load suspended from the boom. This condition sometimes becomes aggravated to a point where collision of the suspended objects may occur with other railroad property or with structures in the yards adjacent to the track upon which the crane travels. This distracts the engineer's attention so that collisions with pedestrians, trucks and teams are more apt to occur.

When locomotive crane track-ways are placed too near buildings, especially on curves, the entire attention of the engineer is often required to prevent collision with buildings, and in cranes that are capable of considerable speed of movement damage is frequent. Where the crane is large, both in lifting capacity and range of boom and the engineer's cab is located some distance above the ground, this hazard is peculiarly acute. The writer recalls a case where a slow-travelling fifty-ton locomotive crane could pass a building only by being turned on its table at the same time it was moving ahead on a portion of a curve. The corner of a building placed beside the curve was entirely demolished and a considerable portion of the roof removed by being struck by the frame. Another time, while making this turn, the engineer was giving his entire attention to avoid collision with the building and failed to notice an automobile truck standing close to the rails. On a straight track it would have cleared the truck, but caused a collision because the crane was turning on its table. The crane, which had considerable power of locomotion, forced the truck against the side of the building, demolishing its entire front end.

Overturnings are frequent with locomotive cranes. In the smaller sizes the wheel base is extremely short, and in many cases the boom is swung with loads beyond the safe capacity for any increased angle of elevation and the crane is tipped on its side when this angle is increased ever so little as a result of even slight inequalities in the roadbed. Even when travelling on a straight track under these conditions and with the boom axis parallel to the axis of the track, slight obstructions on the rail are sufficient to cause disaster because the crane is working practically at its ultimate lifting capacity, and its point of safe balance. This type of accident occurs in construction work particularly, because the road-bed is nearly always of a temporary nature and poorly laid. Moreover, on such jobs, supervision of crane operators is apt to be less careful and the material handled less standardized in size and weight, so that overloading is easier and more frequent.

Another difficulty is the inability of the operator to maintain a clear view both ahead and behind his crane while travelling. Inability to see toward the rear when the crane is moving forward frequently results in people being injured when his crane is turned on its table and inability to see toward the rear may cause people or objects to be run over when the crane moves in that direction. Reflecting mirrors, similar to those used on automobiles, tend to eliminate this difficulty, provided the mirrors are adjusted carefully and are of sufficent size to afford ample view. In some cranes small windows have been placed low down in the rear of the crane and the storage tanks and coal pockets altered to permit the use of peekholes through which the engineer while standing in his usual place and turning his head can see behind the crane. Even when alarm bells or gongs are used the engineer cannot be certain, without seeing, that an accident is not imminent to material or persons on the track.

Whenever any crane overturns, unusual and frequently very considerable strains are placed on the structure of the crane, particularly the boiler and steam piping which, because of the internal pressure in them are already seriously stressed. Engineers, even if they are fortunate enough to scape scalding or injury when the crane overturns, may be penned in and seriously burned unless the doors and windows on such cranes are arranged to open outward and are provided with fasteners operating from both the inside and the outside.

Many times the original structure of the crane, particularly the boom, has been changed; lengthened to increase its range, strengthened to increase its capacity for lifting. Any lengthening of the boom immediately reduces the capacity of the crane to handle safely loads at a given elevation, and an increase of the cable size and strength or an increase of the steam pressure to permit the lifting of heavier loads at greater boom elevations introduces strains that frequently cause collapse. The failure of many crane engineers to recognize the tremendous reduction in the safe capacity of the crane due to any change in elevation has resulted in the collapse of many booms. This tendency to lengthen the boom has been greatly increased by a desire to facilitate the placing of work in locations beyond the reach of the boom as originally made. The writer recalls a number of instances where such changes as this have resulted in death to the operator. It is a tendency that most certainly should be corrected.

If the operator of a crane, and particularly of one that has been structurally changed, is given to the performance of spectacular stunts while operating it, the limit of damage is beyond estimate. Speeding the crane along the track, rotating the crane upon its turn-table at such speeds that the load is swung far beyond a point directly below the end of the boom, thus virtually increasing its length in addition to creating a considerable side strain and the dropping of loads from considerable heights and stopping it just before it reaches the ground, are performances which the cranes were not constructed to stand, even considering all factors of safety used in its design. The combination of two or more of these performances at the same time may introduce strains great enough to overturn the crane, to destroy its structure, and to injure not only the crane but many structures adjacent to it. Where the crane is elevated upon a trestle the hazard is greatly increased because strains are sometimes thrown upon such a structure that it cannot safely withstand them. If the crane falls from such a structure it is obvious that the damage is apt to be tremendous. Many operators overload cranes and take a chance that the crane can handle the load. This tendency is fostered by the fact that the crane is never under the observation of a single foreman but moves from place to place in charge of its operator. While such acts are, of course, matters of discipline, there are several devices which have been attached to cranes to indicate when the crane is at the point of overturning and to give audible warning beforehand. The best devices of this sort are placed in the cab of the engineer and are frequently supplemented by an indicator placed on the boom which shows, by means of a pointer, the safe load that may be picked up for any given boom elevation. This indicator may also indicate safe overhead clearances for the boom. The use of the tables of safe boom elevations for given loads frequently placed on plates attached to the frame of the crane or in the cab, cannot be depended upon because they require the exercise of the element of personal es-

timation of conditions upon the part of the operator.

Whenever cranes approach obscure corners of buildings, door openings, or other point from which traffic or individuals may issue, the engineer should be under obligation either to stop the crane or to have it in such control that a collision could occur only under unusual circumstances and then in a manner to cause only minor injuries.

Locomotive cranes are frequently poorly illuminated even when they perform their work in places where the operator has no adequate opportunity to see clearly the work he is doing. The placing of several storage battery cells aboard such a crane provides current for adequate light in the interior of the cab for firing and for illuminating the gauges and particularly for a spot light that can be controlled by the engineer and thrown upon the objects he is handling. Very frequently a light placed on the tip of the boom, and arranged to throw its rays vertically downward, has been found of great advantage. Whenever such cranes work at night, consideration should certainly be given to these points.

The work done by locomotive cranes is nearly always conducted out of doors and little attempt is made to house them or to protect them from the elements. As a result, rust, with all its attendant and subtle hazards, attacks the machine in various places—the cables particularly. Proper painting should be given at frequent intervals, adequate lubrication provided, and the boiler should have regular inspection. Improper feed water may introduce trouble enough to put the crane out of commission.

In the operation of such cranes dependence is frequently placed upon lowering the load and swinging the boom to throw an object upon storage piles or into a location that cannot be reached by the crane when in its ultimate safe position for such a load. The element of time is here depended upon to permit the load to swing into its final place before it can tip the crane far enough to cause it to overturn or leave the rails. Any failure of judgment on the part of the operator is fatal.

Another pernicious tendency is sometimes revealed when the crane is derailed and a leverage action is created by attaching the boom to the track ahead and by the application of power causing it to lift the rear end of the crane so that it may be swung again to the rails. This is done with the boom in an almost horizontal position and has destroyed cranes by introducing the severest strains to which the crane could be subjected. It is obvious that this can only be done where the road-bed is laid in a manner sufficient to permit such a strain. Recognizing this fact and to increase the leverage the operator endeavors to reduce this strain on the track to a minimum by placing the boom in its lowest position. The housing of the hoisting mechanism and the anchorages of the turn-table are very often torn apart in this manner.

Overhead travelling cranes have probably received as much attention at the hands of designing and safety engineers and inspectors as any other single piece of equipment. This is probably due to the fact that it travels over areas in which are located many workmen and much valuable machinery and material, so that a failure of any part of the crane may bring about disastrous results. A locomotive crane necessarily clears its own way before proceeding so that there is not the same proportion of hazard as in the overhead crane, which may create dangerous conditions over the heads of many men without their knowledge. One common fault is the failure to keep the rails upon which the overhead crane travels in proper line both for lateral and vertical adjustments. A slight settling of the rails or a slight misalignment sideways as a result of strains introduced by wind, settlement of building foundations, overloading of structural framework, etc., frequently causes the tracks to assume an extremely crooked appearance. The writer knows of a case where as much as fourteen inches of settlement occurred and where there was a lateral displacement of nearly eight inches. On this particular crane-way, loads as heavy as twenty tons were being carried, and in order for the crane to navigate at all one rail had been practically freed of all anchorage to its supporting girder, and had even been greased under the flange to permit it to slide sideways and so follow the movements of the crane. Struts, with nuts on the end, held the rails from falling off the girder. The eccentric strains thrown on the frame of the building by this condition and upon the crane, due to a swinging of the load which was thrown out of equilibrium by such movements, was considerable and several serious accidents resulted. Fortunately a change in management furnished an incentive to eliminate these conditions. In another case a crane repeatedly jumped the runway rails at one end until the wheels were found to be of different diameters and so made one end progress farther than the other.

Far too many overhead cranes are used without adequate signs to indicate their safe capacity. The writer recalls a case in which a load, so large that the crane could not lift it, was placed under as much lifting strain as the crane could exert and was then dragged down the length of the shop to its location. Such practices, while they are not frequent, indicate a tendency on the part of the operator to take chances—a tendency probably fostered by his lack of adequate information regarding the capacity of the crane or of the dangers which such treatment introduces.

Wherever the space available in a shop will permit, there should be a free aisle-way from one length of the crane-way to another over which loads may be carried without the necessity of passing over more than a few individuals. There are not many old shops where this is possible, but there should be some portion of the shop specifically kept as free as possible from men and valuable material and machines to permit the crane operator to carry material over such a space without any more hazard than is necessary. When unusual loads are carried over such spaces every individual should be made to stand from under the load.

There are many excellent installations of the highest quality of cranes operating over inadequately illuminated spaces. The fact that the operator is a considerable distance above the floor where the attachments to the crane hook are being made and that he must see through a haze that sometimes develops in shops from product being manufactured in spite of proper ventilation only aggravates an already bad condition. This atmosphere might be a permanent or only a temporary condition. For example, a foundry is very often badly troubled with this haze during a pour, and a machine shop that may be generally clear will become clouded for a portion of the day as a result of a large babbitting operation done inside the shop or from the wafting of smoke or fumes into the shop from other parts of the building or from out-of-doors. On days when natural illumination varies it sometimes happens that the lights are not turned on during the darker periods so that there are periods of comparatively poor illumination from the crane operator's standpoint. In many shops the artificial illumination is not sufficient to afford adequate vision at any time. It may be far too expensive to increase the general illumination for the benefit of a single crane operator, and in such cases, and even when illumination is good, excellent results have been obtained by attaching to the crane trolley one or more lights properly covered with a focussing reflector, and so arranged that the area immediately about the hook when at its lowest point and near the floor is brightly illuminated. Such illumination tends not only to assist the crane man to observe what is being done on the floor, but helps crane attendant to make proper attachments to the load. Furthermore, when such a load is travelling down the shop, the brilliant illumination throws it into bold relief, and it serves as an admirable warning of its approach. In many shops the hook of the crane is painted white and kept white in order that it shall attract attention to itself and furnish some measure of indication to the crane operator of its location with reference to the floor. Where such a hook is illuminated by overhead lights as just suggested, it is very conspicuous.

In many shops lighting fixtures arranged to furnish general illumination of the floor are from necessity, placed above the travel way of the crane. If such buildings have wide spans, the crane operator, unless properly shielded by an awning to his cab, is confronted in his view up and down and frequently across the shop with many spots of brilliant and glaring light that serve to confuse his vision. In some shops this general illumination from above the crane-way is augmented by lamps having angle reflectors, and too often no reflectors at all, placed just below the crane runway. When operating the trolley on the far side of the shop these lamps throw a steady stream of light into the face of the operator, seriously confusing his action. Such lamps should be shielded from above with reference to any posi-

tion the load to be observed by the crane operator must assume.

A person making an examination of any considerable number of overhead travelling cranes is impressed by the fact that so many of them have none of the electrical equipment in the cab properly guarded. There are exposed contact points, circuit breakers, knife switches and terminal lugs carrying from 110 to 500 volts or more. Contact with these exposed points may not only kill a crane operator but may temporarily incapacitate him so that his crane continues its motions uncontrolled. The use of the simplest form of shields or guards composed of asbestos, wood, sheet metal or other material are not only easily applied but inexpensive. The possibility of serious accident in the movement of an uncontrolled crane is sufficiently great to require ample protection for the crane man and new equipment should be specified to have only back-connected control panels and inclosed resistance grids.

Many cranes have practically nothing more than a hand rail to keep the operator in the cab. During his slack moments, when he is comfortably stretched on a box, stool or bench, any lapse of consciousness would permit him to shoot under this rail and fall to the floor below. There is no reason why the crane should not be enclosed to a reasonable height with grillage to prevent such an accident and in a manner that need in no way interfere with the craneman's vision or movements.

Cranes, like all other apparatus, require occasional repairs, and continual maintenance. It strikes one as almost criminal to note the lack of any adequate repair deck over which the crane may be housed and from which oiling, adjustments and repairs may be safely performed. There is scarcely a condition in any shop where such a deck cannot be provided in one end or the other for at least a portion of the width of the crane span. Although there are many heavy parts used in the construction of the trolley of a crane, no provision is made for a small wall crane or a travelling chain hoist to assist in this work. Many times repair men are exposed to serious hazards from falling on account of this lack. It is not infrequently the case that the bottom chords of the roof trusses are used in making repairs and at such times they are subjected to strains which they were never designed to withstand. Workmen are frequently called upon to make crane repairs after dark and to use electric drills or soldering irons in connection with their work. The placing of a few plug receptacles for the attachment of portable extensions to make connections to these tools would greatly assist in this work. Such provisions should be made as parts of a repair deck.

Most cranes are not fitted with an over hoist or over travel stop that automatically arrests the upward travel of the hook and its load if the operator fails to disconnect the power of the hoisting motor as the hook-block approaches the hoisting drum. On large cranes that handle heavy loads the hook travel upward is slow and in many cases the part being hoisted requires a maximum upward travel of the hook. Crane operators have been observed to turn on the power and calmly wait for the load to come into contact with the over travel release, thus disconnecting the motor. The fallacy and danger of such operations are evident and should be matters of strict discipline.

Every crane requires its cable to be lubricated to prevent wear from friction and destruction from rust. While such lubrication accumulates grit and dirt in some shops the advantages of the lubrication tending to give long life to the cable more than offset the damage which this grit may do. The lubrication of the cables is sometimes accomplished by a man standing on the trolley who applies the grease as the cable is wound up. Sometimes the cable is all wound up and the top half of the drum properly greased. The bottom half is then greased after the drum has made a half revolution to bring the ungreased cable into an upward position. The writer recently saw a very clever greasing device which could be temporarily attached to the top of the hoisting block in such a way that an arm holding collar made of soft wicking could project out and surround the cable. This arm was connected with a tank supplying grease in such a way that the cable, by passing through the collar, became properly lubricated throughout its entire length.

In view of the present knowledge concerning crane operation it seems rather trite to mention the fact that so many cranes are operated without a safe or convenient means of access to their cabs. The daily exposure of operators to falling, to contact with live wires, or to being overcome by fumes or gases while climbing to their cabs is considerable. It would seem the part of wisdom that not only new structures, but old structures as well, should be equipped with either a properly enclosed ladder or an adequate stairway from which the cab could be reached with a minimum of risk.

Overhead travelling cranes, and locomotive cranes to an increasing extent, are handling material by means of electro-magnetic lifting devices. These are so ruggedly constructed that they will withstand almost unlimited abuse. The only weak link in their safe operation is the cable connecting them to the source of power or the power supply itself. Usually the power is sufficiently reliable to make failure only a remote possibility. The cable, however, is subjected to all manner of rough handling as a result of following the movements of the magnet and from its contact with the ground, material being handled and, sometimes, with the devices that are used to keep the slack of this cable from fouling itself with the boom. One of the best solutions of this difficulty has been the adoption of a cable which can follow the magnet in the same manner that the lifting cable follows it. If this cable passes over a suitably grooved pulley at the tip of the boom, or on the trolley drum of the crane, and is so arranged that a counterweight will carry the slack down the boom or that it will wind up on the drum of the trolley most of the wear can be avoided. Suitable electrical connections can be made by means of contact with a sliding bar or with a rotary collector ring on the trolley winding drum. A proper application of this device will result in longer life to the cable and avoid all damage due to kinks, cuts, abraisions and strain.

One may still find a tendency to overload crane hooks. While the hazards created by the improper use of chains is well known, and may result in careful handling of them on the part of well-informed operators, there are still a considerable number of floor men who introduce strains in crane hooks which it is impossible for them to stand without serious deformation or breaking. In handling some objects, several chains are used, so that the mouth of the hook is filled and attachments are made to the very tip of the hook in such a way that a severe side bending strain is introduced in addition to the lifting strains introduced by the chains hanging at the bottom of the hook.

The inconvenience attendant upon work performed on overhead cranes and the failure to provide convenient platforms from which to perform such work, has resulted in much neglect of crane repair and upkeep. One of the most noticeable defects is an increase in the amount of play and back-lash that is allowed to develop in all parts of the structure, particularly in the gears. When this is excessive and the gears pound badly, the starting of the motor or its reversal from a raising to a lowering motion introduces strains on pinions, shafts, keys, and other parts sufficient to cause much damage. This wear is very often due to the fact that adequate lubrication has not been furnished because access to the oil and grease cups has been difficult and the person responsible for maintaining the equipment has neglected to do his work because of the difficulty of getting at the places where it must be performed. In some cases this condition has been helped materially, and even overcome by the use of oil cups or compression grease cups serving all parts of the crane and so located that they can all be reached from the crane walkway. It then becomes necessary only to go with an adequate amount of grease or oil to the several conveniently located cups to keep bearings adequately lubricated.

Gantry cranes, wall cranes, and other combinations of hoisting apparatus capable of operation in one or more directions, each has its particular problems, but they have been covered by consideration of similar conditions that occur largely in both locomotive and overhead travelling cranes. There is probably no piece of apparatus that does more to facilitate easy and convenient work than do these various types of cranes, and it seems strange when one considers that so much has already been done to make them safe, that there still remain so many obviously dangerous points at which they could be improved, not only to facilitate their speed of operation but to reduce materially the hazard to the operator himself and to those adjacent to the movements of such cranes.

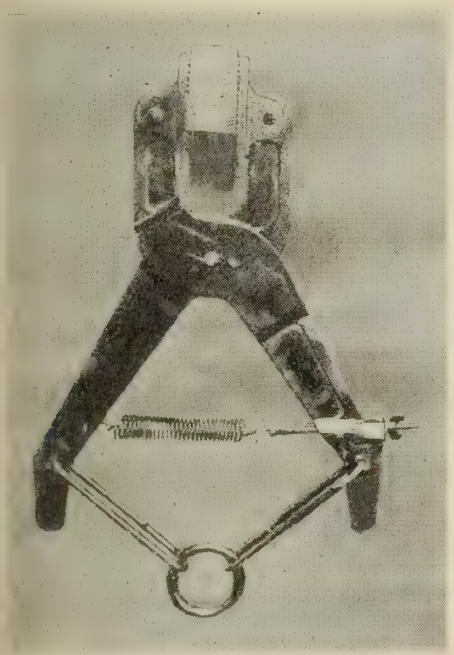
A New and Novel Quick-Action Gripping Hook

Readers Have no Doubt Heard the Old Joke About the Sky Hook, Which You Hitch on to a Passing Cloud. Well, This Isn't a Sky Hook, But You Attach it Almost Anywhere

By J. H. M.

IN commencing this article let it be understood that the author merely presents before readers of CANADIAN MACHINERY a new feature which is useful to shop or garage.

The views accompanying this article were taken in a garage simply because it was not convenient to photograph them elsewhere. We would have preferred these views to show some machine tool plant, but we can at least repeat what the inventor of this novel gripping hook told CANADIAN MACHINERY'S representative.



A DETAIL VIEW OF THE HOOK.

The principle of the idea lies somewhat along the lines of a pair of ice tongs. Fig. 1 shows the grip hook itself, with a piece of timber between the jaws for illustrative purposes.

These hooks are to be made in all sizes up to at least three-ton capacity. The range will be in all probability 1 ton, 2 ton, and 3 ton capacities. So far only the 1 ton size is on the market.

Each jaw is complete in itself, and is made of malleable iron. The two links and ring for the tackle to hook to are made of steel rod welded.

Every grip is tested beyond its capacity before being passed. The advantages of a hook of this nature are claimed to be as follows: On a ceiling with no space between the beams and ceiling it is a difficult matter to attach lifting tackle without first drilling a hole through the beam, placing a stout bolt through this hole and attaching tackle to the bolt.

This procedure takes considerable time. It is in such cases that this hook is used. It will grip on any beam from 1½ inches wide up to 6 inches. The jaws are 5 inches long by 2 inches wide, making a total gripping surface of 20 square inches.

The heavier the weight the tighter the jaws grip. The chief feature is the speed in which it can be placed in position. The user merely pulls the hook open by hand, places over the beam, lets the jaws grip naturally, after which attach block and tackle to the lower ring as shown in photo.

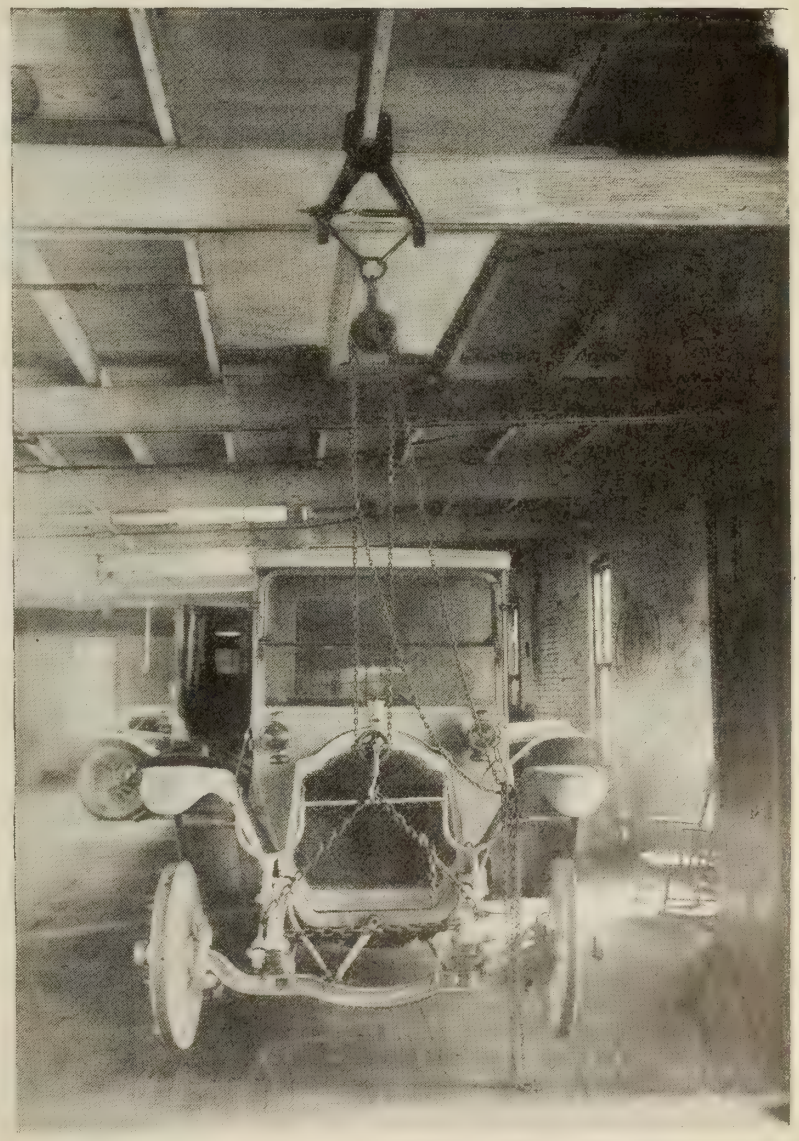
At Fig. 2 we show one of these one-ton blocks raising the forward part of a Packard car from the floor. There is approximately one and a half tons on the hook which is shown in the illustration.

The main use for such attachment is claimed to be in the hanging of shafting for lifting heavy work on the lathes, planer, or other machine tools; in fact for around shop purposes.

The inventors, the Patterson Brothers, of Hamilton, Canada, have patented this hook in both Canada and the United States, and are quite optimistic as to its future possibilities.

Village Constable (to villager who has been knocked down by passing motor-cyclist): You didn't see the number, but could you swear to the man?

Villager: I did, but I don't think e' 'eard me.—Galveston News.



GENERAL VIEW, SHOWING THE HOOK IN USE. THE HOOK IS NOW LIFTING APPROXIMATELY 1½ TONS.

Canadian Machinery Drafting Course—Part V

Geometrical Terms and Meanings With Figures Illustrating Same —Various Kinds of Triangles and Quadrilaterals Defined—Six More Problems Given Together With Explanatory Data—Fifth Plate of the Course

By J. H. MOORE, Associate Editor Canadian Machinery

IN the previous instalment on this very necessary subject we defined certain definitions, up to the point of the obtuse angle, stopping at the aforementioned angle in order to proceed with plate No. 4.

We will now go further into the subject of geometrical terms and their meanings.

Leaving the angles we next come to the subject of surfaces, which prompts the enquiry, "What is a surface?"

A surface is produced by the motion of any line. It always has two dimensions, namely length and breadth.

There is another type of figure termed the plane figure. This could be explained as follows:

A plane figure bounded on all sides by lines (that is, taking it for granted that they are straight lines) is called a polygon, or as sometimes termed, a rectilinear figure.

So now, since we've come to polygons, let us see what various types we find.

A polygon proper is a plane figure which is bounded on all sides by straight lines, these lines being called sides, and the sum of these sides being termed the perimeter, which means the length of the boundary.

These polygons are classed according to the number of sides they have and are as follows:

A triangle is a polygon with three sides; a quadrilateral is a polygon with four sides; a pentagon, with five; a hexagon, with six; a heptagon, with seven; an octagon with eight; a decagon, with ten; a dodecagon, with twelve; an equilateral is a polygon whose sides are all equal. A regular polygon is one all of whose angles and sides are equal.

These definitions describe in full the various type of plane figure met with in geometrical problems, in fact some of those mentioned in the list very seldom appear, but for the student's benefit have been spoken of in order that he may familiarize himself with the names.

Now polygons again can be classified into various headings, in fact such is necessary, so briefly we will proceed to define some of these general headings.

First we come to triangles, namely the polygon, with three sides. The angles of a triangle are of course the angles formed by these sides. Figs. 1 to 6 illustrate the different type of triangles met with. At Fig. 1 we see the right angled triangle, or, as it is commonly termed, the right angle. The longest side of this angle, that is the side opposite the right angle, is called the hypotenuse, the other sides are simply termed sides, or, as some people prefer to say, legs.

Fig. 2, the obtuse angled triangle, is one that has an obtuse angle as shown.

Fig. 3, the acute angled triangle, is one which has all its angles acute.

Fig. 4, the equilateral triangle, is one (as the name denotes) having all its sides equal.

Fig. 5, the isosceles triangle is one, two of whose sides are equal.

The altitude of a triangle is the length of the perpendicular drawn from the vertex to the base, see line A on Fig. 5.

Fig. 6 illustrates the scalene triangle. This triangle has three unequal sides.

The lowest side of a triangle is always called the base. Any side may of course be taken as the base, but usually the side upon which the triangle is supposed to stand is generally accepted as the base.

Quadrilaterals

Polygons are again subdivided into quadrilaterals, or polygons with four sides, of such shape and names as follows:

A quadrilateral is, to commence with, a figure bounded by four straight lines (see Fig. 7).

A parallelogram is a quadrilateral whose opposite sides are parallel (see Fig. 8).

A rectangle is a parallelogram whose angles are all right angles (see Fig. 9).

A square is a parallelogram whose sides are all equal, and whose angles are all right angles (see Fig. 10).

A rhombus is a parallelogram whose sides are equal but whose angles are not right angles (see Fig. 11).

A trapezoid is a quadilateral having only two sides parallel (see Fig. 12).

But enough of definitions in this section, so let us get on to plate No. 5.

As will be noticed, this plate is divided into six problems, each dealing with polygons in one form or another. As before, the dimensions are 9 in. by 13 in. for the border lines, and 9½ in. by 13½ in. for trimming. Divide the 8 in. by 13 in. space into six portions as shown and proceed as follows:

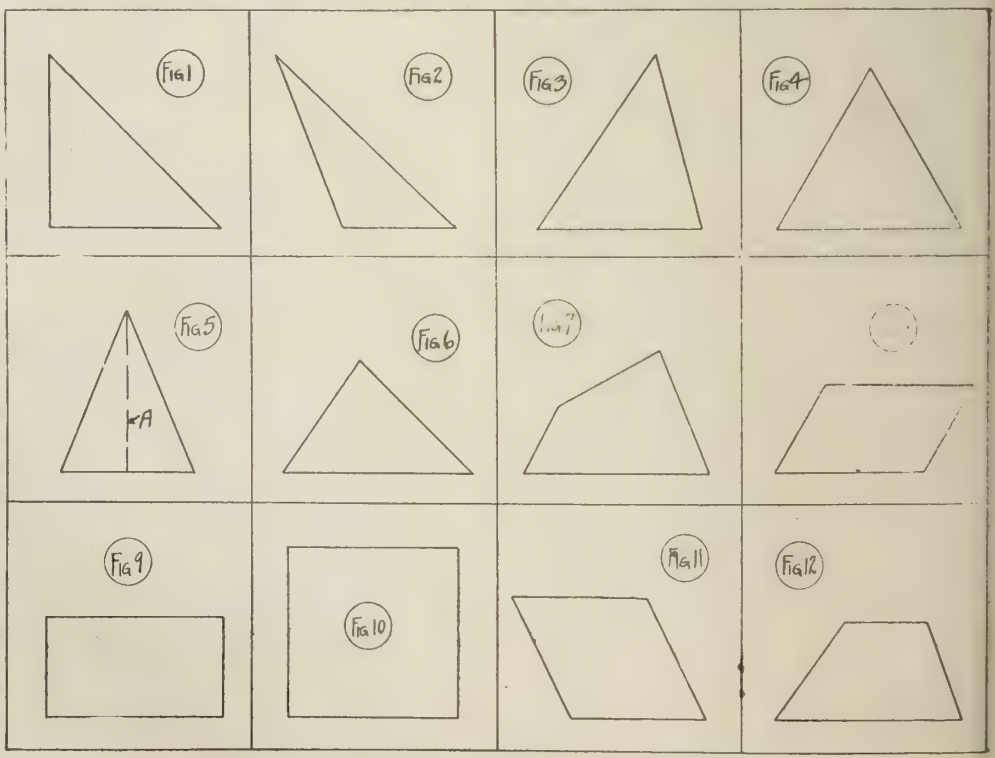
Instructions For Plate 5

Problem 1.—To construct an equilateral triangle, one side being given.

Draw A B 2¾ in. long. With A B as a radius, and A and B as centres, describe two arcs intersecting at C; join CA and CB. The result being an equilateral triangle.

Problem 2.—To construct a parallelogram when the sides and one of the angles are given:

Suppose AB and CD to be the given sides, AB 2¼ in. long, CD 1¾ in. long. Let E be the given angle. Draw FG equal to AB and draw GH, making the angle with FG similar to the angle E.



FIGS. 1 TO 12—SHOWING VARIOUS TYPE POLGONS.

Make the line GH equal in length to CD. With H as a centre and a radius equal to AB, describe an arc at I. With F as a centre and a radius equal to CD, describe an arc cutting at I; join FI and IH, when you have constructed your parallelogram.

Problem 3.—To inscribe a square in a circle:

Draw the circle, as shown, 3 in. diameter; draw next the two diameters AB and CD at right angles to each other; join these points of intersection with the circle, and in short order you have a square completed as shown.

Problem 4.—To inscribe a regular pantagon in a given circle:

Draw the circle as shown 3 in. diameter; draw the two diameters AB and CD as before; consider the centre of the circle as the letter O; bisect OB as shown at E (note: your previous plate gave this problem of bisecting a line). With E as a centre and EC as a radius draw the arc CF, cutting AO at F. With C as a centre and CF as a radius, draw the arc FG, cutting the circumference of the circle at G. The chord GC is one side of the pentagon. The rest of the construction is left to the student, for it is self apparent, the one side being obtained.

Problem.—To describe a regular octagon in a given circle:

With O as a centre describe a circle 3 in. diameter; draw the two diameters AB and CD, bisect angle AD at E, and draw line E to F; bisect the angle AC at G, then draw GOH. Join the points of intersection with the circle and you have your regular octagon constructed.

Problem 6.—To inscribe a regular polygon of any number of sides in a given circle:

With O as a centre draw a circle 2½ in. diameter. Draw the two diameters AB and CD; prolong AB as shown, making AE equal to three-fourths of the radius OA; divide the line CD into as many equal parts as the polygon has sides as shown at 1, 2, 3, 4, 5, 6 and 7. (Of course this can be any number). Now draw a line through points E and 2, cutting the circle at F; draw the chord CF, this is one of the sides of the polygon. Of course the others are easily obtained by spacing off around the circumference.

This completes plate 5. Print in Problem 1, etc., in their proper places, also be sure and print in the title, for it is all good lettering practice. Keep on sending in your plates.

Tear off and send with drawing

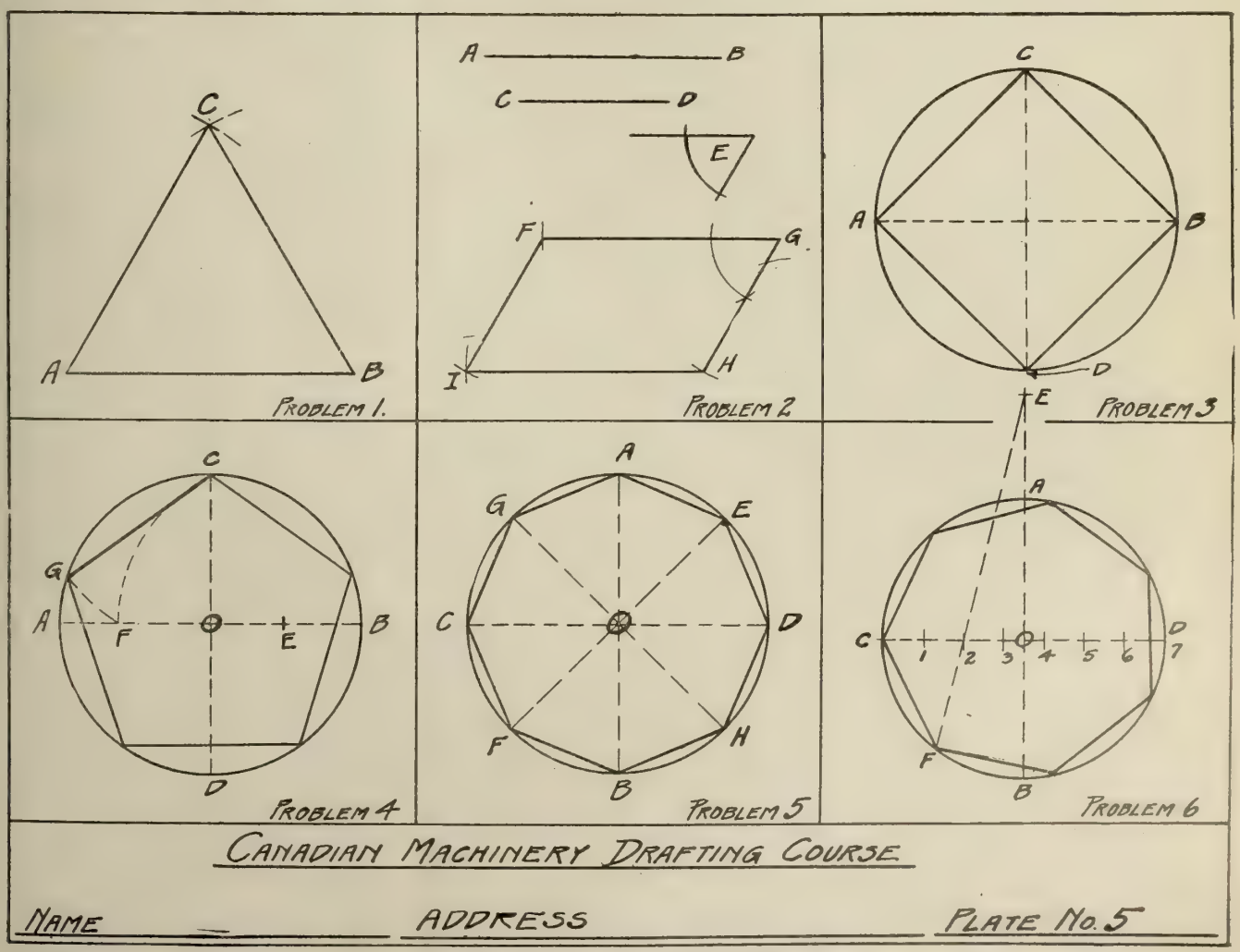
Name .....

Address .....

Position .....

Firm's name.....

Cleveland.—There is less grain in stock in elevators at the head of lakes than at this time last year. Elevators at Chicago, Duluth and Fort William were holding at last reports 43,920,000 bushels of all kinds of grain, compared with 58,800,000 bushels last year. There has been a good movement from Port Arthur and Fort William recently, and most of this has been carried in Canadian vessels.



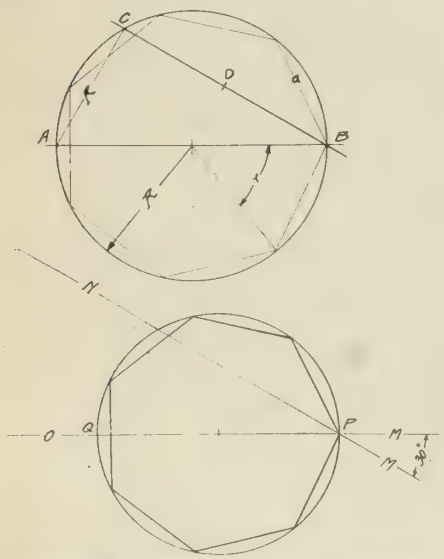
THIS COURSE DEPENDS ON YOUR REPLIES FOR ITS SUCCESS. ARE YOU SENDING ON YOUR WORK REGULARLY?

WHAT OUR READERS THINK AND DO

TO CONSTRUCT A 7-SIDED POLYGON

By Robert Hofstetter

IT IS very evident that readers of CANADIAN MACHINERY are taking keen interest in our drafting course, for from time to time we receive comments upon the same. Here, however, is not only a comment, but a suggestion well worth passing on to other readers who may care to follow up the correspondent's method in place of the one shown in our course, but we shall let the author of this suggestion speak for himself. He writes as follows:



HERE IS MR. HOFSTETTER'S METHOD.

In the CANADIAN MACHINERY Drafting Course Review I noticed on plate 5, problem No. 6, which shows the construction of a 7-sided polygon.

I take the liberty of submitting what I believe to be a simpler construction, as follows:

1. Draw a circle with a radius (R).

2. Draw a diameter of this circle (A-B).

3. From one of the intersections of diameter and circumference (A) draw a chord equal in length to the radius (A-C).

4. Connect the other intersection of diameter and circumference (B) with the intersection of chord and circumference (C).

5. Bisect the distance thus obtained (C-B) and this bisector CD or BD will be found to equal very nearly the side of a 7-sided polygon.

To show the error involved, let us assume a circle of 4 in. diameter and we will have the following relations:

A = length of side of polygon.
N = number of sides of polygon.
V = suspended centre angle.
R = radius of circumscribed circle.

$N = 7 \qquad R = 2$ in.

$V = 360 : N \qquad 360 : 7 = 51°.43$

$$A = R\left(2 \sin \frac{v}{2}\right) = 2 \times 2 \times 0.4339$$

$= 1.7356$ in. length of side.

The right angle relations check out as follows:

$\sqrt{4^2 - 2^2} = \sqrt{12} = 1.7321$ in.

an error of less than four-thousandths of an inch, or very close to two-tenths of 1 per cent.

As it happens, this process is reversible, by which is meant, that the length of the side may be given (in inches for instance) and it is required to construct the 7-sided polygon with this length of side.

The procedure would be as follows:

Draw two intersecting lines (M-N and M-O) at an angle of 30° from the point of intersection P. Step off on MN twice the length of the given side and drop a perpendicular on MO, given a new point of intersection Q. Bisecting the distance, O-P, will be the radius of the circumscribed circle for the desired polygon.

Readers can compare the method shown in our course with Mr. Hofstetter's, and use whatever method appeals to them. This interchange of ideas is just what we desire, not only in the drafting course, but on any other subject.

SELECTING AND TESTING SHOP SUPPLIES

By F. E. Merriman

SO many and rapid are the changes taking place even in quite staple goods that an article best suited to a specific purpose to-day may not fairly lay claim to that distinction a few months later. New styles, kinds and varieties of goods are constantly developed and placed on the market and so demand the continual attention of the manufacturer who would exercise maximum economy in the purchase of his supplies. Furthermore, "quality" is becoming more and more the slogan of the manufacturer and this makes many articles available for use though, heretofore, found unsuitable. This, of course, raises the question of how best to make the selection and how to keep apace with changes, for some knowledge of all improvements is essential to those purchasing.

Manufacturers and buyers are taking note of improvements and developments in their supplies and checking them against their requirements in various ways. The large manufacturer has his testing laboratories and corps to keep him informed of the value of these things, others ignore them and stick to past practice; but many cannot afford the first and are unwilling to follow the other policy. To the manufacturer unable to have a laboratory there are other less expensive, and often equally as efficient, methods open. It is the purpose of this article to discuss a few practical instances of simple, inexpensive, but reliable comparisons of articles and goods of common use in manufacturing plants.

Belting is a material in common use in factories; but concerning the merits of the various kinds there is much prejudice, diversity of opinion and experience. There is, first of all, leather of various makes, tannages and methods of manufacture. Again there are belts which are of woven material and impregnated with various substances, also rubber belts, all having their uses and successful installations. Regarding their relative merits for a particular plant no general conclusion can be drawn, for every plant has a variety of drives and operating conditions to which certain kinds of belting are much better suited than others. The fallacy of expecting to use one kind of belting throughout a factory needs much emphasis, for it is a very common error. Many can be found who will say and believe that leather, or some other particular kind of belting, is the best for all purposes. It is well known high speed steel is better than carbon tool steel for certain places and conditions, but no one would think of recommending it as the best for every purpose. The same is true of beltings, they will have their application. This short discussion has shown that to properly select belting we must first of all understand the general characteristics of the various kinds available. This, of course, calls originally for some kind of a trial and there is none better than a practical application to the various types of drives about the factory. To determine what these types are, requires some knowledge of the factory and some analysis. To illustrate the idea, there are drives where rubbing

occurs, due to belt shifters, drives where the belts run over small pulleys, belts with idlers and tighteners, high or low speed belts, vertical belts, horizontal belts, long and short centre distances between driver and driver pulleys, high and low powered belts, wet surroundings, greasy drives, etc., all common to nearly every factory. All these conditions call for certain common characteristics in belts and qualities necessary for a certain drive may not be at all essential to others. A little study shows what the most important characteristics are. For example, a belt where a shifter is used must successfully resist rubbing on the edges, small pulleys are more destructive than large, because they bend the belt to a greater extent. Excessive moisture or oil, when present, increase the tractive difficulty as do short drives. The horizontal drive is easier than the vertical drive. A practical belt test under such conditions discloses its characteristics in these particulars. It shows that leather resists rubbing on the edges better than belts from woven materials. Also under certain greasy conditions leather will not always do as well as certain other materials.

To obtain a reasonable idea of the value of various kinds of belting need be neither expensive nor yet long drawn out. Drives selected for test should be of sufficient difficulty to disclose the merits of the tested material in a short time. Such a test, when the material fails, often discloses characteristics valuable and sometimes superior for other applications. A brief trial or two of this kind usually furnishes the information necessary to determine where further tests can advantageously be made. Drives where trouble is found often furnish suitable places for a trial. In this connection a warning may well be sounded against too severe a test, for really good material has sometimes been condemned by senseless and unreasonable tests. Common sense is as necessary here as elsewhere.

An illustration of the knowledge gained from a test of this character will be of interest. The drive was from a main line to a countershaft. Considerable power was transmitted and, due to the presence of a clutch, considerable oil was present. It was considered a difficult drive. Oak leather was the initial belt and afterward two woven belts were used on two similar drives with very close to the same conditions. One of the trial belts was of woven material folded to make several plies and finally stitched together and impregnated with a waterproofing substance. The other was woven to the desired thickness in one ply. The results were as follows: The leather belt became saturated with oil and then lost its tractive capacity; the folded and stitched belt ran successfully until the outer ply wore out, including the stitching, the plies then separated and the destruction of the belt soon followed. The third belt was still running in good condition long after the others were useless. It was found that the second belt carried the drive as long as three leather belts and not as long as the third trial belt. The leather belt, however, had a reclaim value not possessed by the woven belts.

Cost of 3 leather belts	$24.62
Reclaim value	14.77
Belting cost	9.85
Cost of folded belt	4.78
Saving over leather belt	5.07
Cost of single ply belt	3.51
Saving over leather belt	6.34

The lesser risk of shut down in the case either of the two belts tested was of considerable value and a still larger balance in their favor could readily be shown.

The success of the instituched belt in this trial suggested its use for a spindle drive on the radial arm of a large drill press where, due to a poorly arranged oiling system, much oil was present. This made it a difficult drive for leather belting. The trial belt here was a success, though the life was not great, due to the destructive effect of the small pulleys used.

Another installation, a wet grinder, proved a leather belt of special tannage, superior to anything else, for it had long life and excellent driving power, notwithstanding the large amount of water present. The other belts were less successful under these circumstances.

These tests all required some time and attention, but most of this was furnished by the millwright foreman, who was easily interested in making the tests. In fact it was the interest on the part of this foreman which was instrumental in carrying the test to a successful conclusion in each case. The point of greatest interest is, however, the fact that the tests were made with no interruption of regular factory operation and at practically no expense. The results were worth many dollars to the firm.

One of the much-mooted questions in many factories is the question of a proper cutting lubricant. Many hold there is nothing equal to a good grade lard oil. Others, however, find an advantage in the use of other fluids. Due to the many variable conditions present such as the operator's opinion, the quality of the cutting tools, the grade and condition of the material worked, etc., definite comparisons of performance are not readily set up. However, an analysis of these conditions will point out what may be called a typical job on which the cutting fluid may be given a trial. The result of such a trial will demonstrate in many instances the value of the goods not only for the job, but also for the usual run of work.

In a certain instance turning and threading nickel steel bolts was selected. A very good thread was required and the work was to fairly close limits. It was found that the behavior of the chasers and the finish of the thread furnished a reliable criterion of the value of the cutting fluid. Based upon this test quite a large saving was effected in the cutting fluid costs and a better quality of work resulted. The deterioration of the machinery and tools was also considerably less.

These instances suffice to indicate the importance of selecting the place and conditions of test before making trial of the goods. The trial should be selected in such a manner as to afford as clear cut a comparison as possible of the materials tested and as wide application to other conditions as may be practical. In fact this initial selection is of the greatest importance. Tests on a large scale are necessarily expensive, often cause much interruption and frequently afford no tangible results. Restricted tests wisely selected and interpreted can usually be made to afford sufficient information for all practical purposes.

By such methods and principles of trying out and selecting the many kinds of supplies used in every factory may be purchased to an increased advantage.

READERS, ATTENTION!

Every week that you read these pages, is there not some stunt or idea that crosses your mind, some scheme you used with good success in your experience? Of course you think of these things as you read the various devices shown in this section, but—it's a big one—do you follow out your thoughts by sending us in your ideas? If you do, well, you're one of the wise ones. If you don't, there is something wrong. We pay good space rates for acceptable material and are always glad to consider your work. Granted that you may not be much of an artist, but send us a rough sketch anyhow; we will do the rest. Once more let us repeat: "Send us your work for consideration."

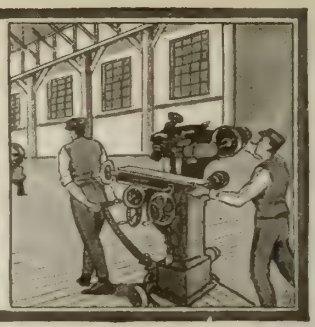
ALUMINUM WELDING A LARGE HOLE

The "Journal of Acetylene Welding" says that when the welding of a large hole is required a chill of galvanized iron is provided, backing up the hole and welding against this when filling the hole with aluminum. Galvanized iron is preferable to any other material, such as tin or iron, since it peels away from the aluminum quite readily, and can therefore easily be removed after the weld has been completed. This is undoubtedly due to the zinc content of the galvanizing composition.

The chief value of the use of the chill is that it causes the filler to cool and harden prematurely, thereby preventing it from contracting after the weld is finished. It also prevents the heat of the weld from spreading, which might cause the job to crack back.

The chill causes the added metal to cool almost as fast as it is connected to the edge of the break. After the weld has been finished and cooled, the chill can be removed by gently prying it away from the weld by means of a cold chisel.

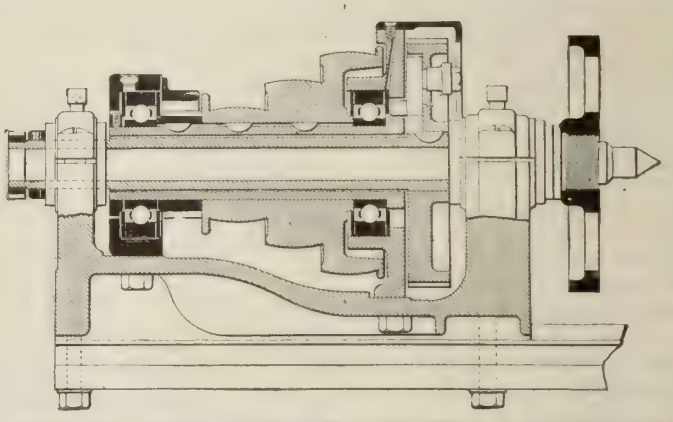
DEVELOPMENTS IN SHOP EQUIPMENT



FLATHER 7-IN. MANUFACTURING LATHE WITH BALL-BEARING CONE

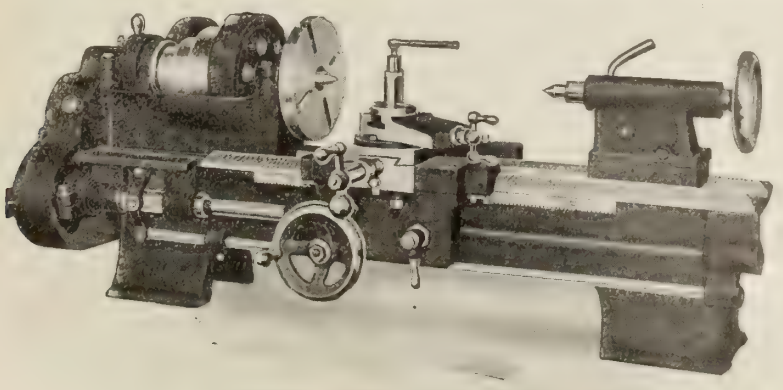
The Flather Manufacturing Co., Nashua, N. H., is now marketing a new 7-in. manufacturing lathe that has unusual features in that the cone is mounted on a set of ball bearings, while the spindle is of the floating type mounted on separate bronze bearings. Fig. 2 shows the design of the headstock. The machine is a manufacturing lathe and has been designed to supply the demand by manufacturers and toolmakers for a standard, rigid, compact, high-speed, screw-cutting engine lathe for accurate work within its capacity, which is about 8 in. over the ways and 15 in. between centres, with a bed length of 36 in. The bed is broad and deep, is braced with cross webs and has bench legs cast integral. In case it is desired to use the machine as a floor type, it can be bolted directly to a pan and legs that can be supplied. All beds are planed and scraped to receive the taper attachments, which are interchangeable on any of the machines.

The headstock has long bearings on the bed and is webbed. The spindle is of high-carbon steel with a ¾-in. hole bored through to accommodate a draw-in chuck with collets up to ½ in. in diameter. The front end of the spindle is reamed to a Morse taper. The spindle bearings are of special bronze, and the cone, which runs on its own ball bearings, is for a 1¼-in. belt. This cone is mounted on bearings held in separate housings from those carrying the spindle boxes. This method of construction allows the spindle to run freely and takes all belt pull off the spindle bearings. Pack gears are provided, the ratio being 7 to 1.



SECTIONAL VIEW OF HEADSTOCK SHOWING BALL BEARINGS.

The carriage and apron are heavy, the carriage being arranged with long bearings and felt wipers. A feed stop is incorporated that can be set for any length of feed, this stop automatically disengaging the feed clutch when the required length has been reached. The lead screw is held by a middle bearing on which the step nut acts, leaving the screw free at the back end for expansion and contraction. The nut is of cast iron, and is operated by a cam milled to allow the nut to be closed firmly on the screw. The cross slide is graduated for adjusting the compound rest and the cross-feed nut is so arranged that it does not have to be disconnected when using the taper attachment. A countershaft of the two-speed, double-friction type is furnished and is operated by double toggle joints.



GENERAL VIEW OF FLATHER 7" LATHE.

JOHANSSON GAUGES AND FIXTURES

After an absence of thirty-five years, C. E. Johansson has returned to this country, bringing with him from his Eskilstuna factory in Sweden some special precision instruments to supplement and broaden the scope of his standard blocks, which are marketed here by C. E. Johansson, Inc., 245 West 55th St., New York City.

The set of angle blocks shown in Fig.

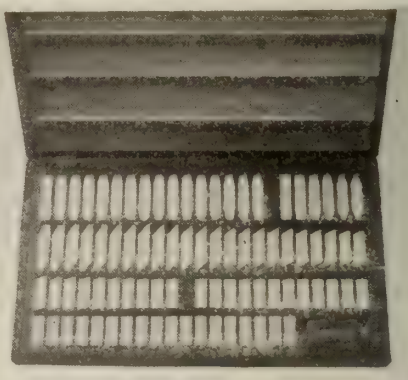


FIG. 1—THE COMPLETE SET OF ANGLE BLOCKS.

1 is probably the one of these new instruments which seems to have the widest field. This set is about the same size as the standard set of size blocks, but each block, instead of having parallel edges, has each of the four corners beveled off at a different angle. The angles have been so worked out that combinations from 1 min. of arc to 270 deg., varying by minutes, are possible. These blocks can be combined with the regular size blocks for making gauges for angular formed cutters, checking sine bars, etc.

Another set of blocks, Fig. 2, is of more interest to the scientist than to the manufacturer or toolroom foreman. The set consists of 11 flat size blocks claimed to vary by equal amounts from

0.100000 in. to 0.100010 in. As to just how one would use these blocks so that they would not be affected by the warmth of the body of the operator does not seem very apparent, but the scientist who may use them will undoubtedly devise a means.

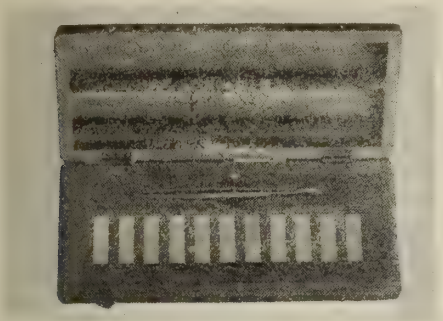


FIG. 2—A SET OF BLOCKS OF PARTICULAR INTEREST TO THE SCIENTIST.

Fig. 3 shows a laying-out and locating fixture for use in combination with Johansson size blocks. The two movable beds are shifted by accurately cut screws ending in the large knurled nuts shown, and the size blocks are inserted between a carefully finished surface on the lower table and plug in the upper one. This fixture lends itself to a variety of uses in the shop and toolroom where quick and accurate work involving close measurements is to be done.

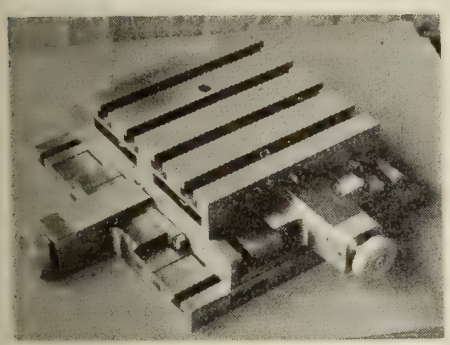


FIG. 3—A LAYOUT AND LOCATING FIXTURE USED IN CONJUNCTION WITH JOHANSSON SIZE BLOCKS.

"FULFLO" REVERSING PUMP

The Fulflo Pump Co., Blanchester, Ohio, has just placed on the market the reversing centrifugal pump illustrated. Its design includes the prime-retaining, non-clogging features of the other pumps of this line with the reversing feature in addition.

The ability to reverse the flow of water or coolant through the pump is obtained through the design of the impeller blades and the introduction of a bronze deflecting gate in the discharge passage. As both openings are at the top of the pump it is always primed and will immediately start the flow of the liquid in either direction, depending on the direction of rotation of the driving pulley.

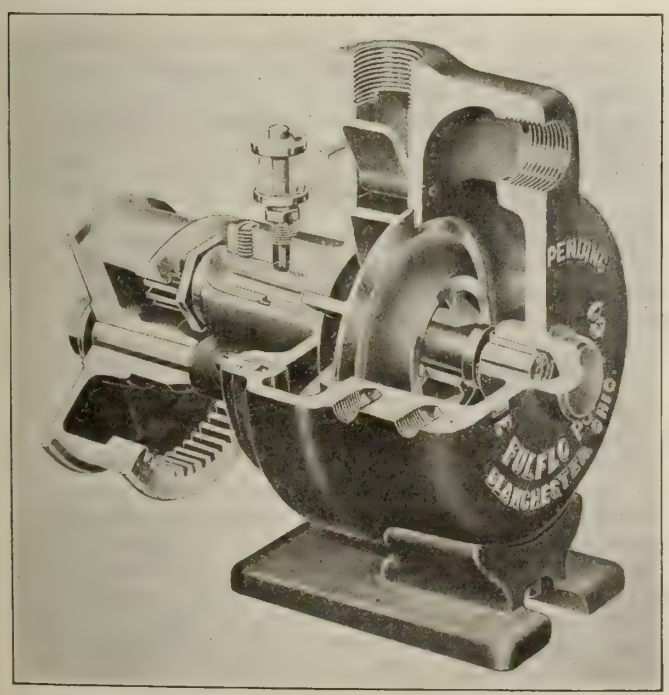
The pad for mounting the pump is detachable and may be located in any one of three positions at 90 deg. to each other. It is fastened by two flush-head screws.

As regularly furnished with ¾-in. pipe, the pump has a capacity of 15 gal. per minute with a 15-in. suction lift against a 4-ft. head at a pulley speed of 450 r.p.m. When equipped with 1-in. piping the discharge can be easily increased. Variation of the pulley speed naturally varies the output of the pump.

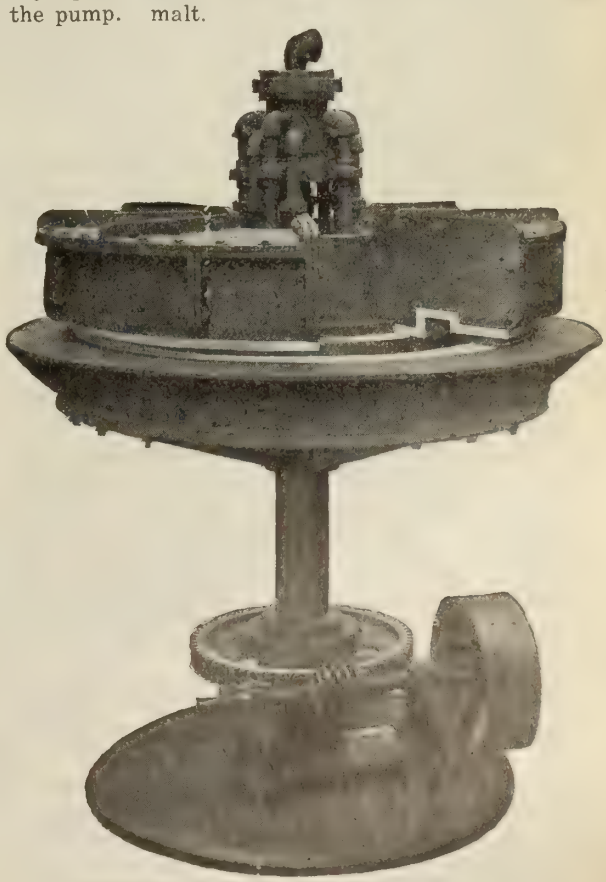
STANDARD ROTARY END-HEATING FURNACE

The rotary end-heating furnace shown in the illustration is a recent product of the Standard Fuel Engineering Co., 1646 Woodward Ave., Detroit, Mich., and is intended for heating for hardening the ends of tools and other steel parts in which a local application of heat is desired. The lower part of the furnace body consists of a revolving table on which the pieces to be heated are to be laid, the ends projecting into the heating chamber. The operator stands in front of the furnace where one segment of the heating chamber is removed and deposits the pieces to be heated on the table and removes each piece as it emerges from the furnace after its rotary travel around the heating space. In the illustration the driving mechanism is shown at the front of the furnace in order to show its construction, but this is turned around to rear out of the way when the machine is in use. Small tools or other pieces of steel may be heated all over by placing them on that part of the hearth that travels through the heating chamber. The heating chamber itself has a vertical cross-section of 4 in. wide and 4¾ in. high, and the height of the opening through which the tools project into the furnace is 1¼ in. The height to the table is 36 in. and the cutside diameter of the machine is 45 in.

Site for New Dock.—The Federal Government have located a site for the new dry dock they are going to build in Esquimalt. The negotiations have been extended over several weeks, and the position chosen is Skinner's Cove, Esquimalt.



SECTION VIEW OF THE FULFLO REVERSING PUMP.



GENERAL VIEW OF THE FURNACE.

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Canada Should Take Notice

THE strike fever that has seized United States may bring home to Canada a lesson that must be learned, namely, that this country must become more self-contained. Should the coal strike become serious, we will suffer, and the steel strike has already gone far enough to look dangerous to Canadian industry.

When things are going well we are too apt to regard it as a very easy matter to bring steel and coal across at a price that is hard to overtake here. As things are shaping at present, industrial Canada is liable to become indirectly the victim of all the agitations carried on by the foreign labor leaders in United States.

Having our supplies of coal and a great deal of our steel at the mercy of the radical labor element in the States is a condition that, in view of the great resources of this land, we cannot face with any degree of complacency.

Were soft coal shut off completely, United States would suffer more industrially than Canada by reason of the great advances made here with water power development. But we are still in the market for U. S. coal, as the records of our imports show. For twelve months, ending March, 1919, we imported in coal, coke and charcoal a total of 78,913,921 tons, and every bit of this, with the exception of 2,824 tons, came from United States.

To get some idea of the amount of finished steel and iron coming to this country, the Government reports for twelve months, ending with March of this year, show an importation of 5,376,931 tons of plate.

In sheets the tonnage from United States amounted to 6,058,316 tons.

Of pig iron approximately 2,000,000 tons.

Angles, beams, etc., for ships, 8,324,780 tons.

These items are only a few, taken for the sake of showing the extent to which this country depends on the coal mining and steel and iron making industries of United States.

The growth of labor trouble in United States, where there is such a large percentage of foreigners in these basic industries, makes it increasingly urgent that Canada should think seriously along these lines.

If this country, as well as suffering from its own labor troubles, is going to become a fellow sufferer every time the labor leaders of United States call "strike," it is high time we laid our hands on our own great natural resources, and seriously undertook the task of discounting the great distances that at present separate our coal and ore bodies from the industrial sections of Canada.

The Strike of the Miners

THE spectacle of half a million miners quitting work on the eve of winter because they failed to make a new agreement with the operators is mighty poor entertainment.

The miners and operators were in conference for four days, during which the chief pastime was getting an alibi ready when it came to fixing responsibility for freezing the public.

The man who, in the long run, pays the shot for the outcome of all these wrangling and talkfests is the consumer.

The present strike is just another of "the public be damned" incidents that are becoming so common as to excite no comment.

As far as the consumer is concerned, the miners and operators have made one fine mess of coal mining in Western Canada and in the regions across the border.

We are fast approaching a state where the little man, the consumer, will be told in trombone tones, when he mentions his rights as a citizen, "You aint got any."

Apart from that it looks as though the troubles of the United States were far from settled.

Their production is bound to suffer in all lines. Whether some mild form of Bolshevism has gained a footing is hard to state. But to be honest and blunt, it looks like it.

The Use of Time Clock

WHEELS move within wheels. A few years ago when nine or ten hours was the day's work, time clocks were usually at the entrance to the factory, and anything from three to five minutes from the various departments.

With the coming of the eight or seven and a half hour day, these clocks have been moved and multiplied and the rule is, in most cases, that actual operations shall start at the time when the employee used to enter the shop.

The sale of time clocks has grown enormously with the shortening of hours, due to a desire of the management to combat the tendency toward decreased production by securing continuous effort every minute the man is in the shop.

The use of time-recording instruments is fair to all concerned. They save many a squabble for the timekeeper, and they are now made with such precision that their record can be accepted without question.

Back to Standard Time

STANDARD time is having its innings once more, much to the relief of all concerned.

There are cases where the change works advantageously, and there are cases where it will not work at all.

On the whole, it is hard to see where there is enough advantage to warrant the change.

It has yet to be shown that we can make any great improvement in affairs by tinkering with the clocks.

There are numerous cases where the same end can be achieved by buying an alarm clock and being about early in the morning.

There are plenty of things a hundred times bigger for the Federal House to bother with than having a session at clock tinkering.

The Gold and the Dross

PARTICULARS of a will probated in an Ontario court were published, along with others, a few days ago. There were a number of so-called securities left to the widow and children. To look at the lot it might be supposed that they represented a fairly good living for some years to come.

But get under the surface. They were doubtful industrials, a few mining stocks, cash in the bank and some Victory bonds. The total in figures of the stocks looked big beside the size of the Victory bond holdings, but in actual worth the investment in bonds was worth more to the family in trouble than all the others combined. They were of doubtful value. They might have been bought with the idea of a quick sale, but the man who was going to attend to this had been called, and no one knew his plans.

But there were the Victory bonds. They were just as good with the purchaser of them away as with him there to look after them.

That is the big point in the Victory Loan campaign that is on now. Every cent gets you something real. Something that has more security behind it than a first mortgage, or a municipal or bank bond. It is such a good investment that all that is necessary is that it should be offered to the Canadian people. The chance to "get in" on such a security does not come often to the small investor.

A Mighty Poor Exhibition

UNITED STATES authorities have a small conception of the use of police and militia, when they call on them to stand guard while a grand opera company bawls out a few scores of German song in New York.

Mounted police charged a crowd that threatened to clean out a playhouse in New York where some of this German gibberish was being staged.

In the fracas that followed one man, a sailor, had his head split and was rushed to the hospital in dying condition.

All honor to the U.S. troops that had their heads split in fighting to keep German civilization from sprawling itself all over Europe.

But there's no honor in calling out U.S. cops to crack heads so that German songs may be sung in a land where homes are saddened by the acts of German murderers at sea.

If United States cannot get enough songs sung to it without dabbling in German songsters, let United States go empty for song.

The spectacle of U.S. police battling indignant citizens in order to protect German opera in New York is a mighty thin and white-livered sequel to hang up against the bravery and devotion that U.S. men showed on the Western front.

National Salesmanship

IF Canadian manufacturers are to get into the markets of the world, their products must be better known than at present.

Inquiry made by CANADIAN MACHINERY of many large firms of importers in Australia, South Africa, Sweden, etc., brings out the information that Canadian products are not well known. The answers received contained the admission in several cases that the firms were not familiar with lines made in Canada.

It would be of more assistance to Canadian export trade to have the Trade and Commerce Department give some help in this direction than to have tariffs heaped on until they were in the prohibitory class.

There is a big opening in the world to-day for many things Canada can make, but people in South Africa or Australia, or in a dozen other parts of the world are not going to trot over this country and wander from town to town finding out what we want to sell them.

Canada needs an injection of national salesmanship more than she needs anything else in the way of industrial encouragement from the Government or any of its branches.

A Joyful Thought

There is a keen, a subtle joy, in autumn's cooling clime, that makes it quite a pleasure to tear off yards of rhyme. We sing no more of summer days, of rivers or of lakes, of squattin' on a piece of rock just where the breaker breaks.

Nor yet of strips of wooded land, of cottages nor camps, with a hundred bugs and spiders and a dozen kinds of ants.

Begone such things, there, flee away, you're but a memory now—likewise the country scenes as well of piglets and of cow. We think of sterner things this month, of taxes and of coal, there's window sash and double doors to rend and vex the soul.

And underwear as thick as pie, it costs like silk and plush, to cover up the system from the snow flakes and the slush. But let us sing in joyful way, oh cheery be our tune—and blast it out at morning time, and then again at noon.

While seasons come and seasons go, there's recompense for each, the spring time has its budding tree, the fall its squash and peach. But, ah, to us, the thing that is of all things wondrous fine, concerneth not the things we see, nor things on which we dine.

We blush almost with modest joy to mention this here thing, of which we're moved upon this day to versify and sing. But when the warming rays of Sol get on their northern slants, your winter coat will cover up the patches on your pants.—ARK.

AN ITEM appears in a contemporary, stating that the construction of a steel ship of 6,500 tons is about to be commenced in the Three Rivers shipyard. This vessel is claimed to be the largest steel ship ever built in a Canadian shipyard. This is not the fact. There have been a number of steel vessels built on the St. Lawrence and on the Pacific coast of Canada much larger than this, while contracts have been let for steel ships of 10,500 tons, and the keels actually laid. We are speaking, of course, in terms of deadweight, and we take it our contemporary is using the same measurement. If, however, they are speaking of tons gross, the vessel will not be the largest ever laid down in Canada, as the deadweight capacity would only be 9,700 tons, as against 10,500 tons being built in Nova Scotia.

MARKET DEVELOPMENTS

Shipments from Strike Zone Are Not Good

In Some Lines No Material Has Come Across for Several Days—Premiums Are Being Secured by Some of the Jobbers Who Have Material on Hand—Scrap Markets Are Uncertain

ALTHOUGH it is claimed by the steel mills of United States that the strike there is being broken, and that gains are being made in the list of the mills producing, it can be said that the result is not to be noticed in the shipments that are coming across the line. Of course, there are cases where delivery is fair, but in others the material is not in sight. Warehouses have been cleaned out of several lines, and it is not an uncommon thing now to hear of premiums being paid for certain much-wanted lines. In particular these are sheets and plate, one warehousing firm stating this week that they did not even have a piece of galvanized iron that they could hand over to a good customer as a sample. When it is stated that for the year ending with March of this year this country imported 5,376,931 tons of plate from United States, it is easy to see that a fifty per cent. interruption in such a volume of business for any length of time is going to run into a lot of material. This volume also represents actual requirements, as there has been very little material purchased in this country for stock purposes in the last few months.

The big steel companies doing business in this country seem to have set their faces against any increases in prices, and when this takes place it is after the jobbers have secured the material and are reselling. Another feature that tends to aggravate the situation is that when mills that are operating get hopelessly booked up they withdraw from the market, thus making it harder to get any responsible place to take business with any chance of delivery. First quarter 1920 selling is going on here with the distinct understanding that deliveries are subject to strike conditions.

Machinery sales are holding up well, but nearly all are to be traced to the auto industry, or to interests that have taken contracts for the production of parts. One standard line of lathes this week notified the trade of a ten per cent. increase, bringing the machine to above the war prices.

Uncertainty seems to settle on the scrap metal market. Coppers are not showing strength, probably because second quarter 1920 copper is quoted now below present figures. Some material is coming from the Old Country to Canada for resale in United States.

SHIPMENTS OF MATERIAL HAVE NOT BETTERED AT MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, Que., Oct. 29.—The local situation has reflected the near approach of the Victory Loan campaign, and also the fact that the Prince will spend the current week in Montreal. These incidents have not interfered with the regular run of business, but the interest displayed has detracted from other matters. The general undertone, as gathered from information obtained from dealers and manufacturers, is one of gradual improvement and increasing activity. There is a steady demand for many commodities, and although the requirements are not always large, the movement is steady and regular, in most cases. The inquiries for used equipment is gradually falling off, largely because the supply is decreasing. Sales of new material are becoming more pronounced. The factor of the delivery is an interesting one, as delays are frequently experienced when goods are brought in from the states. While we are given to understand that the situation, as regards the steel strike in the States, is improving and that mills are operating close to normal, there is nevertheless an atmosphere of uncertainty surrounding the steel market. While the situation here does not seriously reflect the curtailment of steel that must have resulted by the shut-down of the mills, the reports would imply that the situation is not yet entirely satisfactory. It may be true that the production is ample to meet the demands, but in such cases as tubes and sheets, the delivery to local dealers is still of uncertain character.

Unchanged Metal Market

There is little to report in the metal situation, other than that a steady business is still carried on, but of light volume. The strike of steel workers has had a little indirect influence on the metal market but this is becoming less pronounced. The general demand is for small regular supplies, and quotations are firm and unchanged. (Through a printer's error, last week's metal quotations were not altered to conform to the changes mentioned in the Montreal letter.)

Machine Tools Moving Steadily

The machine tool situation is much the same as that of the past several weeks, with the general sales of fair volume and wide distribution. There appears to be less used equipment available just now, and in many respects the current demand leans more to new tools. One feature of present activity is the demand for different size motors, much of which is for used machines. In one instance a local firm made a sale in the neighborhood of $15,000 for used motors and generators. Tool dealers are favorably impressed with the movement of equipment and are generally optimistic on the possibilities of winter business, many believing that the coming year will develop an extremely good demand for every class of machine tool equipment. There is a good demand for supplies, but in some regards the maker may be classed as a competitor of the dealer, as the manufacturer in many instances are selling direct to the consumers, so that the dealer must be content with smaller profits when making sales.

Scrap Moves Moderately

Little activity has been apparent in the movement of scrap during the week and dealers reports are to the effect that the bulk of present buying, which in the aggregate is comparatively light, is of a conservative character, as few future sales are recorded. Local foundries are steady purchasers for small regular supplies. The market may be qualified as nominal, and price quotations are more of a guide than to the actual figures that would apply for a definite sale. The prices quoted, however, are a fair average of what the dealers will offer.

SHIPMENTS DO NOT SHOW IMPROVEMENT

And Firms Depending on U. S. For Raw Material Are Having an Anxious Time

TORONTO, October 29.—Although very few complaints have been made openly so far, it seems increasingly certain that the United States steel strike is going to result in stinted supplies for certain important Canadian factories. Shipments are coming through very poorly, and the stocks in this country are not in shape to provide anything like a reserve to draw from.

There is a nice volume of business going in nearly every department. Warehouses (where they have the material), machine tool and small tool dealers, and scrap metal yards are handling a fair amount of trade in spite of the fact that shipment to United States points is largely held up.

The Steel Situation

There has been a great buying movement in this corner of Canada for the last three weeks or so in the lines that are usually carried in the warehouse business. The prospects of the strike coming on created something like a small panic. For a long time before that there had been no haste to get into the market, although dealers and mills advised the trade many times that nothing at all was going to be gained by staying out to look for better prices. The result was that stocks were low when the strike came, and there was an immediate rush to gather up anything that was available. There could be only one result, and that has come to pass, viz., many of the warehouses now have little or nothing to offer to the trade.

The gains of mills turning again to production in the strike zone are very slow. Those mills that have been operating steadily have been smothered with an avalanche of orders, so large that in many cases they are now withdrawing from the market, leaving the would-be buyer with no place to put his business. One Toronto concern tried several times to have business transferred from a booked-up mill to one that might take on more orders, but was unsuccessful.

"There has been a tremendous warehouse trade in the last four or five weeks," stated one of the dealers to CANADIAN MACHINERY to-day, "but the trouble comes now when we want to buy for our own stock, we can get nothing at all."

A very fair shipment of boiler tubes arrived this morning. They weer assorted sizes, from two to four inch. They have been much wanted for some time, and their arrival was none too soon.

It is the opinion of several very close to the trade that the shortage of supplies is certain to be felt in some circles before very long. Automobile, shipbuilding and agricultural industries are doing a lot of buying just now, and it is only natural to suppose that they will be among the first to feel the results of the trouble across the line.

Stocks of sheets are practically cleaned out. Gauges such as 14 and 16 are wiped off in some of the warehouses in Toronto.

"How about galvanized?" queried CANADIAN MACHINERY.

"We haven't a sheet that we could give you as a sample," was the prompt and emphatic reply.

As a matter of fact the filling of orders is a matter of some difficulty just now, and transferring of odd lots of stock from jobber to jobber is being done at more or less of a premium. It is another case where the price has not very much to do with the business at all. It is more a case of getting the material than haggling over the price that is to be paid for it.

Reports seem to differ as to the amount of material that is coming through from the mills in the strike zone. Some places the reports are that for almost a week now they have not seen a shipment of sheets or plates getting across, nor can they find out that they have anything on the way. In other places the reports are more encouraging, and the claim is made that the amount of material coming across is showing an increase. Advices indicated that a considerable tonnage for Canada has been rolled but cannot be sent away from the mills on account of the shortage of labor necessary to load the material.

Business that is being booked now for first quarter steel is being made very plainly subject to strike conditions by the sellers here.

POINTS IN WEEK'S MARKETING NOTES

The United States coal strike, if not prevented, will mean a shut-down for many of the Canadian as well as U. S. plants.

—

Japan is buying machinery for making automobiles in that country.

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In New York one dealer took in thirty used lathes and sold them in a week.

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Delivery is of greater concern than price in machine tools at the present time.

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Shipments of sheet and plate coming to Canada are not improving, and a shortage of raw material is anticipated.

—

Recovery in production at the U. S. steel mills proceeds very slowly, and many mills that are operating become so booked up that they have withdrawn from the market for the time being.

The Machine Tool Market

Canadian machine tol men who have been through the shops of several machine tool builders in the United States report that in nearly every case they are booked ahead. Stock orders are practically unknown now, and deliveries are not improving. They are as a general thing from one to two months off. The interests in United States that are doing the bulk of the buying are following closely the same lines as in this country, and are headed by the automobile business.

One of the standard lines of lathes has announced a 10 per cent. increase, but otherwise prices are holding at the same mark that has been quoted previously. Dealers and salesmen are hoping they stay there for a time.

The movement in used machinery is brisk, and a fair stock of these, which have been rebuilt and overhauled, are arriving in some of the warehouses in the city.

The Scrap Metal Market

Coppers are not showing any particular strength. In fact there is a decided uncertainty in the whole situation at the present moment. This is probably due to the quotations that are given in New York now for No. 1 standard ingot copper for second quarter of 1920, for 21½c. Trade must look for cheaper markets and plentiful supplies, else that quotation would never have a chance to be made. This has a tendency to flatten out business in the scrap market in these lines. Lead is fairly strong, spelter is holding about the same.

Conditions are rather chaotic in the scrap market for the moment, and it is only fair to say that the figures given in our price list are more or less nominal. Some buyers might be willing to take on anything in the list at the price, while in other places the same offerings would be discounted. The strikes and the general feeling of unrest in United States keeps the buyers there out of the market, although it is a fact that some tonnage is now coming from the Old Country to Canada, and from here sold to United States.

The whites are strong in the market now. Stove plate and agricultural scrap are wanted, and the chances are that there may be an improvement noted in the prices that will be paid for some of these latter lines.

ONE DEALER DISPOSED OF THIRTY USED LATHES INSIDE OF A WEEK

Special to CANADIAN MACHINERY.

NEW YORK, Oct. 30, 1919.—Pending and threatened labor troubles have not had much effect upon machine-tool trade. Some sellers, however, note a slight falling off in inquiries during the past week. The bituminous coal strike, called for Nov. 1, if not prevented by the Government, will result in the closing down of many industrial plants, and it is to be expected that this will cause some hesitation in buying. The best deliveries that can be obtained on many lines of machine tools are from two to four months, so a considerable part of present business is being placed so as to insure delivery at a time when industrial skies presumably will have cleared.

The General Electric Co. has bought considerable new equipment for its Lynn, Mass., plant and is about to close on about tools for its Schenectady works. A new list will be issued by this company soon covering complete equipment for a new shop at Schenectady. The E. W. Bliss Co., Brooklyn, N.Y., manufacturer of presses and other sheet metal working tools, has been a large buyer, its purchases totalling from $300,000 to $400,000. Among its requirements were about 15 heavy planers, also slotters, boring mills, etc. One large planer cost $40,000. The American Car & Foundry Co. is in the market for a considerable amount of equipment for its various plants. Purchases are being made from the company's New York office. The New Departure Mfg. Co., Bristol, Conn., a subsidiary of the General Motors Corporation, is starting to buy on a list of several hundred tools.

In the export trade comparatively little is being done. Some orders have been placed for Japan, notably for an automobile manufacturing plant in that country. European business, however, is almost at a standstill owing to the exchange situation, and exporters continue to hear of sales of German tools in Europe at prices with which American builders cannot compete. Germany derives an advantage, of course, from the low value of the mark.

Second-hand machinery business is very good, and the amount of such equipment that is being absorbed is somewhat surprising. A dealer in used machines a few days ago purchased 30 turret lathes and had disposed of them in different parts of the country within a week.

Prices have not changed within the last few weeks. Buyers now pay very little attention to price, delivery being the chief consideration. Machine-tool sellers who can make the best deliveries are, as a rule, getting the business.

ORDERS FOR STEEL ARE PILING UP AND PREMIUMS ARE FREQUENT NOW

Special to CANADIAN MACHINERY.

PITTSBURGH, October 30.—The rate of recession of the iron and steel strike continues to be a very slow one, though it has improved a trifle in the past week or two. While production was down to about 50 per cent., taking the steel industry as a whole, at the middle of the first week of the strike, it is now, after five weeks of strike, fully 60 per cent. Gains of two or three per cent. a week, however, are very small, considering that the strike, through its own efforts, never had a chance of winning when the first week showed that it could not close more than half the industry.

There has been a theory that the strike was being kept going by hopes of intervention from Washington. If so, that hope must now be gone. The Senate committee on education and labor, which investigated the strike, concluded that the strike was almost wholly by the foreign-born, ignorant of the language of the country, and decided to urge legislation to Americanize foreigners. The labor or industrial conference, which had been urged to take up the steel strike, is disbanded. Wednesday, October 22, the labor group bolted because its resolution favoring collective bargaining was not adopted. President Wilson then asked the public group to continue the work, thus politely relieving the employers' group from further activity, but after a couple of days the public group concluded it could do nothing, and disbanded. So far as Pittsburgh opinion is concerned, the failure of the conference created no surprise. There had been much doubt whether such a conference would get anywhere.

It is too soon to observe whether the collapse of the labor conference is going to cause the strike to crumble more rapidly. It must be remembered that labor was in rather short supply in the iron and steel industry before the strike, and even with the strike entirely over the mills are likely to be somewhat short of men. Furthermore, the strike has been causing much moving around of men, and working forces will be more or less disorganized for some time, thus restricting production. One observer estimates that even if the strike now wanes rapidly it will be six months from now before working forces are as efficient and well balanced as before the strike.

Gains in Output

In Western Pennsylvania employment has increased somewhat in the week. Except for a few plants there are approximately as many men as needed but taking the region as a whole production is 10 to 15 per cent. under normal. The greatest improvement at any one point has been in the case of the Lackawanna Steel Company, in the Buffalo district, whose works were completely closed at the beginning of the strike, but which are now showing a moderately fair operation. The tonnage is not altogether in proportion to the number of men in employment, but is increasing. Other works in the Buffalo district that were affected by the strike are doing better.

The Mahoning Valley in Ohio, which comprises about 10 per cent. of the country's steel making capacity, was closed tight within the first two days of the strike. It is expected that whenever operations should be resumed in the valley, and particularly at Youngstown, the principal point, the resumption would occur through there being a general break in the strike. That, however, has not been the course. Three weeks ago one blast furnace in Youngstown resumed, but even now only a small percentage of the capacity of the valley is in operation. It is understood that in many cases the men at work are living inside the mills.

The Wheeling district remains closed tight, except for a few sheet and tin mills in Wheeling that have operated right along, and two or three plants on the outskirts of the district. It is the common belief that it is at Wheeling that the strike will hang on the longest, the district being famous for strikes and labor troubles generally. Reports from Gary and Chicago are that operations are heavier in that district, though it is very doubtful whether production there approaches 50 per cent. of normal. The whole South continues to operate normally, as does Eastern Pennsylvania.

Steel Price Prospects

If the law of supply and demand were allowed free play it would send steel prices up. Steel was by no means plentiful before the strike, yet the mills were making approximately as much as they could, their output being between 85 and 90 per cent. of capacity, and at the rate of about 2,500,000 gross tons of finished rolled steel a month. The deficiency in output in the first month of the strike was between 1,000,000 and 1,250,000 tons, and the second month, now entered upon, promises to witness loss of by far the better part of a million tons, so that even if the strike should now recede rapidly there is indicated a deficiency of at least 2,500,000 tons, or a whole month's production, since after the men are all back at work production will not at once jump to normal. Before the strike steel prices were strong, and they are low rather high compared with commodity prices in general. The March 21 steel prices, which have remained since then as the quotable market, are 81 per cent. above the ten-year pre-war average of steel prices. The Dun and Bradstreet index numbers, of commodities in general, have advanced since March 21, and now stand at 112 per cent. and 128 per cent. respectively above their corresponding pre-war averages. Demand and supply would point to higher steel prices, and relationship

of steel to other commodities would point the same way.

From the present outlook, however, the prospect is that basis steel prices will not advance. While no formal announcement has been made, there is much reason for believing that the United States Steel Corporation is strongly opposed to there being any price advances, either during or for some time after the strike, and some of the large independents may line up on that side. The smaller mills, those that do not sell far ahead, would undoubtedly charge all they could get, and that would mean premiums on early deliveries, with prices unchanged for delivery at mill convenience.

All the indications are that demand for steel will be heavy for a long time to come. The cost of making steel is not likely to decrease materially, and is much more likely to increase. When the strike is all over the mills will consider the matter of adopting the eight-hour shift as against the present twelve-hour shift, and its adoption will probably hinge largely upon the question of its being possible to obtain the additional men needed. If that is done men will receive less pay per day but higher pay per hour and thus the wage cost of making steel will increase. With values of commodities generally so much higher, relatively, than steel prices, it is not entirely improbable that in the long run steel prices will advance. Some time in the future there will be panic and industrial depression, with men hunting jobs instead of shirking work, but practically everyone expects that time to be several years in the future, leaving time for various fluctuations to occur meanwhile.

Pig iron is strong and advancing, largely in line with its strong tone before the strike, rather than because of the strike. While the strike has closed a few merchant furnaces it has also decreased the quantity of merchant pig iron used directly or indirectly by the steel works, so that advances in pig iron are not to be ascribed wholly, or perhaps even largely, to the strike. The lake front furnaces at Chicago, Cleveland and Buffalo have been greatly affected by the strike, but few furnaces elsewhere are idle from strike.

MONTREAL NOTES

The St. Lawrence Welding Works of Montreal are going in for the manufacture of steel tanks. They will acquire a new plant for this purpose.

The Modern Tool Company, of 1495 Notre Dame Street East, are going into the manufacture of one-ton trucks for industrial and warehouse purposes.

The Canadian Kron Scale Company, of 16 Notre Dame Street East, Montreal, has acquired a local plant where they will manufacture the Kron scales for the Canadian trade. This company has also taken over the selling agency for Eastern Canada of the Brantford computing scales. The Kron scales are almost exclusively used in manufacturing plants, warehouses and factories, while the Brantford line is more suitably adapted to the retail trade. The Kron Scale Company has likewise secured the Canadian manufacturing and selling rights for the Stuebing Truck Co. of Cincinnati, Ohio. G. H. Smith is the Canadian secretary.

Chas. Crawford, of Crawford and Co., chain manufacturers of Walsall, England, has been in Canada during the past week or so, visiting Montreal and Toronto, with the object of studying the field with a view of developing trade in this country.

It is announced that the Dominion Steel Corporation will shortly undertake the development of new submarine coal areas on the north side of Sydney Harbor, the headquarters of the mine to be at Bonar Point. The work is part of the plan necessary to supply a high grade metallurgical coal that will be required to manufacture the steel produced at the new steel plate mill, and also contemplate shipbuilding developments. The necessary equipment will involve an approximate expenditure of $2,000,000.

The arrival of ten captured German guns was a feature of last week's activity at the harbor, but the event was known to few beside the officers in charge of the vessel and the guns. The guns were those taken by Montreal units, and will be drawn through the streets during the Victory parade in honor of the Prince.

At last week's meeting of the Engineering Institute of Canada, a paper entitled "Grain Dust Explosions; Their Cause and Prevention," was read by J. A. Jamieson, M.E.I.C., M.A., Soc. C.E., who was the designer of the Port Colborne elevator, which was the scene of a serious explosion some time ago. In the opinion of the speaker, the cause of the accident was the choking of one of the lofters. The author of the paper went into the matter very thoroughly and discussed the technical points involved in the cause of dust explosions. A discussion of this paper will be conducted at this week's meeting of the society.

Mr. J. F. Paige, general manager of the Port Arthur Shipbuilding Company, is leaving there shortly to take charge of the Halifax Shipyards. Mr. Paige has had a very broad experience in the shipbuilding and marine engineering fields. He was formerly with the Fore River Shipbuilding Company, and while with them visited Japan and Italy in their interests, looking after the turbine installations in Japanese and Italian warships. Mr. Paige is a Canadian, having been born in Nova Scotia, in which province he served his apprenticeship. He also sailed as engineer for some years in the Dominion Atlantic Railway Company's ships.

AUTUMN MEETING OF ELECTRICAL ENG.

Review of Work Undertaken at the Ottawa Conference—Papers Are Read

The first autumn meeting of the Toronto Section, the American Institute of Electrical Engineers, was held in the Engineers' Club, Friday, October 24. A review of the work accomplished by the National Industrial Conference held at Ottawa was presented by Mr. Frank R. Ewart, representative of the institute. The appointment of engineering delegates representing the various societies was a recognition of the engineer's status as one who, while coming into intimate contact with both the manufacturer and laborer, yet was in a position where impartial judgment and knowledge might be expected. One of the most noticeable things about the proceedings of the conference was the complete and accurate information of the labor delegates. When one of them spoke, no time was wasted in preliminary remarks, but the whole time available to the speaker was made use of in the presenting of information vital to the cause of labor. The briefs presented by those representing the manufacturing element of the community in some cases were not so well prepared, nor did they show such a familiarity with statistics and other information pertinent to labor. Mr. Ewart's further remarks had to do with the various topics of the agenda and the manner in which they were treated. In the discussion which followed, Wills McLachlan emphasized the importance of the necessity for thorough knowledge of economics on the part of both manufacturer and engineer. Both should be as familiar with the subject as was the laboring element of the community.

An interesting paper on water-turbine design was read by Mr. Adolph Eberli, hydraulic engineer, the Hydro Power Electric Commission of Ontario. Information regarding the design of this prime mover was given, and in the paper itself and in the discussion which followed, interesting facts regarding present-day developments were brought out. The Francis turbine, which is used almost universally up to high heads, is only a development, so far as its present design is concerned, of the past twenty odd years. It was formerly thought only suitable for moderate heads, but is now used everywhere, except where exceptionally high heads are encountered, as in mountainous districts. The turbines being built for the Chippewa-Queenston development are of this type.

The Black & Decker Mfg. Co., Baltimore, Md., have recently issued a very attractive and interesting catalogue on electric air compressors, portable electric drills, and electric valve grinders. Those interested in these lines can secure a copy by application to the above mentioned concern.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$25 00	$26 25
Electro copper	24 50	26 00
Castings, copper	24 50	25 00
Tin	58 00	58 00
Spelter	10 00	10 00
Lead	7 75	7 00
Antimony	10 00	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛	in.	$ 6 00	$ 8 00
¼	in.	4 68	6 81
⅜	in.	4 68	6 81
½	in.	6 21	7 78
¾	in.	7 82	9 95
1	in.	11 56	14 71
1¼	in.	15 64	19 90
1½	in.	18 70	23 76
2	in.	25 16	32 01
2½	in.	40 37	51 19
3	in.	52 79	66 94
3½	in.	67 16	84 18
4	in.	79 57	99 74

Standard Lapweld

2	in.	38 81	35 34
2½	in.	42 12	52 36
3	in.	55 08	68 47
3½	in.	69 00	86 94
4	in.	81 75	103 00
4½	in.	93	1 18
5	in.	1 08	1 37
6	in.	1 40	1 78
7	in.	1 83	2 32
8L	in.	1 93	2 44
8	in.	2 22	2 81
9	in.	2 66	3 36
10L	in.	2 46	3 12
10	in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	21 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

No. 4—Inclinable Open Back Press.

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represent the highest grade in quality of material, design and workmanship, and have many exclusive features which make for economy in operation, notably the three locking points in the hubs of all flywheels, giving 20 per cent. more production than any press having only two locking points in flywheel to engage clutch.

PRESSES FOR MARKING FUSES, FOR FUSE BODIES, FOR BLANKING, CUPPING AND DRAWING CARTRIDGE CASES.

Also a general line of Punch and Inclinable Presses.

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Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

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Phone Victoria 1492

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When Buying Set Cap Screws, Semi-Nuts or Twist Drills

It's important to say "Morrows" and mean it. No other make is so dependable. A strictly Canadian company operating for Canadians with only Canadian capital and expert Canadian workmen.

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DRILLS FILES MORROW MORROW NUTS MORROW

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 25
Sheets, black, No. 10	5 15	5 25
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 75
Premier, 10¾ oz.	....	8 05
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ¼ in., $9.75; ⅞ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11
Dark colored	09
Mixed colored	10

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.03

Prices per lb. unless otherwise stated

GEOMETRIC

Adjustable Collapsing Taps

Have overcome all the expense and annoyance of tapping screw threads with a solid tap.

Anyone doing thread tapping knows what backing out a solid tap each time means. It usually means low production, poor threads, and worn out taps.

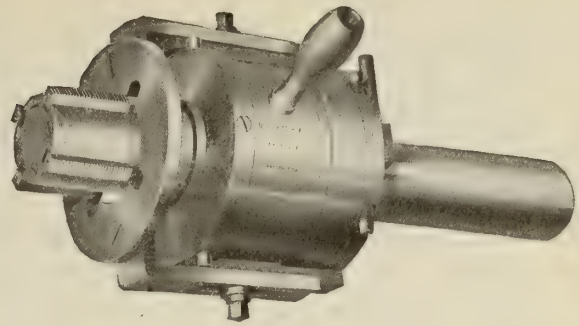
The mechanism of the Geometric Taps takes care of adjustment to correct diameter each time a thread is tapped, it collapses the chasers automatically, leaving a thread clean cut and perfect.

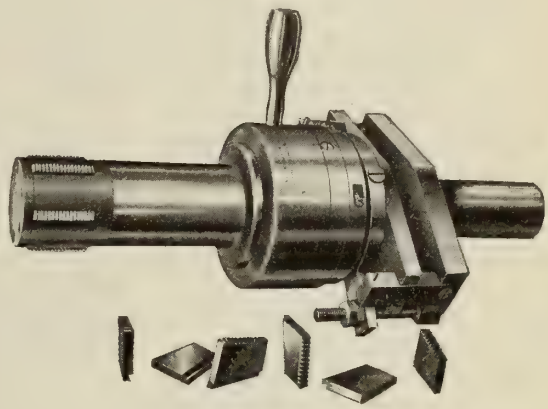
The chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

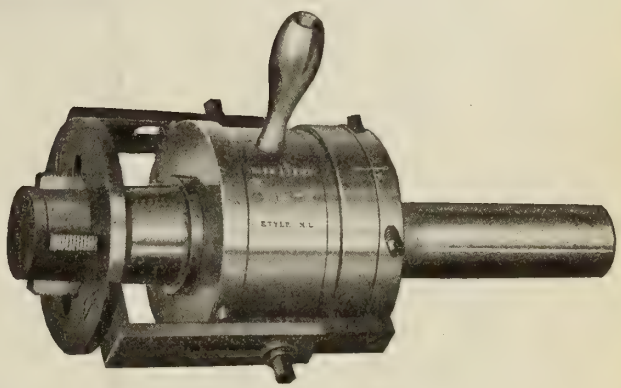
The manufacturers of the Geometric line of Collapsing Taps and Self-opening Die Heads are justly proud of the distinction which is theirs:—

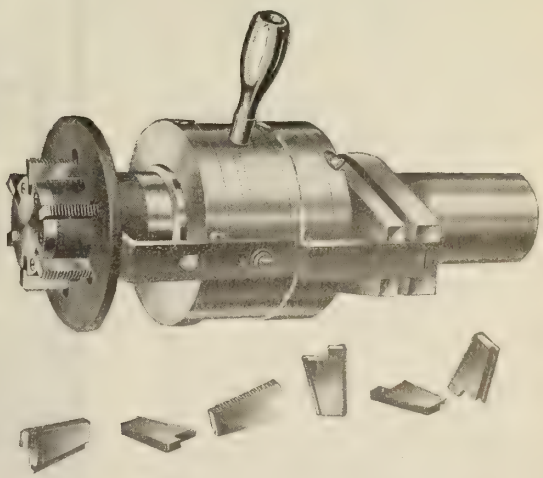
The Originators
and the
Largest and Best Known Manufacturers
of
Automatic Threading Tools

For cutting all classes of screw threads, internal and external, of any diameter and form.









The Geometric Tool Company

New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.; Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

RATIONS SERVED IN OLD COUNTRY

Railroad Strike, as Experienced by Former Member of CANADIAN MACHINERY Editorial Staff

A. G. Webster, formerly on the staff of CANADIAN MACHINERY, writing to this paper from Sheffield, on October 1, says:

"The threatened railway strike has become an accomplished fact, and the whole country is tied up. Conditions in Great Britain were never, perhaps, in such a chaotic state as at the present time. The strike of railway employees, including locomotive engineers and firemen, following the iron moulders' strike, has tied up the engineering industry. A few trains are running, but it has been necessary to organize motor transports to feed the population and carry mails, while motor bus services for passenger traffic have been organized by private enterprise. In this way the business of the country is being carried on. The situation is particularly serious owing to the fact that increased production is so vitally necessary for the welfare of the country, and under prevailing conditions business is almost at a standstill.

"I have heard nothing lately in regard to Canadian business in England, and less seems to have been written about American material being delivered here. The strike, however, will probably cause considerable business to leave the country. Readjustment is proceeding very slowly, and unsettled conditions will prevail for some time to come. I suppose it is a natural result of the upheaval caused by the war and is world-wide. This week we are being rationed on a war basis, 2 ounces of margarine, 30 cents' worth of meat, 2 ounces of sugar, and so on per week per head.

"I have not yet been able to secure a berth on a steamer but believe the situation is becoming easier as more troops are shipped back.

"The Government have a peculiar way of annexing a considerable portion of one's salary, and the high cost of living attends to the balance. There is thus every inducement for people to leave the country, and I believe a large number are doing so, or at least as many as can get passage."

DEEPEST WELL IN THE WORLD

The "Mining and Scientific Press" tells us that the deepest well in the world, already 7,363 feet deep, is now being drilled on the Goff farm, eight miles northeast of Clarksburg, W. Va. The drilling is still in progress, and sufficient length of cable and adequate power and tools are at hand for driving still farther into the crust of the earth. The well goes frther down than the deepest mines in Michigan, Brazil, or Europe. Several oil wells in California, in the Southwest, in West Virginia, and in Pennsylvania have exceeded 4,000 feet in depth, and one near MacDonald, Pennsylvania, fourteen miles west of Pittsburgh, reached 7,248 feet below the surface. The temperature at a depth of 7,000 feet was found to be 152° F., and the rate of increase at this depth is about 1° in every 51 feet. It is estimated that the temperature of the rocks beneath the Goff well will be found at the boiling point, 212° Fahr., at a depth somewhere around 10,000 feet. The well is being drilled in search of deeper oil-sands than have been reached in this part of the basin. If the well strikes a valuable oil or gas pool, it may lead to the development of new reserves that may open up a new era in the history of the Appalachian oil and gas region.

What is said to be a record in steel production has been made by a steel mill in Lanarkshire, Scotland. Working at a cold charge capacity of 45 tons the mill produced in one week 21 charges, totalling 980 tons. The product was made into plates, rails and angles. The highest output with similar furnaces in the United States is 600 tons. The U. S. must look to its laurels.

Apropos of the League of Nations, and the universal peace which is so confidently expected by some, it is interesting to learn that Vickers, Ltd., the great English firm of shipbuilders and armament manufacturers, are shortly making new affiliations. It is said that they are about to form a partnership with the Creusot firm, with a view to establishing a Polish firm at Warsaw, to be devoted to the production of war materials. Evidently this firm at least has little faith in the dawn of the millennium.

Sir Joseph Davies, K.B.E., the well-known South Wales financier, speaking at the annual meeting of Messrs. J. Samuel White & Co., Ltd., made an interesting remark. He had just returned from a visit to the United States, where he had inspected the largest yard, including that at Hog Island. His impressions were summed up in the following manner: "I should like to mention one thing in regard to America, where I have had the opportunity of seeing the new and old yards. I have come back satisfied that we can always hold our own in shipbuilding unless a great change is brought about on the other side."

Consolidated Smelters Move to Montreal.—The head office of the Consolidated Mining and Smelting Company will in future be located at 511 St. Catherine Street W., in the Drummond Building, Montreal. The Ontario sales office will still be kept on in the C. P. R. Building, Toronto. The company have added two new mines to their list of shipping mines recently, the Stemwinder at Greenwood and the Mountain Chief at Renata.

IS THERE ROOM FOR ME?

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

St. Thomas Gets Plant.—It is rumored that Dodge Bros., Limited, have decided on locating a plant in St. Thomas for the manufacture of automobiles.

New Toronto Firm.—The incorporation is announced of the Canadian John Wood Company, Ltd., with head office in Toronto, and a capitalization of $200,000.

Brantford's Good Business.—A leading Brantford industrial magnate made the statement recently that every big factory in Brantford had orders on hand to keep them working at full capacity for a considerable time to come.

Wants Machinery.—The St. Lawrence Welding Co., 138 Inspector St., Montreal, want a second-hand power punch and shear to work half-inch plate; also a set of power rolls, 10 ft. to 12 ft. long, to roll ½-in. plate.

Electrification at Dominion Coal.—The Dominion Coal Company at Glace Bay are planning to utilize all their exhaust steam to drive low pressure turbines, in turn driving generators, to supply all the power at the new mines, and future developments.

Exporting Steel Products.—The growth of the Armstrong, Whitworth plant at Longueuil, Quebec, near Montreal, is shown by the fact that not only are they supplying the Canadian market with steel tyres for locomotives, but are exporting their product to Australia.

Mines Kept Idle.—Through a shortage of cars on the Canadian National Railway the coal mines at Wayne, Rosedale and Drumheller were idle for two days. There are no domestic coal stocks on hand in Alberta, and interruption to the shipments will be attended with serious results.

School By-law Passes.—A by-law submitted to the ratepayers of Ingersoll for a new central school to be built at a cost of $120,000, was passed by a majority of 395. A similar by-law presented four years ago was defeated, and the board made preparation of this one by wide advertising and a vigorous campaign.

To Assist Loans.—In connection with the Victory Loan in Ingersoll, the local factory employees have been organized to render assistance in the campaign. After listening to addresses from the organizers, men in ten different factories were selected to handle the work for their own industry. A successful campaign is anticipated.

West Wants Factories.—Mr. T. A. Russell, president of the Toronto Exhibition, has just returned from a trip West. He says that the people of the West are anxious to have branch factories established in their provinces. They seemed as reluctant to send their money east to manufacturers there as we are to send ours to the States.

STEEL TIRES ARE MADE IN CANADA

Error Made in Announcing New Industry—Armstrong Whitworth Making And Exporting as Well

In connection with the announcement in last week's CANADIAN MACHINERY of a new industrial enterprise for the manufacture of steel tires, it was stated that this was a new industry in Canada, these tires having, until now, to be imported. This was inaccurate, as the Armstrong-Whitworth of Canada, Limited, have a large plant where this work is done at Longueuil, Que. For the past eighteen months this company has been manufacturing locomotive and car wheel tires at that point, and tires of their make are from steel of their own manufacturing, and the various processes, such as forging, rolling, finishing, etc., are completed in their shops. They have supplied tires to practically every railroad in Canada with the greatest success both as to quality and workmanship, and have also shipped tires to such countries as the Dutch East Indies, Australia, South America, etc. CANADIAN MACHINERY regrets the mention of the fact that tires had to be imported, as the Armstrong-Whitworth Co. have a very large and capable organization turning out a superior product.

New Terminal Company. — The Havana Marine Terminals, Limited, has been incorporated at Ottawa with a capital of $30,000,000, and headquarters at Montreal. The company has a very wide charter, including the building of graving docks and acquiring of steam and sailing ships. Gordon McDougall, K.C., is among the provisional directors.

Brantford Factories Prepared. —The various factories in Brantford are not worrying over the prospect of a coal strike on November 1st in the soft coal mines of the United States. Nearly all of them have a stock of coal to last them over six months, and the schools and waterworks are likewise well supplied.

New Industry in Hamilton.—After negotiations stretching over a period of one and a half years, the British-American Oil Company have decided to erect an oil refining plant in Hamilton. The news was announced by Industrial Commissioner Kirkpatrick, who stated that the plant would mean an investment of $100,000 and would be located near the Oliver Chilled Plow Works.

Nova Scotia Miners' Demands.—The miners in Nova Scotia have been holding meetings to determine their attitude towards wage increases. While nothing definite has been settled the feeling is that there should be a revision upwards. It is expected that the men will wait and see what action is taken by the American mine workers, and follow it up with similar action on their part.

Fuel Commissioner's Warning.—Mr. H. A. Harrington, Deputy Fuel Commissioner of Ontario, has made a statement that the coal situation throughout the province requires careful handling. He calls attention to the following order: "Anthracite coal of what is known as prepared sizes shall not be used by any industrial consumer for heating or power purposes except with the written consent of the Fuel Commissioner.

Telegraph Rates To Go Up.—The Board of Railway Commissioners are to hold a series of sittings over Canada to obtain the views of the public on the application of the telegraph companies for an increase of practically 20 per cent. on the present telegraphic rates. Sittings will be held in Ottawa on Nov. 11 and 12; Winnipeg, Nov. 15, 17 and 18; Vancouver on Nov. 22 and 24; and Victoria on the 25th November.

To Handle Grain.—There will be ship capacity to the amount of 15,000,000 bushels required to handle the grain at the head of Lake Superior for late loading. A large part of this grain will have to be stored in ships in Canadian ports, being too late for shipment down the lakes. It is probable that a number of American ships will be used to handle the grain, under the rates of the present agreement with the United States Food Administration.

Toronto Firm Reorganized.—Kerr Bros. File Works, Toronto, a long established concern, has been taken over by new interests and will in future be known as The Kerr File and Tool Company, Limited, head office at 39 Richmond Street East. A new and large building is under construction. They will be in a position to greatly increase the production of their files. For the present files only will be manufactured, but it is possible that small tool manufacturing will be started at a later date.

Machinery Wanted.—A new firm locating in Canada have asked the Chapman Ball Bearing Co., 347 Sorauren Ave., Toronto, to put them in touch with firms who are in a position to supply the following equipment:

1 No. 0 Brown and Sharpe Plain Milling Machine.

1 No. 2 Brown and Sharpe Plain Milling Machine.

10 No. 00 Brown and Sharpe Automatic Screw Machines.

4 No. 0 Brown and Sharpe Automatic Screw Machines.

5 No. 2 Brown and Sharpe Automatic Screw Machines.

Patents Issued:—The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, 156 Yonge Street, Toronto, from whom further particulars may be obtained: John L. H. Blackwood, button stick; Edward B. Killen, vehicle spring suspensions; Gutta Percha & Rubber, Limited, rubber mat; Fred L. Rapson, lifting jacks and the like for use on motor, road, and other vehicles; Woodington & Young, abrasive wheel; Huan A. Matear, internal spring heel seats; J. Stone & Co., Limited, valves for fluid pressure systems for operating bulkhead and like doors; Farm & Dairy Machinery Co., pneumatic valve actuating devices; Edward Manser, acid still.

Extending Plant.—Armstrong Bros. Tool Co., of Chicago, are making extensive additions to their plant, buildings and equipment. The new buildings include an addition to the Drop Forge department, a new building for the hardening and heat treating department, and a new reinforced concrete building for the general office, finished stock and shipping department. Building operations, which were tied up for several months by strikes, are being rushed to completion. The new buildings and equipment, together with the re-arrangement of the entire plant made possible thereby, will largely increase the company's production, an increase urgently needed to take care of its rapidly growing business.

TENDERS

The Deputy Minister of Provincial Highways is calling for tenders which must be in by November 5 for the clearing, grubbing, and all necessary work for the construction of the provincial highway in the vicinity of Ancaster. Plans and specifications will be available after October 27 at the office of the Resident Engineer, Paris, Ont.; the City Engineer, Hamilton, and the Deputy Minister, Parliament Buildings, Toronto.

INCORPORATIONS

The Central Electric Supply Company, Limited, has been incorporated under the Ontario Act, with a capital of $150,000 in 1,500 shares of $100 each. The head office will be in Toronto and the business of the company to deal in and instal electric apparatus and fixtures.

The Canadian Mexican Oil Company, Limited, has been increased under the Ontario Act with a capital of $1,000,000, divided into one million shares of $1 each. The head office will be in Toronto, and the company will carry on business as miners, explorers, etc.

The Ontario Tie Timber & Construction Company, Limited, has been incorporated under the Ontario Act with capital of $350,000, divided into 3,500 shares of $100 each. The head office to be in the town of North Bay and the company's business to deal in lumber, and carry on a general contracting business.

The E. A. Lowry Power Equipment Company, Limited, has been incorporated under the Ontario Act with a capital of $50,000 divided into 500 shares of $100 each. The head office will be in the city of Guelph, and the business of the company to manufacture and sell all kinds of power plant equipment.

The J. K. Carroll Construction Company, Limited, has been incorporated under a provincial charter in Ontario, with a capital of $40,000, divided into 400 shares of $100 each. The head office of the company will be in Kingston. The object of the company will be to deal in real estate, building operations, etc.

The T. M. Partridge Lumber Company, Limited, has been incorporated under the Ontario Companies' Act with a capital of $100,000, divided into one thousand shares of $100 each. The head office will be in the town of Rainy River. The company will carry on a general lumbering business.

The Canadian Oliver Chilled Plow Works, Limited, a company incorporated under the Federal Law, has been granted a license by the Ontario Government to carry on its business in Ontario, under the act respecting the licensing of extra provincial corporations. The company must not use a capital of more than $20,000 in its Ontario business.

Other incorporations are as follows: —Farmers' Mining Company, Ltd.; Riverdale Garage, Ltd.; The Mississippi Golf Club, Ltd.; Elgin Milk Products Company, Ltd.; Food Shops, Ltd.; Allen's Russel Theatre, Ltd.; Crookston Quarries, Ltd.; Weston Flour Mills, Ltd.; K. & S. Tire & Rubber Co., Ltd.; Northern Ontario's Great Mines Development Co., Ltd. (no personal liability); Hollinger Stores, Ltd.; The Fort William Arena Company, Ltd.; John D. Ivey Co., Ltd.; McLennan's, Limited; The Guelph Arena Co., Ltd.; The Bluffs Shooting & Fishing Club; Durham Securities, Ltd.; Glendale Realty, Ltd.; Cadogan Investments, Ltd.; Skead Gold Mines, Ltd. (no personal liability); The Verral Storage Company, Limited.

MARINE

Shipbuilding Returns.—Lloyd's Register of Shipping gives the vessels under construction at the end of September as 5,230,000 outside of the United Kingdom, and 2,800,000 tons in the U. K. Of the vessels being built abroad, 2,584,000 tons are under Lloyd's classification.

New Steamship Services.—New services are being inaugurated by the Canadian Government Merchant Marine and private lines. These include services between Buenos Ayres and Monte Video and Canada, and also a service from Vancouver to the Mediterranean and Black Sea ports. These new lines will make their initial sailings in October.

Halifax.—Mr. Harry T. Sailor, of New York, has purchased the new four-masted schooner "Breakers," built in Yarmouth for the American Balso Company. She will be renamed the "Balso" and placed under the United States flag. Capt. Dixon, late of the United States Shipping Board, has assumed command.

Bridgeburg.—The crew of the ferry steamer "Orleans," owned by the International Ferry Company, quit work without any notice. They wanted an increase of pay, but the captain claims that they did not ask for it, but just quit. After some hours a new crew was shipped at the same rate of pay, and the old crew have started work at the shipyard.

Ottawa.—By a recent act passed by the Parliament of Great Britain, all vessels sailing from a U. K. port, under the British flag, must carry a wireless installation, and wireless operators. This will apply whether the vessel is registered in Great Britain or one of the Dominions, if the vessel is of 1,000 gross tons or over. The act will come into force three months after the expiration of the Defence of the Realm Act, by the declaration of peace.

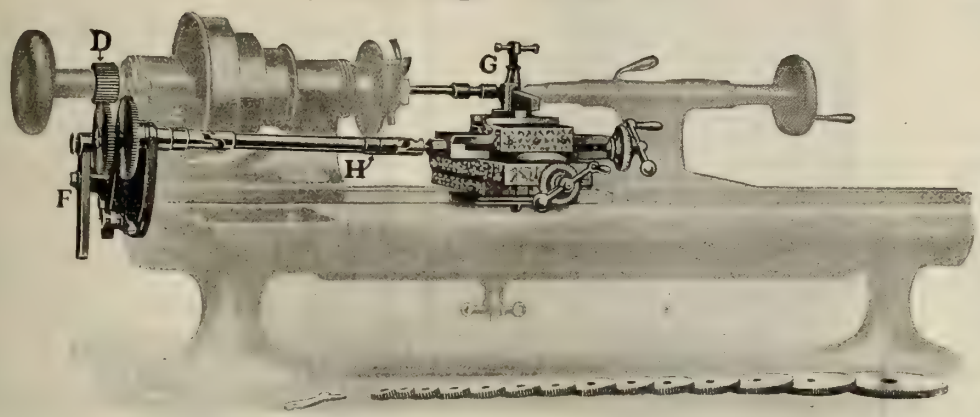
Montreal.—The "War Raccoon" has arrived down from Toronto and will go into the dry-dock of the Canadian Vickers Co. before loading a cargo of lumber. She was built for the Imperial Munitions Board and is owned by Tyzack & Brantfoot, Newcastle-on-Tyne. Another new vessel in the port is the "New Toronto," built for the Elder, Dempster Line by Harland & Wolff for the Canada-South African service. She will sail about November 5.

Ocean Service Improving.—According to Mr. A. G. Henderson of Glasgow, director of the Cunard and Anchor Steamship Lines, a great improvement would soon be noted in ocean services. Both the lines he was interested in were building new steamers rapidly, and these vessels were more commodious than their predecessors. In about one year to a year and a half the services between Canada and Great Britain and Europe would be equal, and may be superior to those of the pre-war period.

The Cataract

Precision Bench Lathe and Attachments

(Hardinge Bros. Inc.)



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The Cataract Quick Change Swing Precision Lathe for Tool Makers.

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The Cataract Precision Bench Lathes, of which there are six sizes, with full line of attachments.

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WHEN ANSWERING ADVERTISEMENTS KINDLY MENTION NAME OF THIS PAPER

Ottawa.—An amendment will be made to the Canada Shipping Act, enabling any Canadian registered vessel exemption from pilotage in certain waters. The amendment applies to vessels trading between British Columbia ports and San Francisco, or ports north of the latter.

PERSONALS

The vacant treasurership of the Engineering Institute of Canada has been filled by the appointment of Sir Alexander Bertram to the office. He succeeds the late Ernest Marceau.

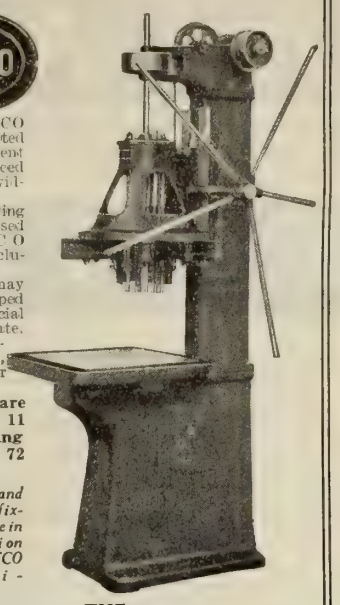
Mr. L. R. Brown has been appointed road engineer with the Dominion Tar & Chemical Company. Mr. Brown was formerly engineer and superintendent of the Toronto Chemical Company, Sault Ste. Marie.

W. C. J. Hocken, of the Chapman Double Ball Bearing Co., has just returned from Winnipeg, and has placed orders in Winnipeg city for the Western trade for roller bearings for Ford and Chevrolet axles, amounting to $20,000.

Mr. R. A. Ross has been elected to the presidency of the Engineering Institute of Canada for the year 1920. Mr. Ross is City Commissioner of Montreal and chairman of the Lignite Utilization Board of Canada. Mr. Ross, who formerly had a large private practice as a consulting civil and electrical engineer, has been city commissioner for about a year and a half.

No. 12

NATCO



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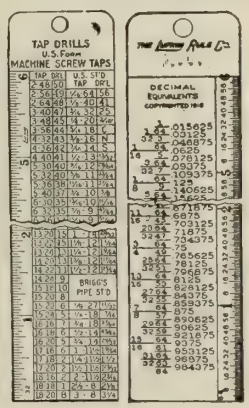

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GOOD OPENING FOR AMBITIOUS YOUNG man, graduate in Mechanical Engineering, preferably under thirty years of age. Canada Forge Company, Welland. (c19m)

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WANTED—A SECOND-HAND POWER PUNCH and shear to work ½" plate. Also set of power rolls, 10 to 12 ft. long to roll ½" plate. St. Lawrence Welding Co., Montreal. (c19m)

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ABOUT 150 LBS. RED CUT SUPERIOR ANnealed High Speed Steel 4 x ½" at 20% less than cost for cash. Write A. E. Curry, 592 Gladstone Ave., Ottawa. (c20m)

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Round Brass Rod

Mill lengths of the following sizes:—		Diameter
30,000 lbs...	.250"	¼"
24,500 lbs...	.533"	Abt. .17/32"
62,500 lbs...	.625"	⅝"
73,250 lbs...	.750"	¾"
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45,000 lbs...	1,250"	1¼"
26,000 lbs...	1.375"	1⅜"
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A firm of Canadian engineers to manufacture and sell on royalty basis a hand-operated stoker. This is an established appliance, and is the ideal installation for the small plant, where investment cost is an important item. Combustion principles are same as on highest priced automatic stokers. The ideal stoker for the Canadian market, where the one boiler plant is in the majority. Write to Box 632, Canadian Machinery, 143 University Ave., Toronto, Canada.

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1—No. 26 Bliss Embossing Press	2	30	800
2—No. 27 Bliss Embossing Presses	2	32	1,000
2—No. 59 Toledo Crank Presses, double back geared	12	31	350
1—No. 57 Toledo Crank Press, double back geared	24	24	300
3—No. 77½ Bliss Crank Presses, double back geared	18	30	350
2—No. 87 Bliss Crank Presses, double back geared	16	27	250
2—No. 60½ Bliss Rack and Pinion Drawing Presses	60	21	100
12—No. 60½ Bliss Rack and Pinion Drawing Presses	42	21	100
1—No. 857 Toledo Rack and Pinion Drawing Press	48	25	100
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35—Special Cartridge Case Bullard Turret Lathes.

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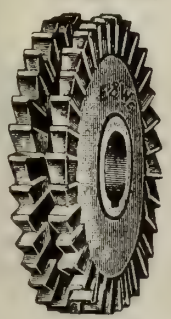

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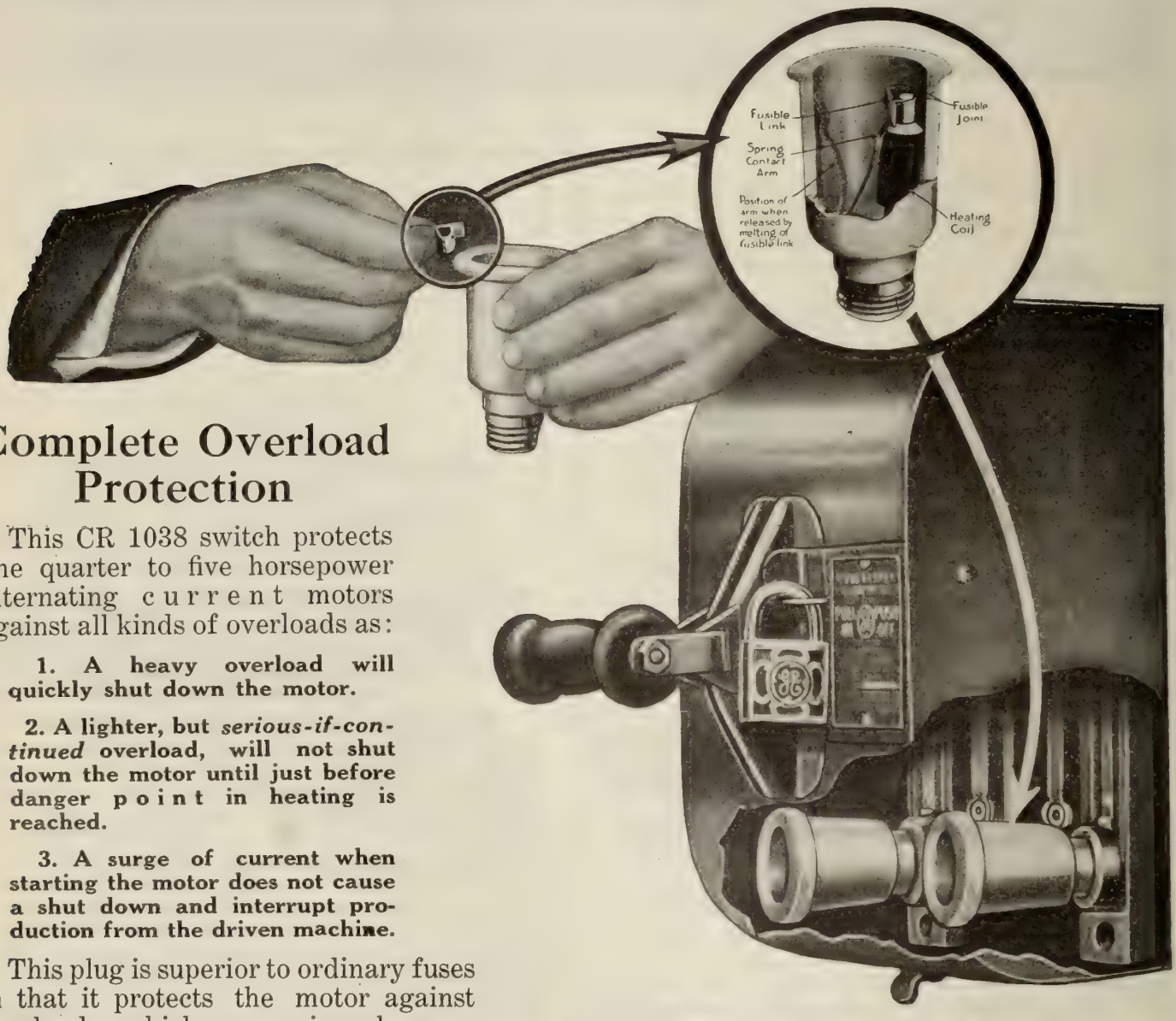

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This CR 1038 switch protects one quarter to five horsepower alternating current motors against all kinds of overloads as:

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Turn to the "Classified" section in this issue and see what is being offered and what is wanted at present.

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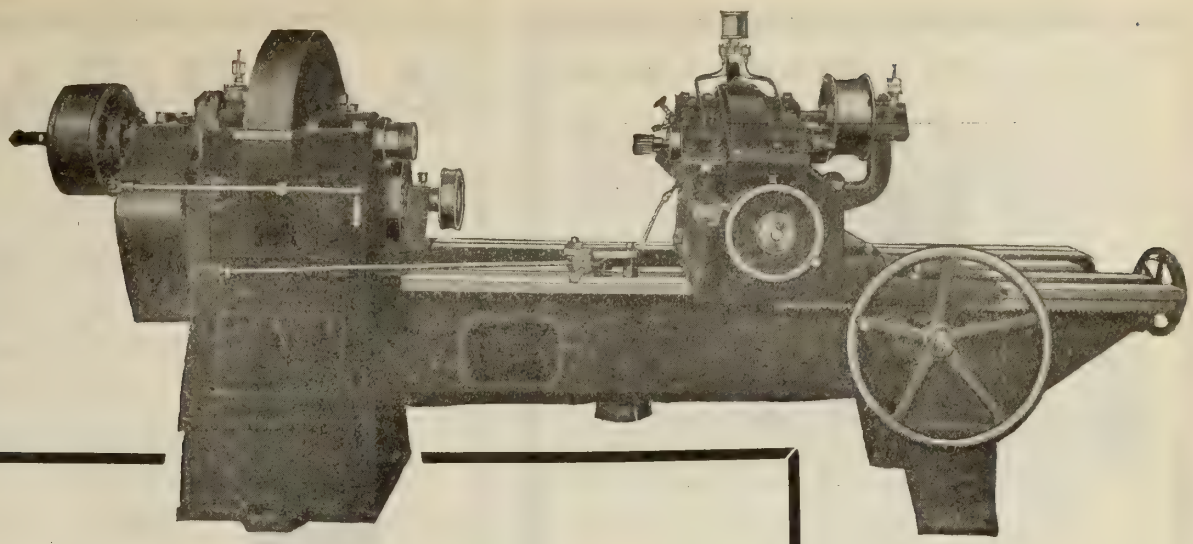
Issued by Canada's Victory Loan Committee in co-operation with the Minister of Finance of the Dominion of Canada.



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Welded Pipe Joints Prevent Leakage

The welding of nipples into pipes, instead of using threaded fittings, is now standard practice in many plants. Welded joints are positively and permanently leak-proof, and cost less.

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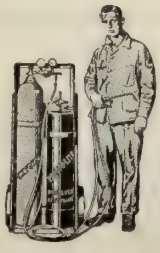

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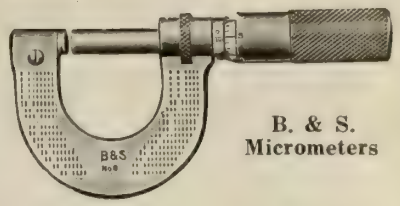

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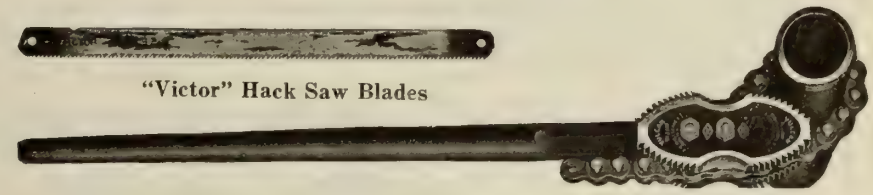

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60 Rivets in a Minute

Faster if the work can be fed faster.
But at least 60 every minute.
And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

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handle any rivet up to ¼-in. shank.

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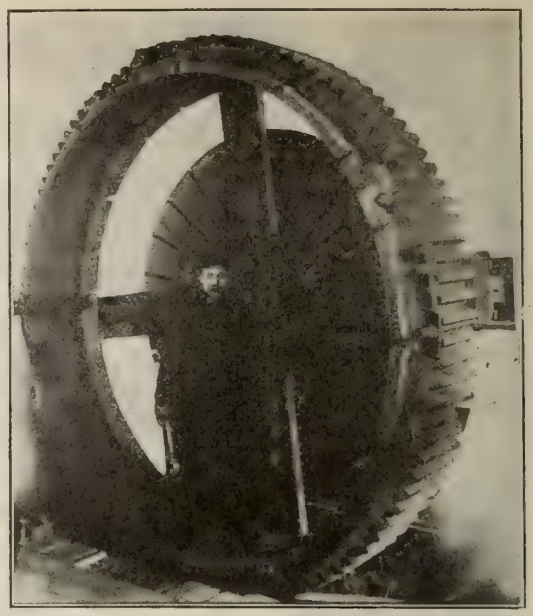

In the installation of new machinery in the working out of new processes—you may require gears or sets of gears, and no matter what the diameter, the Hisco process relieves you of the necessity of having patterns made—entailing considerable cost and delay.

"HISCO" machine moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high lumber and wages, and when time is a factor—is something to be considered.

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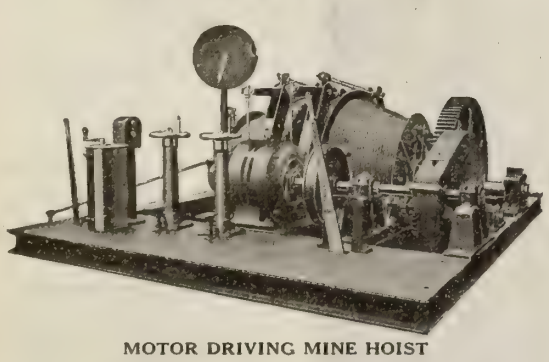

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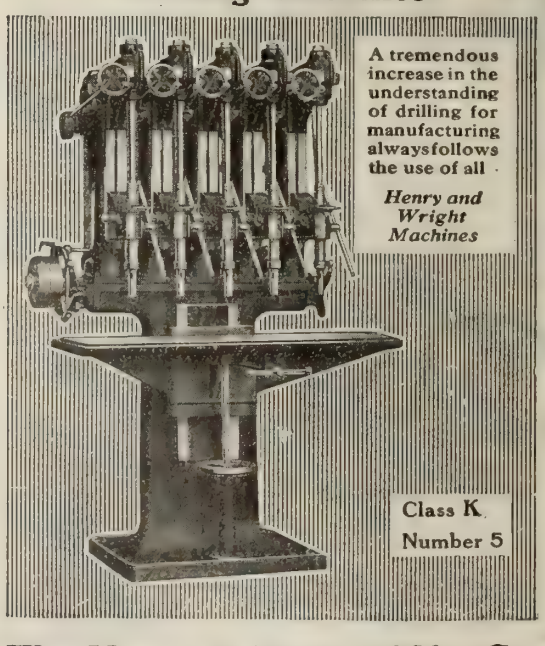

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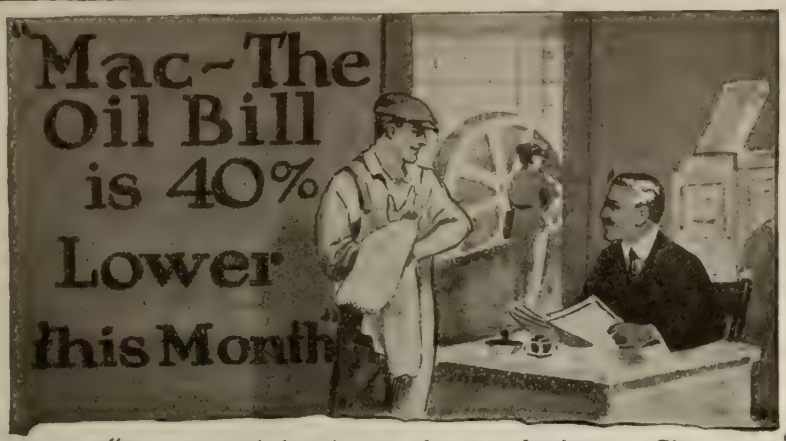

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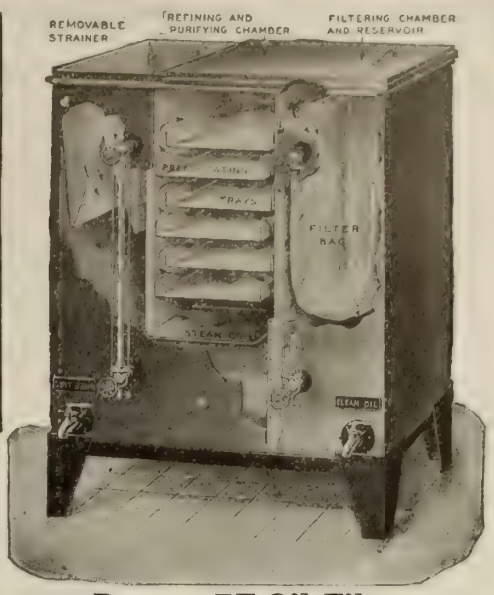

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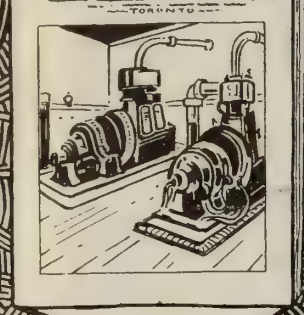

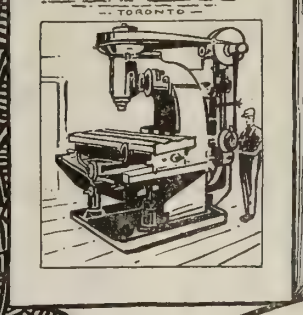

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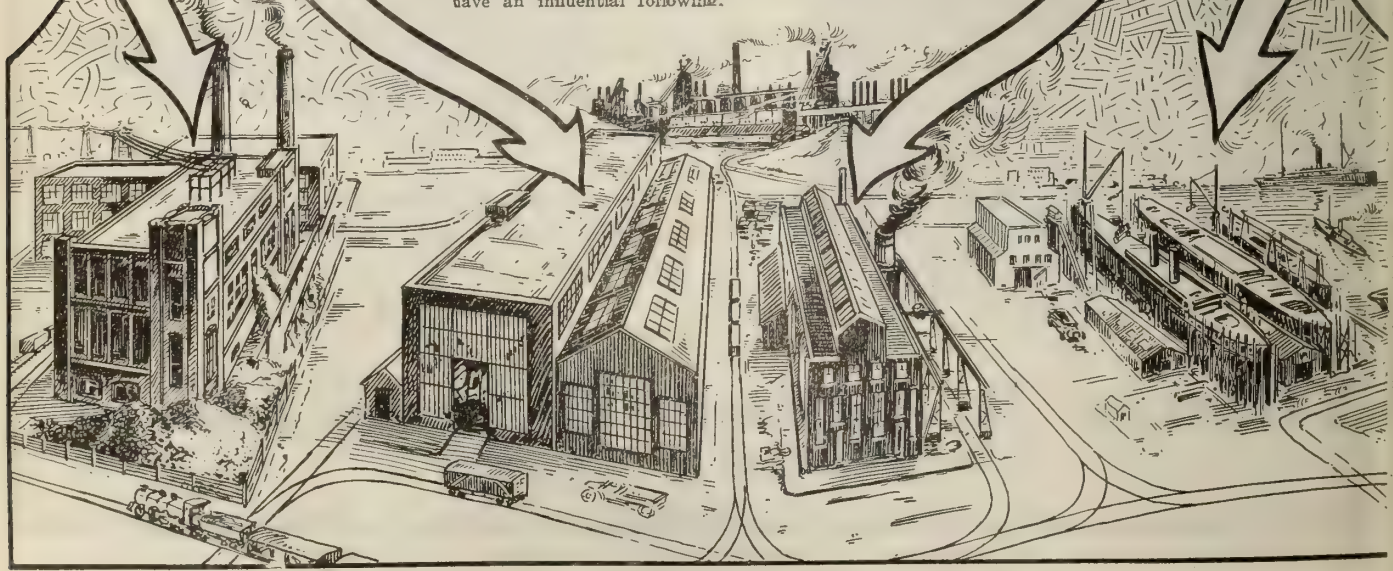

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"Just one blank strip after another"

This is where The Arrow Electric Company of Hartford, Conn., turns out blanks for electric light fixture parts and—makes records on "BLISS" Presses. When a strip of steel, brass, copper or pressed paper has clicked through, another follows it with the promptness of machine-gun delivery.

There are two special rules in the Arrow plant: first, rapid-fire production; second, "BLISS" Presses (over 100 of them). Like everything else in the plant these two rules work together mighty smoothly.

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No. 13

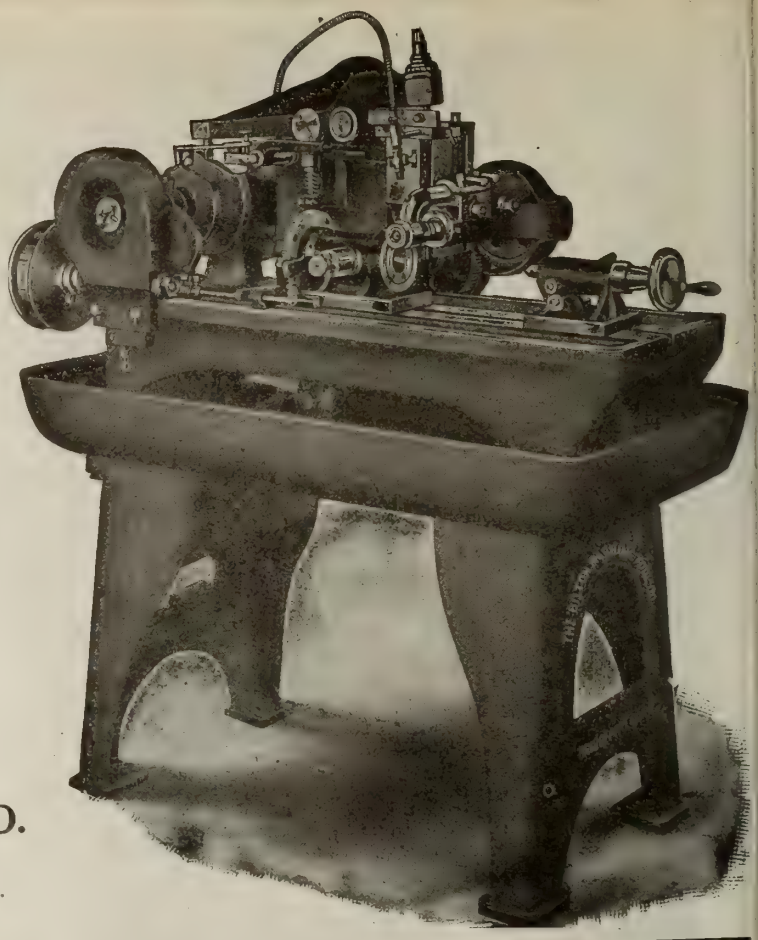
When you want to cut small gears think of

Bilton

Gear Millers
Gear Hobbers
Worm Millers

Spur
Bevel
Spiral
Worm
Small Worms

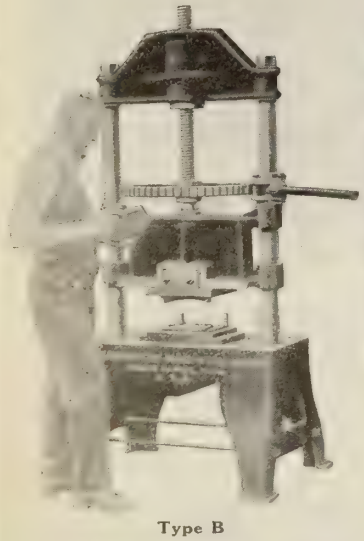
Gears



These machines have full automatic action, accurate indexing mechanism, quick releasing arbors or collets.

Let us tell you how they could handle your work.

THE BILTON MACHINE TOOL CO.
Housatonic Ave., Bridgeport, Conn., U.S.A.
Foreign Agents: Alfred Herbert, Ltd., Chas. Churchill and Co., Ltd.



Type B

Manhattan Screw Presses

Save Time Boost Production

A toolmaker requires no help in handling any dies because this is a strictly one-man machine.

You need it because it offers value and utility in the highest degree.

Let us send full details.

Manhattan Machine & Tool Company
Grand Rapids, Mich., U.S.A.

Foreign Representatives:
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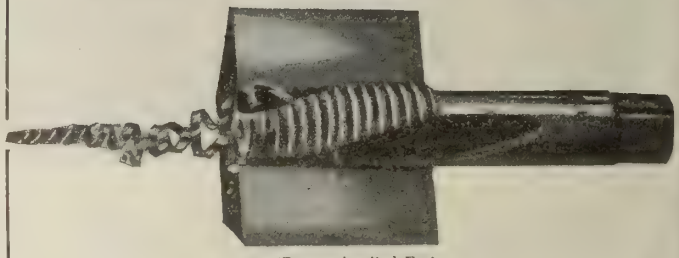
Farmer & Co., Clerkenwell, London, E.C.

3

THE "SEMPLE" TAP



(Patent Applied For)

A SCIENTIFICALLY CORRECT
CUTTING TOOL
makes tapping a pleasure

The Most MODERN,
The Most EFFICIENT,
The Most ECONOMICAL.

Send for a "SEMPLE" Sample Tap. Made in any thread
Special Taps for blind holes.

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Manufacturing and Consulting Engineers

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WORKS—166, Dumbarton Road, Partick, Glasgow.
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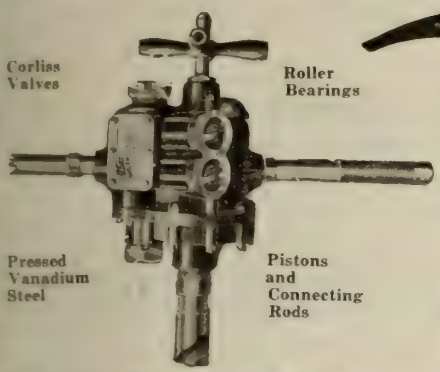
Thor

Pneumatic Tools

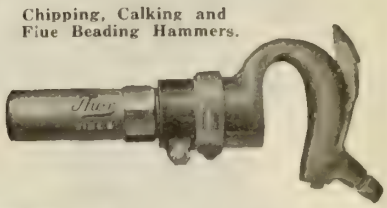
Piston Air Drills and Reamers



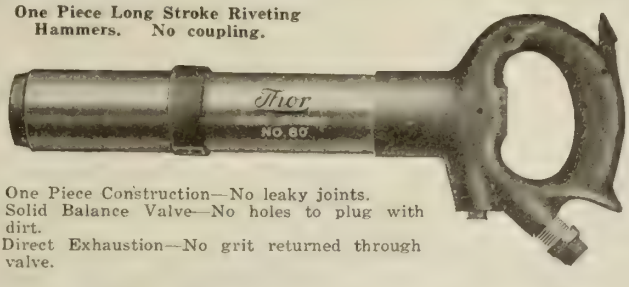
Four cylinder type, two on each side. Semi-Corliss valve close to each pair of cylinders gives greater efficiency and power, saves clearance losses and allows air to enter cylinder at full pressure of the pipe line.

SPEED UP YOUR PRODUCTION AND BE PREPARED FOR THE COMING BOOM

Chipping, Calking and Flue Beading Hammers.



One Piece Long Stroke Riveting Hammers. No coupling.



One Piece Construction—No leaky joints.
Solid Balance Valve—No holes to plug with dirt.
Direct Exhaustion—No grit returned through valve.

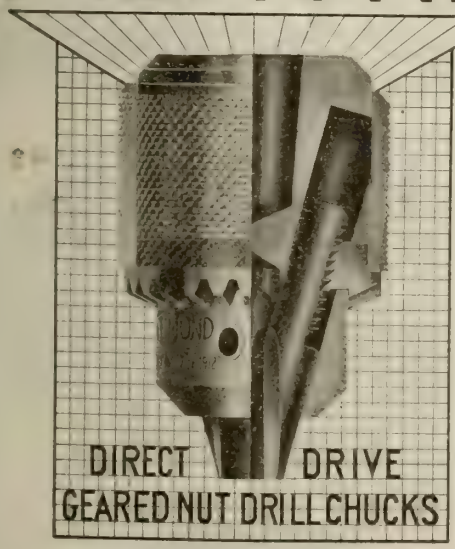
Four sizes, 1″ to 4″ stroke. The barrel and all wearing parts are hardened and ground, making the Thor Chipper practically free from vibration.

Independent Pneumatic Tool Company

General Offices: 600 West Jackson Blvd., Chicago

CANADIAN OFFICES: 334 St. James St., MONTREAL; 32 Front St., TORONTO; 123 Bannatyne Ave. E., WINNIPEG; 1142 Homer St., VANCOUVER

ALMOND



TEETH cut on the nut giving DIRECT DRIVE and the hardened steel Pinion Bushings which prevent wear, insure long life.

OTHER ALMOND PRODUCTS
LATHE CHUCKS, RIGHT ANGLE TRANSMISSIONS, MICROMETER CALIPERS, FLEXIBLE STEEL TUBING

T. R. Almond Mfg. Co., Ashburnham, Mass.

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Die Head Cuts

Perfect Threads

The H. & G. Die Head illustrated is only 3⅝″ outside diameter, yet it will cut from the smallest up to 1″ standard thread and up to 1⅛″ fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or areoplane plant for certainty.

on Nickel Steel

Made in 9/16″, 1″, 1½″ and 2″ sizes.

No stronger, more durable, more accurate Die Head was ever made.

Ask for Catalog

Eastern Machine Screw Corp.

New Haven - Conn.

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"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

We wanted something original—this is what we got

BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
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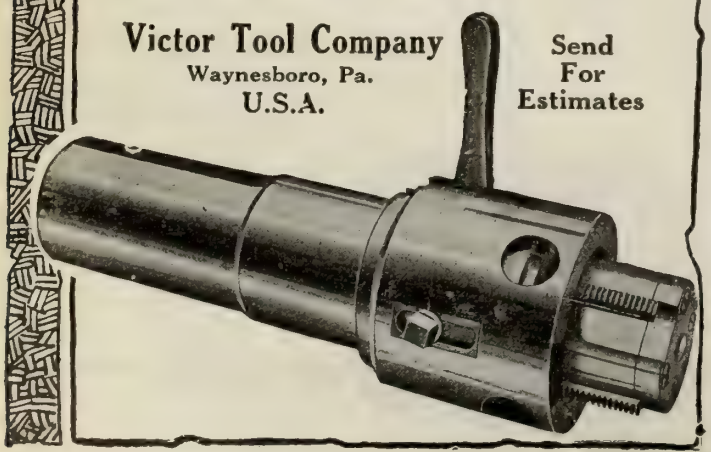
Send For Estimates



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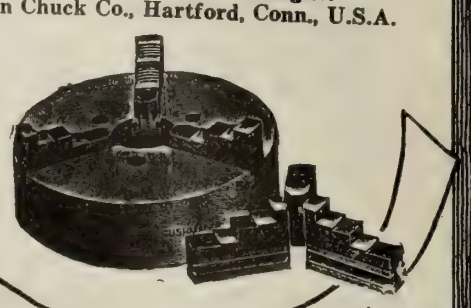
We've been Manufacturing

Nothing but Chucks and Their Accessories

FOR NEARLY 60 YEARS
AND OUR PRODUCTS SHOW IT

Years of experience in using our tools has convinced manufacturers that the word "Cushman" stamped upon a chuck is a guarantee of its quality and efficiency.

Let us send you our catalogue.
Cushman Chuck Co., Hartford, Conn., U.S.A.

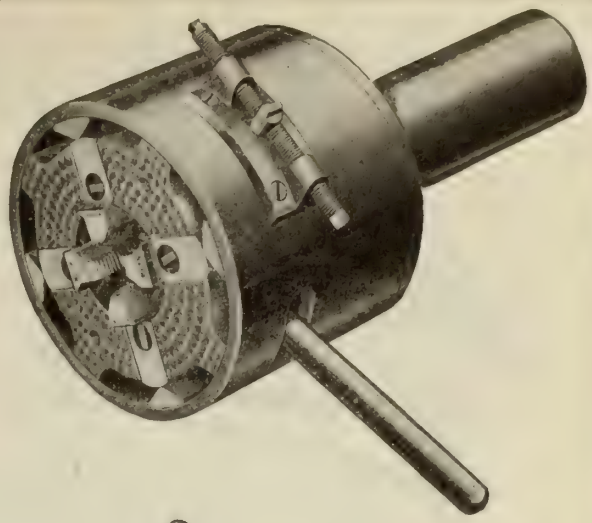


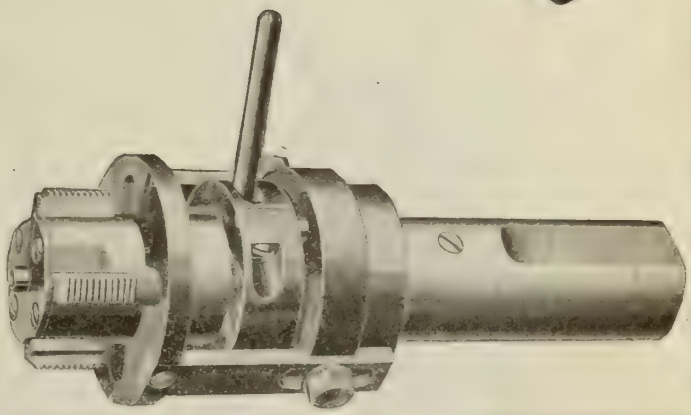
NAMCO DIES TAPS

It doesn't make a bit of difference whether it's threading screws or tapping axle housings, there's a NAMCO Threading Tool for every thread cutting requirement.

NAMCO Dies and Taps are simple in design, rigid in construction to cut threads true to specification on all classes of work.

Ask for catalog--no obligation





The National Acme Company

CLEVELAND, OHIO

New England Plant - Windsor, Vt.
Canadian Screw Plant - Montreal, P.Q.

Branch Offices:
New York Boston Chicago Detroit Buffalo
Atlanta San Francisco

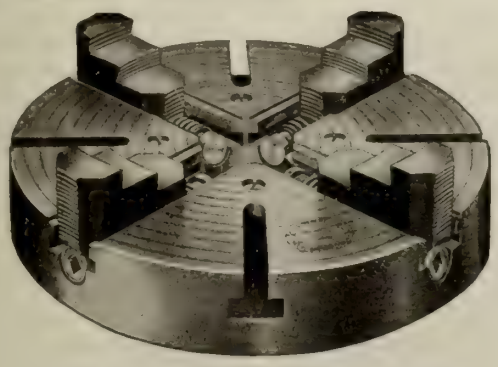
Warehouses: New York and Chicago
Representatives in Foreign Countries

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products, at Cleveland, Ohio

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY

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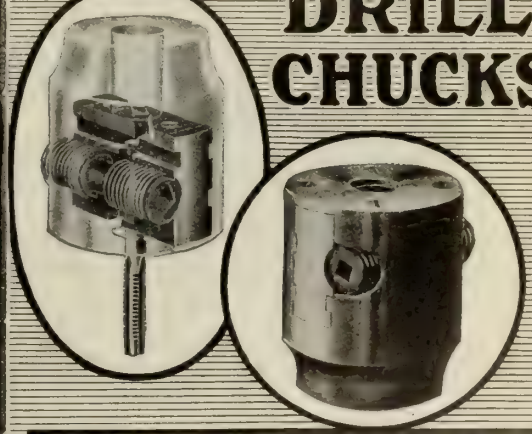
***New York Office:* 26 Cortlandt Street**

Makers of a complete line of chucks

SKINNER DRILL CHUCKS



Built For Production—Not For Price

Skinner Drill Chucks—best for accurate work. These chucks will firmly hold drills or taps accurately on centre under the most difficult and continuous operating conditions.
The Jaws are correctly adjusted, tempered, hardened and accurately ground.

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WHEN THINKING OF BELTING KEEP IN MIND THAT

The back of the OX

is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

Tullis
LEATHER BELTING
COLUMBIA BRAND

is made entirely from this portion of the hide.

SEND FOR OUR ILLUSTRATED CATALOGUE

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THE BICKNELL-THOMAS TAPPING ATTACHMENT
Fits Any Make Drill

A friction mechanism inside the body of the attachment is automatically adjusted by the driving pressure, creating a very sensitive drive and eliminating the sudden strain of the reverse—responsible for many broken taps. This attachment is fitted with a plain chuck with jaws that grip both the round and square end of the tap shank.

Made to take taps from 3-32" to 1-4" in diameter.

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Here is another chuck from the "Sweetland" family. Our well-known "Geared Scroll Chuck" with hardened jaws ground perfectly true on face and bite. This style is also made with four jaws. We also manufacture the entire family of "Sweetlands": Independents, Universal and Combination Chucks.

Think twice on your next order; then call on "Sweetland," the old reliable.

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Capacities: 2 Tons to 200 Tons

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REVOLVING TOWER CRANES

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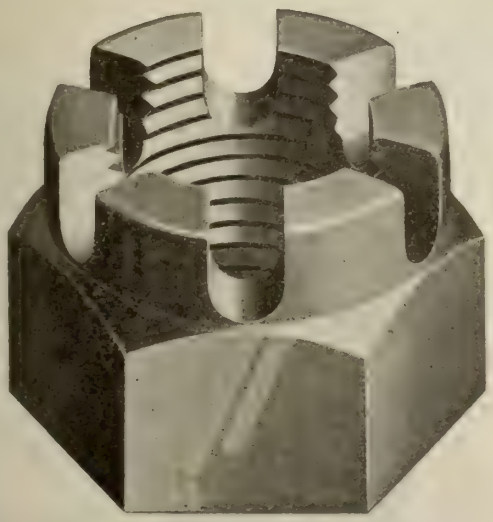

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PLAIN OR CASTELLATED

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PECIALS TO YOUR SPECIFICATIONS

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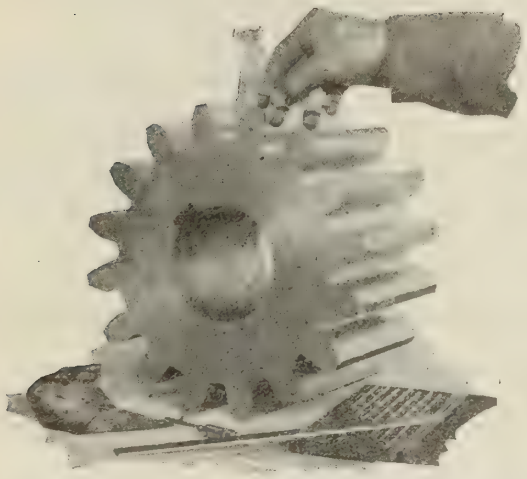

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Hamilton Gear Co., Ltd.

Van Horne St., TORONTO

There's a Famous Five File for Every Kind of Work

And every one is made of high grade steel, and ground and cut for its particular purpose.

Give your men Famous Five File to work with, and you will get good results.

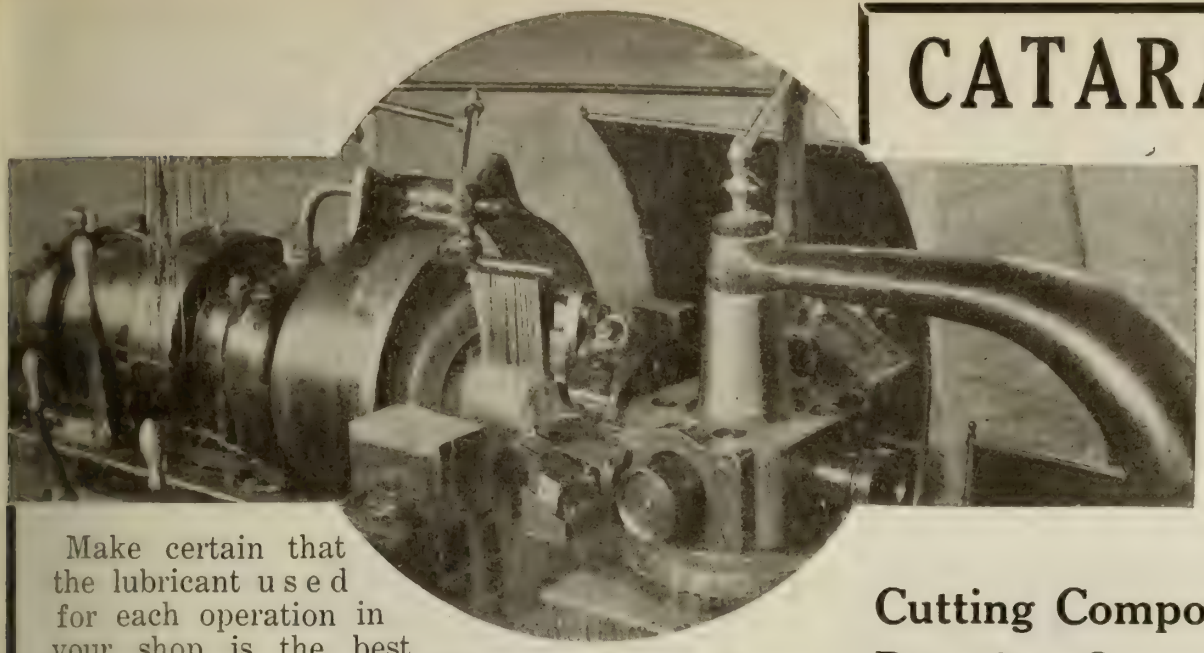
Also teach them to turn in a file as soon as it becomes dull.

You do not need to be afraid to do this with Famous Five Files because they will not grow dull quickly.

Specify them when ordering.

They are:

CATARACT



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Make certain that the lubricant used for each operation in your shop is the best obtainable for the purpose. Otherwise your men and your tools and your machines work at a disadvantage.

Write us to-day that we may demonstrate how Cataract Lubricants can increase production and reduce cost in your plant.

Cutting Compounds
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Announcing—

WILLIAMS' "Vulcan" Forged-Cutter Tool Holders give unequalled service to those who prefer the solid, forged-type of cutting tool. Each Holder, by the mere insertion of small High Speed Forged-Cutters is adapted to the heaviest service on Lathe, Planer, etc.

The economy and convenience of this line, when installed as standard shop equipment, is at once apparent, as all blacksmith work, to say nothing of the very considerable investment necessitated by heavy, solid forged-tools of costly High Speed Steel, is eliminated.

Absolutely simple in construction, yet possessing all the advantages of the solid tool without its expense.

Cutters, drop-forged from the finest grade of High Speed Steel, in stock in a great variety of sizes and types, finished and hardened ready for use. Ask for descriptive booklet.

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The A. G. Low Co., Ltd., 45 Pacific Ave., Saskatoon, Sask.
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Williams' "Vulcan" Forged-Cutter Tool Holders

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Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.

PRESSES and SHEARS
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THE D. H. STOLL CO., INC.
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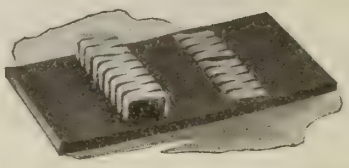
Builders of
Hole, Hole and Face and Deep Hole Grinders



MAXIMUM EFFICIENCY IN BELT LACING
A broken belt won't hold up production long if you repair it with
Patent Steel BRISTOL'S Belt Lacing
Pronounced the most efficient, because it is the easiest, the quickest and the best to apply.
No special tool is required. Simply a hammer and a soft block of wood to drive the sharp, staggered steel prongs through the belt in double rows and to clinch the points. The belt is gripped firmly without danger of cutting or weakening.
Send for samples and Catalog I-707.
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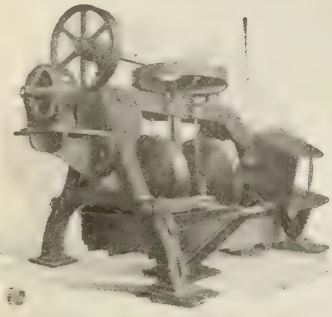
Canadian Steel Foundries Need Frost Improved Sand Mills



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Heavy Mullers
Unloading Device
Motor or Belt Drive
The Frost Mfg. Co.
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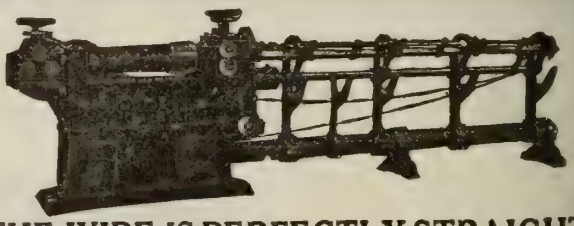

THE WIRE IS PERFECTLY STRAIGHT
and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.
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Formerly John Adt & Son. Established 1866.
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

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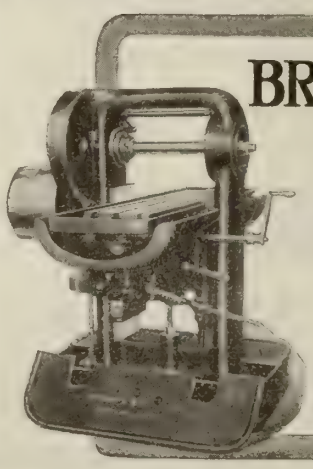
Trade Mark Reg. U. S. Pat. Office
A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.
Catalog No. 6.
Greenfield Machine Co.
Greenfield, Mass., U.S.A.



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This Miller is breaking production records wherever introduced. It handles work no other machine of its size can touch and it does perfectly accurate work. Rigid, powerful, accurate.
We should like to show how "Briggs" adaptability and convenience can better output and lower costs for you. Get in touch with us.
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PRESSES ALL—TYPES

Press Attachments, Automatic.
Metal and Wire Forming Machines.
Tumblers—Large Line.
Burnishing Machines. Grinders.
Special Machines.
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A big, powerful, well proportioned lathe that will stand up under the heaviest service.
Write for descriptive literature.
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DROP FORGED STEEL
ALL SHAPES
ALL SIZES
Best Quality---All Alloy Steel Screws
COMPLETE CATALOG FREE

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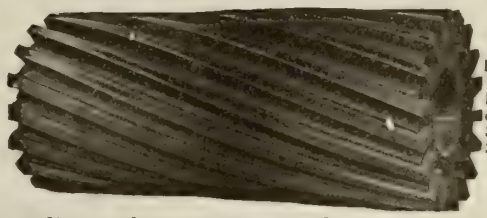
"The Tool Holder People"
306 N. Francisco Ave., - CHICAGO, U.S.A.

Taylor-Newbold Milling Cutters

Fast Cutting
Power-ful



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Will outlive and out-cut any other on the market
4-in. Diameter for General Use.
Send for Bulletin R-P and 30-day trial offer.
THE TABOR MANUFACTURING COMPANY
PHILADELPHIA, PA., U.S.A.

Speed in Cutting Off

Hurlbut, Rogers Cutting-Off & Centering Machine

TWO CUTS AT ONCE—one up, the other down. This is what makes the Hurlbut, Rogers Cutting-Off and Centering Machine virtually double the output and reduce the cost per piece one-half.
You should learn more about it. Write for description to-day.
The Hurlbut, Rogers Machinery Co.
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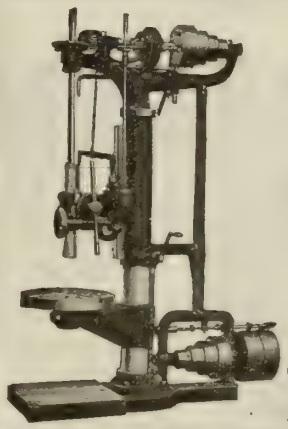
FOREIGN AGENTS: England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne.



6 Positive Geared Feeds

instantly obtained, are but one of many advantages provided by

SILVER DRILLS

For 64 years these upright Drilling Machines have served well in the States and Canada.
Write for full description of our 20" and 25" sizes.
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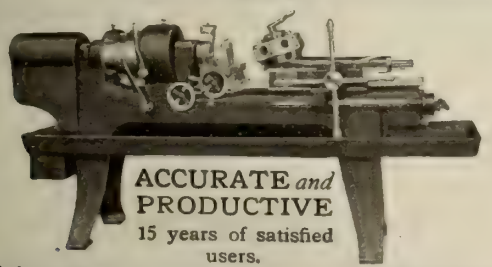

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Ask the User *Send for Catalog*
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"MADE IN CANADA"

"Type D"

Electric Travelling Cranes, Hand Cranes, Electric Hoists, Air Hoists, Foundry Equipment, Cupolas, Ladles, etc., etc.

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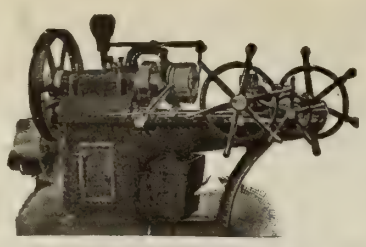

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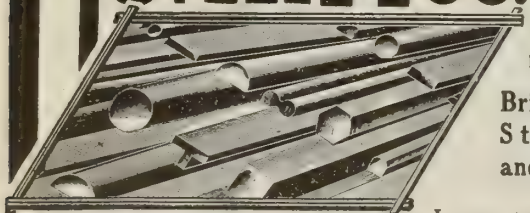

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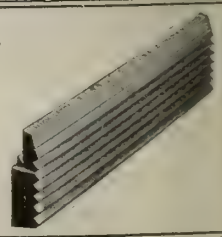

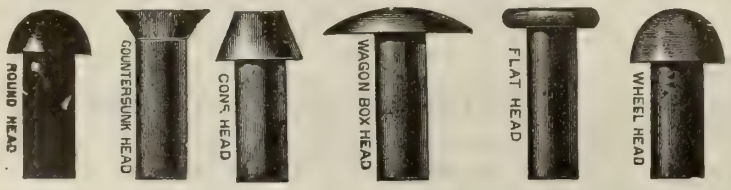

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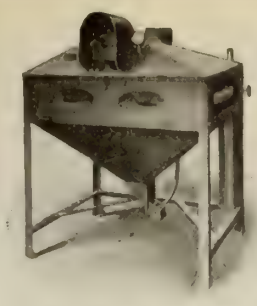

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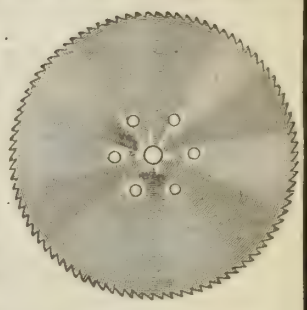

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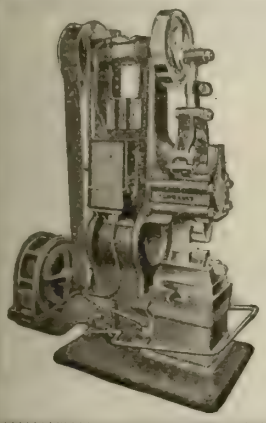

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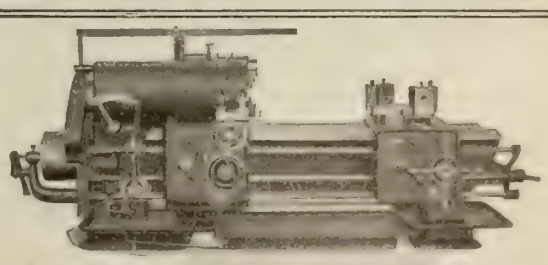

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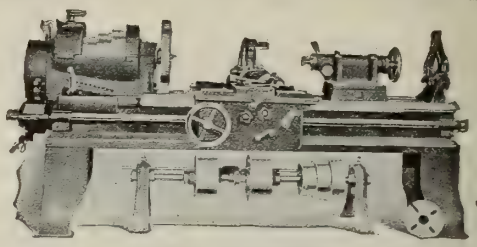

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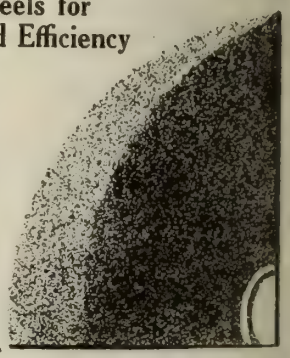

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Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT, IRON
Warmington & Co., J. N., Montreal, P.Q.

CEMENT, ELASTIC JOINTING
Warmington & Co., J. N., Montreal, P.Q.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MACHINE MILLING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAMPS, BELT
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal. Que.
Williams & Wilson, Ltd., Montreal. Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blancke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

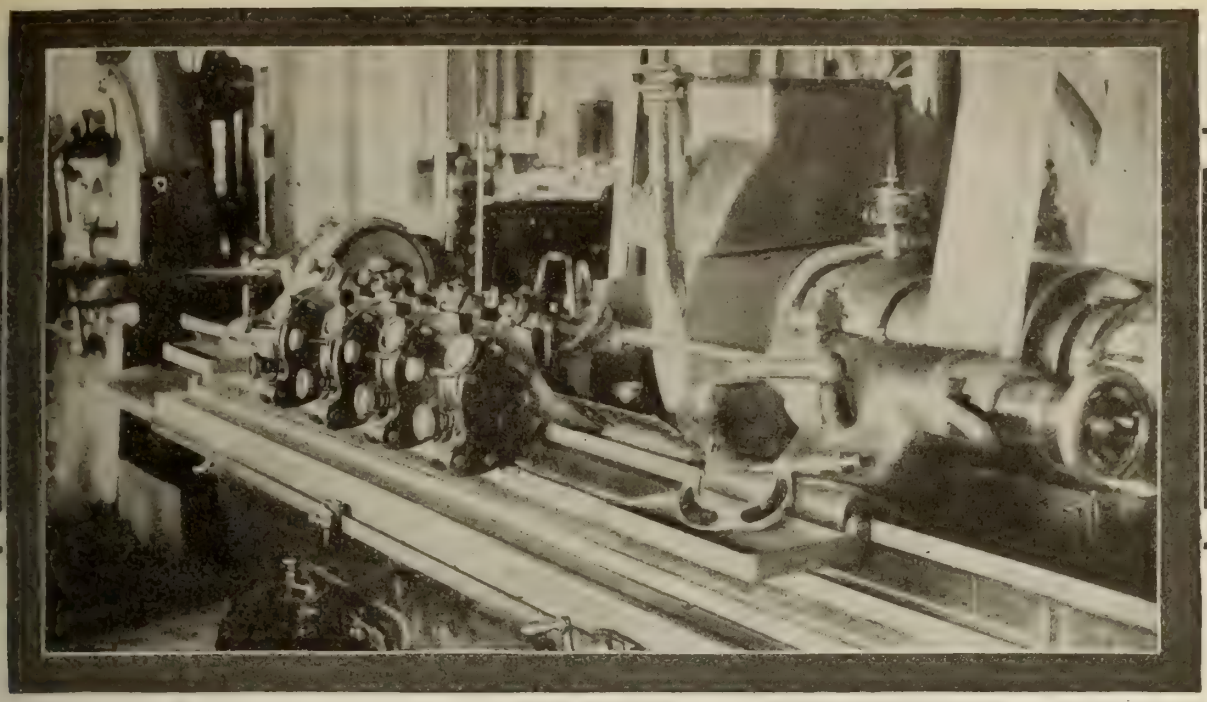
COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.



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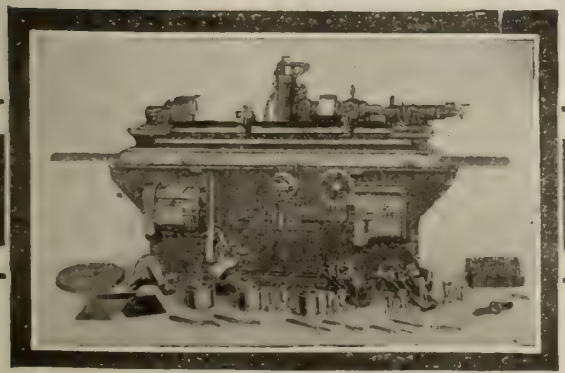

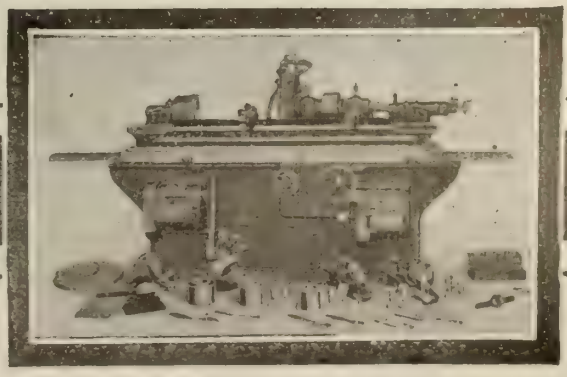

If interested tear out this page and place with letters to be answered.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found'g & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIES, CUTTING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, METAL STAMPING
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
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Pratt & Whitney Co., Dundas, Ont.
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Kayser-Ellison & Co., Ltd., Montreal.
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Norton, Ralph B., Agent, Montreal.
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Fry's (London), Ltd., London, Engla
Garlock-Walker Machinery Co., Toron
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, C
Williams & Wilson, Ltd., Montreal, Q

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Butterfield & Co., Inc., Rock Island, Q
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Morse Twist Drill & Machine Co., N Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O
Wilt Twist Drill Co., of Can., Walkerv
Williams & Wilson, Ltd., Montreal, Q

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Cleveland Twist Drill Co., Cleveland.
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Morrow Screw & Nut Co., John, Ingers
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
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Wilt Twist Drill Co. of Can., Walkerv

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Butterfield & Co., Inc., Rock Island, Q
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Cincinnati Electrical Tool Co., Cincinn
Geo. F. Foss Mch. & S'ply Co., Montr
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Niles-Bement-Pond Co., New York.
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Butterfield & Co., Rock Island, Que.
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H. A. Drury Co., Montreal.
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Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
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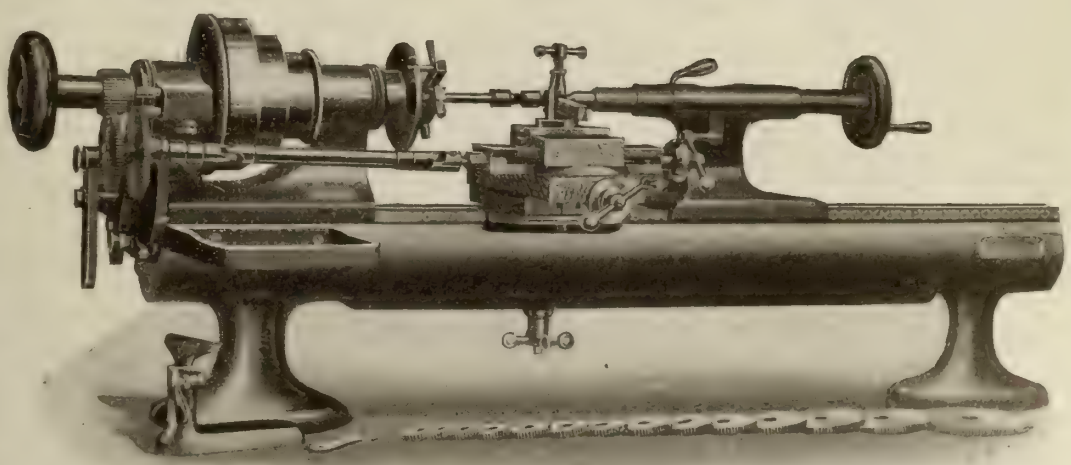

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Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Clevel
Willson & Co., Inc., T. A., Reading,
Welding & Supplies Co., Montreal.

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Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herb Niagara Falls, Ont.

GREASE CUPS, PRESSED STE BRASS
Can. Winkley Co., Ltd., Windsor, On

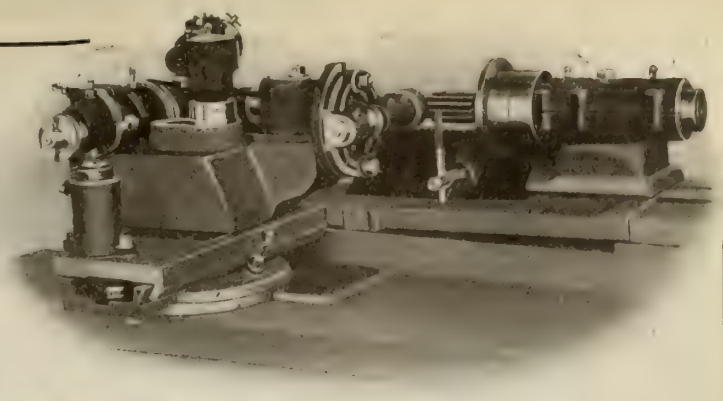
GREASES (See Lubricants)

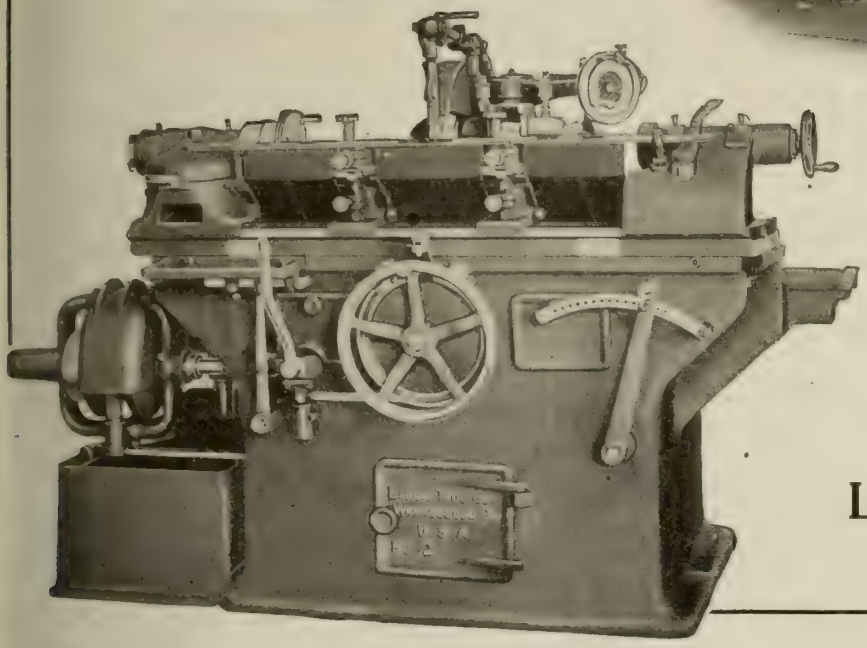
GRINDERS, AUTOMATIC KNI
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Mont
Garlock-Walker Machinery Co., Toront

GRINDERS, CENTRE COLUMN PEDESTAL AND BENCH
Wisconsin Electric Co., Inc., Racine,
Can. Machinery Corp., Galt, Ont.

Easy to Operate

Landis Universal Grinding Machines





Backing-off Straight Reamer

Their application is practically unlimited, combining, as they do, both an external and internal grinding machine.

Besides they are economical, and increased efficiency can be obtained by the use of the magnetic chuck, side mill grinding attachment, gear cutter grinding attachment, etc. (See sketch herewith).

Landis Tool Company
Waynesboro, Pa.

LANDIS

A Plant Equipped in Every Detail to Suit Your Every Need

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Open Hearth, Basic and Acid, Electric and Alloy Steels.

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For Ships, Railways, Rolling Mills, Gears, Machinery and Ingots to 35 tons.

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PLATES

Plates and Heavy Sheets to 30 inches wide, Soft and High Carbon, Automobile Plates and Sheets.

AGRICULTURAL STEEL

Soft Centre and Solid Plow Steel, Harrow Discs, Shovel Steel, Cultivator Blades.

DOMINION FOUNDRIES AND STEEL, LIMITED
HAMILTON, CANADA

If interested tear out this page and place with letters to be answered.

Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Katie Foundry, Galt, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford.
Niles-Bement-Pond Co., New York, N.Y.
Perfect Machine Co., Galt, Ont.
United States Elec. Tool Co., Cincinnati.
Williams & Wilson, Limited, Montreal.

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Foss Mchy. & S'ply. Co., G. F., Montreal.
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Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal.

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Modern Tool Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.

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Armstrong Bros. Tool Co., Chicago, Ill.
Ford-Smith Mach. Co., Hamilton.
Gardner Machine Co., Beloit, Wis.
Heald Machine Co., Worcester, Mass.

GRINDERS, FLEXIBLE CASTING

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Foss Mchy. & S'ply. Co., G. F., Montreal.
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Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal.

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Greenfield Machine Co., Greenfield, Mass.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

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Wisconsin Electric Co., Inc., Racine, Wis.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Grant Mfg. & Mach. Co., Bridgeport, Conn
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago.
United States Elec. Tool Co., Cincinnati.
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Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
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Norton Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

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Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford, Ont.
LeBlond Mch. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wiss.
Williams & Wilson, Ltd., Montreal.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Norton Co., Worcester, Mass.

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Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Norton Co., Worcester, Mass.

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Canada Wire & Iron Goods, Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland.

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Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Fry's (London), Ltd., London, England.
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Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
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Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

HACK SAW FRAMES

Aikenhead Hardware Co., Toronto.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
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Williams & Wilson, Ltd., Montreal.

HACK SAWS, POWER

Aikenhead Hardware Co., Toronto, Ont.
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Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply. Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.

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Whitman & Barnes Co., St. Catharines.

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Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

HAMMERS, HELVE POWER

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West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal.

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Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
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Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, STEAM

Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

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Chapman Double Ball Bearing Co., Toronto
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
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Williams & Wilson, Limited, Montreal.

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Shore Instrument & Mfg. Co., New York.

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Strong, Kennard & Nutt Co., Cleveland.

HIGH SPEED STEEL

See Steel.

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Illinois Tool Works, Chicago, Ill.

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London Bolt & Hinge Wks., London, Ont.

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Illinois Tool Works, Chicago, Ill.
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Taylor, J. A. M., 318 Stair Bldg., Toronto.
Wells Bros. of Canada, Galt, Ont.

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Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

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HOLDERS, ELECTRIC

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Clipper Belt Lacer Co., Grand Rapids.

HOPPERS

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Dominion Bridge Co., Montreal, Que.
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Independent Pneumatic Tool Co., Chicago.
Wells Bros. Co. of Canada, Galt, Ont.

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HOSE, SAND BLAST

Pangborn Corporation, Hagerstown, Md.

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Metalwood Mfg. Co., Detroit, Mich.
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Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.
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Williams & Wilson, Limited, Montreal.

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Taylor Instrument Co., Rochester, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES

Brown & Sharpe Mfg. Co., Providence, R.I
Dickow, Fred C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal.

INDICATING INSTRUMENTS

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Nova Scotia Stl. & Coal Co., New Glasgow

INGOTS, FORGING AND ROLLING

Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS

H. H. Robertson Co., Ltd., Sarnia, Ont.

INSTRUMENTS, ENGINEERING

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Swedish Steel & Impt. Co., Ltd., Montreal.

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Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

JOURNAL WEDGES

Canada Foundries & Forgings, Welland.

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Williams & Co., J. H., Brooklyn, N.Y.

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Can. Blower & Forge Co., Kitchener, Ont.
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MacKinnon Steel Co., Sherbrooke, Que.

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Gray Ball Bearing Co., Ltd., Toronto.

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LABORATORIES, INSPECTION AND TESTING (See Chemists)

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Northern Crane Works, Walkerville.

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LAMPS, TUNGSTEN AND NITRO

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LAG SCREW GIMLET POINTERS

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LATH

H. H. Robertson, Ltd., Sarnia, Ont.

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Wood Turret Machine Co., Brazil, Ind.
Williams & Wilson, Limited, Montreal.

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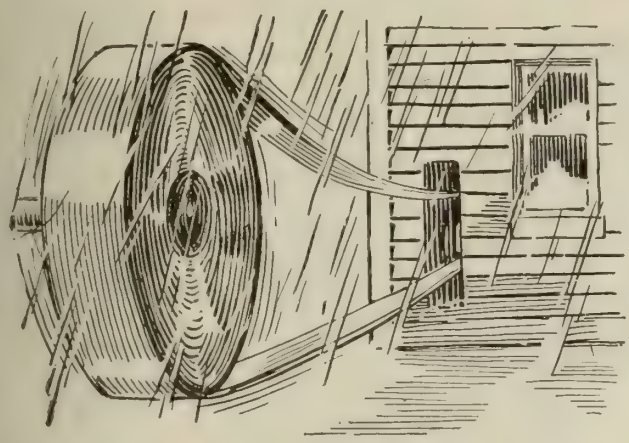
BELTING

It will surely pay you to use

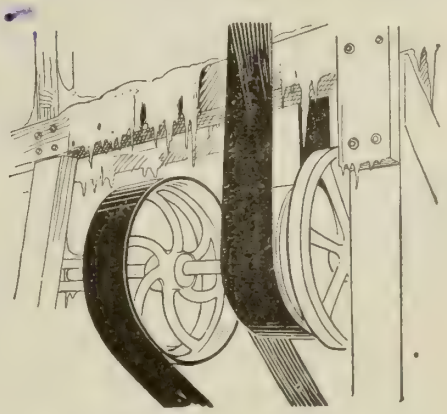
"Lanco" Balata Belting

on some of your drives

TRADE MARK LANCO BALATA BELTING

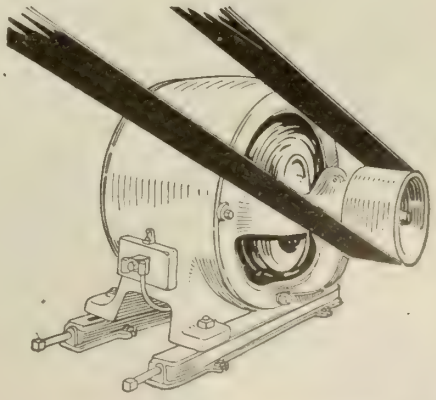


IT is a real waterproof belt and not merely waterproofed. Balata gum is applied in solution and impregnates all the fibres of the duck. Every ply of this belt is waterproof. This means that if the surface is worn off or even after a ply is worn off you still have a waterproof belt. For this reason this is the belt for wet places where you require long service.



THIS belt is good for cold places and can be used under any atmospheric conditions except those of heat. For work in wet or cold places you can buy cheaper belts that will do the work as well for a time, but would you not rather have a belt that would last longer even if you had to pay more for it?

THIS belt makes an excellent motor drive belt. It is as nearly stretchless as it is possible to make a good belt and for this reason requires very little attention. We can make it endless at our own plant and this makes it even more ideal for motor service. It will pay you well to use this belt in all places covered in the above description.



FEDERAL ENGINEERING CO., LIMITED

172 John St., Toronto

If interested tear out this page and place with letters to be answered.

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Hendey Machine Co., Torrington, Conn.
Williams & Co., J. H., Brooklyn, N.Y.

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Gisholt Machine Co., Madison, Wis.
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LATHES, BORING
Bridgeford Mach. Tool Works, Rochester.
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Williams & Wilson, Ltd., Montreal, Que.

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Hardinge Bros., Chicago, Ill.
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Williams & Wilson, Ltd., Montreal, Que.

LATHES, ENGINE
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Cisco Machine Tool Co., Cincinnati, Ohio.
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Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis
Kennedy & Sons, Wm., Owen Sound, Ont.
R. Mc'Dougall Co., Galt.
Miles-Bement-Pond Co., New York.
Rae Mach. Tool Co., Ramilton.
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Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.
Worcester Lathe Co., Worcester, Mass.

LATHES, FOOT POWER
Seneca Falls Mfg. Co., Seneca Falls, N.Y.

LATHES, HORIZONTAL
Wood Turret Machine Co., Brazil, Ind.

LATHES, JOURNAL TRUEING
Bridgeford Mach. Tool Works, Rochester.

LATHE MANDRELS, HARDENED AND GROUND
Elliott & Whitehall, Galt, Ont.

LATHES, PATTERNMAKERS'
J. G. Blount Co., Everett, Mass.
Can. Machinery Corp., Galt.
Wood Turret Machine Co., Brazil, Ind.
G. F. Foss Mchy. & S'ply Co., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, POLISHING
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SCREW CUTTING
Bertram & Sons Co., John, Dundas, Ont.
Bridgeford Mach. Tool Works, Rochester.
Canada Machinery Corp., Galt, Ont.
Cisco Machine Tool Co., Cincinnati, O.
Foss Mchy. & S'ply Co., G. F., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Rae Mach. Tool Co., Ramilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Wickes Bros., Saginaw, Mich.
Williams Machy. Co., A. R., Toronto.
Wood Turret Machine Co., Brazil, Ind.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, SPINNING
Bliss Co., E. W., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

LATHES, TOOL ROOM
Cisco Machine & Tool Co., Cincinnati, O.
Canada Machinery Corporation, Galt, Ont.
Rae Mach. Tool Co., Ramilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Worcester Lathe Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

LEAD BURNING
St. Lawrence Welding Co., Montreal.

LEAD BURNING OUTFITS
Turner Brass Works, Sycamore, Ill.

LEATHER STRAPPING
Graton & Knight Mfg. Co., Worcester, M.

LENSES FOR GOGGLES
Standard Optical Co., Geneva, N.Y.

LETTERS AND FIGURES, METAL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

LIDS, SCREW TOP AND HINGE
Can. Winkley Co., Ltd., Windsor, Ont.

LINK BELTING
See Belting, Chain.

LINOLEUM MILL MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.

LOCKERS, STEEL WARDROBE AND STEEL MATERIAL
Canada Wire & Iron Gds. Co., Hamilton
Dennis Wire & Iron Works, London, Ont.

LUBRICANTS
Cataract Refining & Mfg. Co., Toronto.

LUBRICANTS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

LUBRICATING, OIL FILTERING AND CIRCULATING SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

LUBRICATORS
Trahern Pump Co., Rockford, Ill.

LUMBERMEN'S TOOLS
Thos. Pink Co., Ltd., Pembroke, Ont.

MACHINE COUNTER WEIGHTS
Katie Foundry, Galt, Ont.

MACHINE TOOLS
Rae Mach. Tool Co., Ramilton.

MACHINERY, CORNER AND BENDING
Peck, Stow & Wilcox, Southington, Conn.

MACHINERY DEALERS
Archibald & Co., Chas. P., Montreal.
Can. Fairbanks-Morse Co., Montreal.
Elliott & Whitehall, Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MACHINERY GUARDS (See Guards)

MACHINERY, SPECIAL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

MACHINISTS' TOOLS
Brown & Sharpe Mfg. Co., Providence, R.I.

MAGNETIC BRAKES FOR ELECTRIC MOTORS
Volta Mfg. Co., Welland, Ont.

MANDRELS
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.

MARKING DEVICES
Pritchard-Andrews Co. of Can., Ottawa.
Matthews & Co., Jas. H., Pittsburgh, Pa.

MARKING MACHINERY
Brown, Boggs Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Perrin, Wm. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MASKS, WELDING, SMOKE, FUME, GAS, ETC.
Strong, Kennard & Nutt Co., Cleveland.

MEASURING MACHINES
Pratt & Whitney Co., Dundas, Ont.

MEASURES, REGISTERING
Bowser Co., Ltd., S. F., Toronto, Ont.

MEASURING TAPES AND RULES
Chesterman & Co., Jas., Sheffield, Eng.

METALLURGISTS
See Chemists.

METAL CLEANERS
Oakley Chemical Co., New York, N.Y.

METAL SAWS
See Saws.

METAL SAWS, POWER
Hoefer Mfg. Co., Freeport, Ill.

METALS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.
Canada Metal Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.

METAL, STAMPINGS, SMALL
Can. Winkley Co., Ltd., Windsor, Ont.

METERS, OIL, GASOLINE, KEROSENE, ETC.
Bowser Co., Ltd., S. F., Toronto, Ont.

MICROMETERS
Almond Mfg. Co., Ashburnham, Mass.
Taylor, J. A. M., 318 Stair Bldg., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLS, BRACE AND TUBE
Elec. Steel & Metals, Welland, Ont.

MILLS, SAND
Frost Mfg. Co., Chicago, Ill.

MILL MACHINERY
Alexander Fleck, Ltd., Ottawa.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

MILLING ARBORS
Brown & Sharpe Mfg. Co., Providence, R.I.
Kearney & Trecker Co., Milwaukee, Wis.

MILLING ATTACHMENTS
Becker Milling Machine Co., Boston, Mass.
Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, AUTOMATIC
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

MILLING CUTTERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HAND
Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
Gray Ball Bearing Co., Ltd., Toronto.
United States Mach. Tool Co., Cincinnati.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HORIZONTAL AND VERTICAL
Becker Milling Machine Co., Boston, Mass
Bristol Machine Tool Co., Bristol, Conn.
Brown & Sharpe Mfg. Co., Providence.
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLAIN, BENCH AND UNIVERSAL
Becker Milling Machine Co, Boston, Mass.
Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, PLATE
Marshalltown Mfg. Co., Marshalltown, Ia.

MILLING MACHINES, PROFILE
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

MILLING TOOLS
Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Ford-Smith Mach. Co., Hamilton, Ont.
Geometric Tool Co., New Haven, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Williams & Wilson, Ltd., Montreal, Que.

MINE CARS
Can. Fairbanks-Morse Co., Montreal.
Dominion Bridge Co., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.

MINING MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Elec. Steel & Metals, Welland, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MIXERS, SAND
Frost Mfg. Co., Chicago, Ill.

MORTISING MACHINES
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gray Ball Bearing Co., Ltd., Toronto.

MOTORS, ELECTRIC
Can. Fairbanks-Morse Co., Montreal.
Can. General Electric Co., Toronto.
Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
Volta Mfg. Co., Welland, Ont.
Williams Mach'y Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MOTOR SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

MOTORCYCLE FRAME AND FORK
The Dunbar Brothers Co., Bristol, Conn.

MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co., Toronto.

MOULDS, RUBBER
Hoggson & Pettis Mfg. Co., New Haven, Conn.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,
Nat. Automatic Tool Co., Richmond, Ind.

MUNTZ METAL
Brown's Copper & Brass Roller Mills, New Toronto, Ont.

MUSIC WIRE
Blancke Co., L. C., New York City.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Boker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
See Steel.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tuffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

OIL STONES
Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

OIL STONE GRINDERS
Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

OPENING DIE HEADS
Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

OVENS FOR BAKING, BLUING, DRYING, ENAMELING, JAPANNING AND LACQUERING
Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbooke, Que.

OVENS FOR DRYING, TEMPER AND OXYGEN, ELECTROLYTIC CELLS UNDER TRUCKS
Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

PACKINGS, ASBESTOS
Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.

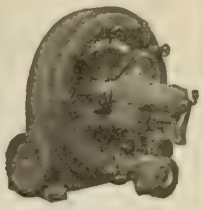
Planing Mill Fan

No. 2 Vacuum Cleaner

Sturtevant (TRADE MARK)

SYSTEMS

Autoforce Ventilator

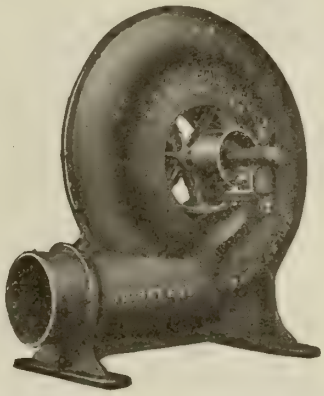

Steam Turbine

Electric Propeller Fan

Sturtevant (TRADE MARK)

STEEL PRESSURE BLOWERS

Medium Pressure Blower



Low Pressure Blower

High Pressure Blower

For All Purposes

THO designed originally for supplying air to cupolas and forges Sturtevant steel pressure blowers are now used for all purposes where pressures up to 16 ounces to the square inch are to be maintained; and where air is to be forced for long distances. Regularly built with horizontal discharge but can be readily made for down blast or up blast. Built in all sizes and may be belt, motor, engine, or turbine driven. Operating and upkeep cost is remarkably low as proven by actual performance in many long term (30 years and more) installations. Design and construction are typically Sturtevant—supreme! Blast wheel is made of refined steel and galvanized to prevent rust. Wheels are accurately balanced and run smoothly when driven at high speed. Bearings are each cast in one piece and are lined with highly durable non-heating white metal. Write for catalogue.

Volume Blower and Exhauster

Gasolene Generating Set

Turbo-Blower

Direct Current Motor

B. F. STURTEVANT COMPANY of Canada, Ltd.

Factory and Main Office
Galt, Ontario

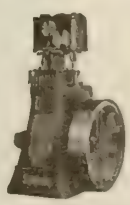
Sales Office: Toronto,
Montreal, Winnipeg

Type H Air Washer

Fuel Economizers

Sturtevant (TRADE MARK)

PRODUCTS


VS-7 Steam Engine

Heater

If interested tear out this page and place with letters to be answered.

Perrin, Ltd., William, Toronto.

PANS, WET AND DRY
Frost Mfg. Co., Chicago, Ill.

PAPER MILL CONVEYORS AND DRIVES
Bertrams, Ltd., Edinburgh, Scotland.
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

PATTERN SHOP EQUIPMENT
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES
See Lathes.

PATENT SOLICITORS
Budden, Hanbury A., Montreal.
Fetherstonhaugh & Co., Ottawa.
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
Shipman & Co., H. C., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Greenleafs, Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

PECK CARRIERS FOR POWER PLANTS
Can. Link-Belt Co., Toronto, Ont.

PENSTOCKS
William Hamilton Co., Peterboro, Ont.

PERFORATED METALS AND ORNAMENTAL IRON GOODS
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PIG IRON
Hanna & Co., M. A., Cleveland, O.
Steel Co. of Canada, Ltd., Hamilton, Ont.

PINS, TAPER
Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

PIPE FITTINGS, MALLEABLE AND CAST IRON
International Malleable Iron Co., Guelph

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Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PHOTOSTATS
Commercial Camera Co., Providence, R.I.

PIPE RIVETED STEEL
Toronto Iron Works, Ltd., Toronto.
William Hamilton Co., Peterboro, Ont.

PIERCING
Oliver Machy. Co., Grand Rapids, Mich.

PIPE CUTTERS, ROLLING
Curtis & Curtis Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, Ltd., John H., Brantford.
Wells Bros. Co. of Canada, Galt, Ont.

PIPE TOOLS AND DIES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE CUTTERS AND REAMERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE STOCKS AND THREADERS
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE TAPS AND VISES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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National Acme Co., Windsor, Vt.

PLANER BOLTS
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PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Williams & Wilson, Ltd., Montreal, Que.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Co., St. Catharines.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Williams & Wilson, Ltd., Montreal, Que.

PRESSED STEEL PARTS
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlass Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SEAL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
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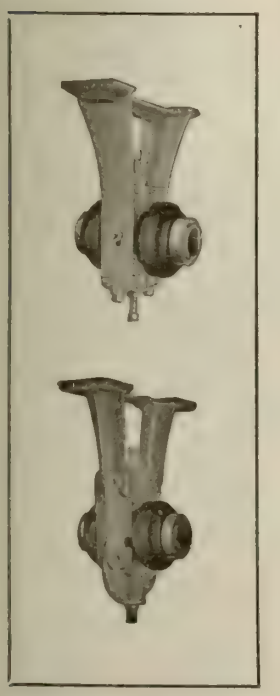

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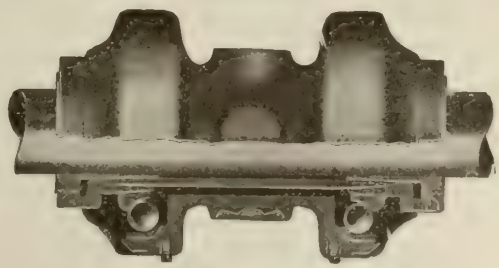

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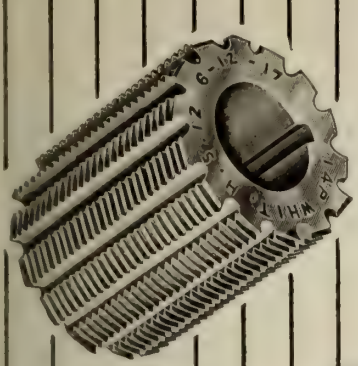

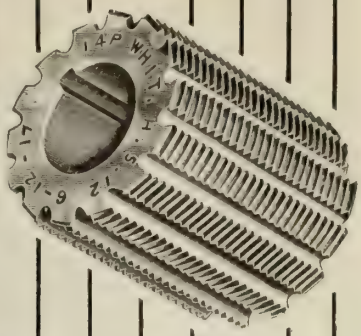

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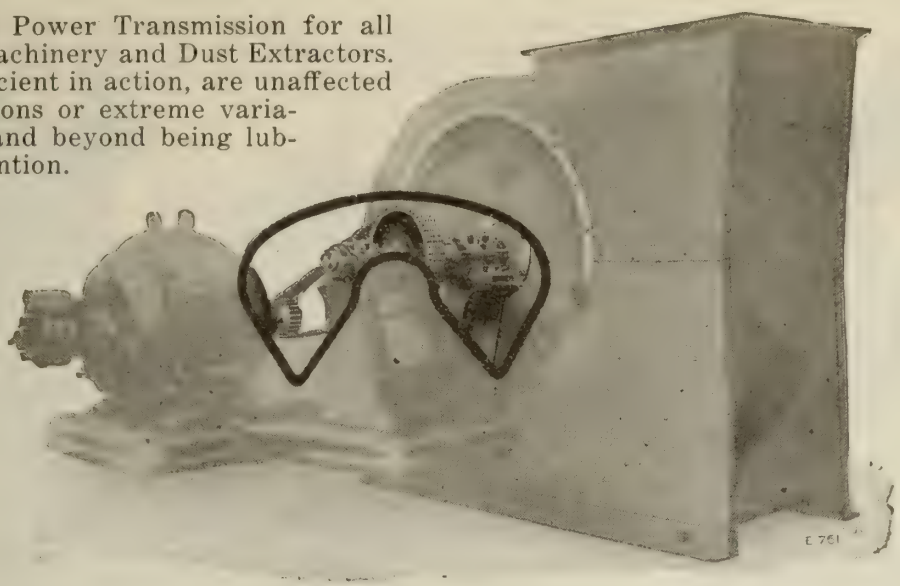

A 25" Keith fan, driven by "The Coventry" Noiseless Chain Motor of 7½ h.p., running at 950 r.p.m., fan 400 r.p.m. This illustration shows how floor space is saved by using chain transmission.

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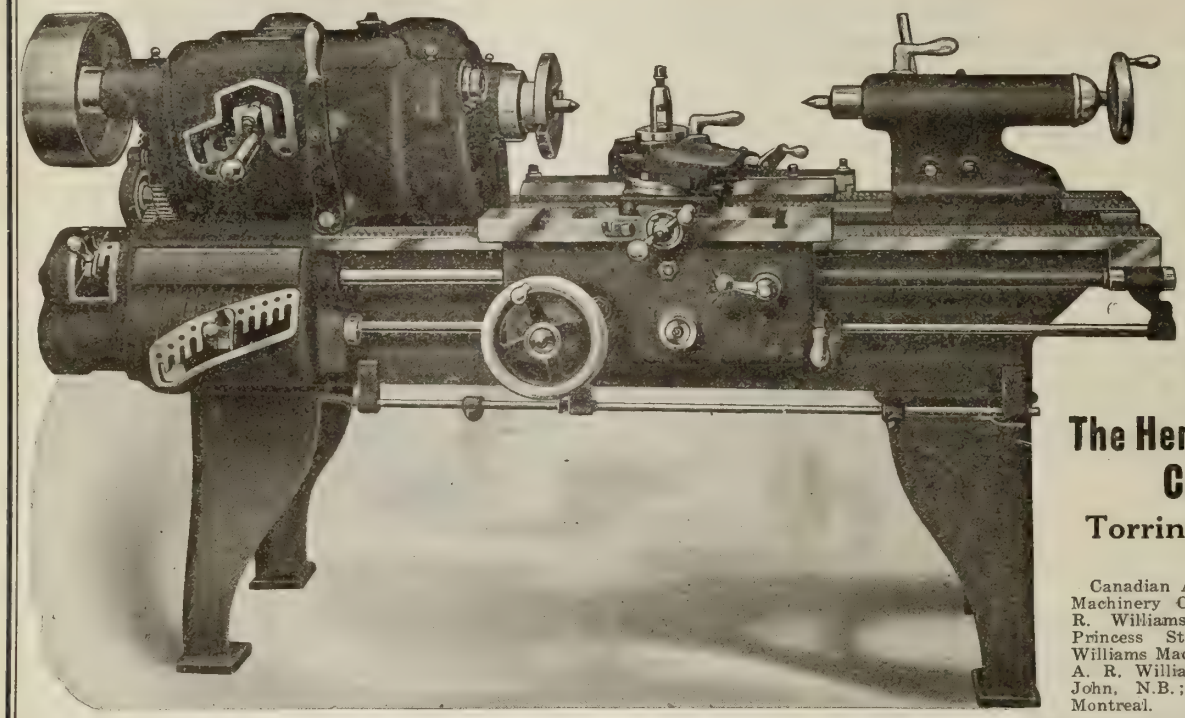

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1—Mueller 3-Foot Radial Drill.

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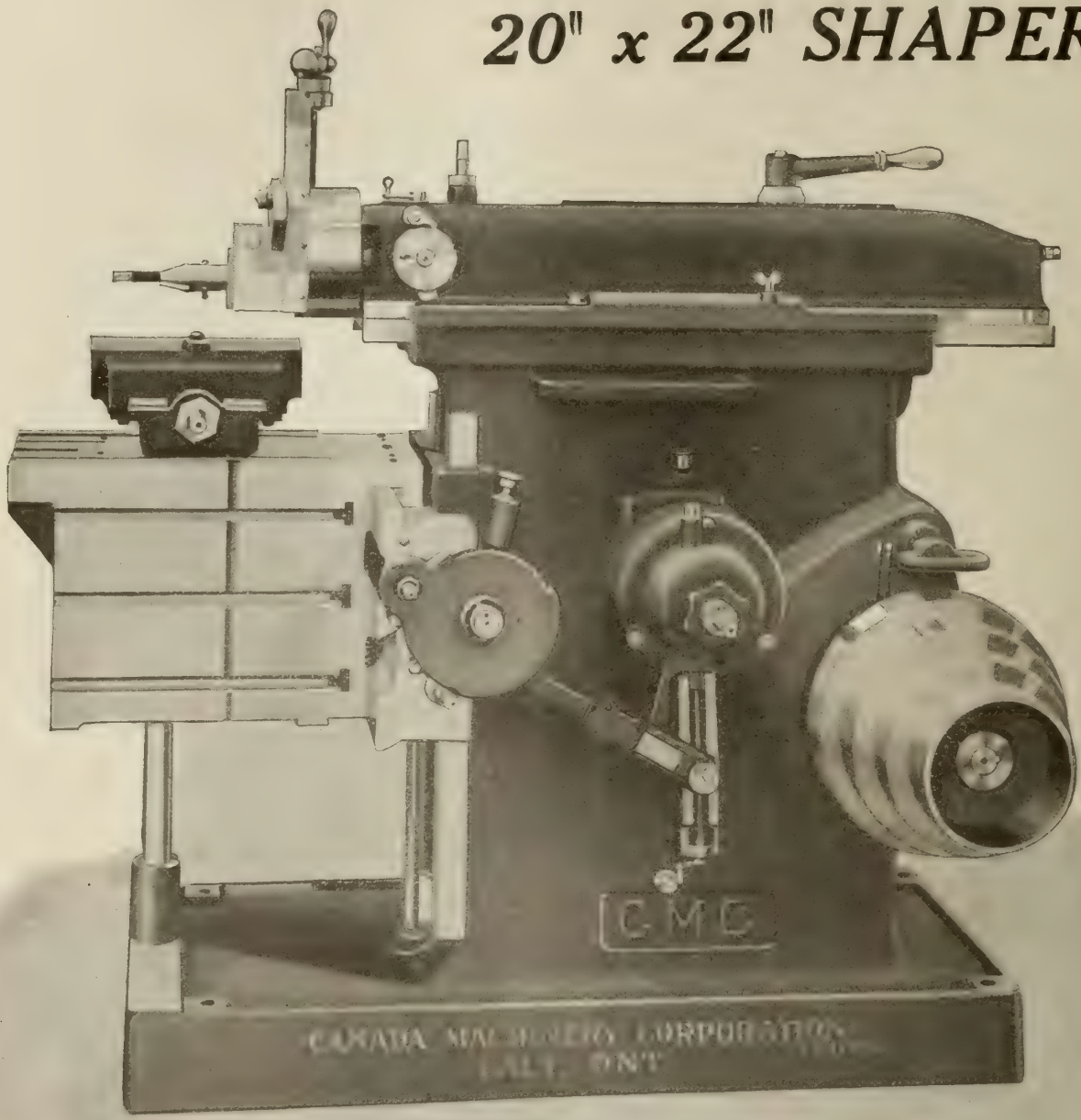

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

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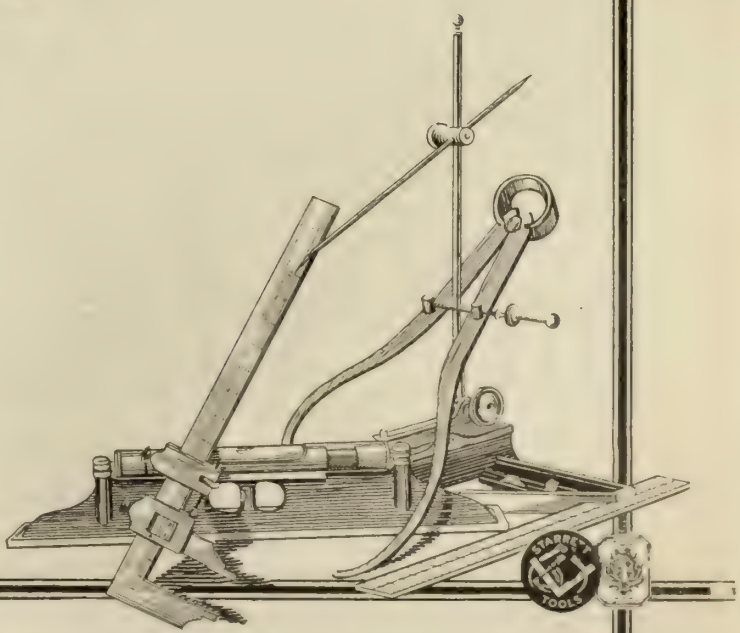

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If you were to board a train at Halifax or Vancouver and ride for 3,500 miles across this broad country—you would see something of the security behind the Victory Bonds. You would ride for a week—but even then you would only see a narrow strip of Canada's hundreds of millions of acres—a country nearly twice as large as all Europe. You would see

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the prairie and plains
the mines and the mills
the docks and the elevators
the steamers and the railroads
the cities
the towns

All this is the security behind your Victory Bonds.

This is the security that makes Victory Bonds one of the world's premier investments. Victory Bonds are the safest securities. Victory Bonds pay a good rate of interest—nearly twice as much as Savings Banks. And you know how vital it is to Canadian Prosperity—and your own welfare—that the Victory Loan shall be successful.

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Put your present savings into Bonds and borrow against your future earnings.

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It needs a little effort and some determination to rekindle the old fire, but it must be kindled if the Victory Loan is to be a success.

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And that can best be expressed if you do your utmost to inspire people to

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Canada Fights to Win

When Canada fought—Canada fought to win.

We are now in the midst of another campaign.

The Victory Loan is a campaign to raise money to pay the obligations that the war has left us, and to keep Canada prosperous.

The Victory Loan 1919 calls for vigorous individual and concerted action.

It is a national platform on which all citizens concerned in their country's prosperity and welfare can, without reservation, take a strong, emphatic stand.

The Victory Loan 1919 is the "clean up" chapter in Canada's War History—it is needed to round out the most glorious of our achievements.

It is needed to "carry on" the National Business—to successfully bridge the period from War to Peace—and to speed our country along the highway of international commerce in successful competition with other great nations.

Your personal co-operation is imperative.

Your support is vital.

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Let us show the world again that what Canada undertakes Canada accomplishes.

Buy Victory Bonds

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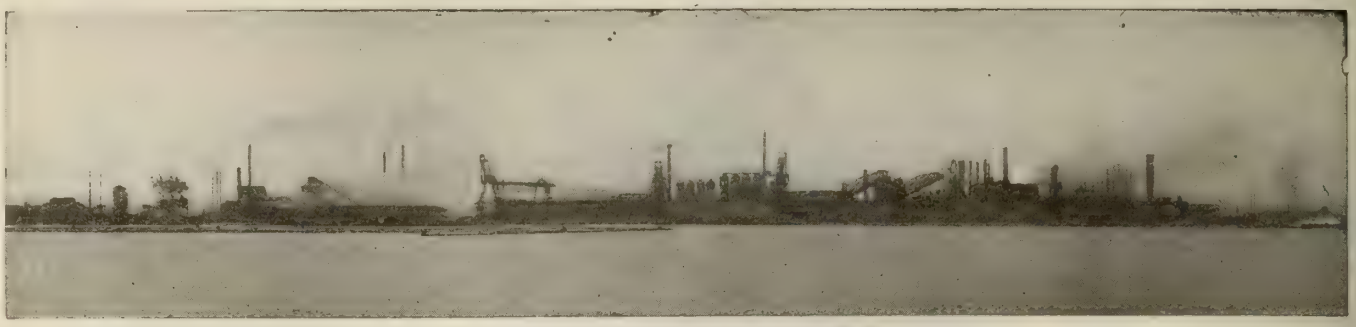

General View of the Plant of the Algoma Steel Corporation from the Waterfront.

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1½ x 1½″—1¼ x 1¼″

ANGLES—Unequal Leg—
6 x 4″—6 x 3½″—5 x 4″
5 x 3½″—5 x 3″—4½ x 3″
4 x 3½″—4 x 3″—3½ x 3″
3½ x 2½″—3 x 2½″—3 x 2″
2½ x 2″

BEAMS—
15″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

CHANNELS—
15″, 13″, 12″, 10″, 8″, 6″, 5″, 4″, 3″.

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜″
3⅜ x 5⅛ x 3⅜ x 7/16″
3 1/16 x 4 x 3 1/16 x ¼″
3⅛ x 4 1/16 x 3⅛ x 5/16″
3 3/16 x 4⅛ x 3 3/16 x ⅜″
2 11/16 x 3 x 2 11/16 x ¼″
2¾ x 3 1/16 x 2¾ x 5/16″

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All sizes from ½″ up to and including 4″.

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All sections from 12 lbs. up to and including 45 lbs. per yard.

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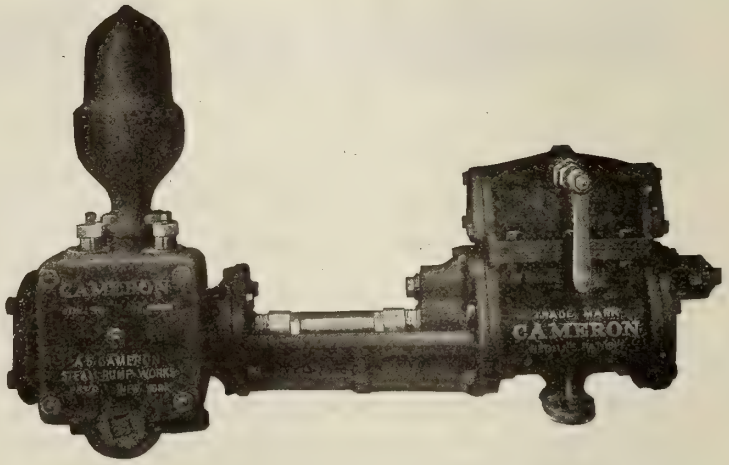
Bulletin 7150 shows typical Cameron pump efficiency curves---based on average performance



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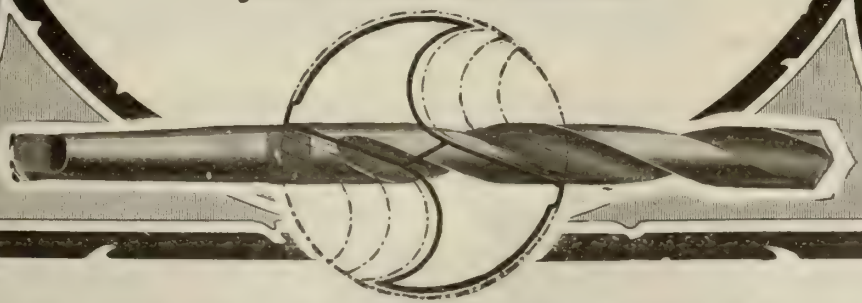

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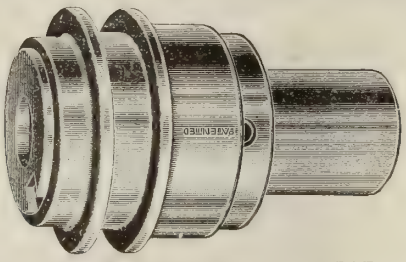
THE JOHNSON FRICTION CLUTCH



SINGLE CLUTCH--EXTERIOR

THE SIMPLEST WAY—AND THE BEST

In a clutch or any other mechanical device, unnecessary complication means trouble. Make a single part serve where two have been used before, and you have reduced by one-half the places that can break, wear or get out of adjustment. Put the cost of **extra** material into **better** material, and you have doubled the length of service.
In the Johnson clutch, this idea has been followed out to its practical limits. The result is a model of simplicity in clutch construction—a few sturdy parts, each correctly built and accurately tested for the duty it must perform. This lack of complication means continuous service and low maintenance cost. Johnson Friction Clutches stay on the job.

WE CAN BUILD TO SUIT YOUR NEEDS

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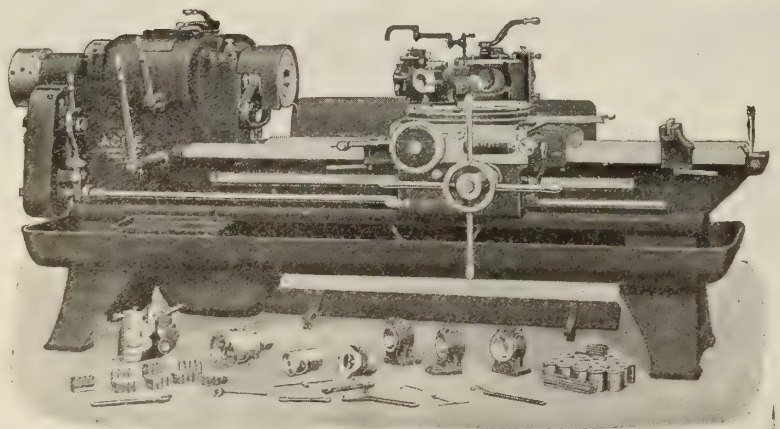
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Doubly Efficient—Does Both Bar and Chuck Work

This Cincinnati Acme Flat Turret Lathe is a double-production, geared head machine of the sliding gear type. It operates on minimum power because the only gears running are those doing the actual work.

This machine saves remarkable time and labor machining either bar work or chuck work up to 16 in. diameter.



3½ in. x 36 in. Flat Turret Lathe, Equipped for Bar Work.

Head is cast solid with the bed. You know what that means: accuracy, rigidity, constant and perfect alignment of spindle with vees, upon which the turret carriage travels.

We also make a full line of Screw Machines and Turret Lathes.

Write for Valuable Bulletin

The Acme Machine Tool Co.

Cincinnati, Ohio

Canadian Agents: Rudel-Belnap Machinery Co., of Montreal and Toronto

It is the duty of all to

BUY VICTORY BONDS

and, by supporting the present Loan, to maintain Canada's credit and secure her future prosperity.

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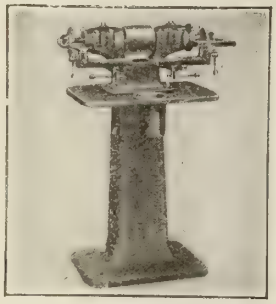
FORD-SMITH Grinders

A fine example of high grade material and workmanship



General Purpose Grinder

Water Tool Grinder

FOREIGN AGENTS:
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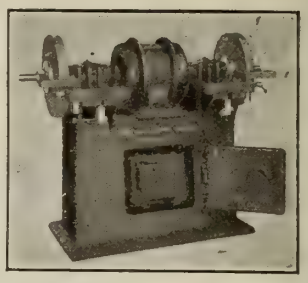

Motor-Driven Floor Grinder

Motor-Driven Grinders
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Special Grinding Machinery
Hack Saws
Swivel Tables

Write for Catalogue and price list.

The Ford-Smith Machine Co., Ltd.
HAMILTON - ONTARIO

Canada Fights to Win

When Canada fought—Canada fought to win.

We are now in the midst of another campaign.

The Victory Loan is a campaign to raise money to pay the obligations that the war has left us, and to keep Canada prosperous.

The Victory Loan 1919 calls for vigorous individual and concerted action.

It is a national platform on which all citizens concerned in their country's prosperity and welfare can, without reservation, take a strong, emphatic stand.

The Victory Loan 1919 is the "clean up" chapter in Canada's War History—it is needed to round out the most glorious of our achievements.

It is needed to "carry on" the National Business—to successfully bridge the period from War to Peace—and to speed our country along the highway of international commerce in successful competition with other great nations.

Your personal co-operation is imperative.

Your support is vital.

It is unthinkable that Canadians—united for years when things looked dark—would not, in the same spirit of patriotism, unite in this last great war effort.

Let us show the world again that what Canada undertakes Canada accomplishes.

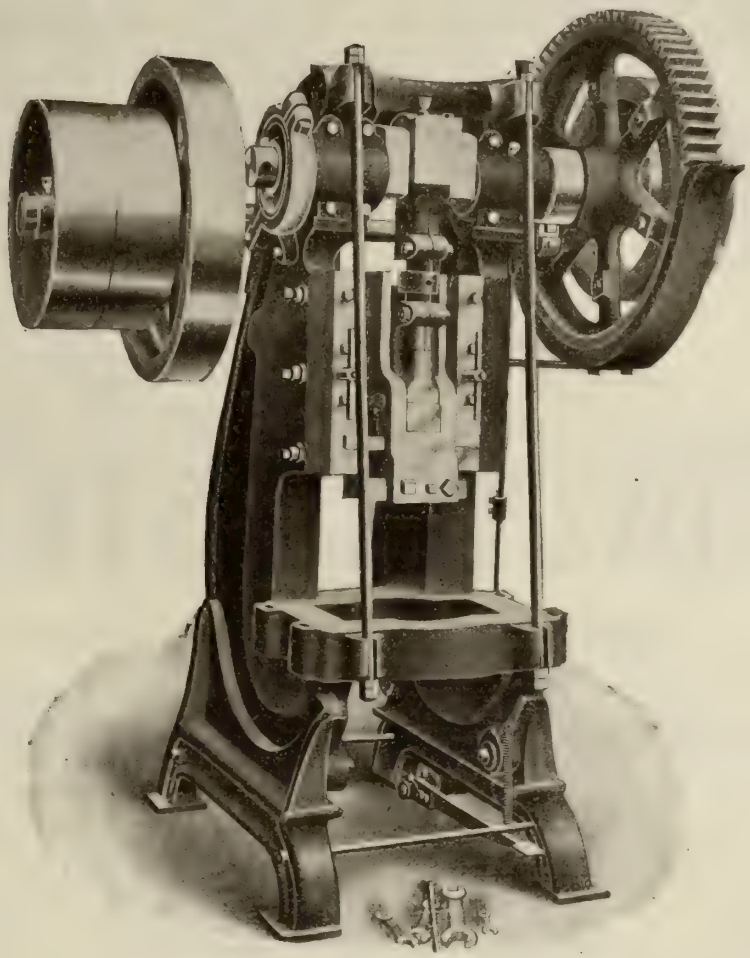
Buy Victory Bonds

Every Dollar Spent in Canada

This space donated to the Victory Loan 1919 Campaign by

The Ford-Smith Machine Co , Limited
Hamilton, Ont., Canada

For Your Pressing Needs



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Quality that is **"Built In"** stands out on all B.B. Power Presses.

The long slides insure accurate work and long life to your dies. The steel pitman screw gives added strength at a vital point.

The Crankshafts are made from high carbon steel forgings and are **"Heat Treated"** so as to give the maximum shock-resisting qualities and prevent crystallization. This is a feature no other press manufacturer can claim.

Let us quote on your next presses. The machines are the best that can be produced and our prices are low in comparison with the value you will get.

The Brown Boggs Co., Limited

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Manufacturers of Presses, Shears, Rolls, etc., also Tinsmiths' Tools and Sheet Metal Working Machinery of every description.

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BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and Cold Rolled Strips, Cold Drawn Cast Steel, Wire and Drill Rods

HIGH GRADE STEEL FOR ALL PURPOSES

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Complete Stock - Montreal Warehouse

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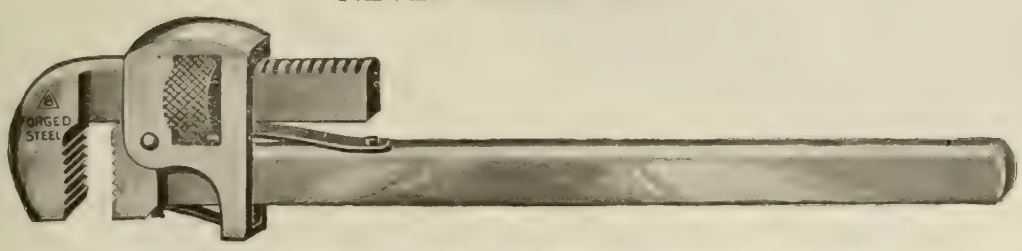
NEVER WEAR OUT

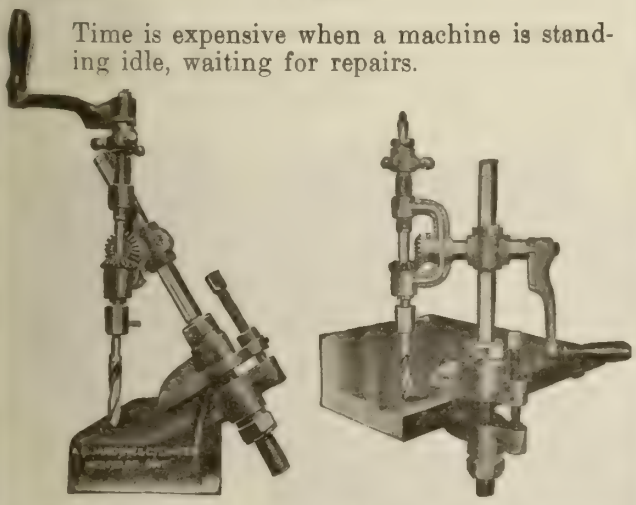


PIPE THE WRENCH—WRENCH THE PIPE

Canadian Billings & Spencer Plant
Welland, Ont.

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
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LOCOMOTIVE AND CAR WHEEL TYRES

HIGH-SPEED AND CARBON
TOOL STEEL

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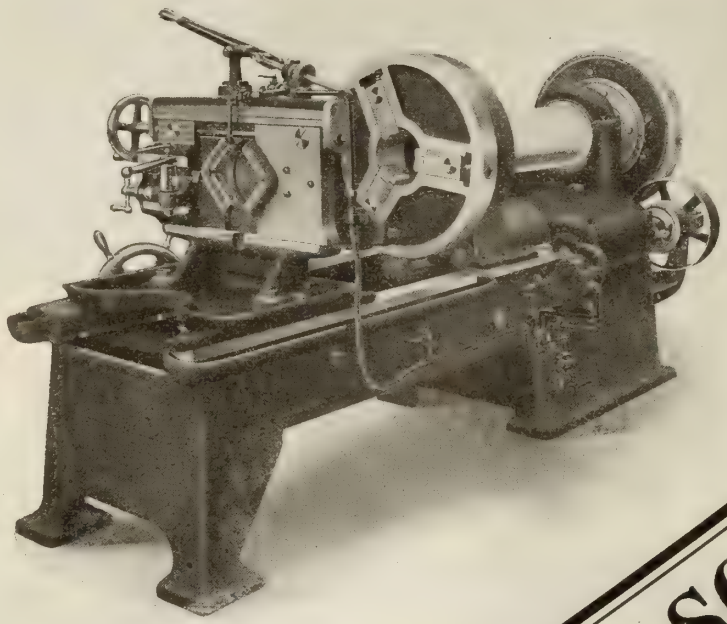

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PIPE MACHINERY

JOHN H. HALL & SONS, LIMITED

BRANTFORD, ONTARIO
MANUFACTURERS OF

Pipe Threading Machinery

No. 6 Belt Drive
Capacity 1¼ to 6"
Built to
Last

All
Sizes
Pipe Machines
Nipple Machines
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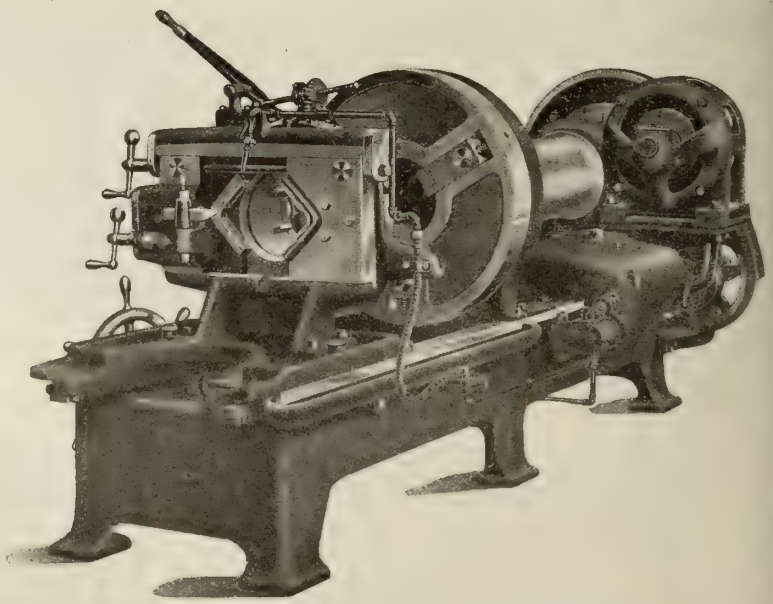

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Capacity 2½ to 8"

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Just Issued

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An Exchange of Money That Pays

When you buy Victory Bonds, you simply exchange one kind of money for another.

A dollar bill is Canada's promise to pay.

So are Victory Bonds.

But Victory Bonds pay INTEREST.

Consider the security behind Victory Bonds—

Canada and all that is contained therein.

Consider the good rate of interest—

Victory Bonds pay 5½%—nearly twice as much as Savings Banks.

Consider the saleability of Victory Bonds—

Their use as collateral for a loan.

Their prospective advancement in price.

Consider the purpose for which Canada requires the money:—

Cleaning up our obligations to the army and maintaining the prosperity of the country.

Are not these reasons the best in the world for exchanging one kind of money for another?

Should not every Canadian put all his weight behind this Loan?

Should not he exchange all the money he has for Victory Bonds?—and all the money he can save for the next ten months to come?

Buy Victory Bonds

"Every Dollar Spent in Canada"

THIS SPACE DONATED TO THE VICTORY LOAN CAMPAIGN BY

ROELOFSON MACHINE & TOOL CO., LIMITED

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Works and Warehouse: Galt, Ontario, Canada

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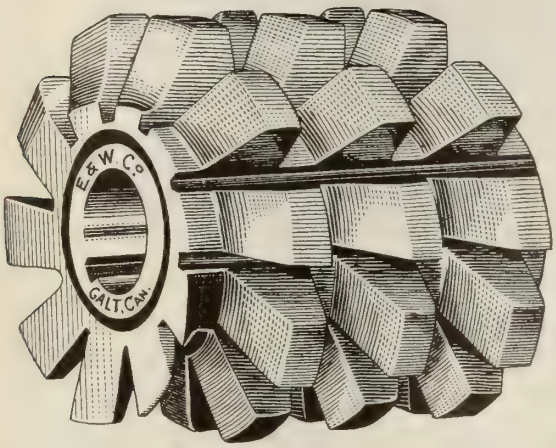
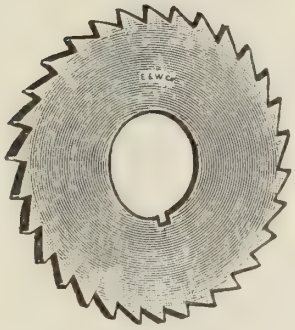
Elliott & Whitehall
Galt, Onta

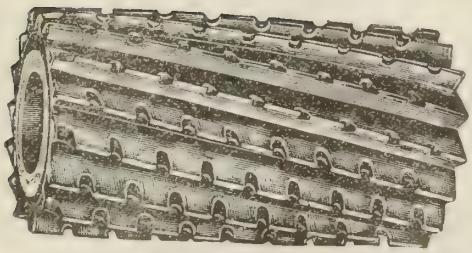


Plain Milling Cutters, Side Milling Cutters, End Mills, Angular Cutters, Convex Cutters, Concave Cutters, Interlocking Side Milling Cutters, Special Cutters, Gear Cutters, etc.

Hand Reamers, Shell Reamers, Chucking Reamers, Taper Pin Reamers, Lathe Mandrels, Arbors, Gauges, Jigs and Fixtures, Metal Stamping Dies, etc., etc.

Ask for a our New Catalogue





Elliott & Whitehall

Manufacturers of High Gi de

Galt, Ont a

Machine and Tool Co.
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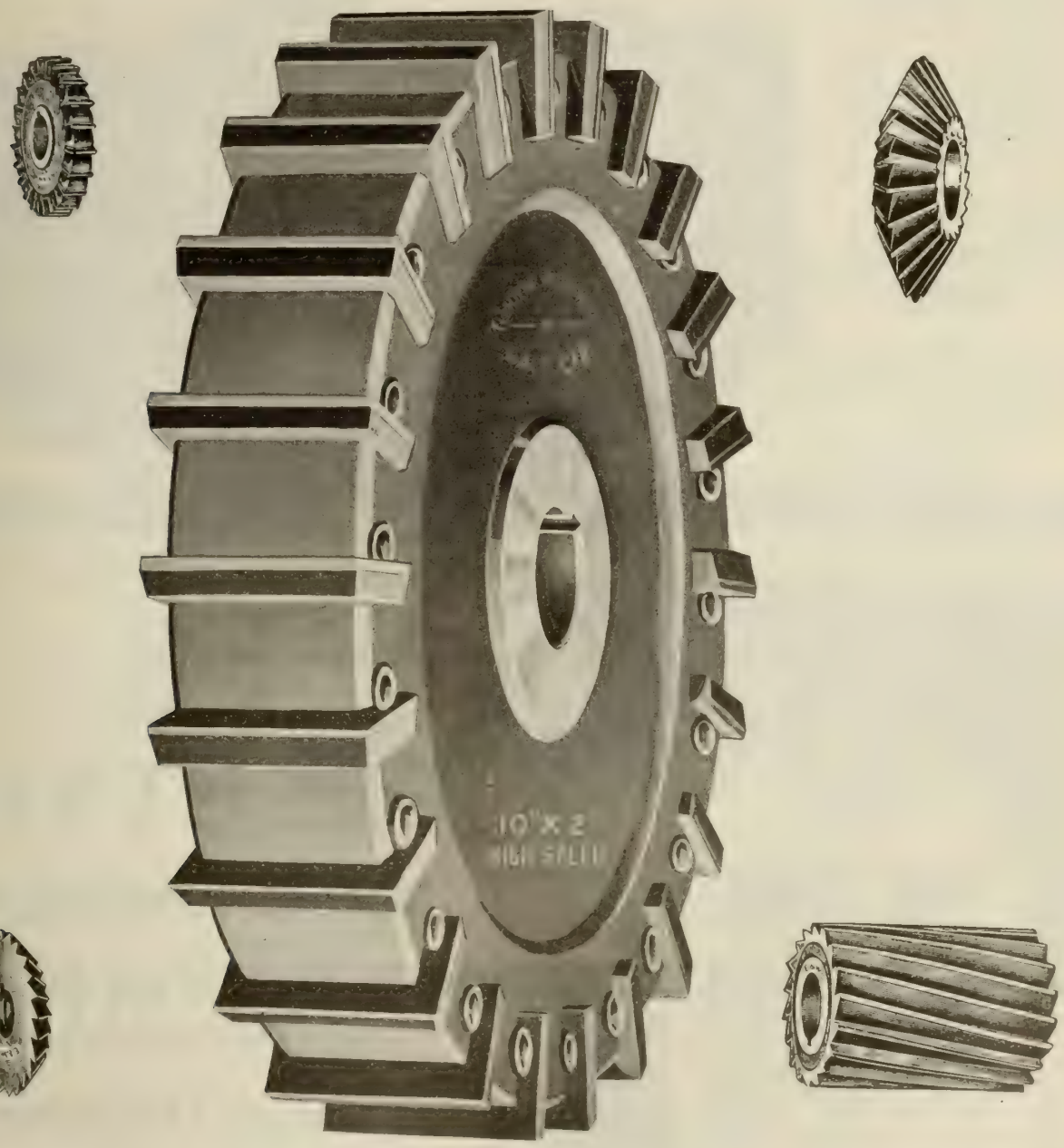

Machine and Tool Co.

Milling Cutters and Small Tools

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STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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Steel Ingots
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Swedish Steel & Importing Co., Limited

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Direct representatives of foremost Swedish mills: makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

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PROMPT SHIPMENTS from large stock

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ELECTRIC

Steel Castings

High Grade STEEL Castings
Of Every Description

Prompt Deliveries

Send us your drawings for estimates.

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED
WELLAND ONTARIO

IF YOU DON'T—WHO WILL?

If you don't
but Victory Bonds and assist Canada to fulfil her debts of honour to her army—

Who will?

If you don't
buy Victory Bonds and enable Canada to provide credits to Great Britain with which to buy Canada's surplus farm products—

Who will?

If you don't
buy Victory Bonds and assure Canada the opportunity to extend credit to Great Britain with which to purchase our surplus manufactured products and keep our factories humming—

Who will?

If you don't
buy Victory Bonds and enable Canada to grasp her golden opportunity to hold and extend her overseas markets and assure good times and good wages at home—

Who will?

If you don't
buy Victory Bonds and do your part to insure your business or your job—

Who will?

BUY VICTORY BONDS TO THE LIMIT

This space donated to the Victory Loan 1919 Campaign by—

H. A. DRURY STEEL COMPANY, LIMITED

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"WACO"

THE HIGH SPEED STEEL

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
WM. ATKINS & CO., LIMITED
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ALL SIZES IN STOCK

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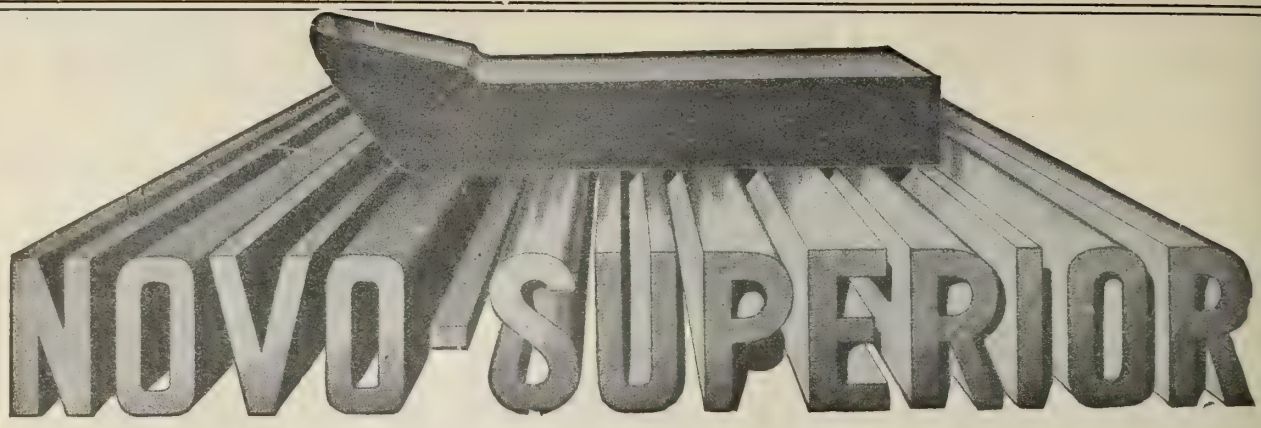

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SWEDISH LANCASHIRE IRON.

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.
Music Wire for Springs, Steel Balls
Cold Rolled Tool Steel in Strips and Sheets.

We call to your particular attention that we make a specialty of and solicit your inquiries for
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Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

Our Guarantee is Back of Every Pound of Babbit Metal We Make

Manufactured by
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HAMILTON WINNIPEG
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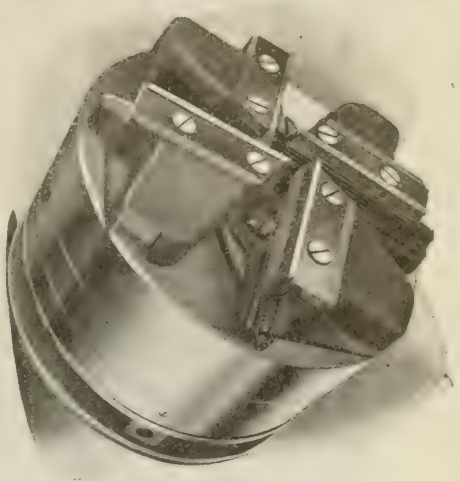
XXX
Genuine Arctic Metal

will give satisfactory results in the most troublesome bearings. Will last longer and save many times its cost in repairs. Will reduce your overhead expense.

Tallman Brass & Metal Limited
HAMILTON, ONT.

APPLY THE LANDIS DIE HEAD TO YOUR THREADING MACHINE

Landis Bolt or Pipe Threading Heads applied to your threading machine give you all the advantages of the Landis chaser. The application is very simple, merely requiring an intermediate flange which we will gladly furnish.

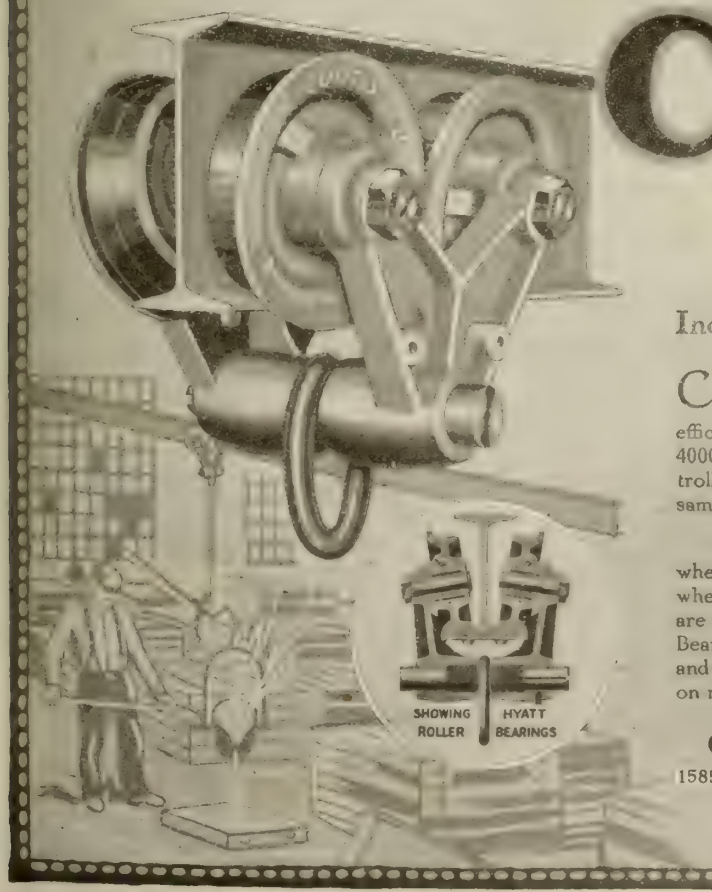


The Landis head on your old machine will revolutionize threading in *your* shop just the same as it has in many other shops. You will then appreciate the variable rake or cutting angle of the chaser, the interchangeability, the absence of annealing, hobbing and retempering and the exceptionally long life.

Landis heads are daily being applied to other makes of threading machines and our customers report better threads, double production and a much lower cost of upkeep. Landis-ize your shop. Get full details at once.

LANDIS MACHINE COMPANY

Waynesboro, Pa.



CURTIS TROLLEYS

Increase Production—Save Man-Power

CURTIS Single I-Beam Trolleys are being used by progressive firms demanding the highest operative efficiency. A Curtis Hyatt Roller-Bearing Trolley with a 4000-lb. load can be moved by a 50-lb. pull, while ordinary trolleys require nearly twice as much power to move the same weight.

Curtis Trolleys are constructed with large inclined wheels and self-equalizing steel side-frames—so that each wheel always bears its rightful proportion of the load. They are equipped with shock-absorbing Hyatt flexible Roller Bearings—which make the trolleys easy-starting, easy-rolling and long-lasting. Full information and descriptive literature on request.

CURTIS PNEUMATIC MACHINERY CO.

1585 Kienlen Avenue St. Louis, U. S. A.

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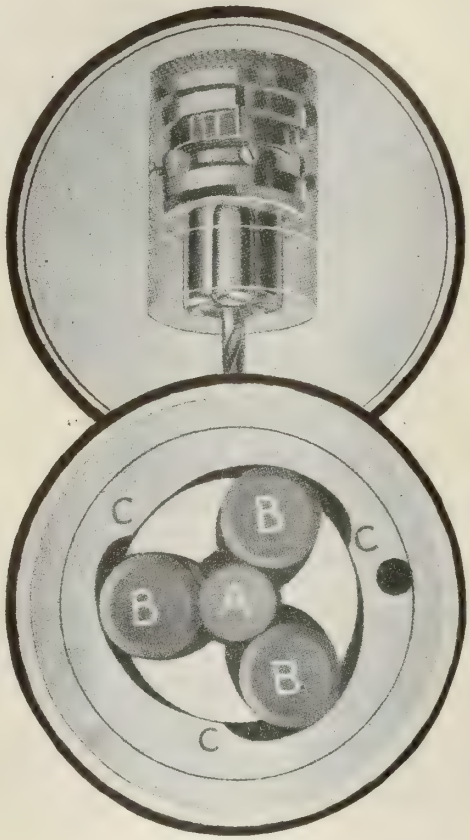
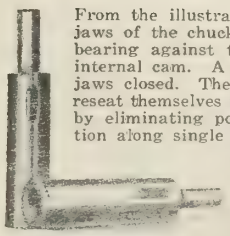
SKF AUTOMATIC-QUICK ACTING SELF CENTERING DRILL CHUCKS

Suggestion No. 3 →

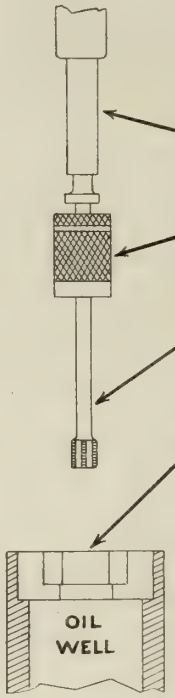


A—*Drill Shank*
B—*Roller Jaws*
C—*Cam Surfaces*



Increase Size Range by using Adapters

From the illustration it will be seen that the jaws of the chuck are formed by three rollers bearing against the surfaces of a three-lobed internal cam. A coiled spring holds the roller jaws closed. The rollers are free to turn and reseat themselves with every drill release, thereby eliminating possibility of wear or indentation along single line of contact. The drilling resistance forces these rollers up the cam surfaces, causing them to close upon and grip the drill shank with a power always proportionate to the drilling stress, thereby precluding slipping of the drill under any conditions whatsoever.



The Drill Spindle keeps turning in one direction continuously

AS each nut is tapped the drill spindle is lifted and the nut is carried up on the shank of the tap. When the shank is filled, the whole tap is taken from the S K F Chuck, the nuts dropped off, and the tap reinserted—all without stopping the drill spindle.

The same S K F Chuck that makes this possible has set new standards for automatic drill chucks—with its perfect centering device, its special roller jaws, and its entirely automatic action.

There is no limit to the uses to which the S K F Chuck can be put. Our engineering service department is at your call.

CANADIAN SKF COMPANY, LIMITED

EASTERN SALES OFFICE :
412 ST. JAMES ST.,
MONTREAL

HEAD OFFICE :
KING ST. WEST,
TORONTO

Can You Forget?

As long as you live you'll remember November 11th, 1918 —Armistice Day.

That was the day the enemy surrendered.

That was the day of Victory for our army.

Day after day—year after year—through rain, cold, heat, mud, death—they had fought bravely, stubbornly, cleverly, faithfully—the spearhead of fate pointing inexorably at the black heart of the enemy.

Remember the Somme? Ypres? Vimy? Passchaendale? Cambrai? MONS?

Can't you catch this brave spirit?

Can't you see how small is our task compared with theirs?

Shall we fail to lend our money to the country for which they gave their lives?

The Victory Loan 1919 must be a victory, too. It is needed to pay our obligations to the army and to keep the fair name of Canada writ high among the nations.

This is a War Loan.

Canada needs to borrow your money.

If the Victory Loan succeeds it will be another Mons for Canada.

Let us show the world again that what Canada undertakes, Canada accomplishes.

Buy Victory Bonds

"Every Dollar Spent in Canada"

THIS SPACE DONATED TO THE VICTORY LOAN 1919 CAMPAIGN BY

CANADIAN SKF COMPANY, LIMITED

Eastern Sales Office:
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Head Office:
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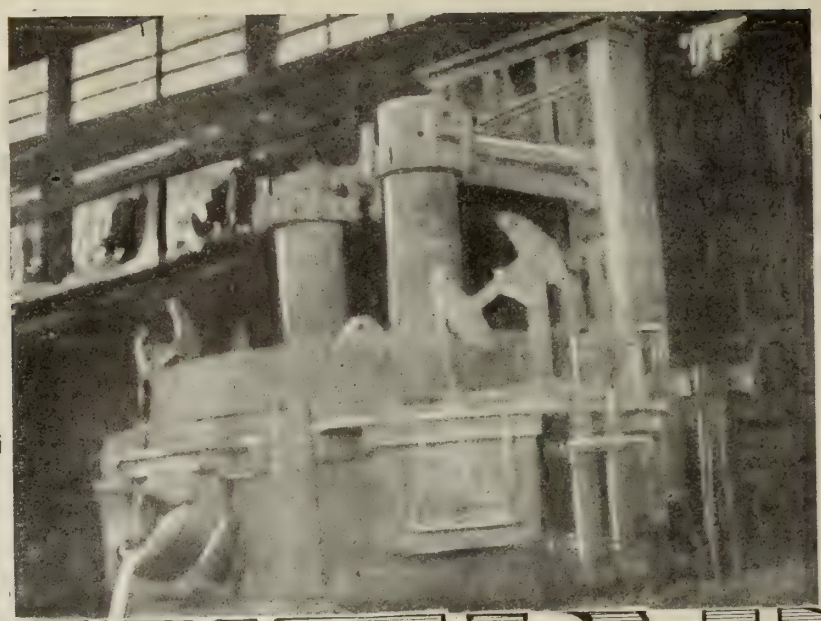

ELECTRITE

High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces — entirely infallible, automatically regulated, delivering the same result time after time.

Uranium — This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
LATROBE, PENN.

URANIUM

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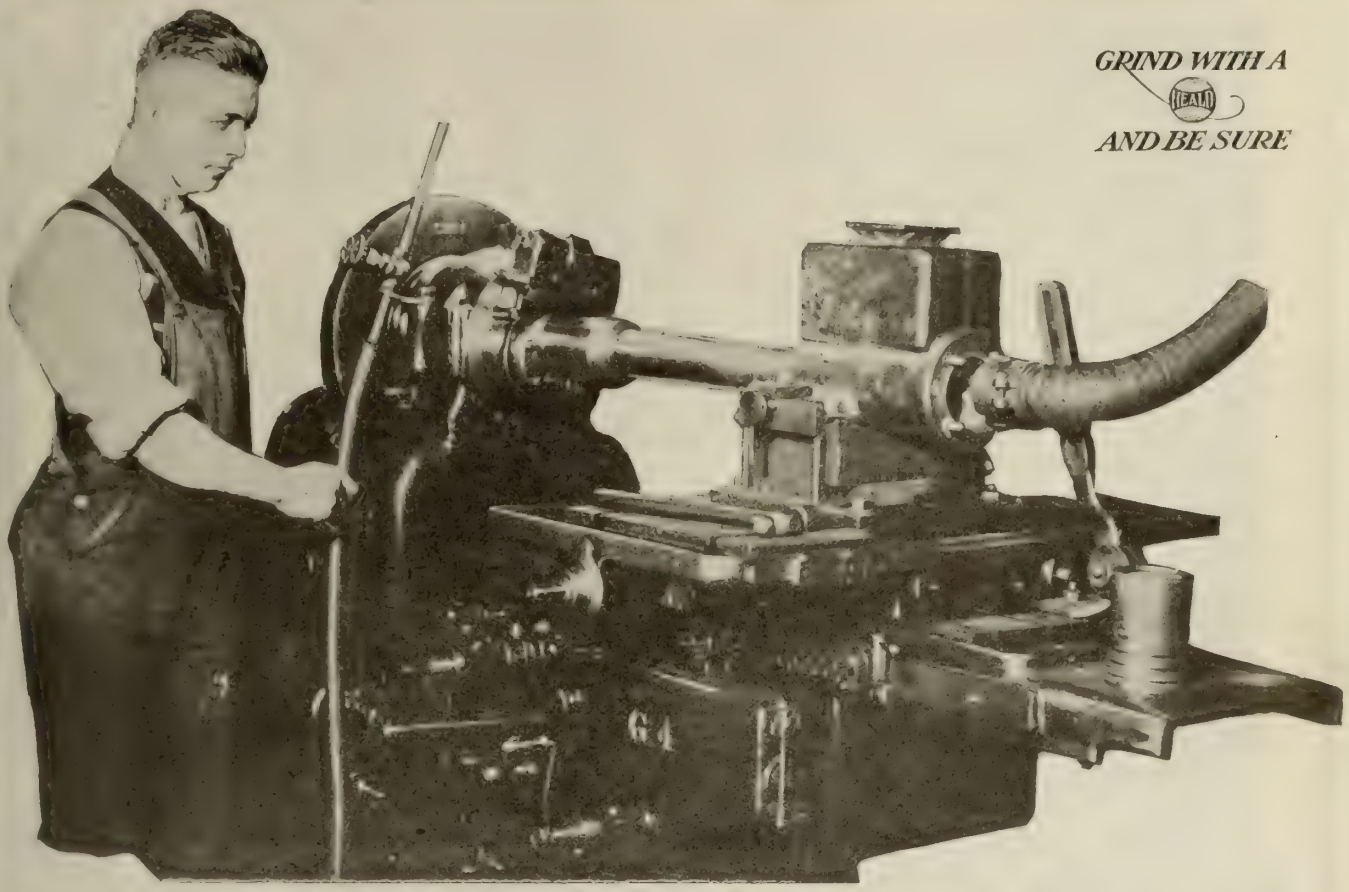


ECONOMY IN GRINDING STATIONARY GAS ENGINES

The John Lauson Mfg. Co., of New Holstein, Wis., at whose factory the above photograph was taken, makers of stationary gas engines, are convinced that the Heald No. 60 Cylinder Grinding Machine increases production and accuracy, while reducing the cost of manufacturing by grinding bores.

They have demonstrated that ground cylinders will cut the testing of running in time 50% or better and will produce a more desirable and economical engine.

In their catalogue they state that their cylinders and pistons are ground to size, which assures a smooth, round cylinder that will hold compression under all conditions, will last longer and deliver more power and require less lubricating oil than the bored type.

The above conditions are true not only of stationary engines, but also of every combustion engine, including automobiles, airplanes and tractors. The Heald No. 60 will grind any part which cannot be readily revolved.

We build internal and rotary grinders, also magnetic chucks. Literature on request.

THE HEALD MACHINE COMPANY
Worcester Massachusetts

BRANCH OFFICES:—New York, 839 Singer Bldg. Philadelphia, 1308 Commonwealth Bldg. Chicago, 26 South Jefferson St. Detroit, 401 Marquette Bldg. Cincinnati, 311 Provident Bank Bldg. Cleveland, 721 Engineers' Bldg.

WESTERN AGENTS:—Eccles & Smith Co., Los Angeles, San Francisco and Portland. Salt Lake Hardware Co., Utah and Idaho.

FOREIGN AGENTS:—Alfred Herbert, Ltd., England. Société Anonyme, Alfred Herbert, France, Switzerland. Societa Anonima Italiana, Alfred Herbert, Italy. F. W. Horne Co., Japan. Wilh. Sonesson & Co., Sweden, Denmark and Norway. Henri Benedictus, Brussels, Belgium. American Machinery Syndicate, Spain and Portugal.

If interested tear out this page and place with letters to be answered.

THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

The Nationally Known—First Quality

HIGH SPEED STEEL

is the best for all Machine Work

ARE YOUR TOOLS MADE OF "Red Cut"?

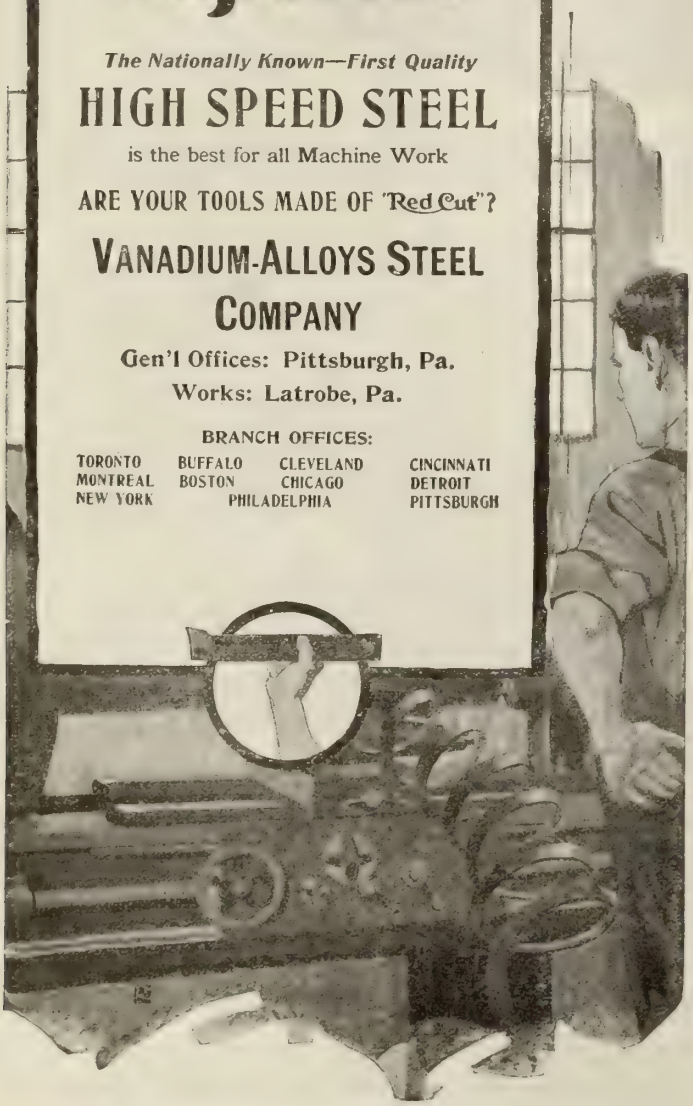
VANADIUM-ALLOYS STEEL COMPANY

Gen'l Offices: Pittsburgh, Pa.

Works: Latrobe, Pa.

BRANCH OFFICES:

TORONTO BUFFALO CLEVELAND CINCINNATI
MONTREAL BOSTON CHICAGO DETROIT
NEW YORK PHILADELPHIA PITTSBURGH



DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being **accurate.** Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.

BRISTOL, CONN

60 Rivets in a Minute

Faster if the work can be fed faster.
But at least 60 every minute.
And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

GRANT

Rivet Spinning Machines

handle any rivet up to ¼-in. shank.

If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.

The Grant Book called "Perfect Riveting" tells how to give an extra appearance of quality to your product. For your copy

Write to-day

GRANT MFG. & MACHINE COMPANY

Holland Avenue, Bridgeport, Conn.

Photographs and data by courtesy of our customer.

This "Bliss" No. 5-S Toggle Press is shown producing a cooking utensil that will play an important part in feeding the new national army.

The wash basin illustrated is another of many things this press turns out. It is drawn from 30 gauge pickled and annealed sheet steel, three at once, size 11½ inches. Production on Power Presses varies widely according to the article and the operator's skill. In the case of this basin 1250 per hour is the average. Five years' continuous use without interruption for repairs is a characteristic "Bliss" record.

BLISS 1857

E. W. BLISS COMPANY

BLISS 1919

Main Office and Works: BROOKLYN, N.Y., U.S.A.

CHICAGO OFFICE
People's Gas Bldg.

DETROIT OFFICE
Dime Bank Bldg.

CLEVELAND OFFICE
Union Bank Bldg.

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S.E. No. 17

PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

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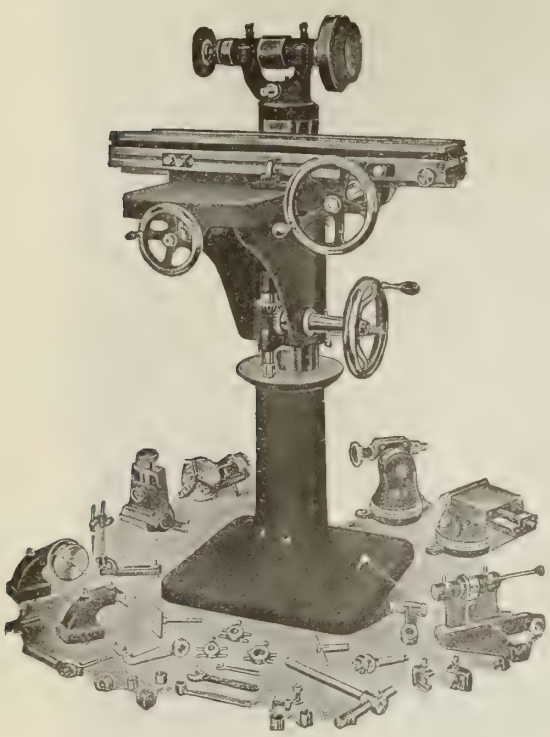


The Greenfield Universal Grinder

For General Tool Room Work

This grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,
GREENFIELD, MASS., U.S.A.

5000 H.P. Morse chain (4 strands) operating generator from water wheel.

"Renold" or "Morse"
Silent Chains

are employed throughout Canada on **Main Drives, Municipal Fire Pumps, etc., Evidencing Absolute Reliability.**

Jones & Glassco, Regd.
Canadian Agents
Toronto - Montreal

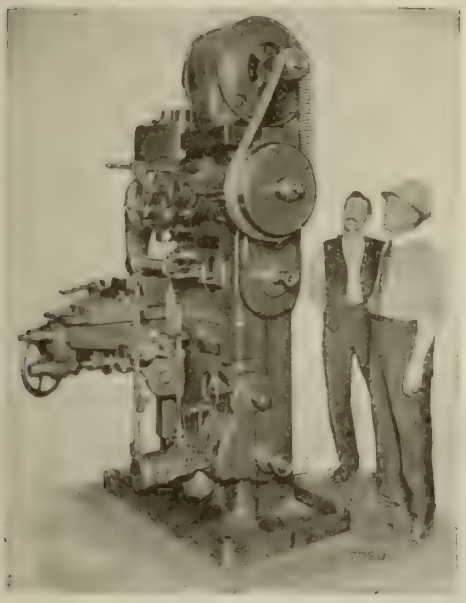
A Favorite—
Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.
Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY
EVERETT, MASS., U.S.A.

LINK-BELT

SILENT CHAIN DRIVES



For Machine Tools

DRIVE your machine tools with the efficient Link-Belt Silent Chain Drive. In addition to a 20% greater output and a 20% saving in power, you get from four to five times the service on cutting tools, and better finished product.

Remember the following facts about Link-Belt Silent Chain Drives.

1. It is 98.2% efficient (on actual test).
2. Permits convenient location of driving parts.
3. Any reduction in speed is possible.
4. Uniformity of product.
5. Less wear and tear on cutting edges of tools.
6. Increases production.
7. Results in economy of power.
8. Occupies little space.
9. Oftentimes lowers first cost of motors, on account of large speed reduction possible.
10. Oftentimes reduces horse power and cost of motor required.
11. Not restricted to motor drives, but suitable, for instance, for driving from shaft to shaft, as integral parts of machines.
12. Overloads taken care of without diminution of speed.
13. Our casings assure "Safety First" to all employees.

CANADIAN LINK-BELT COMPANY, LIMITED

WELLINGTON AND PETER STREETS, TORONTO

Look for the name on the washers; Look for the liners in the joints.

Fill in the data—clip the coupon and mail it today. It places you under no obligation and brings you prices and information on Silent Chain Drives

367

Link-Belt Company (Date)_____

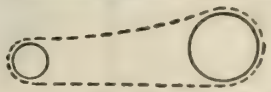
Please send us quotation for a silent chain drive to operate_____
We give the following to enable you to figure closely:

Maximum H-P to be transmitted_____

Dis. from center to center of shafts_____

	DRIVER	DRIVEN
Diam. of Shafts		
Revolutions per minute		
Max. Wheel Diam.		
Max. Wheel Width (Space on Shaft)		
Split, Yes or No		
Key Seat		

Is the load steady, or intermittent as with pumps?_____
Is the chain used in a clean or dirty place?_____
Is the chain subject to shock?_____
How many hours per week will it operate?_____
What percentage of time at full load?_____
Are there means of adjusting centres?_____
If there is a longitudinal float or movement, give amount?_____
If to replace belt, other chain or gears, describe same_____



Indicate Position of Drive and Direction of Rotation
MARK DRIVER WHEEL "R"
MARK DRIVEN WHEEL "N"

Draw line showing relative position of floor

*Name*_____
*Street Address*_____
*Town and State*_____

☐ Please send us literature on the Link-Belt Silent Chain Drive

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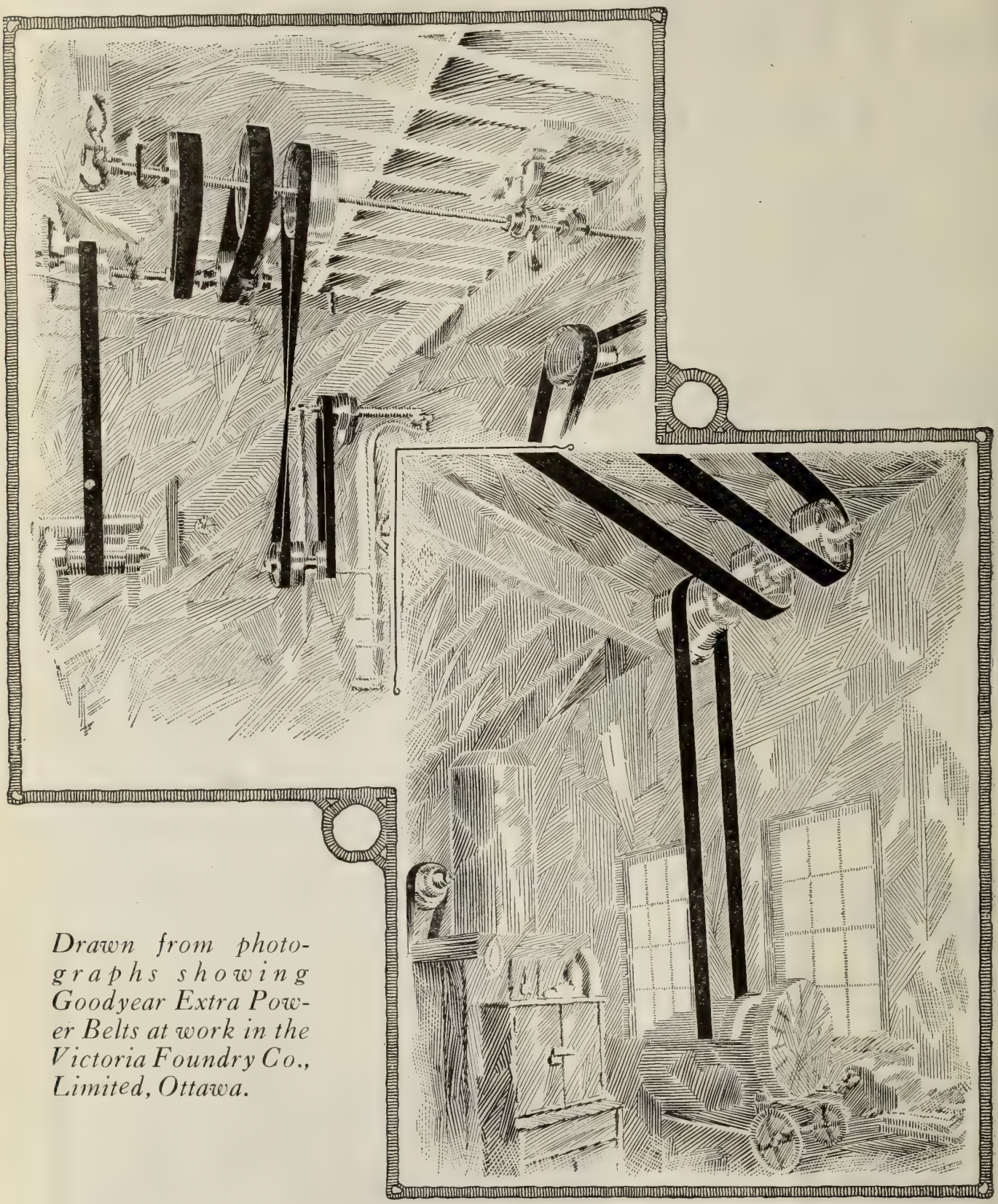


Drawn from photographs showing Goodyear Extra Power Belts at work in the Victoria Foundry Co., Limited, Ottawa.

GOODYEAR
MADE IN CANADA

Reduce Belt Replacement

Changing belts costs money.

Belts which wear out quickly must be replaced frequently.

This costs money for belting.

Costs money for idle machinery.

Costs money for idle hands.

Costs money because piece-workers become dissatisfied.

Goodyear Extra Power Belting reduces belting costs.

It wears long, and so makes the belting itself cost less.

It keeps machinery and men busy, and enables everyone to produce at greatest efficiency.

This has been the experience of ever one of the more than a thousand Canadian plants which use Goodyear Extra Power Belting.

For example, here is what the Victoria Foundry Company, of Ottawa, say about their Extra Power:

VICTORIA FOUNDRY COMPANY, LIMITED, OTTAWA

Gentlemen:

We have certainly had great satisfaction from your "Extra Power" Belting.

We have used it on all kinds of machines. It has been in service a surprising length of time—and is still in service.

For instance—

16 months on the cone of a 30-inch Lodge & Shipley lathe.
18 months on the cone of a 24-inch lathe.
24 months on a 30-inch drill press.
12 months on main drive of a 36-inch planer.

And all still in service. Not a replacement so far. We are mighty pleased.

Yours very truly,

THE VICTORIA FOUNDRY COMPANY, LIMITED.

Men trained by Goodyear to solve belting problems are always available to confer with you. No obligation. Just wire, phone or write the nearest branch.

The Goodyear Tire & Rubber Co. of Canada, Limited

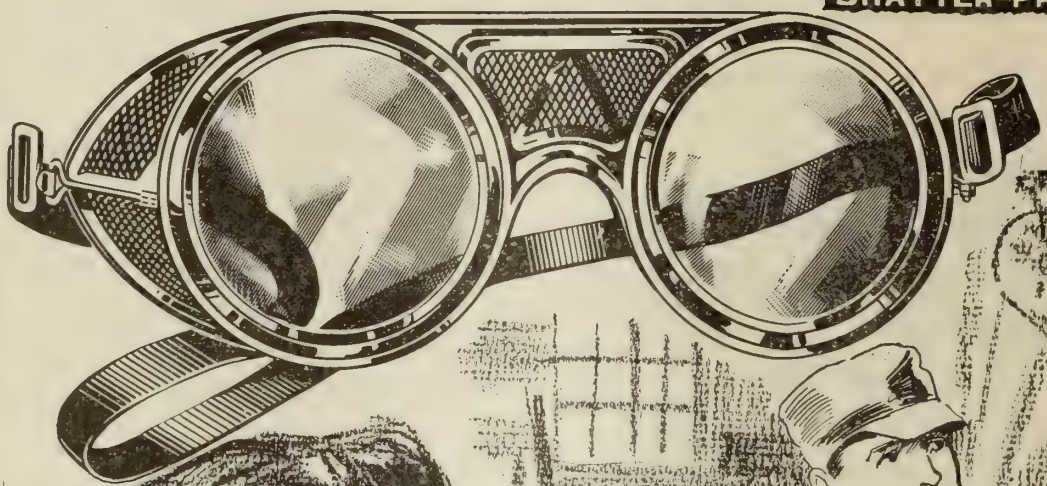
Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Calgary, Edmonton, Vancouver

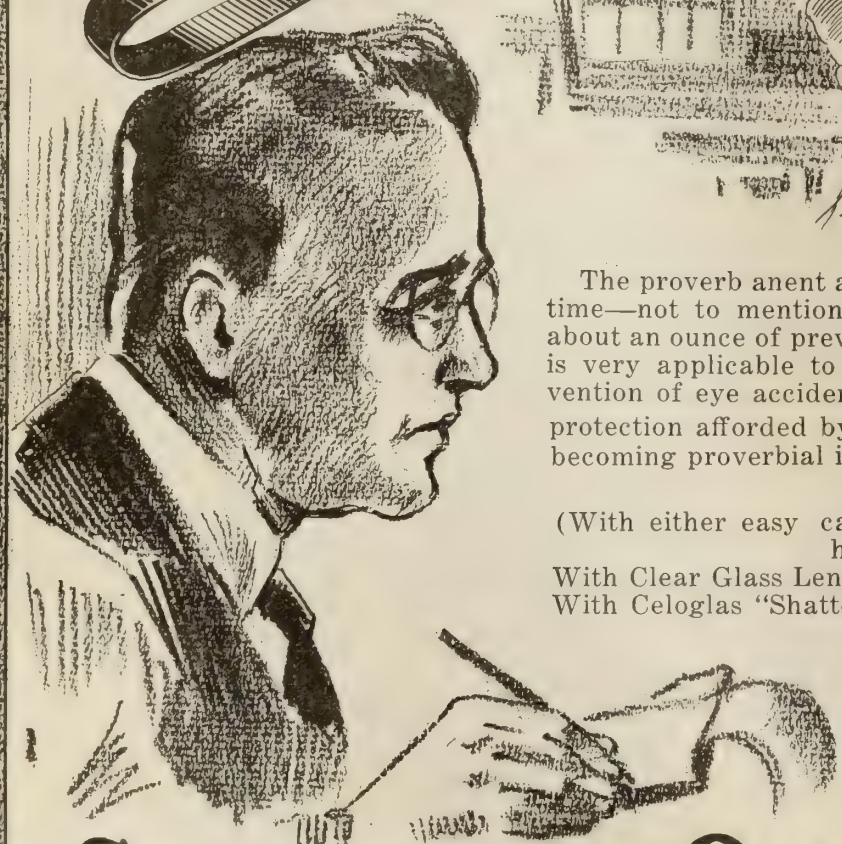
EXTRA POWER BELTING

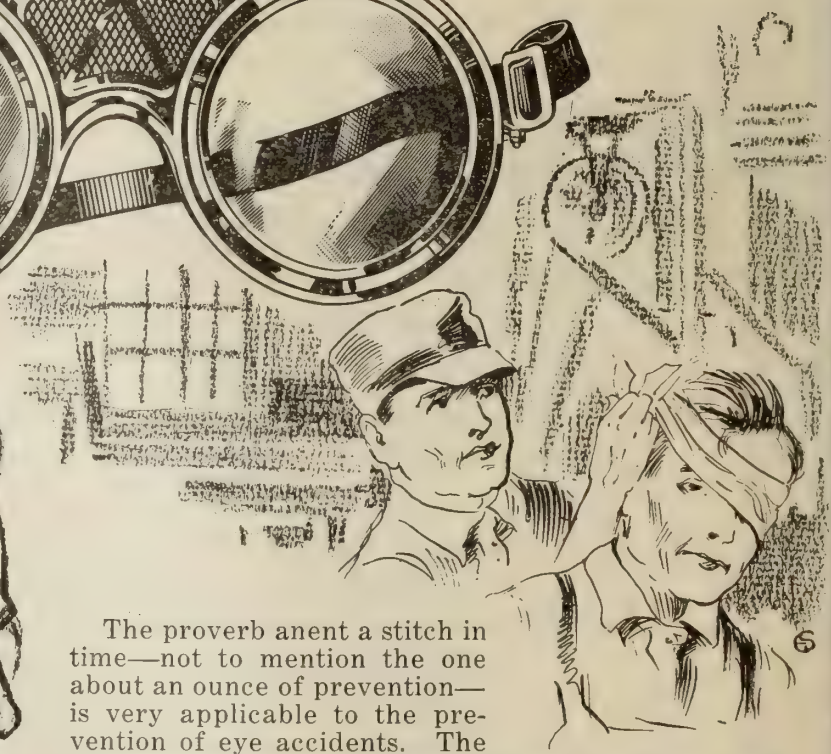
If interested tear out this page and place with letters to be answered.

Mr. Safety Engineer, don't wait for an eye accident before ordering STOCO SAFETY GOGGLES "CELOGLAS"

SHATTER-PROOF LENS







The proverb anent a stitch in time—not to mention the one about an ounce of prevention—is very applicable to the prevention of eye accidents. The protection afforded by STOCO Safety Goggles is fast becoming proverbial in industrial fields.

PRICE

(With either easy cable earbows or black elastic headband)	Per 100
With Clear Glass Lenses	$115.00
With Celoglas "Shatter-Proof" Lenses	$150.00

A sample of the STOCO Safety Goggle will be sent without charge to Safety Engineers, Purchasing Agents and Superintendents on receipt of request on letterhead.

STANDARD OPTICAL Co.

GENEVA, N. Y.

They're a mighty nice bunch to deal with— they handle

CLEVELAND

THE CLEVELAND TWIST DRILL CO., Cleveland, New York, Chicago

Agents for Europe, CLEVELAND TWIST DRILL CO.-(GREAT BRITAIN), Ltd., 36-37 Upper Thames St., London E.C.4.

MALLEABLE AND CAST IRON PIPE FITTINGS

M

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

When ordering from your jobber be sure you buy---"the brand that has the quality." They are different. A trial order will convince.

International

Malleable Iron Company, Limited

Guelph, Ontario, Canada

Keep Canada Humming

Canada is running a great National Store.

Great Britain and other lands come here to buy our surplus agricultural and industrial products. These are the orders that are keeping Canadians busy and prosperous. That is where the money comes from that is paying our farmers for their surplus products and providing full pay envelopes for our workers.

But Great Britain and our allies are temporarily short of "cash." So Canada must extend them "credit" — just as any storekeeper extends credit to any customre whose financial standing is good.

The success of the Victory Loans 1917 and 1918 made possible the giving of these credits.

Continuation of these credits and the maintenance of our valuable overseas markets—depend upon the success of the Victory Loan 1919.

You will therefore plainly see how closely bound up with the Victory Loan 1919 is the prosperity of everyone in Canada, without exception.

Do not think your individual co-operation "does not matter."

It does matter!

Unless Canadians to the last man support the Victory Loan, it will not be the success that our continuous prosperity demands.

Let every Canadian do his share to keep things humming.

BUY VICTORY BONDS

"Every Dollar Spent in Canada"

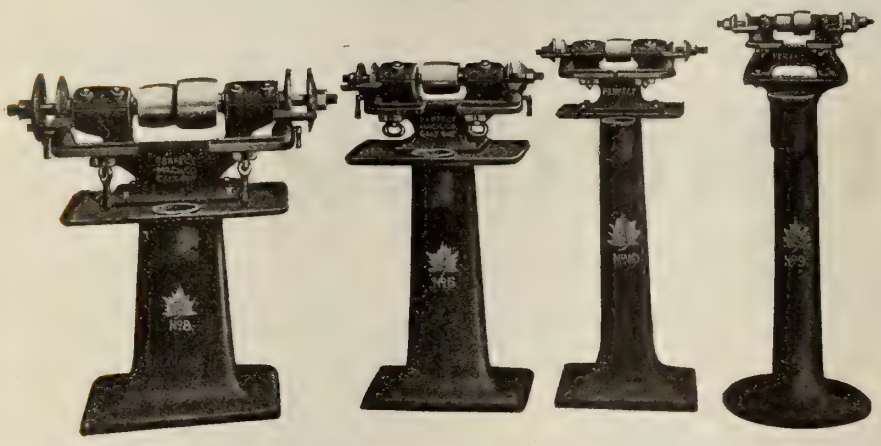
THIS SPACE DONATED TO THE VICTORY LOAN 1919 CAMPAIGN BY

CANADIAN MACHINERY AND MANUFACTURING NEWS

TORONTO, ONT.

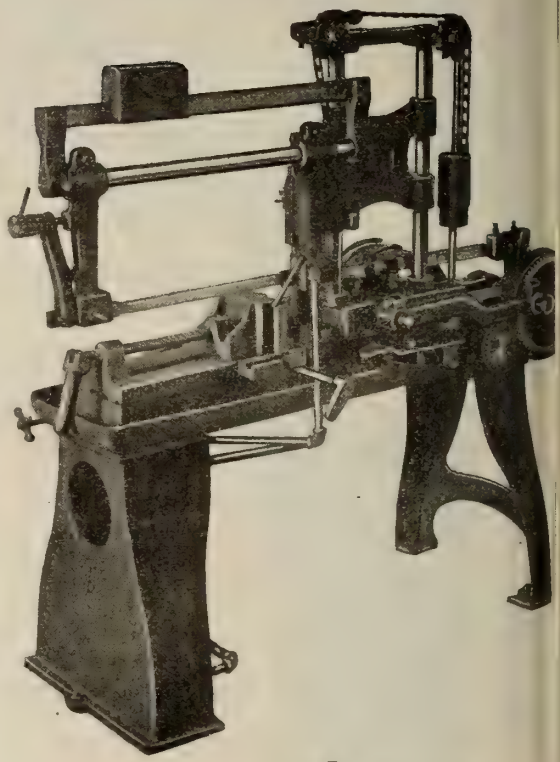
Perfect Machine Co., Limited

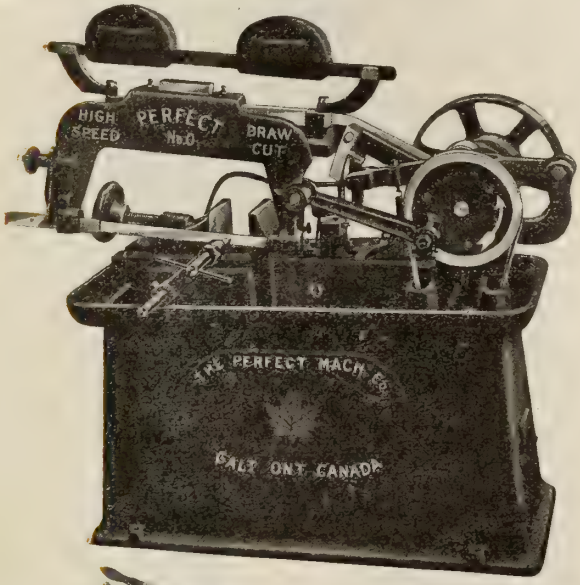
Galt, Ontario, Canada



The Perfect Grinders. They've stood the test; the oiling device can't go wrong; the material, workmanship and service is guaranteed. Guards and exhaust hoods furnished on request, and the price is very moderate when compared with others.

Represented by the
Leading Machinery Houses in Canada
and
in Great Britain
by
Fry's (London) Limited





No. 0
PERFECT HACK SAW

Capacity 0" to 5" or more, on request.

Speed: 120 R.P.M.

Weight: 600 lbs.

It's a Perfect Machine.

No. 1
PERFECT HACK SAW

Capacity: 7" x 7".

Speed: 120 R.P.M.

Automatic Lift.

Adjustable Frame.

Milled Gears.

Swivel Vise.

Weight: 550 lbs.

No. 2
PERFECT HACK SAW

Capacity: 5" x 5".

Speed: 80 R.P.M.

This is a nice smooth-running machine, well worth the price.

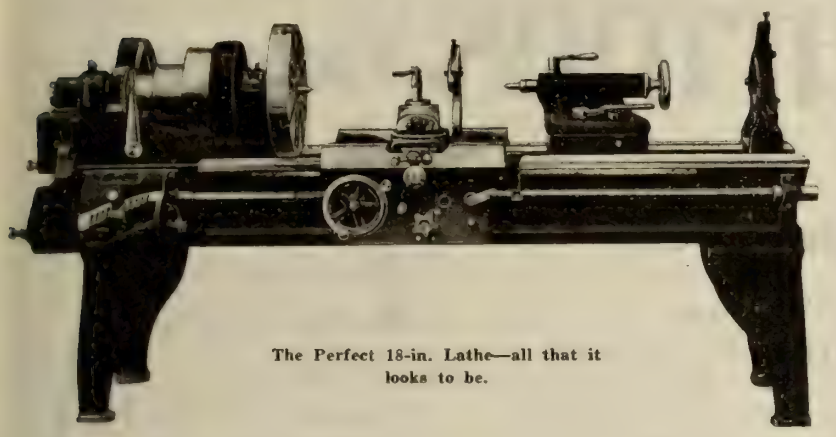
You'll appreciate it.

No. 3
PERFECT HACK SAW

Capacity: 6" x 6".

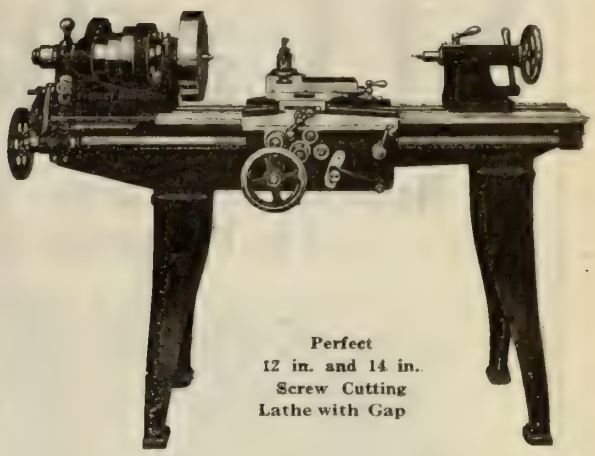
An ideal, all round Machine Shop Saw, always ready, automatic shut-off, adjustable arm and saw guide.

Perfect Machine Co., Limited
Galt, Ontario, Canada



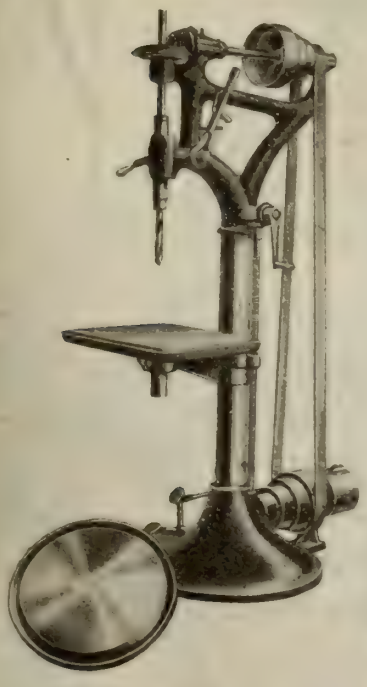
The Perfect 18-in. Lathe—all that it looks to be.

For tool room or machine shop. Capable of delivering the most accurate work at a high rate of speed. A lathe of great power and rigidity. Quick change gear, double back gear, any length you want. You'll be pleased you put this tool in your shop and so will the man who runs it. Our price is right. **We have a reputation for accuracy, fine workmanship and finish and our guarantee stands behind every piece of every machine we manufacture.**

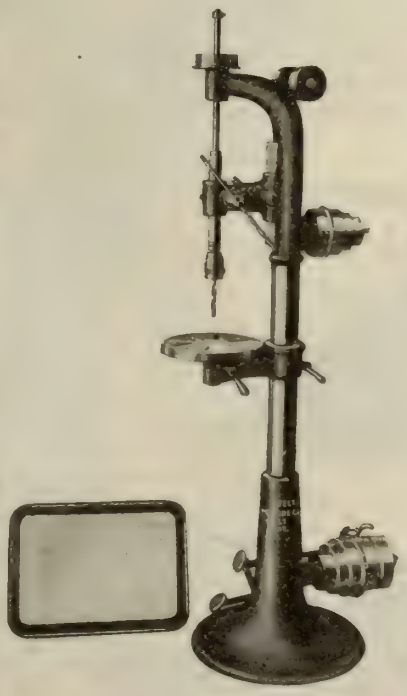


Perfect 12 in. and 14 in. Screw Cutting Lathe with Gap

Furnished in 6′ or 8′ lengths. Just the lathe for machine shops, experimental shops, technical schools, garages, etc., nice convenient design, small consumption of power, and low price. This tool is in a class by itself. If you want a small lathe, you can't afford to overlook this machine. Ask for catalogue.

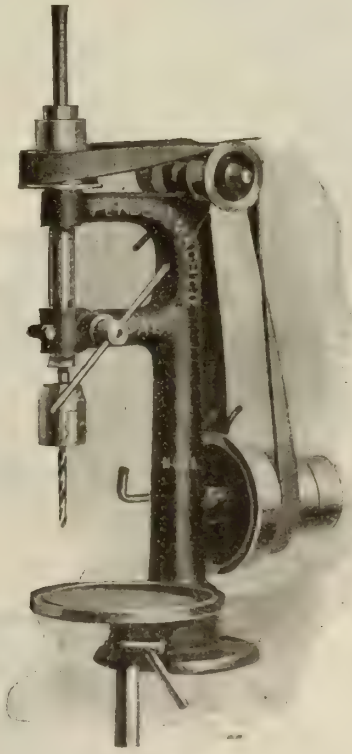


Perfect No. 19 Drill, geared 2 to 1, is driven by a 2-in. belt; has lots of power; handles a drill from 0 to 29/32. You don't realize its value until you compare it with other 18 x 20 in. drills.



NO. 14 PERFECT

A high-class drilling machine, speed 2,000 R.P.M. Drills from 0 to ½ in.
Looks right—
Acts right—
Because it's built right.



NO. 18 DRILL

Drills to centre of 10 in. Speed 2,500 R.P.M.

Purchase our machines for efficiency, accuracy, durability and ease in handling.

Every machine we manufacture is guaranteed. You take no chances when buying the product of our factory.

Every tool is thoroughly tested by an expert before they leave our plant.

Perfect Machine Co., Limited
Galt, Ontario, Canada

Representatives in Canada:

The Leading Machinery Dealers from Coast to Coast

In Great Britain:

Fry's (London) Limited

If interested tear out this page and place with letters to be answered.

The City of St. Catharines

Manufacturers Locate in St. Catharines —The Prosperous Industrial City

Facts about St. Catharines

CHEAP POWER—City owns Hydro-Electric Light and Power System; rates exceptionally low. 60,000 H.P. development of the Dominion Power & Transmission Co., Ltd., two miles south of the city with local distribution system.

TRANSPORTATION—Situated on C.N.R., G.T.R. and Welland Canal. Dominion Express and Canadian Express in operation. Steamer line to Toronto. Electric railway line to Niagara Falls, Welland, Port Colborne, Niagara-on-the-Lake, Port Dalhousie, Merritton and Thorold.

GENERAL—Population, 19,500. City has up-to-date street railway, electric, gas, water and sewage system. Centre of Niagara fruit belt. Industrially the district now includes principally metal industries and pulp and paper mills, several silk, woollen and hair cloth factories, auto tire and rubber footwear industries and numerous industries connected with the fruit products of the district.

The Prosperous Industrial City

SPECIAL INDUCEMENTS—The city is prepared to co-operate with new concerns and offer attractive inducements to all worth-while industrial projects.

Write the secretary of the Board of Trade for full information.

Buy Victory Bonds

All Victory Bond Money Stays in Canada to Help finance Canadian Industry.

Buy all the Bonds you can.

Canada will pay you 5½% interest—

and you'll help to keep Canadian plants busy and give employment to thousands of your fellow-men.

Six Times as Many Pieces per Grinding

This is the record of

DAVIDSONIZED High Speed Steel Tools

in one of the great Philadelphia plants.

The tools were side mills, 5⅛-inch diameter by ⅝-inch face; the stock, cold rolled steel.

The plant had been experiencing considerable trouble in milling this stock because it had been found impossible to obtain anything but a dragging cut which had made it necessary to follow the milling with a scraping operation.

Upon changing to Davidsonized Tools, not only was the number of pieces per grinding increased six times over, but a fine finishing cut was obtained, of such character as to eliminate the scraping operation.

Davidsonized Steel has long since passed the experimental stage. In the light of the daily experiences of prominent plants throughout the country, no fair-minded man can longer doubt that tools of this fundamentally superior steel will give him faster sustained production, reducing tool costs, labor costs and overhead for every piece produced. Write us to-day.

THE DAVIDSON TOOL MFG. CORPORATION

Main Office: 118-122 Maiden Lane, New York
Works: 6-62 North 6th St., Brooklyn, N.Y.

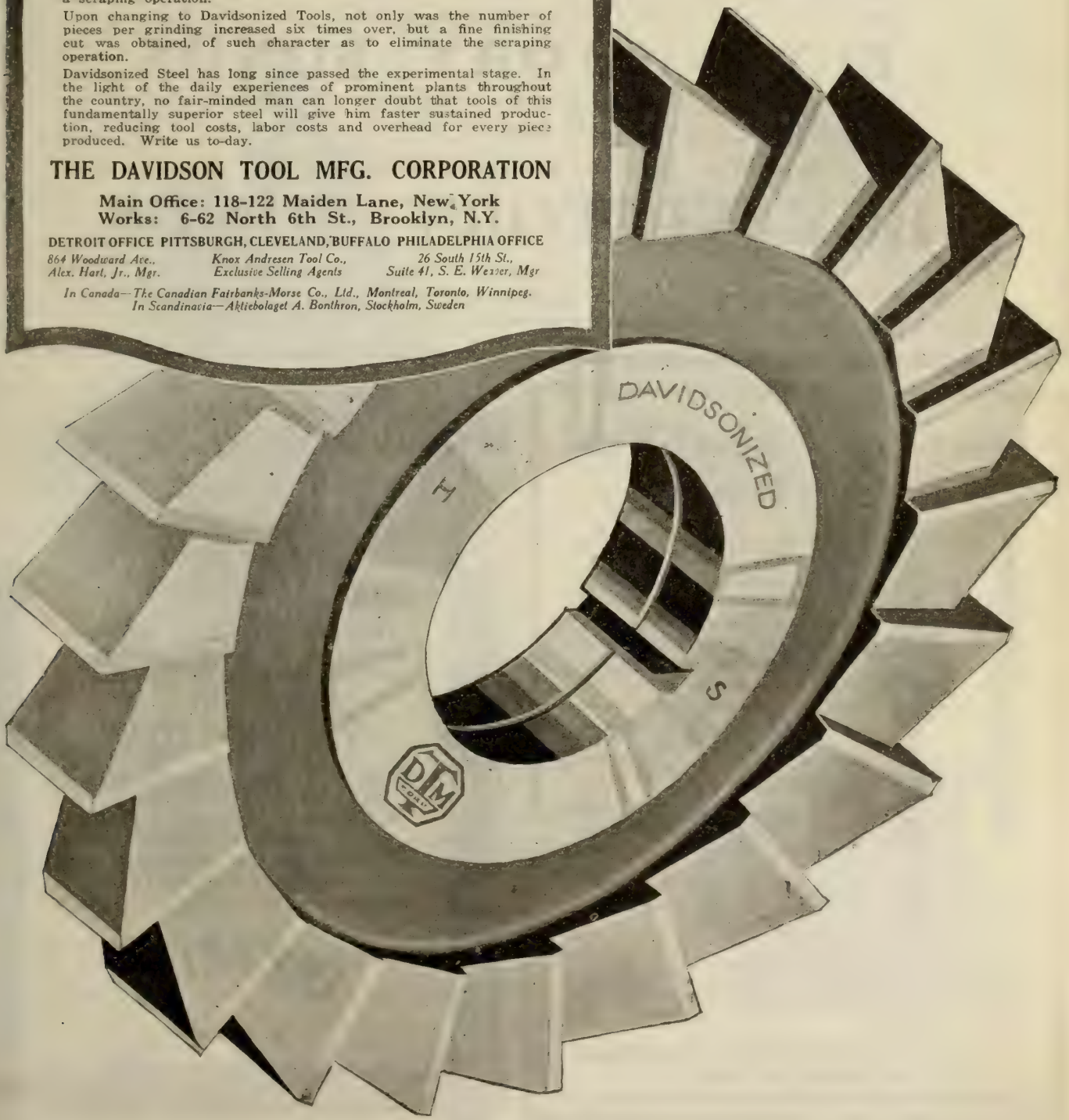
DETROIT OFFICE — 864 Woodward Ave., Alex. Hart, Jr., Mgr.
PITTSBURGH, CLEVELAND, BUFFALO — Knox Andresen Tool Co., Exclusive Selling Agents
PHILADELPHIA OFFICE — 26 South 15th St., Suite 41, S. E. Wexler, Mgr

In Canada—The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Winnipeg.
In Scandinavia—Aktiebolaget A. Bonthron, Stockholm, Sweden

Special Service

To Concerns Who Make Their Own Tools

We will supply Davidsonized High Speed Steel Blanks, semi-finished to within approximately .015 to .020, either soft annealed or hardened.



Do It Again

The reaction from war to peace has been sudden and strong. Our courage may be a bit spent, our enthusiasm for service a trifle on the wane.

It needs a little effort and some determination to rekindle the old fire, but it must be kindled if the Victory Loan is to be a success.

Canada calls upon you, therefore, for a renewal of your effort.

And that can best be expressed if you do your utmost to inspire people to

BUY VICTORY BONDS

P.S.—There is an old saying to the effect that "if you can't sing the words you can whistle the tune."

If you haven't any ready money, borrow some and

BUY VICTORY BONDS

This space donated to the Victory Loan 1919 Campaign by—

THE R. McDOUGALL COMPANY, LIMITED, GALT, ONTARIO

The Canadian Fairbanks-Morse Co., Limited Sales Agents

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

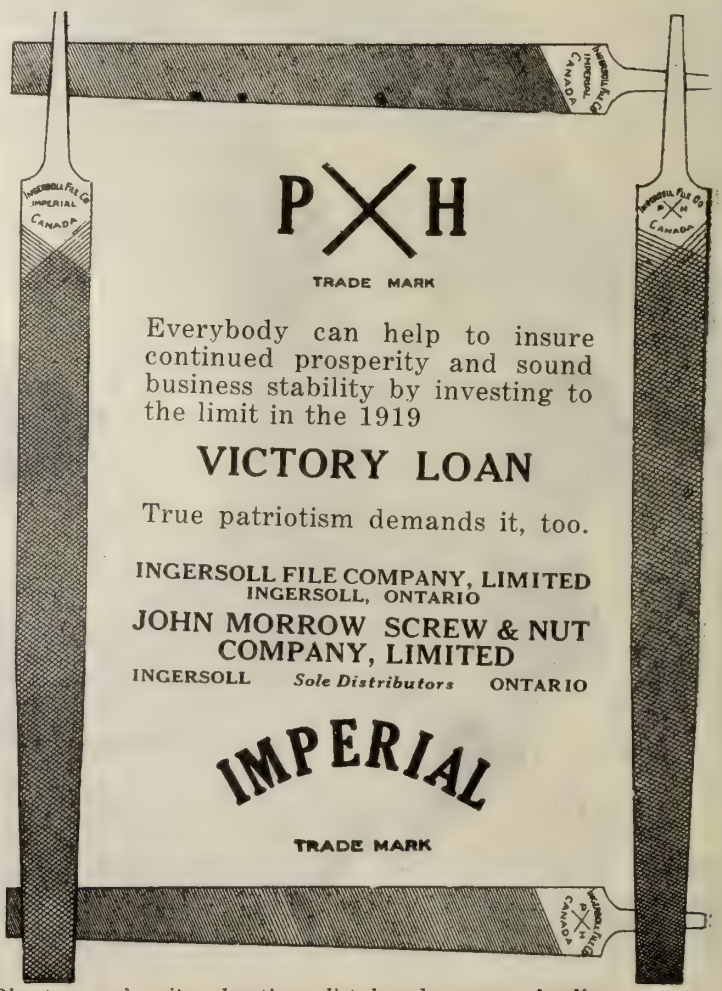
For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of **Economical** Grinding Wheel Dressers is catalogued. **Write for** copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain



Everybody can help to insure continued prosperity and sound business stability by investing to the limit in the 1919

VICTORY LOAN

True patriotism demands it, too.

INGERSOLL FILE COMPANY, LIMITED
INGERSOLL, ONTARIO

JOHN MORROW SCREW & NUT COMPANY, LIMITED
INGERSOLL *Sole Distributors* ONTARIO

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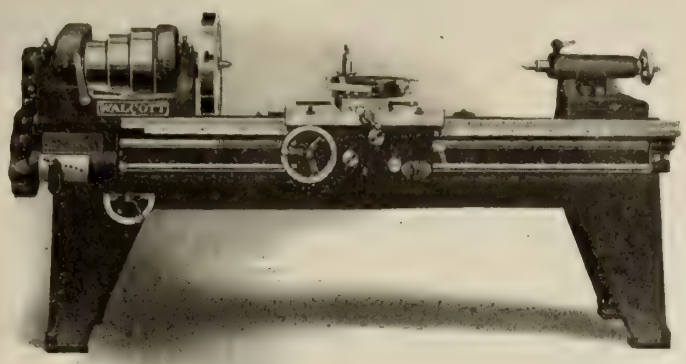
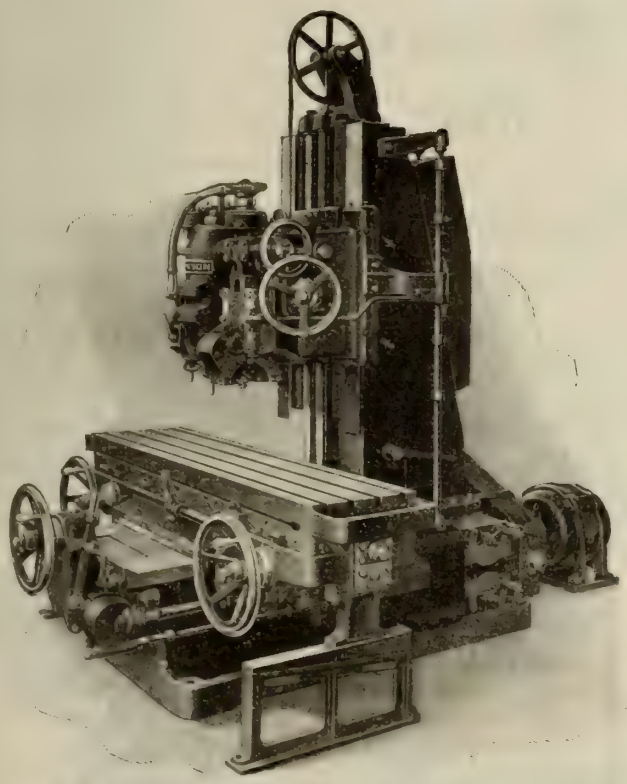
TRADE MARK

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



WALCOTT ENGINE LATHE



JACKSON DUPLEX TYPELESS DIE SINKERS

Three Machine Tools Worth Investigating

WALCOTT ENGINE LATHES.

WALCOTT CRANK SHAPERS.

JACKSON DUPLEX TYPELESS DIE SINKERS.

These machines are backed by nearly forty years of machine tool building experience. They are designed in sizes to meet the requirements of your shop, so as to insure the highest production.

Canadian Fairbanks-Morse Company, who have been selling our line of machine tools during the past at Toronto, are so well pleased with their results, they have now taken the agency throughout the Dominion of Canada.

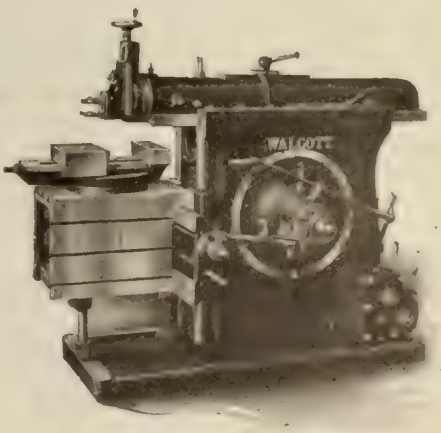
Walcott Lathe Co.

115 Calhoun St. Jackson, Mich.

Est. 1881

THE CANADIAN FAIRBANKS-MORSE CO., LIMITED

Halifax St. John Quebec Montreal Ottawa
Toronto Hamilton Windsor Winnipeg
Saskatoon Calgary Vancouver Victoria



WALCOTT SHAPER

If interested tear out this page and place with letters to be answered.

Notes On Grinding
NORTON COMPANY WORCESTER, MASS.

No. 73A

Grinding Wheel Economy in the Foundry

A thorough knowledge of the physical properties of the metal to be ground is the first essential to the economical use of the grinding wheel in the foundry. The selection of the proper abrasive is entirely dependent upon this knowledge.

For materials of high tensile strength—annealed steels, malleable or wrought iron—the best results will be obtained by using ALUNDUM wheels. On gray cast iron, chilled iron, malleable iron, brasses, bronzes, aluminum and copper CRYSTOLON wheels will be found the most efficient.

The size of the wheel, the amount of material to be removed, and the nature of the material readily determine the size of the grain. Finish is seldom a consideration; therefore, it is always best to use as coarse a wheel as practicable.

The speed of the grinding wheel is of the utmost importance, and must be held within the correct speed range of from 5,000 to 6,000 surface feet per minute, if proper cutting action and economy in wheel consumption are to be obtained.

The life of a grinding machine largely depends upon the care it is given—all bearings must be kept adjusted and in good condition—the spindle must be rigid, and the foundation solid. A grinding wheel that vibrates or jumps is soon pounded to pieces by the shocks and stresses from the action of the castings on the face of the wheel.

The personal factor should be given careful consideration. No two men will get the same life or production out of a wheel even though the work and conditions are identical—some work the corners hard, others are abusive in applying the casting, or will remove too much abrasive in dressing. All these factors have their effect and often the manufacturer is unjustly blamed for apparent variations in wheel life when the true cause can be attributed to the personal factor.

NORTON COMPANY.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec Que.

Grinding Wheel Plants, Worcester, Mass.

Electric Furnace Plants Niagara Falls, N.Y. Chippawa, Ont.
New York Store 151 Chambers St.
Chicago Store 11 No. Jefferson St.
Detroit Store, 73-75 W. Congress St.

NORTON

Mark Your Products The "Matthews" Way

STEEL LETTERS AND FIGURES

In shops where the highest standards are maintained the stamping equipment is generally "Matthews Made."

Matthews Letters and Figures are hand made from carefully selected steel, heat treated for hardness, insuring long service under hard usage. They make deep, clean-cut impressions that outlast the product.

Mark your next order for steel lettering, dies or stamps—"Matthews Made."

Canadian Fairbanks-Morse Co., Limited

Montreal Toronto, St. John, Quebec, Ottawa, Hamilton Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Jas. H. Matthews & Co. - Pittsburgh, Pa.
STEEL LETTERING DIES AND STAMPS

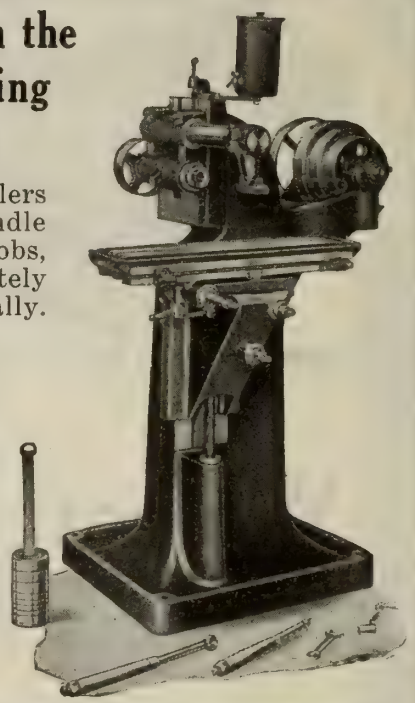
Keeps down the cost of milling Small Parts

These small millers are built to handle small milling jobs, quickly, accurately and economically.

The U.S. Miller so greatly increases output of small parts as to actually reduce milling cost 1/3 to ½.

Neither in power nor capacity is any other miller of similar size its equal

May we send catalog and full specifications?



U.S. MILLER

Manufactured by
United States Machine Tool Company
Cincinnati, Ohio, U.S.A.

This Book Tells How

Here is a booklet that will help you to obtain actual belting economy in your plant.

It is unusually complete with descriptions, recommendations, rules and tables which will enable you to quickly determine the scientifically correct belt for any given condition.

It explains Standardization as applied to Belting, tells you how to determine the right belt for the right place on the one true economical basis—the work to be done.

Write for it—we'll be glad to send it to you.

The CANADIAN GRATON & KNIGHT CO. LIMITED

MONTREAL, CANADA

Canadian Representatives: The Canadian Fairbanks-Morse Co., Ltd., St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Vancouver, Windsor, Winnipeg, Victoria.

Oak Leather Tanners, Makers of Leather Belting and Leather Products

Branches and Distributors in All Principal Cities

COUPON

You may send STANDARDIZED LEATHER BELTING Book

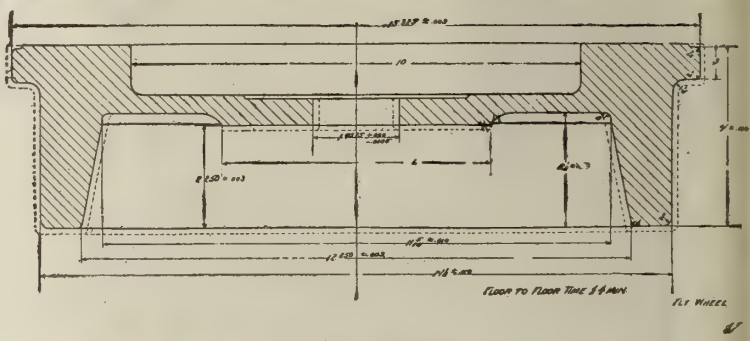
To .....

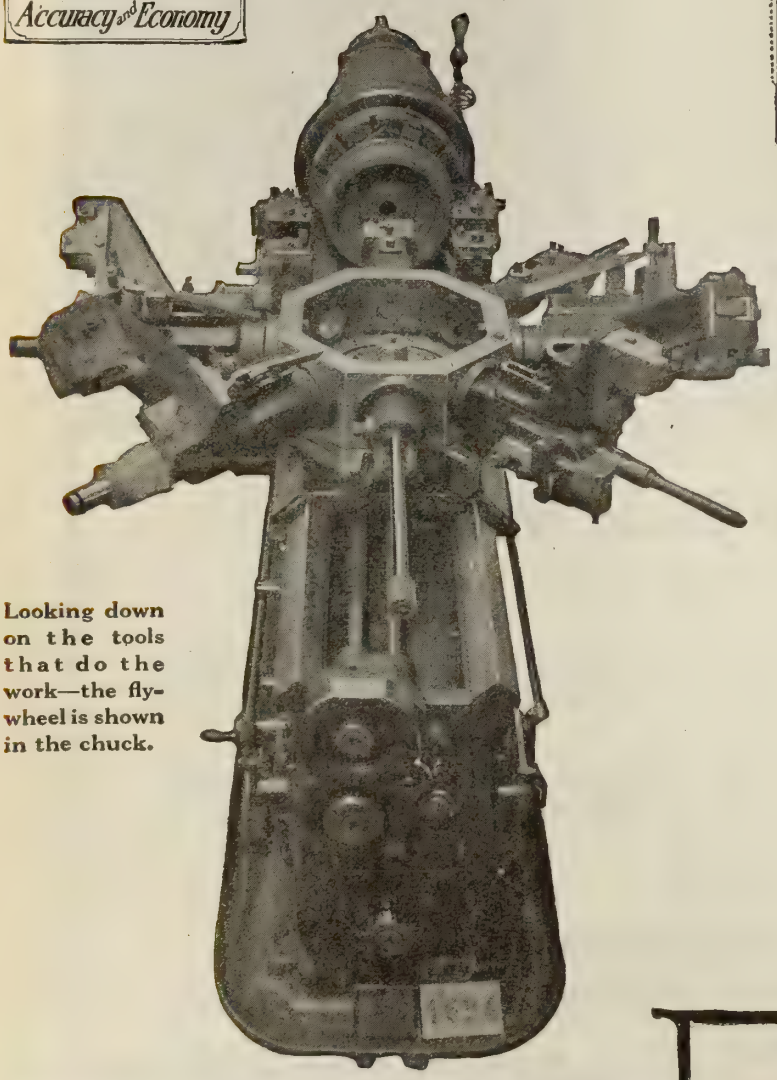
.....C. M.

If interested tear out this page and place with letters to be answered

GIS

Gisholt Methods Insure Accuracy and Economy





Looking down on the tools that do the work—the flywheel is shown in the chuck.

14-Minutes Each On the Gisholt Automatic

If you have any Automatic Chucking Work, let us tell you how the Gisholt will cut your costs.

Gisholt Automatics show time saving wherever used. They are backed by our years of experience in Turret Lathe production.

GISHOLT MACHINE COMPANY, 1201 EAST

Builders of Standard and Automatic Boring Mills, Tool Grinders,

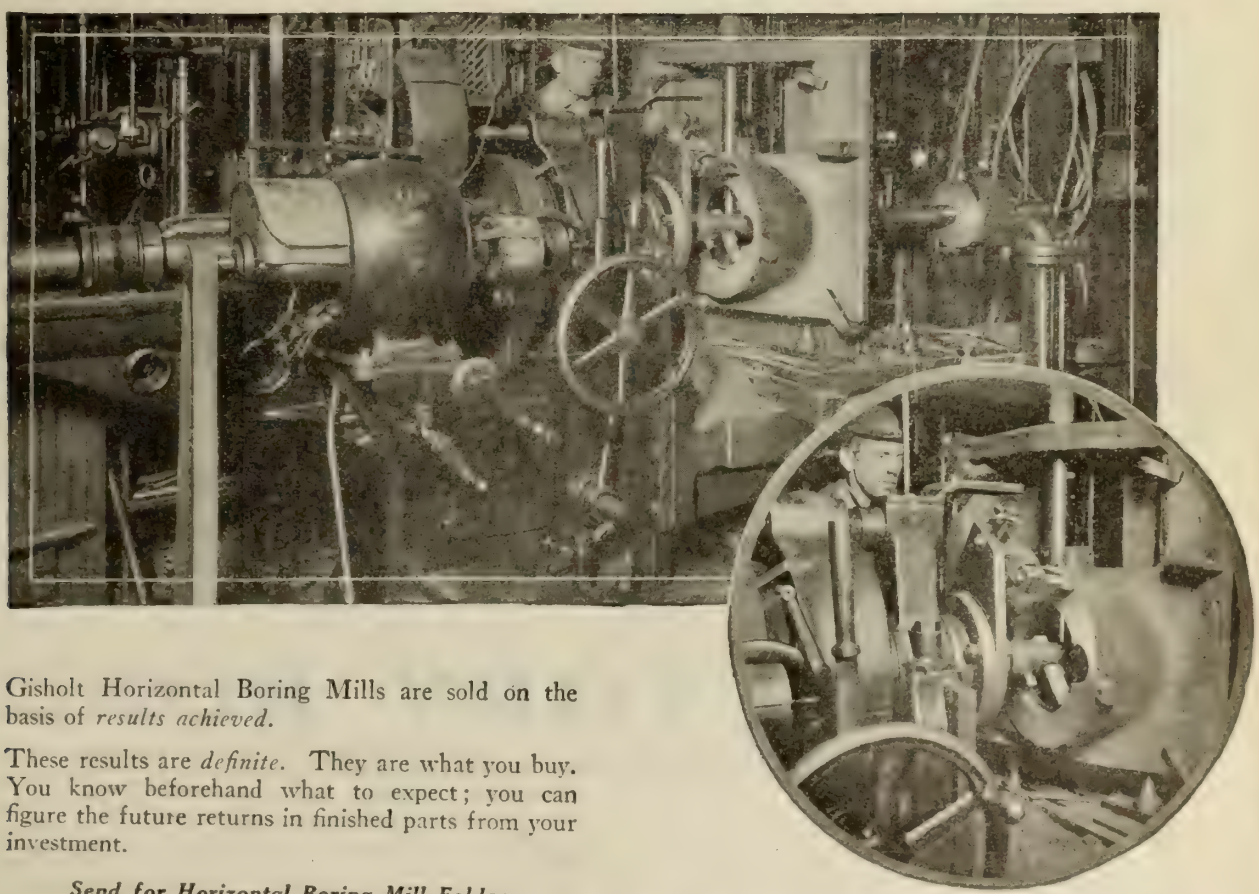
Eastern Sales Office: 30 Church St., New York.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., St. John, Quebec Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

HOLT

Results Count



Gisholt Horizontal Boring Mills are sold on the basis of *results achieved.*

These results are *definite.* They are what you buy. You know beforehand what to expect; you can figure the future returns in finished parts from your investment.

Send for Horizontal Boring Mill Folder.

Gisholt Methods Insure Accuracy and Economy

WASHINGTON AVE., MADISON, WIS., U. S. A

Turret Lathes, Vertical and Horizontal Small Tools, Special Machinery, etc.

Works: Madison, Wis., Warren, Pa.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

If interested tear out this page and place with letters to be answered.

An Exchange of Money That Pays—

When you buy Victory Bonds you simply exchange one kind of money for another.

A dollar bill is Canada's promise to pay.

So are Victory Bonds.

But Victory Bonds pay 5½% interest.

Consider the security behind Victory Bonds—
Canada and all that is contained therein.

Consider the good rate of interest—5½%.
Victory Bonds pay nearly twice as much as Savings Banks.

Consider the saleability of Victory Bonds—
Their use as security for a loan—
Their prospective advancement in price—

Canada must have this money to clean up our obligations to our army and maintain the prosperity of our Country.

These are the best reasons in the world for exchanging one kind of money for another.

Every Canadian should put all his weight behind this Loan.

He should exchange every dollar possible for Victory Bonds—and every dollar he can save for the next ten months.

BUY VICTORY BONDS

Every Dollar of this Loan will be Spent in Canada

The Canadian Fairbanks-Morse Co. Limited

Halifax St. John Quebec Montreal Ottawa Toronto
Hamilton Windsor Winnipeg Saskatoon
Calgary Vancouver Victoria

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 18 November 6, 1919

Canada Must Work to Secure Export Trade

In Several Cases Dealers in Foreign Lands State That They Do Not Know Anything About Canadian Lines—Openings for Various Lines if Price is Right

SOME time ago CANADIAN MACHINERY sent a circular letter to a selected list of importers in other countries with a view of securing information for Canadian manufacturers. In order that readers may correctly gather the meaning of the letters used here, we give the list of questions asked in our letter:—

1. Openings for goods that might be supplied by Canadian manufacturers that are not at present being sent from here.

2. Changes in tariff or transportation regulations.

3. Hints regarding the proper packing of goods, and things to be guarded against in the method of packing and shipping.

4. Suggestions in regard to catalogues and advertising matter sent out from Canadian firms. Should these be in languages that are not now sent out? If so, what changes are desirable?

5. What financial arrangements should be made? What system of arranging credits is being successfully followed by the manufacturers of other countries?

6. Are there special designs of machine tools or other articles needed for your trade, or is the standard Canadian line suitable?

Swinnock & Palmer, 18-20 Durham St. W., Auckland, Australia—"There is an opening here for store trucks. Documents should be posted properly to ensure being here before the goods. British manufacturers are now so handicapped by shortage of timber and other raw materials that it is now impossible to import at a saleable price, and Australian goods are very inferior and also higher in price."

Not Acquainted With Canada

The Toowoomba Foundry Co., Ltd., Box 109, Toowoomba, Queensland:—"Our trade with Canada has been small, which perhaps has been influenced by our experience with the methods of manufacturers and traders in the United States, which has been anything but favorable.

"We only wish to say in respect of your Question 5, about financial arrangements, that the American system seems to be to demand cash with order, as compared with the British system of shipping the goods with charges paid, and making draft at sight or as otherwise arranged with the purchaser. British bankers cater for business along these lines, but American methods seem to be on different lines, in that facilities are not provided for the sale by manufacturers and merchants of their drafts.

"We have had experience even in pre-war times of an American manufacturer taking two years to execute an order, and then being at a loss to know how to obtain payment, to such an extent that after our waiting for some months for the draft to arrive, we finally remitted from this end, as in the meantime the goods had been in our hands for sometime."

Present Designs Are Suitable

Maynham Tin & Steelware, Ltd., East London, South Africa:—"Opening here for tin plates, steel sheets. Stoves sent to this port are better uncrated. Sheet iron mostly in felt-separated bundles. Very rough handling is given goods here. System of letters of credit ties up for months quite a lot of money. Four to five months' indents have to be paid for in advance, which was never done in pre-war days. As far as we know existing designs of Canadian machines are suitable here."

The Market in Sweden

Aktiebolaget, Rylander & Asplund, Stockholm C.:—

1. The importation to Sweden of Canadian-made machinery is not very large, and never was, but as per our opinion, Canadian goods could get rather a good market over here providing they could compete successfully with goods made in U.S.A., with regard to prices as well as qualities.

2. No changes have occurred to the customs tariff and no special transport regulations with Sweden have to be reckoned with.

3. We feel this question needs not to be specially spoken of, the proper methods of packing machinery being well known to all manufacturers. An important point in this connection is, of course, that machines must be very carefully greased and oiled for the long transportation, especially during the present scarcity of shipping room, causing now and then long storage periods in the export ports.

4. Sufficient stocks of describing and illustrating material is needed to the Swedish importing dealers. Catalogues could gladly be printed in English, this language being sufficiently known to all Swedish engineers and mechanical men of any authority.

5. Providing this question asks for a reply referring to normal, not war, conditions, the reply is that exporters of other countries are generally allowing to the Swedish importers a 3 months' credit, or a cash discount when paying within 30 days. These are the usual terms, which, of course, are subject to slight modifications. Only firms unknown to the foreign sellers, or firms of less capacity, are asked to pay in advance or against shipping documents.

6. We regret to have only little personal knowledge of the standard Canadian machine line, owing to the fact stated above under (1), but we are under the impression

that the Canadian line is following the U.S.A. line with regard to the general designs, and if so, no special changes need to be made to suit the Swedish market.

The right way to get Canadian machines successfully introduced on the Swedish market would no doubt be that the Canadian manufacturers had their interests taken care of by active and capable Swedish dealers on basis of sole agencies. This is the method usually adapted by the leading U.S.A. and British manufacturers, and which have proved, we believe, to give satisfaction to both parties. It no doubt would be worth while that the Canadian manufacturers sent representatives over here to enter connections with the proper Swedish importers; in this connection we wish to mention that many Swedish importers have sent representatives over to U.S.A. as soon as the relieving of war restrictions made such journeys possible, but we are under the impression that only in very rare cases these journeys are extended to Canada, which is due to the fact that the Canadian manufacturers are comparatively unknown over here.

We wish to repeat what we have said above under (1), viz., that the hardest competition for the Canadian manufacturers is that from U.S.A., and if it would mean a hard job to the Canadians to get introduced in Sweden, the job certainly would be worth while.

Care Needed in Packing

George H. Alexander, Coleshill St., Birmingham, England:—

1. All classes of machine tools and small tools at present supplied by the U.S.A. might be supplied by Canadian manufacturers.

2. Impossible to say what changes are likely to take place in either tariff or transportation.

3. Very important to pack machinery in such a way that the flares, guards and all the light parts of the machine should not be broken in transit. Breakages of parts like this, which are difficult and expensive to replace is one of the troubles that should be guarded against.

It is important to thoroughly grease or protect with anti-rusting material all the bright parts of the machine, and to see that thick oil is well soaked into all the slides and operating parts of the mechanism.

4. For this market, English is all that is necessary, but a good supply of advertising matter, apart from the catalogues, i.e., all the talking points, should be liberally supplied.

5. The present financial arrangements are satisfactory for general purposes, in special cases it is necessary to arrange for extended credit.

Machine Tools Are Wanted

The Meadowbank Manufacturing Co., Works and Head Office, Meadowbank, near Sydney, New South Wales:—In response to your circular, we may express our appreciation generally of CANADIAN MACHINERY, and regret that we cannot help you so much as others on account of our small experience with Canadian goods.

Answering your questions:—

1. There should be good opening for Canadian machine tools. We, ourselves, are looking for:—

A small turret lathe after the style of "Warner-Swasey."

A drilling machine with multiple adjusting head, similar to that advertised—"Whole Hog."

A good type of rotary cutting machine in connection with shaping panels for motor bodies, similar to "Quick Work."

A machine for rolling mudguards for motor bodies.

A wood-working machine for using up scraps of timber by jointing and gluing.

Generally speaking, such lines as bolts and nuts, screws, and general hardware are in good demand, also steel.

We are particularly asking for a quantity of pig iron suitable for making malleable castings.

In addition, will you please tell us what Pyrometers are used in Canada in connection with malleable iron foundries?

2. A complete revision of our tariff is contemplated, and you will be able to obtain full particulars in due course.

3. Cargo, if reasonably well packed, reaches us in good condition by steamer. Sailers are to be avoided on account of rust.

4. Catalogues are all right, but price lists should accompany them.

5. Australian buyers generally settle by draft at sight or terms.

6. What suits Canada ought to be quite good for Australia.

Some Chance in Cuba

Ernesto A. Carcas Y Ca., Aguiar No. 110, Habana, Cuba:—We are at the present time endeavoring to get in touch with responsible machine manufacturers for the manufacture of **Asbestos-cement, corrugated sheetings, tiles, slates, etc.,** as are being manufactured in the United States, England, etc. We are interested in purchasing the necessary machinery for the manufacture of these articles, and shall appreciate mightily if you will have the goodness to refer our request to responsible manufacturing firms in those lines, and to take the matter up with us at once.

A Cheap Machine Wanted

James Greaves & Co., P.O. Box No. 406, 11 and 13 Ridgefield, Manchester:—We are in receipt of your circular letter with reference to your Export Number of CANADIAN MACHINERY, and this we are sending out to our correspondents in India for their information. Our lines of business, however, are chiefly confined to textile machinery. We also ship machine tools to India, but they are chiefly the cheaper type of lathes, which are required for grooving the leather rollers of cotton gins. Before the war, we used to buy these lathes in Yorkshire, at about £37 each, including 8 screw bell chuck, 14 in. independent four-jawed dog chuck, index plate, countershaft and 22 change wheels. The lathes have 8 in. centre by 10 ft. gap bed, and include self-acting, sliding, surfacing and screw-cutting motions. If, however, you have a cheap lathe that would fill the above specifications, we shall be pleased to hear from you, although we can quite understand that prices now will be dearer than they were prior to the war.

Charles Booth & Co., Engineers' Tool, Steel and Machinery Warehouse, Booth's Buildings, Park Lane, 38, 40, 42, 46, and 48 Park Lane, Liverpool:—In reply to your circular letter, we consider that there is a large outlet for cheap machets and shall be glad if you can put any makers in touch with us. They are a very cheap article, but are used in very great quantities.

Interested in Machine Tools

T. Eilbeck & Son, 2-8 John St., West Perth, Western Australia:—At the present time with the exception of a little agricultural machinery and Ford Cars, we know of very little Canadian manufactures imported to this State.

We find that most American goods are well packed and shipped, and presume that the Canadian manufactures would be packed in a similar style.

As we have not been in touch with any Canadian firms except through London buyers, we can pass no remarks about their catalogues. It is certain that your journal reaches most firms here, and is well known, and the advertisements in such a journal reach the source for which they are intended.

Most of our business has been done with English and American firms. We have usually paid cash against sight draft this end. In the case of firms whom we represent, goods are forwarded on consignment to us payable within twelve months from the time of delivery. We think most probably this is the same system as adopted by your manufacturers.

Machine tools are a line in which we are very interested. We find that the American and Canadian lathes, for instance, are not adapted to our market. Most of the engineering shops handle all classes of work, and the straight bed lathe is not suitable, and very few are sold compared with the gap bed. The same remarks apply to a number of their tools, which in the American markets are made for repetition work, and are not suitable here, because we have not the population to give that repetition work which would require the use of such tools. All machine tools used with a few exceptions are for general all-round work, and have to be selected accordingly. We find that there is more demand for the English type of machine than for the American of this kind.

General. We are ourselves manufacturers of wire nails and other such lines, and cannot remember having been approached by a direct representative of one of the Canadian steel firms, whose agents in most cases are in the Eastern States of Australia. As we are over 2,000 miles away from the Eastern State, naturally we are practically isolated, and have to get in direct touch with the manufacturers, thus we usually buy through London. We would be pleased to answer any questions within our capacity regarding this market.

About the South African Market

Especially prepared by MR. W. J. EGAN, Canadian Trade Commissioner to South Africa.

Documents—It is essential that one copy of invoice and non-negotiable BILL OF LADING should reach customers in South Africa on or before the arrival of the carrying steamsr. Selling to arrive, is a big factor in South African trading. Overseas customers should be advised as far ahead of actual shipment as possible, of the consignments coming forward. Other countries shipping to South Africa follow the above practices and as trade will always follow the line of least resistance Canadian shippers must conform or lose the trade in hand.

Invoices—On all invoices with C. I. F. quotations invoice must state the amount of the ocean freight. The face of invoice declaring true value at the time of shipment should correspond with the declaration on the back of invoice.

Insurance—Place all your overseas customers' INSURANCE with companies represented at destination; when this is not done, claims are delayed in settlement from nine to fifteen months. There are other difficulties, but the one quoted is enough to bring home the reasonableness of the demand.

Drafts—South African merchants want their drafts through their own BANKS. Many importers have stated that so little attention has been paid by Canadian shippers to their instructions that for the future they will stipulate on all order forms, that they reserve to themselves the rights of refusing acceptance of goods unless their instructions re DRAFTS are followed.

Shipping—Remember that shipping "overseas" is not the same as "inland." The packing must be strong and yet not cumbersome. Do not leave batten space which eats into delivery costs.

When you use iron hooping on cases see that it is a hooping and not a baby ribbon. Every case, crate, barrel, bale or single bar of iron should be marked in such a way that the name of the port of destination is always in evidence.

Heavy bales should be strapped and not tied with string or light rope for overseas shipping.

The test of your success in export can be judged by the repeat orders.

Make your first three or four shipments so perfect that it only requires representation to hold and increase future business.

If your shipping methods are such that your represensative is always fighting a battle to excuse your errors, what is the result? You will lose your representation as well as your business and the good representative is not easy picking.

You should by personal visits and inspection, see to it that the shipping department is living up to its job.

Keep the shipping department impressed with the fact that shipping 8,000 miles overseas is not the same proposition as say, from Hamilton to Toronto.

Remember always that comparatively the initial order is easy to take, it is the SHIPPING METHODS that count. Make your shipping department so thoroughly efficient that your overseas client will always remember what a smooth job it is to cost and pass the Customs entrees on your goods. When he thinks of the line you manufacture it is the name of your firm that is before him, although he may have on file fifty other manufacturers of your article.

Department of Trade and Commerce,

Ottawa, July 19th, 1919.

DRAWING COURSE PRIZE ANNOUNCEMENT

OWING to the poor class of work sent to us on plates Nos. 1 and 2, we cannot, to do justice to these plates, award the usual three prizes. Two prizes, however, are awarded to plate No. 1, and one to plate No. 2. The names of the lucky ones are shown below.

On plate No. 3 every scholar fought shy of this plate, although lettering is of such importance, so no awards can be given for this section.

Plates for Nos. 4 and 5 are still coming in nicely and we are glad to say that the class of work is steadily improving.

Our advice is this—stick to it, send in your work—and secure a prize.

We have definite word to the effect that considerable numbers are following this course, yet they seem to refrain from sending in their work. Once more let us repeat: We wish to see the result and will, if necessary, suggest where improvement can be made.

Following are the prize winners: Plate 1—Earl Forrest, 182 Albany Ave., Toronto, Ont.; G. Arundel Lamb, 36 Homewood Ave., Kitchener, Ont.

Plate No. 2—George W. Hibbard, 45 Riverside Drive, Cottage No. 3, Lachine, Que.

Canadian Machinery As An Advertising Medium

By J. H. M.

THERE is a saying that no matter where we go we will meet with a doubting Thomas, and, of course, the same holds good as far as advertising is concerned.

"You've got to show me," is a favorite expression of these Missouri inhabitants, so following is proof of the most convincing character. To commence with, the writer is not connected with the advertising staff, but merely one of the editorial department. He was not in search of a glowing tale regarding the possibilities of advertising, but he was out to find how business in general was going.

The gentleman whom he interviewed was S. L. Clark, Esq., of the Perfect Machine Tool Company, Galt, Ontario.

"How's business?" was my first question, and the reply was as follows: "Splendid. We are doubling our foundry capacity and intend doubling our machine shop space directly after."

Naturally, such a reply was encouraging.

"How do you account for this rush and where is the work coming from"? was my next query.

"To your first question I would say that this is the result of producing a first-class article and advertising the same judiciously and wisely; secondly, that our orders are coming in from all over the Dominion of Canada and Great Britain," was his reply.

"Evidently you are a firm believer in advertising," I said.

"I certainly am," was the reply. "Here are my views on the subject:

"In advertising, just the same as in anything else, good judgment must be used. You must study where to advertise, when to advertise and how to advertise. Each feature is equally important. You can spend more money foolishly through advertising than in any other way. In some cases I would not give five cents for space which they ask $10.00, $20.00 or $30.00 for, simply because I believe that no results would be obtained. In other words, I pick carefully where I advertise. I am a firm believer in the possibilities of export business and have secured inquiries from England, France, Spain and South America through judicious advertising in CANADIAN MACHINERY. We have made good connections already in England and hope soon to make connections of like nature in the other countries mentioned. The man who advertises is bound to go ahead, providing that the article he is advertising backs up every statement in his advertisement and he uses judgment in what he puts before the buying public.

"Personally, I cannot speak too strongly for the cause of advertising, and I firmly believe that CANADIAN MACHINERY, as an advertising medium, has helped us considerably in our present business expansion."

Accidents Have Taken a Back Seat in This Plant

Power Presses Are Generally Conceded to be Dangerous Machines to Operate, But the Various Safety Devices Herein Described and Illustrated Have Made the Press Operators' Work Perfectly Safe

By J. H. MOORE, Associate Editor Canadian Machinery

SOME twelve to fourteen years ago, the writer was engaged in the pleasant (?) occupation of pushing various three-wheeled trucks filled with tin cans acros the floor of a certain can-making factory. While making these daily journeys it used to be a common sight to see some press operator suddenly give a yell and jump up off his stool, but not before he was minus a finger, or perhaps a goodly portion of his hand.

One got hardened in time to these sights, which were, as a general rule, of daily occurrence. Even the operators themselves seemed to realize that they were engaged in a hazardous task, and simply made the best of it.

No one ever thought of properly safeguarding these presses. The danger was ever present, yet still it remained with no real serious attempt to minimize it or to eliminate its existence.

Certain half-hearted attempts were made to place some sort of protection in front of the punch, but no serious thought was given to the problem, with the result that the trouble went on as usual, in spite of the fact that accident reports showed that more injuries occurred on power presses than on any other type of machine, with perhaps the exception of the circular saw, which was a close rival for injury toll.

But time works many changes, and now it is the writer's privilege to tell another story of a can-making industry. This time an entirely different tale. Where his first little reminiscence told of lack of safety devices, his second tale is one fairly pounding the words **Safety First** home to his readers.

It is good to know that there do exist firms so interested in their employees' welfare, that they make a careful and special study of the safeguard problem, and the following article concerning the plant of the American Can Co., Ltd., proves conclusively that not only has this firm spent considerable time and money in safety devices, but that the workers in turn appreciate what the firm is doing for them.

To enter an article of this nature is somewhat difficult, for it is not our intention to confine this story to the press room alone, but rather make it general in character, describing the various safety devices throughout the entire plant.

Many of these devices, or appliances, were impossible to photograph to advantage owing to their location, etc., but a written description of the ideas as adopted will suffice for the purpose of explanation.

Regarding the power press problem. We have secured photographs of several press guards in actual operation in order to clearly bring before the reader's eye, how the devices appeared on the press. All data procurable have also been added to the title of each photograph, and in the reading matter following.

It is our hope that readers will obtain benefit from this article and find some of the guards referred to applicable to their own industrial line.

In such case the time spent in studying the material given will be time well spent.

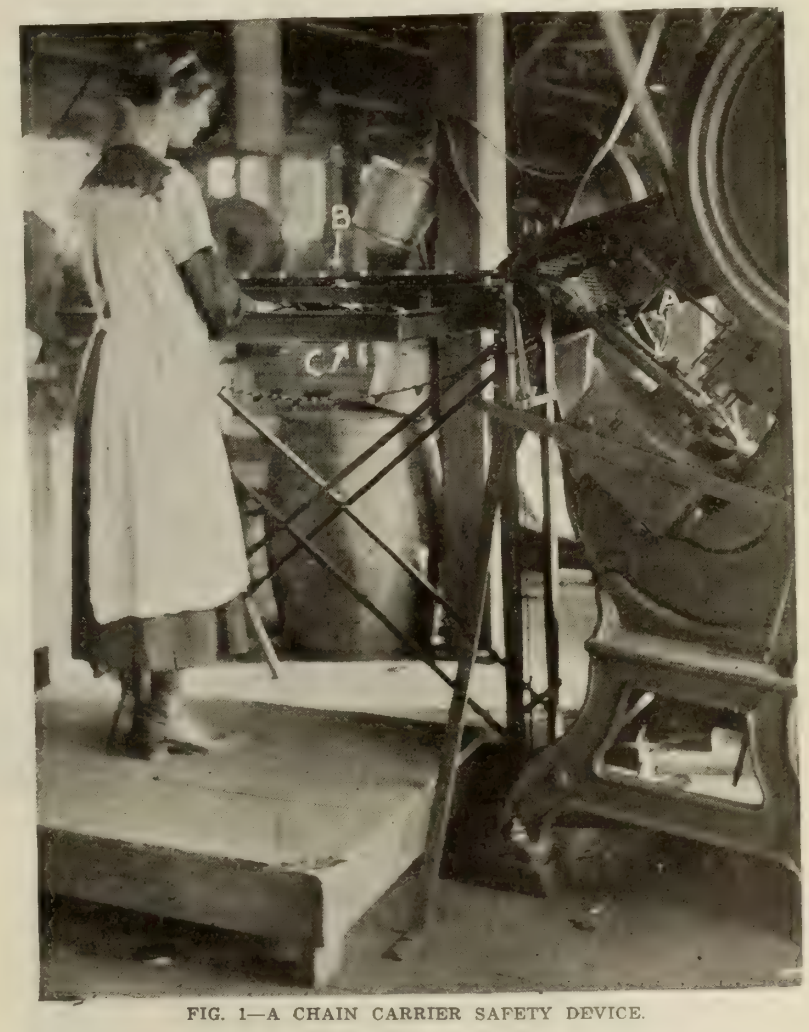


FIG. 1—A CHAIN CARRIER SAFETY DEVICE.

The company we speak of operate sixty different plants, and maintain at their headquarters in New York a safety department regularly organized with a manager and the necessary under organization, whose time is devoted entirely to the furthering of the safety idea, and the general welfare of the employers.

On commencing the tour of the plant the first important point which came to the writer's notice was that of the splendid lighting system (both daylight and artificial), throughout the entire works. This is a matter which unfortunately does not always receive the careful consideration it deserves.

The Woodworking Dept.

Inspection of the woodworking department was next made, and here the safety guards were first in evidence. Every saw was properly protected with an efficient guard, so that the operator could not injure himself without actually removing the guard. All belts, gears, pulleys, etc., which were in any position at all likely to prove dangerous, were properly protected by suitable guards, but of these we will say more later on.

A walk through the entire plant was made, the writer noting down what he believed would interest not only one class of readers of CANADIAN MACHINERY, but all classes, so he will merely set down his impressions one by one, leaving the reader to study from his own angle as how best to adapt the

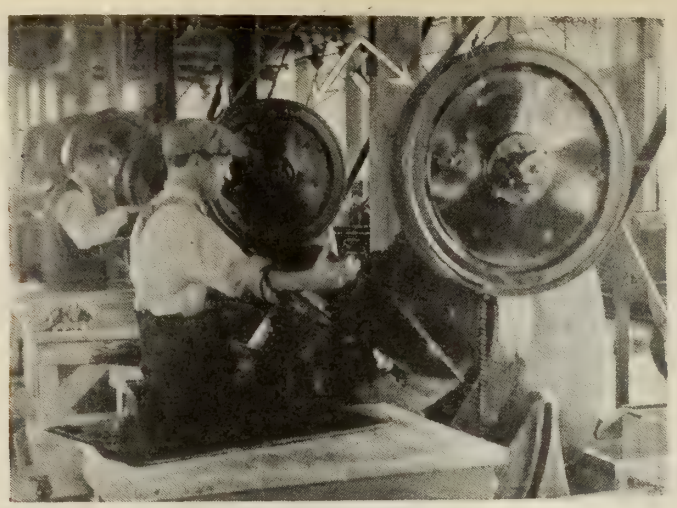


FIG. 2—THE GENERAL APPEARANCE OF THE DISKED FLY-WHEELS ON PRESSES.

various ideas to his own particular conditions.

The Fire Zone System

This firm has adopted a splendid system of fire drill. Every portion of the plant is divided into certain zones, each worker within that zone being thoroughly instructed what they must do in case of fire. Each zone has a certain exit to which the workers in it must go, this feature preventing panic and overcrowding at any one exit. Blue prints showing the layout of plant, with zone areas, exits, etc., all plainly marked, are placed throughout the factory, so that workers can have no excuse for not remembering the instructions given them.

The Elevators

Another safeguard system is that adopted on the various elevators throughout the plant. Each elevator is operated by a carefully trained workman, and all doors at each floor automatically close as the elevator leaves the floor. On each elevator there is a card on which is plainly marked the elevator's capacity, above which it must not be loaded.

Various Type of Guards

Passing through the various departments, one cannot help but notice the multiplicity of guards. They take the form of belt, gear, pulley, rheostat and motor guards. Wherever there is a belt in a precarious position it is suitably guarded by means of a wire mesh guard on an iron framework, or by a cast iron guard if the conditions warrant such a procedure.

Overhead belts especially, are watched carefully, for while these could not very well do any damage so long as they run correctly, they might cause considerable trouble by breaking and coming down on the head of the passer-by.

Gears, pulleys, etc., on all machines are, wherever possible, guarded with wire mesh or tin guards, also in some cases with guards of grey iron. Wall rheostats and motors, either on platform or floor, are all suitably guarded with wire mesh, and iron framework. In other words, in all corners of this plant the safety first idea holds sway.

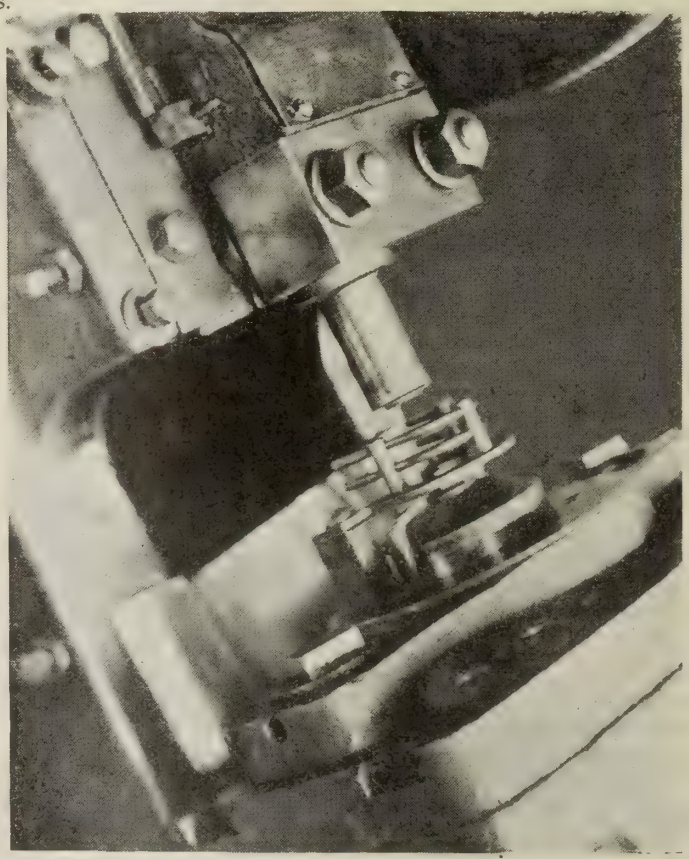


FIG. 3—A SIMPLE AND EFFECTIVE CAGE GUARD.

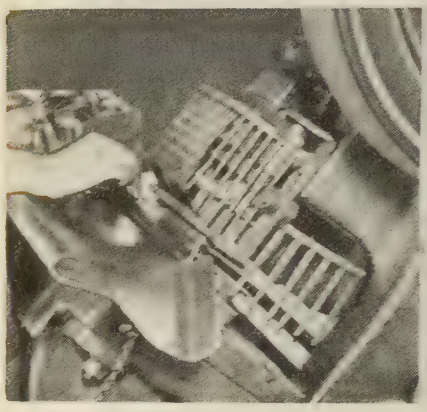


FIG. 4—A SIMPLE WIRE CAGE GUARD.

FIG. 5—SAFETY DEVICE, ADOPTING A CHUTE AS THE SAFEGUARD.

First Aid Room

There is a splendid first aid room situated on the ground floor, with a trained nurse in attendance. The room is modernly equipped in every respect to handle accidents, (but, if one may be allowed to make a comment), the nurse is not overworked since the installation of these various safety devices.

Paper Can Section

In addition to the regular tin cans, etc., which this firm manufacture, they turn out a complete line of paper cans of all sizes. The same feature of belt guards, etc., is carried out in this department, but no guards are necessary on the presses, as these are automatic

in action, the operator never being near the punches while in operation.

The Press Room

Last, but not least, let us consider the press room. As we enter this room the orderly appearance of the presses strikes the eye. These presses are arranged in three main rows, with plenty of aisle space between. At the back of each press is arranged a suitable chute to catch the finished work. In addition to these chutes, plans are under way to instal suitable belt conveyors to carry the work to other presses for further operations. This belt conveyer system is already adopted in the paper can section.

A big safety feature in the press room is the fact that all press flywheels are disked, as can be noticed on one of the accompanying photos. The same plan of covering the spokes of the wheels is carried out throughout the entire plant. The advantage of such a scheme needs no comment for its value is self apparent. The workman cannot get his clothing caught on such a wheel as has often happened with the spoke variety.

Portable floor cranes are provided to help the workman place his dies on the press, and speaking of dies brings us up to the method this firm has of storing their dies not in actual use.

Suitable shelves are built up and divided off to accommodate the dies. Cards plainly marked with all particulars are fastened at the various shelves, so that the workman knows at once where to go for a die, and what it is for. We cannot here refrain from remarking that we have seen plants where this idea could be carried out to good advantage.

At the side of each press, is either a suitable tray on which is placed the work for the operator, or a wheeled truck if such a tray is not practical. The trays mentioned can be seen in several of the photographs illustrating this article.

FIG. 10—IT IS ALMOST IMPOSSIBLE TO GET HURT WITH THIS MACHINE.

FIG. 2—A NOVEL SAFETY SCHEME, WHERE THE TABLE COMES OUT FROM UNDER THE PUNCH, FOR LOADING PURPOSES.

A part of the equipment on each press is a air hose which always has sufficient air pressure on it to blow away dust or small portions of tin which would have a tendency to stick on the die.

Should a larger portion stick to the punch or die, a skillet is provided on each press to knock away such obstructions.

This skillet, which is a large tapered piece of hard wood, is fastened to the side of press by means of a chain. The chain can be seen on several of the photographs. Of course, there is no possibility of losing the skillet when it is fastened in such a manner. Above all, the operators are warned not to place their hands under the punch.

On the ram of each press is fastened a set of safety rules, one of which covers the above-mentioned point. These

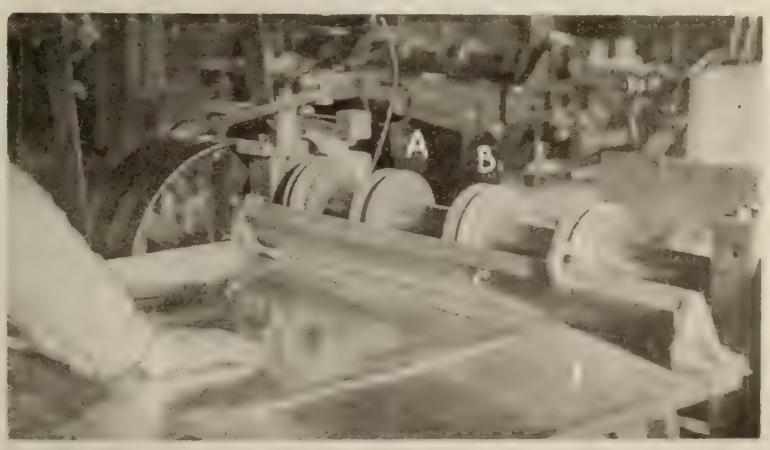


FIG. 11—A VERY EFFECTIVE TIN STOCK CUTTER GUARD.

rules are so important that we publish them in panel form.

Brief Description of Devices

Following we give a brief description of each of these devices, also below every photograph we mention the vital points in its favor.

In Fig. 1 we illustrate what the workers have nicknamed "The Flying Dutchman," and what we would call about as perfect a safety device as could be wished for.

It will be seen that the operator is quite a distance away from the press, which is continuous in its action, therefore in no danger. The automatic chute feed A, is merely a guide slide which sends down one piece at a time. The operation being performed is that of a bumping operation, the work being the tops of the well-known Dutch cleanser tin.

The tops are placed on the travelling chain B, out of the tray C, and a continuous feed is kept up. The die embosses, rolls the edge and bumps the perforations on this can top, all in one stroke of the press.

This installation has not only safeguarded the operator, but has increased production to a considerable extent.

At Fig. 2 we give readers a good idea of how the disked fly-wheel appears to the eye. As we have already mentioned the advantages of this system, we will go on to Fig. 3, which illustrates a very simple but effective cage guard used on a press punching milk can plug.

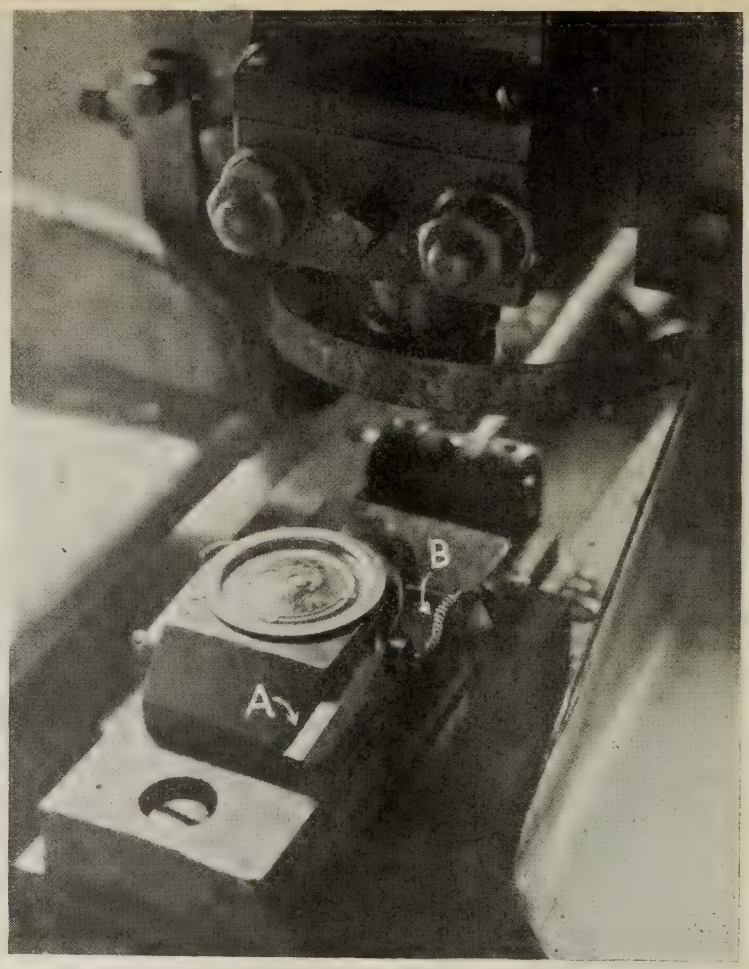


FIG. 7—A CLOSE UP VIEW OF THE STRIPPING MECHANISM DESCRIBED IN ARTICLE, RELATIVE TO THIS DEVICE.

FIG. 8—PRESS EQUIPPED WITH AUTOMATIC FEED SLIDE.

It is impossible to get your hand under the guard, and, of course, there is no need for you to stick your hand over it. The stock used is single width, and feeds in sidewise, as usual. The operator is never in danger, as the guard is so close to the die that it is impossible for anything thicker than the stock to pass through. 40,000 of these plugs have been turned out every nine hours since the installation of this guard.

Figs. 4 and 5 illustrate two more efficient safeguards. The former is simply a wire cage which completely surrounds the die, the work being slid down a small chute on to the die. In this operation, which is the punching of milk can plugs, two punchings are made at one time, the die being of double design. These punchings are made entirely from recovery stock, (i.e.) stock which has been recovered or salvaged from former operations. Considerable saving is thus effected.

Fig. 5 illustrates the chute principle in a more distinct form, the operation being the bumping and flattening of Crisco can tops. Production has increased since this guard has been placed on the press, and, of course, the operation is now free from danger. The operator's hand placing the tops in place in chute is clearly seen.

At Fig. 6 is shown what the workers call the "Go way—come back" press.

In a way this is not a bad name for it, for that is exactly what it does. The table A, on which the work goes, moves in under the punch immediately the treadle is depressed. Down comes the punch and performs the operation and out comes the table A, once more for the operator to remove the finished product, and to replace another piece in perfect safety. The action of this table is controlled directly through an arm from the crank shaft, with suitable lever and spring. A cam on the crank shaft pushes this table in and out, as the ram of press descends and ascends.

Before this method was adopted, six to seven thousand was the maximum production of can tops, with considerable danger attached to the operation, but at present nine thousand can be turned out in similar time with perfect safety.

Readers will also notice the guard B, which has a transparent front, in order to allow the operator to see clearly the action of the punch.

At Fig. 7 we show another installation of the "Go way—come back" motion, with yet another added feature. Readers will note the small lever A, with small spring B, behind it. Immediately the operation is performed the work table returns as usual, but in this case this lever kicks, or trips, ejecting the work automatically and throwing it into a chute which carries it into the waiting truck. By this method, the operator need only concern herself with the loading process, as the unloading or stripping of work takes care of itself.

We now come to Fig. 8, which illustrates an automatic feed slide A. It will be seen that the operator is so far removed from the punch as to be in no danger. To make sure that no punchings stick in the die, a swinging apron, B, is also installed as part of the die. This apron is made in two halves, swinging from stud C, as a fulcrum, and a similar stud on the other side of the die. The operation being performed is what is known as a friction plug. Briefly, the action is as follows: The ram descends, the apron B opens, being opened by the pin D, which goes through a hole in the apron. A similar pin on the other side opens other half of the apron. The portion E trips the lever F, and feeds down the work at the proper time. The operation being performed, the ram, with punch, ascends, the apron closing automatically, the punching drops on the apron and slides into the chute G, and from there into the receiving box or truck.

The previous production before this safeguard was installed was 2,500 per hour, but 3,000 per hour is now turned out with the operator's safety assured.

We call the readers' special attention to Fig. 9, as here is shown the latest safeguard of all. This guard, A, is used in conjunction with what is known as a 5-step gauge, B.

A study of its action will be time well spent. The stock is first of all cut off in five widths, that is, sufficient stock for five rows of punchings. Readers will, by looking at this photo, notice four different gauge points, C, D, E, and F.

These handle quickly four different positions of the stock. The fifth position, which, in reality is the second row of punchings made, is controlled by the finger gauge G, which is operated by the heel of the operator's hand on the lever H. On the other row of punchings being made it is necessary that this finger gauge be lifted out of the way. This is accomplished by means of the pin J, supported from the bracket K. Every stroke of the ram the spring clip M comes down on this pin J and trips finger-gauge G, lifting it sufficiently to allow the stock to pass through. The action of depressing the lever H allows the finger-gauge to remain in place to gauge the stock on the second row of punchings. Readers will, of course, easily grasp the construction of the guard A, as it is merely a well-constructed cage with a plate glass front to enable operator to watch closely the operation.

Fig. 10 illustrates an altogether different type of machine, but a safeguard of splendid design. The operation to be performed is that of trimming and beading the bottoms of shoe blacking boxes. The work is fed into the chute A, the wheel B allowing but one piece to go through at a time. The operation itself is performed down towards the bottom of this photograph, so that the operator

SAFETY RULES

1. Do not operate this machine until you have been shown how to run it.
2. Do not operate any machine in this factory until ordered to do so.
3. Never place your fingers under a punch or knife, or between dies or rolls of any machine.
4. Use a stick or hook to remove pieces of work, dirt, etc., from dies or any other part of machine. If no stick or hook is handy ask the foreman for one.
5. If machine gets out of order stop it and tell foreman. Do not start it again until it has been fixed.
6. Never clean machine while it is running.
7. These rules are for your safety, and must be obeyed.

(Signed) AMERICAN CAN CO.

NOTE.—A set of these rules is printed on a tin panel and fastened to the ram of every press in the plant.

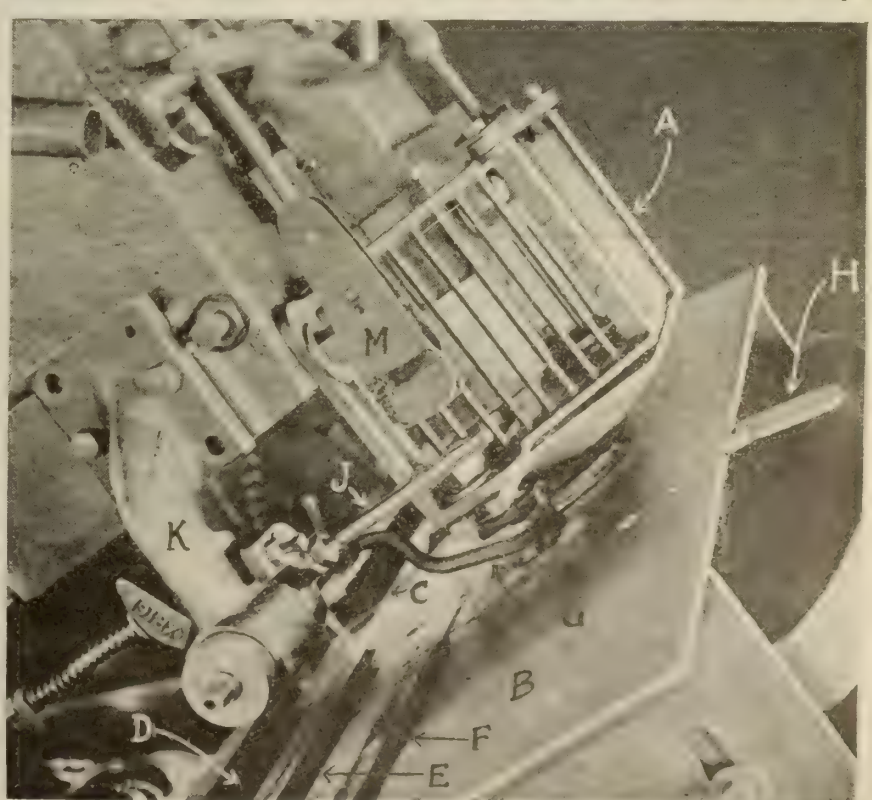


FIG. 9—A NEW DEVICE, COMBINING SAFETY AND EFFICIENCY, KNOWN AS A FIVE-STEP GAUGE.

is never near the scene of action, therefore in no danger.

Last but not least, we come to a very simple gauge (shown at Fig. 11) and yet one which has prevented many an accident. The operation is cutting the wide stock tin to various widths.

The wheels A, B, etc., accomplish this operation. Formerly it was a common slip, and, although not actually taking off his hand, these wheels or cutters used to give him a nasty wound.

But now conditions are different, with practically no added expense to speak of. A simple cast iron guard C is fastened on to the bed of the machine as shown, and the operator cannot possibly get his hand near these cutters except he deliberately takes his hand off the stock and sticks it over on to the revolving wheels. Of course when a man does this sort of thing he needs a doctor in more ways than one.

Having studied the various safeguards, let us see what conclusion we can arrive at. For instance: **Does it pay to instal safety devices,** both from the employers' point of view and from the employees' standpoint? We would say **Yes** with a capital Y, for not only is the employee protected, but the employer gets added production, with the knowledge also that he is, as far as humanly possible, looking to the welfare of his workers.

"Has it paid the firm referred to to instal these devices?" might be another question we could ask.

Again we say yes emphatically, for although this firm has appropriated over $188,000 (throughout all their plants) on safety devices of all kinds, they consider it money well spent.

Against a record of numerous accidents of all kinds, the firm have only two accidents to tell of this year, each of which could easily have been avoided with a little care on the part of the operators.

It will be noted throughout this article that production figures on all operations show an increase instead of a decrease, as some people would have you believe always happens when a safety device is installed. Such an impression is erroneous in every respect, for it stands to reason that the worker feeling perfectly safe can enter into her work with more speed and zest than before.

As the great percentage of press operators in this plant are girls, still greater credit is due to the management, in that they have reduced accidents to a minimum In conclusion, we can only express the hope that readers will find at least one idea in the present article which they can adopt in their own line of business.

Above all, boost the safety movement. Remember the three rules of safety: **First, look; second, look again, and third, look once more.** If you do this you will never regret it.

Making Steel in Canada

The Open Hearth and Bessemer Processes Are Described in This the Last Portion of the Series. The Acid Open Hearth and the Basic Open Hearth Processes Are Discussed in Detail

IN the early days of the iron and steel industry the product of the blast furnace known as pig iron, was converted by means of a puddling furnace into wrought iron. The furnace in which this conversion took place is shown in Fig. 1. In most cases it was fired by coal, although in some progressive plants gas was used.

The iron made in these furnaces was made as the result of very severe physical exertion on the part of the workman—the quality of the material depended upon both the workman's mental and physical powers. The furnace held five or six hundred pounds of metal, this metal was subjected to the influence of the heat and air from blowers until it reached a semi-liquid condition, and then by means of an iron rod, called a fettling bar, the operator worked up balls of semi-plastic material, weighing about one hundred pounds each. The balls were removed and taken either to a hammer, or a set of rolls, and worked into bars. They were known as puddle bars, and formed the basis of all other rolled and forged materials. The theory at the back of the puddling furnace is a little hard to understand, but the impurities were removed by oxidization, and the working of the material in the bath exposed all portions to the action of the flame, and resulted in a material tough and fibrous. The drawback, of course, was that only small quantities could be made at a time, and that a dependable analysis was hard to obtain.

This product, as mentioned before, was known as iron. Steel was made by taking selected pieces of iron, packing them in a crucible along with certain materials high in carbon, and bringing the whole to a soaking heat for a certain period. This produced a material that could be used for the purpose of making cutting tools, knives, etc.

After the discovery in year 1856, by Sir Henry Bessemer, that steel could be made in larger quantities, definitions have changed, and steel can now be defined as "Purified pig iron, which has been cast while in a molten state, and in which the carbon and other impurities present in the original pig iron have been reduced to such a point that the ingot cast is capable of being forged, or rolled into blooms, slabs, billets or bars."

To day we have four (4) main branches of the iron family:

Cast iron, which contains anything from two and one half (2½) to three and one half (3½) per cent. carbon, and is the product of the blast furnace without any refining, except remelting.

Steel which has been defined

above, and for usual commercial purposes, such as structural steel bars, etc., has a carbon content of from .20 to .50 per cent. carbon.

Steel castings, or cast steel, which is a material very much the same as the steel mentioned above, except that it is cast into a mould, and intricate and massive shapes obtained, which cannot be manufactured by rolling.

Tool steel and alloys steel made by melting either in an electric or a crucible furnace, selected portions of bar steel with special chemical ingredients to obtain an extremely hard material capable of cutting and working other steels.

All the above are known as ferrous materials, ferrus being the Latin name for iron, and they are thus distinguished from the non-ferrous materials having copper, etc., as a base.

We have already mentioned Sir Henry Bessemer, who in year 1856 made known what was then called the method of making steel without fuel. The apparatus he used is that known as the Bessemer convertor. Roughly, the process consists of placing a quantity of molten iron in a vessel; air is then introduced at the bottom and blown through the bath of metal. The rapid combustion that ensues eliminates carbon and other impurities, and the working of the bath secures a thoroughly mixed material.

The shape of the vessel is very peculiar. It is suspended by trunnions between two high "A" frames, the air entering through one of the trunnions and being carried down to the wind box at the bottom. The wind box contains the bottom section in which are a number of small holes, 3/8 to 5/8 inch. in diameter, through which the air is forced into the molten metal. The bottom portion is made removable and special facilities are usually provided to enable bottoms to be changed without loss of time; their average life is from twelve to twenty operations, or blows, as they are termed. The other trunnion is used for attaching the necessary gearing for rotating the vessel, and the peculiar shape of the nose-piece is to enable the molten metal to be poured in when the vessel is laying in a horizontal position. The vessel is lined with firebrick, laid

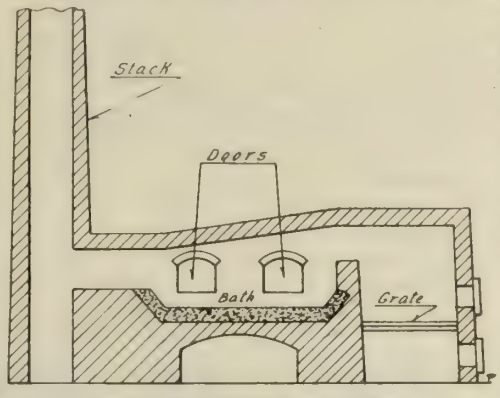


FIG. 1—PUDDLING FURNACE.

with great care, a lining may last from six hundred to one thousand blows.

The actual time to blow a charge of metal is about twenty minutes, but charging and pouring consume, perhaps, another thirty minutes, so that one blow per hour is all that can be counted on. Modern convertors usually have a capacity of from fifteen to twenty tons.

The metal is brought from the blast furnace in the hot metal ladle. The ladle is lifted up and the contents either poured direct, or by means of runners into the convertor, the blast is then turned on and the vessel turned to the vertical position. After blowing, the vessel is again rotated and the contents are poured into other ladles, and from this thence into ingot moulds. The blast is supplied by a blowing engine, or turbine, and has a pressure of from twenty to twenty-five pounds per square inch.

This invention of Sir Henry Bessemer marked an epoch in the history of steel making, for by it large quantities of steel could be produced at a time, but owing to the rapidity of the process the analysis of the material was not completely under control. It is quite true that practically all the carbon could be removed, and carbon in one form or another added in certain weights to give the desired results, but the other ingredients, such as manganese, silica, sulphur and phosphorus were not under complete control, and Bessemer steel lacked the uniformity that afterwards came to be desired, so a process known as "The Open Hearth Process" was perfected by Sir William Siemens about the year 1861. Fig. 2 shows a cross-section of an open hearth furnace, and before proceeding further we should become acquainted with the particular parts:

Furnace Proper. Note the heavy steel binding, and the manner in which the furnace can be rotated in order to pour the metal, and skim off the slag.

The Port Ends. The lower opening is for the gas, and the upper opening for the air. Combustion, of course, does not take place until the two intermingle in the furnace.

The Checkers. A mass of brickwork arranged with openings somewhat similar to the checker-work in a blast furnace stove. One checker is for heating the gas, and the other for heating the air.

The Stack, which provides the draft for pulling the gas through the furnace.

The Gas Inlet Valve.

The Air Inlet Valve.

Now, follow a complete cycle of operations, the gas and air come in through their respective valves, which are so set as to enable them to pass along the flues, through the checkers, up through the ports and into the furnace; they mingle and ignite, pass over the bath of metal in the furnace, out through the ports on the opposite end of furnace, down through the checkers,

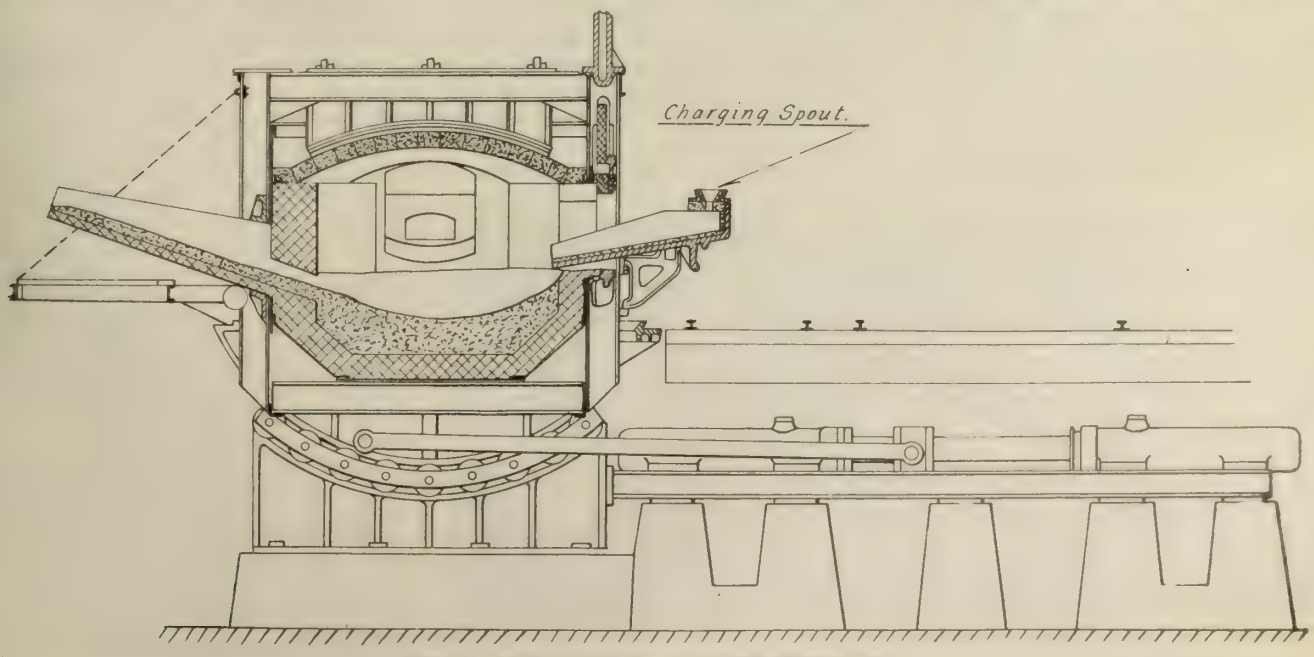


FIG. 2—CROSS SECTION OF 25-TON FURNACE.

giving up their heat as they pass to the brickwork, through suitable openings in the gas and air valve into the flue and out of the stack. After operating in this manner for, say, twenty minutes, the valves are reversed and the gas and air take exactly the opposite path. When a furnace gets properly into operations, the air is pre-heated to a temperature of about one thousand degrees by the heated brickwork of the checkers. This process of obtaining heat from the waste gases is known as the regenerative process.

Not all furnaces are made of the tilting type. Many are stationary, and have a tap hole opened very much the same as a blast furnace. The brickwork forming the end of the ports is contained in a cage and made removable, so if the end of, what might be termed, the blow pipe becomes burned away, it can be replaced without stopping operations for a lengthy period.

Steel made by this process is, of course, known as open hearth steel, and the usual period to refine a charge of metal is from ten to twelve hours. At any time samples may be taken and analyzed, so that the metal is under complete control of the melter. Capacity of the furnaces varies from ty-five to one hundred tons.

There are two distinct open hearth processes: the acid open hearth process and the basic open hearth process. The furnaces, port ends, checkers, etc., are the same for both processes, except for a difference in the material forming the furnace bottom lining.

The different processes are to suit ores of varying qualities. Let us review the impurities in the raw materials:

1.—Carbon—which settles the class and strength of the steel.

2.—Silicon—desirable in correct proportions.

3.—Manganese—desirable in correct proportions.

4.—Sulphur—produces red shortness.

5.—Phosphorus—produces cold shortness.

The acid process takes care of low phosphorus and sulphur ores, while the basic process takes care of high phosphorus and high sulphur ores.

The Acid Process

The acid process aims at reducing to allowable limits the following impurities in the steel:

1—Carbon.
2—Silicon.
3—Manganese.

The sulphur and phosphorus is not eliminated, so the total furnace charge must not contain more of these constituents than is desired in the finished heat.

The process is one of oxidation, or burning, the carbon in the steel is oxidized to carbon monoxide, which further changes to carbon dioxide and passes off as a gas. The silicon and manganese are oxidized and form the slag that floats on top of the bath of metal and protects it.

The Basic Process

The basic process aims at reducing to allowable limits:

1—Carbon.
2—Silicon.
3—Manganese.
4.—Sulphur.
5.—Phosphorus.

The first three items are removed in the manner described in the acid process, while the sulphur and phosphorus are removed by the addition of lime, which forms a slag to absorb them.

The charge of a furnace consists of hot metal, scrap and lime. The metal is poured in by means of a charging spout. The lime and scrap are charged by means of a charging machine, Fig. 3. This machine picks up a steel box full of scrap or lime, takes it to one of the furnace doors, pushes the box into the furnace, turns it over, dumping the contents and then withdraws.

When the heat is ready, samples having been taken and quick analysis made to determine the pouring, the ladle is placed before the furnace, the melter takes his position and with a signal orders the huge furnace to be slowly rotated, the silver stream of liquid steel breaks away from the bath, rushes along the pouring spout and plunges into the ladle.

The analysis of the metal is known, and the melter also knows what class of steel is desired, swift calculation is made and carbon in the shape of powdered coke, or coal added to correct; also manganese in various forms.

The ladle fills, the slag overflows and is caught in a pit or another ladle, then the crane hoists the 75 or 90-ton load and places the ladle over the waiting row of ingot moulds, the opening at the bottom is opened and the steel flows out and fills the moulds.

The moulds are all on cars, and after cooling are taken to the stripping crane, where the mould is lifted off and the ingot is then ready for the mills. See Fig. IV.

Before passing on there are one or two details deserving attention. The reversing valve, Fig. V, notice how the direction of the gas is reversed and the path of the waste gases altered by the one movement.

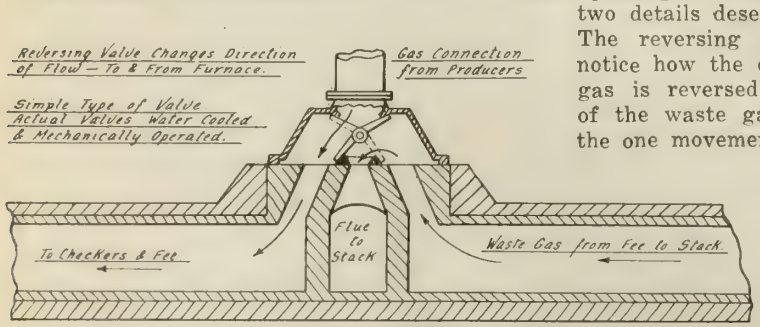


FIG. 5—GAS REVERSING VALE.

The pouring nozzle in the ladle, Fig. VII, which enables the metal to be poured from the bottom of ladle into the moulds.

In some plants the metal from the blast furnaces is taken first to a mixer,

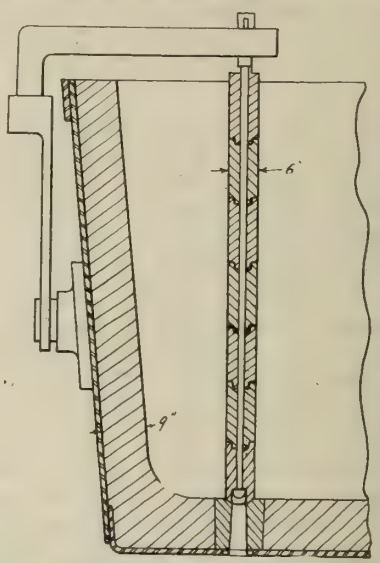


FIG. 7—SECTION OF A PRODUCER.

which acts as a reservoir and secures uniformity of product.

The usual fuel for open hearth furnaces is producer gas, made from bituminous coal, but coke oven gas and tar are sometimes used.

The gas producer is an appartus for producing combustible gas by the incomplete combustion of solid fuel.

Fig. VIII shows a section of a producer manufactured by the Morgan Construction Company. The operation of making gas is as follows:

When the producer is in operation, the layer of ashes extend to a height of about three feet above the ash-pan, or to such a point that the top layer of ashes is kept opposite the sight-holes in the producer shell. The central blast tuyere is, therefore, surrounded by ash and protected from the heat.

A horizontal layer of incandescent coal from 2 ft. to 3 ft. thick commences at the level of the sight-holes. At this point the red-hot carbon, coming in contact with air and steam which have been superheated by passing through the glowing ashes, seizes the oxygen from both and is transformed into carbonic acid (CO_2), at the same time liberating the hydrogen from the steam. The carbonic acid passing upward seizes another atom of carbon from the hot fuel, forming carbonic oxide (or carbon monoxide CO), while part of the hydrogen from the steam will also unite with the glowing carbon, forming marsh gas (CH_4) or other hydrocarbons. In the upper layers of the coal a somewhat lower temperature prevails, but even at the surface of the fuel the heat is sufficient to liberate the rich volatile gases which are found in varying percentages in all bituminous coals.

To melt a ton of steel takes about

Continued on Page 84

How One Galt Concern is Forging Ahead

Herein is Described the Plant of the Elliott & Whitehall Co. This Concern, Though Only Established Two Years, is Handling in Splendid Shape Some Very Important Work

By J. H. M.

IF you were to select say ten parties and ask them how long, in their opinion, a concern should be in existence to become established, the answers would be without doubt varied. This question of existence and establishment carries a greater problem than appears on the surface, for conditions, not only of trade, but of location, labor, etc., enter into the matter very strongly.

We do not intend this article to be an attempt to prove that two years' existence means establishment, but we do wish to place on record that here is a firm only a few years of age, so to speak, and yet very well established and running night and day.

To reach this result in such a short space of time, needed perseverance, ingenuity and hard work, coupled with a firm belief that success would come in due course of time, but these are characteristics that both members of this firm possess.

Their plant is filled with all the latest type of machines, such as Cisco Tool Room Lathes, LeBlonds, Turret Lathes, LeBlond Universal Milling Machines, McKenzie Shapers, Oakley Grinders, Rivet Internal Grinders, and a variety of special machines for the tool room department, etc., and owing to the daily repeated orders from the largest manufacturers in Canada, this young concern will soon be branching out into larger quarters to make it possible to keep their promises on deliveries on their work.

The class of work tackled by them is varied to say the least, for while their regular line is milling cutters and small tools, they also handle special machinery such as jigs and fixtures, metal stamping dies, etc.

The photos throughout this article illustrate some of their machines in actual operation and in addition to the regular equipment, they are building at the present time a special saw grinder from which they expect good results. This is the firm's own scheme and will aid greatly in their production.

The heat treating portion of the plant is well looked after, three units built by the Standard Fuel Engineering Co. of Detroit being used, a carbon steel furnace, a high speed furnace and oil tempering furnace being installed. The oil quenching bath is enclosed in a water cooling arrangement which ensures fresh water at all times, keeping the oil at proper temperature. Work of all kinds including carbonizing is easily done with these heat treating units.

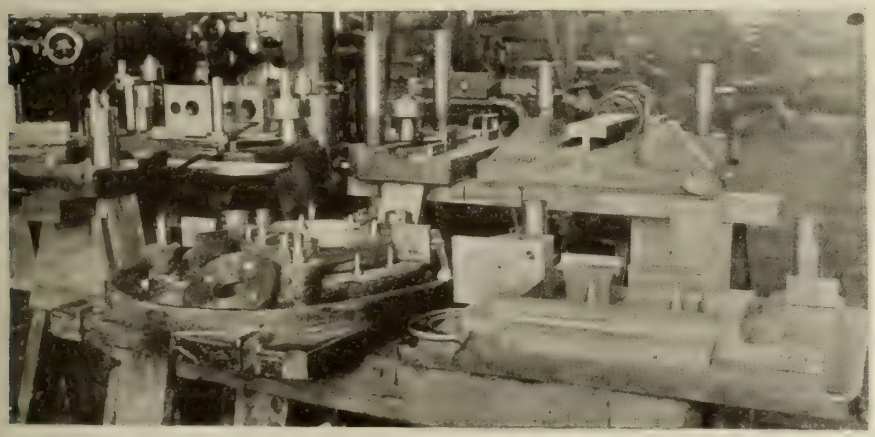


FIG. 1—GENERAL VIEW OF VARIOUS DIES MADE AT THIS PLANT.

If you look at Fig. 1, you will see various types of dies, etc., made by this firm. No attempt has been made to show any particular die, but rather to show a general view of the different kinds, and Fig. 2 shows a portion of the plant operating these dies.

While the next portion of our story may not be strictly mechanical, yet it's worth the telling, for at the present time everyone is talking Victory Loan and Victory bonds.

This firm was the first concern in their city to be awarded the Prince of Wales emblem for obtaining 100 per cent. in this new loan campaign. In addition to this honor, seven crowns have been awarded them for exceeding the allotment in the amount of the subscriptions. The flag is now proudly floating over their plant. Pep, vim, and enthusiasm make such conditions possible.

One thing more and we are through for the present. Every employee is a reader of CANADIAN MACHINERY. We mention this with justifiable pride, for while we would not go as far as to state that we are, by our paper, helping them along, still it shows that their success is due to initative together with employing of men of ambitious nature, who are anxious to keep up to date, and therefore read CANADIAN MACHINERY.

Car Company Reorganization.—Reorganization of the National Steel Car Company will be considered at a meeting of the shareholders to be held shortly. A circular has been issued showing accounts payable of $3,487,740, and accounts receivable and inventory, $1,884,556, leaving a deficit of $1,603,184. The company has adjustments under negotiation with the P. L. M. Railway in France, which would result on the company receiving $450,000, and its real estate, plant and machinery are valued at $2,600,000. The reorganization proposed calls for a new company, 19,000 shares of the stock of which would go to the shareholders of the National Steel Car Co., the latter also receiving the proceeds of the French settlement.

FIG. 2—GENERAL VIEW OF THE MACHINE SHOP.

Solving the Problem of Why is a Hot Box

Excerpts From a Paper Read Before the Canadian Railway Club, of Montreal, at Their September Meeting, on the Subject Above Mentioned. The Discussion of Same is Also Reported

"Why Is a Hot Box?"

Mr. President and Members.—The query offered you in this little paper strongly reminds us that a person of inferior intellect may advance a proposition that a sage may find difficult of solution. In other words, a fool may ask a question a wise man cannot answer. If you will accept the part of wisdom and look for the answer, I will bear the onus of the simple, but inquiring mind.

The expression "Hot Box" is the one generally used to describe that condition which results from the journal of a car truck becoming heated.

This heating of the journal has a wide effect. It first sets fire to the waste and oil in the journal box, then it warms up the temper of the brakemen, this is transmitted to the conductor, and from him to the engineer. The next to hear of it is the dispatcher and he becomes hot. Then the trainmaster comes in on the game and he heats up the superintendent and the car department. If there is sufficient fire it gets up to the president at times and great is the "Passing of the Buck" all along the line.

The only one vitally interested who keeps cool seems to be the car knocker, who puts in the new brass and dope, which costs the railway anywhere from 5 to 8 dollars. He seems to be a fatalist and regards the matter as an act of God, against which it would be futile for him to rage, or get hot.

I used the expression "Passing of the Buck" in this connection, and as I am afraid some of you may not know what I mean by that, I will explain that it is merely that regular routine of our daily life wherein you attempt to get from under, and put it on the other fellow, regardless of the merits of the case.

In dealing with hot boxes, the "Buck" is a lively animal, as he has a wide field to cover, but one thing we do know and that is that we are further away from a solution of the problem to-day than we were 25 years ago.

Some young men of a serious turn of mind will no doubt resent me treating this matter in a semi-humorous manner. Well, you see we get that habit of late years. The boys at the front, you know, went out after the Hun with a joke, but he knew how deadly the thing was just the same. We at home joke about the high cost of living and other serious things, while we wear our year before last underwear and get that old suit turned wrong side out for twelve dollars because we can't pay twenty dollars for a new suit, and pay for a bond at the same time.

I really am not disposed to treat the hot box in a light manner. It is far too important for that. It means huge sums of money and danger to life and limb of the railroad man and the traveling public. Nor am I disposed to give that lively animal the "Buck" any more exercise than I can help in dealing with this matter.

There is no effect without a cause, and behind everything is a fundamental principle. The cause in the case of the hot box is 99 per cent. neglect—the effect is bad.

The first thought in the minds of some of you is to jump up and protest that word neglect, but wait awhile and see how it turns out. In dealing with hot boxes you will find the "Buck" turn up under many aliases—a few of them are: Bad oil, bad waste, bad brass, rough journal, rough truck, truck out of square, overload, etc. Each and every one of these spells "neglect" by someone.

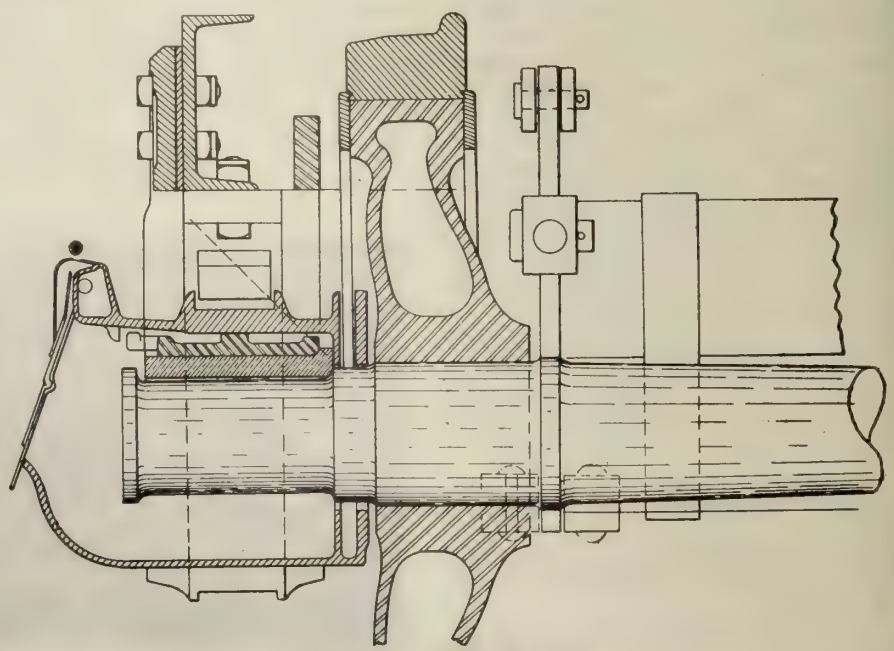
A car truck mechanically correct requires very little lubrication to keep it running with cool journals. By mechanically correct we mean that the truck has been properly constructed to do the work it was intended it should do. The journals on which it rides are of a size to carry the load they will be called on to carry, the saddle, or wedge, of proper shape and the journal bearing of a quality of metal that will reduce friction to a minimum.

If we start out with such a condition, and maintain it, the question of lubrication is so simple that it is practically non-existent, or it would be if the conditions surrounding the working of a car truck were not so diversified.

Now let us glance at a concrete example. We will take a train load of grain from the West, or the lake ports. The cars are, when loaded, in fair condition, not perfect, but fair. Some of them have new journals and wheels, some of them have old. Some new brasses and some part worn. This train starts out with a locomotive that leaves it at the end of 125 miles. The locomotive is carefully looked over by the engineer and then placed in round house where other men look it over and do any repairs necessary, and it starts out on its next 125 mile run in pretty good order. At least it has had a good deal of attention paid to it.

What about the cars? They are run onto a siding and two car men start down the line to inspect the boxes. How do they do it? They pull off the box cover, glance at the end of the packing in sight, see that there is no smoke, close the lid and go on. The engineer when going around his engine, places his hand on the big end, the little end, the slide bars and many other parts to note how cool or warm they may be. He knows they are not hot, but he wants to know if they are thinking of becoming hot. Does the car man do this? He does not, and the cars start out on another 125 mile run. How many hot journals are there at the end of that run? We don't know, maybe one or six. These receive attention of a kind at this stop, and on they go again.

Before they reach the end of the next



SECTIONAL VIEW OF BOX.

run some of those that were hot have had several brasses applied to them with more or less success. Some of them are in bad shape and must be stopped for new wheels, the journals have been cut, and some that did not give trouble at the first or second stop are giving trouble now, and so it goes on to the end of the run. Now, if these journals had all been tested with the hand at the first stop and those showing an inclination to heat given a little attention, and the same thing done as often as the engineer tested his engine, do you believe there would have been so many hot boxes on that train?

Did any of you gentlemen ever use a horse and buggy and suddenly find one of the wheels sliding and jump out and grab the nut with your fingers, and let it go again quick, because it was hot, and after it had cooled off and you removed the wheel you found plenty of oil on the journals, with the exception of a spot about half an inch wide? I have, and it made me realize that it is not necessary for a journal to be all dry to make it run hot. It is the back end of the car journal that needs attention, but how seldom it gets it until too late.

Do you agree that the hot boxes on the train we have tried to describe were due to neglect, and was that a fair skeleton description of the average train? Well, then was not it neglect to give the necessary attention that was the cause of 99 per cent. of the hot boxes. Why this neglect? Here is one reason, the railroads haul freight at so low a figure that they feel they cannot afford to have the number of men necessary to give the cars the proper attention. What you can't do yourself you must trust in Providence for, and Providence does not look after box cars.

Just here I wish to say that, in my humble opinion the men who design our cars and the men who maintain them come very near performing a miracle in keeping the number of hot boxes so low, considering the adverse conditions under which these cars must operate.

There are many other phases of this question apart from the above, and there is one that is most difficult to deal with. This is the car left at a way station or siding in winter time until the dope is completely frozen, but the car is thrown onto a train and must get along as best it can. However, the better attention at divisional points hinted at above would help greatly in these cases. We cannot, I believe, totally eliminate the hot box on freight cars, but we can reduce the number 75 per cent. by spending the money to do it.

The foregoing few words will, I hope, introduce the subject of hot boxes on freight cars, but we still have the question of the same trouble on our passenger equipment.

Some time ago I had the pleasure of looking into this matter and after taking the statements of trainmen, trainmasters, superintendents, car men and others into account, and also watching the "Passing of the Buck" along the line, I came to the conclusion that here again we come down to that word neglect.

In a Canadian winter our cars do have a hard time of it. Shoved into a yard with snow and ice scraping the journal boxes, with the inside heated to 100 degrees and the outside frozen solid, they cannot be in good condition to give satisfactory service. The only answer to that problem is to have the cars placed in a building as engines are placed in round houses. Such a building should be heated to about sixty degrees and no heat applied to inside of cars. Two hours after cars are placed in such a building all snow and ice falls away from trucks and running gear, leaving the car clean for proper inspection. The dope remains in the best possible condition, and the car goes out for its run in as good shape as we can make it. I have seen cars handled in this way, and I know that the results were good.

Many people will say that it is impossible to house all of our passenger equipment, or not actually impossible, but that the cost would be prohibitive. I fully appreciate the fact that the cost would be great, that is the initial cost, but it is a question if it would not be quite as wise an investment as the round house. It would not be necessary to place every passenger car, mail car and baggage car inside of a building. Many of the spare cars could be left outside as now, but I believe that we should have buildings to accommodate all cars on our regular trains with room for a reasonable number of spare cars that should be available in case of accidents.

The cost of such buildings would be considerable, but against this cost, what would we save? I believe that this building could be heated with less fuel than is now used for keeping the interior of cars warm while standing out of doors, and that the number of hot boxes could be greatly reduced, or practically eliminated. It is hard to tell just what a hot box would cost, but we know that they cost considerable money. I also have statements from car men to the effect that in one year they have expended sufficient money in re-piping cars that have been frozen to pay for a building to protect them. This may be exaggerating, but if the saving in this direction in five years would pay for the building, I believe it would be a good investment.

There is another phase of this question that in my opinion has not received the attention that it deserves, and that is the extent to which we are using, by wear, our journal bearings. I have made several tests of this, and have found that the quantity of brass actually used up by wear is very small indeed. We are practically running on white metal. This does not apply to any particular road, but to many roads, as I have reports from different places on the continent all bearing out what I have said.

Now, what is the trouble here? I think we can all remember when journal bearings were very much more worn in service than they are to-day. I can remember journal bearings that had never given trouble and were finally removed because they were worn so thin that there was fear of them breaking or being worn clean through, allowing the journal to come in contact with the wedge. Such a condition, so far as I know, is practically unknown to-day. It may be stated that in the days when journal bearings were so worn that our cars and loads were lighter, and this is true, but in those days our journal and journal bearings were smaller. In other words, they were designed to carry the loads of that day. The journals and journal bearings in use to-day are supposed to be designed to carry the loads of to-day. They are not doing it in a satisfactory manner. Is this another case of neglect, that is, have we neglected to provide journals and bearings large enough to carry the loads?

I believe that these matters are of vital importance and they deserve all of the attention we can give them, and that any man who has an idea on the subject should feel at liberty to advance that idea. He may be wrong, as I may be in some of my ideas, but by advancing his proposition or idea he may bring out a better one, and that is what we want.

This little paper has been purposely made short. The idea being that it would merely introduce this very important subject, and I have endeavored to interest not only transportation and mechanical people, but also members of the Engineering Department, and have these people present to take part in the discussion. There are many angles to this matter, and one of these is the engineering angle, which I have not touched on at all.

In conclusion, I want to say this, this club has been in existence a good many years, that it has done some good I know, but I honestly believe that if the club will take up this question of hot boxes, and follow it through, and have their work result in the elimination of 75 per cent. of the hot box trouble of this country, it will have done a greater work than anything that it has done in its previous history.

Chairman:

Gentlemen, I think you will all agree with me that this is a very interesting paper and should bring out a lot of discussion. I would like to hear from any gentleman pertaining to this valuable paper.

In a discussion that invariably follows the reading of paper of this description there are generally many reminiscences mentioned that have no direct bearing on the subject, these incidents being cited to relieve the tension that might otherwise develop if the members confined their remarks exclusively to the points in question. Our readers will therefore bear with us if we omit such portions of the discussion

as might be considered of minor import, dealing only with the essential factors that treat on the subject of "Hot Boxes." While the discussion at this meeting was almost entirely one of interest to railroad men, the principle of the arguments could be readily applied to all classes of engine or machine bearings.

In opening the discussion, W. H. Rosevear, of the Independent Pneumatic Tool Co., who has been away from actual railway service for the past sixteen years, commented on the apparently slow progress that had been made in solving the problem of hot boxes. In part he said:

"Mr. McVeigh has touched on the difficulty of getting lubrication at the back end of the journal. I would suggest that each inspector be supplied with an X-ray machine, so that he can examine the lubrication at this part of the box, and see that it is acting as it should do. (Laughter). Another matter that struck me rather forcibly was Mr. McVeigh's reference to journal bearings equipped with white metal. From what I have heard on this question, I was led to believe that they are putting less babbitt in journal bearings, because they are getting a much better mixture of brass than they were formerly able to do. I remember some years ago a certain agent came to see us in an effort to obtain the contract for brasses for one thousand box cars that were to be built. We explained to him, of course, that the whole matter was in the hands of the purchasing agent, and he went to see him. Some time after he came back and said: "Well, I got that contract, but he cut me terribly." I replied that we would expect him to supply brasses in accordance with what we wanted, and he said, "I will supply them according to the price," and that is just what we got. Some of those cars had to have all their original brasses renewed before they reached our line. Another matter is the question of housing passenger equipment. We take care of our locomotives very thoroughly, but the rest of the rolling stock does not get the attention in this respect that it should. Why?"

At this point, C. L. Higgins recited an incident in which he had suffered a loss of several thousand dollars, due to delay caused by a hot box developing on a train upon which he was travelling. As a direct result of his experience, Mr. Higgins has spent considerable time in designing and constructing a device that he claims will practically eliminate the railroad hot box.

He demonstrated with an appliance consisting of a telegraphic relay, an electric bell, with batteries connected to two posts between which was a fusible link. He showed how this link would fuse when the temperature of a journal box reached 150 degrees and the broken circuit would result in operating an electric bell in the coach or sleeping car, which bell would ring until the box received attention. He further explained that a spring in the box could be released by the same operation which would drive a plate holding the packing and oil up against the journal, providing lubrication automatically.

In commenting on the subject of carelessness, C. J. Forrester, of the G. T. R. Car Department, remarked:

I think there is no appliance that is receiving more attention at the present time, but it must be remembered that when you start out with a passenger train that is running sixty miles an hour this means that the car journals are making 50 revolutions—this means that your journals have to do heavy duty and as soon as you get through the white metal you are down to the brass and the brass starts to give trouble. Forty to fifty per cent. of your trouble is due to starting out with new pairs of wheels, and I think that, all things considered—ten per cent. carelessness would be a better estimate. Another thing—in examining a freight train, an inspector will examine 200 or 300 journals per day. He cannot examine the back end of every journal nor see if the white metal is worn from the brass. I think if you examined your lists and saw all the white metal that was going in you would be surprised."

Owing to the abnormal conditions that existed during the war, when it was next to impossible to obtain and retain experienced men, the problems of railroad maintenance were surrounded with almost unsurmountable difficulties. In this connection, C. McNair, of the Galena Signal Oil Co., made the following statement:

"The conditions, during the last few years, railroads had to contend with were the worst ever experienced in regards to lubrication of their equipment. During the war there was a general shortage of railroad equipment and labor was at a premium. The United States Administration and the Canadian Railway War Board worked together, with one thought uppermost in mind, (win the war), did everything possible to keep cars moving, so much so that in many cases cars did not receive repairs which would have been considered necessary during normal times. Coupled with this, labor was so scarce that in many cases men were hired who were not efficient railroad workers, and as a last resort car foremen would give them jobs as oilers. Because they were called oilers and believing their work was pouring oil, they managed to get oil cans and poured oil in journal boxes until the wool waste became so wet and heavy that it lost its resiliency, settled away from the journals and in due time hot boxes were the result.

"Railroad employees in the United States received substantial increases in wages, and later same increases were put into effect on Canadian roads, but for some reason or other employees known as oilers are paid less than car repairers, therefore it is difficult to keep good men working as oilers. I would strongly recommend that these men be paid more than repairmen, because, in my opinion, they have the most important work in a car yard. In this connection I would also recommend that they be given a better or more important title than "oilers." They are deserving of a real fancy name.

"For years instructions were issued showing the proper method of packing boxes (and a great many of the roads endeavored to carry out these instructions) which explained that a roll of waste be formed and applied to back of box, then packing put in from this roll up to the inside of collar at end of journal, then a plug or key applied in front of box, the packing in no case to extend above centre line of journal. In many cases, however, the packing was put in above centre line, the front plug was made of such dimensions that occasionally we would open the box cover and could not see anything but packing. Latterly some of the roads got away from this process by discontinuing the use of the end plug entirely. It was found that this practice gave inspectors a better opportunity to examine the box and bearings, and by watching for dry centres of journals, bearings which would likely run hot were detected, the cause discovered and the necessary remedy applied. This change has done a great deal to eliminate hot boxes.

"Our Canadian roads have been slow in making this change, however, and they lose considerable material when their cars go over into the States on account of these front plugs (which would weigh about one pound of packing in each box) being removed on other railroads and on returning our railroadmen put extra plugs back in cars which have had them removed.

"I have been associated with the Grand Trunk Railway for the past six years in lubricating their equipment and I do not hesitate to say that there are less hot boxes to-day than ever before per thousand car miles run."

Oil, like patent medicines, have their substitutes, frequently the latter showing their superiority. This was exemplified in the remarks of W. A. Booth, chief draughtsman of the G.T.R. at Montreal, when he said:

"I do not wish to hurt the feelings of any of our oil representatives here tonight, but in conversation with a conductor of a freight train some time ago, he seemed to have gotten out a substitute for oil. He said that whenever he had a hot box he ran back to his van and got some wood ashes out of the caboose stove, mixed them with the oil, and got to his destination without much trouble. You can take that for what it is worth. I think the shop people are sometimes to blame in that they at times will leave a knob or other irregularity on the top surface of the brass or key, and if this is not chipped off or removed it will likely result in a hot journal."

L. C. Ord, formerly connected with the

engineering department of the C.P.R., and who has recently returned from overseas, touched on the subject of wear as related to the varying sizes of the axle journals. His comment in brief was as follows:

"I do not know much about hot boxes to-day, but I have had a great deal to do with efforts to prevent them in the past. One speaker says most of the cars are running altogether on brass, another that they are running almost altogether on white metal. Both cannot be right. My personal opinion is that investigation will show that on most roads, and particularly in passenger service, more cars are running on white metal. A very important point in comparison of hot boxes to-day and years ago is in the diameter of the journals. A six-inch journal is moving across the brass at twice the speed of a, say, three-inch journal in the same train and even with the same load per square inch, is harder to keep cool. Another important factor is end wear. The bearing area at both ends of the brass has not increased in proportion with the weight of the car and end wear is greater and the lateral movement of the journal on the brass has a great deal to do with the displacement of the packing in the box, particularly in cold weather and in starting warming at the inside shoulder. There is another factor which is very important in so far as Canadian roads are concerned, and it is the question of low temperature. Railroading in Canada would be all right if it was not for the severe winters, and it is difficult during that season of the year to attend to journal boxes."

Here Mr. McVeigh asked for the expression of some of the members on the matter of end wear, as he had been informed that this was the source of some of the troubles of hot boxes. He also touched on the possibilities of the cone wheel having a more erratic movement than one with a flat tread. In reply, Mr. Ord stated:

"As the question has been put directly to me, perhaps I should answer it. The cone on the wheel is to assist in curving and to reduce flange wear. The question of sharp flanges bears on the same point. When you measure them up you never find a sharp flange without finding a large wheel and a smaller wheel on the same axle. It may be due to bad mating in the first place, or to unequal hardness of the two wheels, one wearing faster than the other in service. These wheels would hold steadily to the worn flange on straight track. The new coned wheel does very little 'hunting' from side to side on the rail. The side movement of the brass on the journal is caused by the swaying of the car body, due to track and service conditions and not to the wheels.

"The lateral wear of the brass is affected by the lubrication on its face and on the inside edge, which latter is a hard place to get at and the hardest place to lubricate, due to the displacement of the packing by the plunger action of the journal. If you had an X-ray machine and could examine carefully and readily the back end of the box at all inspection points you could prevent 75 per cent. of the hot boxes."

The mention of an X-ray machine brought a remark from Mr. McNair to the effect that such an apparatus was now in use, in the shape of an iron made of such dimensions that it would reach to the back end of the box, and with it it was not only possible to know how much packing was in the box, but that the same could be adjusted to the journal. The Club was fortunate to have at the meeting, R. W. Reid, an official of the Midland Railroad of England, and his remarks which follow give a good idea of English practice.

"I am very much interested in listening to this paper on hot boxes. I am engaged on a railway in England where the hot box trouble is not unknown. As you probably know, a very large proportion of the wagons are private property, and a large number of these wagons are lubricated by grease, which is fed through holes in the brass at the top. That practice has been found unsuitable for freight and passenger vehicles running at high speed, and 90 per cent. of the vehicles in fast freight trains run at a speed of fifty miles per hour, and are running in oil bearings, which are faced with white metal. We never count on the bearing wearing through. Several gentlemen here have referred to the quality of white metal and it is a very important thing. If you buy white metal indiscriminately you will find its largest constituent will be lead, and lead is not suitable for carrying heavy weights. To give you a good running bearing it must have a large proportion of tin in it. Most of the English railways lubricate the journals by pads carried on springs in a frame. This pad can be taken out. One or two of the roads use waste packing. Since the war there has been a common use of wagon stock and my railway—the Midland—and some of the others, have taken a record of the number of hot boxes occurring on freight trains, and also the type of box and the packing, and our opinion is quite definite that the waste packing is inferior to the pad. Some gentlemen have referred to the difficulty of examining the back end of journals. That does not exist where you have the pad. Altogether the pad has everything to recommend it. You speak of the difficulty of operating in this country on account of the severe weather. If you use mineral oil, as we do, this oil does not freeze until the temperature gets very low, but if you have water in your box, which is picked up when the engine lifts water at the troughs, you then have ice on the top and the bottom of the oil well. The waste packing has very little resiliency, and, with the present tendency to economy, the waste is taken out and cleaned and put back again, and it is then not as good as when it is new as the horse hairs or other springing materials have been taken out. I do not know whether you have tried the pads. If you have, it would be interesting to hear what results were obtained from them. We have another type of box used in India, where they have extreme heat, and they use an eccentric steel disc which is fastened on the end of the journal. The oil lies in a well in the box and the disc picks it up and throws it over the bearing. This box has given very satisfactory results. It is patented, however, and we have never used it in England. I thank you for the opportunity of speaking to you."

The mention of the oil pads for lubricating axle bearings brought forth a few remarks from Geo. E. Smart, master car builder of the C.G.R., who stated:

"I would like to discuss some of the points raised by Mr. Reid on the different appliances used on the British railways. A number of years ago suburban trains were equipped on the Grand Trunk Railway with ring oilers somewhat similar to the design used on electric and other machinery. They were a success during certain periods of the year, but failed during the extreme winter weather, resulting in some cases in burning of the journal and skidding of wheels. The pad system was also tried out in this country on trains running between Montreal and Ste. Agathe, on the C.P.R. This also was a success during summer weather, but gave trouble during the winter months. The pads were held or pressed up against the journals by means of small coil springs which were riveted to a metal frame inserted inside of the journal boxes, but the extreme cold was the cause of the springs breaking away from the frame, resulting in the pad not being held in contact with the journals, and in each case the railways went back to the ordinary saturated waste for packing the boxes, and there is nothing yet, that I know of, that will give any better result than this method."

A point that was touched on by B. C. Gesner was that of the possible magnetic action that might be created through the contact of the different metals and the subsequent effect on the temperature of the bearing. His theory was stated, in part, as follows:

"I am not a member of this Club, but I listened with very great attention to all that has been said, as I have had something to do with hot box troubles in my time and when we come right down to the final analysis of the question it figures out in dollars and cents. I am, in a way, connected with the Canadian National Railways, and have had a certain degree of supervision over the lubrication of their rolling stock for a number of years past.

To be continued

Canadian Machinery Drafting Course—Part V

The Circle, and Its Various Divisions, and Measurements of Angles Defined—More Problems Given Together With Explanatory Data —Fifth Plate of the Course

By J. H. MOORE, Associate Editor Canadian Machinery

BEFORE proceeding with this, the last portion on the subject of geometrical drawing, let us review briefly where we left off in the other two parts published. We have so far gone through the definitions, from a straight line up to the discussions of quadrilateral figures, and have also completed twelve problems dealing with the preceding matter discussed in these two former parts, so now let us first continue with the geometrical definitions before entering any further actual problems.

Circles

We have so far not stated in defined terms what a circle actually is, so let us consider this point.

A circle is a plane figure bounded by a curved line called the circumference, every point of which is equidistant from a point within, commonly called the centre of the circle.

A circle in turn has other lines which can run through it, each having their proper name, so let us consider a few of these.

Referring to the chart at Fig. 1, we first see the circle itself, O being the centre point. Fig. 2 shows certain added lines to the circle, each having their proper name, A being the diameter. B the radius, and C the tangent to that circle. From this we gather that—

The diameter of a circle is a straight line drawn through the centre, terminating at both ends in the circumference.

The radius is a straight line joining the centre with the circumference.

The tangent is a straight line which touches the circumference at only one point, called the point of contact.

Fig. 3 carries us still further. Here we see a line A passing through two points on the circumference. This is known as a secant. The line B represents a chord of a circle, or a straight line which joins the extremities of an arc, but does not pass through the centre of the circle. The space, or area C included between the arc and the chord line B, is called a segment of a circle.

Fig. 4 again shows some further terms.

The space or area A is called a sector, that is, the area included between an arc and two radii drawn to the extremities of the arc.

Fig. 5 illustrates what is termed as an inscribed angle, that is, an angle whose vertex lies in the circumference, and whose sides are chords of a circle. Fig. 6 at A shows concentric circles, while at B are shown eccentric circles, the meaning of each term being self-apparent, namely, that concentric means having a common centre, while eccentric means the very opposite.

The Measurement of Angles

Before passing on to the next figure let us for a moment consider what we know about angles. We have so far learned in this course regarding the triangles used, namely, the 30°-60°; also the 45°. On each of these there is one angle, which is termed a right angle, which, as we all know, equals 90°. To go still further, we know that if we construct a circle as shown at Fig. 7, and draw diameter lines AB and CD at right angles, that we obtain the angles E, F, G and H, each equal in turn to 90°, or four times 90, or 360 degrees for the complete circle.

Having established in the reader's mind this point clearly, let us pass on to Fig. 8. Here we see a circle divided into 20 parts. Each of these parts is equal; therefore we can take 360 and divide it by 20, which shows us that the angle in each separate sector is 18 degrees. We only point out this illustration to start the germ of the idea of angles into students' minds, for it is something which will very soon crop up in this course, when naturally we will go into the matter deeper. In the meantime students should remember that a circle has always 360 degrees, a semicircle (or half a circle) 180 degrees, and that the sum of the angles on any triangle must always equal 180 degrees.

Solids

We shall now consider solids. First, what is a solid?

A solid has three dimensions—length, breadth and thickness. (Readers will remember that plane figures had only two dimensions—length and breadth.) Solids are subdivided into classes, the more generally used of which are cylinders, cones and spheres. Fig. 9 shows a cylinder, Fig. 10 a cone, and Fig. 11 a sphere.

A cylinder is a solid having two equal parallel surfaces as bases, these being bounded by curved lines. The bases are usually circles, and such cylinders are called circular cylinders.

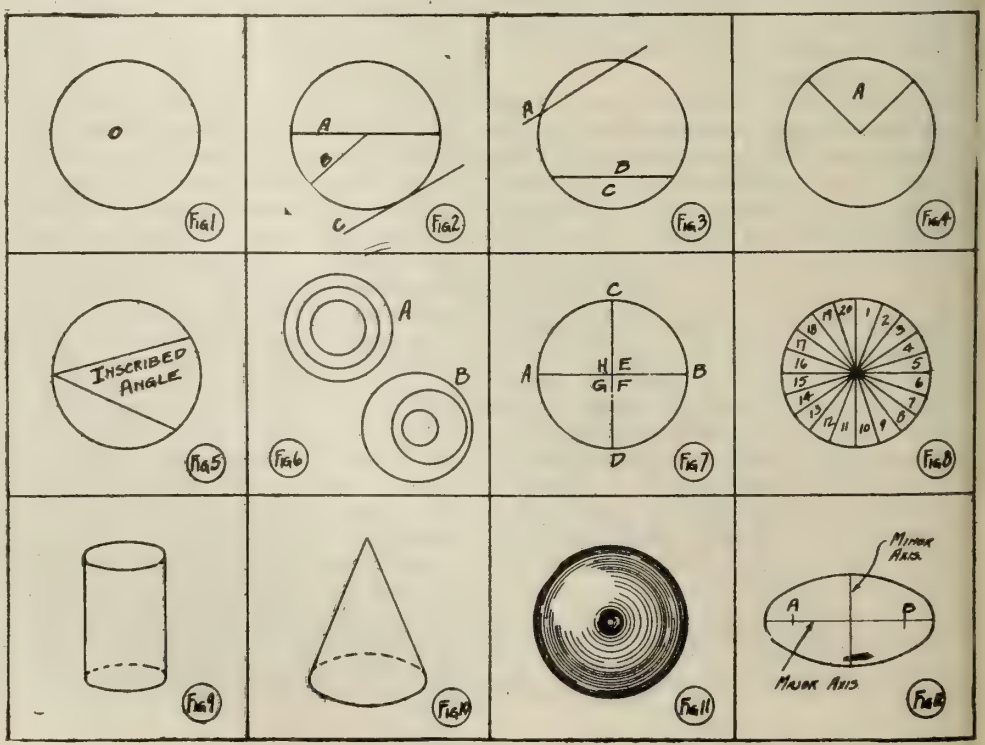
A right cylinder is one whose side is perpendicular to its bases. Fig. 9 illustrates a cylinder of this type.

A cone is a solid bounded by a conical surface and a plane which cuts the conical surface. The plane is called the base, the point which it tapers up to is called the vortex. The altitude of a cone is the perpendicular distance from the vortex to the base.

A sphere is a solid bounded entirely by a curved surface, every point of which is equidistant from the centre of the circle. A ball is a sphere, provided it is entirely round. Fig. 11 represents clearly the construction of a sphere. The shading on this view is given merely to create the appearance of the ball being round.

Let us now give one more definition before starting on plate No. 6.

An ellipse (illustrated at Fig. 12) may be defined as follows:



FIGS. 1 TO 12—FOLLOW THESE CLOSELY WITH THE TEXT.

An ellipse is a curve generated by a point moving in a plane, and in such a manner that the sum of the distances from the point to two fixed points shall always be constant.

The two fixed points are called foci (see Fig. 12 at A and B) and lie on the longest line that can be drawn through the ellipse. This line is called the major axis. The shortest line is called the minor axis, and is perpendicular to the major axis, at its centre or middle point.

An ellipse can be easily constructed if its major and minor axis be known.

Let us now proceed with plate No. 6.

The dimensions as before are the same, 9 x 13. The size of the plate, 9½ x 13 in., the trimming lines. The 1 in. space at the bottom is marked off for the title, and the remaining space, 8 x 13 in., divided into four parts as shown.

Plate No. 6

Problem 1: To draw a line tangent to a circle at a given point on the circumference.

With O as a centre, draw a circle 2½ in. diameter. Assume a point B on the circumference, and join B with O. Now construct a perpendicular to BO in the following manner: Produce the line BO to C. Choose any centre D and describe a circle of such radius that it will cut through point B. Where this circle intersects with the line BOC call by the letter E. Join E and D, producing it out to F. From F draw a line to B, and produce the same out beyond the circle as shown. This line will be tangent to the circle first made.

Problem 2: To construct an egg-shaped oval: From a centre O, with a radius of 1½ in., describe a circle. Through the centre O draw AOB; also a line OC perpendicular to AOB, cutting the circumference of circle at C. Draw the straight line AD at BE. With A and B as centres, and the distance AB as a radius, describe arcs terminating at F and G. With C as a centre, and CF as a radius, describe the arc FG, when you now have the egg-shaped oval complete.

Problem 3: To draw an ellipse by circular arcs.

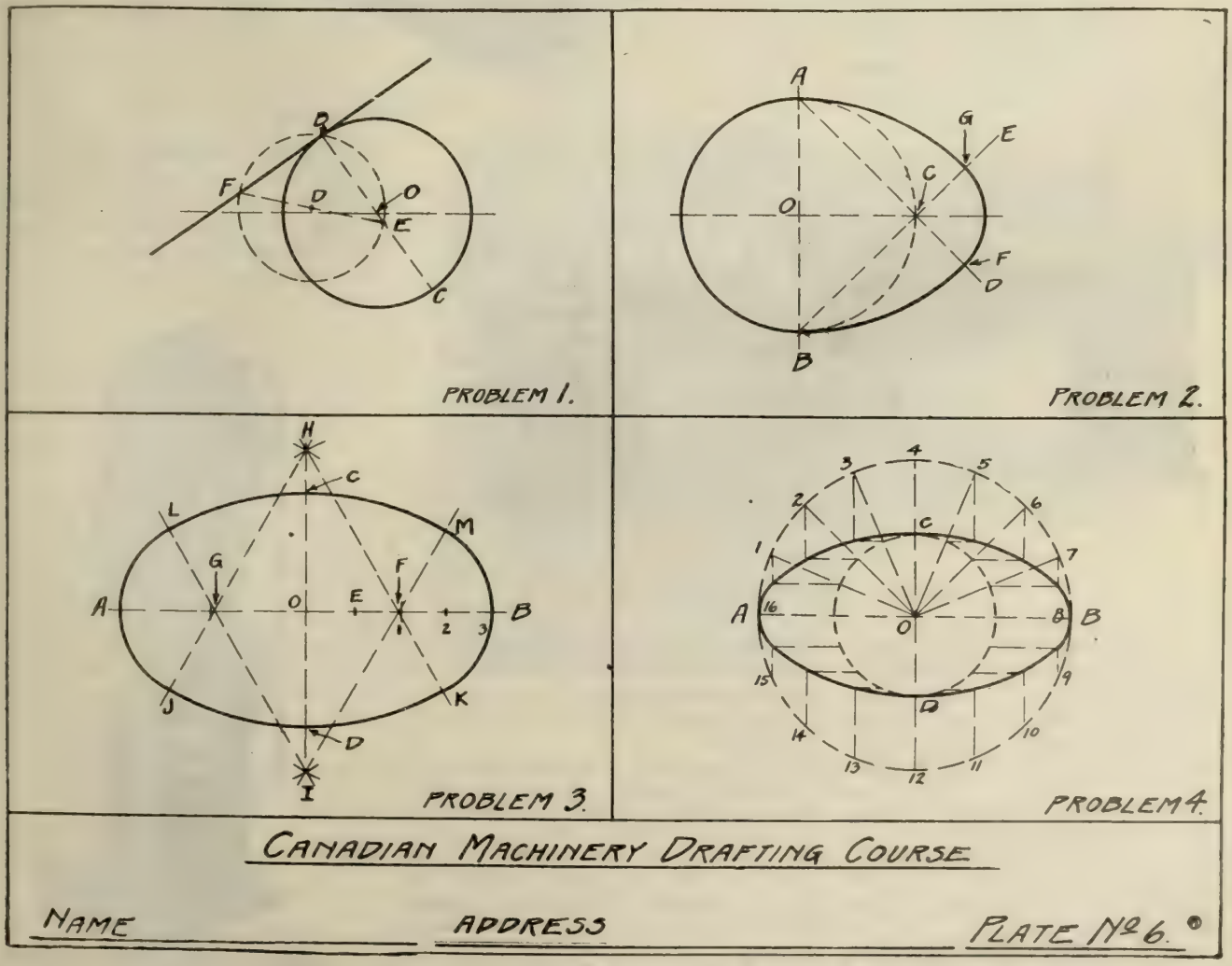
Such an ellipse is not a true ellipse, but suitable for many purposes.

Draw AB 4½ in. long, CD 3 in. long. On the major axis AB, make AE equal to CD, then divide EB into three equal parts. With O as a centre and a radius equal to two of these divided parts, describe arcs cutting at F and G. With FG as a side, construct two equilateral triangles FGH and FGI, and continue these lines as shown. With H as a centre, and a radius HD, describe the arc, cutting at J and K. Then with the same radius, but with I as a centre, describe a similar arc, cutting at L and M. With A and B as centres, and a radius equal to the chord of the arcs AJ or BK, describe arcs, cutting AB near the points F and G. From these new points of intersection as centres, and with the same radius, describe the arcs JAL and KBM. Your ellipse is now complete, although, as said before, not absolutely accurate.

Problem 4: To construct an ellipse by the exact method, the diameters being given.

Let AB be the major axis 3½ in. long, CD the minor axis 2¼ in. long. With O as a centre and OD as a radius, describe a circle. With O as a centre, and OA as the radius, describe another circle. Divide each circle into a similar number of parts, the more parts, the more accurate the ellipse. For our purpose we will say 16. This is best done by dividing the larger circle into 16 parts, then drawing radial lines into the centre as shown on the top portion of the drawing. Through these points of division on the inner circle draw horizontal lines and through the points of division on the larger circle draw vertical lines, the points of intersection being the points on the ellipse. Trace a curve through these points, placing an irregular curve on them in such a manner that its bounding points will pass through at least three intersection points. Be careful not to make your curve too flat. Then ad-

Continued on page 473



HERE IS PLATE NO. 6. SEND US IN YOUR WORK AS SOON AS POSSIBLE.

DEVELOPMENTS IN SHOP EQUIPMENT

OLIVER NO. 166 HAND-PLANING AND JOINTING MACHINE

The illustrations show the No. 166 hand-planing and jointing machine that has been recently placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. Fig. 1 shows the front of machine and its general appearance, while Fig. 2 is a detail view, showing the motor and cutter.

A direct motor drive is used, the machine operating at 3,600 r.p.m., on 3-phase, 2,220 volt alternating current. The cylinder is of the three-knife type, the outer end being shaped to receive the rotor. The stator is held by an adapter attached to the frame of the machine, and by the outer end cover.

The bed, table, in fact all parts, are rigidly constructed, and the capacity of machine is made in 5 widths, 9, 12, 16, 20 and 24 inch, respectively. Table permits a cut up to ¾-in. in depth.

The cylinder bearings are of the self-aligning, frictionless, ball type, requiring little attention.

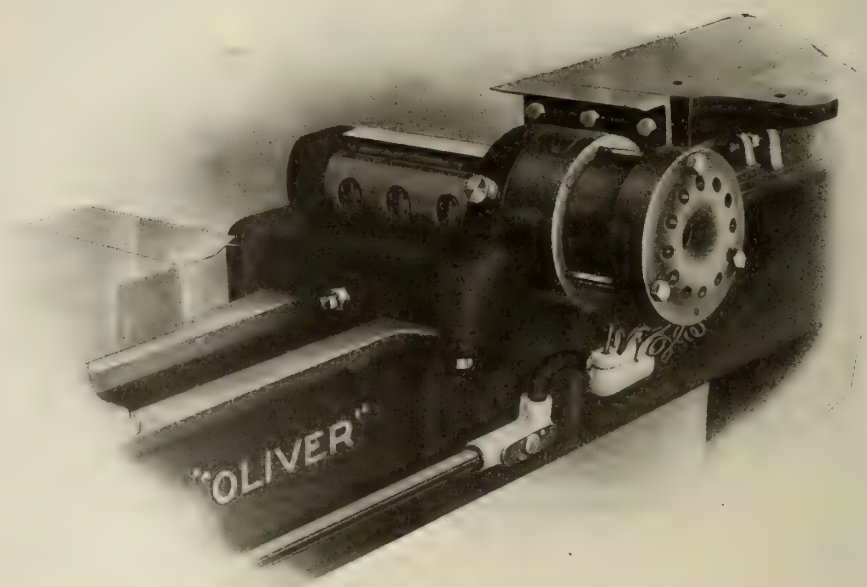


FIG. 2—CLOSE UP VIEW OF MOTOR AND CUTTER.

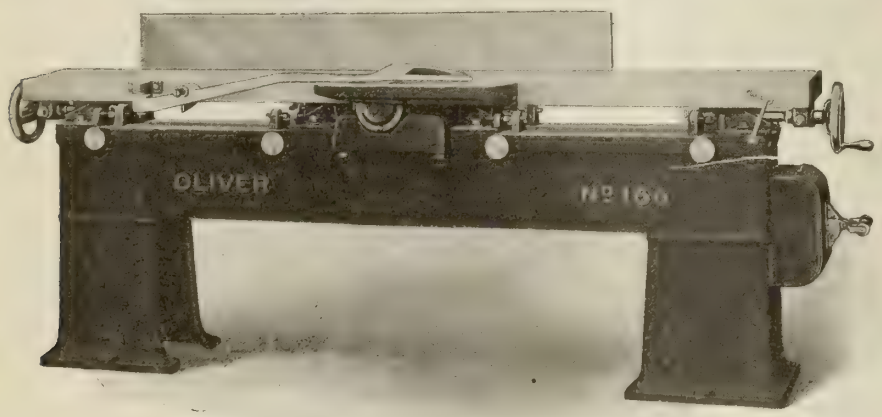


FIG. 1—GENERAL VIEW OF THE MACHINE.

The United Hammer Co., Boston, Mass., comment as follows: Safety devices being the order of the day, we have just brought out a guard for the Fairbanks power hammer, which, while it completely covers the working parts of the machine and thus prevents any possible injury to the operator—leaves the parts as accessible as before for the purpose of oiling and adjusting.

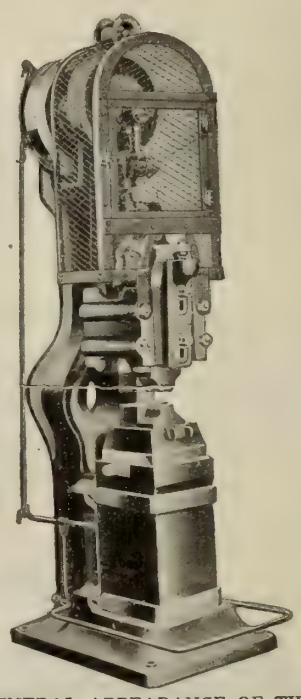
We know of no other hammer on the market which affords the same protection to the operator.

This guard is also easily attached to Fairbanks hammers already in operation and we are prepared to furnish it to all present users of these machines who may desire the same.

The illustration herewith shows the idea clearly.

It may interest readers to know that we are now prepared to furnish Fairbanks power hammers in sizes up to and including 500-lb. weight of ram; this last named size, together with a 400-lb., having just been added to our line. Heretofore Fairbanks hammers have been built only up to 300-lb. weight of ram.

These 400 and 500 lb. sizes have been brought out particularly for the heavier classes of work, such as found in locomotive and car shops, shipbuilding plants, tube and steel mills and also they will prove an excellent size on oil well tool work.



GENERAL APPEARANCE OF THE HAMMER.

"W. & B." HAMMERS

An unusual method of displaying hammers has been introduced by the Whitman & Barnes Manufacturing Company, St. Catharines, Ont. The Adze Eye Nail Hammer display is an attractive easel in three colors, mounting three handsome full-polished nail hammers—octagon, bell, and plain-faced types. The size of the easel, 15 by 11½ inches, not including hammers, makes it convenient for either counter or window display.

THE METHOD OF DISPLAYING THE HAMMERS.

These hammers are drop-forged, heat-treated, hardened and drawn to just the right temper for the work required of them. Special attention is paid to the design to see that the lines are correct, the balance perfect, and the striking power concentrated in the head. The handles are second growth, straight grain, white hickory, wax finished in natural color. A flare at the hand grip prevents slipping. Special steel wedges prevent the handles from coming loose.

A superior feature of the nail hammers is the peculiar design of the claws. The pitch is steep to give them a faster draw. The split permits the claws to take any nail down to the smallest brad, the grip being secure in the shank of the nail, not depending on the head. The value of this feature will be especially apppreciated on repair jobs.

NOTICE OF NEW CATALOGUE

The Wood Turret Machine Co. of Brazil, Ind., have issued a new catalogue showing a full line of the Tilted Turret screw machines, turret lathes, brass-working machines and extra capacity automatic chucking turret lathes. Illustrations and specifications of various types of screw machines and turret lathes are shown as well as cuts detailing the construction.

Several pages are devoted to new improvements and special construction.

Considerable space is given to tooling equipment and various special fixtures that can be furnished with or applied to the Tilted Turret.

A NEW MACHINE

The Riverside Machinery Depot of Detroit, Mich., have recently placed on the market the Daly combined die sinking, milling, and cherrying machine. This machine is equipped with adjustable taper bronze bearings, hardened cut gears, eight spindle speed, and powerful positive drive. We are informed that further information, including illustrated pamphlet, can be secured upon request by those interested.

"W. & B." AUTO TOOL DISPLAY

The Whitman & Barnes Manufacturing Company, St. Catharines, Ont., are offering dealers a handsome display of "W. & B." automobile tools, made in Canada. The essential tools, ball pein hammer, plier, adjustable "S" wrench, automobile wrench and screwdriver, are mounted on a steel easel 13¾ by 19 inches. The easel is lithographed in three colors, and the display makes a strong selling appeal when used on counters or in windows.

The tools are of the very highest quality, and all bear the "W. & B." diamond trade mark. The hammer is handsomely finished; head is a high carbon steel drop forging, hardened and drawn to just the proper temper, and secured to the handle with a special steel wedge. Handle is straight grain, air dried, second growth white hickory, wax finished in natural color. The pliers are made of drop-forged steel, finished either black or nickel-plated. It is of the slip-joint type, 6½ inches long, with screwdriver end. The adjustable wrenches are drop-forged and fitted with case-

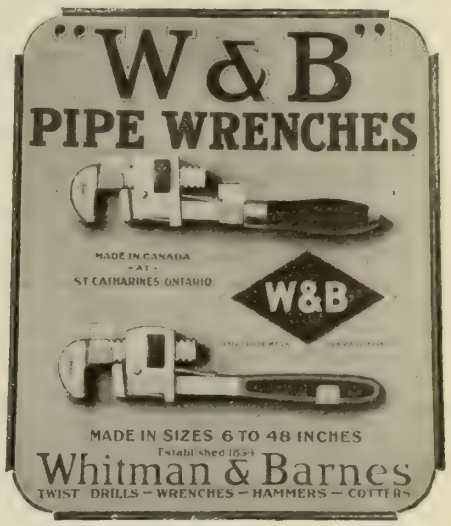
BOARD DISPLAYING AUTOMOBILE TOOLS.

hardened adjusting screws of the "W. & B." easy-acting pattern. Screw-driver blade is a tool steel drop-forging, fitted into a fluted hardwood handle with steel ferrule.

"W. & B." PIPE WRENCH DISPLAY EASEL

The Whitman & Barnes Manufacturing Company, St. Catharines, Ont., have a new display easel to assist their dealers in selling pipe wrenches. The easel is made of sheet steel, attractively lithographed in colors. It carries one each steel and wood handle pipe wrench, and is of such a size that it can be conveniently used either on the counter or in trimming the window.

In their endeavor to produce the finest product of its kind, the makers have



VIEW OF THE PIPE WRENCH BOARD.

spared no expense that would contribute to improve the quality. Bar and jaw are high carbon drop-forgings, heat treated and tempered to insure maximum strength. In addition, both bar and jaw are reinforced at points of extreme pressure or strain. The teeth are milled, insuring a slipless grip. Adjusting nuts are cut from solid steel and case-hardened. "W. & B." wrenches are so designed that the frame is rigidly supported by the drop-forged bar, relieving the frame pin from any strain.

The handsome appearance of these pipe wrenches is in keeping with their quality. The jaws and bars are highly polished and the ebonized wood handles are reinforced with steel ferrules.

CANADIAN MACHINERY DRAFTING COURSE

Continued from page 470

just your curve from time to time until the figure is completed. It requires considerable practice to draw a good curved line by this method, and readers would do well to practise this problem on a separate piece of paper before putting it on the plate. The neater the work, the better looking the curve, and a great deal depends on the student's taste and accuracy of eye.

Now, having completed the third portion on geometrical drawing, we will in our next plate take up an entirely different subject, so keep your eyes open for the next issue on this course, sending your work along as usual in the meantime. Have you secured a prize as yet? If not, why not this time?

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Dangerous For Canada

THE latest strike in United States is poor business for that country, and poor business for Canada. It will give new life to the tired-out steel strike, for the very good reason that steel plants cannot run long without their supply of coke. Coal is not stored in very large quantities at the coking ovens of steel plants. It takes too much room and too much handling.

Canadian firms have had strikes and troubles of their own this year, and they have had them when they were trying to bridge the dangerous interval between war work and peace lines. Now they find that in addition to their own troubles they are hit by plottings and upheavals across the line.

There are Canadian manufacturers who cannot secure raw material with which to go ahead with their season's programme.

The agitator who is crippling the U. S. mines and steel plants is going to take work away from Canadian workmen this winter unless things turn very quickly for the better.

These things must be taken seriously by Canadians. A country with such natural resources as the Dominion should never allow its industrial future to be placed in such jeopardy as present conditions have revealed.

The Need For Apprentices

CANADA needs mechanics if she is going to succeed as an industrial and manufacturing country. Canada needs shops that will teach the apprentice something worth while rather than turn him out as a handy man or a specialist on Operation No. 4 or Operation No. 10, as the time card may call it.

There are tool rooms and there are drafting rooms that do not want to be "bothered with" apprentices. The one big demand of the institution is for production. The demand for producing great quantities of a given article in a short time is the big consideration, and in such an atmosphere it is an easy matter for the apprentice to become "handy" in some particular capacity and stay right there.

If your shop has nothing to offer an apprentice, be honest enough to say so.

You can turn out a mechanic—a rare man nowadays—a machinist, or a specialist. The boy who comes to your shop to learn a trade is entitled to know, all things being equal, what he has a chance of becoming. If only a specialist on some speed production idea, tell him so, in order that he may not waste three or four years of his time on it.

It is short-sighted policy, taking the mechanical field as a whole, to be too busy to "bother with" apprentices. If Canadian firms are going to turn out a product that will stand up in competition with the world, then we must have more and better mechanics. We must aim to bring mechanical excellence, knowledge and practice to such a degree that we can design and build precision tools as good as any on the market.

The shop that is too busy to "bother with" apprentices, but is willing to reach over and steal the finished product by means of a few extra dollars per week has a knot-hole conception of the duty it owes to the industrial fabric of Canada as a whole.

A Decreased Wage Coming?

PREMIER-TO-BE DRURY spoke for the Victory Loan at a meeting in Barrie, and gave it as his opinion that the day of the decreased wage was at hand. With this he coupled the statement that the day of the inflated price of wheat is also at hand.

In a general way the man in the factory will not quarrel with this state of affairs. For his purpose it makes little difference whether he earns $1,000 and spends it all for living, or whether he earns $2,000 in an inflated era and parts with it all in order to keep going.

The one big objection is that our national war debt was incurred in a time when dollars had small value. If we pass now to a period where there are fewer dollars with larger buying powers, it will not assist in liquidating our war debts.

The average man, though, is interested in the first instance in bringing about an era where he will get a fair run for his money when he puts his dollar into the markets.

Such a condition would do more than anything we know of to bring about a healthy feeling of satisfaction that would boot out the strike fever and the strike agitator along with it.

Mr. Drury also reasons that Victory Bonds are a great anchorage in going through the period of deflation which must surely come. The man with a holding of Victories in his possession can sit tight no matter what happens. He doesn't need to scan the papers each day to see if his security has slumped or gone up in smoke.

And it might not be bad business to go in and buy bonds in these days when dollars move in a big way, because as the buying power of your dollar increases, your bond becomes more valuable to you.

The Victory Bond proposition is sure, no matter whether you agree with all the to-be-premier says of other things or not.

THE average man does not love war. But there would be quite a heap of folks ready to sign on if General Reduction started operations hereabouts.

* * *

ALTHOUGH the farmers rule Ontario, Old Man Hicost lingers in our midst.

* * *

THE assurance of Washington that Canada will not be discriminated against in the matter of coal shows more spirit than the threat to cut Canadian power off United States when it was short here.

The Dangers of the Great Lakes Seasons

By T. H. FENNER, Editor Marine Engineering

THE salt water sailor is apt to sniff contemptuously when he hears of the sailors of the great inland waters of the North American continent. He is apt to refer to that class of navigation as dry land sailing, and to couple it in his mind with the navigation of the Mississippi, where the leadsman takes his soundings in inches instead of fathoms. When he is better acquainted with the problems and dangers of Great Lakes sailing he acquires a commensurately greater respect for the responsibilities and troubles of his fresh water brother. Most deep water skippers are troubled and uneasy when making the land, especially if the weather is thick and the shore is a lee shore. Their fresh water contemporaries are nearly always comparatively close to land, and whichever way the wind blows, a lee shore is not so very far away.

These thoughts were prompted by the occurrences of the past week when in the first of the fall gales, two vessels were lost on the lakes, taking a toll of thirty human lives. The "City of Muskegon," making for port in a heavy gale of wind, was thrown bodily on to the breakwater, and foundered in fifty feet of water right at the entrance to her harbor. Most of the passengers saved their lives by jumping ashore, so close were they to safety. However, before they could all reach it the ship went down and twenty-one lives went with her. The second vessel, the "Homer Warren," was simply pounded to pieces by the heavy seas, and went to Davy Jones's locker with nine of her crew. The tenth was saved by the fact that he was not aboard the vessel, but had gone home from the last port she touched at, by train.

Last fall, three brand new trawlers, built at Fort William, and manned by deep sea crews, left Fort William for the voyage to open water. Caught in a terrific gale, two of them disappeared from sight, and took their crews with them. One of them won through to safety, but had a terrible experience. The point is that these vessels were of a type that is usually able to ride out the worst weather that can be met with in the world's open waters. Even in that nightmare of all salt water men, the North Sea at its worst, these taut little trawlers make better weather of it than much bigger ships. Lake Superior proved too much for them, and Lake Superior is not the worst of the lakes. That doubtful honor is reserved to Lake Huron.

Even Lake Ontario can present dangers sufficient for the most adventurous. An old lake sailor told the writer a story of a trip on Lake Ontario which is worthy the pen of a Clarke Russell to do it justice.

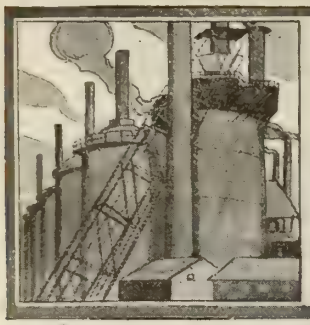
SOME years ago, the wooden steam barge "Resolute" left Port Dalhousie, loaded with about 800 tons of coal, and towing two schooner-rigged barges. She was bound for Deseronto, under normal circumstances probably a twenty to twenty-four hour run. The period when this voyage was undertaken was before the advent of that marvellous help to navigators, the wireless. The season was the late fall, about the middle of November. The weather when leaving Port Dalhousie was fine and clear, with a light breeze blowing. For the first few hours all went well, but as they proceeded northwards a change took place. The clear skies became clouded over, and the soft sighing of the breeze changed to that weird sob which usually heralds a severe blow. The wind increased, the temperature dropped, and as is always the case on these waters, the sea mounted rapidly. Before long it got so bad that the "Resolute," with her heavy tows, became unmanageable, and it was necessary to cast them adrift. Fortunately, the two barges were schooner-rigged and the crews were able to make a little sail, and bear up for shelter. This they reached safely, as was found out later, but for the time being they drop out of the picture.

Freed of her burden, the "Resolute" did better for a while. Soon, however, a new trouble developed. For some little time it had been noticed that steering was becoming more and more difficult. Examination of the rudder disclosed the reason for this. The low temperature was causing the spray thrown on the rudder pintle to freeze up and jam the rudder. When this was found out, a steam pipe was laid aft, and the jet directed down the pintle from above. This succeeded in freeing the rudder, and salt was freely sprinkled around the rudder head, which worked down the pintle and helped to keep it clear. Daylight had come by this time, but nothing could be seen but the viciously breaking waters. The captain judged his position to be somewhere near midlake, and knowing he could not hope to make Deseronto, he kept going straight down for the Thousand Islands. There was no sign of the weather abating, and all they could do was to keep the vessel riding as easily as possible. Getting down the lake in the vicinity of the Thousand Islands a fresh problem presented itself. If they went on, with the weather conditions as they were, and no clear assurance of their position, the chances were that the vessel would meet her doom on some of the rocky shores of the islands. The alternative was to turn back and run up the lake again, trusting to make Port Dalhousie. This was adopted, and after a hard struggle, the "Resolute" was turned round and headed up the lake, and to the south. As time went on the weather moderated, and finally they found themselves on a clear, bright morning close up to Port Dalhousie. This was just under five days from the time of leaving. Try to imagine five days buffeting with wind, sea, snow and ice, with land never far away, but practically out of touch with all the world. So much so that anxious families ashore had given their loved ones up as lost. The two barges, which had found shelter, had brought word of the "Resolute's" hard plight when she cast them adrift. The case seemed hopeless, and the relief was proportionately great when she came back, as it were, from the dead.

The business of the lakes must go on as does the business ashore, so once more the "Resolute," justifying her name, coaled up and started for Deseronto. Once more she left port in fine weather, and once more she ran into wintry winds and angry seas as she plodded north. Buffeting the gale, she proceeded down the lake, but as she approached the port her captain realized that he could never make it safely. He decided to proceed on to Kingston, reaching there safely and tying up after another hard struggle. Here word was received that they were to proceed to Deseronto, but feeling they had done enough, the crew signified that the only way to go to Deseronto was by train, for that season. So in Kingston she stopped.

THE classic instance of what the Great Lakes at their worst are capable of, is, of course, the terrible storm of November, 1913, which carried death and destruction on an unprecedented scale to the unfortunate ships and crews caught in it. This storm, which broke out on the 8th November, lasted till the 11th, and when it had passed on, left a trail of nineteen vessels totally destroyed. Two hundred and forty-four lives were lost. The property damage amounted to $3,157,000. All this desolation in just three days! Besides this, twenty vessels were blown

Continued on Page 84



MARKET DEVELOPMENTS

The Raw Material Shortage Is Serious

Shipments Have Been Falling Off for Some Weeks and No Betterment is Noticed—Some Firms Are Very Short of Plates and Sheets, With None Coming In

IT has been claimed in this report for some weeks past that shipments of steel coming to Canada from the U.S. strike zone did not bear out the contention made that production at mills was increasing quite rapidly. Events of the past week have shown this to be increasingly so. Shipments are more tardy than ever, and there are places where not a pound of sheet or plate has been received for almost three weeks.

One Canadian manufacturer returned this week from booking a nice line of tractor business in the Canadian West, and at once set to work to buy the material required to go ahead. On approaching the steel market he found that his troubles had only begun. He was not able to secure any material, nor was he able to get a delivery promise that would be of any assistance to him for purposes of winter manufacture.

The coal strike, if it lasts, will make matters worse, and may have the effect of putting new zest in the rather tired-out steel struggle. Steel mills use such a tremendous amount of coal that it is not possible to store a supply for any length of time. They depend, rather, on a steady supply coming in, the coal going directly and at once to their coking plants.

Delivery dates are still some distance in the future on machine tools, and considerable business is being lost to some firms on that account. As a general thing a dealer acts as an exclusive agent, and if he cannot get anything better than a May delivery from his principals, he simply has nothing left but to pass up the business.

The scrap metal market is in a poor condition for the moment. Strikes, and talk of strikes, has battered down any strength the market had. Buyers look for lower figures while sellers do not want to take the prices offered at present by the dealers. The result has been the bringing about of a condition not far removed from stagnation.

CANNOT SECURE ENOUGH MATERIAL

Shipments of Steel Are Away Off And The Demand is Growing Very Keen

TORONTO.—The coal strike on top of the steel strike in United States is causing certain industries on this side of the line to stop and think where it is all leading. There can be no question about the fact that the number of serious strikes across the border has a very unsettling influence on business in the Dominion, especially in lines where the finished product here depends on the raw product that comes from some point in United States.

Deliveries Are Slow

Agencies in Canada which are handling American lines are losing sales in many cases because they are not able to get deliveries that will satisfy their customers.

There is still a tendency on the part of many firms to trade in their used equipment, and the exchange of goods in this way tends to keep quite a quantity of material in the used machinery market. One Toronto firm has been placing in its warehouse a quantity of used machines that have been rebuilt at a factory outside the city. There has been quite a steady work in this line for some months past, in fact, much of it has been under way since the clearing out of the shell shops.

Shipments Are Very Slow

"We are at our wits' end to know what to do," was the response that CANADIAN MACHINERY received on asking one Toronto warehouse what shipments were coming through from the strike area of United States. "We thought we were having tough skidding last week, but this week is worse many times over. It is now over 17 days since we have had a shipment of sheets or plates in our warehouse, and orders that were booked to go direct to our customers are faring very little better. Last week we thought we were fortunate because we received a good sized shipment of boiler tubes, but on looking through them we find that the mills that shipped to us were away off on standards, and that most of the material we received were lengths and sizes they had in stock. The ability to ship the much-wanted sizes would have been proof to us that they were operating at something like fifty or sixty per cent. capacity, but it looks as though they were off entirely."

It is hard to convince some of the consumers in this district that production is up to sixty or seventy per cent., as is claimed in many of the reports that are reaching here from the strike district. Seconds in sheets are being bought up eagerly, the buyer apparently being willing to make the best he can of what may be in the shipment.

A Case in Point

One Ontario manufacturer, who conducts a nice business in one of the manufacturing towns of the province has just returned from a trip through the Canadian West, booking tractor business for spring delivery. On his return he found that he had orders for between 75 and 100 machines, so he immediately started to visit the warehouses and agents with a view to securing a supply of material, only to find out that he could get no promises of delivery, let alone any ready material that could be sent along as a starter.

The prices quoted on another page of CANADIAN MACHINERY this week have not been changed because business is being booked at old prices, but there can be no doubt that the prices we give are purely nominal. It is well known that premiums are being paid in many cases, depending on the urgency of the business.

As a general thing it can be stated that the large steel companies across the line, headed probably by the Steel Corporation, are adhering to old prices, and as the last report of the corporation showed very large earnings, there seems to be good reasons to suppose that prices will not go up, although it must be admitted that the scarcity of ma-

terial now is tending to make them unusually firm.

The Scrap Market

Industrial uncertainty, strikes, and all the other things that are parading across the business stage at present, have acted as a road roller to the scrap metal market. It is a hard matter to size up the situation at all. There is only a small volume of business moving. Sellers do not want to take the prices that are being offered by the dealers at present, while on the other hand buyers, watching the trend of the market, are under the impression that prices are due to slump.

It did look a few days as though the whites were due for a better period, and it was felt that there might be some increase in these, but for the present they are dull and stagnant.

In reference to the prices of metals it is well worth noting that cast iron and stove plate, when spoken of in tons, mean net tons in Ontario, and gross in Montreal.

STEEL STRIKE IS BEING FELT NOW

Several Industries in Windsor District Have Very Little Raw Material on Hand

WINDSOR.—As the steel strike in the United States continues Border Cities industries, while suffering from the lack of steel, are putting up a gallant battle to keep their businesses going, and although conditions at present are far from satisfactory, they hope that they will be able to proceed with their work until matters over the border are settled. An official of the Canadian Bridge Company stated that the company is managing to get a little steel, but not nearly as much as their normal import and that it is difficult to say exactly how long the plant will be able to continue operations.

The steel possessed and made ready for export to Canada by American firms prior to the strike has gone up in price and is difficult to obtain. Very little steel is being secured from Canadian factories. Most of the factories in the Border Cities using steel in the manufacture of their outputs frankly admit that they are up against it, and will have to close shop if more steel is not forthcoming in the near future.

The Dominion Forge and Stamping Company of Walkerville, which has been inconvenienced, will probably be able to open in about 10 days, it was announced to-day. This company expects to get a shipment of steel shortly, and officials are confident that business will soon be resumed as usual and with a normal output.

Large Marine Engines.—The Goldie and McCulloch Co. of Galt shipped to Three Rivers and Quebec two of the largest marine engines ever built in an inland Canadian city. Both engines are for the Canadian Government marine and will be installed in "Canadian Trapper" and "Canadian Settler."

COAL ON TOP OF STEEL STRIKE CAUSES CONCERN IN PITTSBURGH

Special to CANADIAN MACHINERY.

PITTSBURGH, Nov. 5.—The iron and steel strike, now in its seventh week, has been receding at a decidedly more rapid rate in the past ten days than in earlier weeks. The most marked progress in resumption of operations has been in the Mahoning Valley, where for about three weeks there was no operation at all. The Carnegie Steel Company is now operating about four of its six blast furnaces in Youngstown, together with one of the two Bessemer converters and a few of the open-hearths. Seven finishing mills at the Ohio works are operating while practically the whole McDonald plant, nearby, is in operation. The Carnegie operation is the more remarkable from the fact that the company made no strong effort to resume operations, feeling that the distinctly home companies, particularly the Youngstown Sheet & Tube Company and Brier Hill Steel Company, should lead the way. These two companies, together with the Republic Iron & Steel Company, are now showing a fair operation, having among them about six blast furnaces operating, with corresponding steel and finishing departments. Reports from the Chicago district are of much better operation there, but information is lacking here as to details.

Western Pennsylvania is now running very nearly full, with the exception of Donora and Monessen, which are still greatly crippled. Tonnage outputs are very satisfactory. For instance, one large plant, whose output was curtailed at the height of the strike by one-third or more, has lately been producing at 80 per cent. of the average rate in 1918, this being equivalent to 85 or 90 per cent. of the rate just before the strike.

A detailed estimate, by districts, based upon such information as is available, indicates that steel production is now at about 63 per cent. of the rate obtaining just before the strike. While this indicates quite a curtailment remaining, it should be noted that the production is well in excess of any output attained prior to the year 1912, and in those earlier years the steel industry thought it was producing a very large tonnage.

Bearing of Coal Strike

The iron and steel strike, however, has had to yield the centre of the stage to the coal strike, which is of importance both as to the curtailment in steel production it may cause, if prolonged, and as to the influence it will exert upon the subject of strikes in general.

The steel mills have some stocks of coal but these stocks are not large by comparison with consumption, it being a physical impossibility for a steel mill to stock sufficient coal to last it any considerable length of time, too much space and too much handling being involved. Some of the mills claim that they have stocks sufficient to last for four weeks, but the general average cannot possibly be as high.

The coal strike is different from all other strikes in that it is directly contary to law, the Government having decided that it is in violation of the Lever food, feed and fuel control act, passed as a war measure, and in force until the President issues his peace proclamation. The coal strike is in violation of the contract the miners' officials signed with the operators, but of course, that does not differentiate it from many other strikes that have occurred.

The extent of the coal walkout cannot be stated definitely at this time. There are conflicting claims. It may be assumed that the walkout is quite general if not almost universal at the union mines, but there is no walkout at all at non-union mines. Interest centres chiefly upon the rate at which men go back to work, as the operators as well as disinterested observers expect that they will go back. The injunction granted Oct. 31, at the instance of the Government, forbids the union officials to do anything in furtherance of the strike, though it does not apply to the miners themselves. Accordingly, the situation

POINTS IN WEEK'S MARKETING NOTES

The automobile business continues to be the large buyer of tools in U.S. market.

Shipments of sheets and plates are becoming very tardy, and some plants are not far from the point where they will have to close down some departments.

It is not possible for steel companies to store coal to keep them going for any length of time, it calling for too much storage space and too much handling.

Premiums are being paid in Canada for deliveries of sheets and plates, although the steel companies are themselves sticking to the old schedule.

Scrap metal market is dull, buyers looking for lower prices, and sellers not wanting to take the prices that are offered.

Several very nice orders for machine tools have been lost lately because delivery dates were too far off.

Pittsburgh reports some sales of bars at $2.50 to $3 a ton premium, and sheets at a premium of $2 to $4 per ton.

is the same as if the union officials had called the strike and then suddenly disappeared. The general belief is that the Government will use all its resources to prevent anything being done in furtherance of the strike, this applying to activity of union officials, the paying of strike benefits, and efforts of strikers to intimidate workers. Often the Government is slow to begin acting, but there is no question once the beginning is made.

One point in the change of conditions produced by the Federal Government taking its stand against the strike is in connection with the Connellsville region, which has always been non-union. Previously it had been thought very probable, in coal and coke circles, that in the event of a strike of the union mines the strikers would march upon the Connellsville mines and close many, if not all of them. The moment the Federal Government announced its position this opinion was changed. Furthermore, Governor Sproul, of Pennsylvania, has made a plain statement that order will be maintained. It is regarded as established that the Connellsville region will operate, and this is very important in view of the fact that from an exclusively coke producing region it has in the past few years become a large shipper of coal. It may be estimated roughly that in normal times the region produces half a million tons of coal a week, which it converts into coke, and half a million tons of coal which it ships.

Among steel producers the view is that the coal strike will help to settle the steel strike. If the coal strike fails promptly it will further undermine the morale of the remaining iron and steel strikers, while if the the coal strike is severe enough to curtail the production of steel the iron and steel workers will be given some idleness they were not counting upon, making them the more ready to go back to work when opportunity is afforded.

Steel Prices

While basis prices for steel products are being held down by the United States Steel Corporation and large independents adhering to their former prices, the March 21 schedule, export prices have shown a sharp advancing tendency and some of the smaller independents, able to make early deliveries, have been charging advanced prices, this representing in substance a delivery premium. Merchant bars have thus been sold at $2.50, Pittsburgh, or $3 a ton premium, and sheets at $2 to $4 a ton premium.

Pig iron is showing a sharper advancing tendency. The first stiffening in pig iron prices occurred towards the close of June but it has been only in the past few weeks that the market has been strongly advancing. Eastern Pennsylvania prices are up a total of $4 a ton from the low point of last June, and Buffalo, Cleveland and Chicago are all up, by an average of perhaps $2 a ton. The latest advance is in the local market, No. 2 foundry (1.75 to 2.25 per cent. silicon) being now squarely on the basis of $28.75, valley furnaces, or $2 above the March 21 prices, which the furnaces had adhered to until quite recently. Some odd lots for prompt shipment have been sold at much higher prices.

There has been an irregular market in Connellsville foundry coke, which sold as long as a week ago at $8.00 per net ton at ovens, as an outside price. Ordinary good brands have been quotable in the past few days at $6.50 for open top loading and $7.00 for box car loading.

AUTOMOBILE BUSINESS IS STILL BUYING HEAVILY IN U.S. MARKET

Special to CANADIAN MACHINERY.

NEW YORK, Nov. 6, 1919.—In the face of the strike of soft coal miners and other labor troubles, the demand for machine tools and allied equipment continues to be remarkably good. One of the largest inquiries now before the trade comes from the General Electric Co., Schenectady, N.Y. A list of about 50 tools issued two or more weeks ago has been supplemented by another list of about 60 tools, and there will be further inquiries. New equipment is to be bought by this company for a new shop at Schnectady for the manufacture of wireless telegraph apparatus.

Eastern machine-tool builders continue to get a good volume of business from the automotive industry. Such companies as the Studebaker Corporation, South Bend, Ind.; the Nash Motors Co., Kenosha, Wis.; the Samson tractor works of the General Motors Corporation at Jamesville, Wis., the Stromberg Motor Devices Co., Chicago, and others have been fairly large buyers. In the East a new automobile company, the duPont Motors Mfg. Co., Wilmington, Del., in which Alfred I. duPont is a prime mover, will shortly be in the market for equipment. The Willys Corporation is preparing a list of its machine-tool requirements for its recently acquired plant at Elizabeth, N.J.

Miscellaneous buying of equipment has been done within the past week by the Delaware & Lackawanna Railroad, J. H. Williams & Co., Brooklyn, the Otis Elevator Co., for its Quincy, Ill., plant, and the Dexter Folder Co., for its plant at Pearl River, N.Y.

PIG IRON TRADE

Pig iron is advancing in price, and consumers are having a hard time to secure metal. 1920 iron is being sold at advanced prices. Following are reports from various U. S. centres:

Chicago.—There is a heavy demand for iron, and furnace stocks are being rapidly depleted. Foundry iron for first half is being quoted at $30 furnace, and malleable at $30.50 furnace. Malleable and silveries are both scarce, making their position strong.

Boston.—The demand for foundry iron is in excess of the supply, and foundries are taking odd lots, regardless of the analysis. 1,000 tons of No. 2 for first delivery was sold at $32. High silicon iron for immediate delivery has been sold as high as $35 Eastern Pennsylvania furnace. Total sales amount to about 7,000 tons, for last quarter and first half.

New York.—Business has been lighter, not because of a decrease of demand, but the difficulty of obtaining iron. Melters have had to pay higher prices for prompt iron, 2.25 to 2.75 silicon brought $33 Western Pennsylvania furnace. A fair amount of charcoal iron has been sold in this district for first half, and 1,000 tons foundry has been sold to a Japanese buyer.

Pittsburgh.—Furnaces are generally fully sold up for this year, and prices of foundry and malleable continue to mount. Shipments for balance of the year cannot be procured under $30, and single car loads are realizing more than that. There is still reluctance in booking 1920 business, until more is known about production costs.

Buffalo.—A sale of 10,000 tons for the first half at $29.50, Buffalo, has been made, an advance at $2.25 over former price. A fair quantity of foundry iron has been sold at $31 to $34.

Cleveland.—Heavy sales of foundry iron for first half are noted here. One interest has closed business for 100,000 tons in the past two weeks, mostly from first half. Pig iron for immediate delivery is very scarce, and matters are being complicated by difficulty in securing cars.

Philadelphia.—Iron is becoming so scarce that fancy prices are being paid in some cases. No. 2 X has been sold $33 Eastern Pennsylvania furnace. All Eastern furnaces are sold up for this year. There is a little iron available in Virginia. An Eastern consumer has bought 1,500 tons basic at $28 delivered. No. 2 X for first half is quoted at $32 to $35.

Cincinnati.—Ohio furnaces are now opening their books for first half business. One furnace has booked orders for first quarter of first half at $29 Ironton, while a second has placed $29.75 as the minimum for 1920 delivery.

St. Louis.—A large amount of iron in small lots has been sold during the week and the demand is good. There are a good few enquiries coming along for next year delivery. A sale of 25,000 tons basic at Chicago for first quarter delivery has been made at $25.75 furnace.

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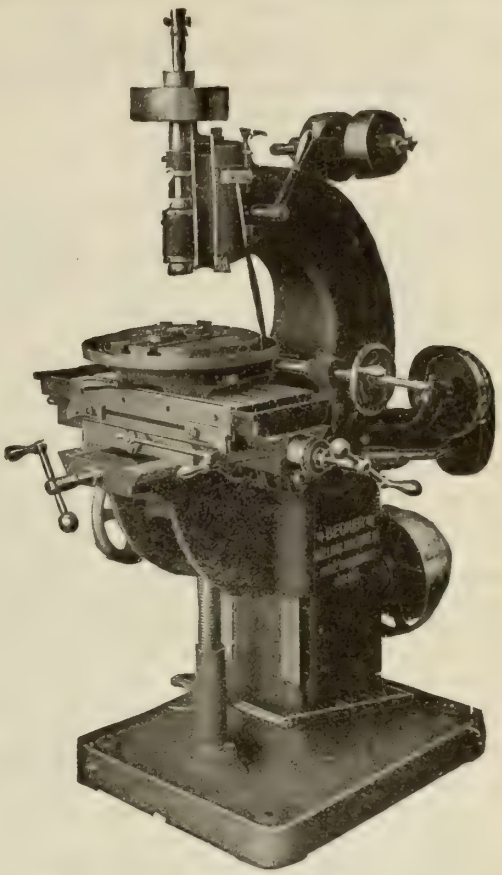

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U.S. SCRAP METAL

The scrap market is showing more activity lately. Foundry grades and machinery scrap are selling well. The car shortage is interfering with business in some places:

Chicago.—With the resuming of work by steel mills the scrap situation has been improved. Prices are showing an upward movement, and heavy melting and rolling mill material is in good demand. Cast scrap and cupola grades are selling above the local pig iron prices.

Boston.—There is a very ready market for machinery scrap, and a price of $28 is easily obtained, with a few sales at $28.50. Steel making grades on the other hand are decidedly quiet. Considerable scrap has been offered lately by the war department.

Pittsburgh.—Foundry scrap has been in strong demand recently, and No. 1 cupola scrap has sold at $25 to $26 delivered. Better prices than this have been secured on some small lots. Another grade in good request is railroad malleable. Railroads are offering 26,000 tons scrap steel.

New York.—Boring, turnings and heavy melting steel are still in demand. Heavy melting is quoted at $15.50 to $16.00 f.o.b. New York. Clean cast borings have advanced to $14.50 and machine shop turnings to $12.

Philadelphia.—There is a good demand for all kinds of scrap, and heavy melting steel has sold at advanced prices. Machine shop trimmings and borings have been sold freely, while the charcoal iron industry has been buying forge and bundled sheets. Cast scrap is also in demand.

Buffalo.—Prices remain the same, but dealers are looking forward to a better market when steel mills get on a normal basis. Heavy melting steel, turnings, borings, malleable and cast are in demand.

Cleveland.—Cast and malleable are in good demand in the Cleveland district, and mills are increasing their production. There is a great shortage of cars. Dealers are holding their scrap and refusing offers above published quotations.

Cincinnati.—There is very little scrap being moved, chiefly on account of the difficulty of getting cars. Some local foundries are buying small quantities that can be delivered by truck. Prices are really nominal transactions, being too few to form a guide.

St. Louis.—There is little movement of scrap, but the limited supply is a source of strength. Dealers are looking forward to the end of the steel strike for a period of good business. Rerolling rails are quoted at $28 to $28.50, this material being in good demand.

Birmingham.—Heavy melting steel is being held for higher prices, and there is a good demand for cast and stove plate, borings and shop turnings. Good business is looked for unless the coal strike disturbs things too much.

FIRESTONE PLANT GOES TO HAMILTON

The By-Law Was Carried There by a Very Large Majority

Hamilton: By overwhelming majorities the electors of Barton township carried the by-laws which assures the Firestone Tire and Rubber Co. making Hamilton its headquarters. Under one proposal the company will pay taxes on an assessment of $100,000 for twenty years, and under the other on an assessment of $150,000 for twenty years. The full school rate, income and business tax will will be paid on all holdings. The vote on the ten-year by-law was 954 in favor and 27 against, the twenty-year by-law 772 in favor, 143 against.

The company has purchased 150 acres east of the city limits on the bay front, including the property owned by Sir Henry Pellatt of Toronto. About two-thirds of it will be used for factory purposes, the first units, on which work will be started at once, employing 2,000 people. The southern part will be devoted to a model town, the company building its own high class houses and encouraging its employees to buy them.

The Jenckes Spinning Co., of Pawtucket, R.I., owners of the largest spinning mills on the American continent, has already declared that it would locate here as soon as the fate of the Firestone by-laws was decided. This company will erect a plant that will give employment to 1,000 people It is said to be one of the first of a number of companies that will follow the Firestone here.

WILL SPECIALIZE IN FORGING NOW

Sale Made to Ford Co. of Plant for the Making of Fenders, Etc.

An industrial transaction of major importance was consummated in Ford City, Ontario, last week, when the Dominion Forge & Stamping plant was purchased by the Ford Motor Company of Canada. The property in question is situated to the south of the Grand Trunk lines, near the Ford plant. The Dominion Forge & Stamping Company has been engaged in the manufacture of fenders, sheet metal work and frames for the Ford Company.

The purchase of the stamping plant means that the motor car firm will make these parts itself, and will leave the Dominion Forge Company free to make forgings and other parts in its second plant. An inventory of the plant involved in the sale was commenced on Friday last, and it is anticipated that the final valuation will be between $700,000 and $800,000.

Expansion of the forging plant by the Dominion Forge Company to take care of larger requirements will probably be an aftermath of the transaction.

The Dominion Forge & Stamping Co., as the result of the sale of these two stamping plants, will devote their entire interests to the forging business, and will be in a better position to handle any kind of drop forging business to customers' blue prints and specifications. At the present time the firm is practically doubling the capacity of their Board Hammer shop, and is installing a new 8,000 pound steam hammer and a new 5 in. forging machine.

FEAR WORKLESS WINTER IN EAST

New Glasgow People Wait to Hear About Development at Scotia Plant

New Glasgow.—A large mass meeting was held in the Itzit Theatre to discuss the question of unemployment at the Scotia Steel Works and the Eastern Car Plant.

The situation in New Glasgow and Trenton among workers at these plants has already become acute, and there is fear that a very serious condition will assert itself before many weeks. Both plants are practically without orders and the prospect is that they will be closed down unless relief comes. The men have already held a conference with the management, and the company is prepared to carry the financial end of any orders that may be secured.

At the meeting several of the workmen were outspoken in their demands for work and the danger of want and hunger which their families were facing. Messrs. Alex. McGregor, M.P., was present, but could not hold out any hope of orders from the Government. Hon. R. M. McGregor also spoke and favored a delegation to be sent to Ottawa to press for relief. This course will proably be followed. Already three men have been slated to approach the Government and the directors of the Canadian National Railway asking for car orders, and also orders for next year's railway supplies, such as ties, bolts, spikes, etc.

The men selected are Mayor Wier, of New Glasgow; Mayor Logan, of Trenton, and H. D. Fraser, president of the Federation of Labor organizations. This committee will be supplemented by business representations and proceed to Ottawa in a few days.

There is a sort of poetic justice in the news of the new sphere of activity of the famous German commercial submarine, "Deutschland." The enterprising Mr. H. Bottomley has acquired possession of her from the Admiralty, and she will be exhibited round the British coast, the proceeds of the exhibition to be given to King George's Fund for Sailors. It is worthy of note that her cargo space has a capacity of only 90 tons measurement, and two foot square package was the largest that could be accommodated through her hatches.

Geometric Production

Installing a Geometric Die Head, or other Geometric equipment, has increased production materially in many plants where an increased output was a vital consideration.

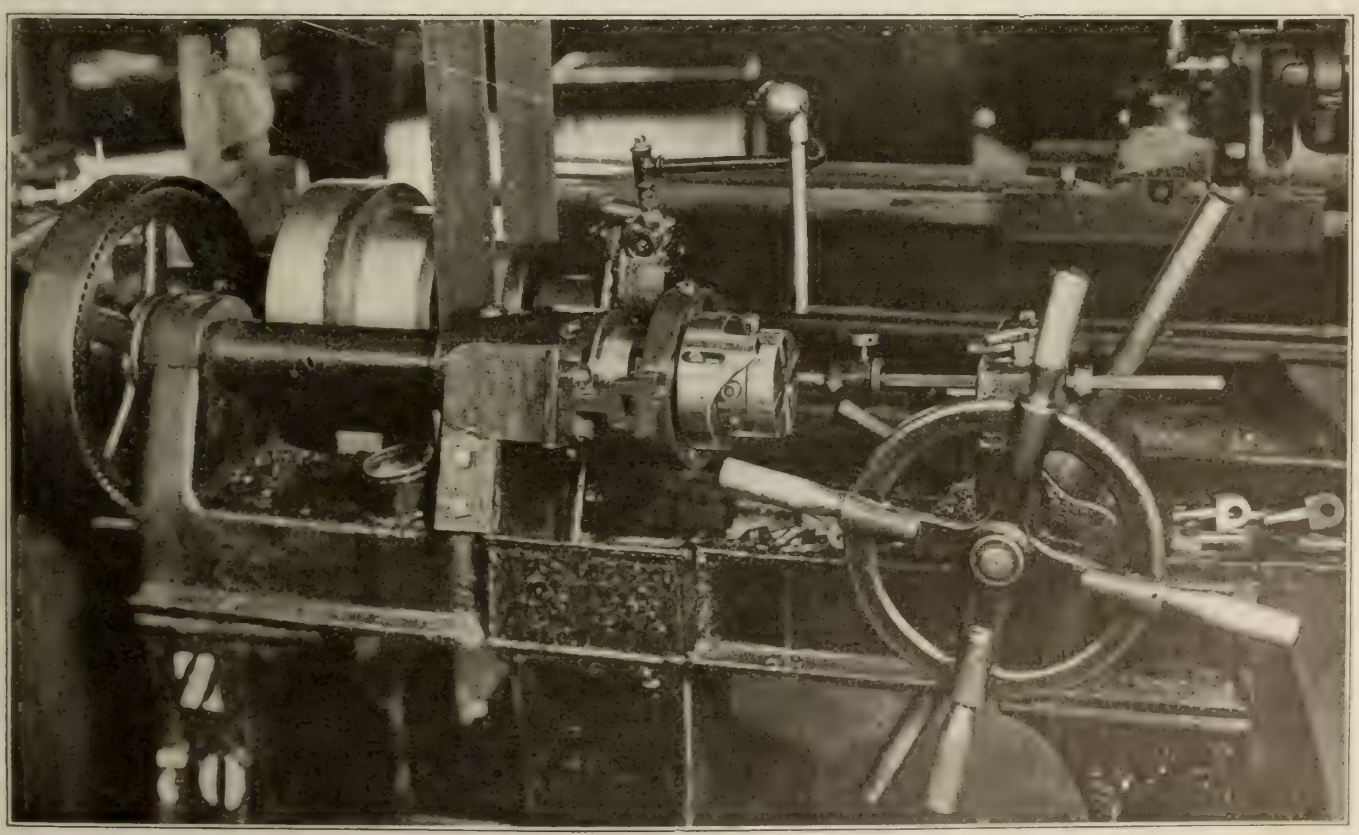
Below is an illustrated instance where a Geometric Die Head (threading machine type) was applied to an old bolt cutter and the production increased six times over what was being done with a solid die head.

Before taking it for granted that you are getting the best possible production on screw threaded parts, let us know what the work is, and we may be able to boost production for you.

The Geometric Tool Company, New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B
Canadian Fairbanks-Morse Co., Limited, Manitoba, Saskatchewan, Alberta



If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$25 00	$26 25
Electro copper	24 50	26 00
Castings, copper	24 50	25 00
Tin	58 00	58 00
Spelter	10 00	10 00
Lead	7 75	7 00
Antimony	10 00	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 50
Plates, 3-16 in.	4 90	4 90

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	21 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

Reduces Tap Breakage

Increases Tapping Speed

Attached to any drill press it will tap holes squarely and ten times faster than is possible by hand.

THREADS ARE CLEAN AND SHARP

The action of the Walstrom attachment closely imitates hand tapping, because of the mechanically obtained **oscillating movement.**

Aikenhead's

WALSTROM ATTACHMENT

The quality of material and construction assures a long lasting trouble-free service. Takes taps of all sizes up to 1½ inch.

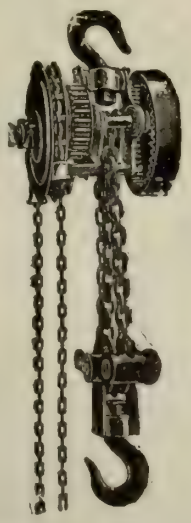
Send for Bulletin.

10 Days Free Trial

Your money promptly refunded if unsatisfactory.

Aikenhead Hardware, Limited

17 Temperance St., Toronto



Showing the lower block in position for regular or low speed.

Aikenhead's

SPEIDEL'S "SIMPEX" Two-Speed Block

The novel feature of the lower block is the simple and ingenious method of securing two speeds, which is of great value where variable loads have to be lifted.

This device is self-disengaging when the load has been hoisted at the fast speed and is lowered below the point from which it has been raised.

This is of great importance and makes this Hoist valuable in connection with cranes and other hoisting machines.

Drop us a line for full information.

AIKENHEAD HARDWARE, LIMITED

17 Temperance St., TORONTO

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 25
Sheets, black, No. 10	5 15	5 25
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	7 75
Premier, 10¾ oz.	....	8 05
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	**.08½**
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	**0 34**
Brass sheets, 24 gauge and heavier, base	**$0 42**
Brass tubing, seamless	**0 46**
Copper tubing, seamless	**0 48**

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 25	$11 50
Sheets, 3½ lbs. sq. ft.	10 00	11 00
Sheets, 4 to 6 lbs. sq. ft.	9 75	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

ILLINOIS

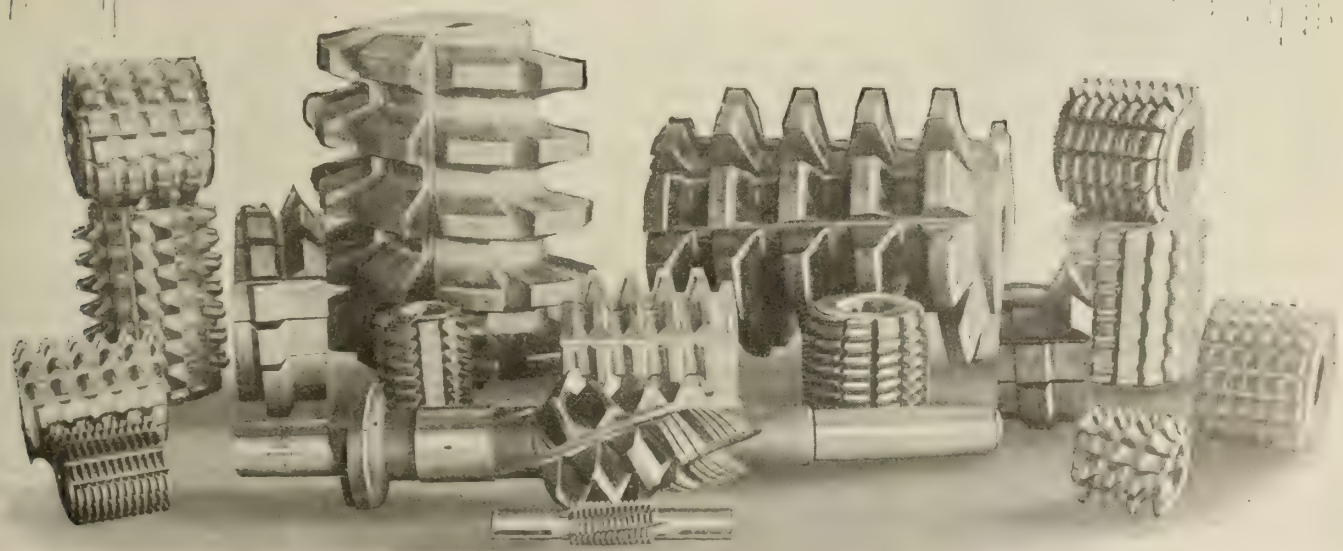
HOBS

CUTTERS

REAMERS

"ILLINOIS" HOBS—
more than high speed tools;
they are the expression
of an ideal of service.

NONE BETTER CAN BE MADE.



ILLINOIS TOOL WORKS, CHICAGO.

Detroit Store
Woodward and Warren Aves.

A. C. Towne, Inc.,
17 W. Swan St., Buffalo.

New York Office
141-145 West 36th St.

S. J. Pfaff
Pioneer Bldg., St. Paul.

Indianapolis Office
616 Fletcher Sav. & Trust Bldg.

Rose Tool and Suply Co.
111 Market St., Pittsburgh

Louis G. Henes
75 Fremont St., San Francisco

Title Insurance Building,
Los Angeles.

If interested tear out this page and place with letters to be answered.

MONTREAL NOTES

That steps are being taken to relieve the shortage of ocean tonnage is shown in the recent announcement of A. G. Henderson, one of the Glasgow directors of the Cunard and Anchor lines, when he stated that quite a number of vessels were now under construction for the Atlantic trade of his company. In addition to providing increased tonnage for the old trade routes the companies are preparing for other new routes as post-war requirements demand. Mr. Henderson intimated that some of these new boats would probably be ready for the Montreal route for the opening of the season of 1920.

* * *

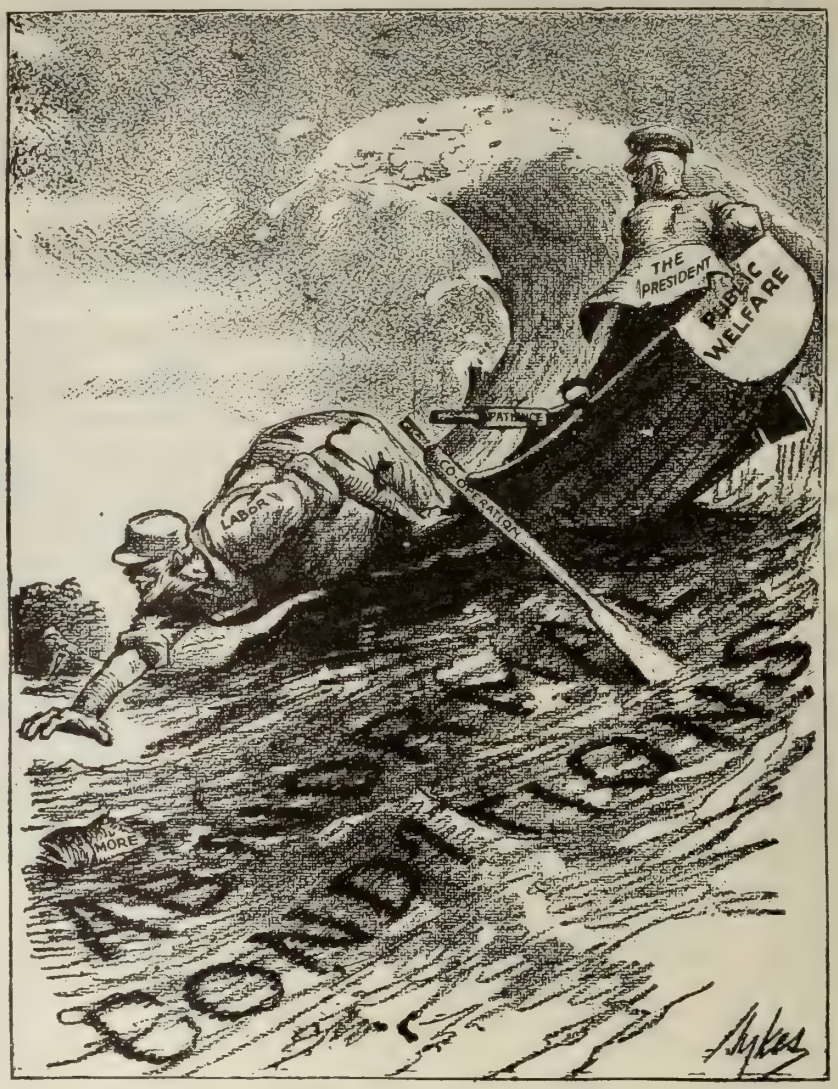
Further impetus is given to the activities of Canadian interests in the incorporation of the International Corporation of Canada, with head offices at 112 St. Francois Xavier Street, Montreal, with a capital of $2,000,000. While the primary object of the company is to trade in products made by Canadian manufacturers, the scope of their activities will be world-wide, as it is the intention to establish agencies in all the principal countries of the world, not only to look after the interests of Canada but likewise to develop trade in all parts of the Empire backed entirely by Canadian capital. The gentlemen associated with the company are prominent in Canadian financial and industrial activities, and it is expected that further announcement as to the names of the directors will be made shortly. It is understood that H. B. Thomson, formerly Canadian Food Controller, will occupy an executive position with the new company.

* * *

The practice of coaling Transatlantic steamers on this side, for the return trip, has become additionally pronounced during the past couple of months, owing to the recent unrest in the industrial situation in England. However, this condition will probably be remedied in the near future as an agreement has been reached between the striking railroad men and the Government, whereby they will return to work while negotiations are carried on. For some time past the congestion of the docks on the other side have become so great that restrictions in shipping have been very necessary. From now on it is expected that relief will be shown in this connection.

* * *

J. W. Norcross, president of the Canada Steamship Lines, has recently returned from Europe, and is very optimistic regarding the shipping activities, both of this and other countries. He states that British and French shipping interests anticipate a period of several years of continued favorable conditions as exist at the present time. Of his own direct interests Mr. Norcross stated: "Developments that have already occurred in the Atlantic business of the Canada Steamship Lines have more than justified this, and important extensions and improvements are now being contemplated." He looks for considerable emigration from the British Isles to Canada during the coming year, and appreciates the fact that shipbuilding and industry in general will greatly benefit by the additional skilled labor that will be available.



Sykes in Philadelphia "Public Ledger."

"Sit Down"

* * *

The Halifax Shipyards Limited has just recently completed the rebuilding of the old "Lake Manitoba," which was stranded in the harbor of Montreal about a year ago, and was in consequence eliminated from all shipping registers. The "new ship" will bear the name of the "Iver Heath," and, it is interesting to note that the repairing and reconditioning of this vessel was the second largest repair job ever accomplished on the Western Atlantic seaboard. The boat has just undergone her trial trips, and her initial performance has reflected great credit on the builders, and fully satisfied the group of experts and officials that were on board, and who keenly watched for any defects to show in the engine-room or on or off decks. When the engines turned over at a speed of 13½ knots, the representatives of Lloyds were so well pleased that they certified an A-1 classification at Lloyds. Four other ships of large tonnage are now under construction at these yards, and it is expected that the first of these will be ready for launching about the first of the year. The yard is particularly busy, and about fifteen hundred men are constantly employed.

Some idea of the changing conditions that are taking place in world commerce may be gathered from the export of coal that has recently taken place from this country. While this state of affairs is largely due to the recent attitude of British labor, there is, nevertheless, a possibility that trade of this kind may be permanent in character. The steamer Ariant, recently arrived at Halifax with a general cargo, has been diverted from her regular activities and will take on a cargo of coal at Sydney for the United Kingdom. Another instance of coal trading is the shipments of fuel that are now going to Holland. Some time ago the Netherlands Government obtained some 90,000 tons of Canadian coal, and it has been been announced that the Dutch Government are so well pleased with the quality of the coal that a further order for upwards of 200,000 tons has been placed.

A Miniature Hot-Blast Cupola Furnace in Action

This Little Cupola May Look Like a Toy, But It Has Features Which Should be Worthy of Consideration in Full-Sized Foundry Cupolas

Fy F. H. BELL, Editor Canadian Foundryman

THE illustration shown in Fig. 1 is from a photograph of the float which represented the part taken by the Owen Sound Iron Works, Limited, in the Trades procession in honor of the returned soldiers a short time ago.

A story of the procession and the reception given to the returned heroes would make interesting reading, as such stories always do, and any story treating on this subject should be appropriate in any class of magazine, but to

FIG. 1—FLOAT CARRYING HOT-BLAST CUPOLA, SHOWN IN FIG. 2.

do it justice requires ability beyond that possessed by the writer of this humble narrative. We will therefore refrain from saying much about the reception, suffice to say, Owen Sound did herself nobly, as she always does; the procession alone being of sufficient magnitude to require ninety minutes to pass a given point.

As we have already said, the float shown in the illustration is that of the Owen Sound Iron Works, of which Mr. James Higham is the foundry foreman. On the wagon will be seen the little cupola shown in Fig. 2, and it is of this little cupola that we wish to speak.

This cupola is the the invention of Mr. Higham, and to show that it is no toy we might explain that Mr. Higham had it in blast all through the procession and had men making moulds and pouring them with metal taken from this cupola.

Dimensions of Cupola

From the sand bottom to the top it is 36 inches and the outside diameter is 12 inches, inside diameter 8 inches. It has two tuyeres, each 1½ inches in diam. It is small, but can and does melt iron, and as Mr. Higham says, it is because it is a hot blast furnace The tuyeres never get bunged up, because the slag slips right past them.

There are lots of furnaces which will not melt continuously for ninety minutes.

Now it is not its size which we will dwell upon so much as its design and the ideas involved. The line sketch shown in Fig. 3 will, perhaps, show more clearly the details of its different features. As will be seen, it is on trunnions and can be swung over on its side for convenience in preparing for the succeeding heat. By this means the workman can do a lot of his work without working in the dust and draught. This feature can be adopted on the largest-sized cupolas and can be tipped by mechanical means. But this is only one of its minor characteristics, the main point being the blast arrangement.

As is well known, every cupola has what is known as the melting zone above which iron does not readily melt, and cast iron blocks have frequently been used to good advantage instead of bricks in this part of the lining, standing the abrasive action of the descending iron and fuel better than fire bricks. But of course every part of the cupola is hot, and while this part of the lining does not get hot enough to melt and run down, it gets near to it and in time it burns out.

In the furnace here shown the lining above the melting zone consists of a one-piece cast iron pipe of the proper inside diameter. This pipe is flanged at the top to fit the inside of the shell. The bottom of the pipe rests on top of the ganister lining of the melting zone, which zone would, in a larger furnace, of course, be bricked up with fire bricks. This makes the entire furnace above the melting zone a continuous hollow jacket. The blast pipe connects to this as shown in the illustrations, and from this to the tuyeres by outside pipes, also shown. The cold blast on entering this jacket has a cooling effect on the inner tube, thereby prolonging the life of the tube, while at the same time absorbing the heat from the tube, and delivering hot air to the tuyeres.

It must be remembered that this hot air is not burned air as every bit of oxygen which the cold air contained is still in it in addition to the numerous heat units, which radiated through the inner tube into the wind chamber.

Now, as we have shown, this is a very small sample of a melting furnace and if a larger one were being constructed, certain changes in the proportions might be found advisable. Characteristic of coke fires in a cupola, the height of the melting zone does not vary in proportion to the size of the furnace, and if the furnace was a large one, projecting up to the second storey of the building, the melting would still be done at the bottom and the zone would not be much higher than in this one. In such a case the inner tube could reach down close to the melting point, and this change would make other possible changes loom up. For instance, the cold blast might be made to enter at the lower part of the belt, where it would be more effective in cooling the

FIG. 2—HOT BLAST CUPOLA.

inner tube where it most required it and also where it would absorb more heat from the inner tube. It might also be advisable to have the pipes leading to the tuyeres connect at the top, where the heated air is most likely to be. But Mr. Higham has all of these points thought out. He has some notion of presenting this one to the Owen Sound Technical School, and building a somewhat larger one for Labor Day celebrations, etc.

Mr. Higham is a native of Stockport, Cheshire, England, and some years ago operated a foundry at Levenshulme, near Manchester, and it was there that he worked out his idea of adopting hot air to cupola practice.

Iron and Steel in Occupied Germany

FROM April 14th to May 3rd a Commission appointed by the Minister of Munitions, and composed of Sir W. J. Jones (Ministry of Munitions), Mr. P. S. Cooper (the Partington Iron and Steel Company), Mr. R. C. Harding (Robert Heath and Sons), and Mr. Cosmo John (Vickers, Limited), visited certain steel works in Lorraine and Saar Valley with a view to reporting upon the developments which had occurred at the works during the war, the present conditions of their plant and machinery, the prospects of the works acting as competitors with British industries, and the developments in fuel economy practised at them.

While the iron and steel works of the Saar Valley worked at high pressure throughout the war, those in Lorraine suffered severly from lack of fuel, and had, especially towards the end, to be damped or closed down for several weeks on end from this cause. Lubricants also gave out towards the close of hostilities, and in some instances both in Lorraine and the Saar Valley serious damage was caused to machinery as a result. In spite of the confident assertions of the German Press, no satisfactory substitute for manganese seems to have been found by the steel makers. Calcium carbide in conjunction with reduced quantities of manganese was employed, but at only one works did the Commission receive assurance that its use was at all satisfactory. At others testimony was received indicating that it gave very bad results, as much as 30 per cent. of the steel produced with it being scrap. Powdered anthracite was used as an alternative de-oxidizer, but was not a success.

The damage suffered by the steel works from bombs appears to have been slight. The Hagondange—formerly Hagendingen—works received 400 bombs, and the works at Hayange 150. Nevertheless, the total damage was estimated at but £5,000, while the loss of life was comparatively slight. Signs were, however, found that the moral effect was considerable.

Dealing with present conditions, the Commission reports that the shortage of furnace coke is severely restricting the output of the blast-furnaces, and consequently of the steel works, which in all cases use hot blast-furnace metal. The iron and steel works of Lorraine are dependent upon the coal and coke supplies from Westphalia, a fact which places them in a very unenviable position. Up to the present, however, the Germans have failed to provide the fuel in the amount specified under the Armistice terms. In the Saar Valley the works are less dependent upon Westphalian fuel, but it is necessary to mix Westphalian coal with Saar coal in order to obtain a good furnace coke.

There are 68 blast-furnaces in the province of Lorraine. Of these 60 were in good condition at the date of the armistice, although only 5 were in blast. Since then as many as 27 or 28 have been simultaneously in blast under the French authorities, but at the time of the Commission's visit the number running was less, and those which were at work were on short blast owing to the scarcity of fuel.

Under the terms of the armistice the Germans were required to deliver 13,700 tons of suitable furnace coke per day. During November and December very little was handed over. In January the deliveries averaged between 5,000 and 6,000 tons per day, but in February and March they fell to between 2,000 and 3,000 tons. Since then the quantity delivered has been negligible. Altogether, instead of 1,500,000 tons, they had delivered at the date of the Commission's visit only about 500,000 tons.

There is no shortage of labor at present, but to prevent unrest the French authorities are paying the workmen full wages during their periods of partial or complete idleness. At the date of the armistice there were approximately as many Germans as Lorrainers employed at the Lorraine iron and steel works. Certain Germans have been sent back to Germany, but for the most part those who remain have no desire to leave. They wish to become French subjects; they are not troublesome, and agree with the French element.

In Lorraine all the iron ore used is obtained from local deposits, being generally brought by aerial rope-way from the mines, which in no case are farther than 11 miles from the works. The ores are of two qualities, calcareous and silicious, and are used jointly to give a self-fluxing mixture. The ores are phosphoric, and the pig iron produced at the blast furnaces is nearly all used for making basic Bessemer steel, their being generally a steel works attached to the blast furnaces. The blast furnace gases are extensively used for driving the works and plant. Generally speaking, the gases are first roughly cleaned and then in part used in the heating stoves of the blast furnaces and under steam boilers. The remaining portion is further cleaned, and is employed in large two-cycle gas engines driving the blowers and in four-cycle gas engines driving the rolling mills, etc. Electric driving of the mills is used in few cases, but the advantage, according to the Commissioners, seems to be less in practice than in theory.

The blast furnaces are in nearly all cases built of brick and banded, very few having steel shells. They are lower and their hearth areas are larger than would be the case in this country for similar outputs, and are only driven at very moderate rates considering the size of the hearths. Only one case was found in which the rate of combustion of coke exceeded 200 lb. per square foot of hearth area per hour. At nearly every works visited plant for producing slag bricks was found. The slag is granulated by being run molten into water. The granulated material, with about 5 per cent. of lime added as a binder, is allowed to rest for 24 hours and is then formed into bricks in machine presses, each of which is capable of turning out 10,000 bricks per day. At some of the steel works a slag cement plant has been laid down.

A feature of the works in general visited by the Commission was the large size and good arrangement of the stock yards. It would appear that the steel works execute a large number of orders from stock, and thus act as their own warehousemen. At one works at much as 27,000 tons of steel were found in stock, while at another 15,000 tons was stated to be the normal quantity held.

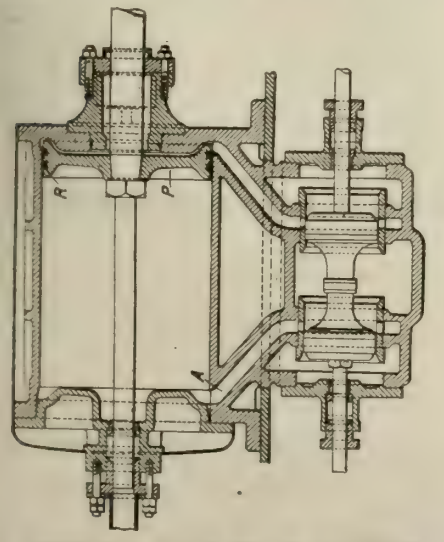
As a consequence of the large demand for electrolytic copper during the war, the price advanced very greatly and many concerns for manufacturing this product were opened in Japan. The raw material for this industry was obtained from the Chinese bronze coin, which was imported into the country in large quantities until the Chinese Government prohibited its exportation. At present the prices of electroytic and ordinary copper varies so slightly that it does not pay to manufacture the former. Copper sheet manufacturers are also hard hit by the decline in prices and some of the large concerns are suspending operations or giving up this branch of business.

UNIFLOW LOCOMOTIVES

The Uniflow type of engine cylinder has been applied with considerable success in England to locomotive design. The accompanying illustrations show the design developed by the North-Eastern Railway at the Darlington works. Three cylinders are installed, each of them 16½ in. dia. by 26 in. stroke. The design of these and their difference in appearance from the ordinary piston valve cylinder may be seen in the line drawing.

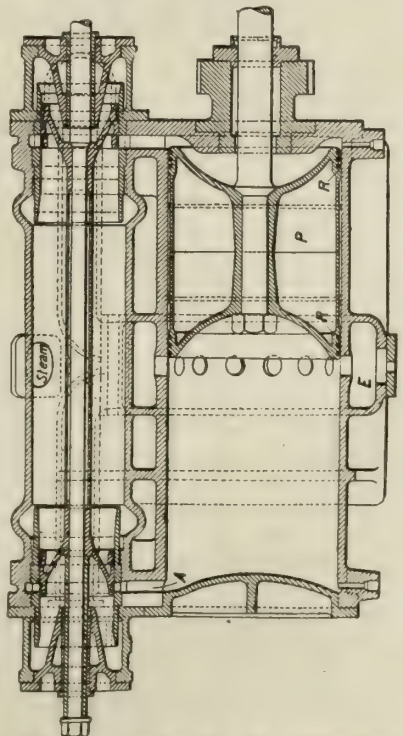
ENGLISH UNIFLOW LOCOMOTIVE

The "Uniflow" principle differs from that of an ordinary cylinder in that the steam entering at one port does not have to return to the same point, but escapes through an exhaust port provided in the middle of the cylinder barrel. The steam, therefore, has only a forward and no backward movement; hence the term "Uniflow." Owing to the fact that the exhaust is in the middle, it is necessary to increase the length of the cylinder to about double what it would otherwise be, in order to allow the steam which enters through the port at one end of the cylinder to press forward the piston for the same length of time or distance before exhaust, as is done in the case of the ordinary engine. The piston in a "Uniflow" cylinder is called upon to govern the exhaust instead of, as in the usual type, leaving that function to the slide or piston valve. The piston is a hollow casting, with spring rings at each end, which prevent any steam passing through to its other side. It is claimed that this piston, being hollow and full of air, protects the live steam of the piston from the disadvantageous effects which the ordinary narrow piston possesses, due to its being a single solid surface, one side or the other of which is always wet from exhaust steam.



SECTIONAL DRAWING OF ORDINARY CYLINDER.

We are indebted to the North-Eastern Railway Magazine for the information contained in this article.



SECTIONAL DRAWING OF UNIFLOW CYLINDER.

Standardization of Roller Chains—The Association of British Driving Chain Manufacturers announce that they have now completed the standardization of roller chains up to 3¾ in. pitch. For the convenience of chain users, and to insure complete interchangeability they have also standardized chain wheel tooth forms. These new tooth forms, while not being identical with any of the existing forms, incorporate the essential features of each. Particulars of the standards set up by the Association of British Driving Chain Manufacturers are to be published in pamphlet form which will be obtainable from the secretary of the Association of British Driving Chain Manufacturers, Bassishaw House, Basinghall street, London, E.C. The association comprises the following well-known firms: Alfred Appleby, Ltd., Birmingham; Brampton Bros., Ltd., Birmingham; "The Coventry" Chain Co., Coventry; Perry & Co., Ltd., Birmingham; Hans Renold, Ltd., Manchester.

The John H. Hall & Sons, Ltd., Brantford, Ont., have issued a very attractive catalogue on their complete lines of pipe lathes, rapid nipple machines and roller pipe cutters.

The cover of this catalogue is a novelty in itself. The already well-known wheel trade mark is stamped out in such a manner as to show the five members of the concern, including the founder, J. H. Hall, who recently passed away. In addition to the regular catalogue, material, repair charts, and instructions for the operator of machines is included. Data on the care of dies for such machines is given, which is exceedingly valuable, for, as a rule this question does not receive the care it deserves.

Taken in all, this catalogue is well worth having to anyone interested in these lines.

In "La Nature" an account is given of an automatic regulator for low-temperature electric furnaces, the invention of which is ascribed to M. Lequeux, whereby the temperature is accurately controlled. The device consists of a glass tube inclined at 30 deg., and connected at its upper end with a vessel containing a fluid which undergoes considerable dilation under the action of heat. The lower end of the tube connects with a vertical cylinder containing mercury in which is an adjustable piston. In the sloping tube, where the mercury enters up to a certain height, are spaced platinum contacts connected with points on the coil of a rheostat. The device is placed in the furnace, and when the latter is cold the platinum points are short-circuited by the mercury. The furnace, therefore, receives the full current. With a rise in temperature the liquid in the upper vessel expands and forces down the mercury, thus putting into circuit a succession of the various sections of the rheostat connected to the platinum points and diminishing the current. The device is intended primarily for laboratory furnaces heated by electricity, but the same principle may be applied to other forms of apparatus so heated.

"You don't mean to tell me you ever doubt the wisdom of the majority?"

"Well," responded Senator Sorghum with deliberation, "what is a majority? In many instances it is only a large number of people who have got tired out trying to think for themselves and have decided to accept somebody else's opinion."—Washington Star.

MAKING STEEL IN CANADA

Continued from page 464

eight hundred pounds (800 lbs.) of coal, each pound of coal makes about sixty (60)) cubic feet of gas (at 60° F.)

The great advantage of gas as a fuel lies in the fact that a low grade of coal can be used, that coal and ashes can be mechanically handled, and the gas and air heated before combustion takes place.

We have now followed the iron ore from its hiding place in the depths of the earth through the blast furnace where the major portion of its impurities are purged away, through the open hearth furnace where the refining is carried still further, and we now have ingots of steel weighing from three thousand (3,000) to eight thousand (8,000) pounds each. Before rolling, these ingots have to be heated in either a soaking pit furnace or a continuous heating furnace. They are then rolled, first in a mill, called a Blooming Mill, which reduces them from ingots of, say, sixteen inches (16 ins.) square to blooms 6 ins. x 6 ins. square. These blooms are then re-heated and rolled into billets, and the billets in turn rolled to the various bars required.

In the cast of steel plates, the ingots are cast in the form of a slab and worked between plain rolls until the desired size and length is obtained. Large structural members as "H" beams and "I" beams are rolled from an ingot cast roughly to the contours of the beam.

The original mills with simple stands of rolls and the bars had to be placed between them and lifted from one pass to the other by man-power. Modern mills are provided with tables of all descriptions to eliminate this hand work and secure immense outputs.

THE GREAT LAKES SEASONS

Continued from Page 475

ashore, receiving damage to the extent of almost half a million dollars. The vessels lost and stranded were of all sizes, from 2,800 tons d.w. to 10,000 tons d.w., and besides the distinctive lake type of carrier, included vessels of the tramp type. These were built in Great Britain, fit and seaworthy to navigate any waters that would float them. Eight of the vessels disappeared totally, among them being the "Wexford," a British-built ocean-going tramp. The "Charles S. Price," a 9,000 ton lake carrier, was found after the storm floating bottom up, with her bow end out of water. Later she, too, sank completely.

The wind at its maximum attained a velocity of 79 miles an hour, and averaged 60 miles an hour, and raised such a sea as has, perhaps, never been raised on the lakes before or since. Vessels running before the wind were continually pooped, the seas filling the engine room, and smashing every deck erection in its path. Those headed into it found it impossible to keep their vessels head up, and they gradually fell off into the trough, where they were pounded by the heavy seas till they foundered, or were driven ashore and smashed to pieces.

That gale will live long in the memory of Lake sailors, and the inhabitants of the towns and villages of the lake shores. It ranks among the great marine disasters of the world, and it is to be hoped that the inland waters will never suffer such another catastrophe.

At the time this happened, much speculation was rife among the uninformed, and among many that should have known better, as to why these ships could not survive a heavy blow. Salt water men pointed out that the British-built tramp did not founder, but was driven ashore, a very different happening. They claim that had the vessel had sea room, she could have lived through any gale. This is practically true.

The answer of the lake sailor is that their vessels are not intended or built to stand such conditions. They are built for carrying a heavy bulk cargo on the least possible draught. They have the reports of a capable weather bureau to guide them, and if bad weather threatens, they remain in port. If on their voyage, and conditions become adverse, they can usually gain shelter. They point out that the percentage of loss to total traffic is decidedly low, but when a loss occurs it is usually of a spectacular character, which focuses attention on it. It practically amounts to the fact that a lake carrier, caught in a heavy storm, stands a good chance of being lost. On the other hand, an ocean-going vessel takes storm and calm all in the day's work, and unless close on a dead lee shore, does not worry much.

If the two types of vessel are studied a little, the reason is apparent. Take two vessels of the same tonnage, one an ocean-going vessel, and the other a bulk carrier of the lake type. A 10,000 ton d.w. ocean-going steamer will have dimensions of approximately 450 feet long by 56 feet beam by 38 feet deep. She will have engines developing 4,000 h.p. The lake carrier of the same size will be 524 feet long by 54 feet beam by 30 feet deep. Here is a great difference. Her engines will be only 2,200 h.p. A greater difference still. The ocean-going steamer has her engines and boilers amidships, and in the bottom, and light or loaded, trims on a practically even keel. The lake boat, on the other hand, has her engines right aft, and the boilers usually set in the 'tween deck. She trims by the stern, and when running light, there is a difference of 10 or 12 feet between the draught aft and forward. Now, what are the conditions of the two vessels in the same waters, and the same weather? The ocean-going ship, full loaded, will be drawing about 29 ft. She has ample power, and steers well. The lake boat will be drawing roughly about 19 or 20 feet. It is at once apparent that of the two vessels the ocean-going steamer is easier to handle. The extra length, less draught, and low power of the lake steamer makes her, in severe weather, almost unmanageable. In very severe weather she becomes helpless. Then again the sea that runs on the lakes is very high, with short intervals between the waves. These seas break very quickly, and the effect is a series of hammer-like blows delivered unceasingly. The fabric cannot resist it if long continued. Now, in open water the seas are long, and a vessel has time to rise and fall to them. Very rarely does the bulk of the sea break on a vessel. It is usually just the crest of the sea that falls on the deck. When a vessel does get under the weight of a real Atlantic roller, she comes into port with her upper works levelled to the deck, and a story of a tidal wave.

I have tried to show in this limited space what the mariners of the Great Lakes have to contend with. As a salt water man, I feel a deep respect for them and their work, and would like to see Canadians in general take a deeper interest in this phase of their national life.

ONE SHORT YEAR AGO

Go back a year—in memory.
Then we **hoped** to win.
We believed we would win.
We were willing to spend every cent in Toronto for Victory. Every man, woman and child in Toronto was prepared to pay any price if only we could achieve Victory.
Now Victory is ours—Complete and decisive Victory.
If you were asked to **give** to the Victory Loan 1919, you should do it in thankfulness for Victory.

But you are not asked to give—only to **lend** your money.
—On the best security in the world.
—At a good rate of interest.
If every citizen of Toronto will make it his duty to support to the utmost of his ability the Victory Loan 1919, we can gain such a reputation for Toronto as will astonish all Canada.
The money is here.
Why not make this a record?

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STEEL MAKING IS GOING AHEAD NOW

Work at Sydney Commences After a Shut-Down Lasting for Some Weeks

Sydney.—Steel making is once more in progress at Sydney Mines. After a shut-down of three and a half months, a portion of the open hearth furnaces of the Nova Scotia Steel and Coal Company are once again producing ingots. The re-lining of the blast furnace has just been completed, and steel officials expect to have the furnace blown in within the next few days. Under the most favorable conditions it takes several days to relight a furnace and produce a cast, but it is not the intention of the officials to force a quick cast, as the new lining is to be given every chance to become gradually accustomed to the increasing heat pressure. The blast furnace and open hearth furnaces were closed down about the first of July and have been under repairs ever since then. The first ingots since that date were produced a few days ago. As far as could be learned winter prospects at the Scotia plant during the coming winter are fairly bright. This seems to be particularly true as regards the steel industry. The company, it is understood, have some fairly large orders in view, but have not yet closed with them. Negotiations are in progress, and unless some unforeseen obstacle arises, the contracts will shortly be completed. The situation at the collieries of this company seems to be somewhat uncertain at present. Just now three of the four collieries of the company are working every day, while the other, the Jubilee, operates from three to four days per week. Whether this situation will continue indefinitely will depend largely on market conditions.

CATALOGUES

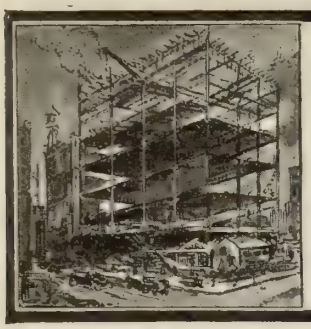
Paul O. Abbe, 30 Broad St., New York City, have issued a condensed catalogue (F), listing specialties such as ball and pebble mills, rotary cutters, mead mills, hammer mills, bolting reels and mixers. Bolting cloth, grinders and vacuum pumps are also listed.

The W. S. Rockwell Co., 50 Church St., New York, have issued a very useful steel heat-treatment chart, on which is given valuable data to anyone interested in this subject. We are informed that they will forward one of these charts to those interested upon request.

J. H. Williams & Co., makers of superior drop-forgings and drop-forged tools, with works at Brooklyn and Buffalo, N.Y., have just issued a catalogue, 4 by 6 inches, 160 pages, fully illustrating and describing their standard stock specialties. These include several lines of new goods, viz.: "Agrippa" turning-tool holders, set-screw pattern; "Agrippa" boring-tool posts; "Vulcan" forged-cutter tool holders, and several new assortments or sets of drop-forged wrenches.

The book contains, also, a description of the drop-forging process in very simple, non-technical style for the benefit of those not conversant with its details.

Plate Next Year.—After completing a tour of inspection of his company's properties, President Mark Workman of the Dominion Steel Corporation has returned to Montreal. Mr. Workman states that some of the furnaces at Sydney have resumed operations. With the completion of the new ship plate mill, which will probably become a producer early in the new year, an additional demand will be made on the furnaces. "The demand for steel products," said Mr. Workman, "is improving. There is, also, an urgent need for coal the world over, and it is this branch of our operations on which we are now concentrating our attention. With our unequalled loading facilities at four ports on the Atlantic seaboard, we are in an exceptionally advantageous position to take care of export and bunker coal requirements, and we are bending every effort toward raising our output to its normal level, in order that we may meet the conditions to the largest possible extent."



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

PERSONALS

A despatch from London, England, says: Roger Beck, director of Baldwin's, the great Welsh iron, steel and coal firm, sails for Canada this week to inspect the big Toronto business, recently acquired by the firm and from which much is expected. It is a coincidence that Lady Rhondda, daughter of the late Viscount Rhondda, is in Canada on business connected with the working of mineral properties purchased by her father.

Mr. P. J. Melvin has joined the staff of the Marine Navigation Company of Canada, Ltd., where he will take charge of all matters connected with the booking and handling of cargo for this company. His headquarters will be in Montreal. Mr. Melvin has been for a considerable period in the employ of the Canadian Pacific Railway as export freight agent.

OBITUARY

The death occurred recently at Monteith of Mr. John Critchley, formerly a well-known building contractor of Toronto. Mr. Critchley had large mining, lumbering and other interests in Northern Ontario. He was secretary of the Public School Board, a prominent Liberal, Mason, and member of the Anglican Church.

Mr. Cowan, well known as a railway construction contractor, died suddenly after addressing a meeting of his supporters in the election campaign recently. Mr. Cowan was 68 years of age, and owned a large farm on the outskirts of Cannington, Ont. He is survived by a widow, one son and one daughter.

Mr. Barry Smith of the Dominion Construction Company, Toronto, met his death at Parry Sound under unusual circumstances. Mr. Smith was resident engineer on concrete construction in this district for the C.N.R., and was traveling in the conductor's van of a construction train when it was wrecked. Fire broke out and Mr. Smith was fatally burned.

Duncan McD. Campbell, formerly assistant city engineer of Halifax, and engineer on the staff of the Nova Scotia Highway Board, died at his home after an illness of about one year. Mr. Campbell was a native of Truro.

Mr. James Low, a prominent contractor of Ottawa, was drowned through falling into the Rideau Canal recently.

The death occurred at St. John's Hospital, Buffalo, of Capt. Clinton G. Innes. Deceased was one of the oldest and best known captains on the Great Lakes. He was 74 years of age, and had sailed the lakes since boyhood. For many years he was in command of steamers of the Pittsburgh Steamship Company. His last boat was the steamer H. H. Rogers of that fleet.

MARINE

Buffalo.—The bow of the steamer "Northland," which has been cut in two at the yard of the Cowles Shipyard, is now ready to leave Buffalo for Levis, Quebec. The Northland has been purchased by the Davey Shipbuilding Co., of Levis, which company purchased the bow end of the Northwest. The stern end of the Northland will be ready to leave very soon after the bow.

Detroit.—The United States Shipping Board have sold the steamers "Seneca" and "Bethlehem" to Great Lakes owners. The steamers will be delivered at Boston. The Seneca has arrived at Boston, and the Bethlehem will leave Portland for Boston as soon as she is discharged. The new owners are in Boston awaiting the vessels.

Cleveland.—There is very little shipment of grain, and most of the ore shippers are cleaned up. There may be better movement of grain at the beginning of the month, but many boats are being tied up. Several steamers have taken short cargoes during the week. Cold weather at the head of the lakes had the effect of delaying ore shipments, as the ore was frozen, and had to be thawed out before loading.

Guernsey.—At the entrance to the Russell Channel leading to St. Peters Port, Guernsey, Channel Islands, a lighthouse has been erected which is entirely controlled from the shore by means of a cable about 1½ miles long. This cable is of very strong construction, and carries current to control the light, and also the foghorn. The horn has been heard on the French coast 34 miles away. The lighthouse is called the Platte Fougere.

Toronto.—The old "Chicora," one of the most interesting vessels on the Great Lakes, foundered at her moorings at the foot of Cherry Street, through a leak of some sort. It is surmised that the packing may have got out of one of the seacocks, or something of that nature. The water came in faster than the pumps of the salvage boats, hastily summoned, could remove it, and she sank, snapping her mooring ropes as she went down. She will be removed.

Ottawa—Up to date 15 ships have been delivered to the Canadian Government Merchant Marine, and are in service There have been 25 sailings, and the tonnage carried aggregates 116,000 tons.

Bridgeburg.—The Canadian Allis-Chalmers have completed the steamers "War Magic" and "War Vixen," and they will have their trial trips at once. The yard has been working overtime in order to complete the vessels before the close of navigation. They are the standard 2,500 tons size built for the Imperial Munitions Board. There are two other vessels on the ways.

Grimsby.—A dredge that was being towed from Grimsby by the tug St. Paul, broke away from the tug during heavy weather, and sank almost immediately. Here the crew were taken off, but one man named John McLaughlin, was taken down by the craft and drowned. Two scows which were in tow were washed ashore later. They carried no crew.

TRADE GOSSIP

Natco to Enlarge Plant.—The National Automatic Tool Company of Richmond, Indiana, manufacturers of multi-drillers, have placed a contract for a new addition to their plant, which will be of steel and brick construction, and will be equipped with the most modern machinery. It has only been three years since the "Natco" doubled their capacity by enlarging their plant, but the increased demand for Natco multi-drillers, both domestic and foreign, necessitates this additional building, which will enable them to again double their capacity.

Textile Machinery Plant for Hamilton.—The Jenckes Machine Company of Pawtucket, R. I., are to build a plant in Hamilton that will employ 1,000 hands. The Jenckes Company is said to be the largest firm in the United States manufacturing textile machinery. Their locating in Hamilton is contingent on the Firestone Tire and Rubber Company ob-

taining the concessions they are asking off the town, as the plant of the Jenckes Company would be employed in making the machinery for the Firestone Company in the first instance.

Doing Quick Work.—Although the Ontario Steel Products received a severe blow in the burning of the company's plant at Chatham in the beginning of September, the energy of officials has to a large extent overcome the disadvantages of the situation, and in a very short time the company will be operating at 50 per cent. of capacity in a new building erected on the site of the old. Furthermore, advantage was taken of the destruction of the old factory to construct a modern fireproof structure, which will insure the company against unfortunate occurrances of a similar nature in the future. The shape of the new building will be somewhat different to that of the old, permitting centralization of operations and producing greater economics in manufacture. In this, they were assisted by the fortunate circumstance that, at the time of the fire, a new plant had been planned for Oshawa, after careful consideration had been given to all details. In consequence of this, a contract for the new plant at Chatham was let within a couple of days of the fire and building operations were immediately proceeded with. Already the plant has sufficiently progressed to permit certain operations to be carried on, and within a fortnight or so it will be operating at 50 per cent. of capacity. The company has more orders on its books than it can attend to for months to come, and, in spite of the interruption will, it is declared, have a good year.

Truck Factory Coming.—Towns in the Niagara district are competing with each other to secure a two-million dollar truck factory, which it is purposed to erect in Canada. This will be a branch of a large American factory with headquarters in Brazil, Ind. Bridgeburg men own some of the stock, and the Industrial Commissioner of Welland is endeavoring to land the industry for his town.

Competition For New Factories.—The town of Guelph is anxious to get new industries, but is not able to put up the inducements that Brantford is offering. Three of the firms which are negotiating with Guelph have announced their willingness to locate there if the same concessions are offered them as at Brantford. Brantford offers to build a new factory, charging the firm a rental of 8 per cent. on the total cost of the building, and giving the firm the right to purchase in five or ten years at actual cost. The firm offering these concessions has its bonds guaranteed by the town of Brantford. Guelph cannot offer any such conditions.

Department of Labor Statistics.—The returns from the Provincial and Dominion offices of the Employment Service show a decrease in the number of placements compared with the returns of the previous week. 8,222 persons had been referred to regular positions, and of these 6,949 received employment (1,294 casual jobs were supplied. During the week 9,097 applicants were registered, of whom 610 were women. Vacancies totalled 9,174, of which 705 were for women. The number of soldiers placed was 2,670, or 38.4 per cent. of the total regular employment placements.

Trade With the Orient.—There is a good opening for profitable trade with the Orient, but Canada is not pushing this to the same extent as the U. S., according to Mr. Gilchrist, a prominent Vancouver man, who has just returned from a trip to China. He said a big concern was being formed in China and was now ready to establish a passenger steamship line to Vancouver from Chinese ports.

Plenty of Coal in London.—London has more bituminous coal than she needs, according to Mr. A. M. Heaman, a leading coal dealer of that city. He said the same condition applied all over Western Ontario. A considerable portion of this coal was left over from last year.

Belleville Goes After Industries.—An industrial corporation has been formed in Belleville with a capital of $200,000 to aid and finance manufacturing enterprises that locate in the district. An automobile tire valve company was contemplating locating in Belleville, and a number of Belleville men were agreeable to taking stock in the company.

Chemical Industry for Vancouver Island.—An anouncement was made recently by Premier John Oliver that large deposits of alum and potash had been discovered on the west coast of Vancouver Island. The Premier stated that if at all feasible the industry would be developed in order to make Canada independent of the German source of supply.

Trade Fair for Britain.—A trade fair to be held simultaneously in London, Birmingham and Glasgow, lasting for a fortnight, is being organized by the Board of Trade. It will be the greatest ever held in the British Empire, and over a hundred thousand invitations will be issued. Only manufacturing firms in the Empire will be allowed to compete. The Crystal Palace will be used for the London fair.

Co-operative Shipbuilding. — At a Board of Trade meeting in Victoria the president of the G.W.V.A. made the statement that the shipyard workers would put up $350,000 if the business men would contribute $500,000 to ensure the continuance of wooden shipbuilding. A representative of the Cholberg firm called attention to the large number of sailing vessels lost during the war, and said that this class of vessel

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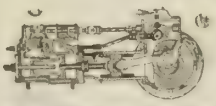
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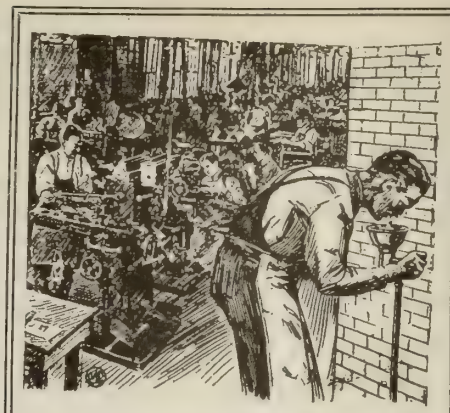

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Trade With South America.—A new company has been formed by South American, United States and Canadian engineers and business men to promote trade between North and South America. The firm will be known as Trading Engineers Inc., and will have offices all over South America. The Brazilian manager is at present in Canada endeavoring to interest Canadian firms in the South American market. The company has a capital of $450,000.

C.P.O.S. and Furness Withy.—Sir Frederick Lewis, of Furness, Withy & Co., has announced the completion of an arrangement with the Canadian Pacific to supply half the tonnage required in the services to Montreal and London, and Montreal and Antwerp. These lines are known as the Canadian Pacific Joint Services. The Furness-Withy Co. have also taken over the New York and Bermuda service of the Quebec Steamship Company, and have bought the steamer "Bermudian." In St. John, N.B., they have acquired the business of William Thomson & Company, who for many years acted as the company's agents in that port.

Albert H. Mitchel has become associated with H. W. Cotton, Inc., of Brooklyn, N.Y., as vice-president and general sales manager, with headquarters at their New York office in the Woolworth Building. Mr. Mitchel was formerly for nine years with Taft-Pierce Mfg. Company of Woonsocket, R.I., having been in their engineering department there, after which he entered the sales department as Chicago representative. For the last five years he has been at their New York office as district sales manager. The H. W. Cotton, Inc., have a large plant in New York State for designing and building jigs, tools and special machines.

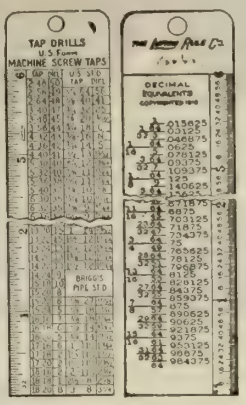
Edward R. Abbott has joined the sales force of H. W. Cotton, Inc., of Brooklyn, N.Y. He will have charge of the Western business, making his headquarters for the present in the Woolworth Building, New York City, and later at Cleveland, Ohio. Mr. Abbott was formerly with the Taft-Pierce Mfg. Company of Woonsocket, R.I., as a member of the sales force of their New York office for several years.

Fire Did Not Stop Them.—The Eureka Pattern & Mfg. Co., Ltd., 337 King St. West, of which D. B. Adamson is the manager, had an unfortunate fire in their premises on Sunday morning. It is not going to put the firm out of commission, as they are already prepared to go ahead with their lines of making patterns, designing jigs, tools, etc.

A New Machine.—The Williams Tool Co., Erie, Pa., manufacturers of pipe-cutting machinery, have developed a machine and attachment for cutting both straight and tapered threads. This operation has, in the majority of cases, required a lathe, and it is claimed for the new type of machine that it will do

the work in one-tenth of the time. A fuller and more detailed description of the machine will appear in CANADIAN MACHINERY later.

Rousing Sales Meeting.—The Independent Pneumatic Tool Company, general offices, No. 600 West Jackson Boulevard, Chicago, has just completed a very successful sales meeting at which branch managers and representatives from the north, south, east, west, and Canada, were in attendance. The meeting was in charge of Vice-President and General Sales Manager R. S. Cooper; other officials of the company in charge being: John D. Hurley, president; F. W. Buchanan, secretary; Adolph Anderson, assistant to president; F. B. Hamerly, works manager; Axel Levedahl, consulting engineer; and R. A. Norling, C.D.



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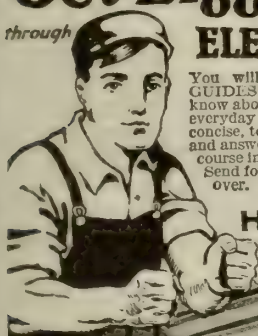

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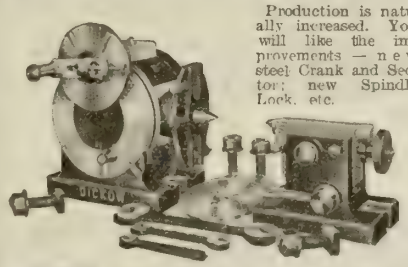

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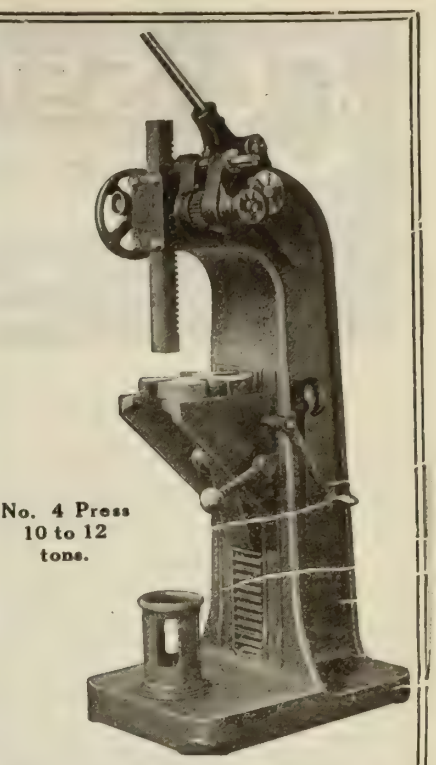

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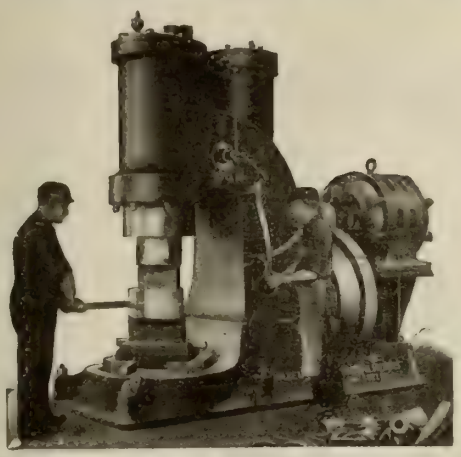

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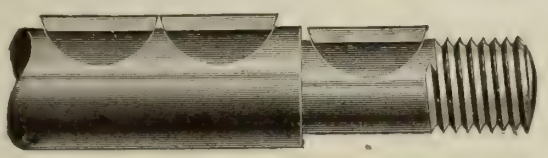

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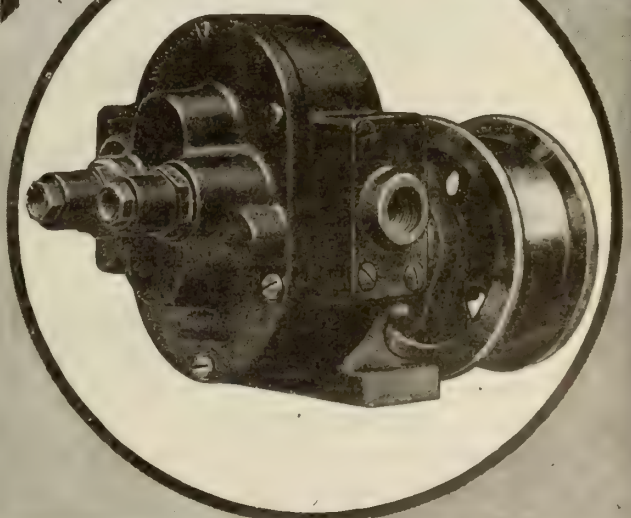

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39 ADELAIDE STREET EAST TORONTO, ONTARIO

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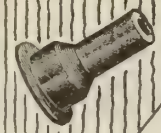
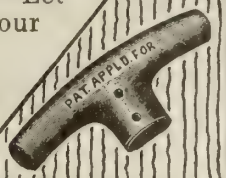
TOOLS & STAMPINGS



We have the equipment to make the tools and produce the stamping. Let us quote on your requirements.



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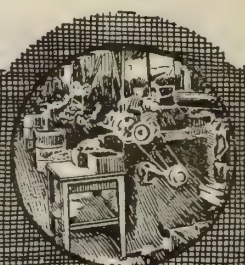

HACK SAWS AND TOOTH SHAPES

Right down at the bottom of cheaper cutting costs is the shape of the tooth. Years of experiment and actual working tests have given us the "Standard" shape tooth. It 'cuts quicker and lasts longer."

And here's the reason. As a saw is used the points are worn off and the "contact area" of the teeth on the work becomes so great that enough weight to make the teeth "bite" crushes or breaks the blade. In other words, "the saw is dull."

Another thing: In the acute or "positive" angle tooth the leading edge points in the direction of the cut, it's always "digging in" under the surface and most likely to strip. The negative angle tooth simply scrapes off the metal and does not actually cut at all. The hook tooth is under the same handicap as the acute angled tooth. In all unusual teeth the "contact area," the friction producing surface, is greater than with the "Standard" tooth.

The easiest, surest way to get economy in Hack Saws is to use Starrett Blades with the Starrett Chart. Send for Catalog No. 21 "3"

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Starrett Hack Saws

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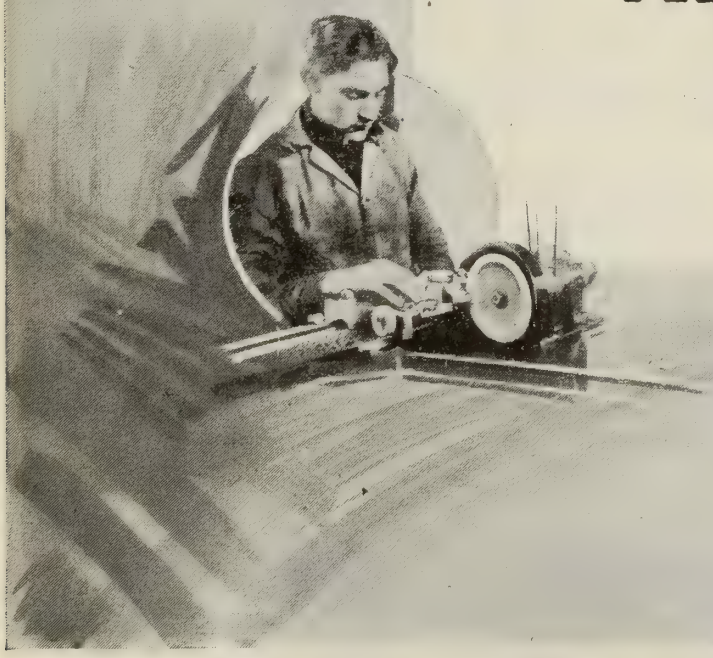
ANNOUNCING THE NEW

ONE OF THE MOST IMPORTANT ANNOUNCEMENTS MADE IN YEARS TO THE USERS OF GRINDING WHEELS IS ON THE NEXT PAGE

IT TELLS ABOUT THE REMARKABLE NEW ABRASIVE

ALOXITE AA



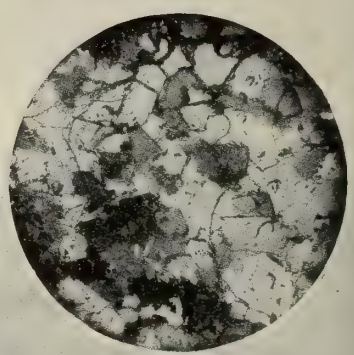


Photo No. 1—Microphotograph showing size of alumina crystals of the ordinary aluminous abrasive. The average diameter is .0027 inch.

THE CARBORUNDUM COMPANY

NEW YORK CHICAGO BOSTON DETROIT CLEVELAND PHILADELPHIA

ABRASIVE ALOXITE AA

FOR some long time the Carborundum Company has felt that industry needed a new abrasive for grinding high-speed steel, case-hardened steel —for the grinding of reamers, cutters, hob mills—for the grinding of certain cylindrical work and for grinding broad steel surfaces where a large amount of stock is to be removed.

Such work called for an abrasive that could be bonded into a wheel that would not only cut cool, but would show marked uniformity in its structure, and would, at the same time, cut grinding costs by producing more work and lasting longer.

The Need Has Been Met and Filled with the NEW ALOXITE AA WHEEL

Aloxite AA is a new aluminous abrasive. It is from 98½ to 99 per cent pure alumina. There are just enough other ingredients, in just the right proportions, to produce a desirable toughness.

One of the most distinctive features of Aloxite AA is the remarkably large size of its crystals. They are much larger than those of the ordinary aluminous abrasive. Because of these big crystals every grit or grain in an Aloxite AA wheel is a definite fragment broken from a larger crystal—and every fragment is keen edged, cutting like a tiny lathe tool, giving the wheel unprecedented sharpness and freedom of cut. Then, too, Aloxite AA Wheels can be made of an open brittle structure yet of a soft grade. This again insures free, clean cutting.

Within the limits of the work mentioned, Aloxite AA Wheels have already, after repeated tests, created a furore among many users of grinding wheels.

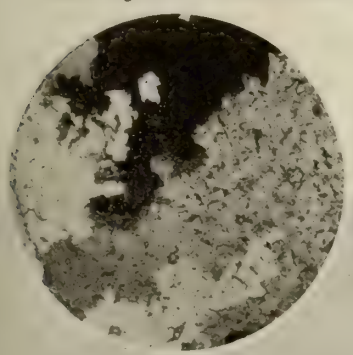
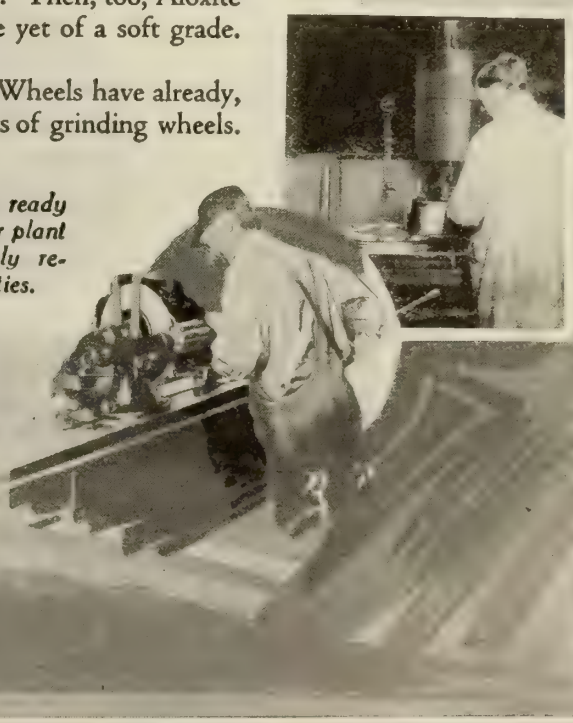


Photo No. 2—Microphotograph showing the large crystals of Aloxite AA. Each area of the same color is one crystal growth. The average diameter is .250 inch, approximately one hundred times larger.

Aloxite AA Wheels are ready right now to come into your plant and demonstrate their truly remarkable grinding qualities.



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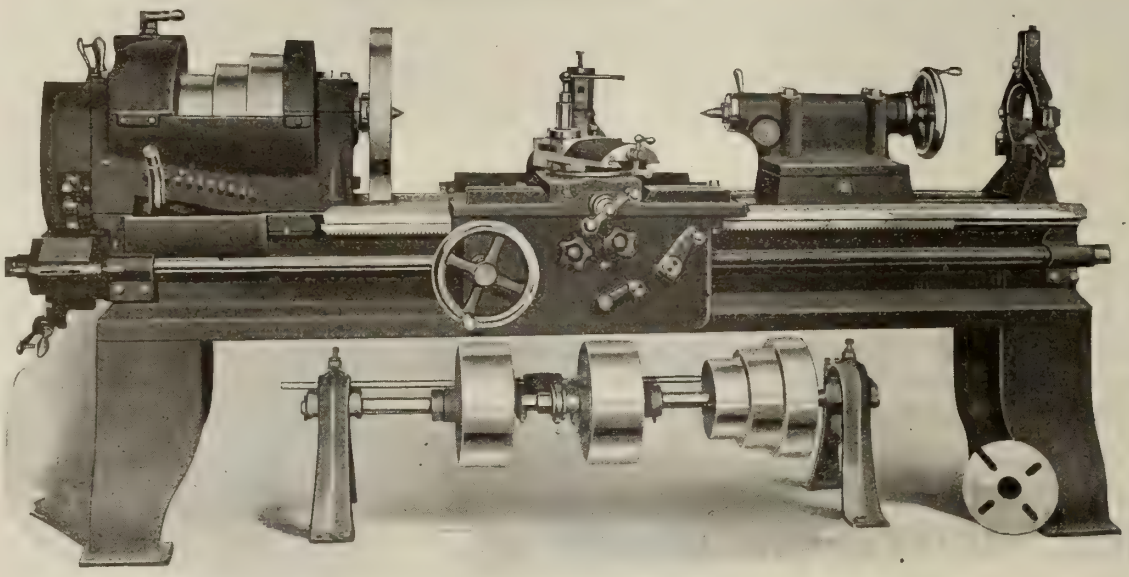

New Type of Webbed Headstock Insures Great Strength and Rigidity Under All Conditions.

When You Buy a Lathe what do you expect?

Some buy simply because of the name, but the real intelligent buyer goes deeper into the problem.

He wants to feel sure that the material and workmanship is there, together with economy of upkeep. Accuracy must be a strong point in its favor. All these features are combined in every Rae Lathe shipped from our plant.

Rae Machine Tool Works, Limited, HAMILTON ONTARIO

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Did You Ever See Two Postage Stamps Stuck Back to Back?

Well, that's the way two bricks stick together when our cement is used.

The greatest loss in your furnace efficiency occurs as the result of leakage, cold air pouring in and interfering with proper combustion.

We Have Got This Licked!

Fireclay dries up and sifts out from between the bricks like powder.

But our cement sets and makes a surface like glass yet allowing for expansion and contraction. It sells hot or cold and stands a heat up to 3,000 degrees Fahrenheit.

This cement makes a joint that is stronger than the bricks themselves, and that is itself the strongest part of the whole furnace.

A five-pound tin of **Clinton Super-Heated Cement** will be sent to you free and all charges prepaid, if you write the

Standard Machinery & Supplies Limited

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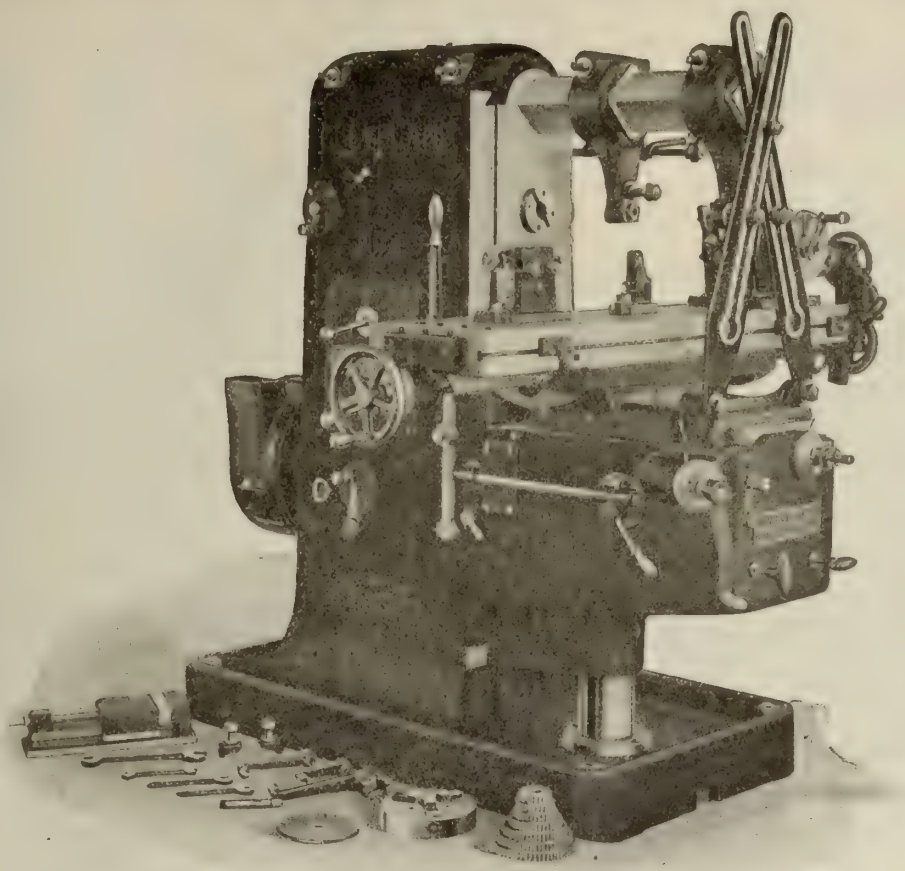

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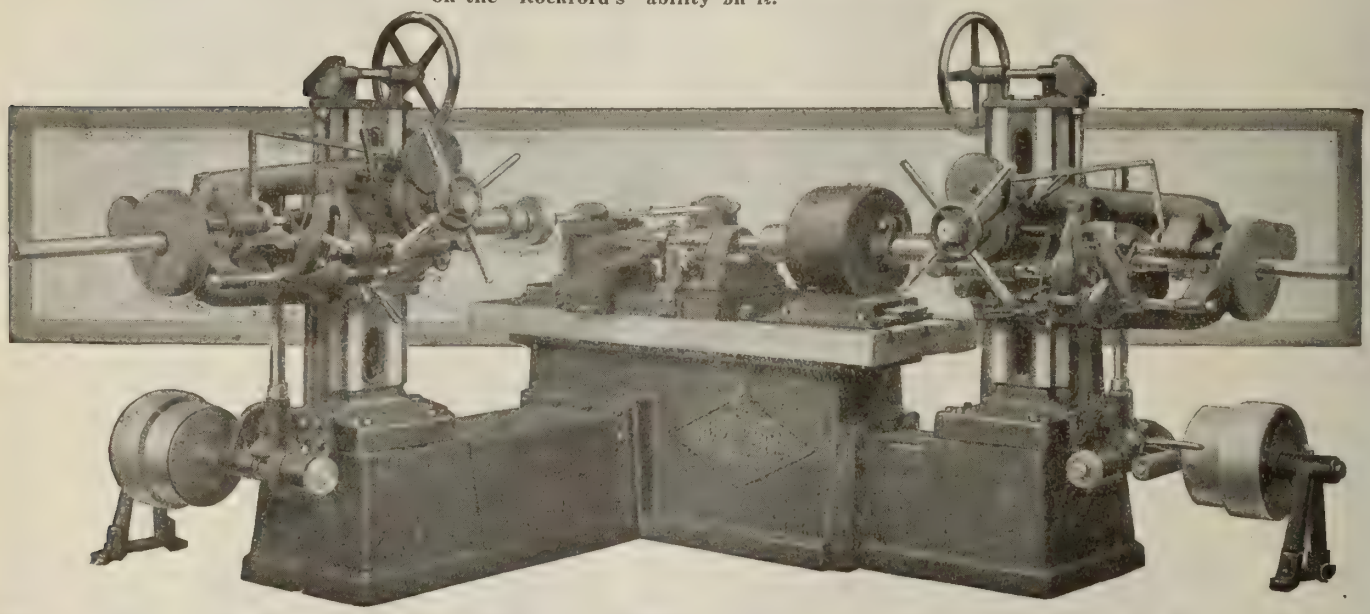
For Automobile Manufacture

This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



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A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

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send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

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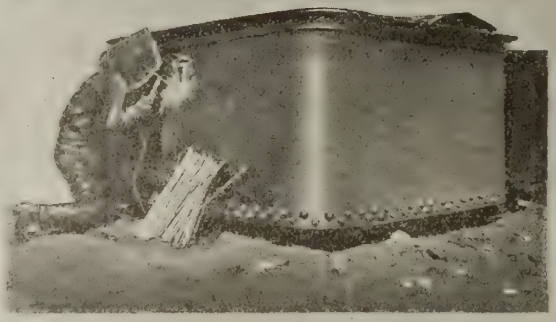
Welding Submarine Cable with Oxy-Acetylene and ARMCO IRON Welding Rods.



Repairing a Tank with the Electric Arc and ARMCO IRON Welding Rods.

ARMCO IRON is the STANDARD guaranteed welding material

Why experiment with inferior products which endanger the weld and cause loss of time and money?

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99.84 per cent Pure Iron Content (minimum) Guaranteed. In uniformity of composition and practical freedom from such foreign matter as sulphur, phosphorus, manganese, silicon, slag, and oxides, ARMCO (American Ingot) IRON actually surpasses the imported welding materials which conscientious welders once considered essential for the best results.

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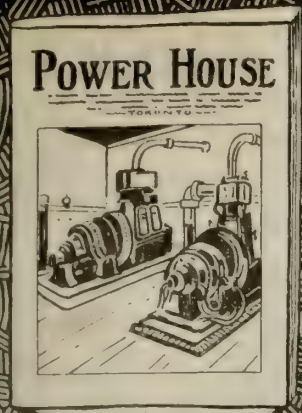

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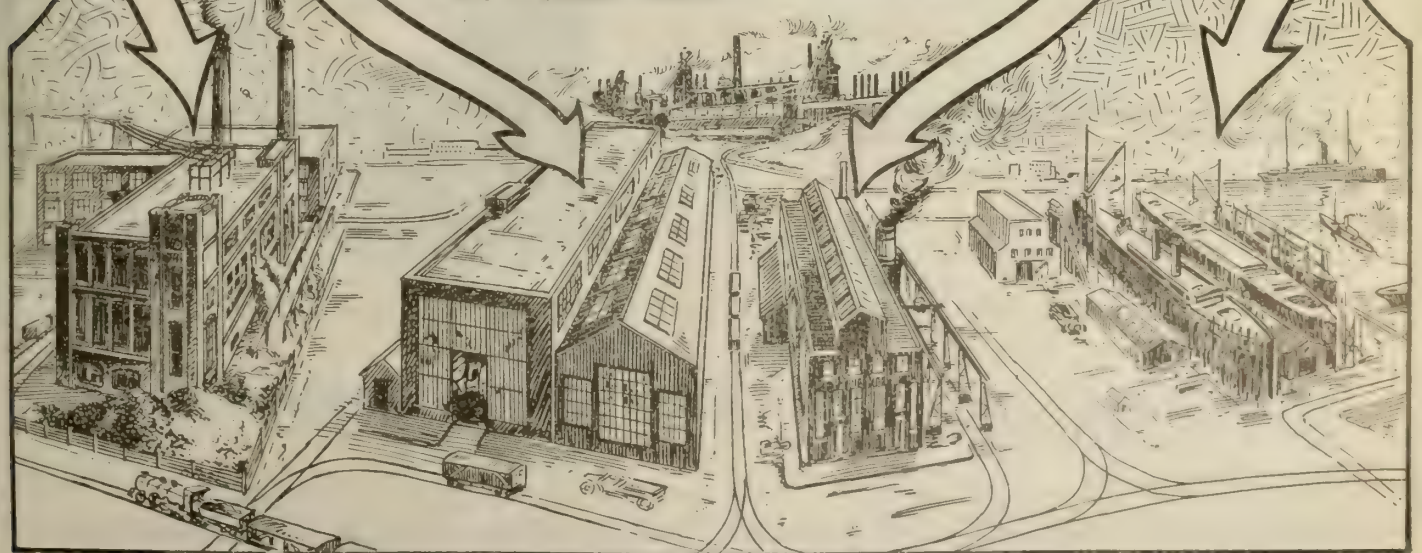

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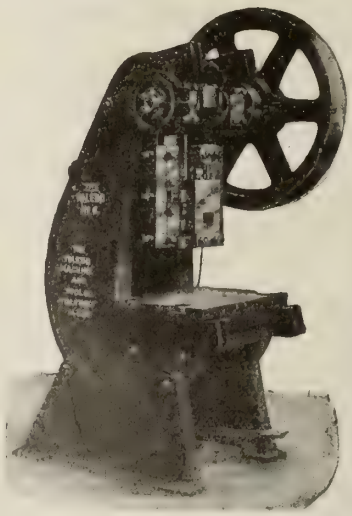

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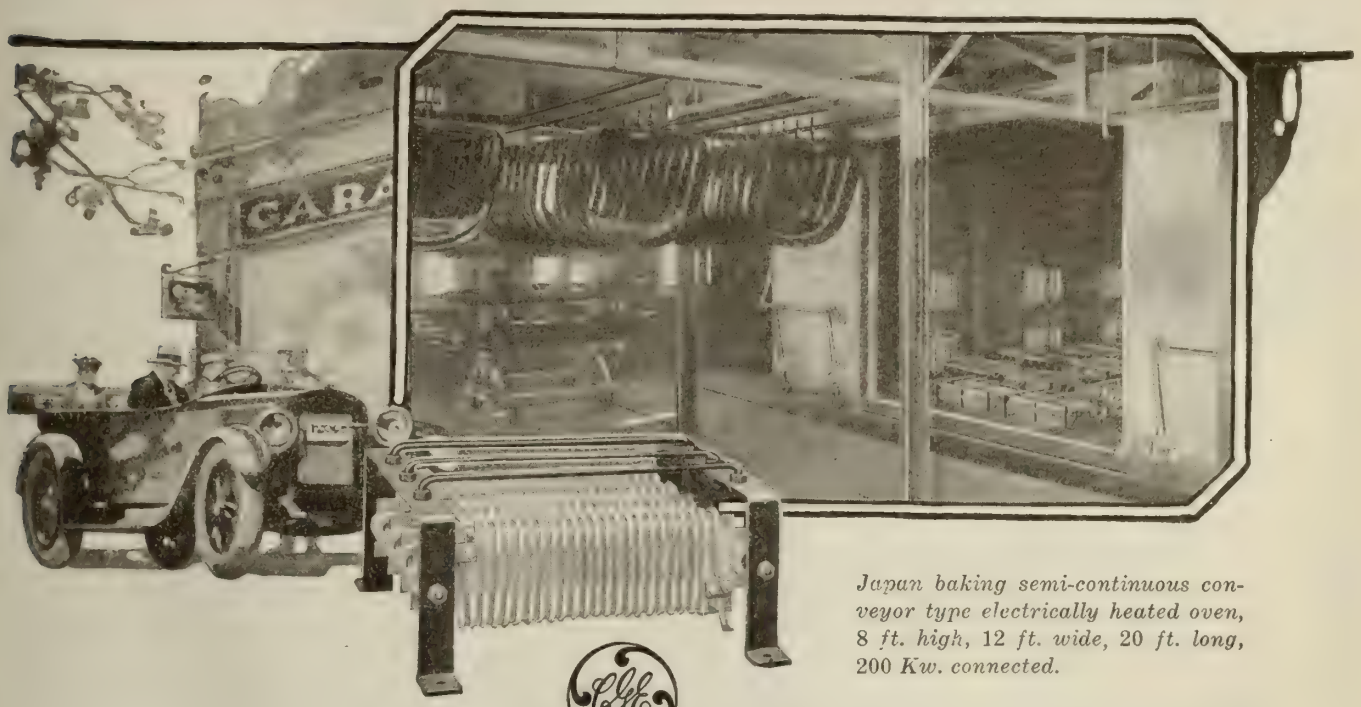

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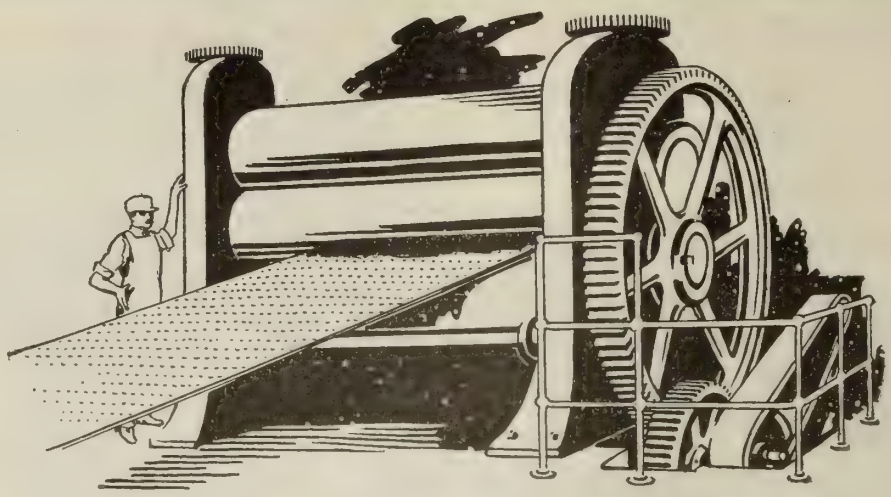

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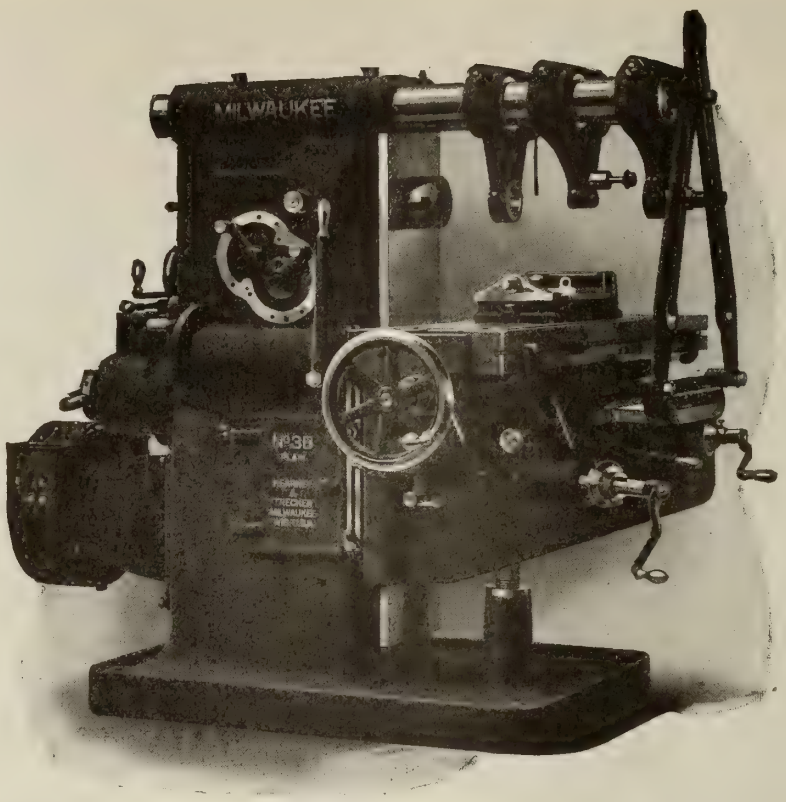

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Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

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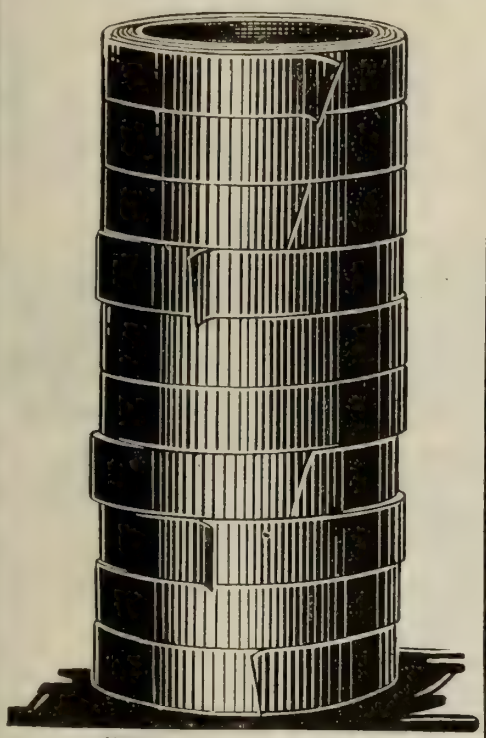
MILWAUKEE, WIS. U.S.A.

The Wallace Barnes Company



"Barnes-made for every trade"

SPRINGS, WIRE & STEEL — EST — "BARNES-MADE" PRODUCTS — 1857 — SCREW MACHINE PRODUCTS

Using Science as an Ally

Before our manufacturing processes begin, materials are submitted to our Laboratory for Chemical and Physical analyses.

By scientific infallible tests these raw products are charted, so that their absolute wearing qualities are ascertained.

The application of science to spring making reduces the number of defective springs in the final inspection by eliminating the unfit material before manufacture.

Our springs are scientifically produced on a basis of the actual needs of the purchaser plus "Barnes-Made" quality.

ESTABLISHED 1857

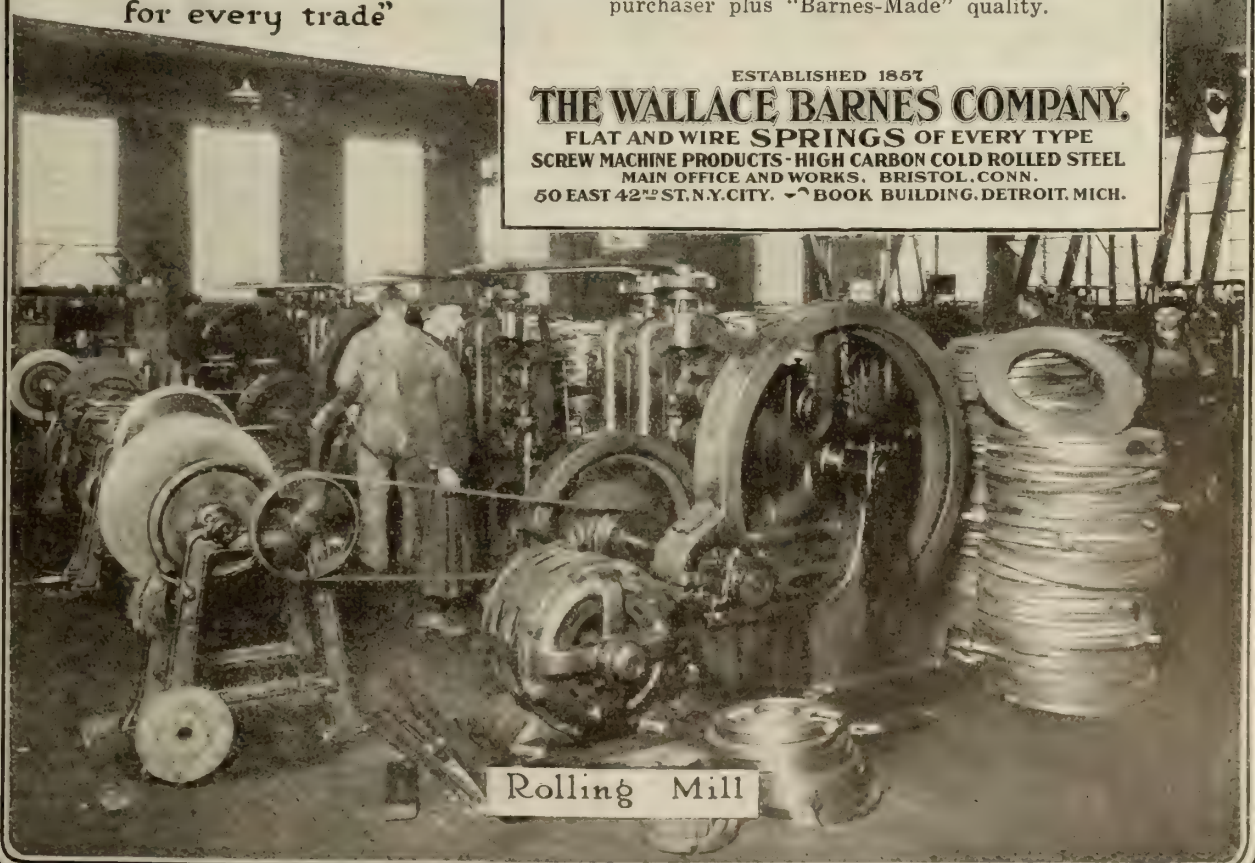
THE WALLACE BARNES COMPANY.

FLAT AND WIRE SPRINGS OF EVERY TYPE

SCREW MACHINE PRODUCTS - HIGH CARBON COLD ROLLED STEEL

MAIN OFFICE AND WORKS, BRISTOL, CONN.

50 EAST 42ND ST. N.Y. CITY. — BOOK BUILDING, DETROIT, MICH.



Rolling Mill

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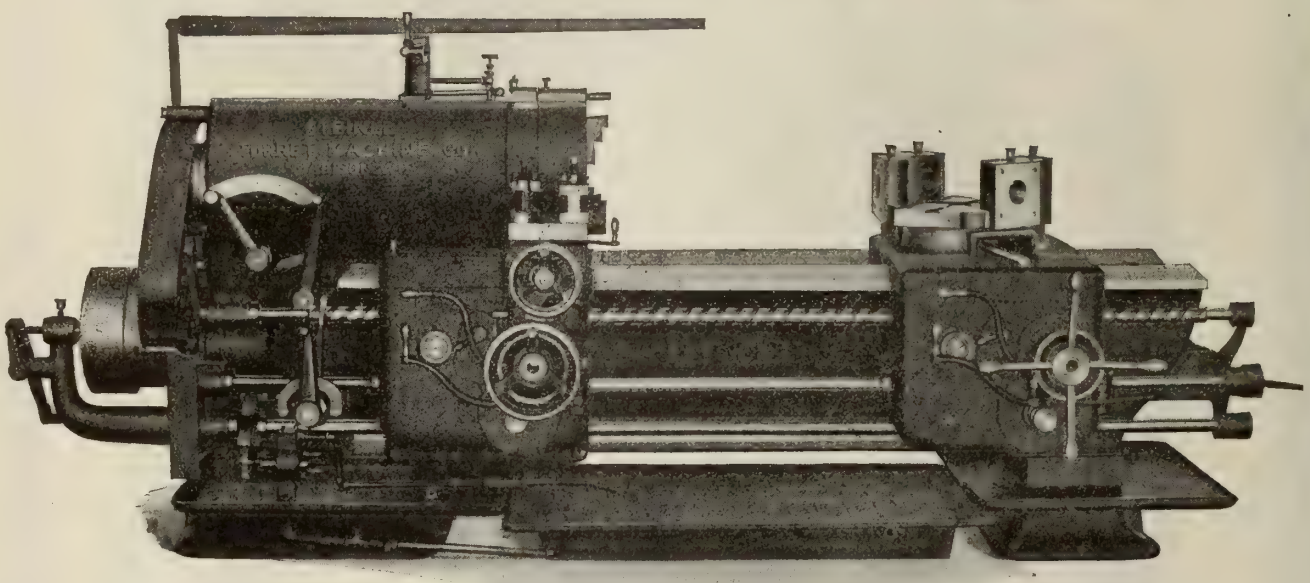
STEINLE



Still another reason why the Steinle 24" Full Swing Side Carriage Turret Lathe is ahead of all others in the economical and accurate production of many classes of work.

THE COMBINATION TURRET

In designing this turret the following points were taken into careful consideration:

The proper manner of supporting different kinds of tool equipment required on a machine of this character.

Avoidance of excessive tool overhang.

Ability to secure the full benefit of the side carriage in relation to the absence of turret tool overhang.

As regularly furnished, the combination turret is hexagon in form, 21" in diameter, and has two open sides and four bored faces. The open sides permit of universal facing heads or similar tool equipment being firmly secured to the bed of the turret and provide for suitable adjustment of tools to the work with a minimum overhang. The bored faces carry drills, boring bars, reamers, die heads, taps, etc.

The combination turret has power traverse and quick change reversible longitudinal feed controlled from the apron.

The bearing on the saddle is the full diameter of the turret. The locking pin is located in front, the greatest possible distance from king pin. One motion of the binding lever releases the pin and turret, or binds same.

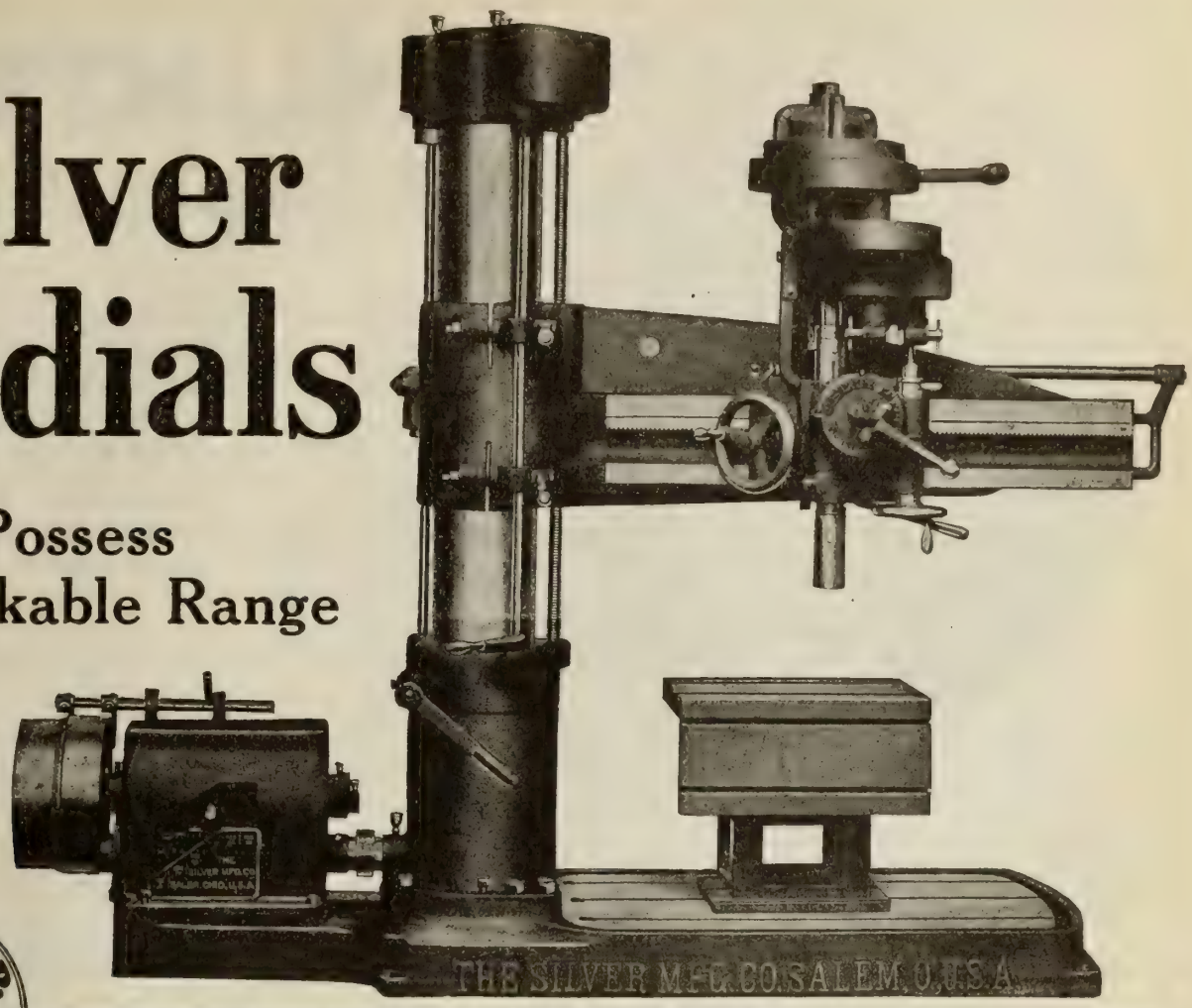
The design of the combination turret secures the full advantage of the side carriage feature.

STEINLE TURRET MACHINE CO.

MADISON - - WISCONSIN, U.S.A.

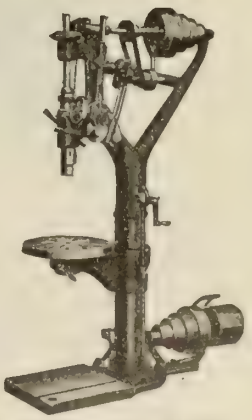
Silver Radials

Possess Remarkable Range



THE possibilities of Silver Drills could not be revealed better than by a tour of the many shops where they are part of the equipment.

It is found in the many lines represented that each superintendent is convinced that the Silver meets his particular requirements. Simplicity and convenience mark every feature incorporated in these drills. Easy running, ball bearing construction, careful design and excellent balance insure increased production with these modern machines. Send for attractive folder on the new Silver Radials.



Silver 20" Upright Drill

SILVER
20-inch Drills

are strong, rigid, speedy and dependable.

They are made in four distinct styles with round or square base, and in gangs of 2, 3 or 4 spindles.

These drills are adapted for all modern machine shop practice demanding speed and accuracy.

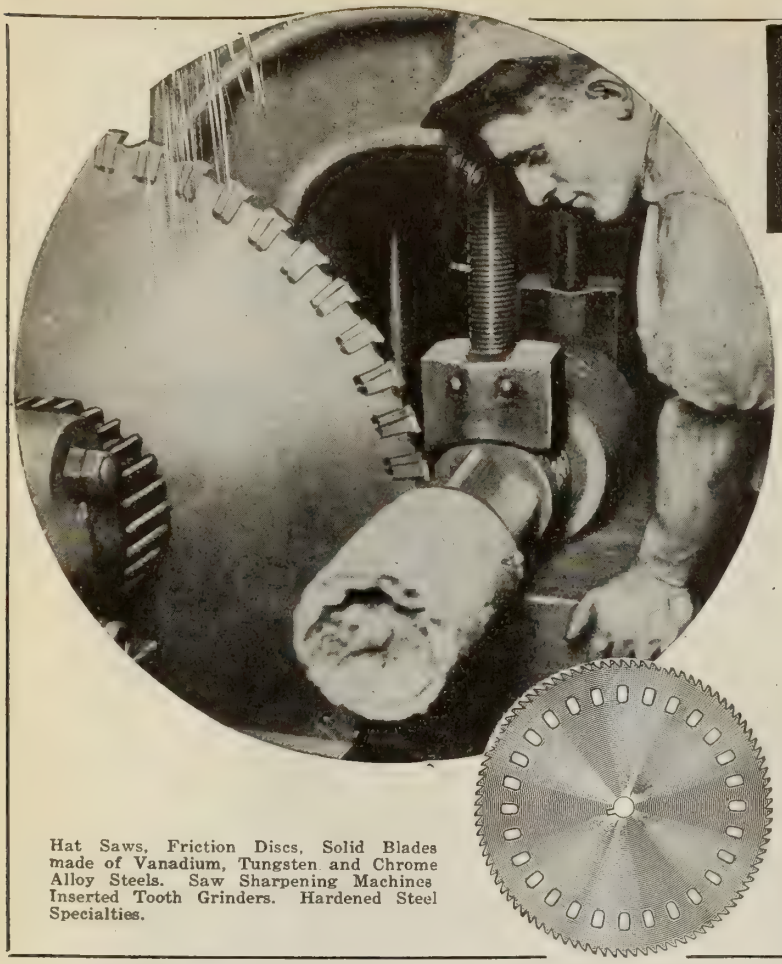
Send for our new Machinery Catalog showing our full line of drills, saws, jointers, etc.

THE SILVER MANUFACTURING COMPANY

BOX 290

SALEM, OHIO, U. S. A.

If interested tear out this page and place with letters to be answered.



HUNTER
Duplex Saws

The selection of many of the best and largest companies in the country for cutting ingots, bars, forgings, castings, rails and structural shapes.

Their fast cutting qualities mean a saving of time and power, plus increased production.

Teeth are accurately formed, ground and set for highest speed and greatest endurance. Made in sizes up to 90 in. in diameter.

Write for price list and full particulars

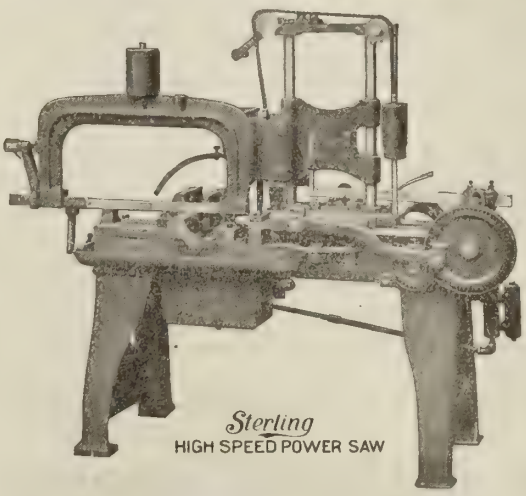
Hat Saws, Friction Discs, Solid Blades made of Vanadium, Tungsten and Chrome Alloy Steels. Saw Sharpening Machines Inserted Tooth Grinders. Hardened Steel Specialties.

HUNTER SAW & MACHINE CO.
Pittsburgh, Pa.

HACK "STERLING" SAWS

"STERLING" Blades are worth a trial. Tell us or your dealers of your needs.

We can save you money.



To get the best results from power blades, a good machine is necessary. Try the "STERLING." The combination is excellent.

Manufactured by

DIAMOND SAW & STAMPING WORKS, 357 Seventh St., Buffalo, N.Y.

Photographic Copying
The PHOTOSTAT

(Trade Mark Registered)

"Orders are now delivered three or four days earlier to our customers by making photographic copies of sketches and drawings which are the same in every detail instead of having our draftsmen reproduce the original.

"Practically all orders were previously held up three or four days by our drafting department while copies of the intricate drawings of ordered tools were being made. Now with the Photostat, only 15 or 20 minutes are required to make the three copies, exact duplicates of the original, which the factory needs to turn out the order. By eliminating this needless delay we are able to provide better service for our customers, and attract new prospects because of prompt deliveries."

This cut shows a PHOTOSTAT on which a large drawing has just been copied in less than a minute.

Never Makes a Mistake

It is simple, practical, easy to handle. Requires no expert knowledge. The machine is loaded with a roll of sensitized paper especially manufactured for the purpose.

The original subject is photographed directly upon this paper producing a facsimile copy which is immediately cut off, developed and fixed right in the PHOTOSTAT itself.

The focusing, exposing and developing are all controlled by simple mechanical devices and no glass plate, film or other intermediate negative has to be made.

After fixing, the copy is removed to a tank of running water and rapidly washed free from chemicals. It is then dried and is ready for use. As many copies as desired may be run off in this manner.

By a simple adjustment of the mechanical focusing device the copy may be made at actual size, reduced, or enlarged, within the size limitations of the machine.

Error in copy is impossible because every copy is an absolute facsimile. The operations are all simple, such as a boy or girl can do.

The PHOTOSTAT Copies

Pencil Drawings, Ink Drawings,
Tracings, Reports
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Contracts, Ledger Pages,
Illustrations for Salesmen, Insurance Records,
Sketches, Blue Prints,
Specifications, Maps,
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AGENCIES:

Alfred Herbert, Ltd., Coventry, England
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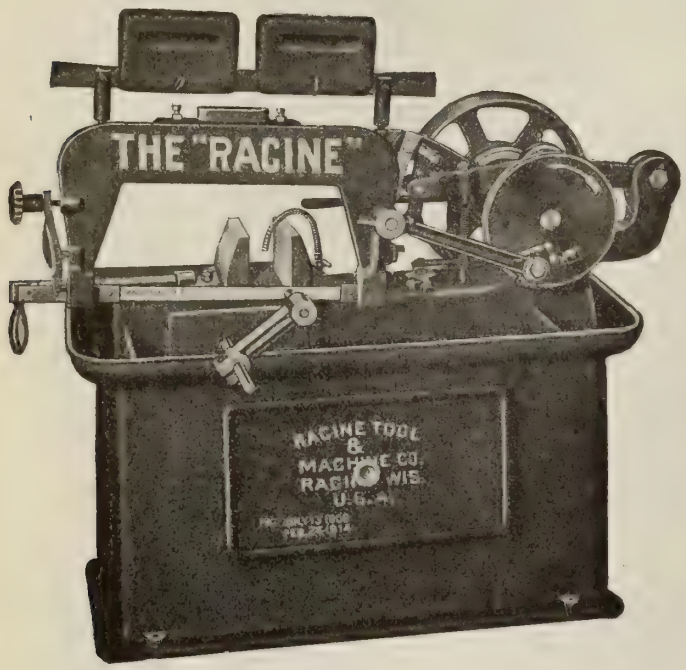
Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

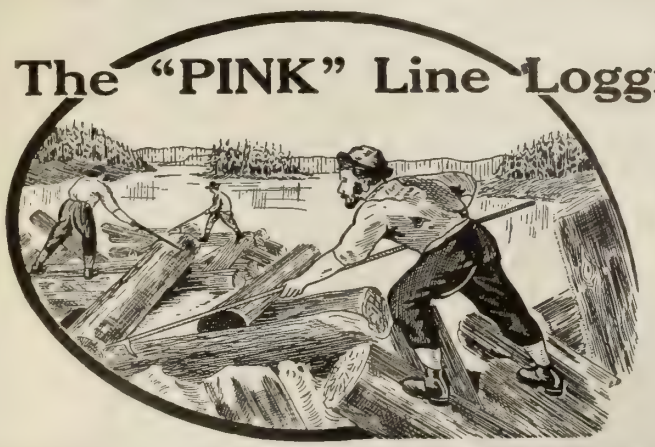
Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue, - RACINE WIS. U.S.A.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

EXPORTERS TO EUROPE

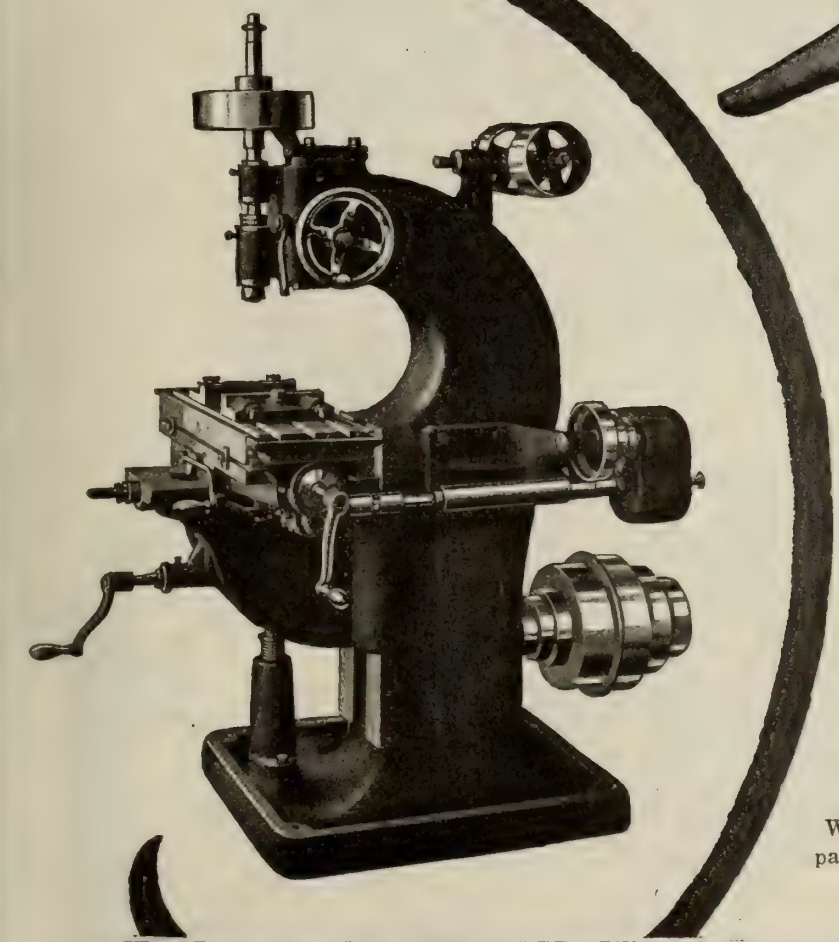
We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited
PEMBROKE, ONT., CANADA

BRISTOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

If interested tear out this page and place with letters to be answered.

If You Want Production--

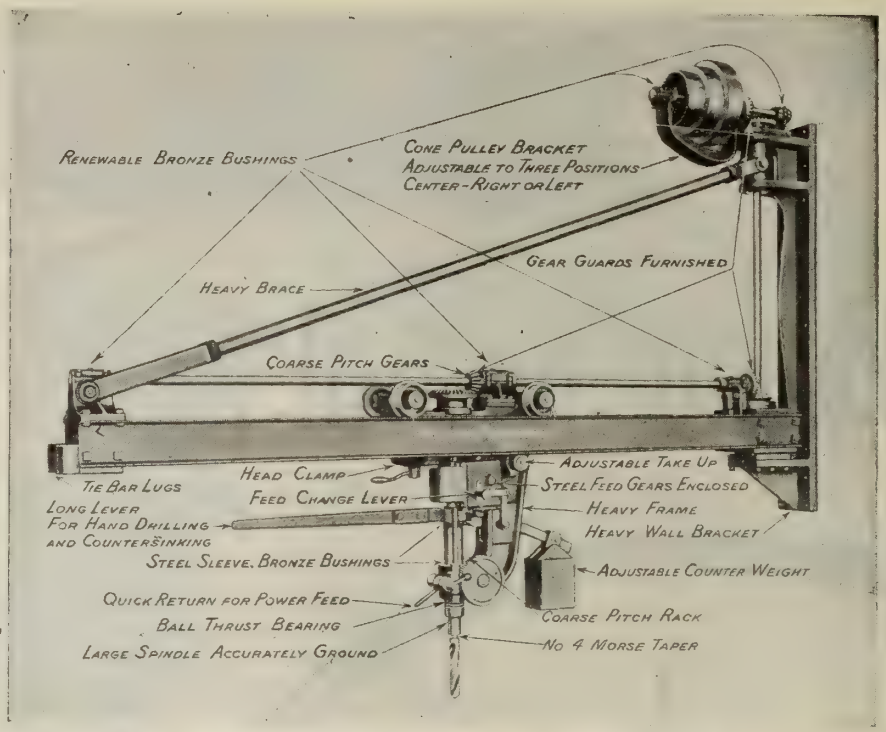
You can't do better than install this Wall Radial Drill in your plant. We'll say you won't have it in operation more than a month before you will begin to congratulate yourself on your judgment in adding this machine to your equipment. Materials and workmanship that you can depend upon to the limit are features of the construction, and our bulletin will give full details.

GET IT TO-DAY!

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue **Dept. B** **BOSTON, MASS.**

Built for Service

The Canadian Radial Drill is designed particularly for work in structural shops. For seaming and countersinking large surfaces such as structural shapes, boiler plates, long beams, etc.

Specifications:

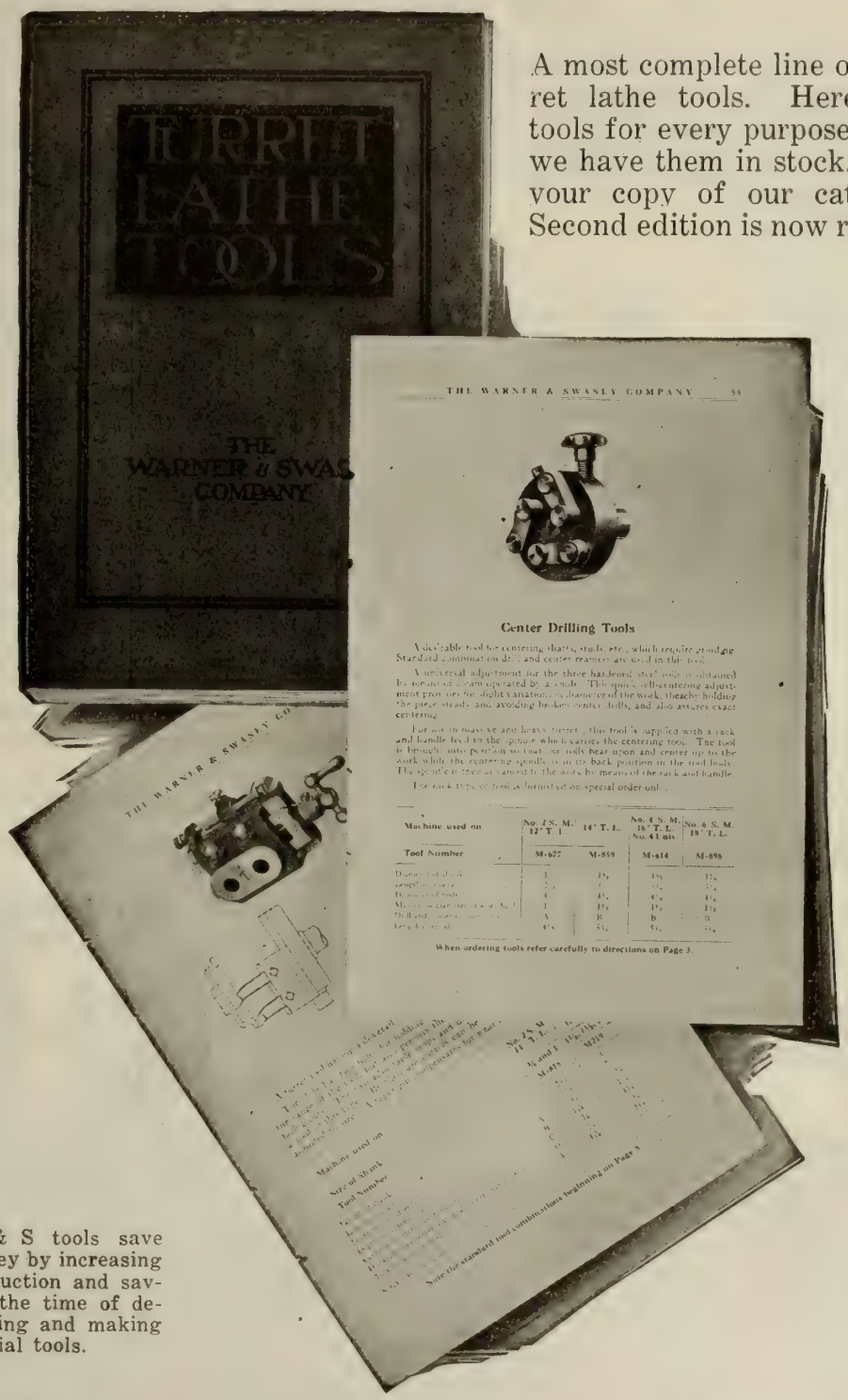
Spindle 2 3/16" diameter No. 2 or 3 Morse Taper Spindle travel 8½".
All gears accurately cut and fitted.
Carriage wheels equipped with roller bearings.
14" x 14" tight and loose pulleys or single pulley for belt drive to motor, or direct connected to motor.
15 ft. Beam will drill to 13' 6" centre.
12 ft. Beam will drill to 10' 6" centre.
7 ft. Beam will drill to 5' 6" centre.

Write Dept. 16 for Literature.

Canadian Blower & Forge Co., Limited

KITCHENER, ONTARIO

Get Your Copy



A most complete line of turret lathe tools. Here are tools for every purpose, and we have them in stock. Get your copy of our catalog. Second edition is now ready.

W & S tools save money by increasing production and saving the time of designing and making special tools.

THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO, U.S.A.

New York Office—Singer Bldg. **Boston Office**—Oliver Bldg. **Buffalo Office**—Iroquois Bldg.
Detroit Office—Ford Bldg. **Chicago Office and Show Rooms**—618-622 Washington Blvd.

FOREIGN AGENTS: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow. Allied Machinery Company, Paris and Turin. Benson Brothers, Sydney and Melbourne. A. Asher Smith, Sydney. A. R. Williams Machinery Co., Ltd., Toronto, St. John, Winnipeg and Vancouver. Williams & Wilson, Ltd., Montreal.

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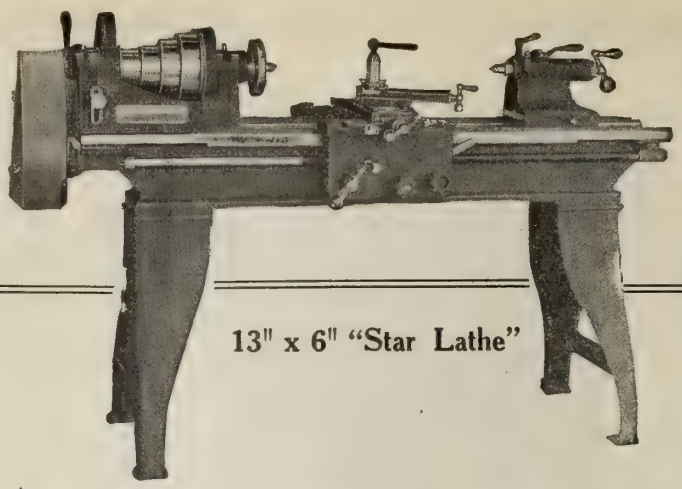
"STAR" Lathes



13" x 6" "Star Lathe"

The Tool that makes Garage Work and General Repair Work more Profitable

This is a remarkably sturdy lathe for its size, and its ease of operation, handiness, and accuracy all make it an invaluable tool. It does the work of larger and costly machines at a much lower cost.

Write for our new Circular

The Seneca Falls Mfg. Company, Inc.

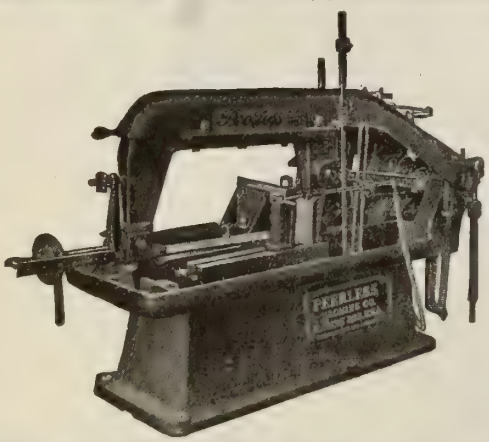
366 W. Falls St., SENECA FALLS, N.Y.

STAR TRADE MARK REGISTERED

Would you like to have us prove that

Peerless HIGH SPEED

Machines do 50 to 100% more work



The Peerless has established a new standard of production in so many plants that we are ready to ship one at our expense and risk, if you agree to give it a thorough test. A trial like this often results in our selling from 1 to 10 machines.

The Balance Lift of the Peerless

automatically raises the blade for the return stroke. This greatly prolongs the life of the blades, economizes power, and increases production. There are more good features which we shall be glad to acquaint you with.

The Peerless assures you the peak of production at very lowest cost. Write for full details.

PEERLESS MACHINE CO.

1607 RACINE STREET RACINE, WISCONSIN

The Hammer With The Human Stroke

HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

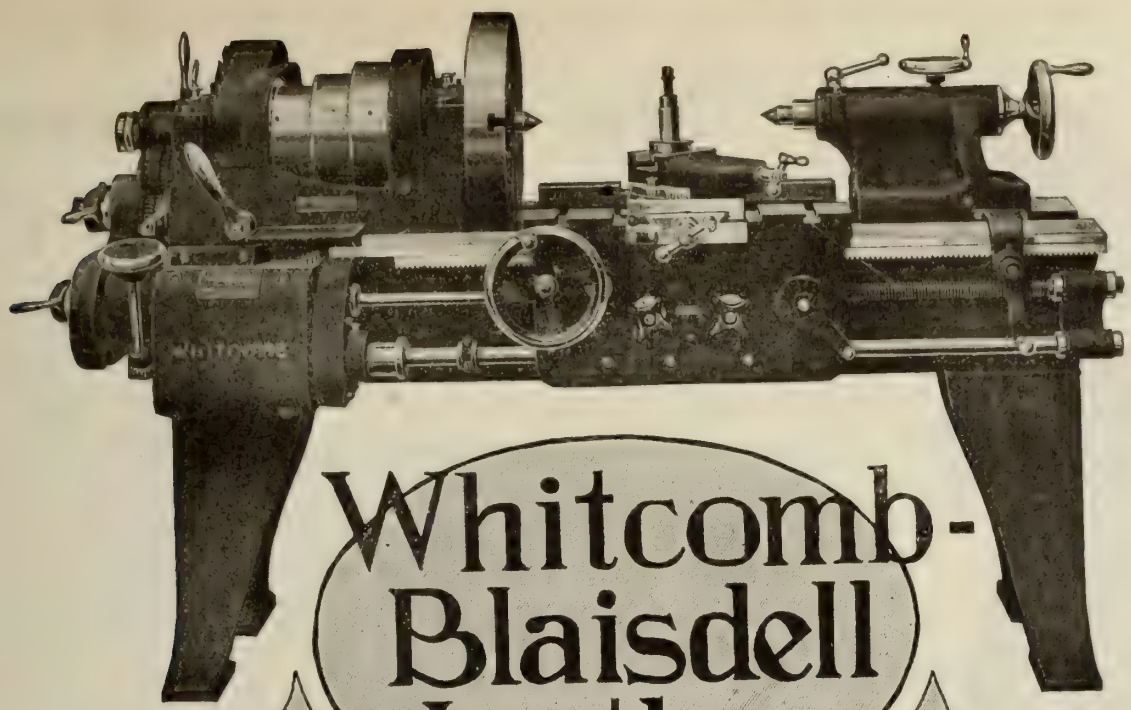
Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.

ROCHESTER, N.Y.



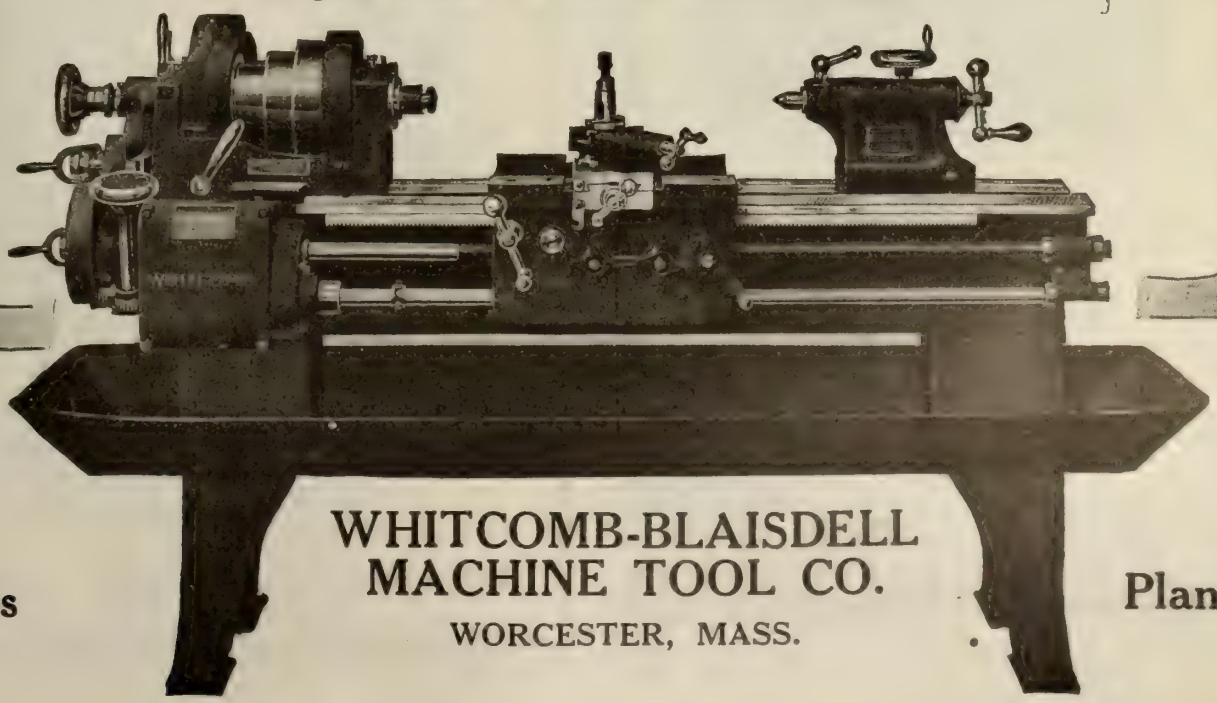
Whitcomb-Blaisdell Lathes

POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product

Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes



Lathes

WHITCOMB-BLAISDELL MACHINE TOOL CO.

WORCESTER, MASS.

Planers

"The Marshalltown Throatless Shears"

guarantees perfect work at less than half the ordinary expense.

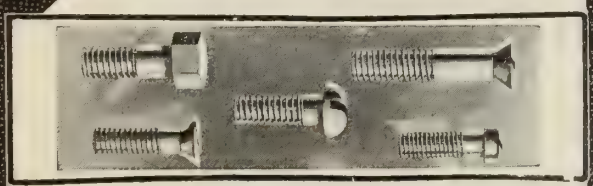
Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

Wood Screw Making Machinery

SEND FOR CATALOGUE
Series B6



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

Write or Wire us.

Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
Western Union

Asa S. Cook Co.
Hartford, Conn.

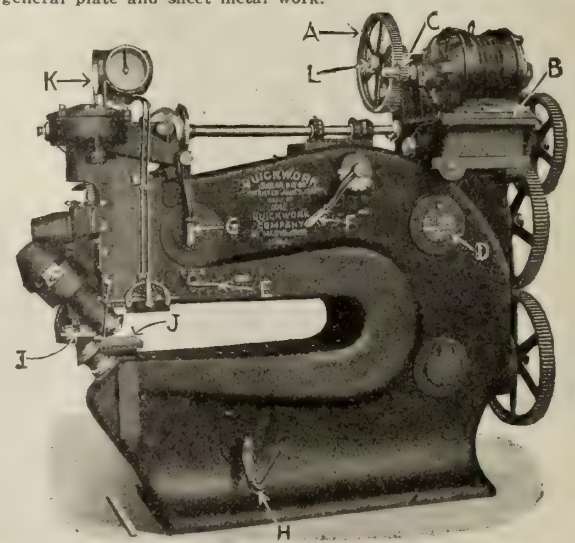
"QUICKWORK"

Registered in U.S. and Foreign Countries.

ROTARY SHEARS

MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

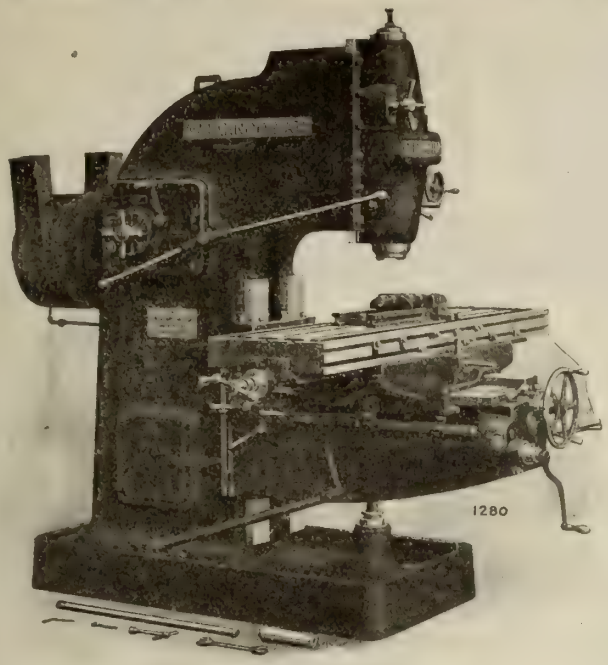
SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing.
Write for Catalogue No. 60.

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.

Cable address: "QUICKWORK."
Codes: W. U. and General.

The New Cincinnati No. 4 High Power Vertical



Intermittent feed, power quick traverse.

Square gibbing with narrow guides.

Feed changes at front of knee by one lever.

Safety couplings in feed transmissions.

Individual feed control levers.

Automatic lubrication.

Centralized oiling.

Stream lubrication.

Hardened sliding gears throughout.

Starting lever at front.

Automatic brake.

Cincinnati standard flanged spindle end.

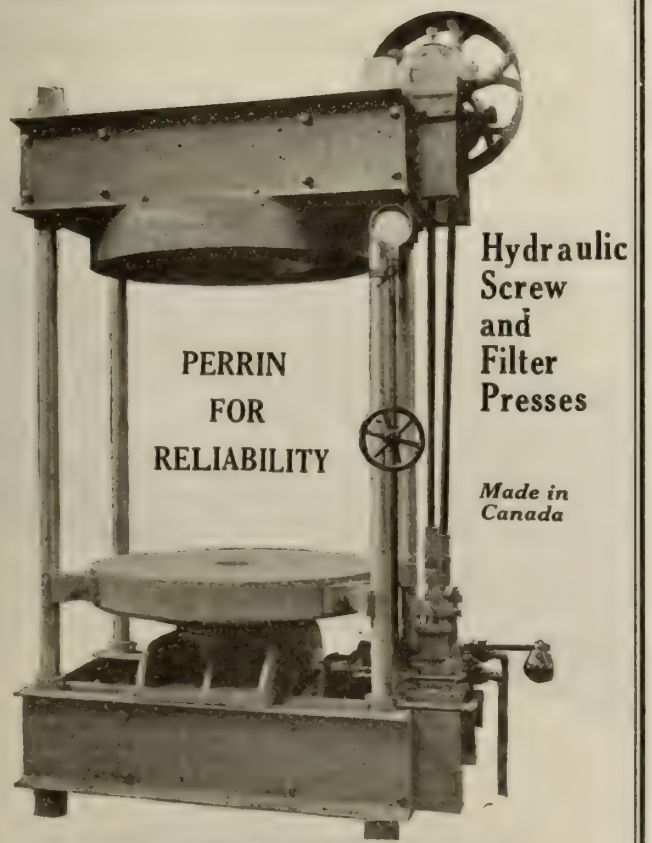
Spindle can run in either direction.

Ask for a catalog of the new No. 4 and 5 High Power Cincinnati Millers.

Patent Rights Fully Reserved

THE CINCINNATI MILLING MACHINE COMPANY

CINCINNATI, OHIO

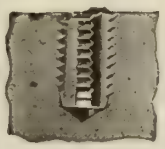


Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED

TORONTO

Of What Does This Remind You?



SUPPOSE that you had on hand when your last tap was broken a commercial device built specially to remove the broken pieces of tap, a commercial device not a home-made article, would you not have saved a great deal of time?

Write us for information.

The Walton Company

310 PEARL STREET HARTFORD, CONN.

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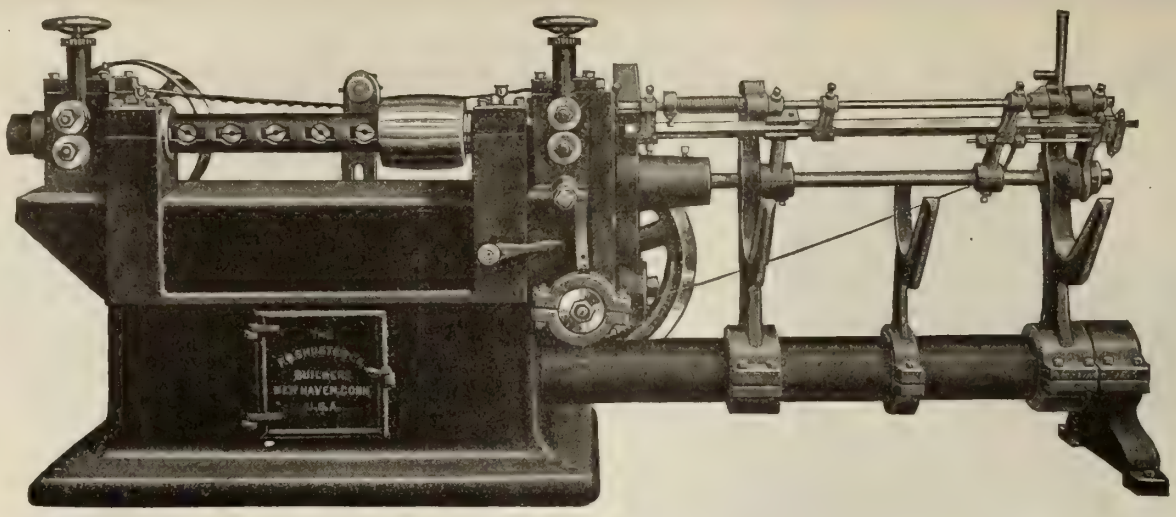


Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

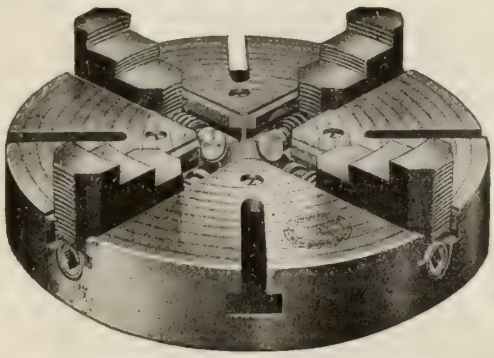
FORMERLY JOHN ADT & SON ESTABLISHED 1886

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

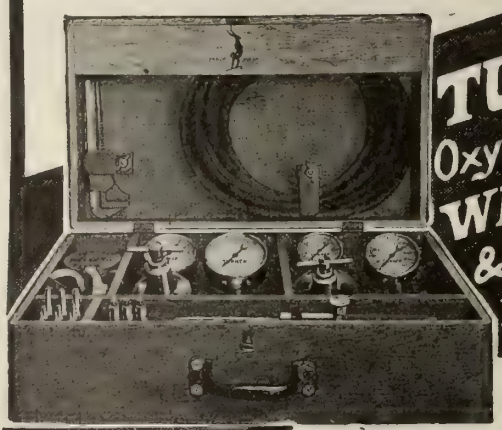
UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: **26 Cortlandt Street**

Makers of a complete line of chucks

For Repairing Broken Machinery or Tools of Medium Size



These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

The Turner Brass Works

SYCAMORE, ILLINOIS, U.S.A.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

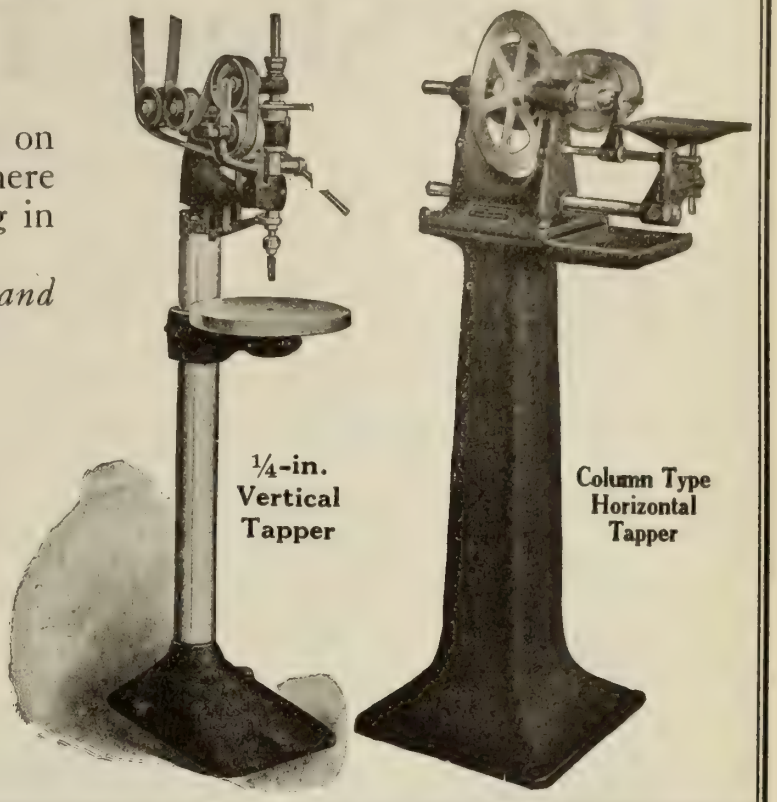
RICKERT - SHAFER TAPPERS

Save Tap Breakage

The *smooth drive* reduces the strain on the taps—they wear longer—and there are fewer delays from taps breaking in the work.

R-S Tappers ensure faster tapping and quicker assembling.

Friction drive, absorbing all the shock, allows a chuck speed of 140 r.p.m. on ⅝-in. work—50 per cent. faster than the usual tapping speed for that size. Uses but 1 h.p.



¼-in. Vertical Tapper

Column Type Horizontal Tapper

Write for specifications

The Rickert-Shafer Co.

ERIE, PA., U.S.A.

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PURE OXYGEN

Save money by using

Electrolytic Oxygen 99.80 Pure

Write for particulars and prices, also samples gladly given for testing purposes.

We also handle Pure Acetylene.

Carter Welding Co. of Toronto
LIMITED
7-11 Sheppard St.

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For Welding Cutting and Lighting

HIGHEST GAS YIELD IMPERIAL CARBIDE MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

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Large Stocks maintained at convenient distributing centres throughout Canada

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One Short Year Ago—

GO back a year—in memory.

Then we ***hoped*** to win.

We believed we would win.

We were willing to spend every cent in Rock Island for Victory.

Every man, woman and child in Rock Island was prepared to pay any price if only we could achieve Victory.

If you were asked to ***give*** to the Victory Loan 1919 you should do it in the thankfulness for Victory.

BUT you are not asked to give—only to ***lend*** your money.

—On the best security in the world.

—At a good rate of interest.

If every citizen of Rock Island will make it his duty to support to the utmost of his ability the Victory Loan 1919 we can gain such a reputation for Rock Island as will astonish all Canada.

The money is here.

Why not make this a record?

All together, now!

Buy Victory Bonds

This Space donated to the Victory Loan 1919 Campaign by

Butterfield & Company, Inc. - Rock Island, Quebec

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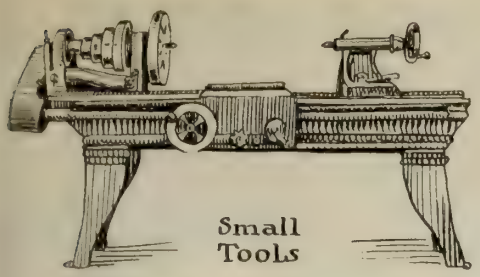
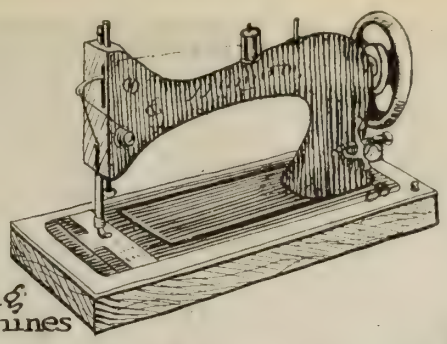

Small Tools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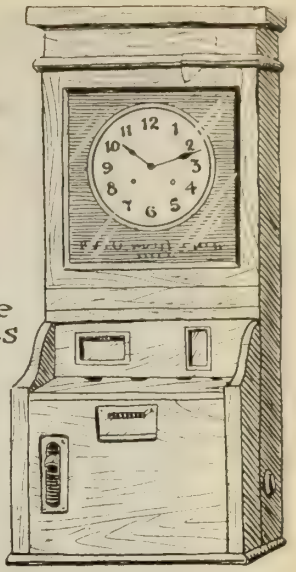
Time Clocks

It's Made for YOUR Work

Leading manufacturers of scores of different kinds of light machines are of the opinion that the Bilton Gear Miller was designed for their individual needs.

It so speedily and accurately produces spur and bevel gears and worms, and the countless small irregular parts that enter in the makeup of your product, that you cannot be blamed for thinking it was built for your special use.

It is a valuable addition to your tool room for producing small milling cutters, reamers, etc.

If production increase interests you, our circulars will make pleasant reading; better put in that request to-day.

Ask for copy of Catalog No. 30

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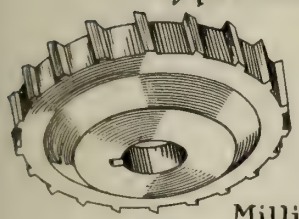
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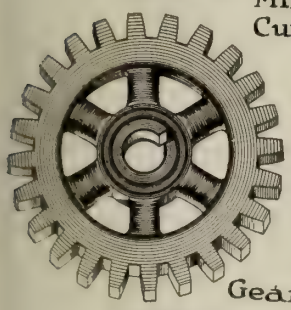
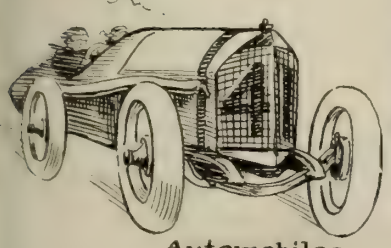

Gears

Speedometers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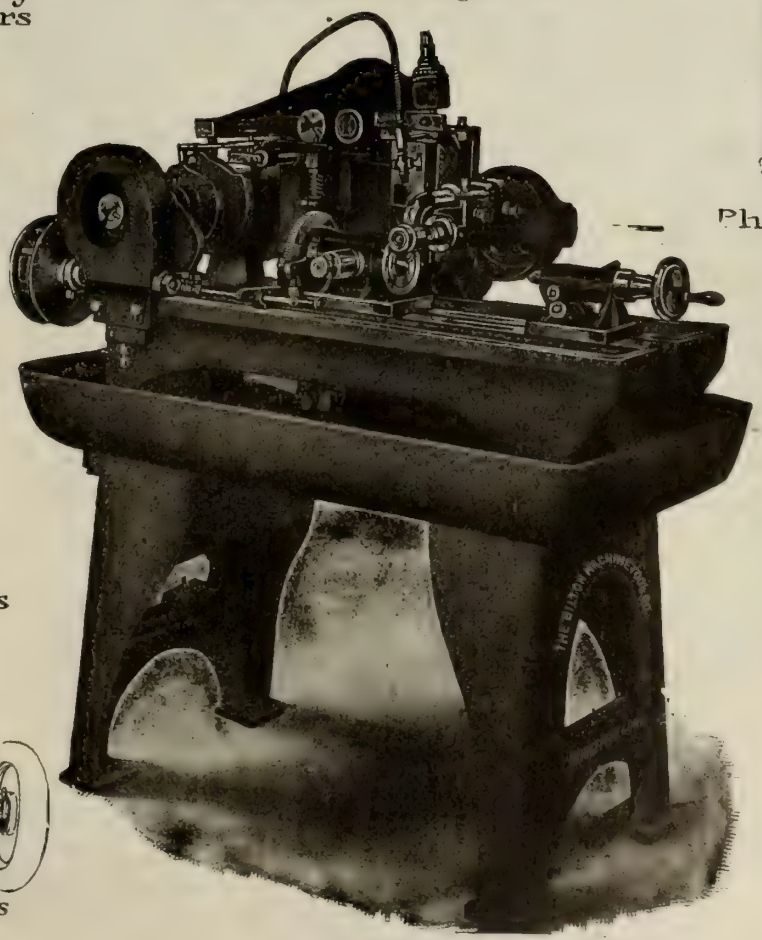
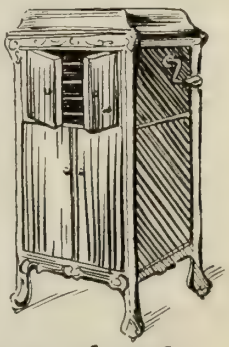
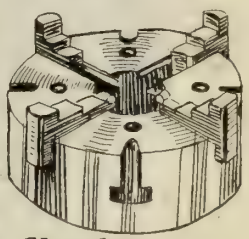



Phonographs

Locks


Chucks

Motorcycles

BILTON MACHINE TOOL COMPANY

Housatonic Avenue, BRIDGEPORT, CONN.

Eliminates One Man In Three

A large percentage of the labor in your factory, foundry, warehouse or whatever your plant may be, is employed in **moving material.** From bench to bench; department to department; shop to shop; tank to tank; vat to vat—some men are spending their time conveying your product or some component of it, from one place to another.

By actual test, we have found that an overhead conveyor outfit **saves the wages of one in every three** men who are engaged in this work. A man can move more, move it faster; load it more speedily; unload it more readily, get through his work more efficiently when he has no floor conditions to bother about. Much larger loads are handled at a time with far less work. In these days of high wages, every man saved makes a big difference.

BT Overhead Conveyors

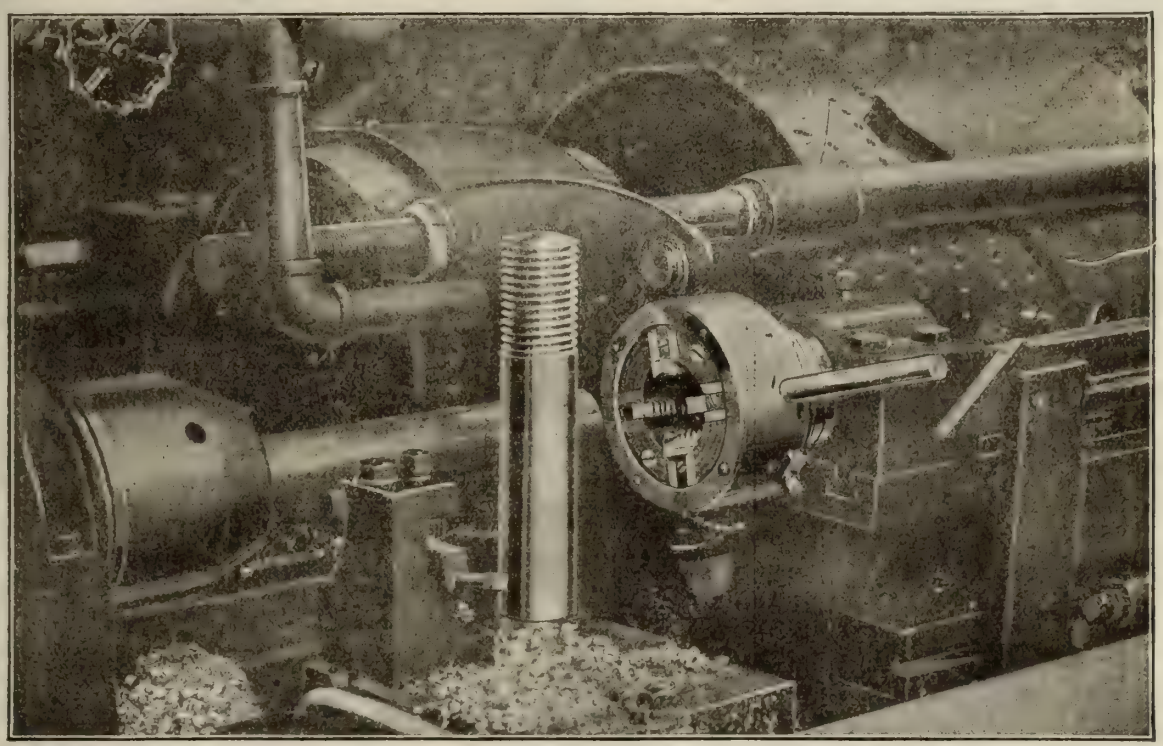
Our regular stock includes certain types of conveyors which we have found of general utility in various plants. In addition our factory is in a splendid position to design a conveyor suited to your special needs. Our track and fittings are adaptable to all conditions and remarkably easy to erect. Just how your plant may be equipped will be cheerfully explained to you if you will express your interest. No obligation attached your written request.

Beatty Bros., Limited

Head Office, Fergus, Ont.

Branches at Winnipeg, Man., Edmonton, Alta., Montreal, Que. and St. John, N.B.

MODERN
Self-Opening Die Heads



This Modern Saves 60% Time

With this No. 5 Modern the National Transit Pump and Machine Company, Oil City, Pa., is cutting 1½ inch No. 6 pitch, U.S. threads, three inches long, in one operation. Same work formerly required two and three cuts. Total time, including cutting off, is 2¾ minutes. The superintendent estimates the actual saving at 60% of former time consumed. Illustration shows Modern Self-Opening Die Head as mounted on Cleveland Automatic.

Nearly every shop has a job on which Moderns can make big savings. Give us the data on your jobs and we'll furnish the evidence of Modern's capability on your work. Send for complete technical bulletin.

MODERN TOOL COMPANY, ERIE, PA.

Main Office and Works: State and Peach Sts.

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Canadian Agents, Rudel-Belnap Machinery Co., Ltd., Toronto and Montreal.
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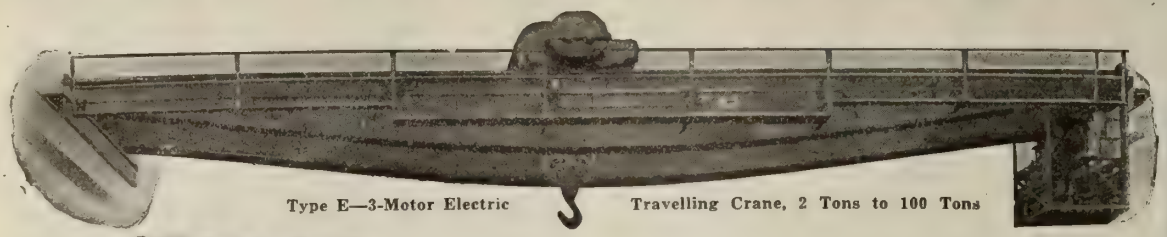
CANADIAN MADE CANADIAN MADE

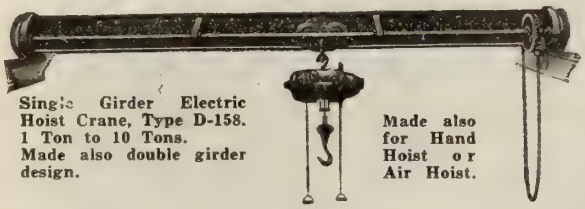
Electric and Hand Traveling Cranes



Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons

Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists —½ to 10 Tons.

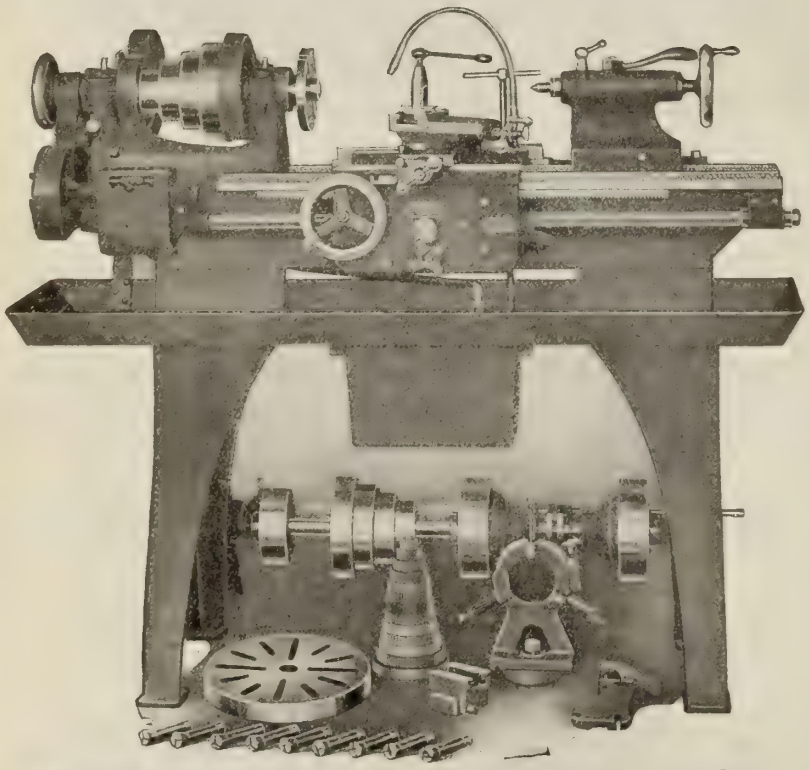
Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada

WORCESTER LATHES



12″ and 14″ Swing
Cone or Geared Head
Single Pulley or Motor Drive.

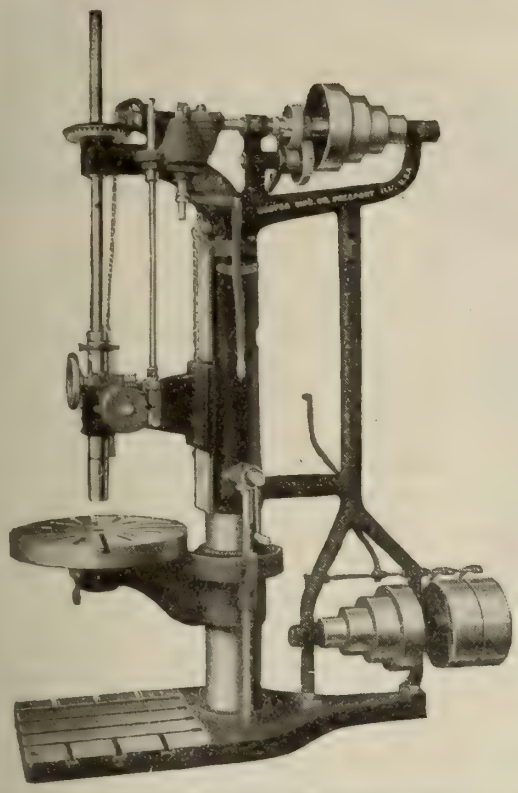
WORCESTER LATHES are especially noteworthy for light toolroom work and are particularly adapted to it because of their accuracy and the small floor space which they require.

In addition to our usual toolroom equipments as shown in illustration, we can also furnish the following: Semi-automatic Turret on Shears, Four Tool Post, Automatic Lateral Feed Stop and Milling Attachment.

Write for Complete Information

WORCESTER LATHE CO., WORCESTER, MASS.

The Driller for Exact Work



HŒFER

Enable Your Workmen to Eliminate Spoilage

The Hoefer Driller is pre-eminently the one to be found in the best plants. "It's almost as good as a Hoefer," so often heard in the machine and tool trade, indicates the position held by Hoefer Drillers.

Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

Twenty-five Years on Market

Twenty-five years making drillers has given Hoefer the "Know-how." The Hoefer Drillers are used by many of America's leading manufacturers. Equip your factory the Hoefer way. Take any kind of a drilling problem you have to the Hoefer Manufacturing Company, and the Company's experts can tell you how it was solved by other men, some of whom you may know.

Investigate now. Write to-day for catalog. The Hoefer engineers are at your service.

HOEFER MFG. CO.
FREEPORT, ILL.

MANHATTAN
UNIVERSAL
Grinder

A tool that stands in first rank in machine design and machine utility.

Simple, sturdy and accurate; a machine that you will be proud to have in your shops.

If you have a big variety of work to be done there's no better investment.

MANHATTAN MACHINE & TOOL CO.
Grand Rapids, Mich., U.S.A.
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Speed With Safety

You can't over-speed a Tribloc. It is built to work safely and dependably at any speed.

The LOOP HAND CHAIN GUIDE, exclusive with the Tribloc, makes fast hoisting or lowering smooth and safe, through preventing "gagging" of the chains in the block. It also keeps the hand chain from overriding the flange of the hand wheel.

May we send our complete and interesting catalog?

Ford Block & Chain Mfg., Company
Second & Diamond Streets
Philadelphia, Pa.

2157-D

Lacing the Belts of Industry

THE Clipper Belt Lacer is to-day depended upon for keeping belts repaired and moving in 100,000 of the leading industrial plants of the world. Year after year its simplicity, economy and effectiveness have commended it to more plant managers, so that now Clipper Belt Lacing Service has become an institution—a part of the equipment of up-to-date manufacturing establishments.

Less speedy and dependable means of repairing broken power belts would mean, in a big plant, incalculable loss. Antiquated methods that take from fifteen minutes to half an hour to repair a joint are too expensive for **any** plant.

The Clipper Belt Lacer Laces a Belt in Three Minutes

Besides mending a joint quickly, the Clipper does the job well. The belt is permanently repaired. It is smooth and flush on both sides, pulls as it should, and is safe. A Clipper-laced joint strengthens the belt at a weak point.

The Clipper lacing tool is so simple that any shop workman can use it. No experts required. The cost of mending belts with the Clipper is negligible.

Your plant may to-day be using Clipper Belt Lacing methods, but may not be equipped with a sufficient number of Clipper tools.

Most big plants make their Clipper service 100% efficient by keeping Clipper tools convenient to every battery of machines for emergency use when a belt breaks.

The American Museum of Safety has expressed its opinion of the Clipper Belt Lacer by awarding it the only gold medal ever given for metal lacing.

To manufacturers who have not had satisfactory belt repairing service, the Clipper is recommended with confidence. It goes to them on free trial and is backed by a permanent guarantee.

The Clipper is sold by mill supply houses. European Trade supplied through London Office Distributors in all parts of the world.

Clipper Belt Lacer Company

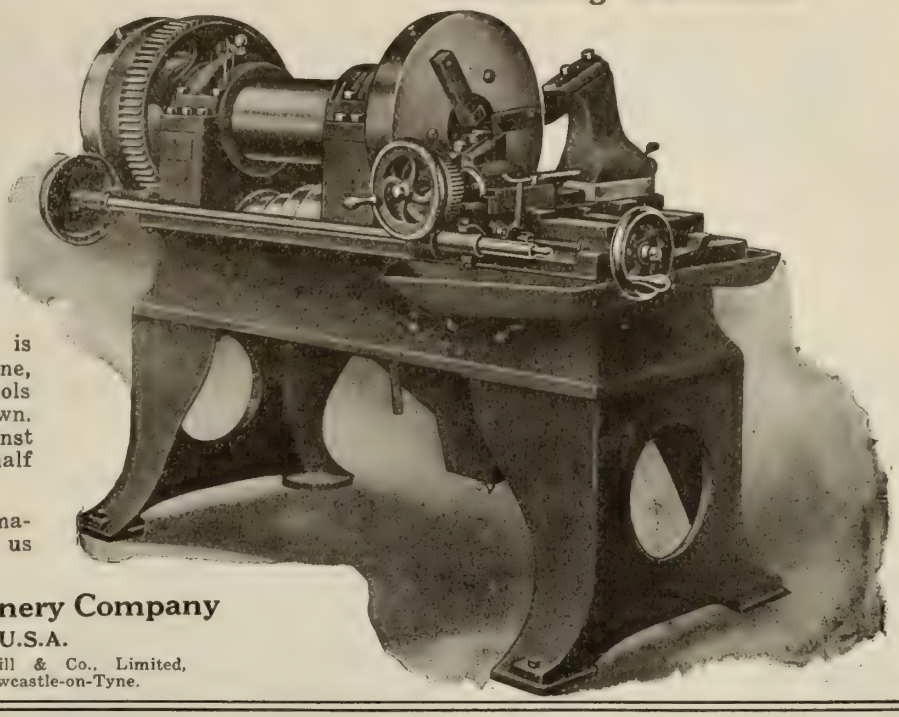
GRAND RAPIDS, MICHIGAN, U. S. A.

LONDON, ENGLAND — No. 10 NORFOLK STREET

Cut Your Cutting-off Costs in HALF

HURLBUT'S

Patent Cutting-off and Centering Machines



TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.

Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

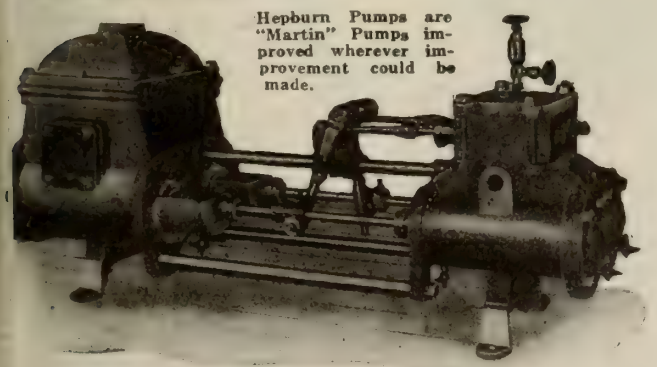
The Hurlbut, Rogers Machinery Company

South Sudbury, Mass., U.S.A.

Foreign Agents—England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

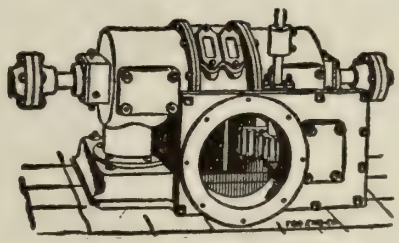


Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street **Toronto, Ontario**

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

THE J. C. WILSON MFG. CO.
LIMITED
BELLEVILLE, ONTARIO

If interested tear out this page and place with letters to be answered.

Gear Cutting With The "IFS" Left Out

The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

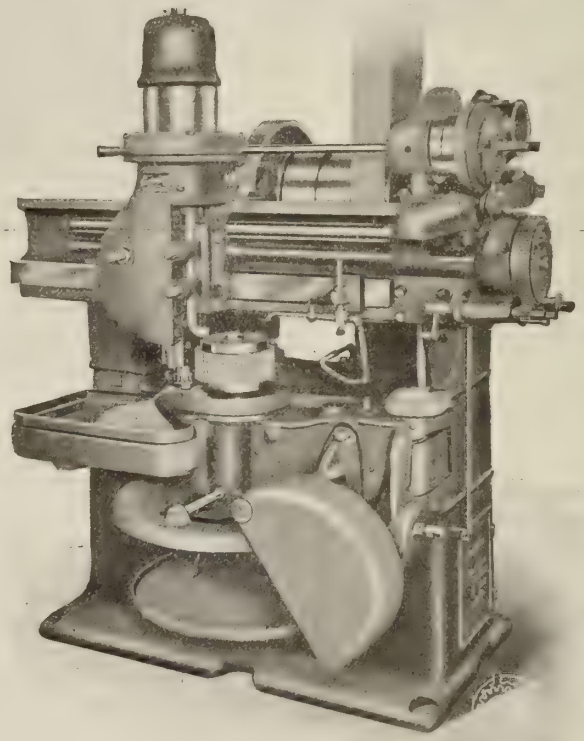
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

Send for your copy to-day.



The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Société Anonyme Alfred Herbert, Paris, France; Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert, Limited, Calcutta, India; A. B. Galco, Limited, Stoekholm, Sweden.

ONE OF THE MANY WAYS

NAMCO TAPS ARE ADAPTED

Four NAMCO Taps at one time on a Four Spindle Drill Press—

That's the method employed in tapping motor valve ports by one manufacturer of high grade automobiles.

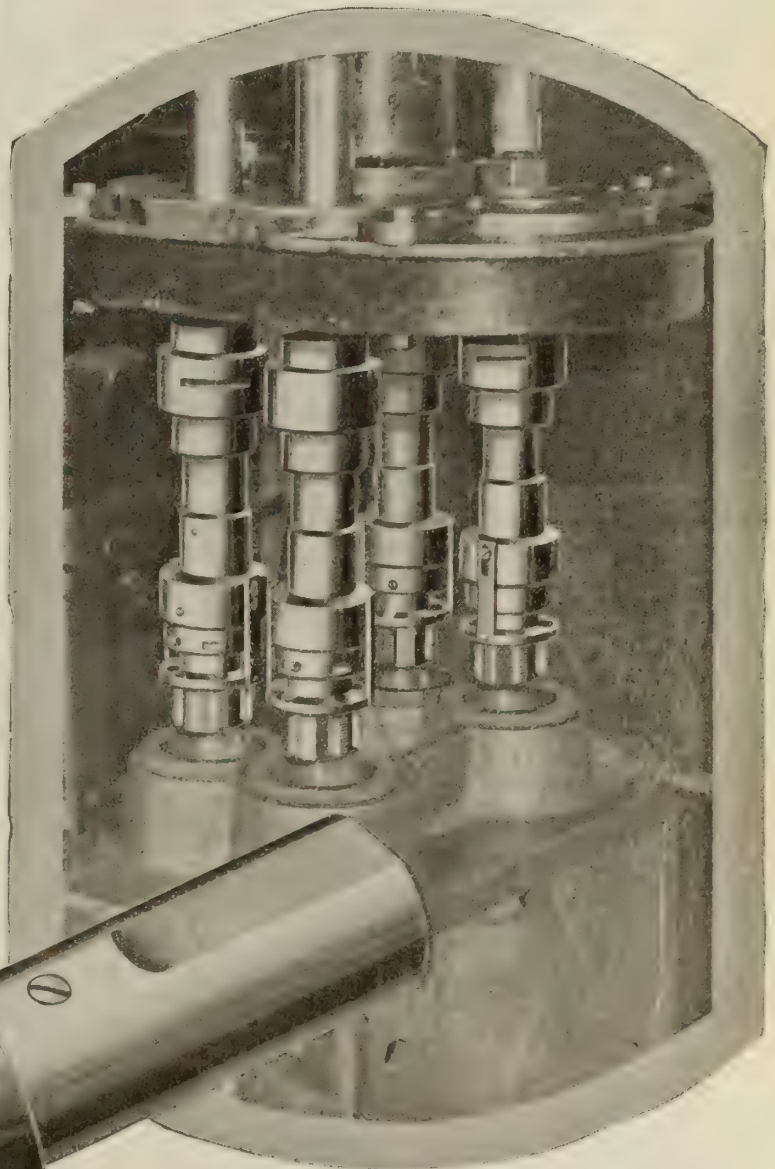
In this case adaptability results in a substantial increase in production.

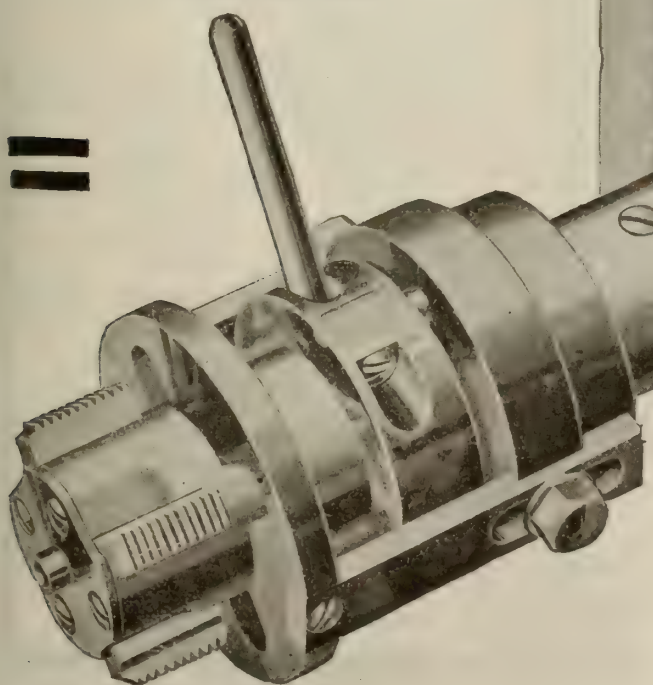
Moreover the simplicity of design and rigid construction of NAMCO Collapsing Taps results in—

First—Lower costs per hole tapped.

Second—An output that is interchangeable.

Ask for thread cutting catalog "Dies and Taps."





THE
NATIONAL ACME COMPANY
CLEVELAND, OHIO

New England Plant
Windsor, Vt.

Canadian Screw Plant
Montreal, P. Q.

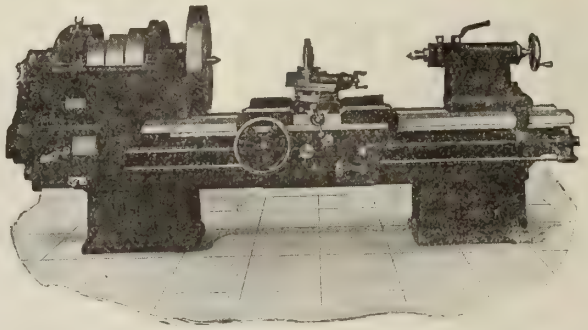
Branch Offices
New York Boston Chicago Detroit Buffalo Atlanta San Francisco
Warehouses: New York and Chicago Representatives in Foreign Countries

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont; and Acme Automatics, Threading Dies, Collapsing Taps, and Screw-Machine Products at Cleveland, Ohio

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double brake gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 ft.

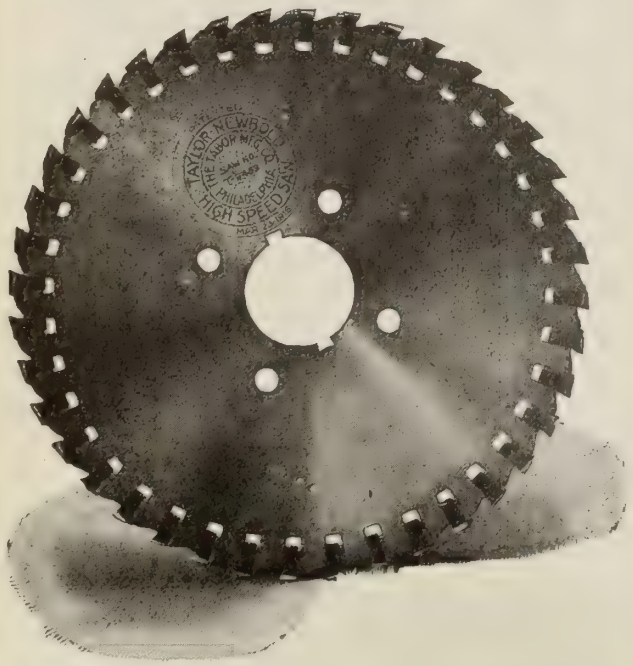
The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: Yeates Machinery & Supply Co., Montreal, Que.
H. W. Petrie, Limited, Toronto, Ontario

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

Bend Pipe Cold

Eliminate Friction

3 New Models

"Wonder" Pipe and Tube Bending Machines (pat.) electrically operated to bend from 1" to 18".

We also manufacture
10 OTHER SIZES

Hand operated to bend from ⅛" to 8".

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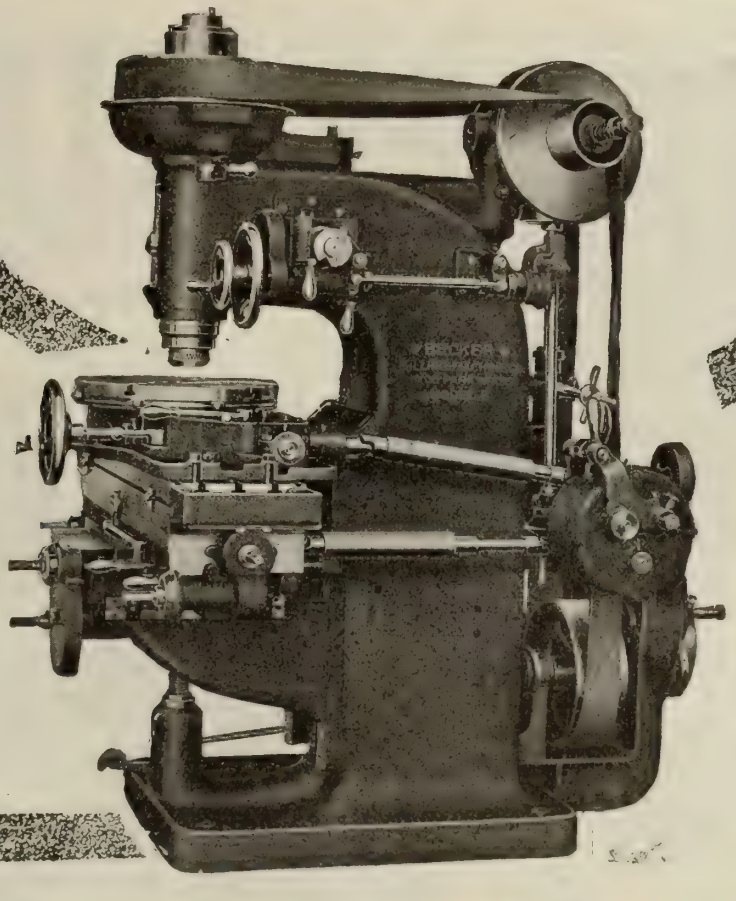
American Pipe Bending Machine Company

50 Pearl St., Boston, Mass., U.S.A.

Becker



"Becker Belt Driven Millers"

The Machine that gives the Smooth Finish

Model B

The machine shown above is a Becker Model B Belt Driven Miller—Like the other machines of this line it is a Production Tool of the first class, embodying all the features that have made Becker Millers the standard.

The strenuous period of war work has introduced Becker Belt Driven Millers into Canadian factories. They were essential then because they greatly increased production without adding to manufacturing costs—and now, they are essential also because they will enable you to reduce your manufacturing costs in order to cope with the keen after-war competition.

You need a Becker Belt Driven Miller.

Write for Circular O-501—NOW

BECKER MILLING MACHINE COMPANY

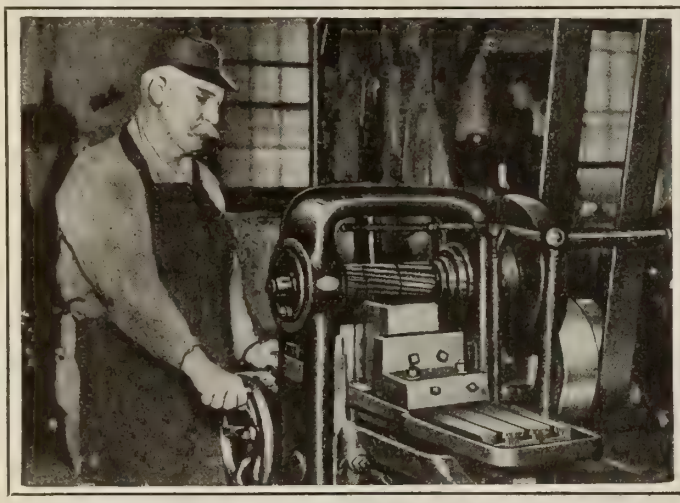
Hyde Park, Boston, Mass.

Canadian Agents:

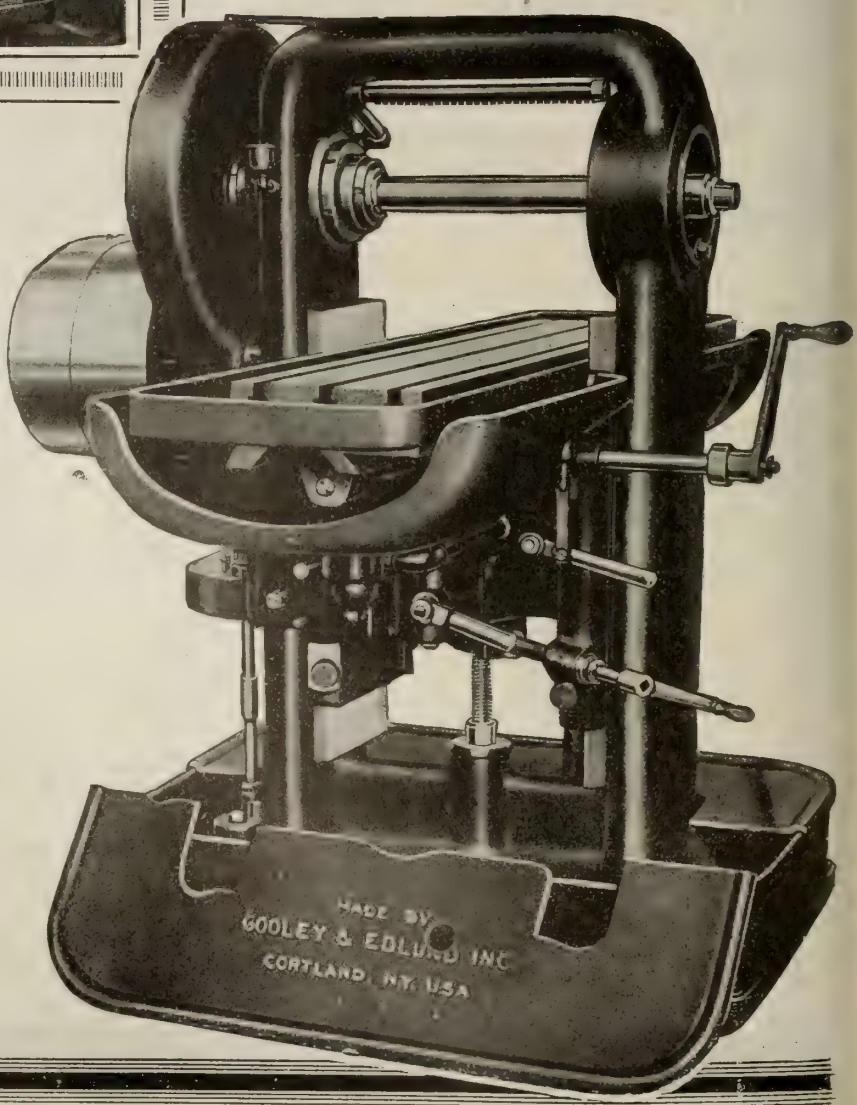
Rudel-Belnap Machinery Company, Ltd., 137 McGill St., Montreal.

A. R. Williams Machinery Company, Ltd., 64 Front St. West, Toronto.

BRIGGS MILLER



Keeps Five Die Sinkers Going



HERE you see the Briggs Miller Squaring Die Blocks, and it is working so fast it keeps five die sinkers going.

Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work. Unusual rigidity accounts for Briggs' higher efficiency.

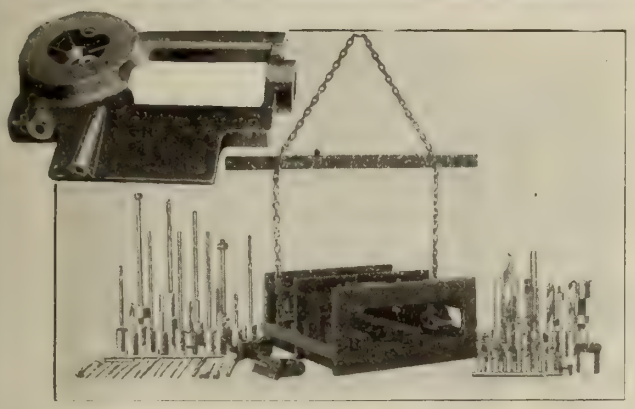
Don't you think you could use this tool to advantage in your shop? Write for the details.

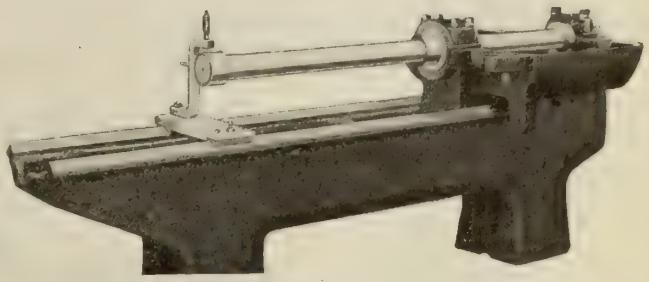
Gooley & Edlund, Inc.

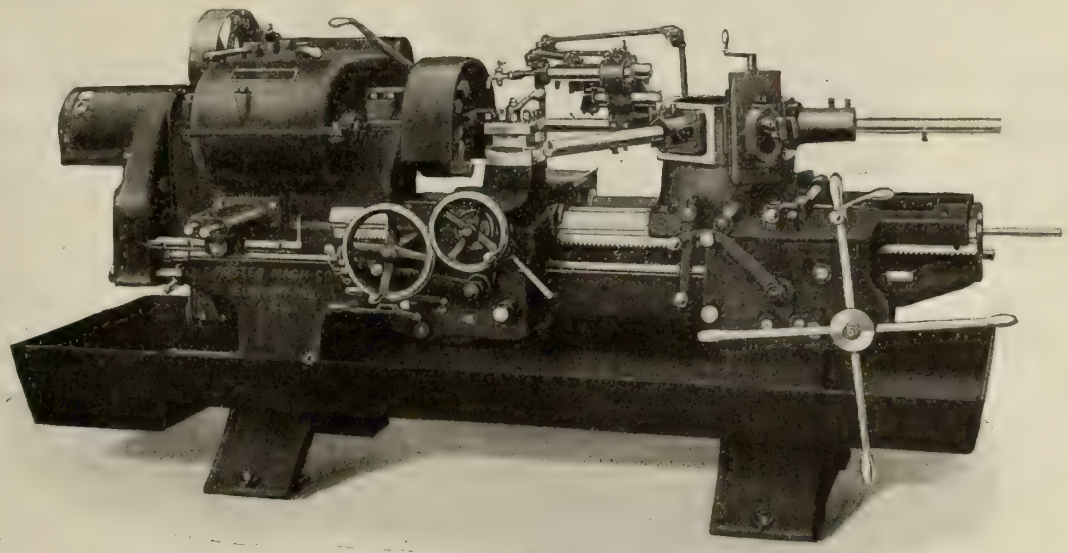
Cortland, N.Y., U.S.A.

Garlock Walker Machinery Co., Ltd.
Toronto, Ont.

Williams & Wilson, Ltd., Montreal







THE HIGH COST OF A BREAKDOWN

Ask your chief cost clerk how much that breakdown cost you in dollars and cents. He will tell you that the operators' wages amounted to so much; the machine charges so much; floor space so much and general overhead so much.

But your factory superintendent will tell another story: He knows that the breakdown of a machine is liable to throw the continuity of flow of production entirely out of gear. The machine performing the second operation on the piece may have to stand idle for lack of work while the breakdown is being repaired. The assembling department may have to slow down from lack of finished parts.

QUALITY IN A MACHINE TOOL IS AN INSURANCE AGAINST BREAKDOWN.

You buy quality when you buy a Foster Universal Turret Lathe.

Quality means that—

1. The design of the machine is correct.
2. The right material is used for each individual part in the machine.
3. The workmanship entering into the building of the machine is of high character.
4. The proper heat treatment is given to all parts requiring such.
5. Every machine is inspected and tested thoroughly before leaving the factory.

We have a booklet entitled "FOSTER QUALITY," descriptive of our methods and equipment. It will interest you.

Write for it

FOSTER MACHINE CO., ELKHART, IND.

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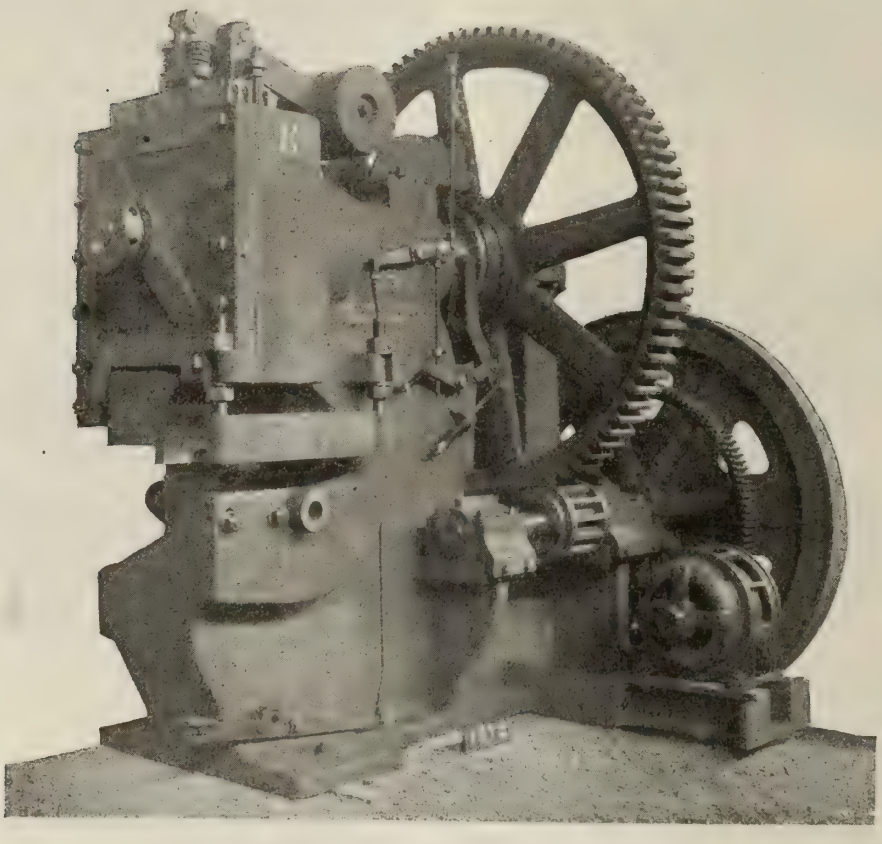
"The Quality Line"

PUNCHING and SHEARING MACHINERY

Machinery Equipment for Rolling Mills Bridge and Structural Works



Machinery Equipment for Steel Car Plants and Shipyards

No. E. OPEN THROAT BAR IRON SHEAR
Capacity 11" x 2¼" Flat, 4" Round, 3½" Square

All machines are built of same high-grade workmanship and material that have given the "L&A" product a recognized standard of quality for over 50 years.

May we send you our big catalogue.

The Long & Allstatter Co.

Established 1856

American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

Incorporated 1878

Canadian Agents:
RUDEL-BELNAP MACHINERY CO., LIMITED
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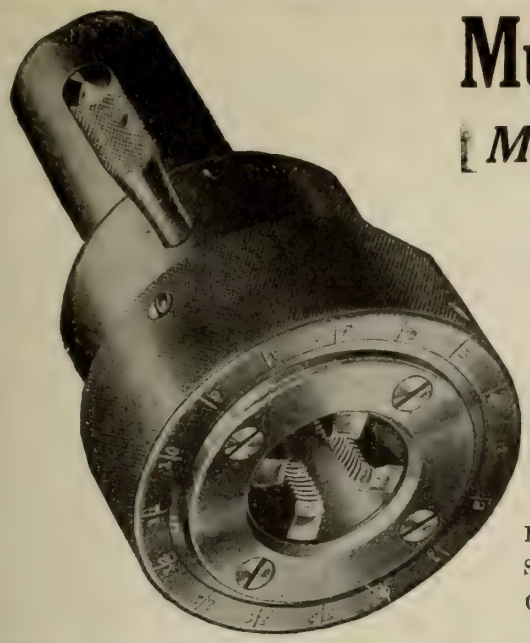
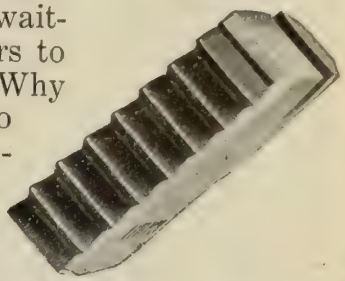
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



Murchey Chasers

Mean Quick Deliveries

Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?



Send for a Murchey Tap or Die on approval and give it a trial. You will then secure actual proof of its value to you.

Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne,
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France

THE BICKNELL-THOMAS TAPPING ATTACHMENT

Fits Any Make Drill

A friction mechanism inside the body of the attachment is automatically adjusted by the driving pressure, creating a very sensitive drive and eliminating the sudden strain of the reverse—responsible for many broken taps. This attachment is fitted with a plain chuck with jaws that grip both the round and square end of the tap shank.

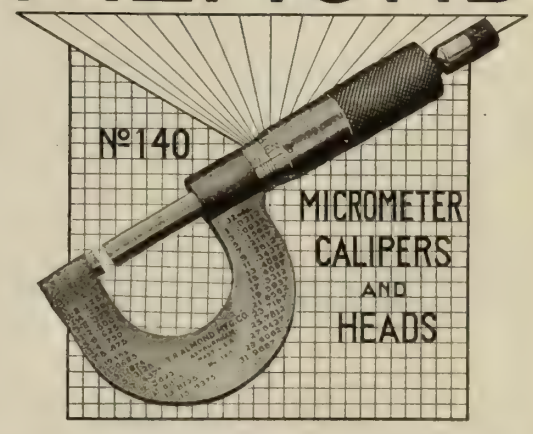
Made to take taps from 3-32" to 1-4" in diameter.

BICKNELL-THOMAS CO.

GREENFIELD, MASS.

Chicago Representative: H. S. Huncke, 15 N. Jefferson St. Pacific Coast Representatives: The Chas. A. Dowd Sales Co., 329 Market St., San Francisco. Foreign Agents, Canada: The Jas. Buckley Co., St. Nicholas Bldg., Montreal. England: Goodchild & Partners, Ltd., London, W.C. 1.

ALMOND



All Almond Micrometers are inspected and adjusted to Johansson Gages and recognized comparison only with these gages.

Almond Service.—Should the Micrometer need readjusting at any time or defect in material or workmanship develop send to Ashburnham and readjustment or replacement will be made without expense.

OTHER **ALMOND** PRODUCTS

DRILL CHUCKS, RIGHT ANGLE TRANSMISSION LATHE CHUCKS, FLEXIBLE STEEL TUBING

T. R. Almond Mfg. Co., Ashburnham, Mass.

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Can you Forget?

AS long as you live you'll remember November 11th, 1918—Armistice Day.
That was the day the enemy surrendered.
That was the day of Victory for our army.
Day after day—year after year—through rain, cold, heat, mud, death—they had fought bravely, stubbornly, cleverly, faithfully—the spearhead of fate pointing inexorably at the black heart of the enemy.

REMEMBER the Somme? Ypres? Vimy? Passchendale? Cambrai? MONS?

Can't you catch this brave spirit?

Can't you see how small is our task compared with theirs?

Shall we fail to lend our money to the country for which they gave their lives?

The Victory Loan 1919 must be a victory, too. It is needed to pay our obligations to the army and to keep the fair name of Canada writ high among the nations.

This is a War Loan!

Canada needs to borrow your money!

If the Victory Loan succeeds it will be another Mons for Canada!

Let us show the world again that what Canada undertakes Canada accomplishes

Buy Victory Bonds

EVERY DOLLAR SPENT IN CANADA

This space donated to the Victory Loan 1919 Campaign by

The William Kennedy & Sons, Limited, Owen Sound

ESTABLISHED 1860

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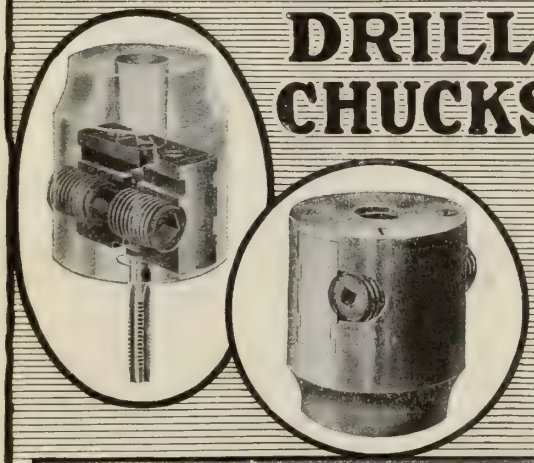

Built For Production—Not For Price

Skinner Drill Chucks—best for accurate work. These chucks will firmly hold drills or taps accurately on centre under the most difficult and continuous operating conditions.

The Jaws are correctly adjusted, tempered, hardened and accurately ground.

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Quality Cutting Dies

For All Purposes

Our experience is varied in this line of work and we are completely equipped to handle any kind of CUTTING DIE WORK.

The picture shows you a few of the many kinds and styles, such as Envelopes, Labels, Lithographs and Advertising Novelties, Boxes, Wrappers, Gaskets, Paper Napkins, Drinking Cups, etc., Cutting Dies which we manufacture.

Send for our literature.

The Hoggson & Pettis Mfg. Co.
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Sold by Geo. F. Foss Machinery & Supply Company, Limited, 305 St. James St., Montreal.

Satisfactory

OUR 16-INCH PLAIN MOTOR DRIVE LATHES

HAVE PROVEN A GREAT SUCCESS

They are very simple in operation, have no overhang. They have almost the power of a geared head. They are compact and rigid, powerful and efficient. They are accurate and economical and very satisfactory.

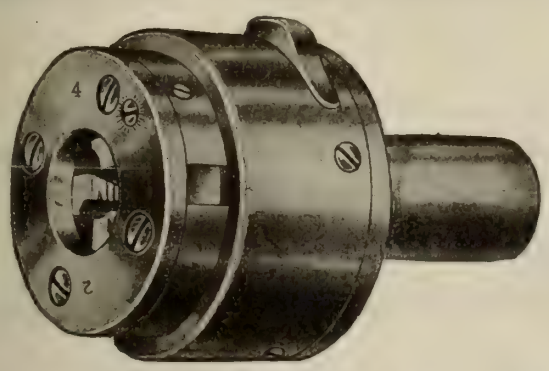
We want you Canadians to install

The Lathe with the Pull
The Lathe of Satisfied Accuracy

Make them pay for themselves, as they will. We build 14-inch belt drive, 16-inch belt and motor drive, 18-inch belt and motor drive, geared head or plain, 20 and 24-inch belt and motor drive, geared head or plain.

THE CISCO MACHINE TOOL CO.

CINCINNATI, U.S.A.



H & G Die Heads

are of small outside diameter compared with the size of work they do.

The H. & G. illustrated is an automatic, self-opening Die Head designed especially for use on Gridley and National Acme Multiple Spindle Screw Machines and others that use the die in a revolving position. The four sizes of this Head cut up to 9/16", 1", 1¼" and 1½".

All parts are hardened and ground and interchangeable. In a word—it's an H. & G.

Ask for Catalog

Eastern Machine Screw Corp.

New Haven, Conn., U.S.A.

"CUSHMAN" CHUCKS 1862

LATHE CHUCKS DRILL CHUCKS
FACE PLATE JAWS

Three Generations of Skilled Mechanics have made them and have used them

THE CUSHMAN CHUCK CO.
HARTFORD, CONN., U.S.A.

Why use makeshifts?

WHY waste time and energy with makeshift devices for boring operations when Williams' "Agrippa" Adjustable Boring-Tool Posts offer convenience and efficiency developed to the nth power?

Each post accommodates a wide range of Bars, the height of which is readily adjusted; a turn of the Knurled Ring raises or lowers the base on which they rest. The whole device is instantly and rigidly locked by tightening the Set Screw.

Four sizes for ½ to 2¼" diameter Bars—furnished with or without Bars.

Ask for Machinists' Tools Booklet.

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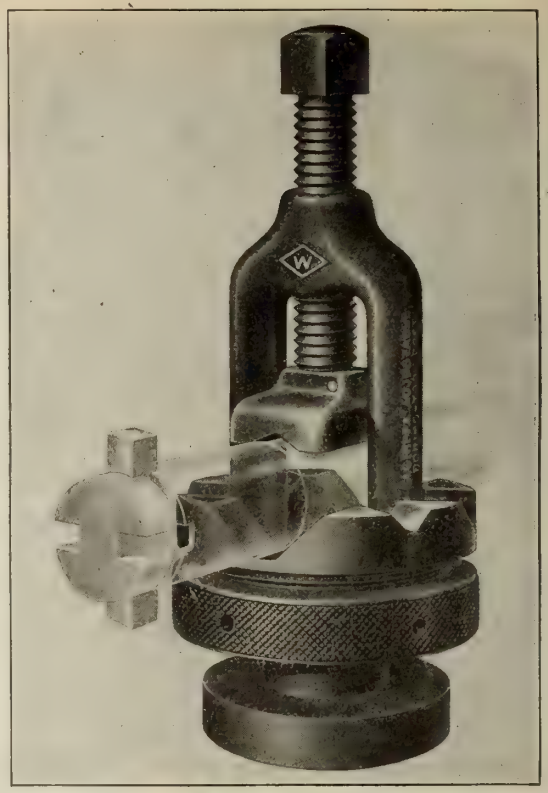
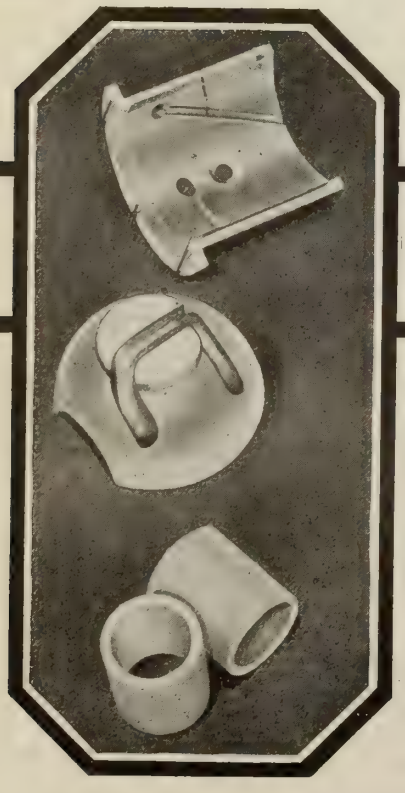
The A. G. Low Co., Ltd.,
45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Alberta, Saskatchewan and British Columbia.



Williams' "Agrippa" Adjustable Boring-Tool Posts



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Fast and Accurate Duplication at Low Cost

Eliminating the excessive cost of machined parts has been our work for twenty-seven years.

Thus the scope of Franklin Die-Castings has widened, their utility in many industries has been demonstrated, and a great and growing industrial economy accomplished.

We cast in aluminum, zinc, tin and lead base alloys. Bearings and hard metal parts. Quantity deliveries assured.

Write for our Booklet "C." Send sample of part, or blue print, and we will promptly make estimate and recommendation.

FRANKLIN MANUFACTURING COMPANY

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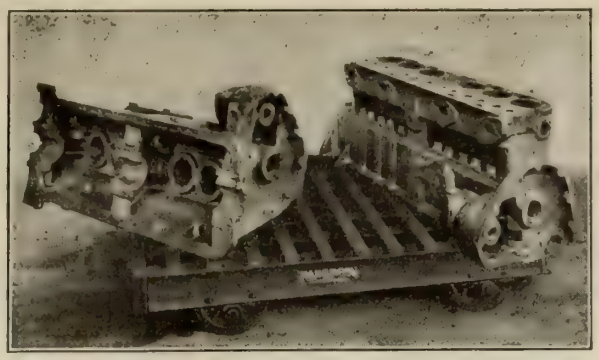
How long would it take to clean this Cylinder by your present methods—and what would be the labor cost alone?



How long would it take to pay for a Sand-Blast Installation from the saving in labor cost if you cleaned it in 3 minutes?

CLEANED IN THREE MINUTES BY

PANGBORN SAND BLASTS

and whether your requirements are the cleaning of Castings, Forgings, Stampings, Sheet, Plate or Structural, or the removal of scale from Heat Treated Parts there's a Pangborn Unit or Combination for every need, large or small, that will make a saving for you — and a more attractive product.

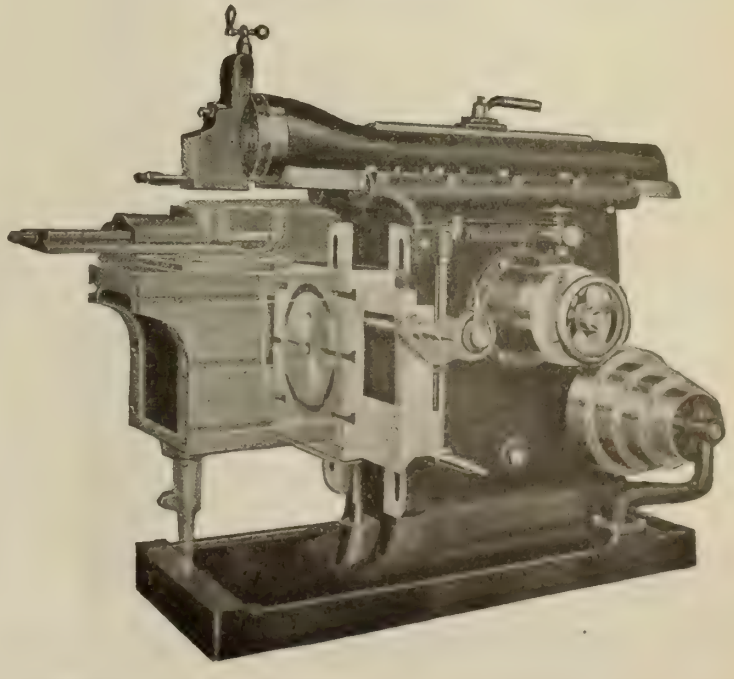
PANGBORN CORPORATION
HAGERSTOWN, MD.
SAND-BLAST SPECIALISTS
P. O. 8503

Milwaukee Shapers

Are needed in Up-to-date Canadian Shops

Milwaukee simplicity, power and accuracy play an important part in turning overhead expense into profitable production.

Milwaukee Back Geared Crank Shapers are built in 16-inch, 20-inch and 24-inch sizes.



MILWAUKEE SHAPER CO.

1029 Coldspring Ave.

Milwaukee, Wisconsin

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Your Money's Worth

Never again will the Canadian Nation and People be the same careless improvident spenders of "ante bellum" days. "EFFICIENCY" and "GET YOUR MONEY'S WORTH" will be the popular motto and the successful machine shop manager must be able to see the advantage of making one pound of High Speed Tool Steel do the same work as ten pounds in forged tools; in other words he must and will

USE ARMSTRONG TOOL HOLDERS

No heavy "stub-ends" to throw away. No time lost with men at the grinder while lathes stand idle. No stock of heavy sizes of steel to carry, and the blacksmith as a tool-dresser is eliminated entirely.

Armstrong Tools are great favorites with the men—a good thing to consider from a production standpoint.

Our Catalogue is of handy pocket size and will be mailed to you upon request

ARMSTRONG BROS. TOOL CO.
"THE TOOL HOLDER PEOPLE"
306 N. FRANCISCO AVE. CHICAGO, U.S.A.

Files That Stay Sharp

Workmen know it is better to throw away a file as soon as it becomes worn. They can't get good results from dull files.

Do not be afraid to tell your workman to discard a Famous Five File as soon as it becomes dull. You will have obtained the maximum service before its usefulness is gone.

Famous Five Files are hardened by a special process which increases their durability.

Specify them when ordering.

They are:

The Largest Selling Quality Pencil in the World

VENUS PENCILS

17 Black Degrees
6B softest to 9H hardest
and
hard and medium Copying
All perfect

Engineers work to scales too fine for lay minds to comprehend; the breadth of each pencil line in a blue print has a significance. They use VENUS Pencils because they can depend absolutely upon the uniformity of each degree.

For bold heavy lines
6B-5B-4B-3B
For general writing and sketching
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For clean fine lines
2H-3H-4H-5H-6H
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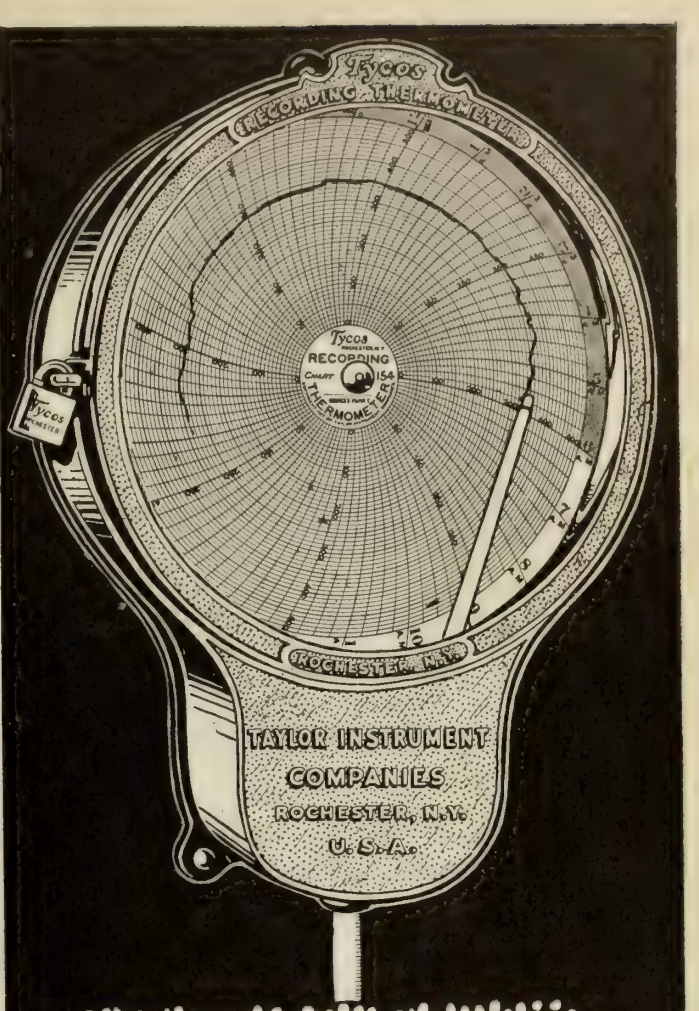
American Lead Pencil Co.
238 Fifth Avenue, New York
and Clapton, London, Eng.

FREE

We shall be glad to send you free samples if you will write on your letter-head, specifying three degrees you wish to try.



There's a *Tycos* or *Taylor* temperature instrument for every purpose

Taylor Instrument Companies
ROCHESTER, NEW YORK

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Engineers, Manufacturers and Founders
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Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.

PRESSES and SHEARS
Sheet Metal Working Machinery
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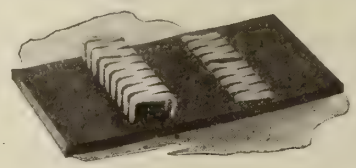
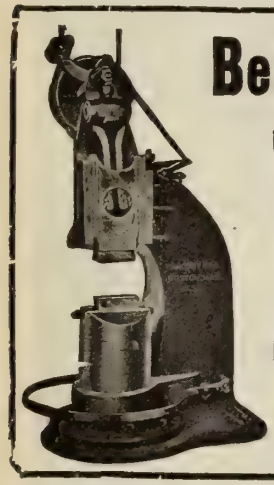
Builders of
Hole, Hole and Face and Deep Hole Grinders



MAXIMUM EFFICIENCY IN BELT LACING
A broken belt won't hold up production long if you repair it with
Patent Steel BRISTOL'S Belt Lacing
Pronounced the most efficient, because it is the easiest, the quickest and the best to apply.
No special tool is required. Simply a hammer and a soft block of wood to drive the sharp, staggered steel prongs through the belt in double rows and to clinch the points. The belt is gripped firmly without danger of cutting or weakening.
Send for samples and Catalog I-707.
THE BRISTOL CO., Waterbury, Conn.



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FOR GENERAL FORGING
Save Fuel, Time and Labor. Cut Forging Costs in two.
BELT OR MOTOR DRIVEN
BEAUDRY & COMPANY, Inc.
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STEEL CASTINGS
ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.
PROMPT DELIVERY
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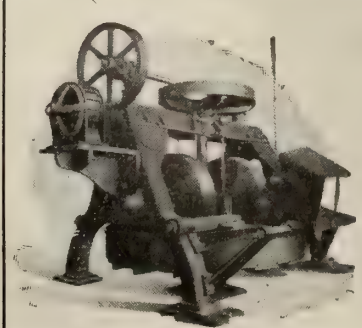
when advertising that as many prospective buyers as possible read what you are selling. We advise you to use **Canadian Machinery.**

Canadian Steel Foundries Need Frost Improved Sand Mills



WINNING FEATURES
Heavy Mullers
Unloading Device
Motor or Belt Drive
The Frost Mfg. Co.
112 W. Adams St., Chicago

WHEEL TRUEING TOOL CO.

DETROIT

IMPORTERS OF
INDUSTRIAL DIAMONDS
Goods Submitted on Memorandum if Desired
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MANUFACTURERS OF
DIAMOND POINTED TOOLS
All Mountings Fully Guaranteed
Office and Factory:
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Combined Jaw and Friction. Friction only.
Gas Engine Clutches. Jaw Clutches.
Write for interesting printed matter.
The Positive Clutch & Pulley Works, Ltd., Canada
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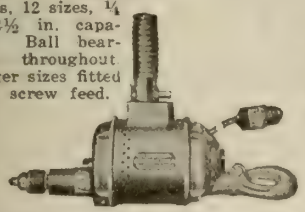
FOR EVERY INDUSTRIAL REQUIREMENT
WILLSON GOGGLES
REG. U.S. PAT. OFF.
ONE PAIR OR 20,000 PER DAY
WRITE FOR CATALOG
T. A. Willson & Co., Inc. *Canadian Office:* 23 Scott St., Toronto

"Cincinnati Electrics"
Cut Your Costs
Hand or Breast Drills, 12 sizes, ¼ to 2½ in. capacity. Ball bearing throughout. Larger sizes fitted with screw feed.



We make complete line of Portable Electric Drills and Grinders for all purposes. Especially built to withstand hard usage. For all currents and voltages. Catalog?

Cincinnati Electric Tool Co., Cincinnati, Ohio

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DELIVERY QUALITY
JOLIETTE STEEL CO.
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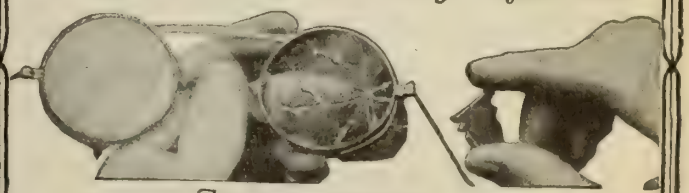
WE SHIP PROMPTLY

SMELTERS & WELDERS GOGGLES
We have a style to meet every requirement



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Consolidated Optical Company
Montreal Toronto Winnipeg Vancouver

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with Condensing Plant for quick delivery from stock at very favorable price.

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112 Coristine Bldg. MONTREAL

SEND US YOUR INQUIRIES AND PRINTS FOR QUOTATIONS
ON SPRING SHACKLE BOLTS OR
PRESSED STEEL AND BRASS GREASE CUPS—OILERS—OIL CUPS

"PLAIN"

Samples and Catalogues Sent on Request
Canadian Winkley Co. Limited
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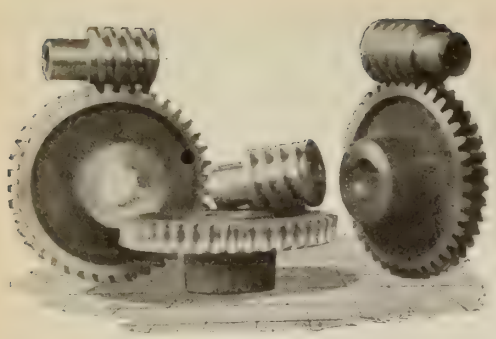
"SECTIONAL"



CUT GEARS

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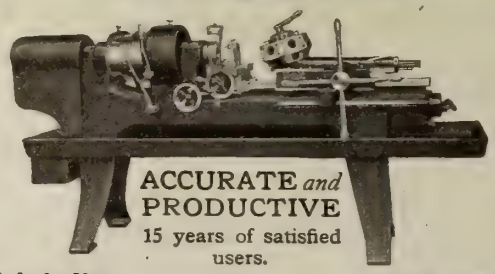

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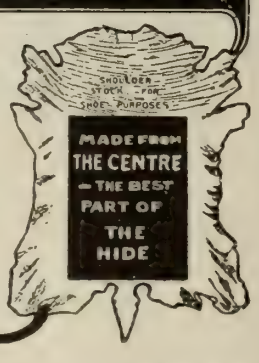

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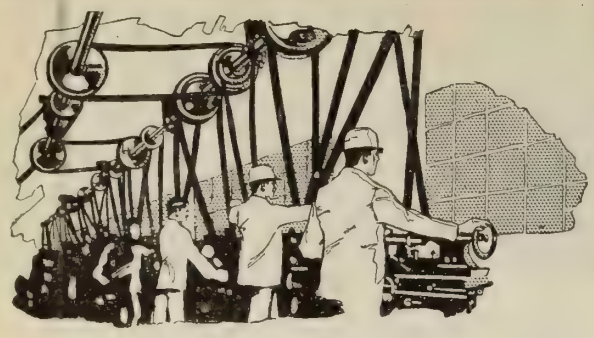

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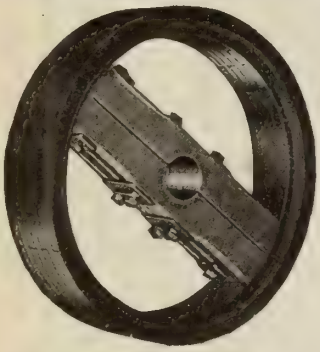

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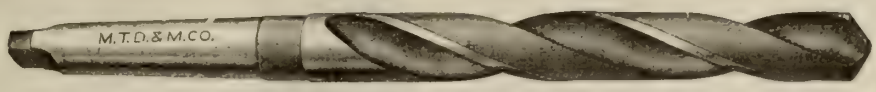

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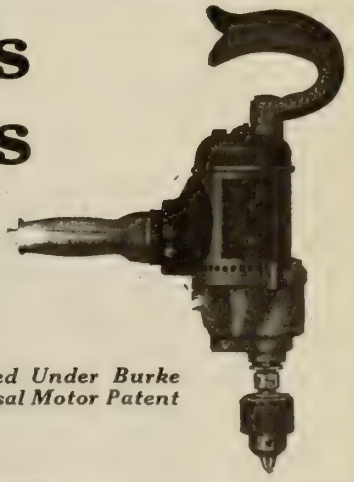

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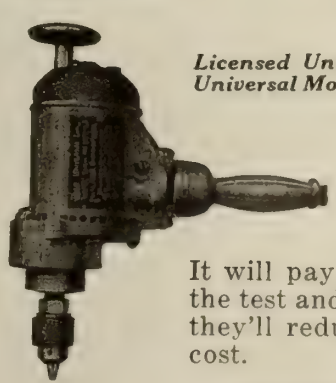

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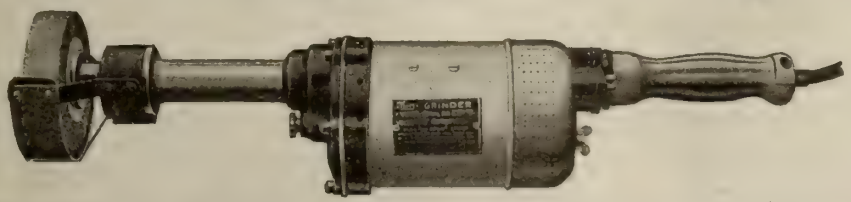

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Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

3 Minutes to Drill 20 Holes

That makes a total of 20 Cylinder Blocks (400 holes) drilled every hour. We really should say "Multi-Drilled," for that is why this output is possible.

A Motor Driven NATCO is doing it in the plant of the Harroun Motor Car Company, Detroit—and thereby making the day 20 times as productive; the entire 20 holes are drilled at the same time. One hole at a time method would not only take 20 times as long, but would require 20 men and 20 machines.

As many as 72 holes, of various sizes, can be drilled, tapped, reamed, spotfaced or counterbored at the same time. The NATCO patented feaure—Independent Change of Speed for each Drill—provides the approximate correct speed for each size tool.

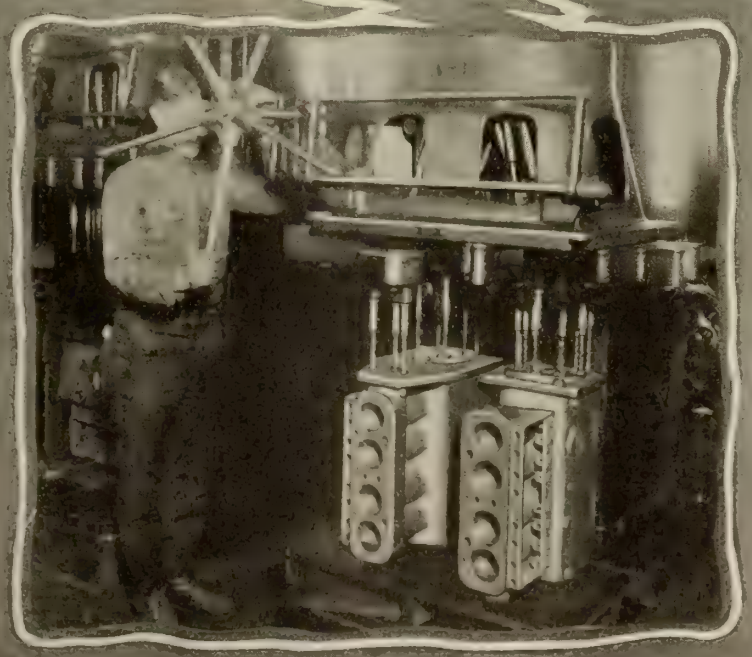
Shall we give you production estimates on your work?
Simply send us blueprints.

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drillers.

The National Automatic Tool Company
Richmond, Indiana, U. S. A.

List of NATCO foreign agents:

Burton, Griffiths & Co., British Isles.
E. Isbecque & Co., Belgium.
Allied Machinery Co. of America, Italy, Spain, Portugal and Switzerland.
Aux Forges de Vulcain, France.



UNIVERSALLY ADJUSTABLE NATCO MULTIPLE DRILLS

DRILLS, PNEUMATIC CORNER
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Butterfield & Co., Irc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

DUMP CARS
Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

DUST EXHAUSTER, ARRESTER SYSTEM
Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.

DYNAMOS AND ELECTRICAL SUPPLIES
Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACES
Volta Manufacturing Co., Welland, Ont.

EECTRIC FURNACE REGULATORS, WINCHES, ROOF COOLERS AND ELECTRODE HOLDERS
Volta Manufacturing Co., Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.
Can. Driver-Harris Co., Walkerville, Ont.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Volta Manufacturing Co., Welland, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto,
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMERY WHEEL DRESSINGS
Wheel Truing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINES, STEAM, GAS, GASOLINE
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. Wire & Iron Goods, Hamilton, Ont.

FINISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.

FIRST AID CABINETS
Strong, Kennard & Nutt Co., Cleveland.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FIXTURES
Brown Engineering Corp., Toronto, Ont.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

FLOTATION MACHINERY
Elec. Steel & Metals, Welland, Ont.

FLUMES
William Hamilton Co., Peterboro, Ont.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON
Blancke Co., L. C., New York City.

FORGINGS
Mesta Machine Co., Pittsburgh, Pa.
Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Blancke Co., L. C., New York City.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL
Armstrong-Whitworth of Can., Montreal.
Blancke Co., L. C., New York City.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
Brown & Sharpe Mfg. Co., Providence, R.I.

FOUNTAINS, DRINKING
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Brown & Sharpe Mfg. Co., Providence, R.I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
W. S. Rockwell Co., New York, N.Y.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit.
W. S. Rockwell Co., New York, N.Y.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield.
W. S. Rockwell Co., New York, N.Y.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GAS AND STEAM ENGINES
Mesta Machine Co., Pittsburgh, Pa.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE TANKS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE PUMPS, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

GAUGES
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGERS, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 518 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, THREAD
Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochester

GEAR BOXES, REDUCTION
Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN
Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Elliott & Whitehall, Galt, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

GEARS, RAWHIDE
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

GENERATORS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

GEARS, SPRING
Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

GEARS, SILENT CHAIN GENERATORS, STEAM TURBO
Can. General Electric Co., Toronto, Ont.

GENERAL MACHINE WORK
Elliott & Whitehall, Galt, Ont.

GENERATORS AND CONVERTORS
Can. General Electric Co., Toronto, Ont.

GENERATORS, MOTOR
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal.
MacGovern & Co., Montreal.

GERMAN SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

GLOVES, ASBESTOS, ACID PROOF, WATERPROOF, ETC.
Strong, Kennard & Nutt Co., Cleveland.

GLUE HEATERS
Oliver Machinery Co., Grand Rapids, Mich

GLASSES, SAFETY
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

GOVERNOR, WATER WHEEL
Wilson & Co., J. C., Belleville, Ont.

GRAPHITE
Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

GOGGLES
Consolidated Optical Co., Toronto.
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.
Welding & Supplies Co., Montreal.

GRAVITY CARRIERS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

GREASE CUPS, PRESSED STEEL, BRASS
Can. Winkley Co., Ltd., Windsor, Ont.

GREASES (See Lubricants)

GRINDERS, AUTOMATIC KNIFE
Canada Machinery Corp., Galt, Ont.
Foss Mchry. & S'ply Co., G. F., Montreal
Garlock-Walker Machinery Co., Toronto.

GRINDERS, CENTRE COLUMN, PEDESTAL AND BENCH
Wisconsin Electric Co., Inc., Racine, Wis.
Can. Machinery Corp., Galt, Ont.

Don't "Leave it to George"

Canada was never lacking in war enterprise—war strategy—war efficiency. She always carried out successfully her plans of war.

Now—we must apply the same determination and energy to the plans of peace, for we now have new problems to solve.

We are faced with the great work of readjusting our country from a War to a Peace footing.

Our immediate duty is to provide the national working capital, without which it will be impossible to carry out the Plans of Peace.

Demobilization, bonuses to soldiers, civil re-establishment, credit loans to Britain for the purchase of Canadian surplus products, ensuring continued employment to our workers. All these call for national capital, and the Victory Bonds 1919 will provide that capital.

Therefore, the success of the Victory Loan is not something that concerns "the other fellow" only.

You have a part to play.

Your individual prosperity is at stake.

YOU must support the Victory Loan just as enthusiastically as your fellow citizens.

Canada must have the money to carry out the Plans of Peace.

If things are to be kept "humming" you must

BUY VICTORY BONDS

"Every Dollar Spent in Canada"

THIS SPACE DONATED TO THE VICTORY LOAN 1919 CAMPAIGN BY

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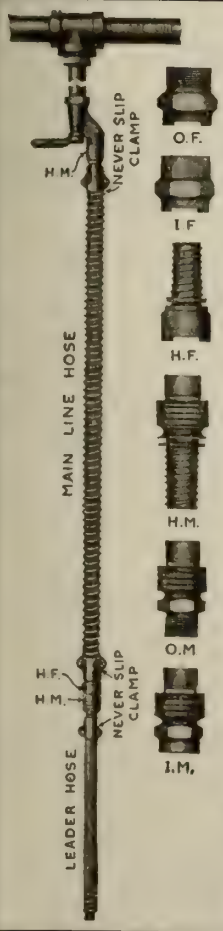

CLEVELAND HOSE SPECIALTIES

Bowes Automatic Air Hose Couplings

Standard Equipment Everywhere

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
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STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ⅜-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-in.

The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.

CLECO GROOVED HOSE NIPPLE

Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Use Annealed Wire No. 14

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Bulletin 34A, 41 and 43.

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A. R. WILLIAMS MACHINERY CO., TORONTO, 337 Craig St., W., MONTREAL. WILLIAMS & WILSON, MONTREAL

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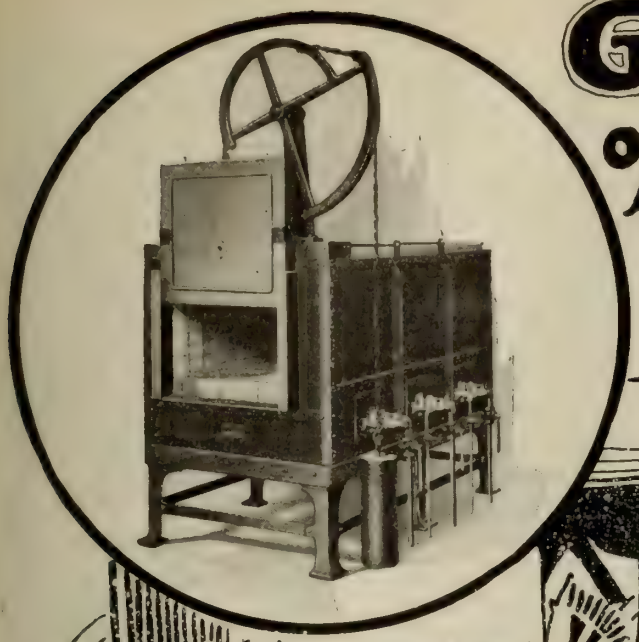

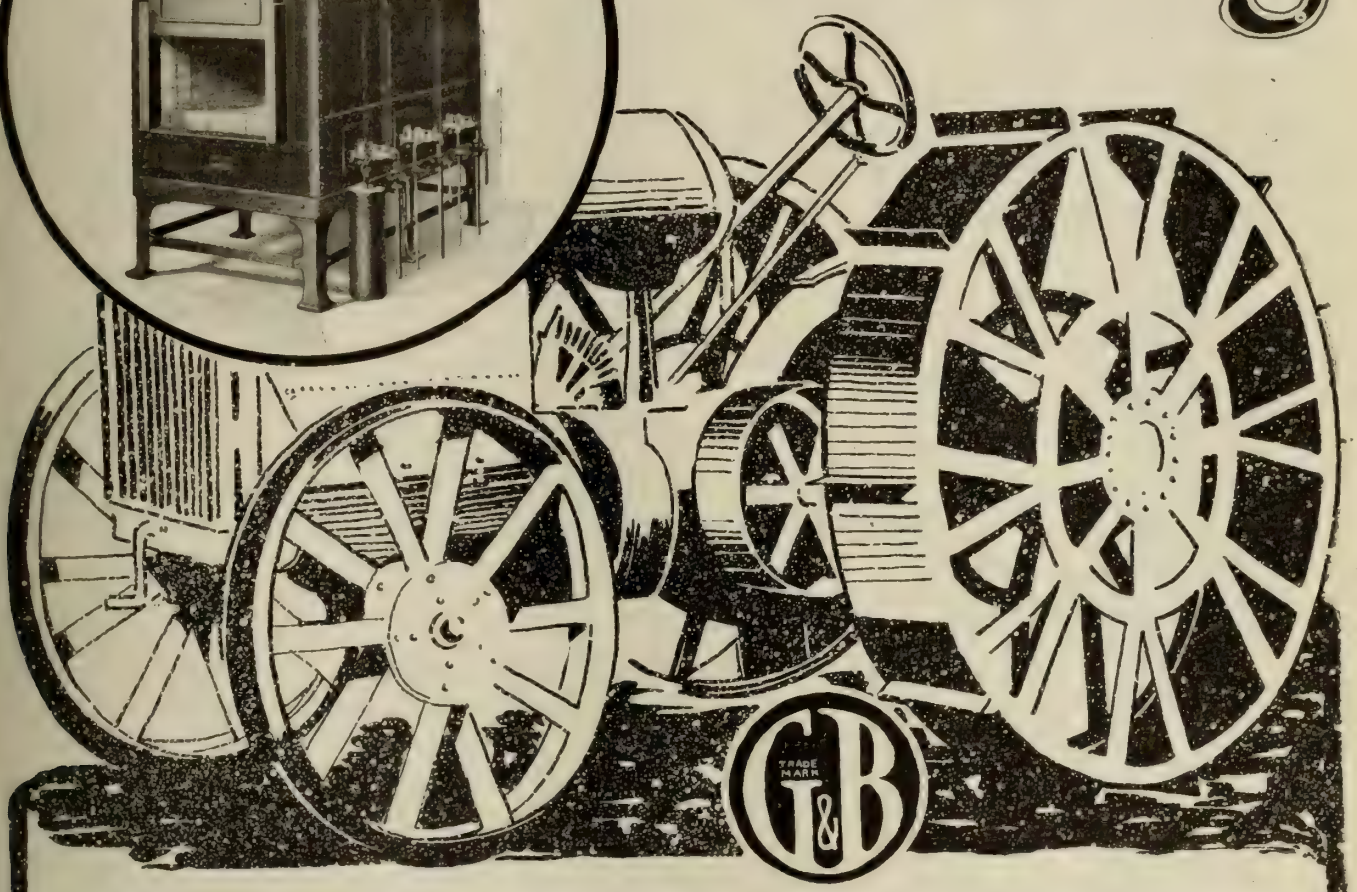

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the result of which is an exceptionally high grade product which measures up to the best manufacturing standards. There is a G. & B. Furnace exactly suited to your requirements. Let our engineers advise you—write. **To-day is a better day than to-morrow to send for Bulletin 24.**

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Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Worcester Lathe Co., Worcester, Mass.
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Graton & Knight Mfg. Co., Worcester, M.

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Can. Winkley Co., Ltd., Windsor, Ont.

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See Belting, Chain.

LINOLEUM MILL MACHINERY

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Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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METAL CLEANERS

Oakley Chemical Co., New York, N.Y.

METAL SAWS

See Saws.

METAL SAWS, POWER

Hoefer Mfg. Co., Freeport, Ill.

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Wells Bros. of Canada, Galt, Ont.

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Kearney & Trecker Co., Milwaukee Wis.

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Bertram & Sons Co., John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
Kearney & Trecker Co., Milwaukee Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Taft-Peirce Mfg. Co., Woonsocket, R.I.
Williams & Wilson, Ltd., Montreal, Que.

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Bilton Mach. Tool Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Betts Machine Co., Rochester, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Cleveland Milling Machine Co., Cleveland.
Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
Williams & Wilson, Ltd., Montreal, Que.

MILLING MACHINES, HAND

Bristol Machine Tool Co., Bristol, Conn.

MILLING MACHINES, THREAD

Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.
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Pratt & Whitney Co., Dundas, Ont.
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Ford-Smith Mach. Co., Hamilton, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
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Brown & Sharpe Mfg. Co., Providence.
Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
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Marshalltown Mfg. Co., Marshalltown, Ia.

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Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
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Geometric Tool Co., New Haven, Conn.
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Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
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MacKinnon Steel Co., Sherbrooke, Que.
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Pratt & Whitney Co., Dundas, Ont.

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Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Garlock-Walker Machy. Co., Toronto, Ont.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
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Graton & Knight Mfg. Co., Worcester, M.

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Nat. Automatic Tool Co., Richmond, Ind.

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Blancke Co., L. C., New York City.

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Can. Driver-Harris Co., Ltd., Walkerville.

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Boker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

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Landis Machine Co., Waynesboro, Pa.
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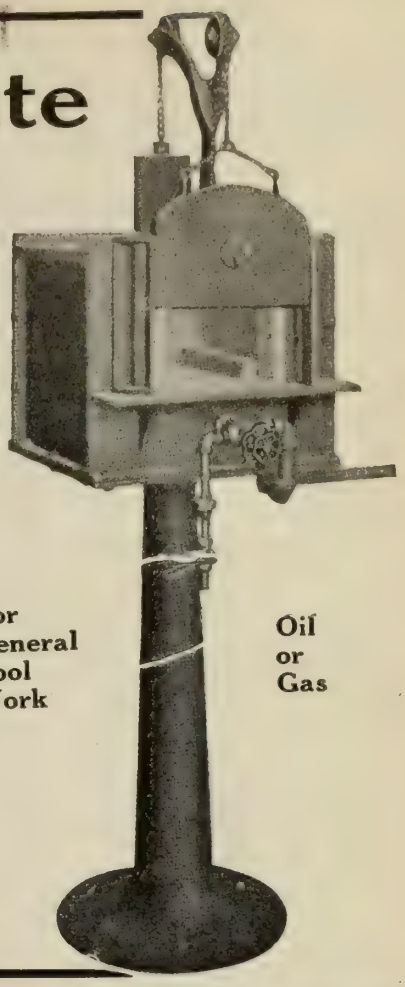

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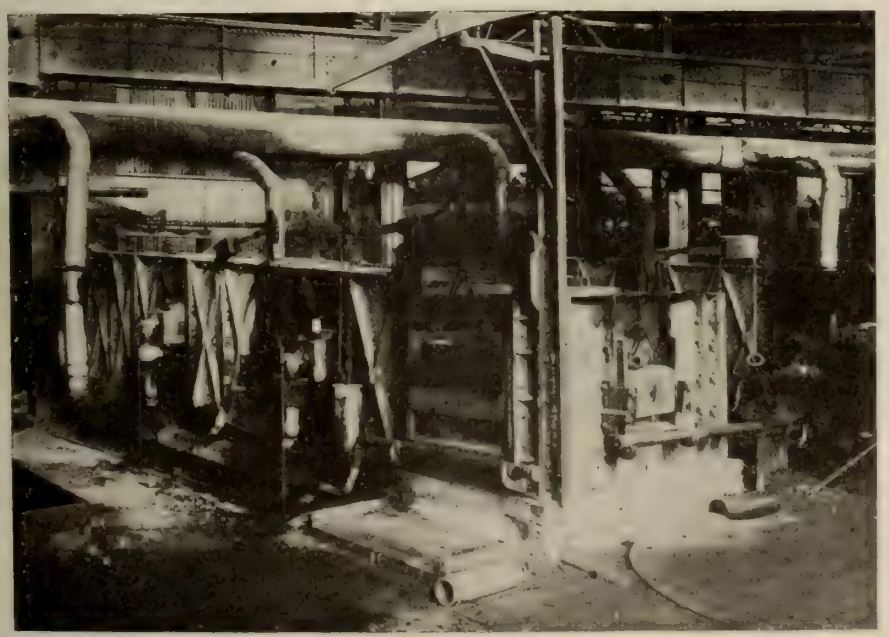

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See Guards

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Gardner & Son, Robt., Montreal.
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PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H. Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Whitman & Barnes Co., St. Catharines.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, Ont.
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Blancke Co., L. C., New York City.
L. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, HAND
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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WELLAND, ONTARIO

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REAMERS, PIN
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland.

RIVETS,
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

RODS, HIGH SPEED AND CARBON DRILL
Blancke Co., L. C., New York City.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd. Walkerville.

ROLL ENGRAVING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROLLS AND TABLES
Elec. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland.

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Mesta Machine Co., Pittsburgh, Pa.

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Manhattan Machine & Tool Co., Grand Rapids, Mich.

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Can. Link-Belt Co., Toronto.

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Hoggson & Pettis Mfg. Co., New Haven, Conn.

RUBBER MFRS.' SUPPIES
Hoggson & Pettis Mfg. Co., New Haven, Conn.

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY, APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Hawlenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW DRIVERS
Whitman & Barnes Co., St. Catharines.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co. Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Milwaukee Shaper Co., Milwaukee, Wis.
Rae Mach. Tool Co., Ramilton.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
Marshalltown Mfg. Co., Marshalltown, Ia.
The Quickwork Co., St Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEET METAL ROLLING MACHINES
Peck, Stow & Wilcox Co., Southington.

SHEETS, NICKEL, RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHEARS, PLATE CUTTING, SLITTING
Marshalltown Mfg. Co., Marshalltown, Ia.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Marshalltown Mfg. Co., Marshalltown, Ia.
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL MACHINERY
Peck, Stow & Wilcox Co., Southington, C.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal.

SHEETS, CRUCIBLE, CAST
Kayser-Ellison & Co., Ltd., Montreal.
Ralph B. Norton, Agent, Montreal.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLICING CLAMPS
Peck, Stow & Wilcox Co., Southington Conn.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.
Jas. Steele, Ltd., Guelph, Ont.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Marten Machine Co., Hamilton, Ont.
Rae Mach. Tool Co., Ramilton.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Wilson & Co., J. C, Belleville, Ont.
William R. Perrin, Ltd., Toronto.
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Hoggson & Pettis Mfg. Co., New Haven, Conn.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

SPRINGS, SPIRAL, TOOL
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SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia.
Wilson & Co., J. C., Belleville, Ont.

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The Dunbar Bros. Co., Bristol, Conn.

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Can. Link Belt Co., Toronto, Ont.

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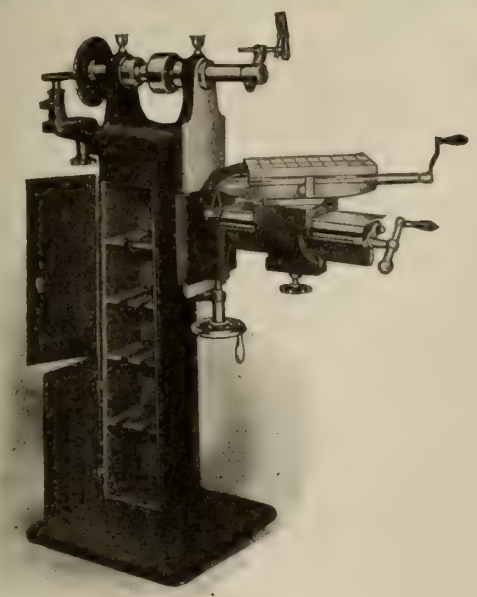

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Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14″ x 6″; SURFACES, 9½″ x 6″

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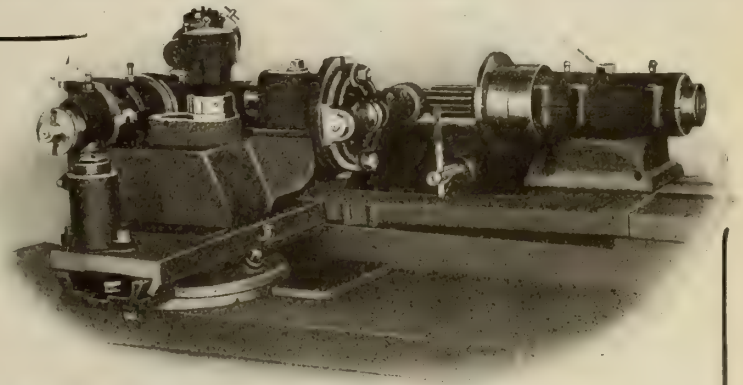
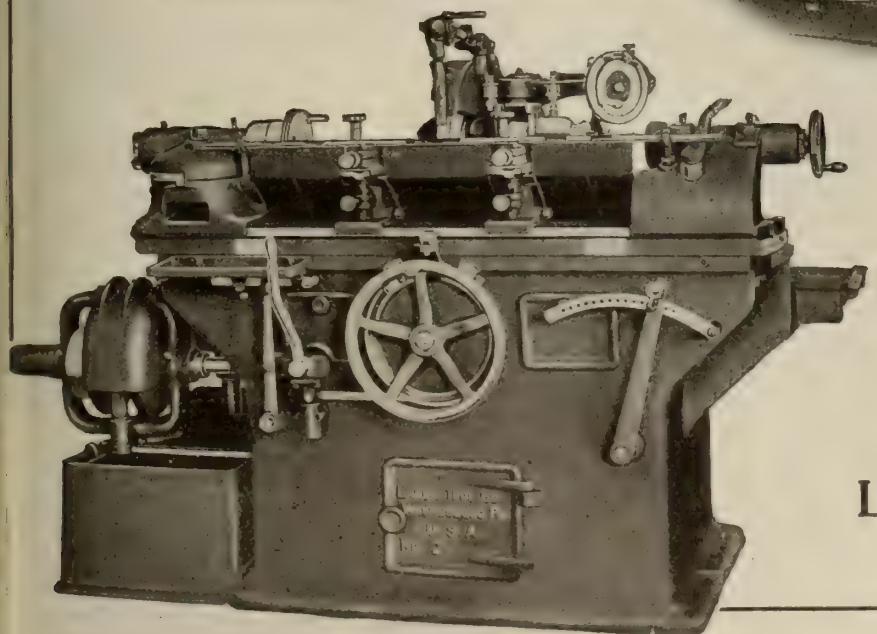
Easy to Operate

Landis Universal Grinding Machines



Backing-off Straight Reamer



Their application is practically unlimited, combining, as they do, both an external and internal grinding machine.

Besides they are economical, and increased efficiency can be obtained by the use of the magnetic chuck, side mill grinding attachment, gear cutter grinding attachment, etc. (See sketch herewith).

Landis Tool Company

Waynesboro, Pa.

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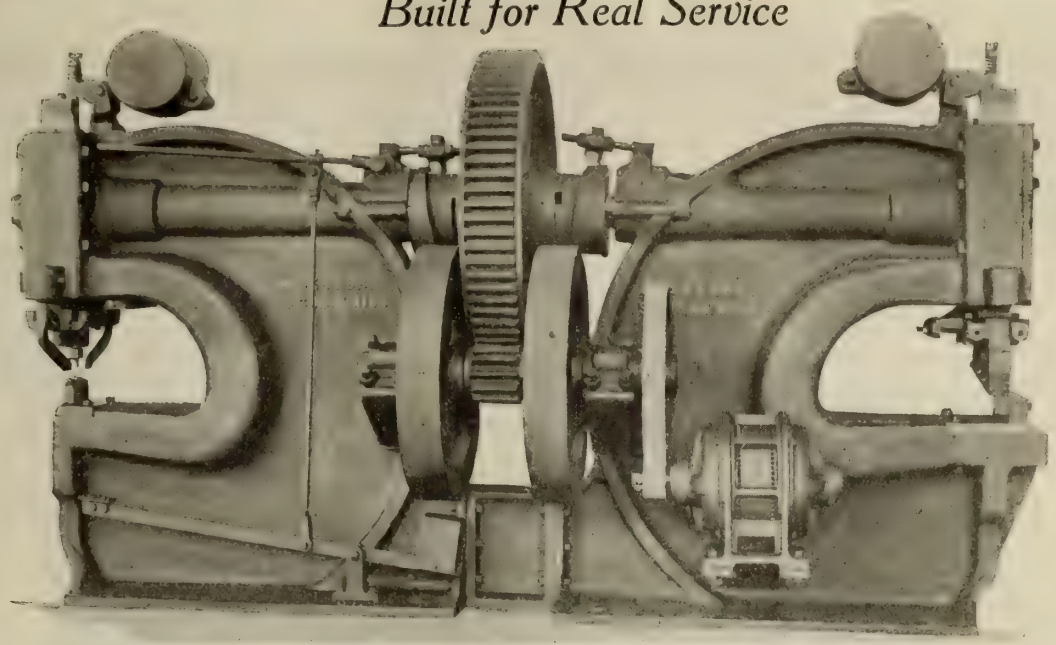

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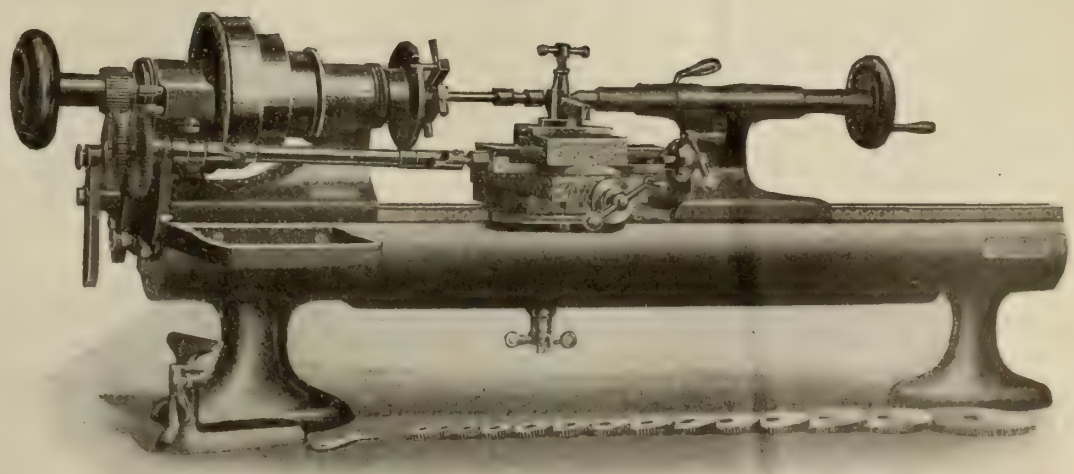

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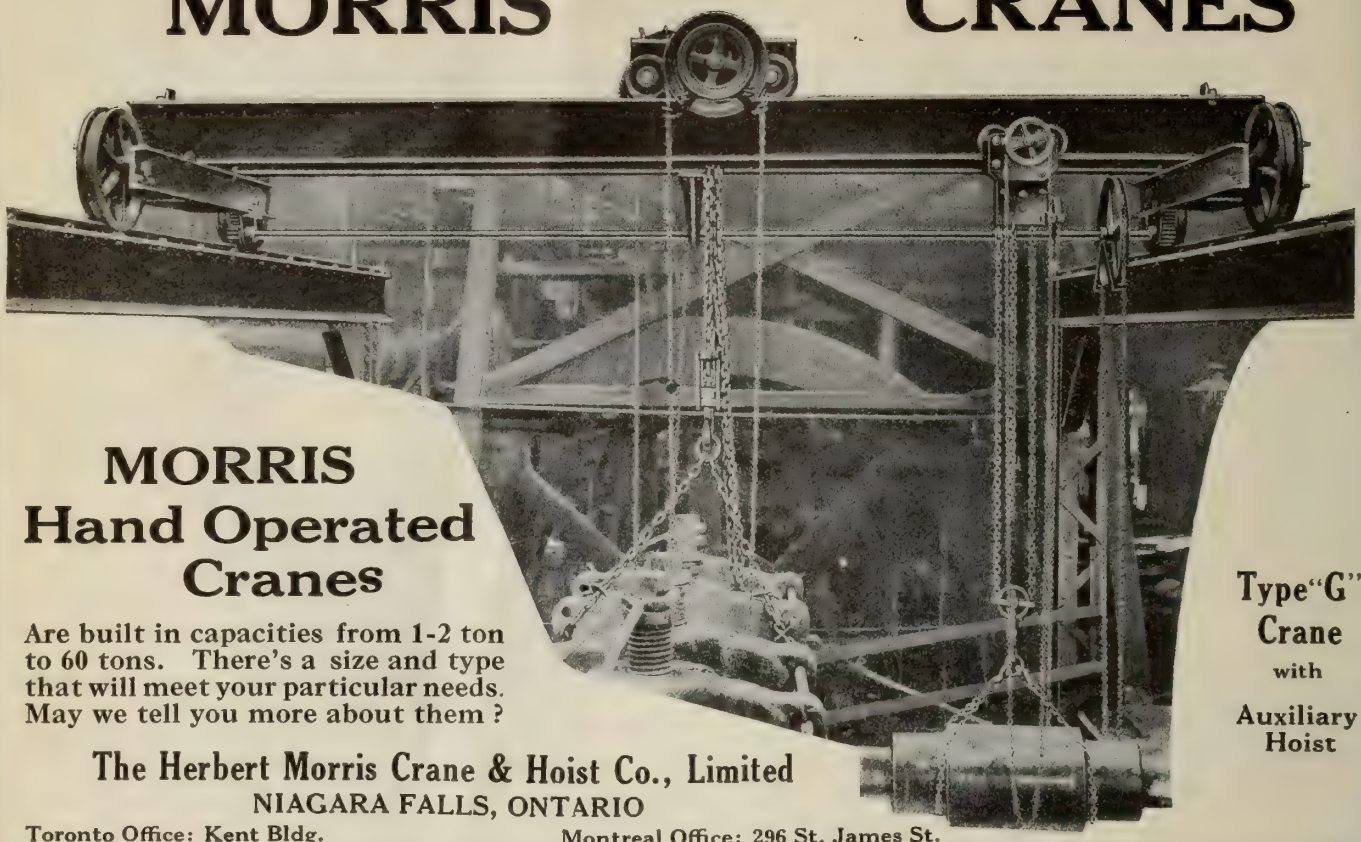

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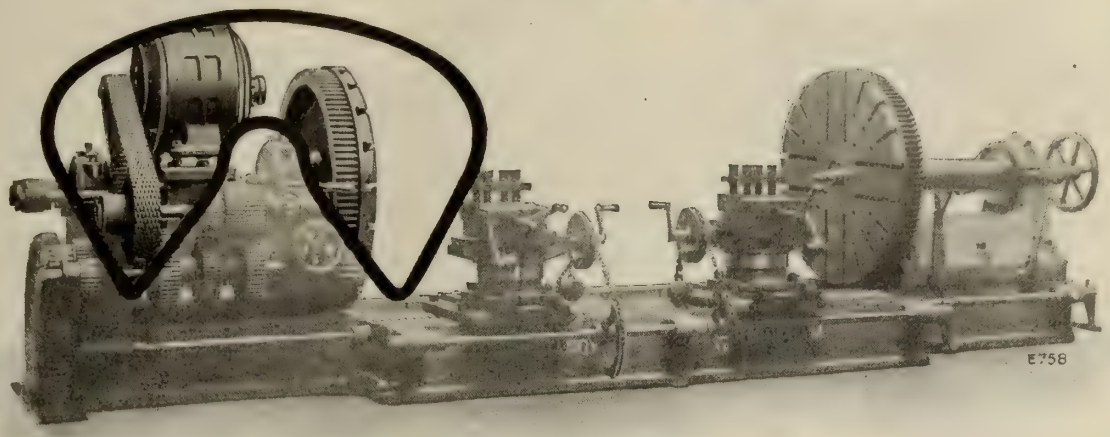

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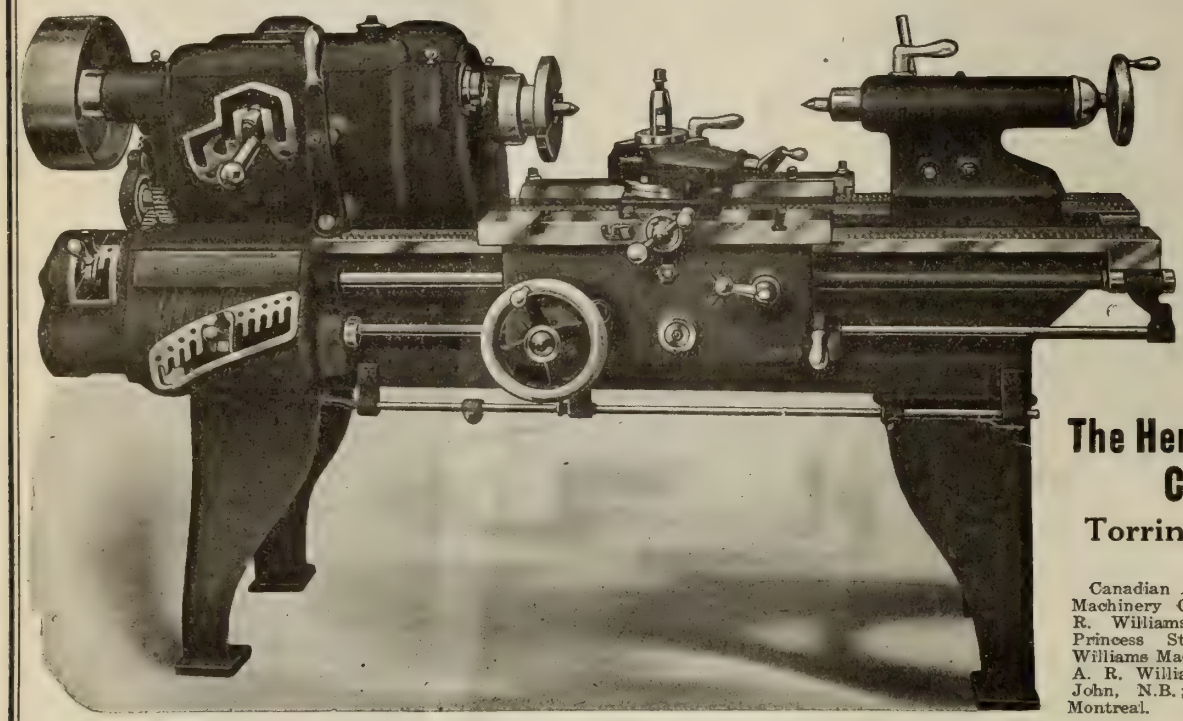

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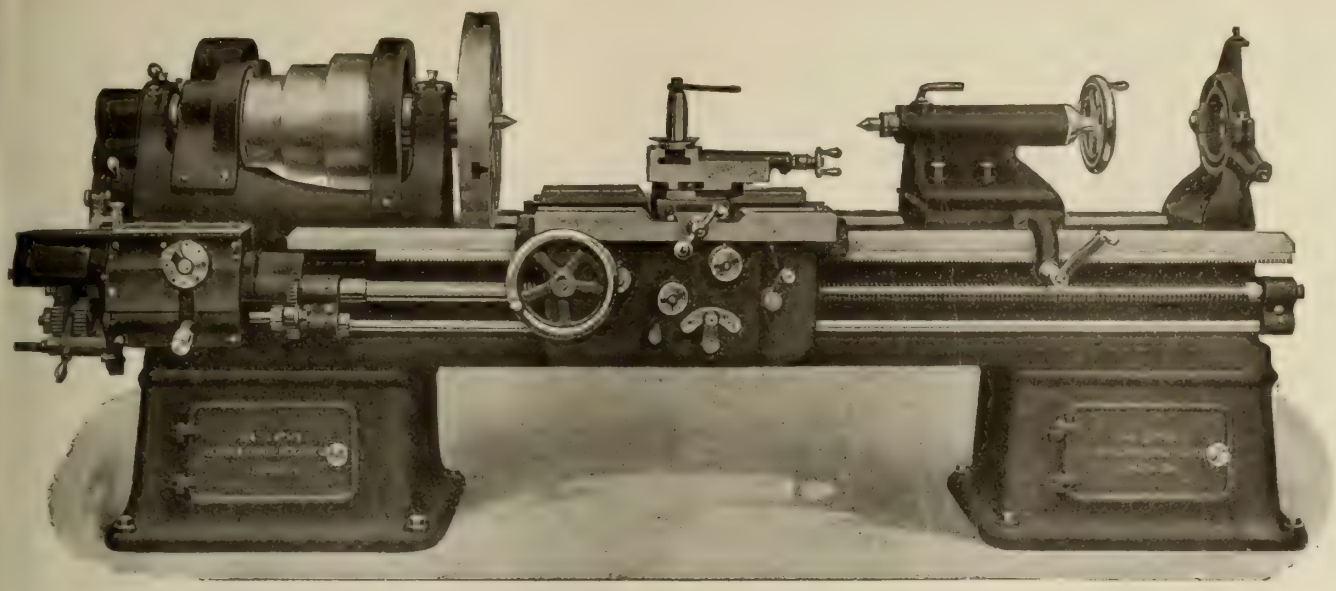

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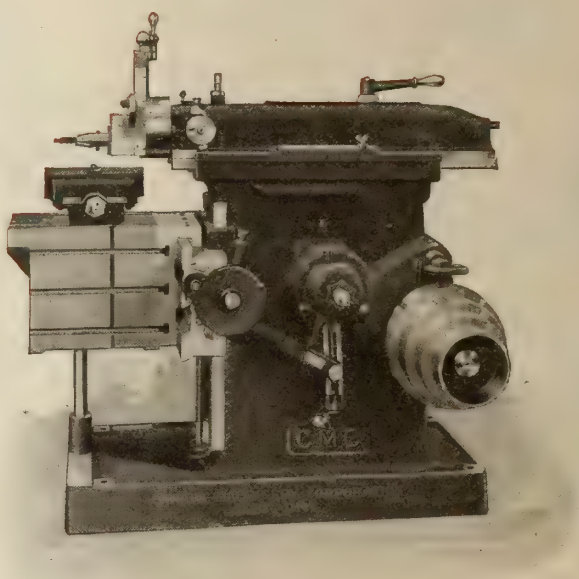

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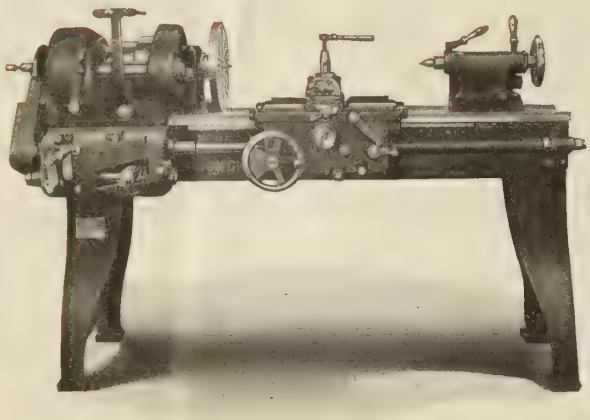

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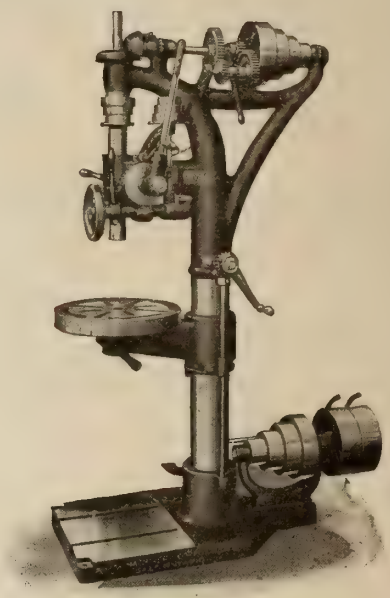

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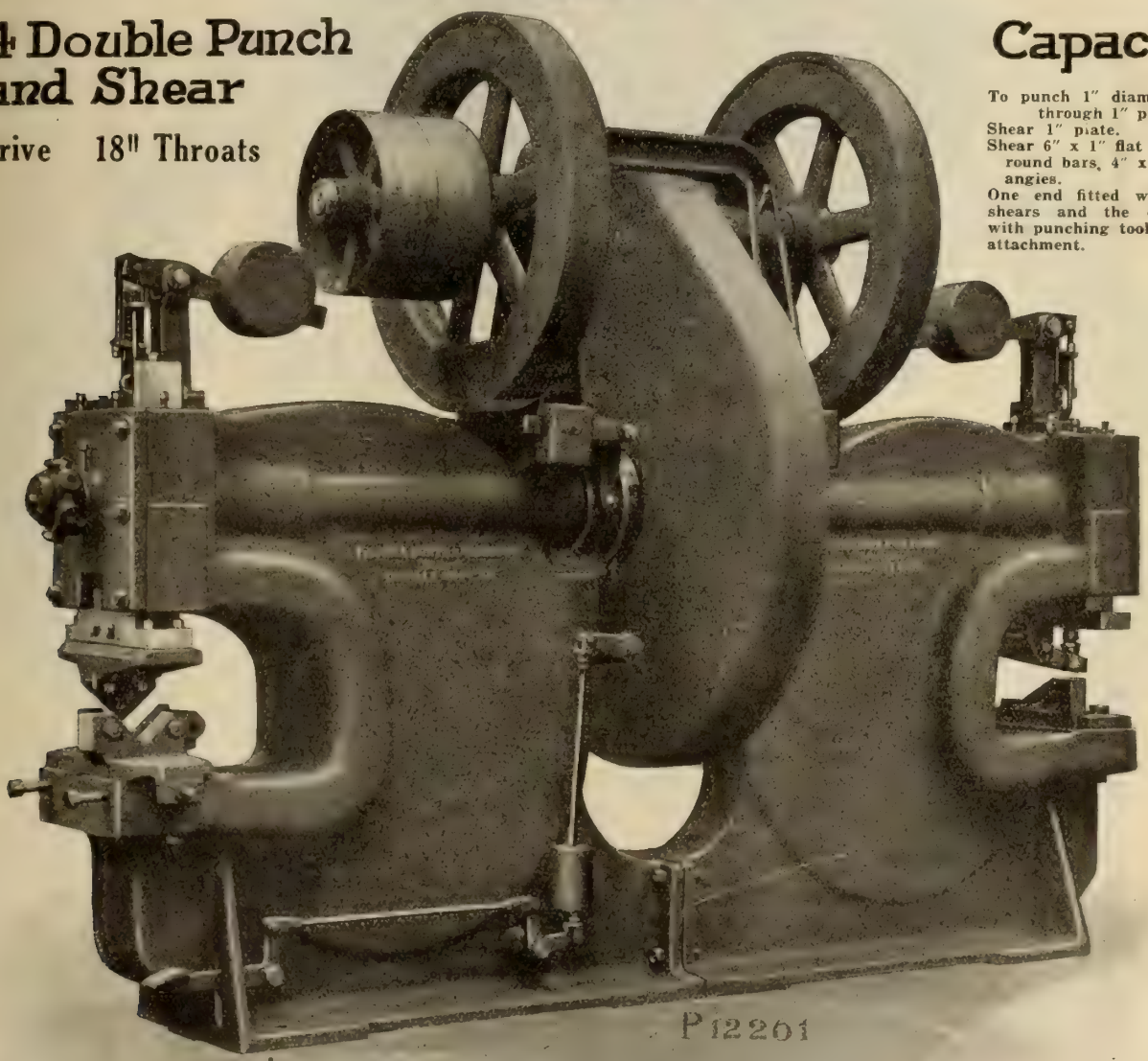

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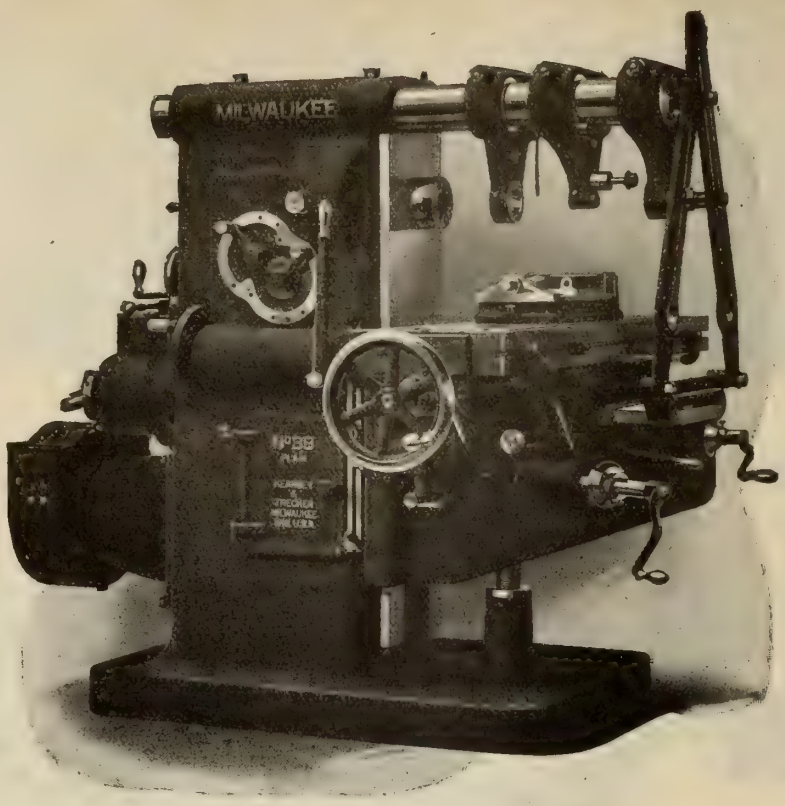

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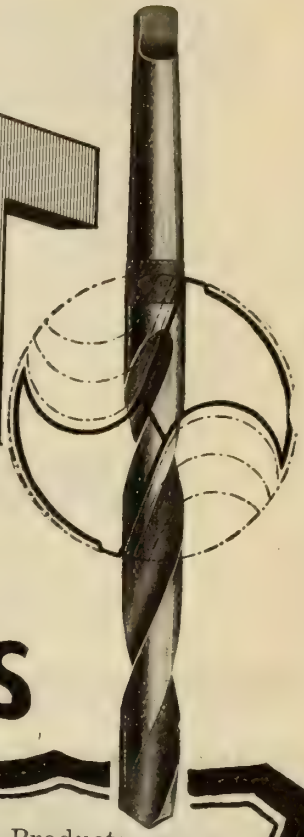

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WILT Products are manufactured with the sole purpose of meeting the demand for an absolutely dependable tool of high quality.

WILT HIGH SPEED and CARBON TWIST DRILLS, REAMERS AND MILLING CUTTERS are the kind of tools you can depend upon to give the highest form of service. If you are not getting the satisfaction you would like, adopt the **WILT** line. They have the quality that gives long and satisfactory service. Give them a trial.

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Whenever a strong, dependable hoist is needed, the "Imperial" air motor hoist fills the bill.

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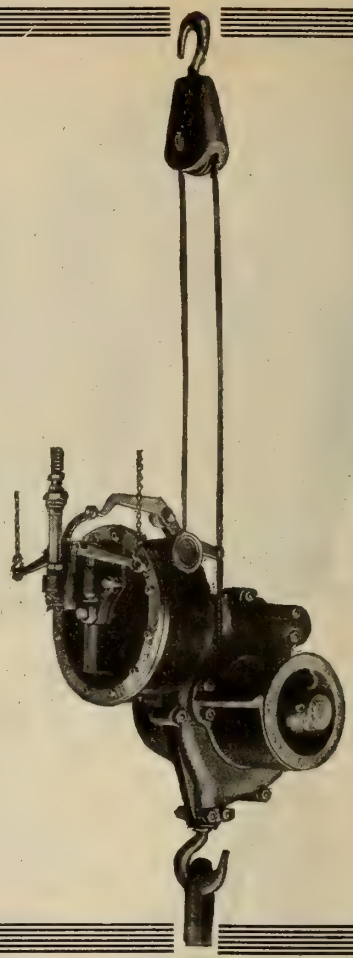
The motor is completely balanced; the sensitive control allows the load to be raised or lowered a fraction of an inch at a time. Ball and roller bearings and thorough lubrication insure long wear.



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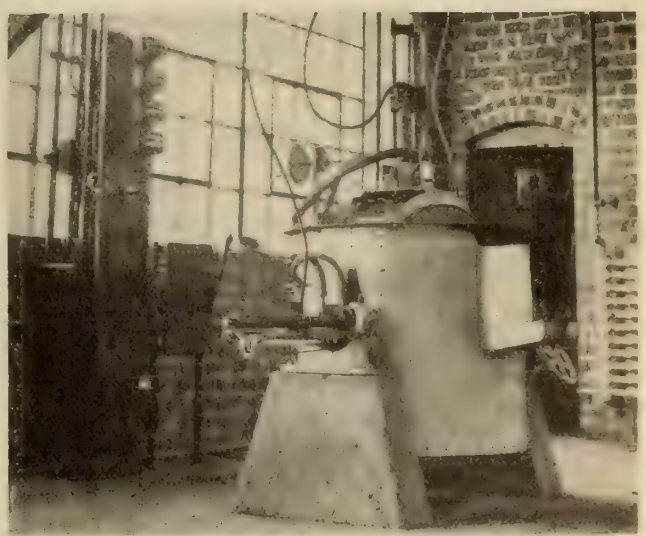

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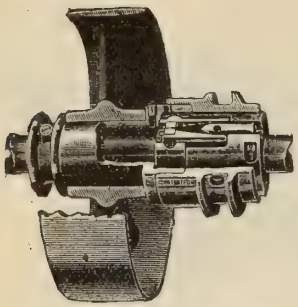

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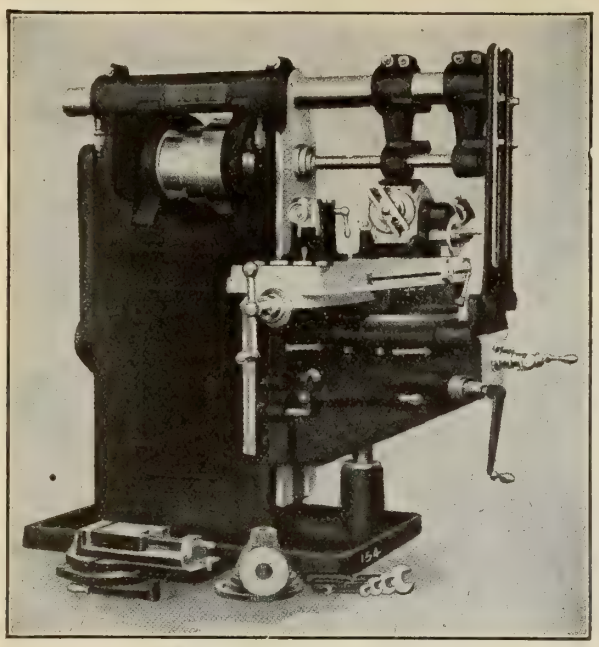

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For Bearings in
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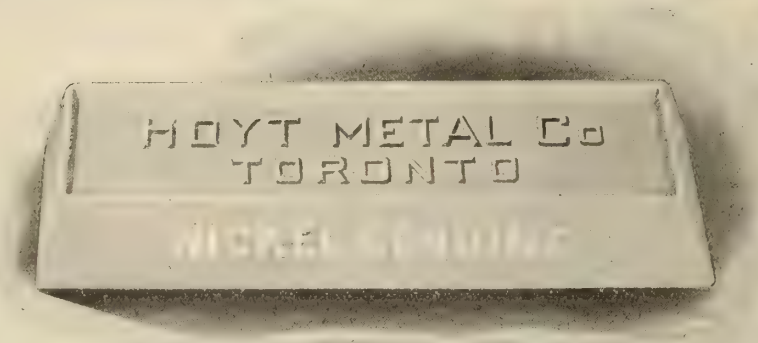

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Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood pattern-makers who are able to make any changes that may commend themselves to you.

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We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

3 Minutes to Drill 20 Holes

That makes a total of 20 Cylinder Blocks (400 holes) drilled every hour. We really should say "Multi-Drilled," for that is why this output is possible.

A Motor Driven NATCO is doing it in the plant of the Harroun Motor Car Company, Detroit—and thereby making the day 20 times as productive; the entire 20 holes are drilled at the same time. One hole at a time method would not only take 20 times as long, but would require 20 men and 20 machines.

As many as 72 holes, of various sizes, can be drilled, tapped, reamed, spotfaced or counterbored at the same time. The NATCO patented feature—Independent Change of Speed for each Drill—provides the approximate correct speed for each size tool.

Shall we give you production estimates on your work? Simply send us blueprints.

We also design and build jigs and fixtures for use in connection with NATCO Multi-Drillers.

The National Automatic Tool Company
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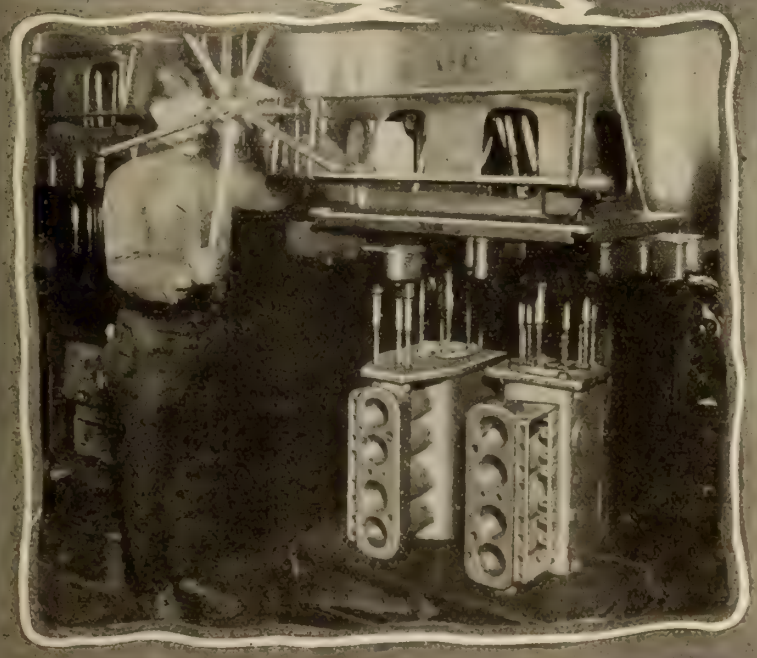

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THE HIGH SPEED STEEL

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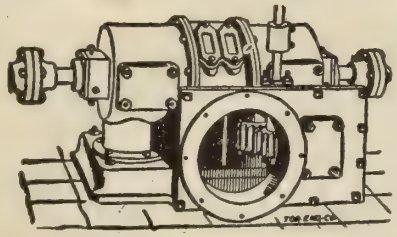

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Can supply complete equipment, including flume, turbine and power transmission.
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

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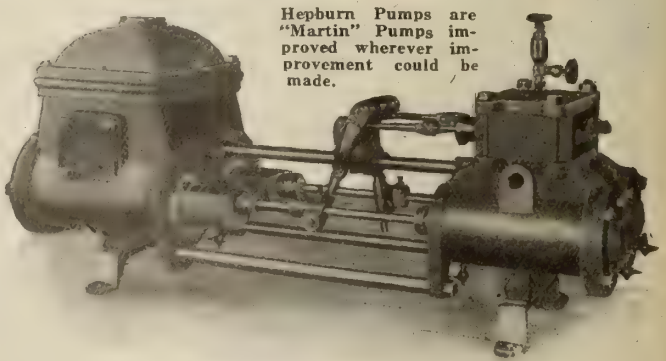
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

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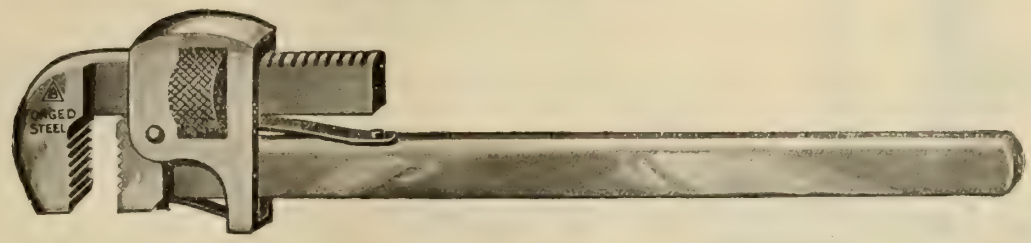

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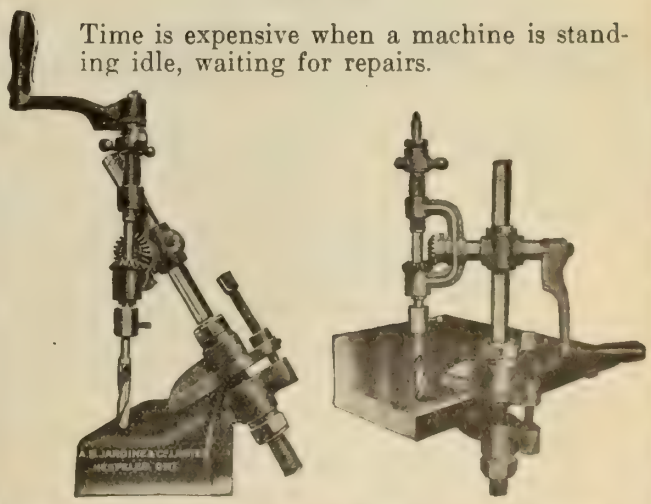
Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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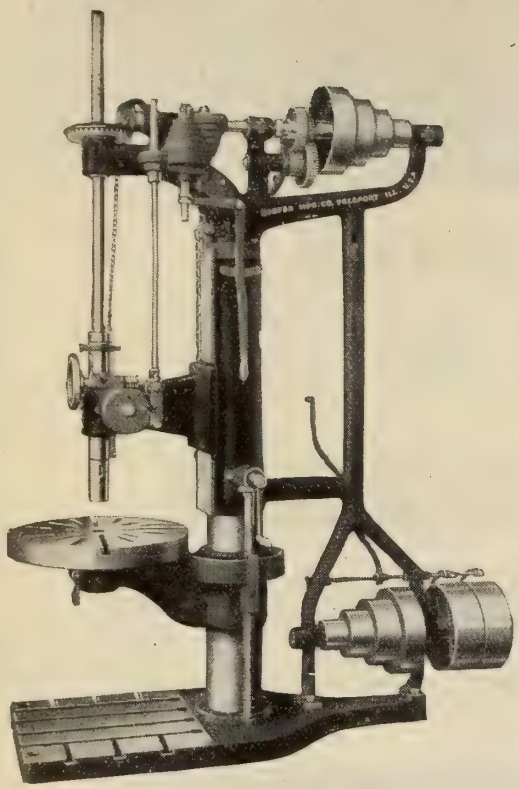

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Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

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Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.

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Potter & Johnston
Automatic Milling Machine

Here is just one of the many pieces that can be produced to advantage on the Potter & Johnston Automatic Milling Machine.

In this case the vertical machine is used and one fixture is held on each table and the operator is loading one fixture while the cutter is working on the piece held in the other fixture.

16 Table Feeds — 7/8 to 12 5-16 inches.

Length of Table Feed — 29 inches.

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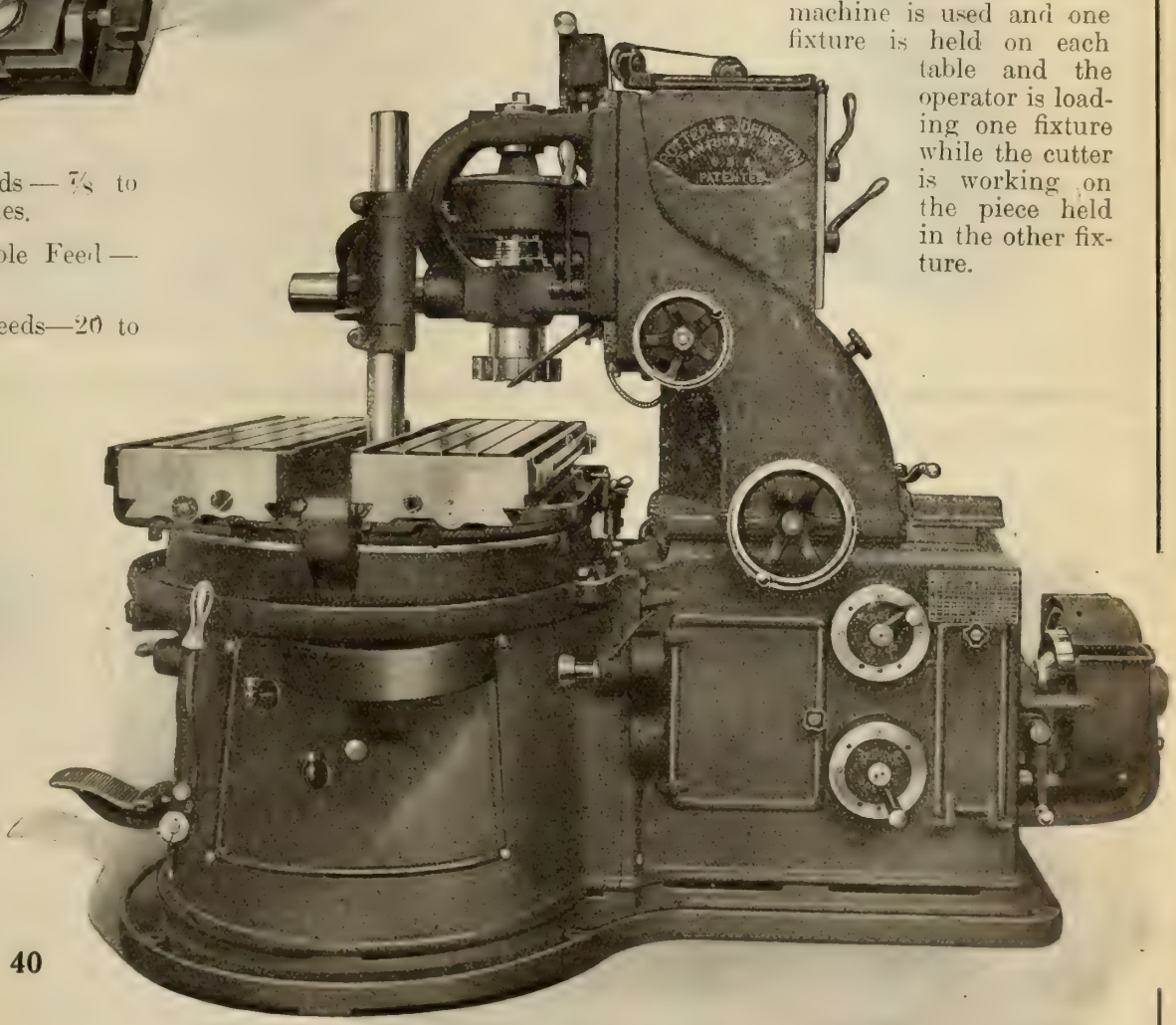

Estimates cheerfully furnished upon receipt of your blue prints or samples.

Bulletin 40

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Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

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Marshalltown, Iowa
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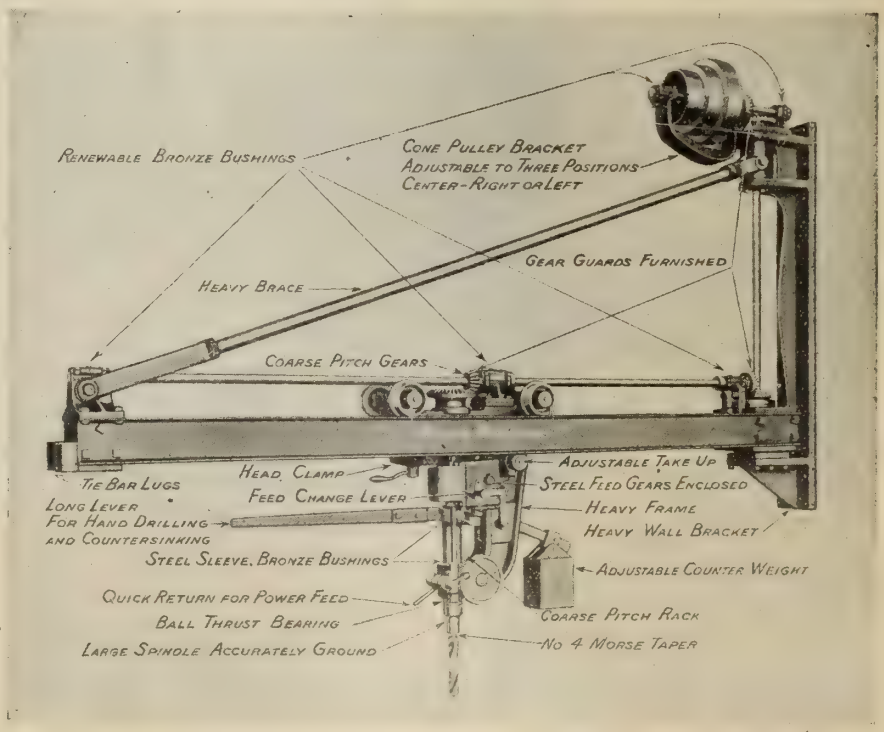
GET IT TO-DAY!

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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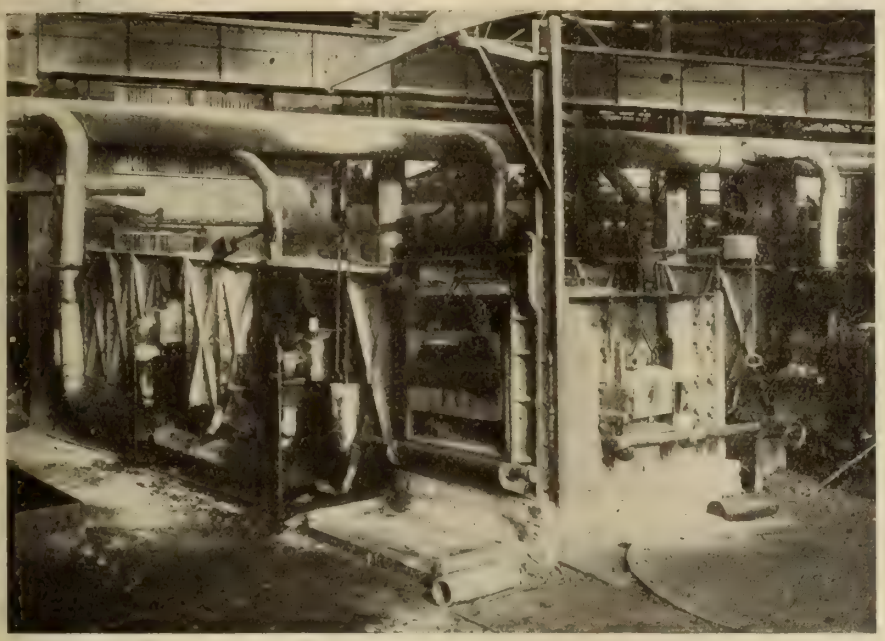
Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges. We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.



Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

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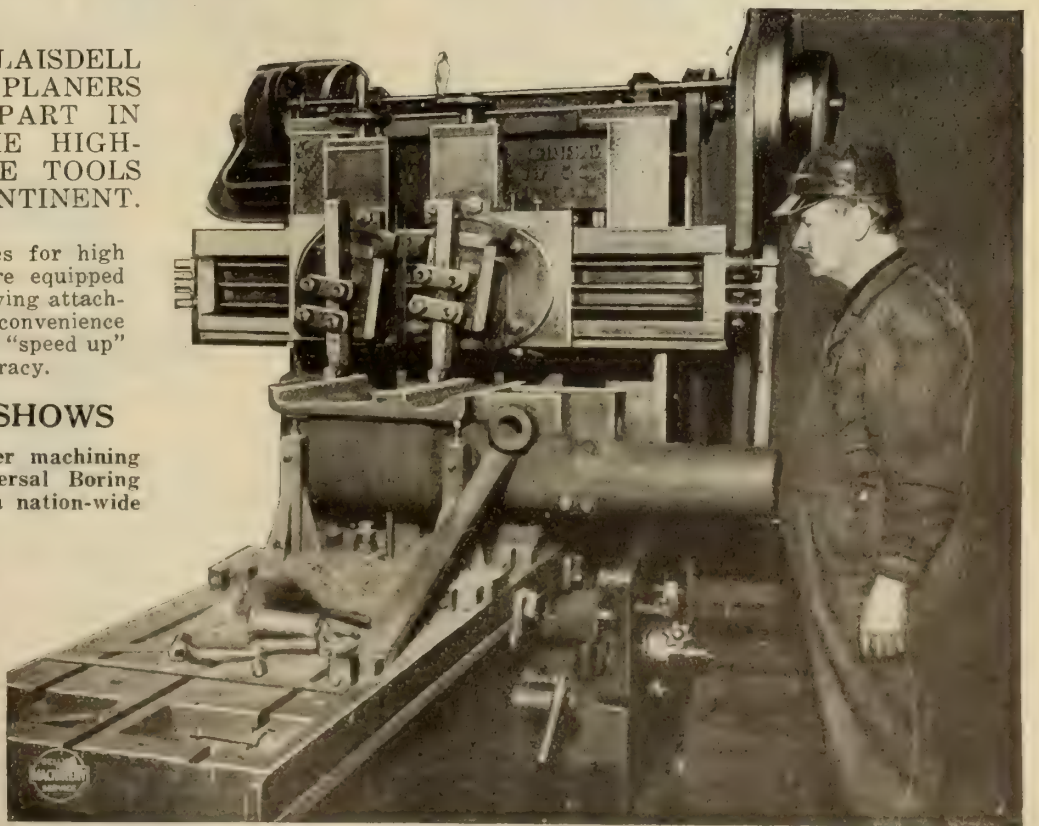
ALL-ROUND machines for high grade work, they are equipped with special labor-saving attachments that add to their convenience and enable the operator to "speed up" without endangering accuracy.

ILLUSTRATION SHOWS

a Whitcomb-Blaisdell Planer machining the head post of a Universal Boring Machine—a machine with a nation-wide reputation for accuracy.

May we send you our catalogue giving full particulars?



Whitcomb-Blaisdell Machine Tool Co.
WORCESTER, MASS.
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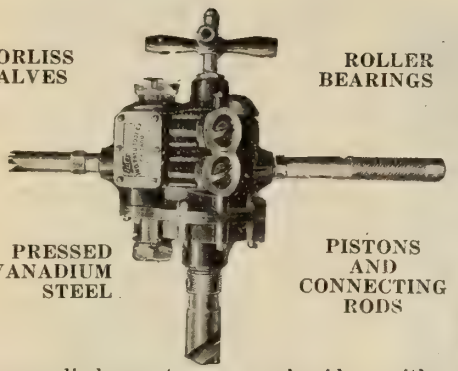

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Four cylinders — two on each side — with Semi-Corliss Valve close to each pair, giving greater power and efficiency.

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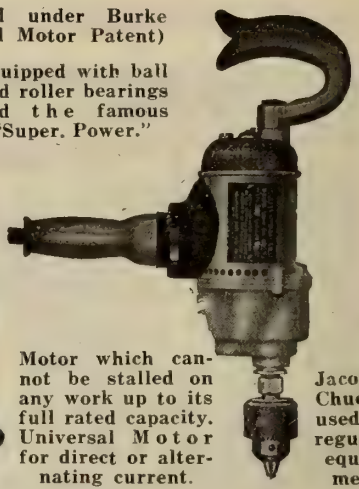
4 Sizes, 1 in. to 5 in.
All parts hardened and ground.

(Licensed under Burke Universal Motor Patent)

Equipped with ball and roller bearings and the famous "Super. Power."



Motor which cannot be stalled on any work up to its full rated capacity. Universal Motor for direct or alternating current.

Jacob's Chucks used as regular equipment.

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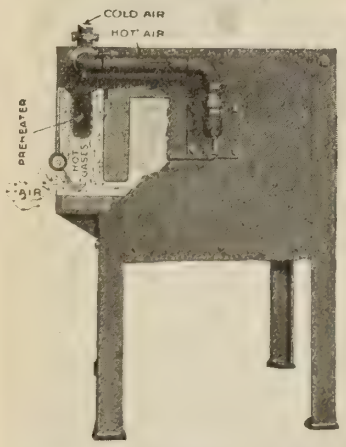

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It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

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Machines do 50 to 100% more work

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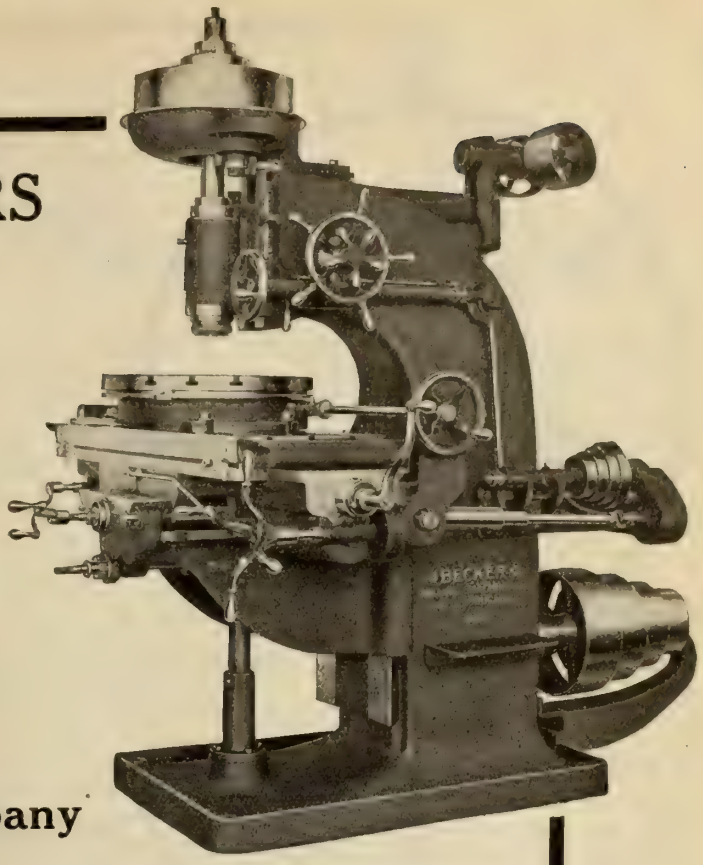
for

GREATER PRODUCTION because they work continuously—every hour of operation is a production hour—

ECONOMY OF OPERATION because they are power savers; the internal belt drive forms an elastic drive to the spindle that prolongs the life of the cutter by eliminating chatter and vibration.

ACCURACY because the machines have exceptionally fine feeds and are equipped with micrometer dials and stop gauges. The Patent Becker Gibbing keeps the work permanently aligned with the spindle.



Becker Milling Machine Company

HYDE PARK, BOSTON, MASS.

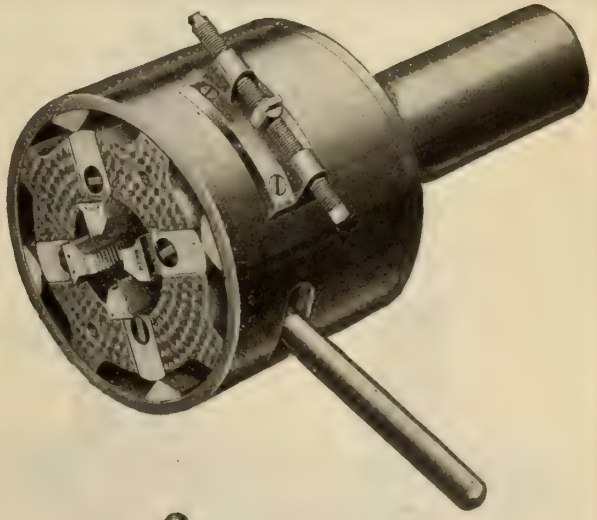
A. R. WILLIAMS MACHINERY COMPANY, LIMITED - 64 FRONT STREET WEST, TORONTO
RUDEL-BELNAP MACHINERY COMPANY, LIMITED - 137 McGILL STREET, MONTREAL

NAMCO DIES TAPS

It doesn't make a bit of difference whether it's threading screws or tapping axle housings, there's a NAMCO Threading Tool for every thread cutting requirement.

NAMCO Dies and Taps are simple in design, rigid in construction to cut threads true to specification on all classes of work.

Ask for catalog--no obligation



The National Acme Company

CLEVELAND, OHIO

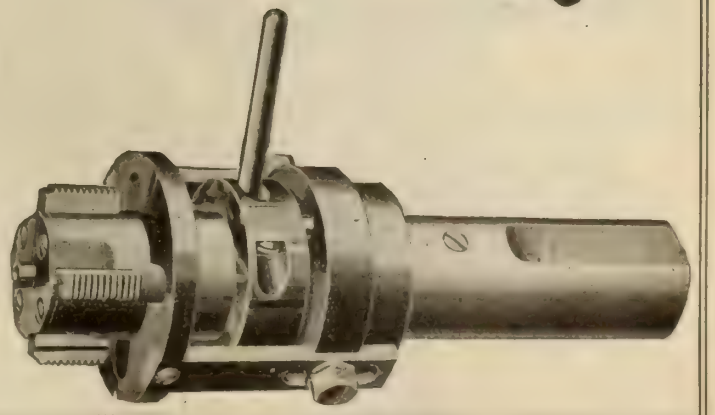
New England Plant - Windsor, Vt.
Canadian Screw Plant - Montreal, P.Q.

Branch Offices:
New York Boston Chicago Detroit Buffalo Atlanta San Francisco

Warehouses: New York and Chicago

Representatives in Foreign Countries

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products, at Cleveland, Ohio



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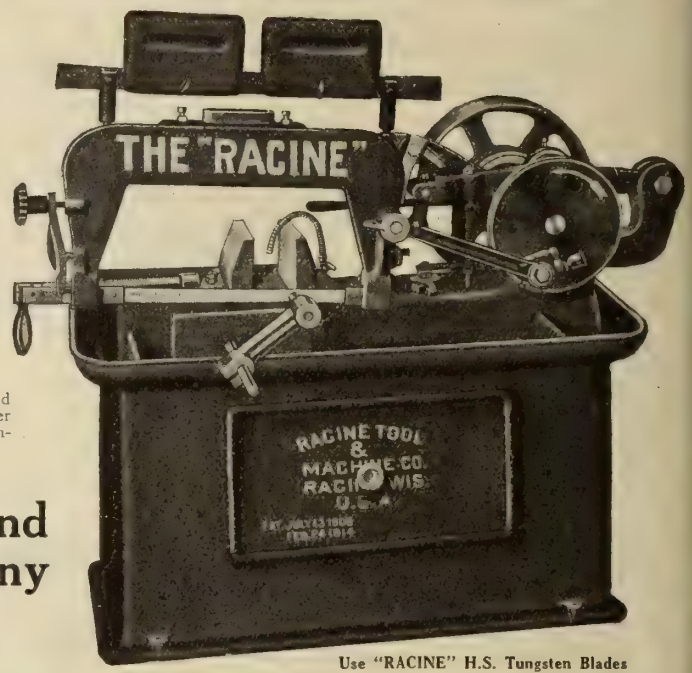
Reduce Your Metal Cutting Costs with

THE "RACINE"

Speediest of All Metal Cutters

DO you know that the "RACINE" High Speed Cutting Machine has a patented feature that lifts it above any other metal cutter made? This is the patented Automatic Lifting Device, which automatically lifts the blade on the return stroke, preventing all dragging and strain on the non-cutting stroke. **The result is speedier cutting with less power and a big saving in blades.**

Instal the "RACINE" to Offset High Cost of Production!

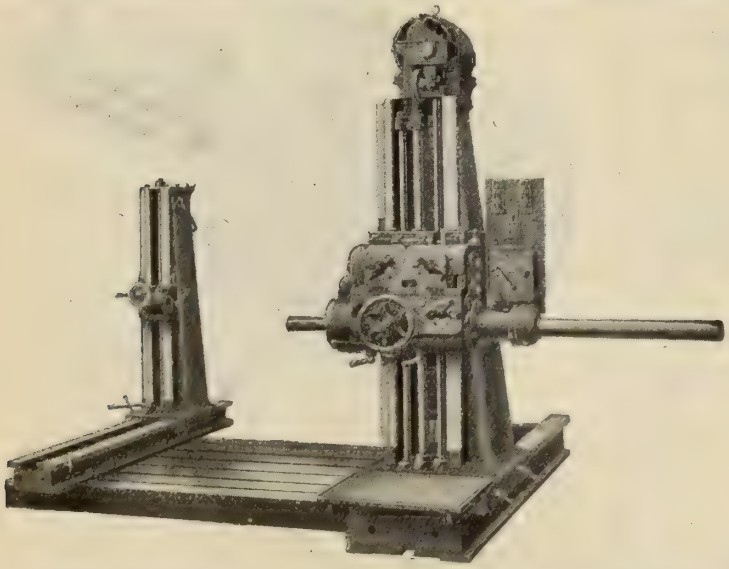


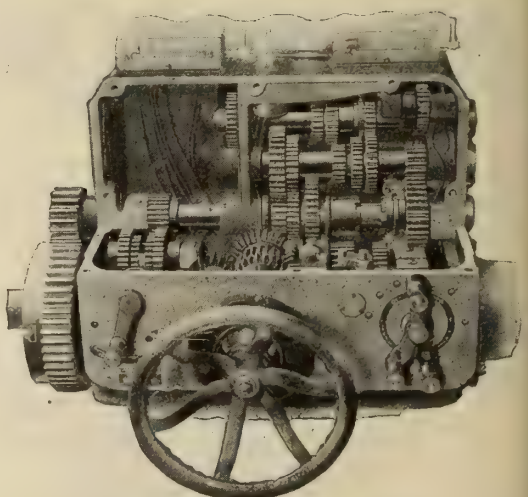
THE "RACINE" machine and "RACINE" H.S. Tungsten Power Blades make an efficient and economical combination—use both.

Standard the World Over

Racine Tool and Machine Company
Melbourne Ave.
RACINE, WIS., U.S.A.

Use "RACINE" H.S. Tungsten Blades





View of saddle with cover removed

Saddle of Improved Box Type Construction

In the Landis Boring Machine the saddle consists of two heavy castings, the body and cover, machined to a right-angle fit and tightly joined.

A train of feed change gears, with the cover form one unit, and the speed gears and spindle, with the body, complete the other.

All operating levers are so placed that they may be reached by the operator from one position. All hand feeding is manipulated through one hand wheel. The feeding of the spindle in either direction is caused by a differential speed between the feed nut and the spindle.

These improvements are but a few of the Landis features which make this boring machine so efficient.

LANDIS TOOL COMPANY

WAYNESBORO, PA.
New York City—50 Church Street

Smalley General
No. 1 Flange Thread Miller

Sturdy
Powerful
Accurate

Mills Flange Threads With Fewer Rejects Than Any Other Miller.

SHORTER hours and higher wages are demanded by workmen. This means increased production costs. How are you meeting the situation? By putting up the price of your products? There is another and more satisfactory method! It is found in giving your workmen improved tools to operate with—tools that are capable of turning out more work per hour.

The Smalley-General No. 1 Flange Thread Miller is sturdy, accurate and fast.

It is so simple in design that an ordinary mechanic can turn out more work in eight hours than is possible by any other method of thread cutting in ten hours.

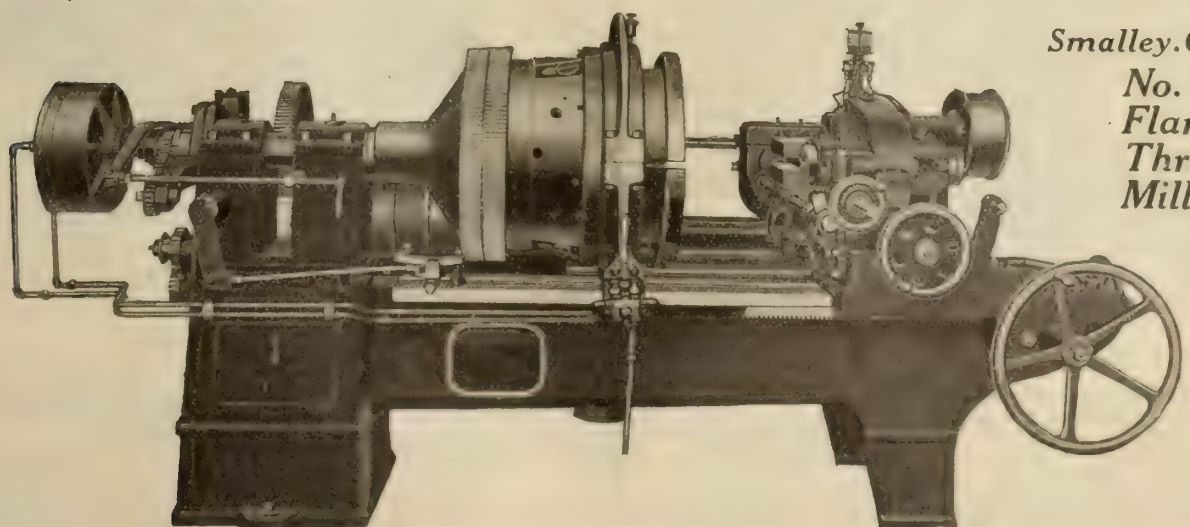
It is the most efficient tool of its kind and because of its several exclusive features will mill flange threads with fewer rejects and at a lower cost.

The same outstanding principle which applies to all **Smalley-General Thread Millers** applies to the **No. 1 Flange Thread Miller.** While the work held in the chuck makes one revolution, the milling head is moved back on the ways, a distance amounting to the pitch of the thread to be milled, and when a multiple tooth hob is used, the thread is complete at ONE revolution of the work.

There are many other points in the construction of this tool you would be interested to know about. **May we send you a complete description of the machine?**

SMALLEY-GENERAL CO., Inc.
BAY CITY, MICH.

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto



Smalley-General
No. 1
Flange
Thread
Miller

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Up To Twenty Tons

THAT is the capacity of the Hisco plant, and Hisco Steel Castings represent the highest possible standard of quality—whether the weight be in pounds or tons. Every heat of steel that is poured has behind it a laboratory test.

There is no element of chance in "Hisco" products, every process that enters into the production must count upon the final factor of responsibility.

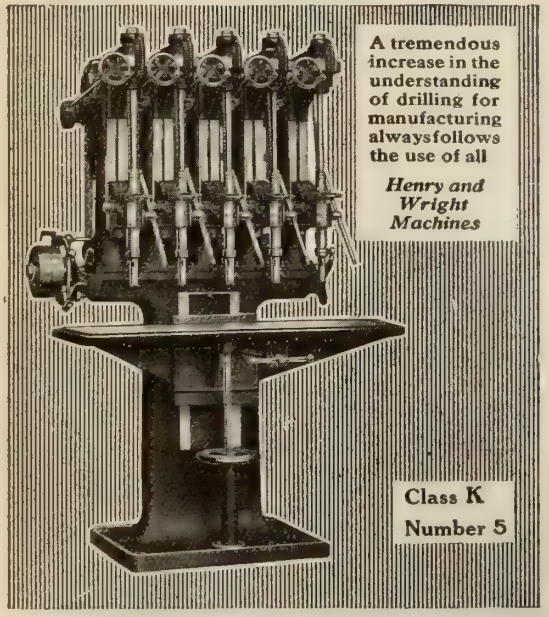
The "Hisco" plant is equipped to produce any definite grade of steel casting in any alloy or process from one pound to twenty tons.

Machine Moulded Gears

in sizes up to 18 ft. without patterns.

Hull Iron & Steel Foundries, Limited
HULL, CANADA

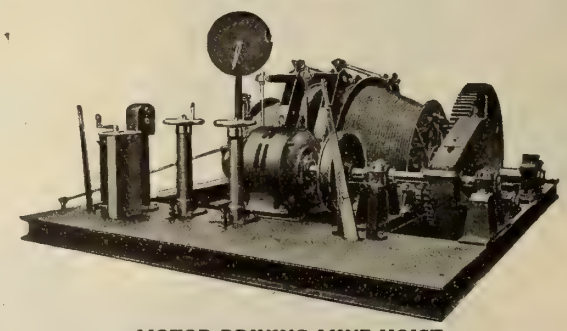
HENRY & WRIGHT
Drilling Machines



The Henry & Wright Mfg. Co.
Hartford, Conn.

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

LANCASHIRE MOTORS
HAVE WORLD WIDE REPUTATION
FOR
"RELIABILITY"



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Specialists in Motor
Manufacture and Application

SEND YOUR ENQUIRIES TO

The Lancashire Dynamo & Motor Co., of Canada, Limited

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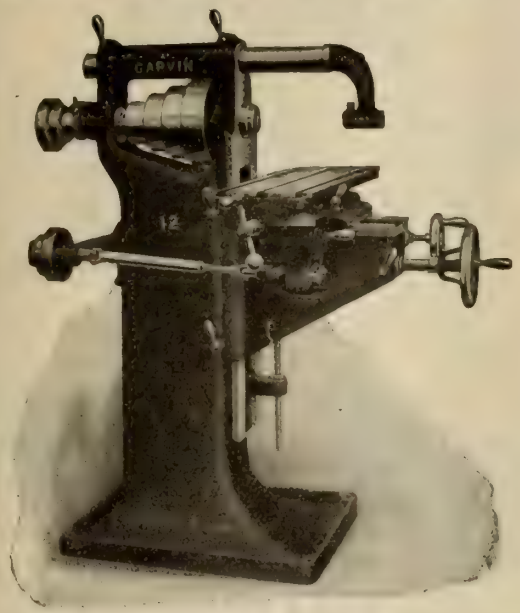

No. 12—Plain Milling Machine—Use Code Abrade

No.12 PLAIN MILLING MACHINE
ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments ..... 18 x 6 x 15 in.

For Further Information ASK YOUR DEALER OR WRITE US DIRECT

IMMEDIATE DELIVERIES

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Manufactured by

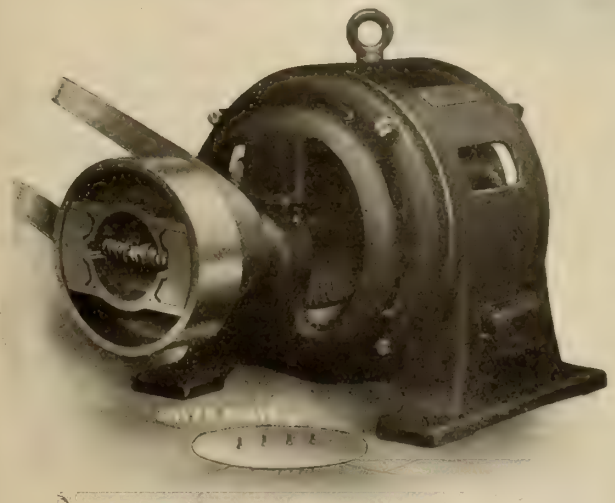
THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) 50 Years New York City

Centrifugal Friction Clutches

To Ensure the Easy Starting of A.C. & Squirrel Cage Motors

½ H.P. to 1500 H.P.



No Motor Should be Without This Simple and Unique Device.

Entirely Dispenses With all Starting Difficulties

The Clutch also Effects a Great Saving in Current Consumption and Reduces the Initial Cost of Motor and Switchgear.

Please Mention Speed and H.P. of Motor When Sending Enquiries and State the Current Supply.

Write for Catalogues and Full Particulars

Thomas Broadbent & Sons, Limited

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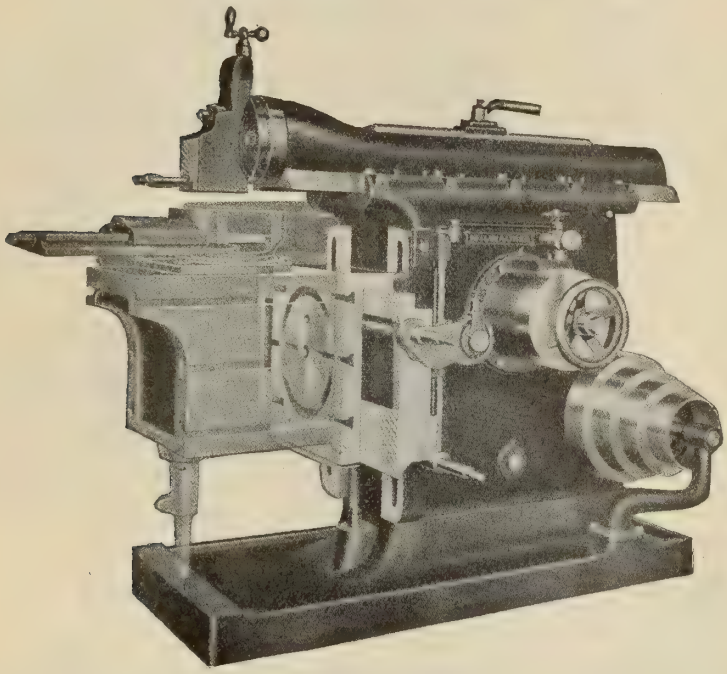
Are Needed in Up-to-Date Canadian Shops



A line that is unexcelled in Rigidity, Accuracy, Power, Simplicity and **Production.**

Built in three sizes: 16 inch, 20 inch and 24 inch.

Write for descriptive Bulletins.

MILWAUKEE SHAPER CO.

1029 Coldspring Ave.

Milwaukee, Wisconsin

Announcing—

WILLIAMS' "Vulcan" Forged-Cutter Tool Holders give unequalled service to those who prefer the solid, forged-type of cutting tool. Each Holder, by the mere insertion of small High Speed Forged-Cutters is adapted to the heaviest service on Lathe, Planer, etc.

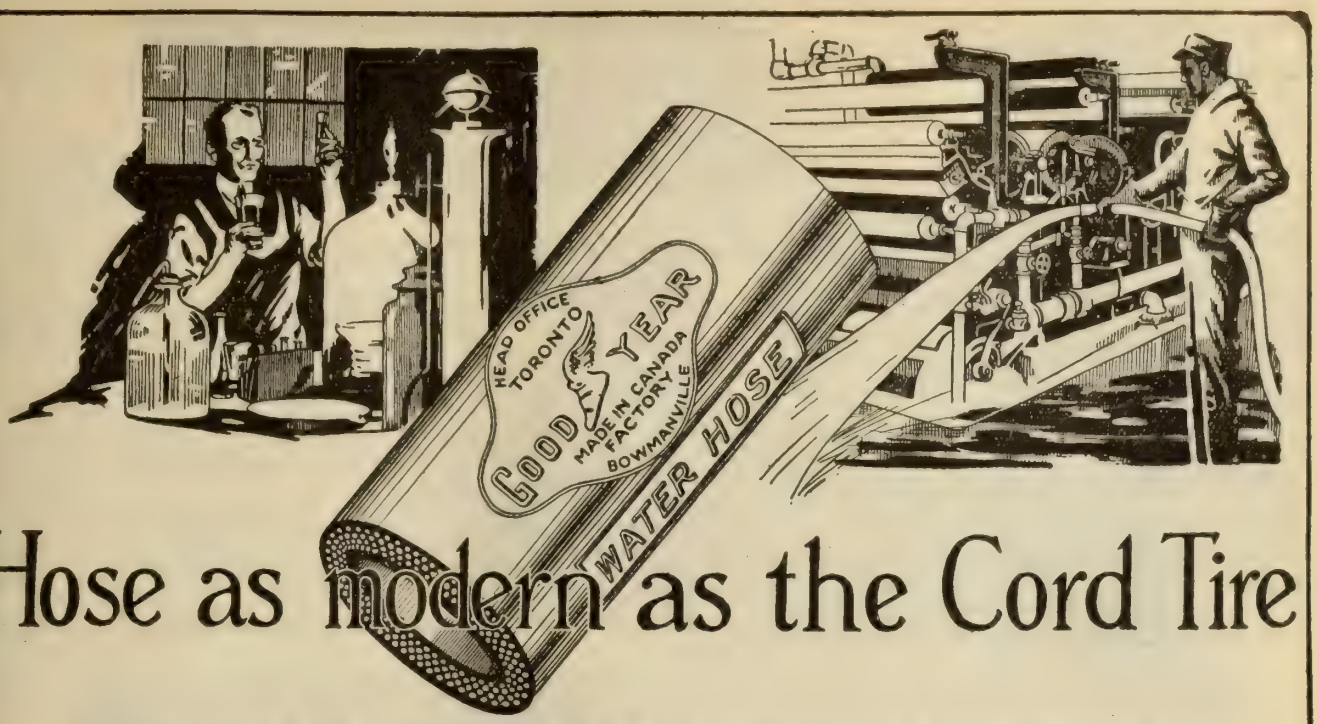
The economy and convenience of this line, when installed as standard shop equipment, is at once apparent, as all blacksmith work, to say nothing of the very considerable investment necessitated by heavy, solid forged-tools of costly High Speed Steel, is eliminated.

Absolutely simple in construction, yet possessing all the advantages of the solid tool without its expense.

Cutters, drop-forged from the finest grade of High Speed Steel, in stock in a great variety of sizes and types, finished and hardened ready for use. Ask for descriptive booklet.

J. H. Williams & Co., 45 Richards Street, Brooklyn, N.Y.
The A. G. Low Co., Ltd., 45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Saskatchewan, Alberta and British Columbia

Williams' "Vulcan" Forged-Cutter Tool Holders



Hose as modern as the Cord Tire

Go back to the days before Goodyear undertook to produce better hose, and you will find that rubber hose was built in much the same way that most hose is to-day.

An old-fashioned product. Good enough for those times, perhaps, but inadequate to meet modern standards of efficiency.

Goodyear opened a new era in the industry. Goodyear disregarded tradition. Goodyear's engineers started from the ground up to build hose of modern efficiency to meet modern needs.

The inevitable result of such methods was the development of better materials and improved hose construction.

Old ideas and old methods were forgotten. Goodyear Hose was built as if hose had never been built before. Modern industry's hose needs was the standard built to.

Is it any wonder, then, that the quality of Goodyear Industrial Hose dominates as does the quality of Goodyear Cord Tires?

Is it any wonder that Goodyear Hose gives longer, more satisfactory service and costs less in the end?

Goodyear builds a particular hose for every industrial purpose—water, steam, pneumatic tool, air drill, railway, fire, suction, and so on.

Let a man trained by Goodyear study your hose problem. Phone, wire or write the nearest branch.

The Goodyear Tire & Rubber Company of Canada, Limited

Halifax, St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Calgary, Edmonton, Vancouver.

GOODYEAR
MADE IN CANADA

INDUSTRIAL HOSE

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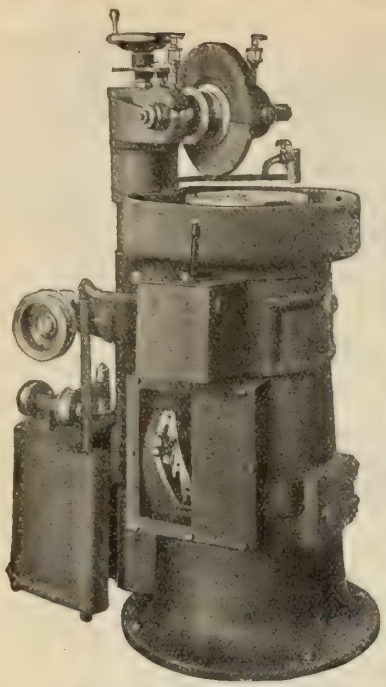

BRISTOOL

Bristol 12-inch Rotary Precision Surface Grinder

Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

Bristol Rotary Surface Grinders are made in several types and sizes and are regularly equipped with 8-in., 12-in., and 16-in. magnetic chucks, either belt or motor driven and for dry or wet grinding.

Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

Grinds within .0004 in. of absolute Accuracy

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

The BARNES DRILLS

TRADE W F & J B MARK

Complete line. 8-inch to 50-inch swing

Gang Drills.—Horizontal Drills.

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W. F. & JOHN BARNES CO.

104 Ruby Street - ROCKFORD, ILL.

Canadian Agents—A. R. WILLIAMS MACHINERY CO.
Toronto, Winnipeg, Vancouver, and St. John, N.B.
WILLIAMS & WILSON, Montreal

Production of Rare Quality at Lowest Labor Costs

There is unusual strength, accuracy, speed, convenience and range in

AURORA

Drilling Machines

You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

Drop a line for full particulars and specifications.

Stationary Head Sizes 20″—21″
Sliding Head Sizes 22″—44″

The Aurora Tool Works

AURORA, INDIANA, U.S.A.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

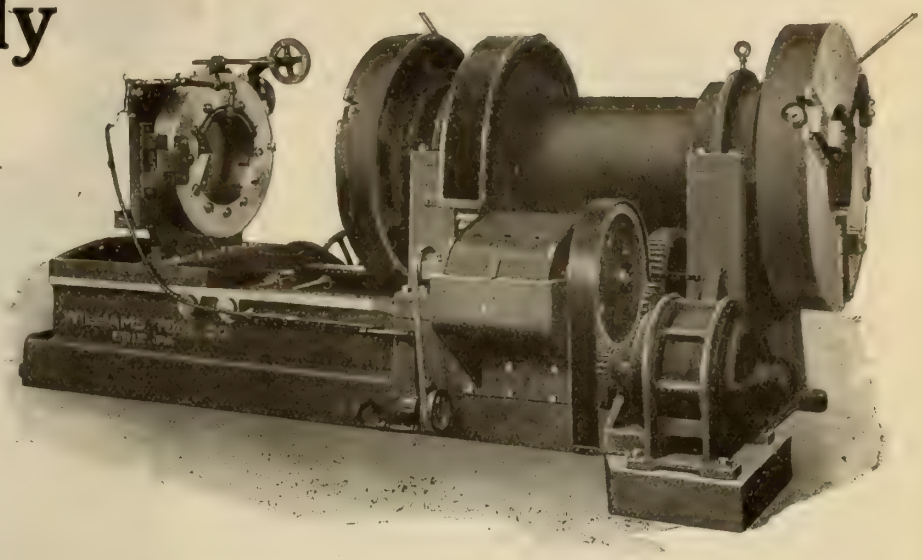
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



Write

Williams Tool Company

Erie - Penn. - U.S.A.

Canadian Agents: The A. R. Williams Machinery Co., Limited, Toronto, Canadan

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The Canadian Disc Sander is 90% Dustless

Think what a godsend that is to the pattern shop! Hundreds of prominent concerns are profiting immensely by using these sanders.

Two types of Canadian sanders are built—the Disc Sander and the Oscillating Spindle Sander. Both machines are equipped with New Departure ball bearings and General Electric motor. The table in each case can be tilted by a hand adjustment, 45 degrees down or 15 degrees up. Power is obtained by plugging into a lamp socket. Canadian Sanders are extraordinarily well built and are guaranteed against all defects.

Ask for Bulletin and Prices

Canadian Sander Mfg. Co.,
Incorporated
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Wire Cloth

of every description

We make **Machinery Guards** of all kinds.

Metal Lockers for Clothes.

Overhead Wire Guards for Elevators.

Drop a line for full details.

Canada Wire & Iron Goods Company

Hamilton, Ontario

Eastern Representative: H. E. O. Bull, 184 Mance St., Montreal, Que.

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Notes On Grinding

NORTON COMPANY WORCESTER, MASS.

No. 74A

Monel Metal

Monel metal is an alloy consisting of approximately 67% nickel, 28% copper, and 5% other metals. It can hardly be distinguished from pure nickel in color and in tensile properties it closely resembles steel, as can be seen from the following table:

	Monel Metal Castings	Steel Castings
Melting Point.....	2,480° F	2,500° F
Hardness (Scleroscope) ...	20—23	22—25
Tensile Strength .....72,000 lbs. per sq. in.		60,000 to 80,000 lbs. per sq. in.

Monel metal is tough and ductile and can be machined, forged, soldered, brazed, and welded by the electric or oxyacetylene method.

It lends itself admirably to casting and many very intricate patterns have been successfully cast. In rod form, its tensile strength is also high and it may be worked with equal facility either hot or cold.

In addition to its resistance to corrosive conditions, monel metal also resists oxidation due to its high nickel content, since nickel possesses in a high degree the property of withstanding the oxidizing influences of hot gases. Monel metal is used extensively for turbine blades and its selection is largely due to its great strength at high temperature, its resistance to the erosive action of steam and its resistance to corrosion. It is also used extensively for pump liners, rods, and valves, because of its extreme toughness and its resistance to abrasion and corrosion.

Other uses of Monel metal are in dyeing machiney, where the metal must withstand strong acid or alkaline solutions; pickling-tank fittings; golf club heads; needle valves in carburetors; tubes, wire cloth, and wire rope.

Monel metal machines with a long tough chip, in this respect resembling copper, but requiring somewhat more power to cut. For this reason the finishing of monel metal by means of grinding wheels or artificial abrasives is to be recommended. For the cylindrical grinding of this material on precision grinding machines, the usual grinding lubricants should always be used. Successful results are usually obtained with an Alundum vitrified wheel, grain 46, grades L or M or 24 combination, grades L or M.

For snagging castings composed of monel metal on floor stand or swing frame grinding machines, Alundum vitrified wheels, grain 16 or 20, grade Q, or grain 16, grade R, usually give satisfaction.

For cleaning heavy monel metal castings with a flexible shaft or portable electric grinding machine, our small 6" or 8" diameter wheels from ¾" to 1½" thick, grain 24. grades R or S Alundum vitrified have been used with success.

There is a certain demand for thin rubber bonded grinding wheels for use on abrasive cutting-off machines, for removing gates and risers from castings, and also for cutting rods, tubes, and wire. For these, we recommend 16 or 20 grit Alundum rubber wheels from 10" to 12" diameter and from 3-32" to ⅛" thick.

NORTON COMPANY.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec Que.

Grinding Wheel Plants, Worcester, Mass.

Electric Furnace Plants Niagara Falls, N.Y. Chippawa Ont.

New York Store 151 Chambers St.

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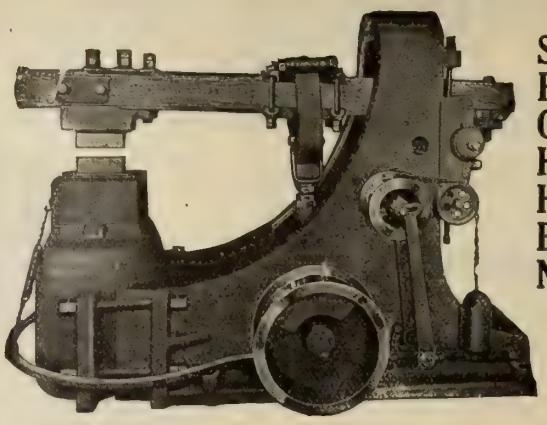
Strike While the Iron's Hot



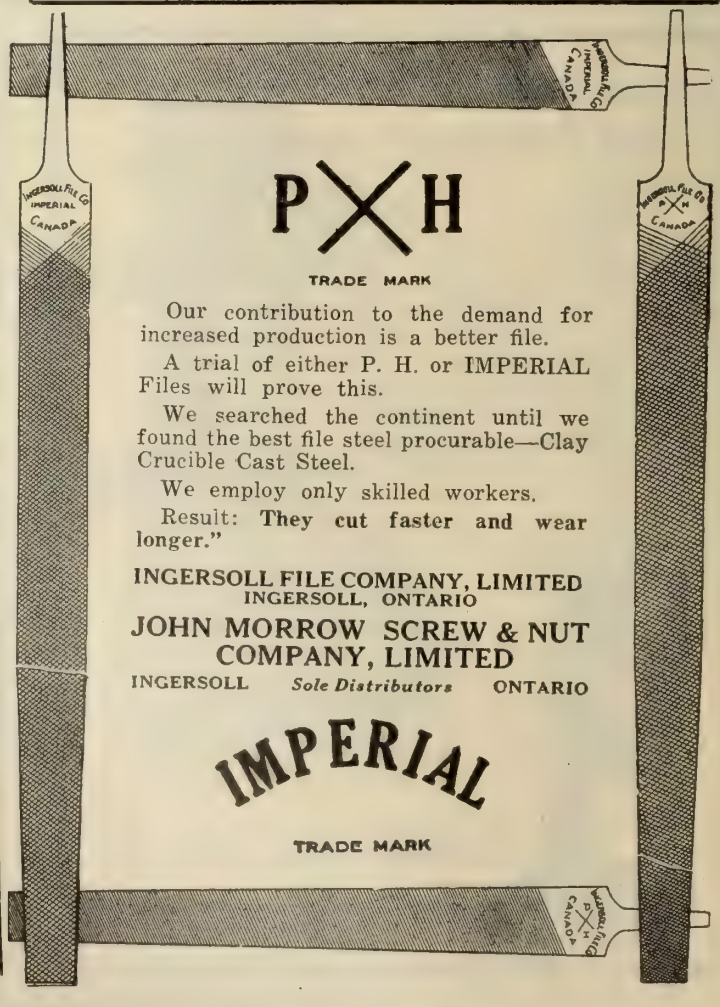
Send For Our Helve Hammer Book Now

The Rochester Helve Hammer

Any blow, long or short, fast or slow, heavy or light—any length, weight and force of blow instantly secured on the Rochester "Helve" while the machine is running. This feature alone saves so much time where there is a variety of small work to be forged, swaged or welded, that it recommends the tool without reference to its other distinctive features. Made in 6 sizes, 2 styles of frames; 25-lb. to 100-lb. heads. For Welding and General Forging the "Rochester" is peerless in efficiency. Get our Helve Hammer Book.

THE WEST TIRE SETTER CO.

ROCHESTER, N. Y.

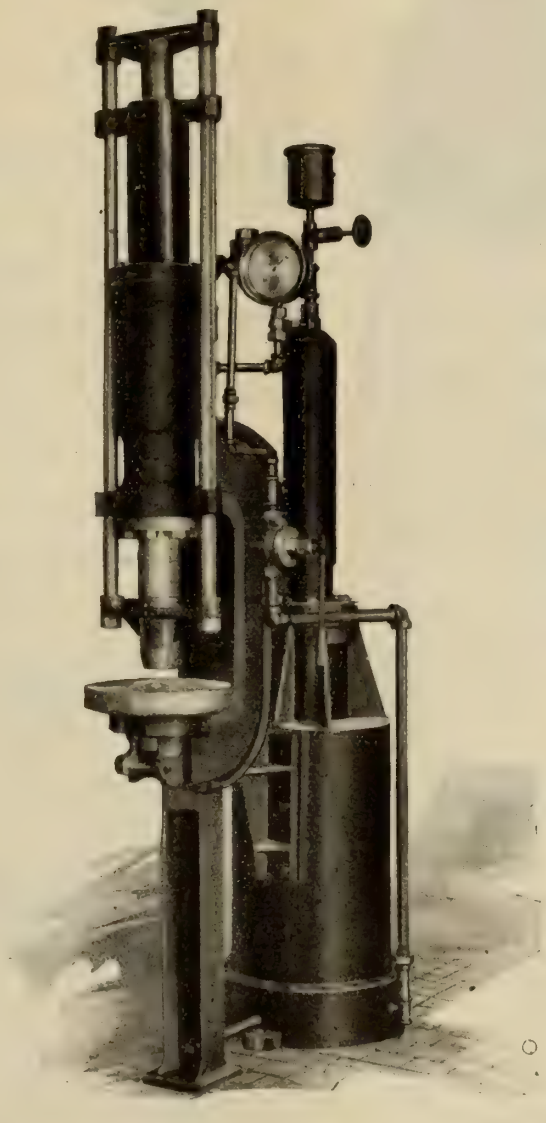


ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

EXCLUSIVE SALES REPRESENTATIVES:

Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Pa.

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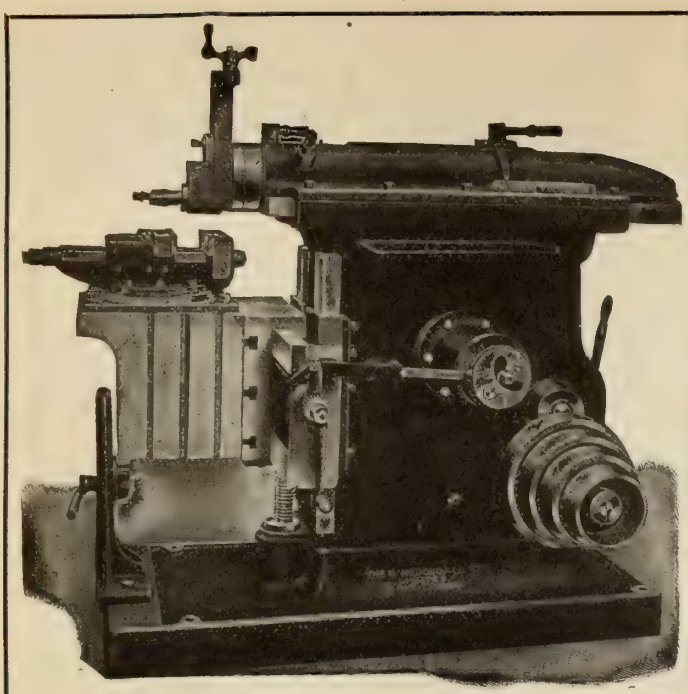

McDougall SHAPERS

Combine the best features of all machines which have hitherto been placed upon the market, and nothing has been included, except those points which experience has shown to be essential.

An examination of the construction will reveal features that make for increased production, ease of operation and accuracy.

Write for descriptive literature.

The R. McDougall Company Limited

Manufacturers

GALT, ONTARIO, CANADA

ARE-MAC-DEE IS A GUARANTEE

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Durably Made Steel Letters and Figures

For Marking on all Kinds of Metal

MATTHEWS Steel Letters and Figures are handmade from high quality Pittsburgh steel, properly tempered to assure hardness. They give long service under hard conditions.

Matthews line of steel stamps includes a wide range of letters, figures and symbols—for concave, convex or flat surfaces.

MARK YOUR NEXT ORDER "MATTHEWS MADE"

CANADIAN FAIRBANKS-MORSE CO., LIMITED

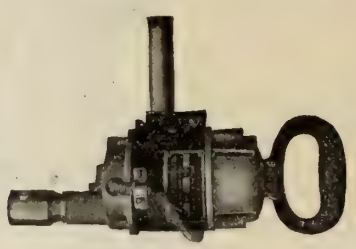
Montreal, Toronto, St. John, Quebec, Ottawa, Hamilton, Windsor Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

JAS. H MATTHEWS & CO. - Pittsburgh, Pa.

Steel Lettering, Dies and Stamps

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

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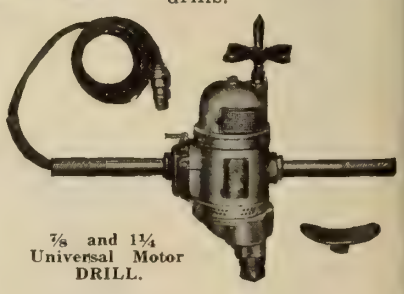

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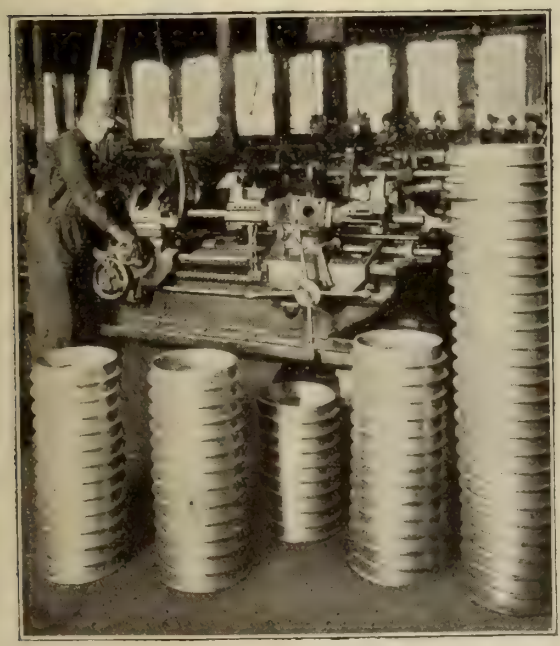

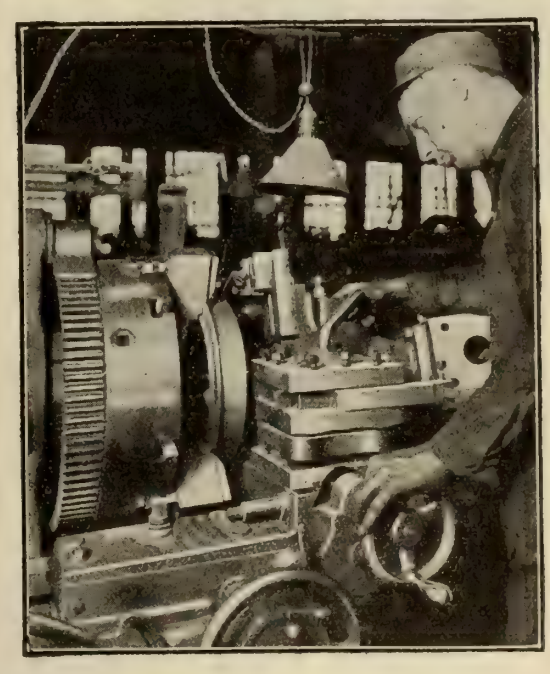

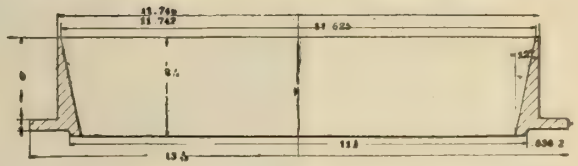

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MANUFACTURING NEWS

Vol. XXI. No. 19 November 13, 1919

Making *Coke* for the *Blast Furnace*

An Article Which Describes the Making of Coke in the By-Product Coke Oven

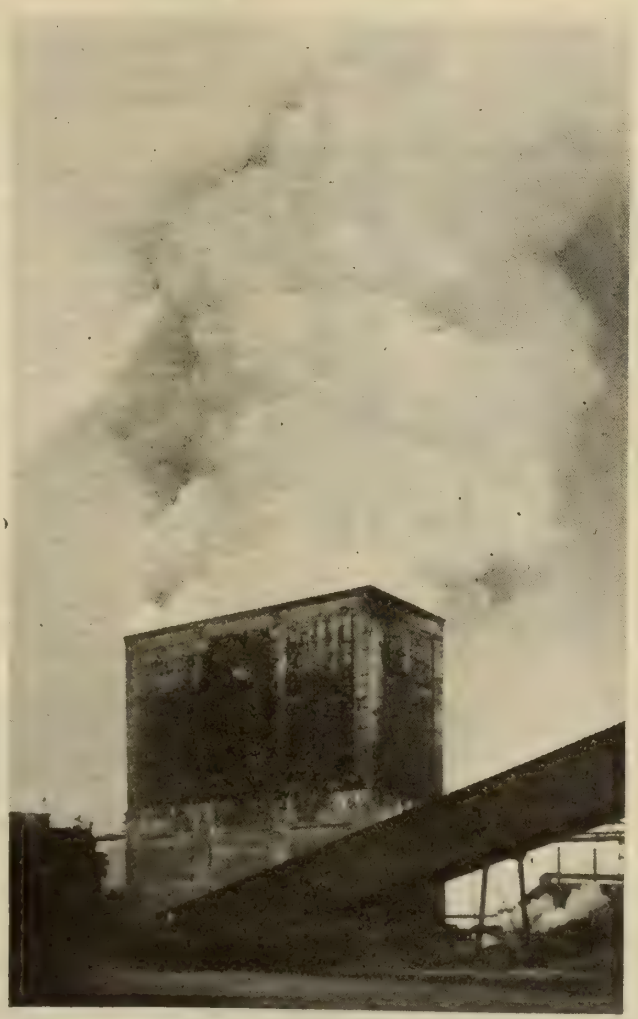
By W. F. SUTHERLAND

The Ovens Are Installed at the Hamilton Plant of The Steel Company of Canada

PRIMITIVE man probably first made iron in an ordinary fire, then improved upon his method by bettering the draft. Later on, the use of the bellows was adopted. The intentional making of cast iron and its conversion into wrought iron and steel followed at a later date and in the fifteenth century ornamental iron castings were made.

Charcoal was the fuel used and the appetite of even the crude furnaces then employed was such as to bring about the first agitation for fuel conservation. Queen Elizabeth forbade the cutting of wood in certain parts of the country and later, furnaces were prohibited in some counties.

This increasing scarcity of wood was probably the reason for the attempts which were made to replace charcoal by mineral fuel. In 1611 Simon Sturtevant patented the use of coal for iron smelting, but it was not until 1735 that Abraham Darby showed how to make cast iron with coke in the high furnace, which by this time had become a veritable blast furnace, although primitive. From this time on charcoal as a metallurgical fuel fell into disuse and is to-day only used where exceptionally pure iron is required.



On a quiet day when the clouds hang low the quenching station is well worth observing. The steam given off in quenching rises to mingle with the clouds above.

The art of making coke, up to comparatively recent years, made little advance and the bee-hive oven in general use to-day resembles the original type very closely. Having the advantage of cheapness in construction and giving good coke, it suffers from the disadvantage of wasting all the gas and other valuable by-products obtained from the original coal. It is in its essentials, nothing but a brick-lined chamber in which the gas, driven off from the coal. It is, in its essen- the coking operation.

The modern by-product oven, a comparatively recent development, on the other hand conserves the gas, tar and nitrogen content of the coal and where combined with blast furnace and steel plant renders a cheap gaseous fuel available for open hearths and other equipment. It also enables the metallurgist to control the quality and physical properties of the coke to a nicety.

The Steel Company of Canada have been operating their new coke ovens at the Hamilton plant for about a year and the following article is descriptive of the plant itself and of its operating characteristics.

Coke used for blast furnace work should be hard,

GENERAL VIEW OF THE HAMILTON WORKS, THE STEEL COMPANY OF CANADA, THROUGH THE DIFFERENT DEPARTMENTS OF WHICH THE BY-PRODUCT COKE IS USED.

strong, porous and regular in composition. It is very light as compared with the coal from which it is made and it is estimated that 50 per cent. of its volume is air space. The amount of sulphur is of importance, for if much is present it enters the iron or necessitates higher temperatures in the blast furnace for its elimination in the slag. Generally speaking, coke with less than one per cent. sulphur is satisfactory.

Since the physical properties and chemical composition of the coke are of such moment, the grade of coal used is of importance. In the present case two kinds are employed, one running about 34 per cent. volatile and the other about 17 per cent. Both run about 8 to 9 per cent. ash content and contain .8 per cent. or less of sulphur.

The coal is unloaded into a receiving pit capable of handling two cars and from this is lifted by an apron conveyor onto a 30-in. belt conveyor. This conveyor, driven by a 50 h.p. motor, carries the coal to the top of the coal-handling plant where it is delivered into the crusher. The crushing is done by a Bradford breaker and on being crushed the coal is screened, the slate, etc., being separated and delivered to a reject bin.

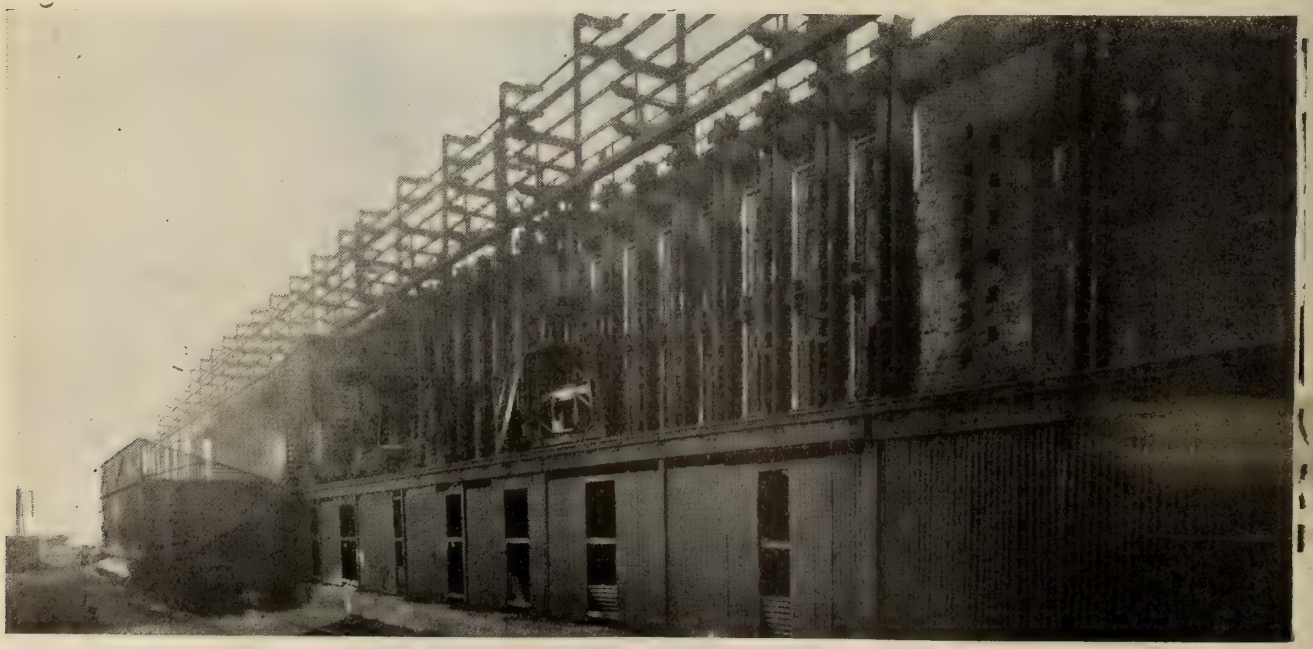
From the crusher the coal is delivered into either one of two mixing bins depending on its volatile content and from these it is drawn out onto the mixing table one floor below. This table consists of two short apron conveyors in line, with their upper surfaces travelling towards each other. The depth of coal on each conveyor is regulated by means of independently adjustable gates. By means of the gates any desired percentage of high and low volatile coals is obtained; at the present time the mixture runs about 85 per cent. high and 15 per cent. low volatile.

From the mixing table the coal now composed of the two grades goes to a hammer mill below, where it is pulverized fine enough for eighty per cent. to pass a ⅛-in. mesh screen. From the pulverizer the coal is conveyed by belt conveyors to a transfer tower and then at right angles by another conveyor to a coal storage bunker holding 1,400 tons. The hammer mill was supplied by the Williams Patent Pulverizer & Crusher Co., and is driven by a 300 h.p. three-phase Canadian Westinghouse induction motor of the wound rotor type. The mixing table is driven by a 10 h.p. squirrel cage induction motor, also of Canadian Westinghouse make. The coal-handling plant, together with the conveying system, was installed complete by Heyl & Patterson, Pittsburgh, Pa.

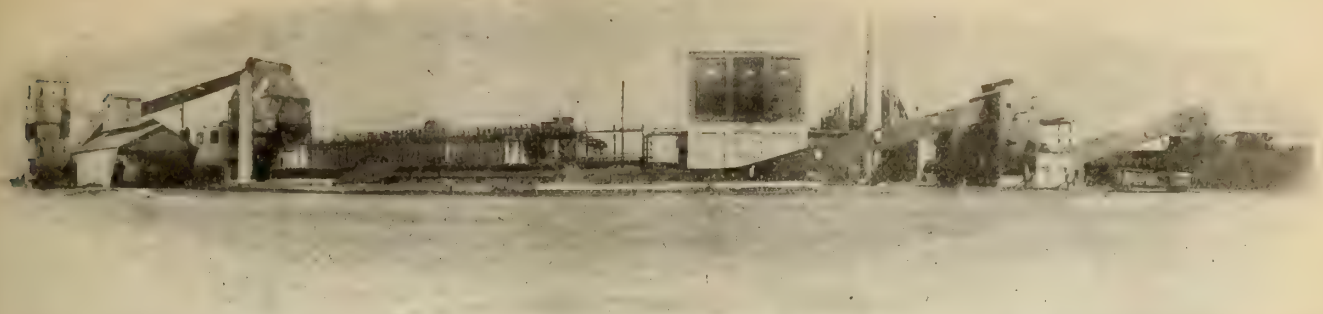
Coke Ovens

The Wilputte by-product coke ovens are arranged in two batteries placed end to end. Each battery consists of 40 separate ovens. Between each oven 28 flues are built into the side walls by means of which the ovens are heated by conduction through the brickwork. Below the ovens and flues proper, regenerative chambers are built in. These are filled with checkerwork and function similarly to those used with the open hearth. A cross-flue connects the tops of the vertical flues with whichever portion of the regenerator is on heat. The air necessary for the combustion of the gas employed passes through that side of the regenerator which is on blast and passes upwards into the twenty-eight vertical flues. At the bottom of these it meets the incoming gas and combustion takes place.

A balanced draft system is employed, that is forced draft delivers the air to the regenerators and induced draft removes the products of combustion. The fans for the air supply are of Canadian Sirocco type and are steam-driven. Three are provided, two in constant use and one



THE DISCHARGE SIDE OF THE COKE OVENS, SHOWING QUENCHING CAR.



A VIEW OF THE COKE OVENS, SHOWING THE COAL BREAKERS TO THE LEFT AND THE LOADING ELEVATORS TO THE RIGHT, OVER WHICH THE COKE IS PASSED IN BEING LOADED FOR SHIPMENT.

spare. The volume of air supplied is controlled from the chart room immediately above.

The induced draft apparatus is housed in a separate building and here three Canadian Sirocco fans are also provided, one of them spare as before. The products of combustion escape through two radial brick chimneys six feet by 75 ft. in height. These chimneys were installed by the M. W. Kellog Co., New York. The exhaust fans are steam-driven and the engines have 8 in. cylinders by 8 in. stroke.

Ordinarily it has been customary on installations of this type to dispense with induced draft fans and to use 200 ft. chimneys for the securing of the necessary draft. It was thought, however, that better regulation and control could be secured with the equipment installed, and operation has confirmed this opinion.

The gas necessary for the maintaining of the proper temperature in the ovens is supplied by two sixteen-inch mains which are carried along the outside walls a few feet above ground level. From these gas mains risers are led off and into the flues. Each riser is equipped with a valve actuated by a rod running the full length of each battery and operated by a motor-driven controlling mechanism.

The air supply is also controlled by reversing valves, motor-operated, and at each half-hour period the flow of air through the regenerators is reversed.

Chart Room

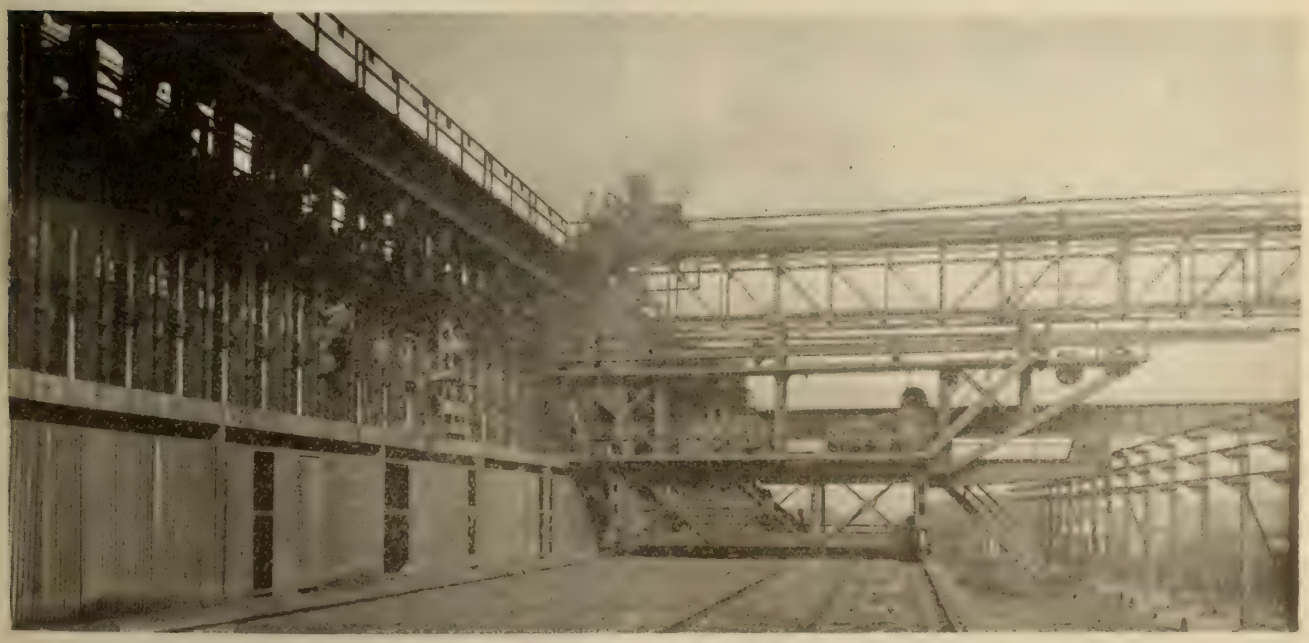
Between the two batteries and over the fan room, a chart room is located. All recording instruments and controls are brought together in this room which provides a central point from which all operations can be directed.

The gas consumed in the heating of the ovens is here measured by two Venturi meters and the pressure on the gas main, the forced draft and induced draft pressures are measured by three Bacharach pressure recording gauges for each battery.

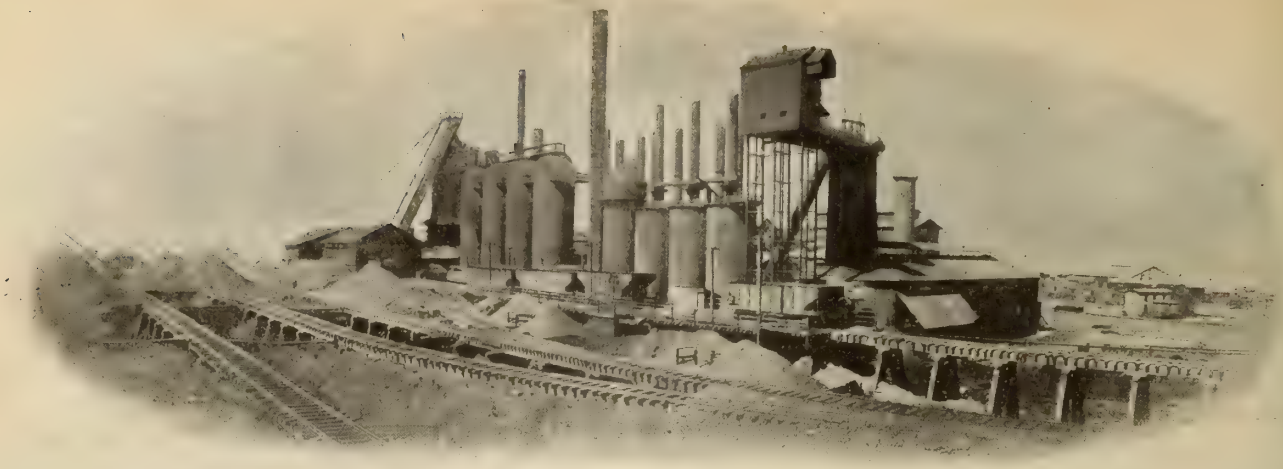
Charging

The ovens are charged from above through four openings to each oven. A charging lorry with four bins travels the full length of the two batteries and receives its supply from the 1,400-ton bunker which is located overhead. Each hopper of the charging lorry holds sufficient coal for the charging of its portion of each oven. Between the ovens and immediately over each of the twenty-eight flues in the side-walls inspection holes are provided by means of which the condition of the brickwork and the combustion going on below can be observed.

When the charge in each oven is converted into coke it is removed by a pusher, almost human in its functions. The pusher travels the full length of the two batteries and is provided with three rams, one of which lifts the oven door off and draws it back out of the way, rocking it about a horizontal axis first to break the clay luting provided for gas tightness. The second ram, when this is accomplished, is advanced and pushes the coke through the door at the other end of the oven. The third ram is used after the doors have been placed back in position



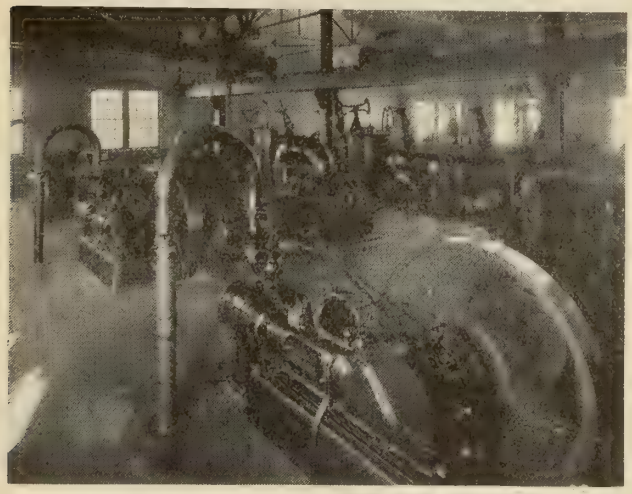
THE COKE PUSHER WHICH REMOVES THE OVEN DOORS, PUSHES THE COKE OUT ON THE OTHER SIDE INTO THE QUENCHING CAR AND THEN LEVELS DOWN THE FRESH CHARGE.



THE BLAST FURNACES AND ORE PILES. THE MAJOR PORTION OF THE BY-PRODUCT COKE, PRODUCED IN THE COKE OVENS, IS USED IN THESE BLAST FURNACES.

and when the fresh charge is placed. It is advanced and withdrawn several times through a small opening in the door and serves to level off the top of the charge.

The main pusher ram is driven by rack and pinion



THE EXHAUSTERS SHOWN HERE BRING THE GAS OVER FROM THE OVENS INTO THE BY-PRODUCT PLANT.

through two intermediate gear trains from a 75 h.p. motor of railway type. A magnetic brake is provided. The levelling ram is driven by a similar motor through a drum and cables. The door extractor is advanced from the cab and its further operation controlled by the door man on the platform. The coke pusher was supplied by Wellman-Seaver-Morgan, Cleveland.

The doors on the discharge side of the ovens are removed by a travelling extractor which is also provided with a coke chute to guide the red hot coke over the platform and into the quenching car below. The quenching car on receiving its load travels to a quenching station, shown in our first illustration, where the coke is wet down and later discharged onto an incline from which it makes its way by conveyor to the coke-handling plant.

The temperature at which the ovens are run has an important effect on the life of the brickwork; at this plant the side-wall temperature carried is 2,200° Fah. Silica brick are used of Harbison-Walker manufacture.

By-Product Plant

In the making of coke a number of valuable by-products are given off, gas which has a high calorific value, coal tar which finds use in the chemical industries and as a fuel, and ammonia compounds. All of these have considerable commercial value and when used in the steel mill or sold, materially lower the cost of the coke. A by-product plant is installed which purifies the gas and recovers the tar, ammonia content, and naphthalene carried over from the ovens.

Each oven is provided with an ascension pipe through which all volatile matters driven off during coking pass. Each pipe is equipped with a cap opening to atmosphere and a mushroom valve, and terminates in a common header. When charging, the gas driven off is allowed to escape until the operation is complete when the mushroom valve is opened and the gases allowed to pass into the header. The header running the full length of the two batteries has tar constantly circulating through it to catch any particles of free carbon carried over.

From the header the gases pass over the pusher runway to the by-products plant and enter the condensers or primary coolers. These primary coolers, shown in one of our illustrations, are three in number, one of them spare. Each of them contain about 900 tubes through which water is constantly circulated on the counter-flow principle. The gases passing over the tubes have their temperature materially lowered and here most of the tar is thrown down, together with ammonia liquor and some naphthalene.

From the primary coolers the gas passes through the gas exhauster plant which provides the suction necessary

ONE OF THE GAS MAINS ON THE COKE OVENS SHOWING THE RISERS AND VALVE CONTROL.

THE OPEN HEARTH STEEL FURNACES, WHICH ARE HEATED BY THE GAS AND TAR PRODUCED BY THESE MODERN OVENS. GAS AND TAR ARE TWO OF THE VALUABLE BY-PRODUCTS.

to draw it over from the ovens. Three units are again provided here, two of them constantly in use and the third one as a spare. The blowers are built by the Connersville Blower Co., Connersville, Ind., and have a displacement of 51.7 cu. ft. per revolution. They are steam-driven, and Fleming engines are employed, made by the Harrisburg Foundry and Machine Works, Harrisburg, Pa. These units are controlled by electrical pressure regulators made by the Rateau Battu Smoot Co., New York. The speed is automatically varied according to amount of gas coming from the ovens and by this means a constant suction is maintained.

From the exhaustor the gas passes to the tar extractors which eliminate any tar fog which may remain. These extractors are three in number, one of them spare, and consist of vertical tanks which contain sheet steel bells perforated with 1-16 in. holes. The holes in successive cones are staggered and any particles of suspended tar are thus eliminated.

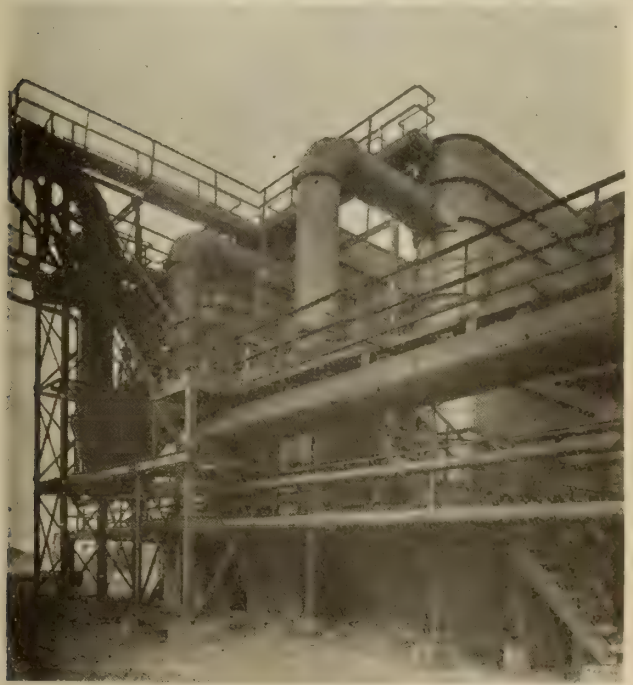
The gas is now free from tar but still contains considerable ammonia vapor. This is eliminated by the saturators through which the gas next passes. Three in number as before, these consist of large cast iron tanks lead-lined in which a 6 to 8 per cent. solution of sulphuric acid is maintained. The gas passing through this acid liquor gives up its ammonia content which unites with the sulphuric acid to form ammonium sulphate. As this

COKE AFTER BEING QUENCHED.

salt accumulates the solution becomes saturated and crystals of ammonium sulphate are thrown down. To effect their removal the principle of the air lift pump is adopted. A jet of air is blown into the bottom of a vertical discharge pipe and carries with it the crystals of sulphate together with some of the acid liquor. Flowing out of the saturator at the top, the mixture passes into lead lined settling trays where the ammonium sulphate falls to the bottom. It is then thrown into steam-driven, centrifugal separators where any remaining acid liquor is thrown off. The liquor is here recovered, and that from the starting point from which countless coal tar dyes monium sulphate is taken to the salt room where it is bagged and shipped to outside consumers.

Quite a romance might well be written about the by-product end of the coke industry. The coal tar is the starting point from which countless coal tar dyes and chemicals are made, and the nitrogen content of the coal is of great value to agriculture and other industries. Nitrogen compounds are essential to vegetable growth, and when these have been exhausted in the soil through intensive cultivation, artificial fertilizers are necessary.

Sulphuric acid has to be added to replace that used in the formation of the ammonium sulphate and it is found that about one pound of acid is required for each pound of sulphate made.



THE PRIMARY COOLERS IN WHICH THE GAS IS COOLED AND IS FREED OF THE GREATER PART OF THE TAR AND AMMONIA LIQUOR.

A GENERAL VIEW OF THE BY-PRODUCT COKE OVENS.

Ammonium sulphate or sulphate of ammonia is one of the most valuable of nitrogenous fertilizers owing to its chemical and other characteristics, and that made at this plant goes to practically every corner of the world. Japan is one of the largest consumers; Java, the Barbadoes and other countries use vast quantities of this fertilizer and it finds considerable use in the cotton-growing countries of the tropics.

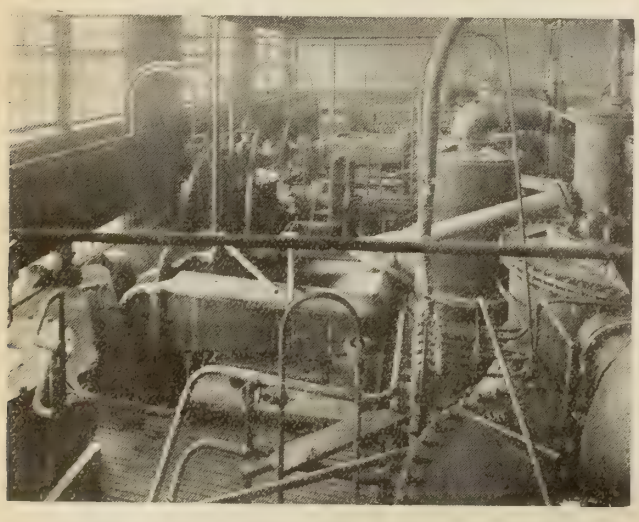
The product exported and otherwise sold by the Steel Company of Canada is aptly named "Gromore," owing to its important usefulness as a fertilizer, and has a whitish or grayish color. Its importance as a plant food is due to the fact that it contains 25 per cent. ammonia and more than 20.5 per cent. nitrogen. This makes it the richest of nitrogenous materials.

Ammonium sulphate can be used alone as a fertilizer, but more often reaches the farmer in the form of mixed fertilizers. It can be used with acid phosphate, potash salts, cotton seed meal, tankage and fish scraps. It is not subject to chemical action when thus incorporated into a mixed fertilizer and its freedom from free acid and moisture is also of advantage.

Disposal of Gas

The gas, now free of tar and ammonia, finally passes through a washing tower where it meets a spray of water and is made ready for use. The water passing through this tower removes the naphthalene present in the gas and this is caught in settling basins for disposal.

From the washer the gas goes to the gas holder and from this it is distributed to the open-hearths, the boiler room and to the coke ovens. That portion which goes to the open-hearth furnaces passes through an exhauster which raises its pressure to 5½ lb. The "Root" exhauster is driven by an R. 20x20 in. Ridgeway engine and has a capacity of 8,000,000 cu. ft. per 24 hours.



THE SATURATORS IN WHICH THE AMMONIA IN THE GAS IS CONVERTED INTO AMMONIUM SULPHATE.

Tar Storage and Ammonia Still

The tar and ammonia liquor begin to separate out at the header on the coke ovens and each header, and connecting pipe contribute some to the total yield. By far the largest portion is recovered in the primary coolers and the remaining small fraction of the yield is obtained

SALT ROOM IN WHICH THE AMMONIA SULPHATE IS STORED.

by the tar extractors. All the tar and ammonia liquor collected from the above sources is pumped into a separating tank. The tar, having a specific gravity of 1.2, settles to the bottom of the tank and is pumped into a tar storage tank. The ammonia liquor flows off and into an ammonia tank. About 25 per cent. of the total ammonia yield is obtained from the liquor, and since this quantity is well worth recovering the liquor is treated.

The weak liquor is pumped from the tank into an ammonia still where it is subjected to heat from low pressure steam. The heat serves to drive off the free ammonia and the addition of lime frees the fixed ammonia.

The mixture of steam and ammonia vapor passes into a dephlegmator or condenser which cools the mixture down below 212°, to 190° to be exact. At this temperature the steam is condensed while the ammonia remains as a gas and passes on into the main gas line before it enters the saturators. Here it is converted into ammonium sulphate together with the 75 per cent. which comes over direct in the main gas line.

The operation of the by-product plant necessitates the handling of various kinds of liquids and a pump room is provided for the various pumps. Tar pumps of both centrifugal and duplex plunger type are provided for flushing the tar through the mains and headers. The centrifugal pump is of the Goulds single-stage type and has a capacity of 660 U.S. gallons against a 90 ft. head. It is driven

THE COAL STOCK PILES, SHOWING THE ENORMOUS TONNAGE OF COAL ALWAYS ON HAND TO SUPPLY THE COKE OVEN REQUIREMENTS.

by a Canadian Westinghouse 30 h.p. induction motor.

Two air compressors are also installed, made by the Chicago Pneumatic Tool Co.

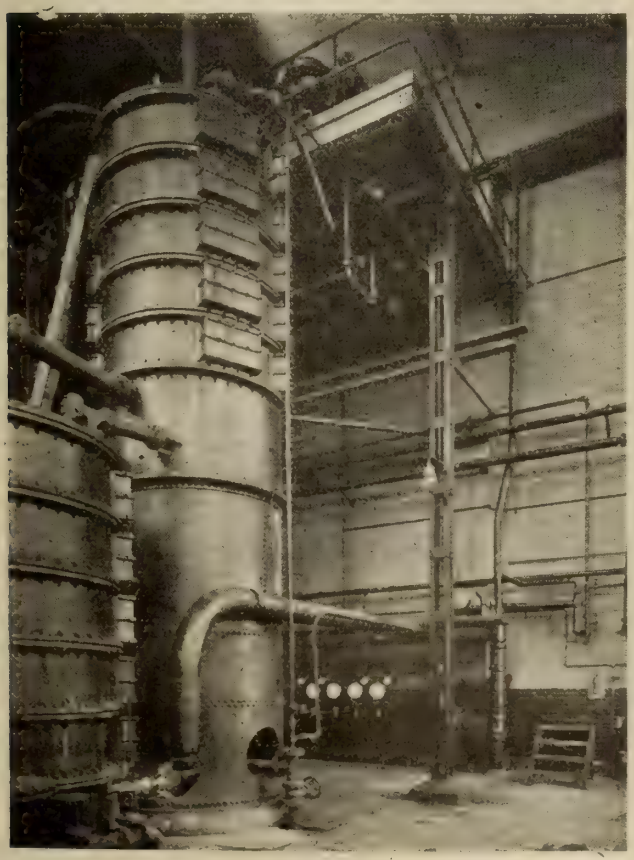
Operating Characteristics

Approximately 13 tons of coal are charged into each oven at a time. The coking time is 17½ hours and 108 ovens are charged per day, producing 900 tons of coke. Of this quantity the greater portion is required for the Steel Company's own blast furnaces, the remainder being disposed of to outside firms.

Each ton of coal as fired produces 11,000 cu. ft. of gas, 11 U.S. gallons of tar and 27 lb. ammonium sulphate. Forty per cent. of the gas is used in heating the ovens and the remainder is available for other plant purposes. The tar, together with most of the gas, is used in firing the open-hearth furnaces of which there are eleven. From each ton of coal three-quarters of a ton of coke are obtained.

Steam Generation

A considerable quantity of steam is used for the ammonia still and for the various engine-driven fans and exhausters. For the generation of this steam a boiler plant of 750 boiler horsepower has been erected.



THE AMMONIA STILL IN WHICH THE AMMONIA LIQUOR GIVES UP ITS AMMONIA CONTENT.

Three Erie City double-drum water tube boilers are installed of 250 h.p. each. A steam pressure of 150 lb. is carried and the steam is superheated 100°.

In the making of coke considerable coke breeze or dust is made and this is used as a boiler fuel. The coke-handling plant screens all the coke and the fines are taken by belt conveyor to the boiler house. Here they undergo a further screening, chestnut size and over being eliminated, the remainder dropping into the bunkers in front of the boilers.

Coxe travelling grate stokers made by the Combustion Engineering Corporation, New York, are fitted to the boilers and are specially designed for the burning of the coke dust. This fuel is difficult to burn and in order to keep the ignition arches at the proper temperature it is necessary to burn gas as a supplementary fuel. Four two-inch gas pipes are led into the combustion chamber of the boiler setting above the grate and the gas passing through them is burned by excess air through the grates, no other air supply being needed. About 250,000 cu. ft of gas is burned per 24 hours in addition to the coke screenings.

The boilers are fitted with Diamond soot blowers made by the Diamond Specialty Co., Detroit and Windsor. All valves used in the boiler house are of Crane manufacture. Forced draft is supplied by a Canadian Sirocco fan provided with two engines, one of them spare. Pin and belt type clutches are provided for changing over from one engine to another.

The feedwater is heated in a Cochrane feedwater heater to 210° Fahr. Exhaust steam from the engines at 15 lb. back pressure is used for this purpose.

The feed pumps are in duplicate, two Canadian Fairbanks-Morse 10x6¼ duplex plunger pumps being installed.

The boiler house is some distance from the by-product plant and two six-inch steam lines are provided. These, for part of the distance, are carried overhead on structural frame work.

Construction

The coke ovens and other equipment including the by-product plant and boiler house were designed and installed by the Wilputte Coke Oven Corporation, 469 Fifth Ave., New York City, who also acted as their own general contractors. The silica brick necessary for ovens, etc., was supplied by the Harbison-Walker Co., Joliet, Ind., while the firebrick was furnished by The Evans and Howard Firebrick Co., St. Louis, Mo. All tanks and tankwork were supplied by the Jas. G. Hagey Co., Joliet, Ind. The coal and coke handling plant was furnished by Heyl & Patterson, Pittsburgh, while the Hamilton Bridge Co. furnished the structural steel. The two radial brick chimneys for the coke ovens and a similar but larger chimney for the boiler house were supplied and erected by the M. W. Kellog Co., New York City.

The Styles of Yesterday in Machine Tools

Styles Change in Machinery as Well as in Clothes and the Machine Tools of Yesterday Are Apt to Look Somewhat Queer to Our Modern Eyes

By J. H. MOORE

IN starting an article of this nature the writer is sorely tempted to ask the question: "What length of time should a machine-tool remain in use and yet be termed a machine tool?" In other words, when does it cease to be a machine tool with working possibilities and merely a decoration for the scrap heap?

While this question may seem a simple one on the surface, the writer believes it a very difficult one to answer off-hand, for there are so many points to be taken into consideration. Many an old machine tool has weathered the storm of time, due to receiving careful attention, while other tools, more modern in design, have gone under before their time simply through carelessness on the part of the operator.

For the purpose of this article, we will decide that a tool deserves the name of machine tool so long as it delivers all that is required of it, so on this assumption we will proceed with our story.

In a certain plant in Canada (name not being mentioned, this having nothing to do with our story) there stand two wonderful examples of tool equipment. The first is that of a lathe seventy years old, and the second, a planer whose life has reached the age of seventy-five. Of course, as can be surmised, these tools are slightly? out of date, yet they deliver all that is required of them in an accurate manner. To quote what the owner remarked to the writer: "So long as they remain faithful and serve our purpose why should we dispose of them?"

Not being a salesman of more modern equipment I did not even raise an argument, but proceeded to photograph the tools under discussion.

Fig. 1 illustrates what the camera discovered on its first exposure on Mr. Planer. We see a general view of this machine, just as it appeared after work has been taken off its bed some few hours before. No attempt has been made to tidy it up, but the view has been taken to show it at its worst.

This machine was made by W. H. Gibson & Co., of Rochester, N.Y., some seventy-five years ago. Since then this machine has led a varied life, but even yet is plugging along with wonderful results. At the present time it is engaged chiefly in planing dies, which have a semi-circular contour. A special tool is of course used in the planing head, but the point is this, that the machine turns out the work in splendid shape and in good time. After all, what more is necessary? To get away from the work that the machine is doing and consider the machine itself, let us look at a few differences between this machine and the modern planer.

Note the fancy curved contour at A and compare this with the straight business-like design of modern planers today.

To consider a closer view of this machine, let us look at Fig. 2. Can you imagine the modern machine-tool carrying such fancy decorations on its sides as shown in this picture? Evidently in those days they firmly believed in establishing the nationality of their machines, for the eagle and the stars and stripes tell their own story.

FIG. 2—DECORATIVE TREATMENT ON PLANER.

Last, and perhaps most important of all, we come to Fig. 3. Can you imagine the modern planer equipped with a trip such as shown? The more one looks at it the more one wonders, and yet the basic principle is exactly the same, and although crude in its design, it accomplishes its purpose. The design of neat handles, knobs, etc., was no doubt an unknown quantity in those days. Note the neat? little knob A, which the operator could grab at will on the trip lever. One thing sure he could hardly miss it.

One need only look at the edge of the table on this machine and realize how long it has been in use. From one end to the other are set-screw marks, worn right into the table, where the dog set-screw was tightened. Readers can note this by looking at the photograph.

These few photos give readers some idea of this old-timer, but as one of the workmen said: "If you could only photograph its noise, your fortune would be made." There is no doubt about it as regards noise, for when this machine was started you certainly knew it was in operation, but old age, noise, and all else is superseded by the fact that it delivers the goods.

At Fig. 4 we show a picture of a lathe which has seen seventy-five years of service. This machine was made by I. Anzell, Rochester, N.Y. There are several features on this lathe to which we would like to call your attention. First, look at the saddle A. Readers will no doubt see some difference between this saddle and the type used on the modern tool of the present day?

The thumbscrew B takes over the important task of locking the saddle. This method has also been slightly? improved since those days.

Next let us consider the face-plate C. Note its narrow face and peculiar con-

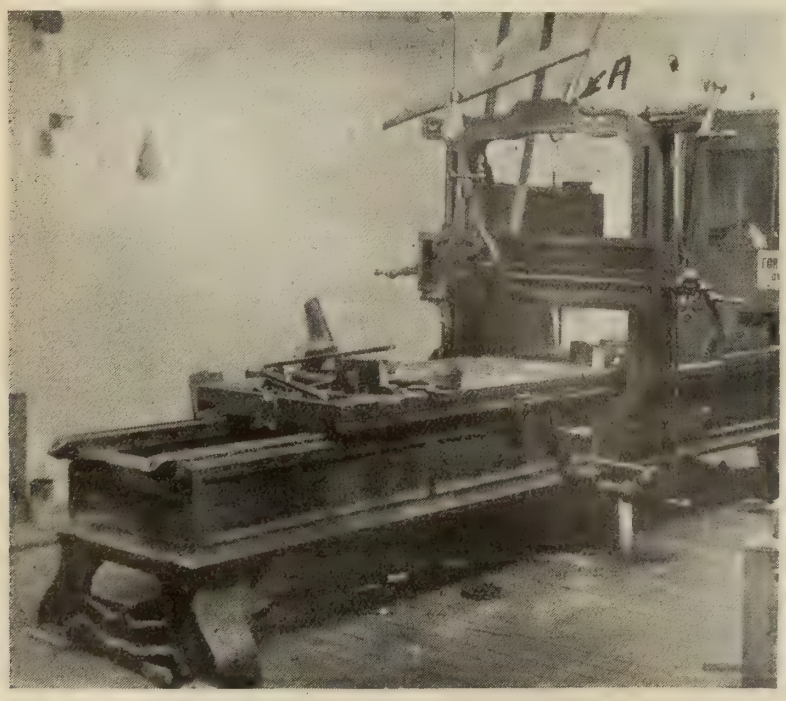


FIG. 1—GENERAL VIEW OF PLANER

struction. Attention is also called to the bearings D. Evidently the importance of wide bearings did not appeal to designers at that time. To hold the train of feed gears in proper mesh the clamp E is called into service and does the work exceedingly well. In addition to these features note the small width of face on all the gears. Finally let us look at the foot F. Here we see the designer's nightmare. Can you imagine a lathe with feet like these at the present time? The back gear is placed in and out of mesh by means of a slotted quadrant, together with an ordinary bolt and wing nut, but enough.

We have, so to speak, picked flaws in this old tool to our heart's content, and yet what is the answer? Joe Mynard, the old chap who operated this lathe for fifty years, claimed it was a good pal to him. Readers may not credit it, but according to the story Joe actually wore a hole in the floor where he stood working this lathe, and they had to patch it up—the floor, not the lathe. Whether this was due to Joe standing on one spot or not, the writer cannot say, but this old tool is still doing duty, turning certain classes of work with good success, relieving the more modern tools of work which would hold production up.

This article has not been an attempt to advocate using tools until they fall apart. Far from it, for the writer's personal opinion is not concerned in this tale. This idea is merely to present before readers an interesting story of how at least two old relics are holding their own.

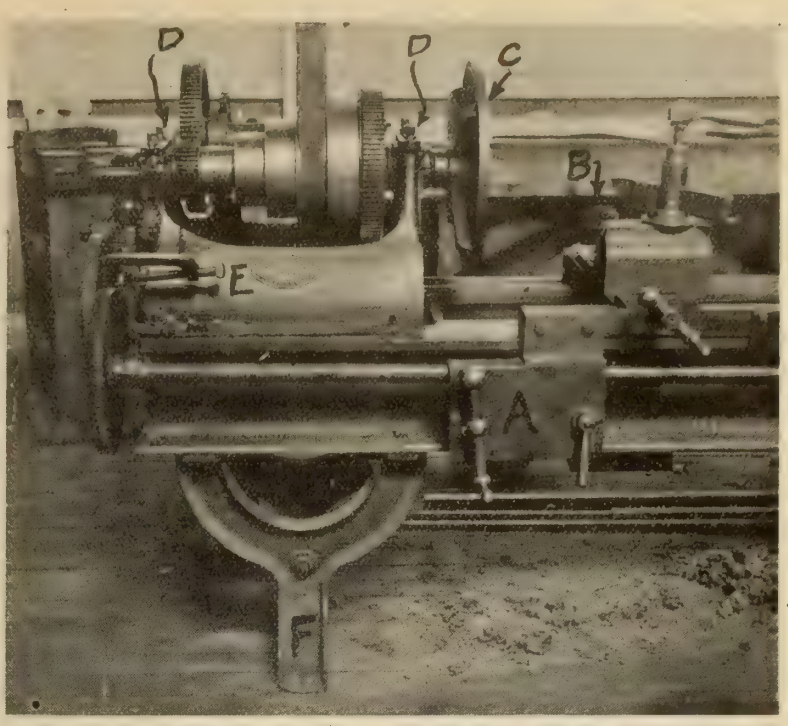


FIG. 4—OLD LATHE.

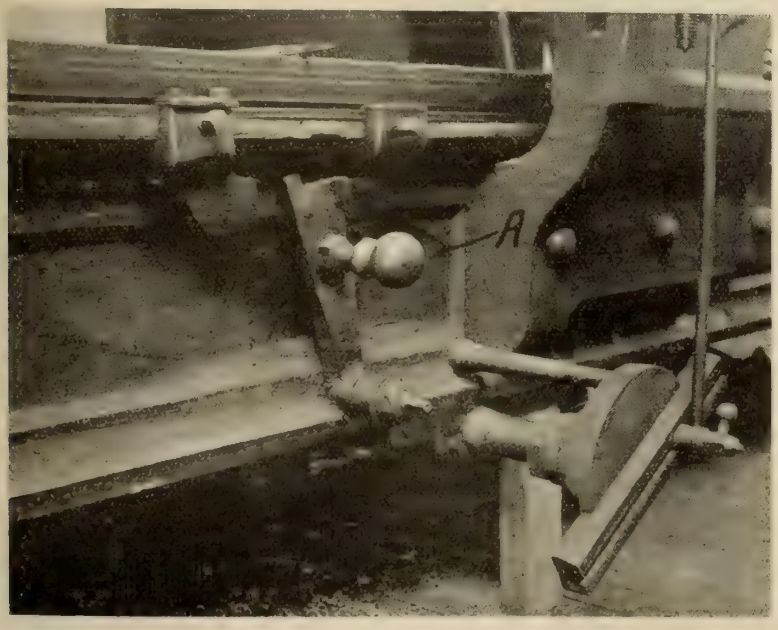


FIG. 3—TRIP MECHANISM.

VANCOUVER CO. INSTALS A "GREAVES-ETCHELLS" ELECTRIC FURNACE

After an extensive investigation of the various types of electric furnaces and a visit to the U. S. Navy Yard at Puget Sound, where a 6-ton "Greaves-Etchells" furnace is in operation, the Vancouver Engineering Works, Ltd., Vancouver, B.C., has given an order to the Electric Furnace Construction Company for a "Greaves-Etchells" furnace.

In a recent paper presented before the American Society of Mechanical Engineers Mr. N. C. Harrison defines pulverized coal as coal that has been reduced to such fine particles that at least 95 per cent. will pass through a 100-mesh sieve having 10,000 openings to the square inch. In other words 95 per cent. must be less than one two-hundredth of an inch cube. He goes on to say that "the average person does not fully realize to what a high degree of fineness it is possible to reduce the coal to-day by pulverization. The finer coal is pulverized the more efficiently it can be burned and the more readily it will be diffused when mixed with the air for combustion and fed into the furnaces. Pulverizing certainly does not change the nature of the coal, but it does change its form to a certain extent in that the coal is changed from a solid into a fuel having liquid properties. As the coal is pulverized it is mixed with air, and when handled in the conveyor it flows like water; when fed to the furnaces it is more or less like a gas, and the furnaces must be designed to burn a gaseous mixture."

In order to facilitate women's work in the repairing shops of the Orleans Railway Company at Paris, where, as in Great Britain, feminine labor is becoming more and more in demand, a very practical portable oxy-acetylene welding apparatus has recently been introduced. It consists of the usual cylinder of oxygen, filled under a pressure of 10 kilos, and the acetylene reservoir, these being mounted on a two-wheeled wagon which can be easily moved from place to place even by a mere girl. India rubber tubes several yards long connect the gases with the blowpipe, which is provided with the customary safety arrangement. In addition, the welder has within easy reach a stop-cock, enabling her to regulate the flow of the oxygen and acetylene before they reach the mixing chamber of the blowpipe. It has been found that, thanks to this handy apparatus, a woman worker is able to do a multitude of small soldering jobs with great rapidity and, what is equally important, with a minimum of fatigue. The apparatus is perfectly safe, and the operators find no difficulty in using it.

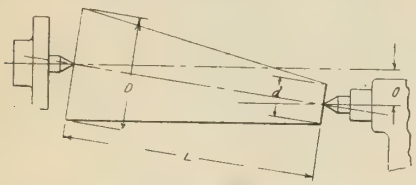
Shop Arithmetic—Problems on Taper Work

No Matter Whether You Have to be Accurate on Every Occasion, it is Well to Know How to do the Thing and Get Absolute Results

By J. H. RODGERS, Montreal

THE problem of machining tapers is one very frequently met with in the daily work of the average mechanic, and while accurate calculations are not always essential, the knowledge of the necessary principles involved in determining the proper offset of the tailstock center, the angle of inclination of the compound rest or dividing head of the milling machine, or other machine tool accessories, is often of considerable advantage to the man on the job possessed of such acquirements, thus enabling him to avoid those inefficient cut-and-dry methods that are sometimes adopted for work of this character. The advantages derived by using a few simple rules and formulæ will amply repay any effort expended in acquiring the principles of applying the same.

When speaking to a lathe hand regarding a taper, he would immediately think of a piece of metal of a conical shape as turned between the centers of the lathe. To illustrate the general appearance of a taper when turned in the lathe, the sketch is given.



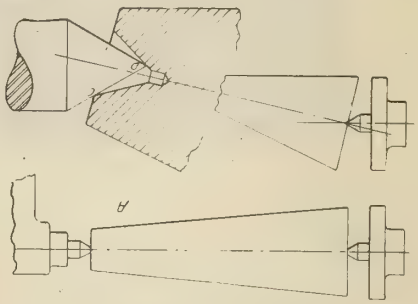
In calculations for tapers of this character, the three primary requirements are the two extreme diameters and the length included between such diameters. Suppose it is required to turn a piece of steel of a conical shape like that shown above, the length of which is to be 10 inches, the large diameter 4 inches, and the taper to be ¾ inch per foot; what would be the diameter of the small end? With a taper of ¾ inch per foot, the taper of the 10 inches would be:

$$12 : 10 = \tfrac{3}{4} : x$$

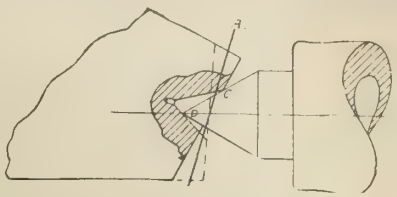
$$x = \frac{10 \times 3}{4 \times 12} = \frac{5}{8} \text{ inch}$$

Therefore, the small diameter would be 4—⅝=3⅜ inches, and the offset, indicated by 0, would be ⅝÷2=5-16 inch. The solution is based on the exact length of the tapered portion, but the accurate adjustment must be determined by actual test, as conditions are never such that the set over can be definitely determined, owing to the varying depths to which the lathe centers enter the work.

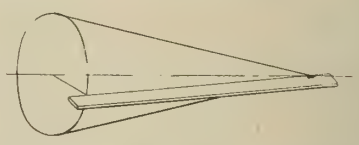
There are certain factors involved in machining tapers that do not come directly under the head of shop arithmetic, but of which it might be well to speak of while on this subject, as they are of vital importance to successful results. One of the primary conditions in connection with taper turning, is the imperative need of perfectly square ends on the work, faced at right angles to the central axis. This is made more clear by referring to the accompanying sketch.



When the centers are drilled in the end of the shaft, they form the ends of the axial center, and when the tailstock spindle is in a central position, the centers of the lathe and those of the work will coincide, as shown at A. To form the taper, however, the tail center must be moved over an amount equal to one-half the difference between the large and the small diameters, as shown at B —tail end greatly exaggerated—and in doing so, the lathe centers are out of alignment, and remain in such position while the taper is being turned. From this it will be readily seen the necessity of having true ends to the shaft. The heavy line A-A indicates the neutral line of the end, or the face as it should be when properly squared off. In turning work by setting over the tail stock, the bearing points on the tail center are at C and D, and if the edge of the shaft center is irregular, it will affect the smooth movement of the work and the shape, when turned, would be eccentric instead of circular.

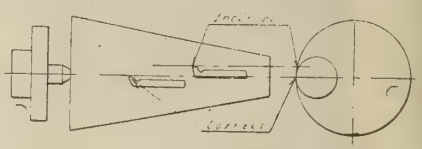


In the more modern types of lathes, that are fitted with taper attachments, this condition is eliminated, but the need of true ends should always receive the best attention. Another factor well worth mentioning and remembering, is that of keeping the cutting point of the tool in the same horizontal plane as the lathe centers. For a straight edge to bear along the full length of a taper cone or frustum of a cone, one end must coincide with the apex of the cone, as indicated in the sketch below:



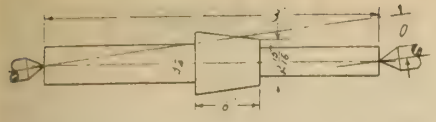
The straight edge here corresponds to the lateral movement of the fixed tool. If the tool point is on the same level as the lathe centers, or where a radial movement of the tool on the work would cause the point to pass through the axial line, the turning of the work will result in a true conical surface, but should the tool be above or below the center, the work will have slight concave shape, as here shown (greatly exaggerated).

This might be made more clear by an end view of a tool setting on taper work.



Here is shown an elevation and an end view of the work, and the importance of the above advice regarding tool position, is quite obvious.

In the case of the taper attachment, the calculations are very similar, but allowance must be made for difference in length between the work and the taper slide. It is seldom, however, that a piece of wark is required where the taper extends over the entire length of the piece, and the method of determining the set over of the center, or the inclination of the taper slide, must be governed by the existing conditions. Suppose we have a shaft 3 feet long, and a taper is desired on a 6-inch section, that has diameters of 3¼ and 2 15-16 inches, what would be the set over of the tail stock center?



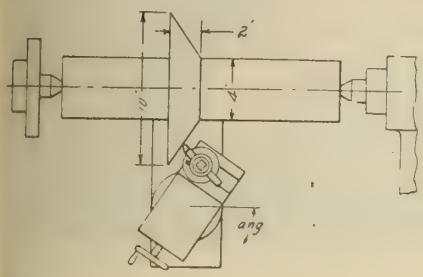
As the taper of the 6-inch section is 15-16 of an inch, the set over would be in direct ratio to the lengths, or, with X representing the offset, the solution would be:

$$\frac{5}{16} \quad 2x = 6 \quad 36 \text{ or}$$

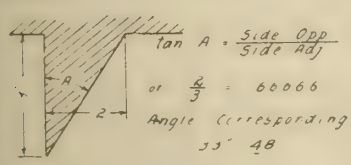
$$2x = \frac{5}{16} \times \frac{36}{6} = \frac{15}{8} = 1\frac{7}{8} \quad \text{and}$$

$$x = 1\frac{7}{8} \div 2 = \frac{15}{16} \text{ inch}$$

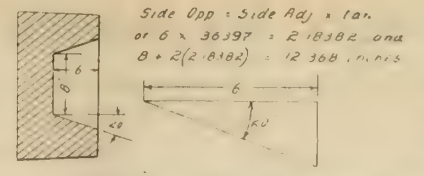
Where tapers are so abrupt that offset of the tail stock, or the use of the taper attachment is impossible, the compound rest must be brought into service, and this method permits of the lathe centers being in perfect alignment, so that more accurate results are obtained. This practice, however, involves calculations that are a little more complex than the other, but are easily understood after a few practical applications. Suppose we have a taper to turn like that shown below:



While an approximate setting could be obtained from working from the face plate, with a square and scale, the more accurate method would be to solve by "trig" for the required angle at which to set the compound rest. The solution, diagram, and the necessary calculations, are shown below:



A case may arise where the angle is known, and some of the dimensions, but the one most desired by the operator is not given. For instance, a die is required as shown below, with the angle, depth and bottom diameter given. In order that some reliable guide may be had by the operator, the large diameter should have been shown, as it is here that his cutting tool must enter the work. However, with the dimensions given, we are able to figure out quite closely the size of the large diameter. The diagram and formula are here given:



Therefore, the large diameter would be 12.368 inches, or close to 12⅜ inches.

THE ELECTRIC FURNACE

Sheffield Industrial Progress During the War

An interesting discussion on the electric furnace, bearing partly on the progress made in Sheffield in the use of this method of steel melting, took place at the inaugural meeting of the Sheffield sub-centre of the Institution of Electrical Engineers, which was held last night at the Royal Victoria Hotel. The institution has recently adopted the plan of sub-dividing its organization, and the advantages of this method were explained to the meeting by the president (Mr. C. H. Wordingham, of London). The excellent attendance at the meeting was an augury for the success of the new sub-centre. Mr. R. H. Campion, of Dewsbury, presided.

Four papers were presented: "The Booth-Hall electric furnace," by Mr. W. K. Booth; "Electric furnaces in the United Kingdom, 1918," by Mr. R. G. Mercer, of the Ministry of Munitions; "A new type of electric furnace," by Mr. A. Sahlin; and "Large electric steel-melting furnaces," by Mr. Victor Stobie.

Mr. S. E. Fedden (general manager of the Sheffield Corporation electricity department) gave an interesting resume of the growth of the use of electric furnaces in Sheffield. He said that in 1882 Sir William Siemens melted 20 pounds of steel, and thought he had done a very great thing. In 1902, pig and scrap iron were made into steel on a commercial basis. The man from Sheffield, however, was very canny, and he took some time before he would even try the experiment. The first firm who ventured to do so on any large scale were Edgar Allen and Co., who put in a single-phase furnace; and shortly afterwards Messrs. Thomas Firth and Sons put one in. These were run by motor generators, and gave very little trouble. In 1910 an Electro-Metal furnace was put in. It was two-phase, off transformers direct. They had a lot of trouble with that, but it was overcome, and then they went forward fairly well.

In 1914 they put in one furnace; in 1915, three (one of which was the first war furnace); in 1916, 11 furnaces, taking 13,000 kilowatts; in 1917, 18 furnaces, taking 14,000 kilowatts; and in 1918, seven furnaces; so that altogether they connected up, in a very short period, furnaces taking an output of no less than 35,400 kilowatts. They had the ordinary load in addition, and in three years the units sold grew from 26 millions to 172 millions, and the maximum load from 14,000 to 57,000 kilowatts. They connected up more furnaces than they had safe carrying capacity for. They had to do so on account of the war. They obtained from the Ministry a permit to put down a special telephone system, and got in connection with all the furnaces; so that, if they got a very bad run of coal or were short of plant, they could immediately ask that the units going into the furnaces should be reduced until they were able to give a full supply again. This arrangement was of very great assistance and enabled them to take on more furnaces than they really ought to have done.

Mr. Fedden analyzed some figures of output given in Mr. Mercer's paper, arriving at the conclusion that the steel manufacturers' load factor was only 15 per cent. He said if they asked anybody else what they ought to pay for a 15 per cent. load factor, they would be given a figure of 3d. to 3½d. Yet the Sheffield Corporation, at which they were always shouting on the score of high prices, had been giving it them for 6d., and practically losing 3d. a unit, for the benefit of steel-making in Sheffield. (Laughter).

Mr. Ernest Wells, of Edgar Allen and Co., said when he went to the Ministry of Munitions electric furnaces were very much over-rated. People were selling them on the principle on which one sold a pup. They were sold on the terms that anyone who bought them, no matter what business they were engaged in, could make good steel castings with them. But the output of good steel castings from the electric furnace until quite late in the war was negligible. The big bulk of castings were produced from the Siemens furnace or the side-blown converter. However, his own firm had sufficient confidence to have ordered some electric furnaces, and were going to make a shot at producing castings from them.

Mr. Travis (Sheffield) took exception to Mr. Wells' statement. He said he thought all manufacturers resented Mr. Wells' action at the Ministry. The fact was that people who had stock converters or other methods of making castings in their works, and who installed electric furnaces, had shut down their other plant and carried on the electric furnaces, which proved conclusively that the electric furnace gave them the result they required at the lowest cost. The very fact that Messrs. Edgar Allen and Co. had installed two electric furnaces, which he understood were ordered just before the armistice, showed their belief in the furnace which Mr. Wells attempted to damn to everyone else.

Mr. C. H. Rose (representing Mr. Victor Stobie), said his firm did not attempt to sell a furnace until after three years' successful manufacture of steel.

Mr. Howard (Sheffield Corporation), expressed the opinion that in many of the older furnaces the voltage was far too low. It ought to be increased by 25 per cent. This would lead to a considerable reduction in cost.

The Drawbridge, Up-to-date, in Industry

The Castle Moat of Former Years and the DrawBridge Over it Have Their Counterpart in Modern Industry Where at Times it is Necessary to Make Provision for Two Streams of Traffic on Different Levels

By J. H. Moore.

THE problem of conveying material from one department to another, throughout a large plant especially, is one well worthy of special consideration. A correct solution to such a problem may mean an enormous saving, while a hasty and not properly thought-out plan may mean, in fact usually means, a decided loss.

It often happens that two buildings are rather widely separated either by a street, railroad tracks, or other causes. Where a street intervenes there are as a general rule only two solutions to be considered, namely, the overhead bridge, or the underground tunnel. It depends, of course, on the general layout of the plant, which of the two policies is adopted.

In a case where railroad tracks come between buildings, the overhead bridge is as a general rule the solution adopted, but this idea, while a very efficient one, is also a costly undertaking. This is especially true if the cars which run on these sidings are only in place perhaps once a week, and in some cases even at longer intervening lapses of time than the former time stated. One cannot blame a manufacturer in such circumstance from saying, "The cost is quite an item."

They say that there is always a solution to any problem if you'll only keep on looking for it, but be that as it may, we have at least come across the solution to the problem we have just been discussing.

DRAWBRIDGE PARTIALLY RAISED.

At the plant of the American Can Co., Hamilton, Canada, the writer noticed a novel counterweighted bridge, which in reality is a commercialized idea of the old bastile bridge of former days. Of course, you remember your history of how these bridges spanned the moat around the fortress, and could be lifted up at will.

The same idea holds good in this case, but in place of the moat we have our railroad tracks. Fig. 1 illustrates how the bridge appears when down in place. It spans from one building to a shipping platform constructed alongside of the other building, and is operated by means of an ordinary rope.

When in position the bridge is held in place by means of a strong pin, which goes through a suitable flange on the bridge. Fig. 2 illustrates the bridge partly up. We photographed it from this position purposely, to show the counterweight space A. Readers will note that the construction is structural steel, with wooden running face. The bridge is built to stand up under heavy usage.

One would be surprised to find how easily this bridge operates. As soon as catch is released it swings up easily and smoothly. Of course, it keeps going up until it touches the building wall, if necessary.

Manufacturers will do well to study their transportation problem afresh, and see if a bridge of such style could not be used to advantage in their particular case.

DRAWBRIDGE DOWN AND IN USE.

Solving the Problem of Why is a Hot Box

The Discussion on a Paper Read Before the Canadian Railway Club of Montreal. The Paper Was Printed in Last Week's Issue

"I DO not agree with the statement made that we are farther away from the solution of this matter than we were twenty years ago, as I know that twenty-five years ago it was a common thing to see a freight train with two or three boxes smoking and others on fire, but you do not see this now.

"I have been wondering if anyone was going to say anything on what I consider to be the vital point in the whole matter. We have heard about the wearing of the white metal lining down to the brass and the serious results which follow. Now, in my belief, this is purely a question of magnetism, but if you talk to the ordinary car inspector about magnetism, you might as well talk to him about the number of feathers in an angel's wing.

"There are some metals that have the same magnetic conductivity, but there are no two metals or combination of metals that have exactly the same conductivity and when you get the bearings worn down and allow the two metals to come together in an infinitesimal, microscopical sort of a way, still they are big enough to cause a lot of trouble. In my opinion this is one of the largest elements in the whole thing.

"In so far as end wear is concerned in examining journals you will find that in turning them up they are carefully chamfered off at the end of the collar outside, but the inside is left perfectly square and the result is that we have a lot of them that are not circular getting into service.

"Some time ago I suggested that this method be changed and the inside corner of the collar be chamfered slightly the same as the outside and whenever this plan has been adopted it has saved an immense amount of trouble, particularly on new equipment. This, and the question of magnetism, are really bigger than most people think.

"I remember a case of some years ago where a big manufacturing plant required 500 coal cars for their own use. When they came to make the car brasses they picked up all the old scrap brass they could find about the place and put it in the mixer. Of course, the product looked like car brasses, but when the cars were turned out they did not run 200 miles light before they had to be re-brassed. The general manager sent for me and I put some of these brasses under the steam hammer and broke them through the centre and I found that they were more or less full of steel filings, borings and lathe chips. Apparently they did not take care enough in running their magnet through this stuff to pick out the steel and iron refuse before it was melted. When the brasses were replaced with the proper mixture the trouble disappeared immediately.

"If proper attention is given by the builders and the railway people there will not be so very much trouble with hot boxes. I do not know just what the figures are, but I am sure that the proportion of hot boxes now is not one-tenth of what it was twenty-five years ago. I would not like to think that the work of the Galena Oil men and the railway people has all been expended in vain in the last twenty or twenty-five years."

Norman Holland, president of the Holland Varnish Co., spoke briefly on the influence of the magnetic action, and the analyses of the metals in the journal bearings. In speaking further, he said:

"Mr. Gesner has brought up the question of the metals used in connection with the journals. He has referred to the electrical relations of these metals to each other. This question of the electro-positive and electro-negative relations of the various metals undoubtedly has some bearing on the question of journal troubles. The influence exerted may not be very great, but it is still quite sufficient to enter into the matter.

"I wonder to what extent the railways check up the analyses of the various bearing metals they buy? Do they know they are getting a composition that will stand the enormous stresses put on a journal bearing? Do they know what proportion of tin they get in relation to the lead used? We all know that owing to the high price of tin the tendency of the babbitt manufacturers is to increase the lead content as much as possible. These are most important points.

"There is no doubt but what the question of hot boxes can be solved to a large extent if the railways will give the matter the proper attention. Mr. McVeigh has pointed out a number of ways in which the matter could be helped. We have a factory in which we use nothing but double ball bearings. These require attention only once a year. They have now been running for nearly ten years and have never given us any trouble. Has any railway ever tried the ball or roller bearing and would it be possible to use either of these in railway equipment?"

Roller bearings had been tried out some time ago on trains of the C.P.R., but Mr. Smart stated that these had to be removed during the winter months, and, so far, had not been found successful for railroad service.

The question of cost was touched on by B. C. Gesner, who stated that the cost of journal lubrication had been reduced approximately, from 28 cents per thousand miles, on freight cars, twenty years ago, to about 4½ cents per thousand miles at the present time.

In closing the discussion the comment of G. M. Wilson, motive power superintendent at the Point St. Charles shops of the G.T.R., emphasized the importance of careful workmanship and supervision in the machine shop before the axles or the brasses were placed in the truck or engine. He said in part:

"I can say the remarks made by Mr. Booth that shop practice has something to do with the heating of journals brought to mind a case that quite recently came under my personal observation. We turned an engine out of the shop to make its customary trial run across Victoria Bridge, but before it had gone very far one of the tender journals ran hot. The wheels were removed for inspection of the journal and to all appearance it was parallel and smooth. I had it properly cleaned for further inspection and upon pressing with my finger and thumb and running them around the journal, I discovered that slight regularly space corrugations bounded its circumference.

"Either the undrilled centre bottom in that journal, or a chattering axle lathe bearing, or a combination of both, together with careless inspection, certainly caused that hot box.

"I came to the conclusion that, so to speak, if a journal is perfectly round, perfectly parallel, perfectly smooth, and perfectly lubricated, it will never run hot."

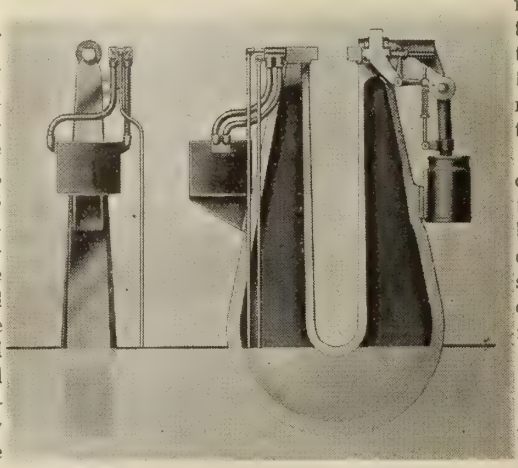
There has been considerable discussion during the past year or two concerning the utilization of Para rubber seed for oil, and it is stated that already exhaustive experiments have been made along this line. It is cited that in one instance oil from rubber seed was sold at about $250 a ton at a time when the price for linseed oil stood at $300. Experts are of the opinion that this oil could probably be successfully used in the manufacture of paints and varnishes, linoleums, soft soap, rubber substitutes, etc. In addition to the use of rubber seed for the purpose above mentioned, it is stated that experiments conducted in the Strait Settlements have clearly shown that a feeding cake for cattle and other stock, favorably comparing with linseed and other oil cake, can be produced from the residue of the Para rubber seed, after the oil is extracted, thus affording an opportunity for the development to very considerable proportions of a profitable industry in connection with the ordinary oil extraction.

DEVELOPMENTS IN SHOP EQUIPMENT

ELECTRIC RIVET FORGE

An electrical heating device for rivets, which is capable of wide application to shipbuilding boiler making and the erection and fabrication of structural steel, has been developed by the United States Electric Co., New London, Conn. The accompanying illustrations show various applications of the device. In its essentials, as shown on the portable rivet forge, it consists of a source of low potential current, a water-cooled and movable upper bridging electrode and two lower electrodes or terminal blocks. Rivets are heated in pairs and on being placed between the two-current carrying electrodes are quickly raised to a riveting heat without the formation of scale.

The forge can heat rivets of ¼ in. to 1¼ in. diameter. On two recent tests two ¾ in. rivets with 2½ in. shanks were heated in 15 seconds; two ⅞ in. rivets with 2½ in. shanks in 23 seconds, and two 1 in. rivets, with 2½ in. shanks in 30 seconds.



ELECTRIC RIVET BEATER ATTACHED TO BULL RIVETER

The following is a test made at Springfield, Mass., October 3, 1919, at the plant of American Electric Service Company:

Test, 50 rivets; total cost, 9 cents; time, ½ hour.

Size of Rivets.	Heating two at a time	Amperes (Transformers)	Volts	Amperes (Current)	Volts
1 inch	25 sec.	5¼	5500	220	190
⅞ inch	18 sec..	4¼	5000	220	175
¾ inch	14 sec.	4¼	5000	220	162
⅝ inch	9 sec.	3¼	5000	220	150

From the construction and principle of the device it is necessary to heat two rivets at once. This is a decided advantage, as the two are heated in the time taken to heat one.

One of the illustrations shows the machine adapted to the bull or gap riveters. The rivets are placed in the rivet holes cold, and the work to be riveted is moved along in front of the electrodes, which may be brought in contact with the electrodes either by the motion of the plunger or by a hand lever.

One rivet is being preheated while the other is being brought to the proper heat. By this means a continuous line of hot rivets is kept on the way to the plunger of the gap riveter during the operation.

In the case of portable riveting machines the device is designed for use with rivets not over 5-8 inch in diameter. It is made to operate in conjunction with the pneumatic hammer.

The operation is rather simple, the tool being attached to either the riveting hammer or the holder-on. Cold rivets are placed in holes shaped to size, the holder-on comes in contact with the rivet as in an ordinary case, but here the electrode is brought in contact with the head of the rivet. Heat is maintained until the desired intensity is reached, then the rivet is headed by turning the air gun around.

The electrode is attached to the side of the riveting gun, allowing two rivets to be heated at once by the use of a bridging conductor, which makes the device useful in heading rivets from one side of a plate, the outside of a boiler or in restricted spaces. Equipments are available in all sizes and for use with 110-volt and 220-volt currents.

The forge type of rivet heater was designed and built to meet the requirements of shipbuilders, structural steel builders and boiler manufacturers wherever it is necessary to use hot rivets from ¾ in. to 1¼ in. diameter, 3 in. shank; the time for heating being from seven to fifteen seconds, and at a very low cost.

The electrodes are arranged to heat two rivets at one time, delivering four 1 in. rivets per minute, which is as fast

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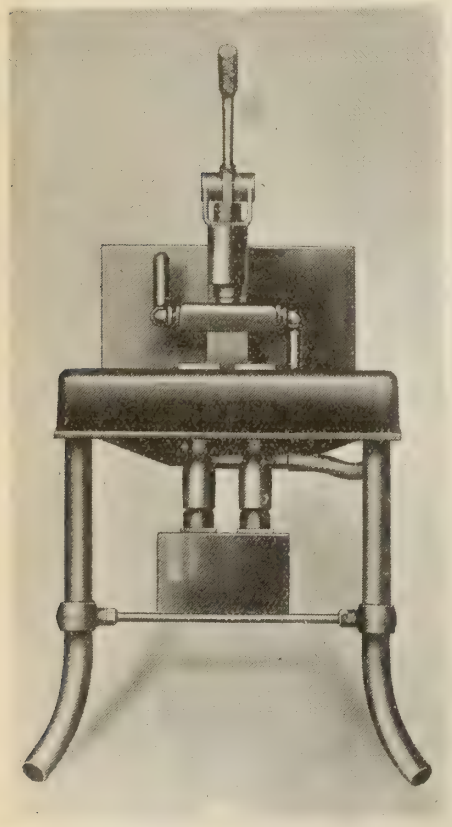
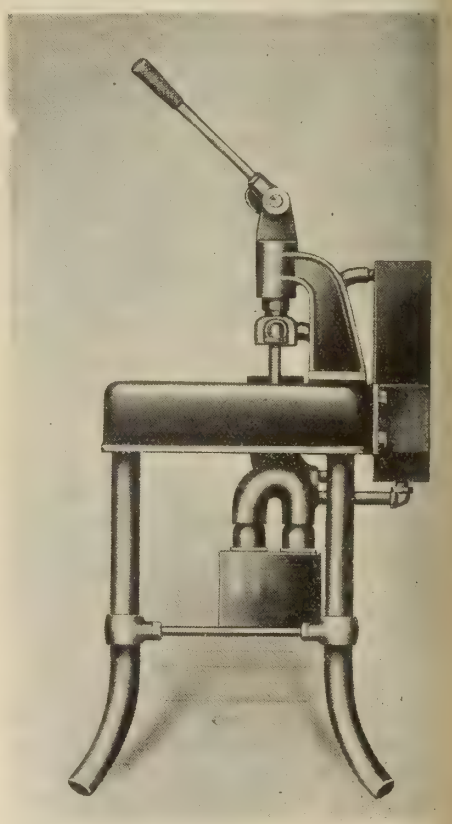


PORTABLE ELECTRIC RIVETER, FRONT VIEW



PORTABLE ELECTRIC RIVETER. SIDE VIEW.

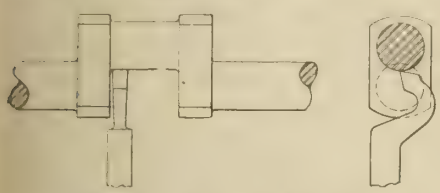
WHAT OUR READERS THINK AND DO

PARTING TOOL DISCUSSION

I have followed the discussion on parting tools with interest and profit. I think it is a good thing to have an exchange of ideas, and I hope these discussions on different topics will become a feature of CANADIAN MACHINERY.

No fair comparison can be made of the relative merits of forged tools and inserted tools, that is small tools held by a tool holder, unless each particular job is taken on its own merits.

For ordinary shop work the inserted tool is most popular and cheapest. We



PARTING TOOL DISCUSSION

learned something about parting tools during the war as Canadian machine shops cut off thousands of shells, and I venture to say that very few, if any, forged tools were used. During the war some steel makers made a special steel for cutting-off tools; this special steel was made in bars with the sides clearance on, so that all that was then necessary was to mill or shape a holder to fit the cutting-off blade which could be used up until it was tool short; all it needed was to grind the front and top clearances.

There are quite a number of other factors beside the shape and style of tools to consider in successful parting operations. The most important is the personal element. The lathe hand or operator, as we all know, given exactly identical conditions, some men will be much more successful than others.

Then there is the cutting speed, the cutting compound (if any), the material, the diameter of the job, and the rigidity with which it is held. To have a piece of work sticking out of the chuck too far always invites disaster.

The width of the tool always needs some consideration, as a rule the smaller the diameter of the job the narrower the tool that is within reasonable limits. The height of the tool in relation to the centre of the work also varies with the nature and diameter of the work.

If you get the tool below the centre of a light, spongy job the job is apt to climb over the tool; if you get it much above the centre you have to have an excessive front clearance to make it cut at all, then the first thing you know the tool will dig into the work and throw it out of the centres.

I have found that in using a parting tool on large diameters it is best to set the tool slightly above the centre, and on small work at the exact centre.

Another point is to maintain a continuous and even feed; it is not often that the cross feed can be used for cutting-off operations, they are generally too fast. To let the tool stop cutting seems to harden or gloss over the surface besides dulling the tool, so that it requires extra pressure to make the tool cut again, often with disastrous results.

ELECTRIC RIVET FORGE

(Continued from page 492)

as they are required. The rivets are brought to the proper heat entirely free from scale, and are passed on to the riveter.

The pan of the forge is designed to hold a keg of rivets in front of the operator or heater, and the rivets are easily placed by hand in the electrodes, and removed with the tongs when heated.

The operation is very simple, the conductor being operated either by foot or hand lever, bringing the electrode in contact with the point of the rivet or rivets to be heated, pressing down on the lever, and, when the desired heat is reached, the conductor goes back by removing the pressure on the lever. This method of heating rivets eliminates the following:

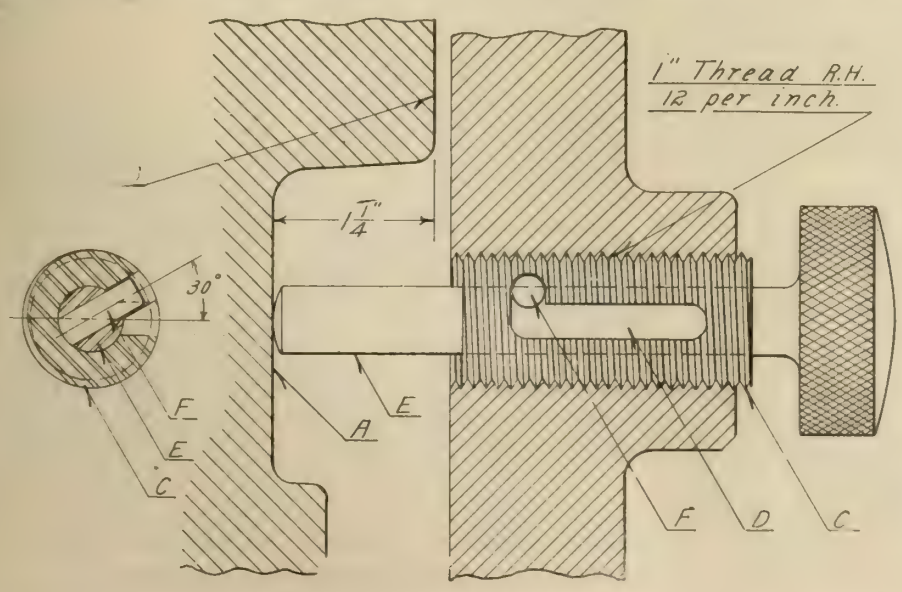
Loss of time in starting forges in the morning and at noon time.

Loss of burned rivets.

Breaking and carrying of coke and fuel for forges.

Air hose and air where same is used to blow up the fires, fittings, etc.

Smoke and gases in close compartments on ships, boilers, etc.



JIGS AND FIXTURES

Application of the Bayonet Lock

The accompanying sketch shows a practical application of the bayonet lock, adapted to a jig or fixture where ordinarily a long, clamping screw would be necessary. When the work is being removed or placed in position the pin F is at the right end of the longitudinal slot D, the central rod E being drawn back to allow the lug B to pass. To clamp the work, the rod E is pushed forward and the pin engages in the short radial portion of the slot, and the threaded bush C is turned in the usual manner.

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Are You a Figure Fiend?

AT an early stage in our lives, most of us, possessed of any imagination whatever, wondered just how much we saved by cutting across lots instead of going around. A little later on another problem intrigued us; we wondered as to just what the relation between the diameter and circumference of a circle was. Fortunately, we had teachers, more or less accomplished, to enlighten us, but in the early stages of the development of mathematics and general science those of a philosophic mind were not so happily situated and perforce, they had to go it blind.

All problems having to do with the mensuration of the circle have to do with the ratio of the circumference to the diameter. To those not conversant with mathematics, it would appear that this should be comparatively simple and so it is of no absolute value required. The ratio commonly denoted as π is in its nature an incommensurable number, that is no fraction can be found which will give its exact value. The commonly accepted approximation of 22/7 is not strictly accurate, for when it is changed into a decimal fraction its value will be 3.142857°, whereas the true value to the same number of decimal places is 3.141592. A closer approximation than the fraction 22/7 is given by another fraction 355/113.

Perhaps the best proof of the fact that no vulgar fraction can be found which exactly represents the value of π is seen in a characteristic of all vulgar fractions. When reduced to decimals it will be found that after a certain number of divisions they repeat themselves thus: 22/7= 3.142857,142857, etc. On the other hand, the number π never repeats, but runs on and on as far as one cares to figure it.

The earliest idea of the number which represented the ratio between the diameter and circumference was probably the number 3. It was so at least among the Jews (1 Kings vii:23, 26), the Babylonians, the Chinese and probably also the Greeks. Archimedes made a notable advance over former knowledge of this subject, and by geometrical means which he originated determined the fact that the true ratio lay between 3 1/7 and 310/71. His method consisted essentially of calculating the length of the sides of regular polygons inscribed in and escribed around the circle.

With the renaissance in Europe more powerful means became available and the use of formulae, in themselves an algebraic shorthand, greatly simplified the labor involved in computation. One Rudolph Van Ceulen (d. 1610), busied himself with the problem for the greater portion of his life and the results of his labors were not interred with him but inscribed on his tomb. He gave the result correct to 20 decimal places and as a curiosity it may be given here:

π=3.141,592,653,589,793,238,462,643,383,279,502,88.

Since his time has arisen a class of workers known as π-hunters, π-cumputers, or circle squarers. Their labors, fruitless though they may be, are interesting from the length to which they have carried the number. A decimal number with several hundred places is common in their results and one figure of 707 places has been reached. When compared with the modest figure given above, this number seems enormous.

Various methods have been used by these investigators for the solving of their problem and much effort has been wasted by some of them in trying to reach the end of their never-ending labors. It has been definitely proved that no such end is possible, and we must be content with approximations, of whatever degree of exactness desired.

Deliveries From the Steel Mills

THE steel companies in United States are having a better time, as far as their dealings with their customers are concerned, than they will when the strike is finally settled. At present buyers are making every allowance because they know what the mills are up against. They are taking any delivery they can get and they are not complaining.

When the announcement comes out that the strike is off, the public will expect immediate recovery from the mills, and they will not be complacent with delivery schedules that are weeks and months behind.

The matter of immediate recovery after a plant has been tied up or fifty per cent. crippled is easier said than done. A steel mill is a great organization, and it is easily thrown out of gear. Capacity production depends upon men being skilled and acquainted with every successive operation.

A strike in a coal mine or a strike in a steel mill soon brings about a state where it is a hard matter to recover quickly.

Unless all signs fail the steel mills, at the close of the strike, will bump into that fickle side of human nature that prefers performance to excuses, and shipments to explanations.

The Use of Weapons

THE number of cases where it has been shown that persons had loaded weapons in their possession seems to increase in Canada. It seems to be the proper thing now to shoot if things don't go to suit you.

After every shooting there is a campaign to stop foreigners from carrying weapons. There are regulations, no doubt, to cover all this, but the fact remains that carrying weapons is a common practice.

A man who carries a loaded gun in his pocket does so because he thinks he will be called upon to use it. There are mighty few men called upon to do any shooting as long as they are minding their own business. The man who carries a gun reckons that he is going to break the law and will need a show of force to do it.

At the present time it is too easy to obtain or keep revolvers. If a man wants to fight, let the law see to it that he comes out in the open with his fists, rather than skulking up some dark lane with a loaded gun.

The State of the Market

IN CANADIAN MACHINERY of August 22, 1918, there appeared an article written by one of the associate editors of this paper on the prospects for machine tool trade following the war. The article is headed: "Should Be No Post-War Slump in Machine Tools." The heading gives a general outline of what the article had to say. It reasoned that the war machine would not come into competition with the general purpose tool, and that much of the material, from long and hard usage, was fit only for the scrap. The fact was also brought out that many firms had dropped usual lines, and large organizations built up for war purposes would be held together to turn to new lines.

It is worthy of note that every one of these predictions has turned out to be true, and it is also worth remembering that toward the end of 1918 the pessimist was abroad in the land. He was saying that 85 per cent. of the business passing was war work, and that was going to be cut off all of a sudden, and the labor market glutted.

That period of readjustment that was going to be such a nightmare, is well under way, and the blue ruin element has not yet entered into the consideration.

There is more business moving than an unthinking or a non-observant man realizes.

Business has remained good in spite of tinkering. Too much tinkering and too much non-production are things we have to guard against. They can wreck our prosperity and batter down our progress more certainly than any other element.

Are You Wasting Your Time?

NOW that the winter months are almost here, what are you doing in the long winter evenings? You say you get enough of the grind all day without continuing it at night. Quite right. But did you ever stop to think that the way to get away from the grind was to grind harder?

The manner in which manufacturing is carried on now, the speed with which operations must be performed, the way in which material must be routed, all mean that the man who is going to master the situation must be a student. What was considered a job for a standard machine yesterday is moved to a special-purpose tool to-day.

What do you read? The papers? Very well, read them. Keep informed, but make certain that your information is going to be worth something to you. You read three columns of stuff about the gruesome details of a murder or a suicide or a divorce case. What better off are you? Absolutely none.

Get a direct drive in your reading. Make it a point to be well informed about some subject. People find it a pleasure to talk to you. There are successful men on the road who do this thing continuously. They enter into a conversation and turn it to a subject on which they have gathered a lot of information. They are able to talk intelligently and they get a good hearing.

You can do the same thing in your own line, no matter what it is.

You can largely make yourself what you want to be.

---

lowed throughout the country, would lead to the bloodiest upheaval in all history, an upheaval in which they would be the first to pay the last price that men can pay for social sins.

"It is a striking fact that it is the 'radical' unions and Socialist organizations, together with some 'liberal' magazines, which today stand almost alone in defense of intelligent and civilized methods of dealing with the problems of the hour. Instead of abolishing the restrictions on free assemblage and discussions, instead of allowing the masses to express their wishes and wants through organized effort,

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THE FLAW!

----Cassel in the Cincinnati Commercial Tribune

refuge is sought in terrorism, illegal suppression and organized violence. The reaction is losing its head -- and the New York "Commercial." Against the "red" campaign of evil "there must be organized one of devotion and patriism," declares the Los Angeles "Times," which goes on to say:

"We must set backfires of intelligence and patriotism. Thrift and industry must combine to fight their own battles. Against the forces of confiscation must be arrayed those of production. They of small incomes and small holdings, humble homes and small bank accounts, must not expect the so-called wealthy classes to fight for them. For not one person in a thousand is in the capitalist class, while half the producers of the country own something which the Reds through their machinations are seeking to confiscate. If anarchy were to prevail for a time, it is the persons of small incomes and the owners of single holdings who would suffer most. The very rich would be able to step across some convenient national boundary where their personal comfort would not be seriously affected. But the ones who would be hit hardest are those who have acquired through industry and thrift a small competence, a little home, a nest egg in the savings bank, who would see the savings of a lifetime swallowed in a whirlpool of Bolshevism--these would pay the penalty of their thrift and industry, while the bestial and criminally inclined would hold high carnival.

"It is during crises like the present that great civilizations in the past have disappeared."

EFFECTS OF THE PRINTERS' STRIKE

THE AGONIZING MENTAL SUSPENSE which magazine readers in general, and serial novel readers in particular, must suffer because of the printers' strike in New York, is pityingly commented upon by a facetious editorial writer, who regrets that the hero will be locked in a death grapple with the villain, while the beautiful Sylvia looks on, for several weeks longer than usual; the brave and unsophisticated country girl, battling with the vicissitudes of life in the great and wicked city, will still be undecided as to whether she should marry the rich clubman and be assured of a life of leisure. And so forth.

PART OF PAGE SHOWING HOW NEW YORK MAGAZINES GET OUT IN STRIKE TIMES.

MARKET DEVELOPMENTS

Some Canadian Firms Have Anxious Times

Hard Matter to Secure the Material They Need—Varying Reports as to the Deliveries Reaching This Country—Machine Tool Market is Brisk

MATTERS are becoming serious for some Canadian concerns which draw their raw material from the United States steel mills. There are various reports in regard to deliveries, and the best of them do not claim much over fifty or sixty per cent., while in other cases the mark is at zero. One large Toronto firm of importers and jobbers stated this week that for the first time in their history they could not find a mill in United States that would take on business for future delivery. Mills that have managed to stay open and operate even on a reduced basis have been swamped with business that will keep them covered for months to come. They become so hopelessly over-booked that their only course is to withdraw from the market for the time being.

There will be a tremendous amount of business piled up against the day when the mills state they are open to take on orders again. Some speculation is indulged in as to whether prices will stay or advance under such conditions. In some ways the war period is being repeated, in that there is a tremendous demand and a limited supply, and without Government control it is easy to see where prices may get a start. Against this it is pointed out that under the present schedule the steel companies are showing good earnings, and any move toward a higher scale would only serve to arouse the agitation of labor leaders for a share of the higher prices. The latter view of the fact seems to be the more likely one. However, there is nothing to hinder prices of material rising after they leave the mills. At present sales are not made on schedules, but on the urgency of the case. Many times it is delivery that is paid for as well as the material. Both plates and sheets were marked up this week.

The machine tool market is very active, and the big problem is the securing of shipments. Rebuilt war machinery is having a good innings in the market now, due to quick shipment and lower prices. One firm keeps a large shop busy rebuilding, and the tools are taken up almost as rapidly as they leave the rebuilding plant.

The scrap metal market is anchored fore and aft at present, and shows little sign of betterment. Speculators who bought in Canada some time ago for resale in United States later are having an anxious time just now, and losses are imminent.

MONTREAL IS ANXIOUS TO SEE THE END OF U.S. LABOR TROUBLES

Special to CANADIAN MACHINERY.

MONTREAL, Nov. 13.—The local situation has developed few changes during the past week or so, but the continued labor difficulties in the States that have resulted in reduced production and increased transportation troubles are beginning to be felt here in the delayed delivery incidental to strikes of this character. The inauguration of the coal miners' strike has been the cause of more concern, in local circles, than the walk out of the steel workers, as the latter was confined to fewer industries than would be affected by a general curtailment of coal supply. However, no serious condition has yet arisen here, but dealers and manufacturers are watching American developments very closely, as the next few days will decide the question one way or another. In some respects the Canadian mills have benefited to the extent that calls upon their lines have been somewhat heavier than formerly, and the volume of business placed reflects the inability to obtain similar products from American sources, within a reasonable time. The general demand for industrial finished steel, however, is not excessive at the present time, and with a few exceptions, the pressure of United States strikes has not been seriously felt in this locality. Navigation is gradually showing the near approach of the closing season, as fewer vessels are coming to the port, but it is expected that official closing will be as late or even later than last year. General business activity continues brisk, more particularly where this is not dependent on American supplies. The movement of machine tools is of fair proportions and would be more so but for the difficulties that surround the shipping and transportation of equipment. The metal market is nominal in ingot business, but finished lines are very quiet, as a result of the impossibility of obtaining supplies. Warehouses are virtually out of sheets, and no galvanized line can be secured. What little comes through is immediately transferred to previous buyers. Old material dealers are listlessly waiting a revision of industrial conditions in the States and few look for better conditions until affairs are more settled.

Sheets Hard to Get

Ingot metals are comparatively hard to get at present and the volume of sales are well distributed in small lots and in no instance are consumers buying very far ahead, content to purchase for immediate needs only. The difficulty at the moment is the securing of requirements for finished products, sheets are almost impossible to get and warehouses are completely stripped, with no definite knowledge as to when a supply can be obtained. Under these conditions dealers are content to let quotations stand as they are, as present prices can only be considered nominal, every sale being made on its own individual merits. Prices quoted, however, are a fair average of the present market. In lead sheets, local dealers are quoting an advance of 50 cents per hundred lbs., the lighter sizes selling for $10.75 and the heavier sizes for $10.25 per hundred lbs., with the usual charge for cut sheets.

Delivery the Problem

The outstanding feature of the ma-

chine tool operations for the week is the difficulty and the uncertainty associated with delivery of equipment from the United States manufacturers. This condition is the one that probably impresses a person here as to the growing seriousness of the strikes in the States, factors that prevent or interfere with the regular schedules of production of machinery and ultimate delivery. During the past week the revival of inquiry for used equipment has reflected the inability to secure new tools for early delivery. Dealers state that they could materially increase their sales if they could give some definite assurance of date of shipment. Many customers, realizing the conditions that exist, are satisfied to place their orders and rely on the dealer to get the tools through as soon as possible.

Local Movement Only

The combination of circumstances has resulted in a very inactive scrap market. The present trade is largely local in character, and the requirements are generally for small supplies delivered regularly, few consumers acquiring stock for future needs. As a result of the recent strikes in the States the shipments of scrap to American mills is approximately nil, and this condition will probably continue while industry is so unsettled. The critical point will be reached before this goes to print and subsequent activity will depend on the attitude of the Government and the miners' organization. Sales are based on prevailing conditions and prices quoted are only nominal, but a fair average of what the dealers are willing to pay.

POINTS IN WEEK'S MARKETING NOTES

The Willys Corporation at Elizabeth, N. J., are planning to get an organization together for an output of 500 cars daily.

Shipments of plate, sheets, etc., from the U. S. mills do not improve and Canadian manufacturers are having trouble in getting enough material to keep their plants going.

The scrap market is more or less stagnant. Speculators who bought in Canada a short time ago to sell in U. S., have not made money. They have lost on their speculation.

Some steel offices in this district can now show a fifty per cent. or slightly better delivery schedule.

Rebuilt machinery in the market now is moving out quickly.

The coal strike, according to Pittsburgh, is not going to help the steel strike, as the steel mills have big supplies on hand.

It is estimated that the steel strike has cost the mills now an entire month's production.

Prices of pig iron are advancing sharply. None of the producers seem to care to take a definite lead in boosting prices, but are quite content to trail along and sell at increased prices.

STEEL SHORTAGE IS MORE ACUTE

Shipments Do Not Improve—Demand for Machine Tools is Still Strong and Increasing

TORONTO.—Unless the reported improvement at the steel plants soon finds a sequel in decidedly improved shipments coming to Canada, there are firms that will have to shut off certain of their departments. That is not a matter of speculation, but an absolute fact. The supply of steel from the mills on the other side is still well down, as against a demand that is increasing rapidly.

The Sale of Machinery

The representative of CANADIAN MACHINERY noticed a nice line of lathes and shapers on the floor of one of the Toronto showrooms, and inquired how it was that they managed to keep that machine. The salesman merely pointed to a white chalk mark on the other side of the tool, which read "Sold." It could be sold a good many times over, for the demand for good machine tools is too keen for the available supply.

As showing the demand for machinery in Canada, the following can be given as an illustration: One firm took in a very large amount of used machinery of the better sort from the war shops. They scrapped any that had been used too roughly, and engaged a machine shop to go ahead and rebuild the remainder. It is coming out of that shop now at a pretty fair rate, but it has no chance to accumulate, as it passes out into use again about as quickly as it comes on the floor of the warehouse.

As noted some days ago in these columns there are firms that are losing business because they cannot give deliveries that meet the needs of the trade. A customer wants a two or three month delivery on a certain machine and it is no use to promise it. In many cases where houses act as exclusive agents, they have nothing else to offer as a second choice. And, as is usually the case in a strong and rising market, the matter of price is not the consideration it used to be. Salesmen state that very seldom do they have to meet this argument seriously. Where a man or a firm really wants a machine tool, delivery is four-fifths of the business at present, and it is delivery that the makers are uniformly weak on just now, with small signs of improvement.

Drew Another Blank

Several Toronto buyers and warehouses drew another blank from the expected shipments of steel from United States strike zone. A nice shipment of tubes came through to one of the firms, and the sizes showed that the mill is operating, as they were specials as well as standards. Dealers here state that operations of tube mills are about forty per cent., but there are others whose goods are held back yet who seem certain that thirty per cent. would be nearer the mark.

And in passing it might be noted that just at this season of the year there is a great demand for tubes, especially of the two and three inch sort. Repairs are being made to heating plants in schools, churches and other establishments, and strange as it may seem, many of the repairs always get shunted off until they are ready to light up the fires for the winter season. Prices have not been increased, although there is a feeling in the market that a higher price could be secured for tubes, but there is no disposition on the part of the big mills to alter prices owing to the strike, and so the jobbers have nothing to work from. They may secure some premiums, though, while the list remains the same.

A New Experience

But there is a shortage, and it is increasing, in regard to steel of all sorts. Here is the experience of one warehouse that operates on a large scale at several points in Canada: "In the last two months we have had a tremendous tonnage turned back on us by mills that we have been selling for years. They will not entertain the prospect even of taking on any business. We never had this happen in all our experience. It looks to us as though there would be a very large amount of business stacked up for the mills when they get down to production again. "The situation," our informant continues, "is very much the same as it was during the war How then, do they calculate to hold prices for next year? Unless there is regulation, and that hardly appears likely, I believe the tendency will be upward in spite of the satisfactory earnings that steel companies are showing under present unsettled conditions."

Other dealers do not share this view. They point to the labor unrest that is existing at the moment in the steel industry of United States, and ask you what effect it would have to raise prices now. They answer their own question in the next breath by stating that it would simply mean that demands would be made for higher wages. These people contend that raising prices would be simply to renew all the agitation that has been gone through with for the past three or four months. The latter view of the case seems to have the better ground of being somewhat near to the real situation. For the present, though, both plate and sheets have been marked up.

Some of the shops in this country are suffering already from the shortage of material. Stove makers feel the need for sheets already. Another firm making metallic furniture practically clean-

ed the automobile steel out of one warehouse to tide over the period of scarcity. It is only a temporary account, and staves off the day when material will be missing entirely.

"While they do not state so openly," remarked one dealer this morning, "the mills give us the impression that they are out of the market entirely until this strike is won. They never suggest a compromise, their attitude being win or break."

A Dull Scrap Market

There is almost no action at all in the scrap metal market. There are a few speculators who are looking for action to relieve them of their embarrassment. It has been, in some quarters, a favorite form of speculation to buy up quantities of scrap here and ship to United States, holding there for better values before releasing for sale. Shipments that went across the line some weeks ago are not going to make money. They are going to lose it.

There is very little business going on now, either between dealers and sellers or mills or other consumers. All the coppers are weak, in fact, almost stagnant. There are none of the white metals that are showing any particular strength in the present market.

WILLYS CORPORATION PLANS FOR AN OUTPUT OF FIVE HUNDRED PER DAY

Special to CANADIAN MACHINERY.

NEW YORK, Nov. 13.—Eastern machine tool builders are, almost without exception, comfortably well off as to business on their books. Some companies are losing orders because of inability to make fairly prompt deliveries. On some lines deliveries are from a month to three months off. Current business is fairly good, although there has been a slight falling off in inquiries during the past week, due, perhaps, to the uncertainties incident to the labor troubles.

The Magor Car Corporation, Passaic, N.J., is in the market for about 25 metal working machines, most plate punches, shears, radial drills and similar machines for car work. Five wood-working tools are also inquired for. Several of the big deals in the East which have been pending for some weeks may soon be closed. Most important of these is the list issued a few weeks ago by the New Departure Mfg. Co., Bristol, Conn., for several hundred tools. The Willys Corporation, Elizabeth, N.J., is about to let contracts for new manufacturing buildings and is interviewing many machine tool engineers in preparing a list of its tool requirements. As the output of the plant is eventually to be 500 or more automobiles a day a very large quantity of equipment will be purchased. The General Electric Co., Schenectady, N.Y., has taken no action at this writing on its recent list, totalling more than 100 tools, but is expected to place orders soon. This is only a part of the General Electric Co.'s requirements for the near future.

Another large prospective buyer is the Stevens-Duryea Co., Chicopee, Mass., which will re-engage in the automobile manufacturing business. The trade expects that a large list of equipment will soon be inquired for.

Crane builders are very actively competing for business, very often at the expense of prices. While several of the crane-building plants have fairly good order books, much of the business has been taken with very little profit. During the war several new crane companies came into existence, and the productive capacity of the country is now in excess of the need. The Midvale Steel and Ordnance Co. has placed an order for several cranes for its Cambria works at Johnstown, Pa., with the Alliance Machine Co., Alliance, Ohio, and the Morgan Engineering Co., Alliance, Ohio, has received an order for five cranes for a new steel rolling mill at Canton, Ohio.

COAL STRIKE NOT REGARDED AS DECIDING FACTOR IN STEEL STRUGGLE

Special to CANADIAN MACHINERY.

PITTSBURGH, Nov. 13.—The coal strike inaugurated Saturday, Nov. 1, found nearly all the steel mills with stocks of coal equal to from two to four weeks of consumption, and the Government distributing authorities determined to avoid, if at all possible, any idleness of steel mills on account of the coal strike since that might lend encouragement to the iron and steel strike. No immediate occasion was found for furnishing coal to steel mills. The railroads seemed to be moderately well supplied, so that some of the commandeered coal, involving all that was in transit, was available for distribution, and this has been given to public utilities, as having the first claim. The Connellsville region was not affected, its coal production, apart from that converted into coke in the region, amounting to several hundred tons a week. The strike did not affect other non-union regions either, and a few small union mines remained in operation, while after the first day of strike there were occasional instances of union miners returning to work.

Increasing Steel Production

At the end of last week, the seventh of the steel strike, production of steel was at the rate of nearly 70 per cent. of the rate just before the strike. Production during October averaged 60 per cent. or a shade less. At the height of the strike, the third or fourth day, production was down to about 50 per cent. of the pre-strike rate. As the strike is now waning rapidly it is important to remember that before the strike production was at considerably less than capacity. From the middle of May there had been a continued increase in production, but just before the strike production was still only between 80 and 85 per cent. of rated capacity. This restriction in output was due in part at least to scarcity of labor, though the manufacturers also held labor inefficiency responsible.

Up to date the restriction in steel production by the strike has amounted to about three weeks of production at the rate before the strike, hence at the lowest estimate the entire restriction is going to exceed a month's production. The great problem with steel manufacturers now is not the strike, which is disappearing with sufficient rapidity, but production after the strike, as in many mills working organizations have been greatly impaired in efficiency and it is likely to be a long time before everything is working smoothly again. During the strike the customers of steel mills are very sympathetic and accommodating, but after the strike they are likely to become more or less peremptory in their demands, probably having the viewpoint that with the strike over they ought to be getting better service than ever.

The Wheeling district is still closed practically tight, but operations are increasing at a fairly good rate in the Mahoning Valley. All the blast furnaces in the valley were closed, but now about one-third as many are operating as before the strike and steel production in the valley is up to 20 or 25 per cent. Three of the four large steel interests at Youngstown are now shipping some steel, while the fourth does not seem to be shipping any, although it is making some pig iron and steel ingots.

Pig Iron

Values of pig iron have stiffened sharply. In some districts there is regular trading, showing almost constantly advancing market prices. In the Pittsburgh Valley district there is relatively little trading and market prices are not strictly defined. The producers, in the main, are indisposed to sell, and all or most of them are holding back, evidently with the idea that as price advances are unpopular it is better to let somebody else put the market up, and then simply come in and sell at the market price. Buyers willingly pay sharp advances over the March 21 schedule for such small prompt lots as they must have, and while prompt iron does not usually make the market, if advanced prices for prompt become well established it may be found easy, later on, to sell for first quarter or first half at those prices.

Foundry iron was $26.75, valley, by the March 21 schedule. A fortnight ago it sold at $28.75 for first quarter, but lately there are no sales for next year. Prompt lots have brought up to $33, valley. Malleable was sold at $30, valley, to a customer, who wanted foundry, which the seller could not furnish, and the $30 price on the malleable was regarded as representing a concession. Basic, which was $25.75 by the March 21 schedule and has been in light demand lately, has sold at $29 for prompt. Prompt lots of Bessemer have sold successively at $28.50, $29 and $29.50, the March 21 price having been $27.95. As closely as the market can be quoted it stands as follows: Bessemer $28.50 to $29.50; basic, $28 to $29; malleable, $30 to $31; foundry, $30 to $33, all f.o.b. valley furnaces, freight to Pittsburgh being $1.40.

In the East there is a clear cut market, No. 2X foundry (2.25 to 2.75 per cent. silicon) being $34.10 to $35.10 delivered Philadelphia. Buffalo has sold little, but the market there seems to be $32 to $33 at furnace.

Furnaces claim their costs readily justify these price advances, but consumers are not convinced. However, it seems clear that the advance is not all to be attributed to the iron and steel strike, perhaps not even the major part of the advancing tendency. Pig iron was advancing somewhat before the strike, and the strike has not affected the merchant furnace production of pig iron nearly as much as it has the operation of steel mills with their blast furnaces. One factor in the pig iron market undoubtedly is that last spring and summer consumers were striving to reduce their stocks, and carried the process too far, as is usual in such cases. Furnaces blew out until production was below consumption, and then came the strike. That the strike is not in itself responsible for all of the present shortage in pig iron is shown by production reports, to the effect that production of pig iron by merchant furnaces was 90 per cent. as heavy in October as in August. The strike curtailment, however, was more than 10 per cent., being probably fully 25 per cent., production having been increased up to the time of the strike, September 22.

Steel Supplies

There is not as great a pinch in steel supplies as might have been expected in the circumstances. Many consumers are getting along fairly well, though probably near the end of their stocks by this time. In some instances the scarcity is acute. Nails are extremely scarce. In automobile manufacture the scarcest steel item is springs for upholstery, and next comes strip steel, bars and sheets following in turn.

The English Market.—If any firm with a specialty of almost any kind that they would like to sell in England, will communicate with Mr. Furniss Clarke, Room 63, 364 University St., Montreal, he can probably place the same for them.

U.S. SCRAP METAL

The scrap situation is stronger. The lack of pig iron is making cupola scrap sought after, and prices have advanced. Following are reports from various U.S. points:

Pittsburgh.—The deficiency in pig iron has boosted the price for cupola scrap. A sale of 500 tons was made at $28 delivered. Dealers are looking for $30 on this grade. A good market is looked for in steel making and other grades when the labor situation is more settled.

Boston.—There has been an active buying market during the week, and a general advance in price has been noted. Among the grades most in demand is No. 1 machinery. Turnings and foundry scrap have advanced, and cast iron borings have sold at $16.

New York.—Cast scrap and heavy melting both show renewed activity with enhanced prices. No 1 heavy cast is quoted $24 f.o.b. New York, and heavy melting at $15.75 to $16.50. No. 1 machinery has advanced $1.25.

Philadelphia.—A sale of 15,000 tons heavy melting to the Lukens Steel Co. at $20, delivered, has cleaned up all this grade obtainable. All other grades are in good demand, especially cast scrap, borings and turnings. Clean cast borings brought $18 delivered.

Cleveland.—While there is active enquiry, there is little trading going on. The tone is strong, but a settlement of the coal and steel strikes is necessary to get business moving.

PIG IRON TRADE

There is a general advance in the pig iron market. Spot iron is exceedingly difficult to obtain, and premiums are being willingly given to get it.

Following are reports from United States points:

Pittsburgh.—What little iron is available for shipment between now and the end of the year is quoted at $30, furnace for No. 2. Malleable is in good demand and 1,000 tons for first quarter was sold at close to $31 furnace. For first half 1920 one interest has booked 100,000 tons foundry iron, but no price is available as yet.

New York. — The scarcity of iron for prompt shipment, has boosted prices. The minimum for Eastern Pennsylvania iron, 2.25 to 2.75 silicon, is now $33, and Central Pennsylvania iron of the same grade has sold at $35. Low phosphorus has been looked for more eagerly, and coppering bearing iron brought $36 furnace. There is a little Virginia iron, 1.75 to 2.25 silicon, available for shipment during the next month, quoted at $31 furnace.

Boston.—There has been a wild rush after any iron that could be obtained for prompt shipment, and prices has been a secondary consideration. Iron in some cases advanced as much as $3 in a day, and found ready purchasers. Panic over the coal strike was the cause of this. Some re-sale iron has been offered at $39 to $40 delivered.

VERY HIGH PRICES ARE PAID AT SALES OF U.S. WAR MACHINERY

A CANADIAN, who is at present engaged in the machine-tool business in Philadelphia, writes to CANADIAN MACHINERY regarding the sales of used war tools that have been taking place.

These sales, he states, are part of the features which make the market hard to gauge, as most of the tools are bought by consumers (users in this case), thus taking trade away from the dealer and manufacturing concerns.

This feature makes it appear that the market is dull, yet the number of tools (and the prices they are bringing) put on the market by the Government, shows the market to be very active.

Most dealers were at the sales Thursday, and I think one or two machines only were bought by them. The dealers were out of the run as the tool users were bidding in competition with the dealers and went a whole lot higher than a dealer could afford to go and make profit. Some of the tools brought practically new and some over new prices.

It is one of the psychological effects on open auctions that the user will outbid, and this to the extent of paying excessive prices at an auction, the prices he would not even consider if he were in a machine showroom, without feeling in duty bound to call the nearest policeman to arrest the dealer for profiteering. The high prices of new tools is also boosting these sales. It is very hard now to talk to a man about new tools until he has tried everywhere around to find a used tool.

The particular sales to which reference is made here was at the plant of the Eddystone Rifle plant, which, during the war, was one of the best equipped rifle manufactories in the country, its production running as high as 7,000 rifles per day. Since the war it has been used as a storage plant, and various Government equipments from other plants have been shipped in.

This sale comprises the machinery and material from the Fox Gun Co., the equipment from the Bethlehem Loading Plant and about 500 machine tools from the Eddystone Rifle Plant itself, in all there being about 900 machine tools and ment of every description.

All sales were made f.o.b. cars at the plant.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$25 00	$26 25
Electro copper	24 50	26 00
Castings, copper	24 50	25 00
Tin	58 00	58 00
Spelter	10 00	10 00
Lead	7 75	7 00
Antimony	10 00	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 75
Plates, 3-16 in.	4 90	5 25

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	21 00	18 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	6 00
Stove plate	15 00	13 00
Cast boring	7 00	8 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20,
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

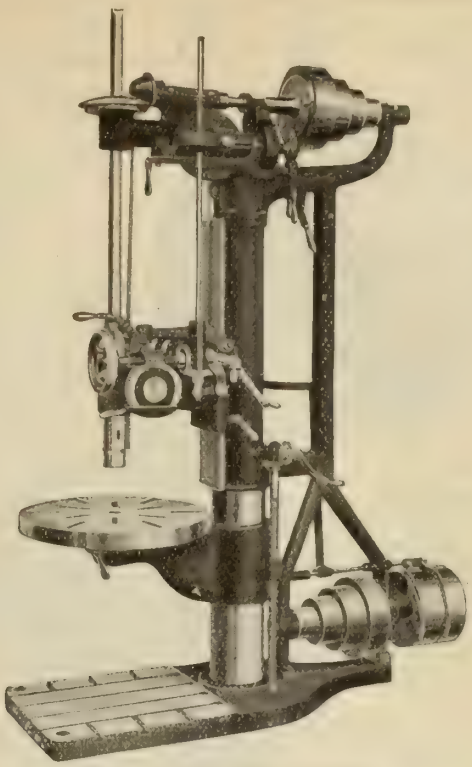
A Complete Line 8 in. to 50 in. Swing
with or without tapping attachment

BARNES

Upright Drills
Horizontal Drills
Gang Drills

Accuracy—Strength
Convenience of Operation

Carried in Stock by



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MONTREAL ST. JOHN, N.B. WINNIPEG VANCOUVER HALIFAX BUFFALO, N.Y.

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

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MORROW SCREWS MORROW
DRILLS FILES
MORROW NUTS MORROW

MORROW
INGERSOLL

Best jobbers carry "Morrow's."

"Morrow" Screws (it's the finishing die that does it).

"Morrow" Nuts.

"Morrow" Twist Drills "will do more drilling with less regrinding."

All of the highest possible quality made in Canada by contented, intelligent experts in the largest and best equipped plant of its kind in the Dominion.

John Morrow Screw & Nut Co.
LIMITED
INGERSOLL CANADA

Always, everywhere, use "Morrow" products. Made just a little better than seems necessary.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks..list plus	10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus 10 to	40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 75
Sheets, black, No. 10	5 15	5 65
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	8 20
Premier, 10¾ oz.	....	8 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10..		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$11 50
Sheets, 3½ lbs. sq. ft.	10 50	11 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

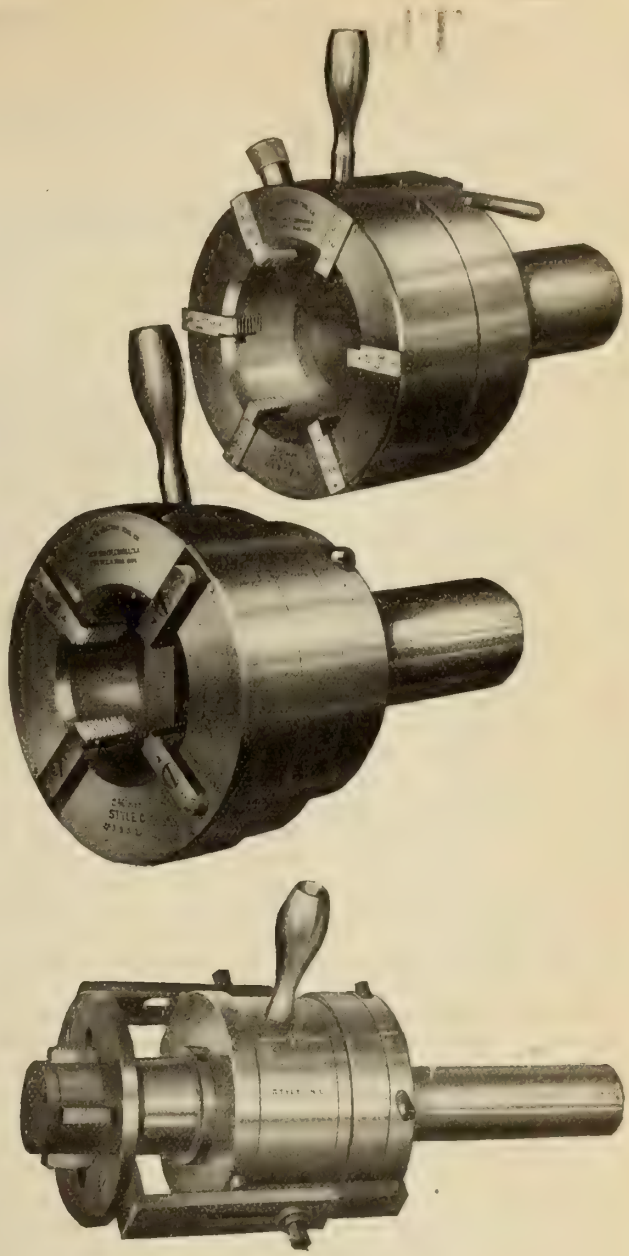
Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy.	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

A GOOD BOON

"Geometric Tools are a good boon in our business. Always reliable and sure of turning out a class job; in fact, I don't know how we could secure a decent output without them."

This is what the Works Inspector of a London (England) shop says. He adds that they are making screw and small parts for air craft, and have quite a lot of Geometric Dies in constant use.



Because of the fact that Geometric threading tools are "a good boon" in the thread cutting business, the majority of screw machines and turret lathes are equipped with Geometrics.

THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.

Canadian Agents:

Williams & Wilson, Ltd., Montreal
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta

For any thread, any size, any pitch — there's a Geometric Collapsing Tap or Self-Opening Die Head. Be assured there is one to meet your particular threading need — whatever it may be. Ask us.

If interested tear out this page and place with letters to be answered.

The Week's Events in Montreal Industry

Roderic J. McLean, consulting mechanical engineer of Montreal, has just returned from a successful two months' business trip to the British Isles.

The St. Lawrence Iron Foundry of Montreal are gradually disposing of their munitions equipment and they anticipate returning to active foundry operations early in the coming year.

The engineering firm of Peacock Bros. will shortly remove their offices from 285 Beaver Hall Hill to 175 Delorimer Ave., where the manufacturing plant is located and operating under the name of the Clyde Engineering Co. Considerable expansion has taken place recently and still further development is anticipated.

It has been announced that H. H. Vaughn has retired from the executive of the Dominion Bridge Company, to take a more active interest in the operation of the Armstrong, Whitworth of Canada, Limited, of which company he was appointed a director some few months ago. Mr. Vaughn is also actively associated with the recently organized General Combustion Company.

The Oil Engine Works of Canada, 29 Prince St., Montreal, will shortly move their plant to Iberville, Que., where they will occupy a portion of the plant of the Rapid Tool and Machine Company. When in Montreal the bulk of the machine work on the engines was performed in outside shops, and the assembling of the units was not all that could be desired. In their new location nearly all of the work will be carried on at the assembly plant. There is a steadily increasing demand for these engines.

That normal Trans-Atlantic shipping is not yet an accomplished fact is shown by the recent announcement of the British Ministry of Shipping regarding the early 1920 sailings to the West Indies, that had been arranged by the White Star-Dominion Line. The S. S. Megantic was to have been placed on this route for a number of pleasure cruisers, but the powers-that-be have seen fit to decide otherwise, and this vessel will remain on her regular route throughout the winter, to assist in relieving the heavy service that is expected during the next six months.

A. W. Swan, who has been associated with the Canadian Ingersoll-Rand Company, of Sherbrooke, for the last two years, has resigned to take over the position of assistant-secretary for the Engineering Institute of Canada, in the head office at Montreal. Mr. Swan graduated from the University of Toronto, with a B.A.Sc. in 1917 and entered the production department of the Can. Ingersoll-Rand Co. Since March, 1918, he has been assistant in the publicity department, in charge of technical journal advertising.

Owing to the large number of returned men that are taking advantage of the rehabilitation classes throughout the district, it has been found necessary to increase the educational facilities. The large factory recently constructed by Caron Brothers, for the manufacture of American shells, has been acquired by the Government and the draughting classes from the Montreal Technical School, and a large portion of the mechanical class, to the number of about 400, are receiving instruction at this plant. Much of the former equipment is being utilized for the purpose.

The finding of the Board of Conciliation, after investigating the claims of the wireless operators on the Great Lakes, has been announced, and as a result, substantial wage increases will be granted to all wireless operators on the lakes service. The Marconi Company, however, have decided to apply the revised rates to every operator throughout their entire service, in which about six hundred men are engaged. The new rates of pay will mean increases ranging from 50 to 100 per cent. The Board commended the splendid spirit of the Marconi officials, in not alone appreciating the reasonable demands of the men, but also in their immediate willingness to extend the new wage scale to the greater number of operators on the ocean service, not within the present finding of the Board. A recommendation is under consideration for a revision of the present contract with the Government, as regards the operation of wireless stations on the Great Lakes. The contract figure of $3,500 per year per station is less than half that required to maintain efficient service.

The City of Outremont will adopt a new type of snow plough for cleaning the streets during the winter. The device is simply a gas-driven rotary snow fan, similar to those used on the railroads, mounted on sleigh runners and drawn by two or more horses. W. H. Stadig is the inventor and the machines are being built by the Canadian Fairbanks-Morse Co.

Chas. Trawford, of Trawford and Company, chain manufacturers, of Walsall, England, has been in Canada during the past month, visiting their Canadian agents, Thos. Moore and Sons, of 224 Lemoine St., Montreal, with the object of studying the field here for the purpose of developing trade in this country.

The Marconi Wireless Company of Canada have removed their main offices from 173 William Street, (the plant location), to 11 St. Sacrament St., Montreal, in the heart of the business district.

G. D. Robinson, who was for twenty-five years with the Canadian Pacific Ocean Service, and European freight agent when he severed his connection recently, has now opened offices in the Coristine building, Montreal, room 511, where he will carry on a business of steamship freight broker, shipping, forwarding and chartering agent.

During a spell of stormy weather last week along the coasts of Nova Scotia considerable damage was done to shipping, and telegraph communications. Quite a number of fishing boats were wrecked or driven ashore, the signal station at Liverpool was blown down, and the three-masted schooner Audrey was wrecked on the rocks at this point.

Demonstrations are now being carried on, at 235 St. James St., Montreal, of a new type of crude oil burner, known as the "Rex." The primary purpose of this device is for the use in the ordinary coal stove or furnace for domestic heating, although the intention of the inventor is to adapt these burners to general industrial as well as domestic use. They operate satisfactory either with natural or forced draft.

The St. Lawrence Sugar Refining Company have just recently equipped three of their six boilers with oil firing apparatus. These three boilers will be operated in direct competition with an identical battery (coal fired). Close check will be kept throughout a period of several months to determine the economic value of oil as a permanent fuel. Tanks have been erected for an oil storage capacity of about 55,000 barrels.

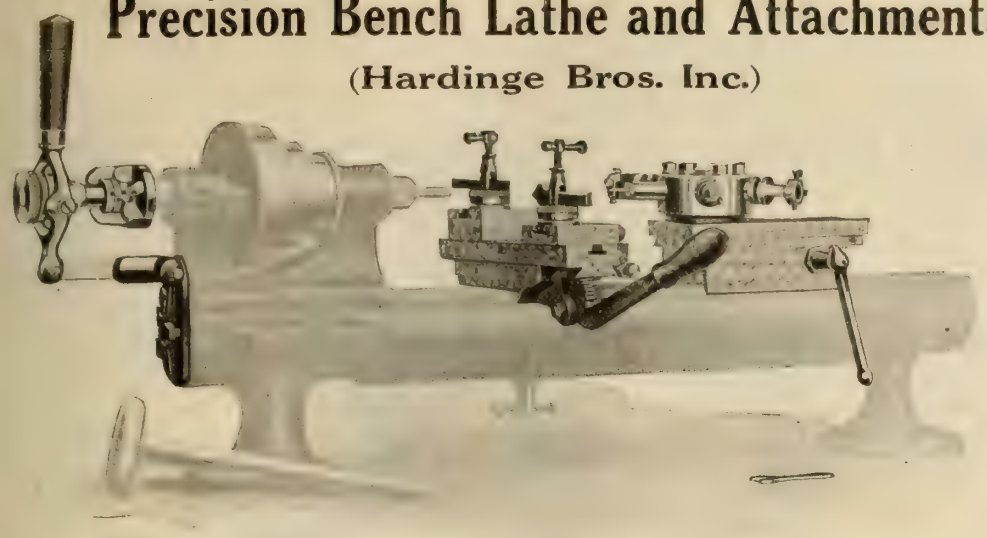
R. M. Rook, who for the past five years has been associated with the Metal Thermit Corporation of New York, has been appointed general foreman of the St. Lawrence Welding Company. Mr. Rook has had a wide experience in welding work of every description, and was directly responsible for the successful repairs on what is considered the largest job yet accomplished by the thermit process. This was on the frame of a large stone machine, the weight of which was approximately 75 tons, requiring about 4 tons of thermit. Nearly seven weeks were required in preparing the mould.

T. W. Rogers has joined the staff of the St. Lawrence Welding Company of

The Cataract

Precision Bench Lathe and Attachments

(Hardinge Bros. Inc.)



Write for particulars of

The Cataract Quick Change Swing Precision Lathe for Tool Makers.

The Cataract Turret-Tool Post Lathe.

The Cataract Power Feed Bench Lathe.

The Cataract Precision Bench Lathes, of which there are six sizes, with full line of attachments.

The Cataract Automatic Gear Cutting Machine.

Draw-Back Chucks and Screw Machine Collets for all sizes.

Special Machines.

Canadian Representatives

Garlock-Walker Machinery Company, Limited

32 Front St. West

Montreal **TORONTO** **Winnipeg**

Montreal, and will have the position of general sales manager of the company. Prior to his recent appointment Mr. Rogers was eight years with Darling Bros., four years as a travelling salesman and the last four as purchasing agent. He was formerly with the heating division of Taylor Forbes Co. The tank development of the St. Lawrence Welding Company will necessitate additional selling organization and Mr. Rogers will have full charge of this department.

At a recent meeting of the Montreal Board of Trade considerable opposition was advanced regarding the proposed advance in wharfage rates that the Harbor Commissioners intend putting into effect at the beginning of the year. It was decided that the council of the Board of Trade interview the Commission to see what can be done as to the withdrawal of the proposed advance, and if this cannot be done to suggest that the matter of the increase be deferred for a time so that the board may have time to bring the whole matter to the attention of the Government.

The St. Lawrence Welding Company of Montreal, have acquired a property adjoining their present plant, which they are now preparing for the installation of the equipment necessary for their tank manufacturing enterprise. Plans now under way will provide this company with adequate facilities for making any size of tank for industrial or domestic purposes. Several machine units have already been ordered and negotiations for others are in progress. The new tank shop will take care of all classes of work up to ¼ inch thickness of plate. The company is continually adding to their general equipment; the machine shop has been enlarged, and by the first of the year they will be in a position to take on almost any class of repair work—welding or machine, or both. Their portable electric welding outfit is so mounted that it can be taken to any section of the country where local apparatus is not available for this purpose. The company are now accepting tank orders for delivery after the first of December.

The Oil Engine Works of Canada, operating for the past few months at 29 Prince Street, Montreal, will shortly move their plant to Iberville, Quebec, taking over a portion of the plant now occupied by the Rapid Tool and Machine Company. They are building the Hvid line of oil engine in 6 and 8 h.p., principally for the farm trade. M. L. G. Vincent is the managing director.

The Dominion Bridge Company will utilize the plant of the St. Lawrence Bridge Company at Rockfield, for the building of the pulp and paper machines, a post-war development that promises to grow into extensive proportions. They also anticipate the building of a grey iron foundry for the making of the large number of castings that will be required in these machines and the turbo-equipment that they are now building.

Realizing that the price of building materials will show little, if any, decline for some indefinite period, the Improvement League of the City of Montreal has decided to take immediate steps to relieve the housing problem in the city. At a meeting held in the Windsor Hotel last week the League passed a resolution to the effect that a committee be formed from the executive, and others chosen by it, to prepare a definite scheme of housing, to draw up a definite plan of amendments to the present housing law and to lay before the municipal authorities a practical system of managing the loans either to individuals or corporations. An additional function of this committee will be to press for the completion of the housing commission, which is not yet at full strength. The City Administration hope to complete the personnel of this body before the close of the year, and an active campaign of building operations is expected in the spring.

W. A. McCallum, who has been assistant to the vice-president of the Canadian Tube and Iron Company, and assistant to the president of the Canadian Rolling Mills, and the Colonial Wire Manufacturing Company, has resigned from these positions to accept the office of vice-president to F. E.

Smith, Limited, of Montreal and Toronto, a firm doing a large domestic and export trade in iron and steel refractories.

Last Saturday afternoon, Canadian Vickers, Limited, launched from their yard at Montreal, the seventh vessel that they have completed for the new merchant marine of the Canadian Government. The ceremony was performed by Mrs. Alex. Johnston, the wife of the Deputy Minister of Marine and Fisheries. The latest addition to the Canadian Merchant Marine will have the name of the "Canadian Spinner," and the vessel will be, in all respects, similar to all the others that have been launched from this yard, her dimensions being: 400 feet in length, 52 feet wide, and a moulded depth of 31 feet, and with a deadweight cargo carrying capacity of 8,350 tons. Following the launching a reception was held in the general offices of the company, many notables being present.

WILL MAKE RANGE BOILERS AND TANKS

John Wood Mfg. Co. Make Product That Will Withstand Heavy Pressure

The Canadian John Wood Manufacturing Company of Consnohocken, Pa., are busy at their new Canadian premises, Coxwell Ave., Toronto, getting into shape to commence manufacturing their product in this country.

The firm make range boilers, the seams and heads of which are fastened by electric arc process. They also make air reservoirs and steam receivers by the same process. Much of the machinery used has been developed by the firm themselves as a result of their manufacturing experience. All kinds of pressure-containing vessels have been made by the firm, and tensile tests made of the finished products have shown failure to take place in the sheet, before the weld was affected.

The efficiency of the weld as determined by a British authority is 92 per cent., and this is the figure which their calculations are based upon. However, as shown above, the practical efficiency is higher than this figure, being over 100 per cent. as compared to the solid metal.

Roentgen rays are now used to test the quality of cast metal and discover any internal defects. They offer an excellent method of determining the influence of aluminum and tungsten on steels. Castings an inch and three-quarters thick may be penetrated by the rays disclosing blow holes and similar flaws.

A contemporary says: "Did you ever see a spectacled waiter?" Now, suppose we take note of that question and see what specimens of spectacled waiters we can locate.

"News," Dallas, Texas.

A personal experience that most of us have had lately.

DOMINION TO OPEN UP NEW COAL MINE

In Order to Get Coke Supply For Operating the New Plate Mill

SYDNEY.—"I foreshadowed extensive developments in the Steel Corporation's activities on my arrival in Sydney the other day," said President Mark Workman. The time has come now to announce an important undertaking.

Bonar Point, on the north side of Sydney harbor, where the Dominion Coal Company has land areas, has been selected as the starting point for new coal mining operations to be carried into the company's submarine areas. High-grade metallurgical coal for the new plate mill is the objective. There will be, of course, no diminution of the coal output on the south side of the harbor. That, too, will be increased.

"It will be remembered," continued Mr. Workman, "that the sulphur content in the coal supplied to the Steel plant was the subject of lengthy litigation before the formation of the Dominion Steel Corporation, some years ago. This impurity exists to a more or less extent in all Nova Scotia coals. In the case of the areas which our company intends to open up the content of sulphur is less than one per cent. The immediate reason for the sinking of the new mine is the imminence of the operations of the new plate mill. The quality of steel required in the manufacture of that mill's product is of high grade, and only the finest metallurgical coal should be used in its preparation."

In Mr. Workman's opinion it is obviously a policy of wisdom on the part of the Steel Company's executive to ensure quality in the building up of the materials for an industry which will undoubtedly mean much to Cape Breton, as it foreshadows the inauguration of steel shipbuilding on a huge scale. It is quite within the range of possibility that the building of ships in the Province of Nova Scotia will be second in importance only to that of the coal mining industry.

The plans which have been prepared for the new mining activities involve the expenditure of approximately two million dollars, and provide for the most modern equipment procurable.

A large number of houses will be erected for the employees, and it is not difficult to see that the new expansion will place a large sum of money in circulation in this district

Announcement of Special Interest

to users of

Drop Forgings

THE Dominion Forge & Stamping Company have sold their two Stamping Plants.

This means that the entire resources and energies of the Company will be devoted to the Drop Forge Industry.

Extensive additions are being made to their Forge Plant to take care of the increasing demand for drop forgings in Canada.

This Plant is one of the largest and best equipped drop forge plants on the continent; and to maintain this position in the industry the company decided on this policy of concentration.

Forgings are made to customer's blue prints and specifications. Inquiries are solicited.

Dominion Forge & Stamping Co., Ltd.

Walkerville, Ontario

Toronto Office: 206 Excelsior Life Bldg.

If interested tear out this page and place with letters to be answered.

TRADE MARK
"HAWK" BRAND STEEL

REGISTERED U.S. PAT. OFFICE NOS. 50932-61344
CANADIAN PAT. OFFICE NO. 44

HAWK VANADIUM" TOOL STEEL

Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

Order "Hawk Vanadium" for your End Mills and cutters. Once known—always used.

Large Stock. Prompt Shipment.

Write for full particulars to

Hawkridge Brothers Company

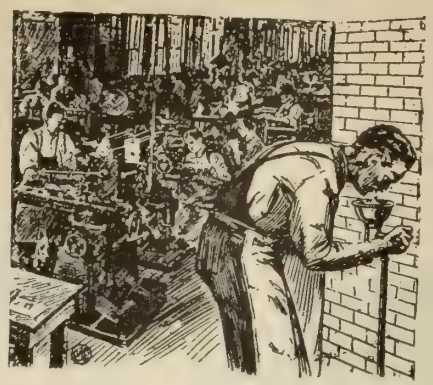
Main Office and Warehouse:
303 Congress Street, Boston, Mass
Storehouses Malden Mass.

STEEL
OF EVERY DESCRIPTION
SEND US YOUR ENQUIRIES.

PATENTS FOR SALE

Two Canadian Patented Steam Specialties for sale; one Steam Trap, Patent Number 187215, and one Steam Separator, Patent Number 183340.

Allentown Experimental Works
Allentown, Pa., U.S.A.



A Drinking Water Service that will last a LIFETIME

What you will pay for a few ordinary drinking cups will meet the cost of the

PURO **SANITARY DRINKING FOUNTAIN**

(MADE IN CANADA)

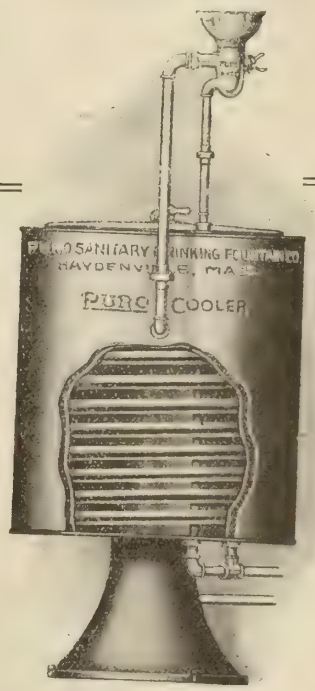
DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15% to 35% in water bill.

"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.

Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."

Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

Puro Sanitary Drinking Fountain Co
Canadian Agents:
McKENZIE BROS.
18 St. Alexis St., Montreal, P.Q.



Victoria, B.C.—Admiral Jellicoe arrived at Esquimault on the battle cruiser "New Zealand.' This begins his Canadian tour. He will go to Vancouver, and return from there to Victoria, after which he goes to Ottawa. He will confer with the Dominion authorities on naval questions, and give his advice if requested. The admiral is accompanied by Lady Jellicoe.

C.G.E. Invade Stratford.—The factory of the Mooney Biscuit and Candy Co. has been purchased by the General Electric Company, who are overhauling and fitting it up. They expect to have 200 employees working by the end of the year, and will employ 700 when fully organized.

Leaside Plant Nearly Demolished.—The buildings at Leaside, belonging to the United States Munition Board, are being rapidly torn down. There are about fifty men at work on the job, and the material is being piled on the ground in readiness for shipment to the U.S. The new building, known as the C plant, which it is stated cost $2,000,000 to build, will soon be in the hands of the wreckers.

Canadian Traffic League.—The annual meeting of the Canadian Traffic Managers' League was held in the rooms of the Canadian Manufacturers' Association recently, and the following officers were elected: Hon. Pres., J. E. Welsh; Hon. Vice-Pres., T. Marshall; Pres., A. W. Bell; Vice-Pres., F. W. Dean; ec.-Treasurer, A. H. Thorpe; Executive Committee, S. B. Brown, G. P. Ruickbe, N. Boyd, F. A. Nance and R. Halliday. There were about 60 members present.

Workmen's Compensation.—Figures given out by the Workmen's Compensation Board, for the first ten months of the year, show an increase in amount of compensation awarded, though accidents were fewer in number. The average number of accidents monthly, were 3,897, though October showed 4,329. The amount paid out was $2,859,448. The total for the year is expected to be well over the 1918 figures. The reason given is the general increase in wages.

Fuel Controller Appointed.—Mr. H. A. Harrington will be Ontario's Fuel Controller for the coming winter. Sir George Foster recently wired Sir William Hearst, asking the Provincial Government's co-operation in connection with the coal situation, brought about by the strike in the U.S. The Minister under whose department the fuel controller works, turned the job over to Mr. Harrington, who is peculiarly fitted to handle it.

Chemical Development in Saskatchewan.—What may easily become one of Western Canada's leading industries is about to be opened up on the shores of Whiteshore Lake, near Oban. The Whiteshore Chemical Company has been organized to work the sodium sulphate deposits of the lake. The deposit is shown by analysis to be 97 per cent pure. Pulp mills, by using this ingredient, can increase their by-products from twelve to forty, one of them being artificial silk. There are 92 pulp mills in Canada, so the company has a big field. A by-product of sodium sulphate is stock salt, which is a substitute for Glauber. This will be only one of many other by-products.

SURPLUS EQUIPMENT FOR SALE

PRESSES

	Stroke Inches	Width Bed	Approx. Cap. Tons
2—No. 666 Toledo Embossing Presses	2	32	1,200
1—No. 26 Bliss Embossing Press	2	30	800
2—No. 27 Bliss Embossing Presses	2	32	1,000
3—No. 77½ Bliss Crank Presses, double back geared	18	30	350
2—No. 87 Bliss Crank Presses, double back geared	16	27	250
2—No. 60½ Bliss Rack and Pinion Drawing Presses	60	21	100
12—No. 60½ Bliss Rack and Pinion Drawing Presses	42	21	100
1—No. 857 Toledo Rack and Pinion Drawing Press	48	25	100
1—Robertson Hydraulic Press with pump and extra set of columns	24	27	800

LATHES

35—Special Cartridge Case Bullard Turret Lathes.

FURNACES

5—25′ x 8′ Rockwell Double Door Annealing Furnaces.

2—16′ x 8′ Rockwell Double Door Annealing Furnaces.
Above equipped with combination oil and gas burners, recording and indicating pyrometers, air rams and air pullers, etc.

1—Gas Furnace for annealing brass turnings.
Hardening Furnaces and Tanks.

MISCELLANEOUS

1—Metal Band Saw.

1—Gray Metal Cutter.

1—No. 1 Quick Work Rotary Shear, 60″ throat.

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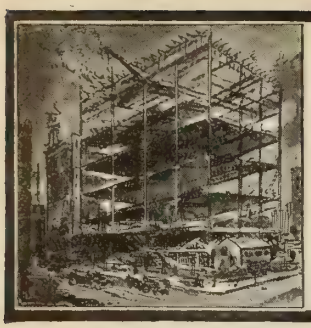

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

U. K. Trade Commissioner Here.—Mr. Harrison Watson, Chief Trade Commissioner to the United Kingdom, is visiting Canada to interview manufacturers who are interested in export trade to that country. He will be in Toronto till Thursday, Nov. 14th.

Protest Against Factory.—The Canadian Collapsible Tube Company, which purposed building a factory on the site of the Parkdale Assembly Rooms, Lansdowne Avenue, has incurred the wrath of the residents on that street. A deputation of them waited on the Board of Control to protest against the erection of the factory.

Ask Government Control of Ferries—A delegation from Windsor has gone to Ottawa to try and secure Government control for the Detroit-Windsor ferries. Parliament will be asked to amend the customs act under which ferry companies operate in Canadian waters. The company can at present charge any fare it likes, as it is operating without license from the Dominion authorities.

Ready to Award Contracts.—The Norton Co. of Worcester, Mass., have started work on the factory they are going to build in Hamilton. The first buildings will be one of three and a half storeys, 50x100 feet, and a second two storeys high, 60x160. The company will manufacture their well-known line of grinding wheels and machines.

St. Thomas May Have No Gas.—Eighteen cars of coal bound for the gas plant at St. Thomas have been seized while in transit, and given over for the use of the B. & L. E. Transit Company. This was under an order of the U. S. Fuel Administrator. This may result in the stoppage of the gas plant. Mr. Caughell, manager of the Gas Company, has taken the matter up with the Ontario Fuel Controller.

Canadian Loco Retains President.—At a meeting of the directors of the Canadian Locomotive Co., held for the purpose of taking action on the resignation of the president, Mr. F. G. Wallace, the Board insisted on Mr. Wallace retaining office. A six months' leave of absence was granted to Mr. Wallace, and it is understood that the active management of the company's affairs will be left to Mr. Wm. Casey, the general manager.

Lyall Shipyard For Sale.—The Lyall Shipyard in North Vancouver is advertised for sale, there being no further work in sight for it. The yard was started for the purpose of building wooden ships, and 40,000 tons of these vessels were constructed. During its building activity, the yard consumed 22,000,000 feet of Douglas fir, and spent $2,500,000 in wages. At its busiest period it employed 1,400 men.

Mr. Workman at Sydney.—Mr. Mark Workman, president of the Dominion Steel Corporation, was in Sydney recently inspecting the progress of the new plate mill. He denied the rumors of negotiations looking toward amalgamation with the Nova Scotia Steel and Coal Co.; stated that the new mill would be operating in a few months, and announced the immediate commencement of mining in a new coal area. This is at Bonar Point, on the north side of Sydney Harbor, and the coal from there will be used in connection with the new plate mill.

Building at Hamilton.—Engineers of the Norton Company, one of the new industries recently landed by Industrial Commissioner C. W. Kirkpatrick, at Hamilton, have been in the city awarding contracts for the erection of the Norton Co. buildings. These will be located at the foot of Lottridge Street and will include one 50 by 100 feet, three and a half stories high, and one 60 by 160 feet, two stories high. The new company will manufacture grinding wheels and grinding machinery. The contracts will probably be let on the cost plus system.

Railway Board Reserves Decision.—On the application of the Canadian Manufacturers' Association, demanding that the express companies be compelled to carry electric light bulbs at first-class rates instead of double rates as at present, the Board reserved its decision. The express companies claimed that owing to the bulbs being very light, and occupying excessive space, they were not profitable to carry. The chairman said that he could not accept the idea that express companies should carry only what they wished. They were a public utility, and as such must perform the services the public demanded of them.

TENDERS

The town of Saskatchewan is about to propose by-laws for the following equipment: new pumps, about $7,000; 4,500 k.w. turbine, about $60,000.

The Chemical Products Corporation, Ltd., Toronto, are considering the erection of a plant in Belleville at an estimated cost of $1,000,000.

For the erection of a new school on Greenwood Ave., Riverdale, Toronto, the advisory committee of the Board of Education have recommended a sum of $200,000 to be placed in the estimates for 1920.

The Lignite Utilization Board of Canada is calling for tenders for briquetting machinery. Specifications and information can be obtained from the Secretary of the Board, at their offices, 80 St. Francois Xavier street, Montreal, and tenders must be in by December 14th, 1919.

MARINE

Fort William.—The Nichols Chemical Company are about to erect a 600-foot dock and loading hoists on the mission. The dock will be located near the Grand Trunk Pacific property.

Cleveland.—Owing to a combination of heavy weather, together with a low temperature that made the handling of ore difficult, there are about twenty-five steamers waiting for cargoes at Duluth. Several steamers which were from twelve to twenty-four hours overdue have arrived safely.

Collingwood.—The Collingwood Shipbuilding Company have carried out successful trials on the "Canadian Gunner," the fourth vessel built by them recently, and she will be handed over to her owners immediately. She was built for C.G.M.M., and will sail from Montreal about the 15th November.

Port Arthur.—In the recent heavy wind and snow storm on Lake Superior, fifteen vessels, including the Assiniboia and the Huronic, were compelled to seek shelter behind islands. The steamers Glen Ellen and Glen Lyon, which were considerably overdue and the cause of much anxiety, have arrived safely at Fort William.

Washington.—Due to the strike of bituminous coal miners, orders have been issued to discontinue coaling of

foreign vessels in American ports. The U.S. Government have been advised that it is just possible to take care of American requirements, so all other vessels will have to obtain their bunkers elsewhere, presumably Canada.

Cleveland.—The end of the lake season is nearly at hand. More than sixty hulk freighters have been sent to their winter quarters. There is a scarcity of cargoes. The cold weather in the Northwest has held up the ore movement. Steamers are taking cargoes to hold, as there is little storage room on the docks, and furnaces are unable to take it.

Government Fleet Profitable.—During the course of an interview with a deputation from Collingwood, the Hon. Mr. C. C. Ballantyne, Minister of Marine, made some interesting statements. He informed the visitors that during the time the vessels so far delivered to the Government had been operating they had made sufficient profit to pay their own cost price. Furthermore, the Government, if it so wished, could dispose of any of their vessels at a profit. All the vessels so far built on the Great Lakes were booked up until June next. The fact of the Government having their own ships available had been a very helpful factor to the export business of the country during the difficult times following the armistice.

PERSONAL

Mr. James Arnold, at present works manager of the James Smart plant at Brockville, has been appointed assistant general manager of the Canada Foundries & Forgings, Ltd. The Smart plant is a subsidiary of the Canada Foundries. Mr. Arnold has been works manager since January last..

The death occurred at his late residence in Toronto on Thursday, October 30th, of Charles Seymour Archibald, sales representative of the Nicholson File Co., Port Hope, Ont., in his sixty-fifth year. Born at Halifax, N.S., of Loyalist descent. He went West in the early days before the building of the C.P.R., later returning to Nova Scotia, where he conducted a wholesale and retail hardware business at Antigonish, under the name of Archibald & Whiddon and later Archibald & Sweet. Later he became connected with the Portland Rolling Mills and Maritime Nail Works of St. John, N.B., and in 1906 moved to Toronto and from that time to the time of his death was sales representative of the Nicholson File Co., Port Hope. He was well and favorably known by all the hardware and iron and steel trade of Canada and will be mourned by a wide circle of friends. He was married in 1883 to Margaret A., daughter of L. J. Crowe of Truro, N.S., and is survived by his widow and six children. Miss Jean at home. Mrs. C. V. Earl, of Toronto; Mrs. G. N. Dalton, of Montreal; C. P. Archibald, of Charles P. Archibald & Co., machinery dealers, Montreal; Lloyd M., of the Dart Union Co., Toronto, and Dr. C. H., of Toronto.

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1	66" x 14'	100		85/110 lbs.
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2	66" x 16'	100	MURRAY IRON WORKS	125 lbs.
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4	250	STERLING		150 lbs.
6	264	BABCOCK & WILCOX	steel	175 lbs.
2	300	CANADA FOUNDRY		130 lbs.
5	308	HEINE		140 lbs.
3	328	BABCOCK & WILCOX	C.I.	125 lbs.
4	350	BABCOCK & WILCOX		200 lbs.
1	350	HEINE		180 lbs.
3	350	HEINE		165 lbs.
2	360	ERIE	steel	160 lbs.
1	380	STERLING		153 lbs.
1	450	HEINE		180 lbs.
3	460	HEINE	forged steel	150 lbs.
2	500	ROBB		175 lbs.
2	500	BABCOCK & WILCOX		160 lbs.
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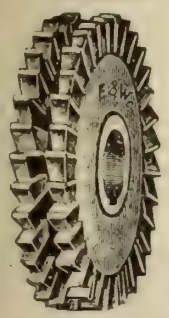

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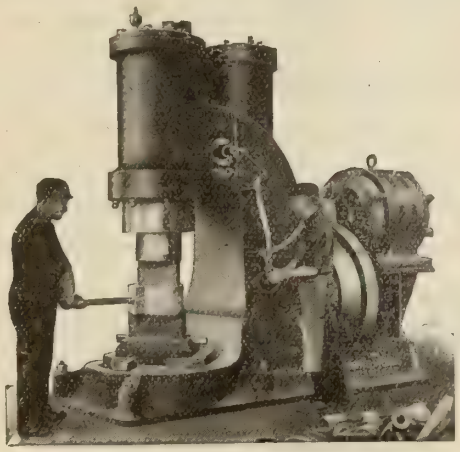

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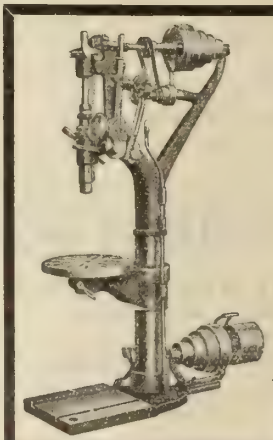

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The Silver Mfg. Co.

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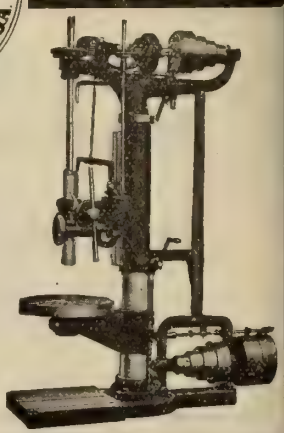

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Announcing

the issuance of a new catalog of prime interest to all users of milling and gear cutters and small tools. Herein you will find listed styles and sizes of end mills (special and plain) T-slot cutters. Key cutters, thread mills, gear slots—in fact your needs in the small tool line of this class are sure to be covered. Get your copy and note its completeness.

If your special requirement doesn't appear, Bilton can produce it—and in true Bilton Quality.

Just sign your name and address on a card and post it to

The Bilton Machine Tool Company
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BOILER BREECHINGS
SMOKESTACKS, STAND PIPES
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STRUCTURAL STEEL WORK

Machine work of all descriptions. Send us your specifications.

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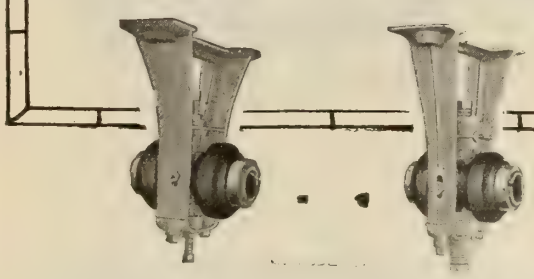
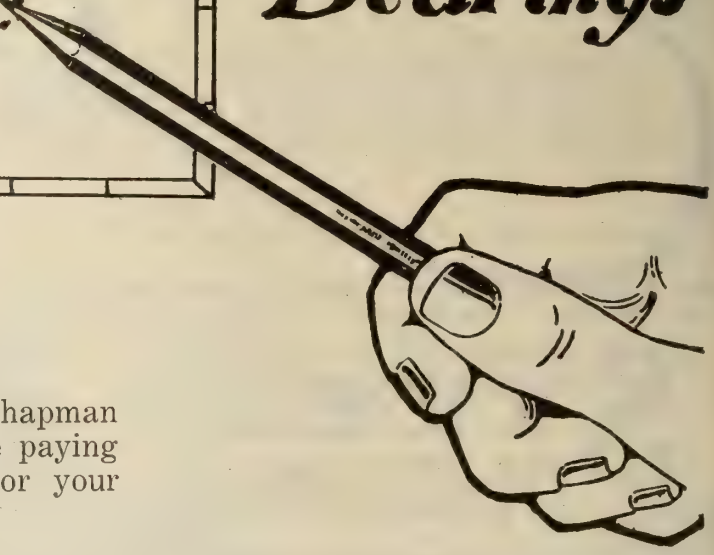
Chapman

Double Ball Bearings

You are paying for them even though you may not have them!





UNLESS you have bearings of the Chapman Double Ball Bearing type you are paying for them without getting anything for your money.

You are paying for them

—in power lost through friction, common to ordinary bearings.

—in lubrication expense, which includes the cost of oil and wages.

—in costly delays caused by hot boxes.

—in expensive rebabbitting.

Can you afford to delay installing Chapman Bearings in your plant in view of these facts?

Chapman Double Ball Bearings Save 15% to 40% of Your Total Power Cost.

Save 95% in Lubrication.

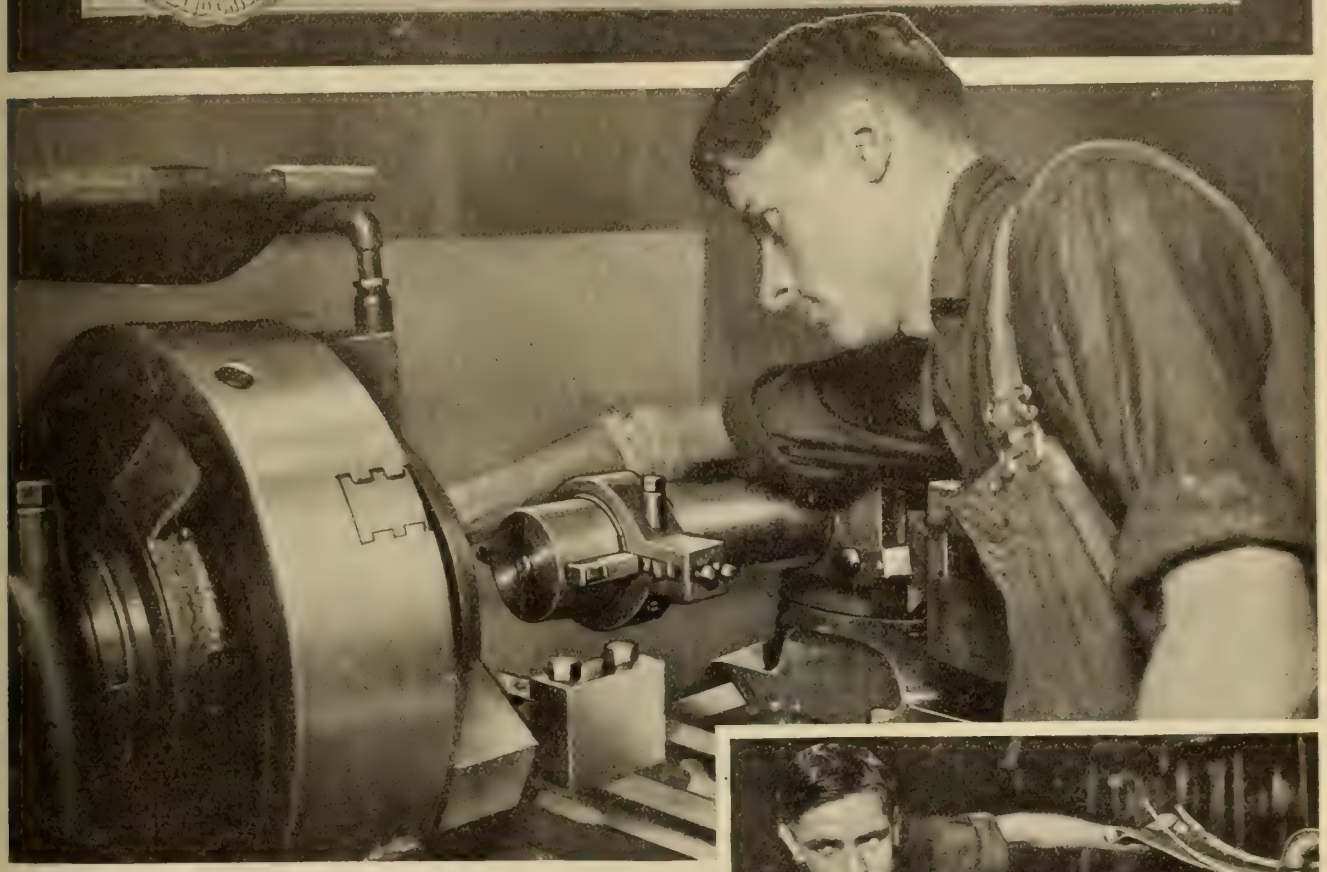
No Hot Boxes—No Rebabbitting
Dust Proof—Dirt Proof
Drip Proof.

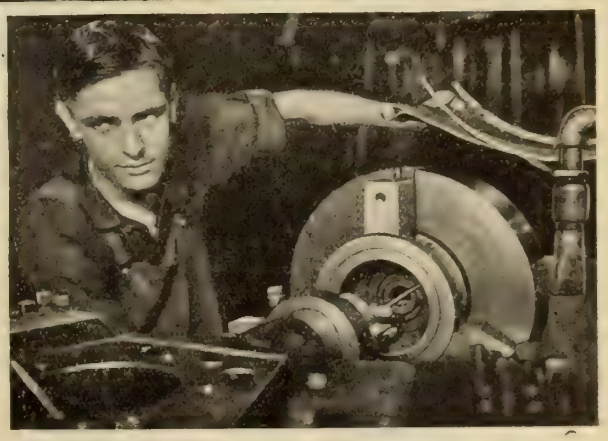
The Chapman Double Ball Bearing Company
of Canada, Limited

339 Sorauren Ave. TORONTO, CANADA

TRANSMISSION BALL BEARING CO., Inc., 1050 Military Rd., Buffalo, N.Y.

KELLY PRODUCTION TOOLS





KELLY REAMERS

Reduce Spoilage 99 Per Cent

A large New York State gear manufacturer had been using Kelly Reamers for only three weeks when he permitted us to take these photos. In that time they had reduced spoilage on large gear bores just 99 per cent.

Production was interesting also. One large Kelly Roughing Reamer was removing 7/16″ on the diameters of steel gears. It stood up over a period of five days and four nights, machining in all 4,950 gears without need of resharpening. The Kelly Finishing Reamer for the same job removed 0.020″ with a tolerance of plus or minus 0.001″, and stood up for a similar length of time.

This company is now using Kelly Reamers on practically all turning machines. And the Kelly Service Man is regularly on the job to see that these tools are giving all they were built for. **Write for Catalog J-3.**

THE KELLY REAMER CO., CLEVELAND, OHIO

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Stewart Furnaces Get Positive Results

CONTROL of temperature is the essential factor in the successful heat treatment of metals. If this control is not positive, the results are uncertain and unsatisfactory. Modern shop practice and steel heating requirements demand precision—every stage of the operation must be predetermined and definite—no "guess work" goes.

Stewart Furnaces guarantee positive temperature control, with positive results in quality and quantity of production. They are delivering reliable service in thousands of industrial plants throughout Canada and the United States. There could scarcely be more severe tests of heat treating furnaces than are met and successfully solved day after day by Stewart equipment in these plants.

You can put **your** heat treating problem up to Stewart Furnaces, and be assured that it will be done exactly as you require it. You run no risk in trusting Stewarts with your expensive dies, tools and parts or other material.

More than a hundred standard types and sizes designed for modern heat treating. If none of these meet your requirements, we will build one that will. The co-operation of our expert furnace engineers is at your service.

New Catalogue of the Stewart Line of Furnaces soon to be ready

Eighty large size pages giving features of Stewart furnace construction, and showing in detail the complete line of Stewart Furnaces, Forges and Heat Treating Equipment.

A number of our specially built Forges for unusual uses are shown in this catalogue.

Two new lines of Oven Furnaces and Cylindrical Furnaces for High Speed Steel are described and illustrated for the first time.

Valuable heat treating information. An attractively printed, effectively illustrated book you will want for reference.

Mail a request on your letterhead.

Chicago Flexible Shaft Company

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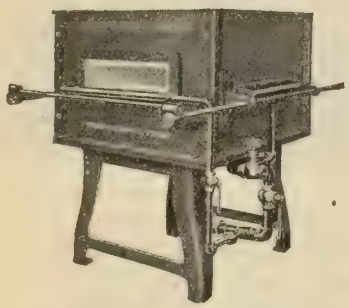
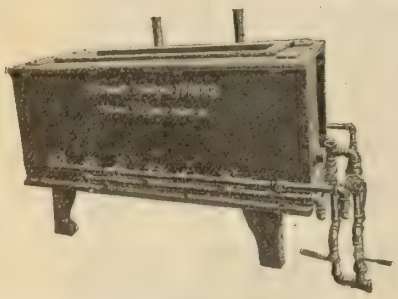


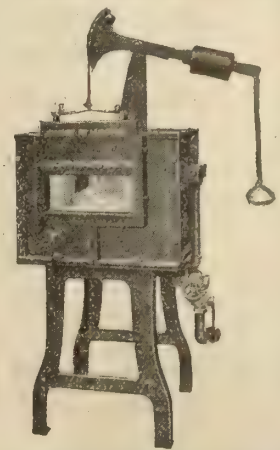
Stewart Drop Hammer Forge
Eight regular sizes.



Stewart Tinning Furnace.
Seven regular sizes.

For High Speed Steel Hardening

Stewart No. 14H Oven Furnace. Under and over fed.



No. 3 High Speed Steel Furnace.

Stewart No. 0 Tool Dressing Forge.

Planing Mill Fan

No. 2 Vacuum Cleaner

Sturtevant (TRADE MARK)

SYSTEMS

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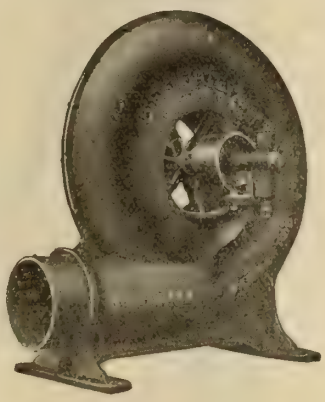
STEEL PRESSURE BLOWERS

Medium Pressure Blower



Low Pressure Blower

High Pressure Blower

For All Purposes

THO designed originally for supplying air to cupolas and forges Sturtevant steel pressure blowers are now used for all purposes where pressures up to 16 ounces to the square inch are to be maintained; and where air is to be forced for long distances. Regularly built with horizontal discharge but can be readily made for down blast or up blast. Built in all sizes and may be belt, motor, engine, or turbine driven. Operating and upkeep cost is remarkably low as proven by actual performance in many long term (30 years and more) installations. Design and construction are typically Sturtevant—supreme! Blast wheel is made of refined steel and galvanized to prevent rust. Wheels are accurately balanced and run smoothly when driven at high speed. Bearings are each cast in one piece and are lined with highly durable non-heating white metal. Write for catalogue.

Volume Blower and Exhauster

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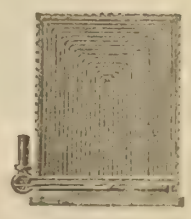
VS-7 Steam Engine


Heater

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McCrosky

McCrosky WIZARD Quick-Change Chucks and Collets

WIZARD production is continuous output on many jobs. On any job they will pay their own cost in a short time.

The tools are changed in rapid succession, without stopping the spindle for a moment and while running at any speed. Will more than double your drill-press in one continuous operation.

With the WIZARD you can drill, ream, counterbore, tap, set studs, etc.

Think what it means to turn out completed jobs with only one handling of the work. It means cutting out costly lost motion which eats up your profits. It means that a WIZARD outfit enables a girl to do more and better work than two men, the old way.

It means keeping your plant busy when the less efficient plant is having a hard time to make ends meet.

Read the full story of the WIZARD and other McCrosky Cost Cutting Tools in Efficiency Book No. 6. Yours on request.

McCrosky Tool Corporation
(Formerly McCrosky Reamer Co.)
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COST CUTTING TOOLS

TRAHERN

Lubricating Pumps

are rotary geared because experience has proven this construction to be the most practical for machine tool use.

Hundreds of machine tool manufacturers throughout the United States and Canada furnish Trahern pumps as regular equipment on their product.

A good oil pump will help sell your product and will intrench its reputation.

TRAHERN PUMP DIV.
Geo. D. Roper Corporation
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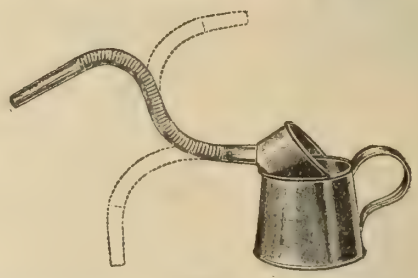
Say Good-bye to Funnels Use this "ALL-WAY" Oiler



Combination Filler and Funnel

This Filler eliminates the necessity of the use of a separate Funnel. With the Flexible Spout any part can be readily reached.

Saves much inconvenience and avoids dripping of oil.

If your dealer cannot supply you, write us.

We also manufacture the well-known "All-Way" Oil can. Saves you 50% of your oil bill.

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ACCURACY ASSURED

You can always depend upon Dunbar Springs being accurate. Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.

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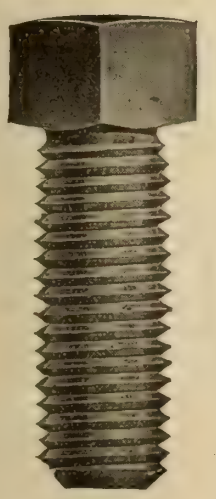

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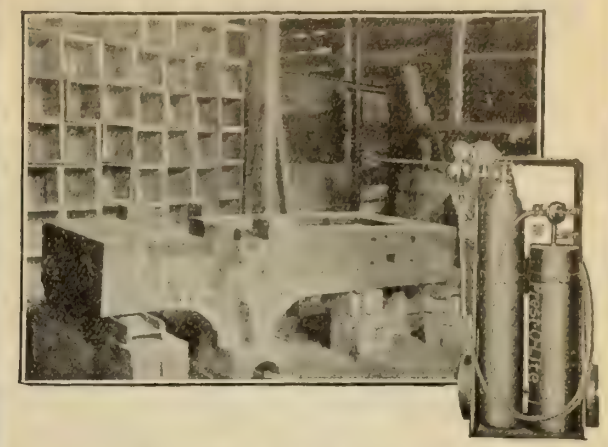
Oxy-Acetylene Welding and Cutting



This $3,000 Casting Saved from the Scrap Pile

Illustration shows a 5-ton Bolt Header Frame, recently repaired by the Prest-O-Lite Process at the Brantford plant of the Steel Company of Canada.

This casting, which is valued at $3,000, had two cracks, one 15-in. long by 6-in. thick, and the other 12-in. long by 6-in. thick.

The saving on this one repair was sufficient to pay for the entire welding outfit many times over.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it.

Address Department C—107

Prest-O-Lite Company of Canada, Limited

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Corner Elm St. and Centre Ave.
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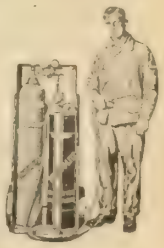
Plants at: Toronto, Ont., Merritton, Ont. Shawinigan Falls, P.Q., St. Boniface, Man.



World's Largest Makers of Dissolved Acetylene

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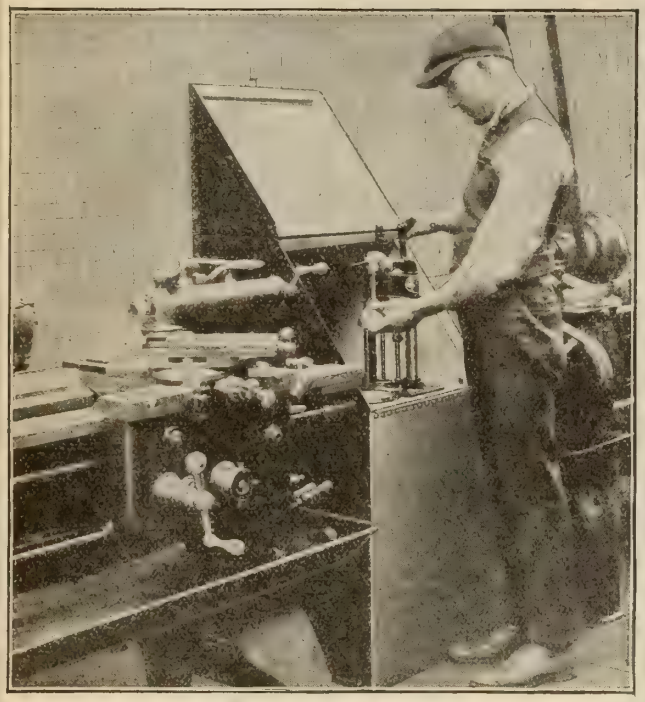
Prevent Idle Time
of Men and Machines



By placing Bowser Lubricating Oil Cabinets in departments where oil is used.

There is no going back and forth to the oil room, no spilling, no wasted oil, no fire risk from the oil storage.

Save the Oil

The oil supply can be stored and handled as systematically as raw materials or finished parts—income checked, distribution measured, charged and recorded.

Write for literature, explaining why and how Bowser Systems pay for themselves, many times over in saving of oils and labor.

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Clothing Protection as Necessary as Machine Guards
PROTEXAL CLOT HING

is safe and comfortable. Extra patented fasteners at wrists and ankles permit garments being more tightly fastened and safeguard the wearer from being caught in machinery; this feature alone helped make Protexal clothing popular.

No Clothing like it Marketed

Made of high-grade, closely woven, especially treated duck material to **resist fire, water or acid**; will outwear overall or other work-cloth.

GARMENTS STAMPED "PROTEXAL"

are backed by our guarantee. A garment for every industrial need. This clothing is as popular as our

ADJUSTOGLAS PROTECTION GOGGLES

for chippers, grinders and welders.

Protexal Booklet and Goggle Catalog No. 2 now ready. We carry a complete line of safety appliances.

The Strong-Kennard & Nutt Co.
Safety, First-Aid and Welfare Equipment
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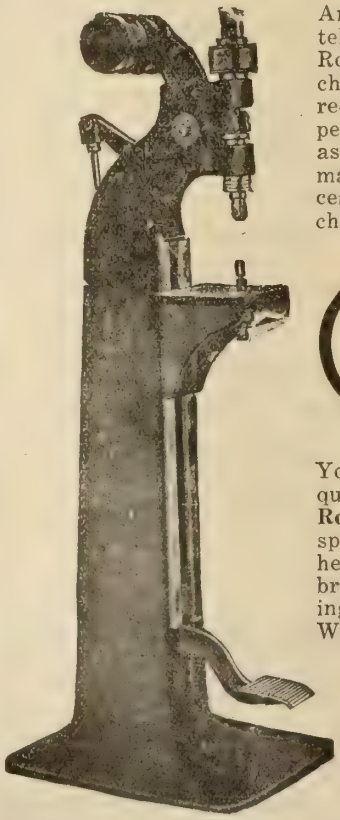
Jobbers and Dealers Wanted. Write Early. Advertising Campaign.

EXHIBITORS AT SAFETY CONVENTION, GRAYS ARMORY, CLEVELAND, OHIO, OCTOBER 1-4, BOOTHS 1-3-5B.

No Skill Required



Anybody with ordinary intelligence can operate this Rotary Rivet Spinning Machine. No special skill is required. It is a tool that perfectly fits labor conditions as they exist to-day. A woman could operate as successfully as the skilled mechanic who went to the front.

The GRANT is Noiseless

You are assured of perfect quietness wherever the **Grant Rotary** is running. And it spins a perfect polished rivet head every second without breaking or marring the casting. Rivets tight or loose. Write for details.

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ACCURATE
RIGID
ECONOMICAL

9"-11"-12"-13" Sizes

Built with a full line of
ATTACHMENTS

The Seneca Falls Mfg. Co.
Inc.
366 W. Fall St. - Seneca Falls, N.Y.

Free Tool Grinding Chart

Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me/us free, one of your tool grinding charts.

Signed .....

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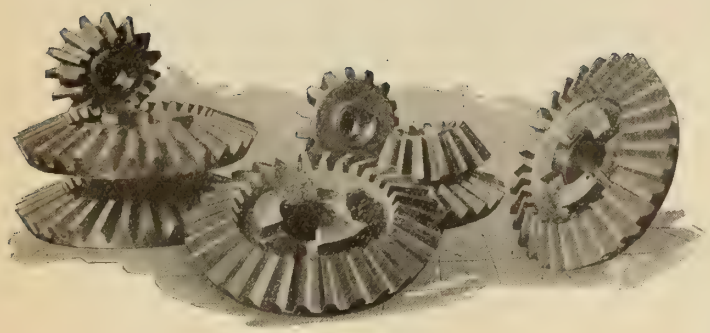

With Accurate, Generated Teeth

Hamilton Gear Co., Ltd.

Van Horne St., TORONTO

You Don't Give— You Lend

In deciding how many Victory Bonds you will buy, remember this important point—you are not giving—you are lending to your country!

You are lending at a good rate of interest.

You are lending on the highest security.

You are lending to maintain your own and your country's prosperity.

In your own personal interest you should make strenuous efforts to buy as many Victory Bonds as you possibly can.

You couldn't put your money in a better place.

You want to save money—everybody does.

It is the only way to get ahead.

And Canada needs to borrow your money to bridge the gap from War to Peace.

It's your duty to lend.

Take the proper view of this Victory Loan.

Say to yourself—"I am going to buy all the Victory Bonds I can pay for now and in the next ten months."

What if it is an effort to pay for them?

Look ahead a little.

Think of what you will own when your Victory Bonds are finally paid for!

Every cent you pay on your Victory Bonds you lend to your country—you save!

Remember that, and

Buy Victory Bonds

Every Dollar Spent in Canada

This space donated to the Victory Loan 1919 Campaign by

Nicholson File Company

Port Hope, Ont.

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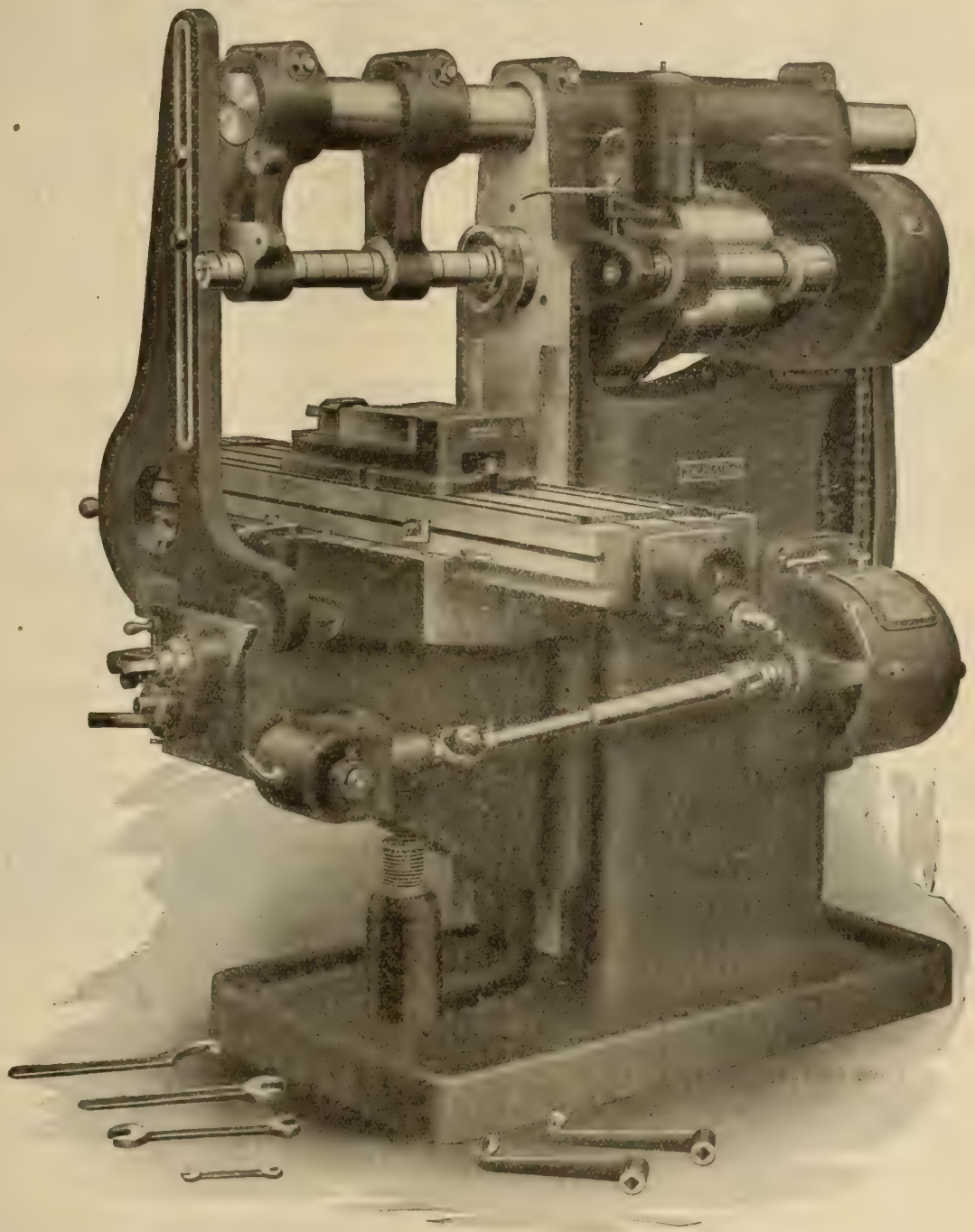
KEMPSMITH



KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared.

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

THE KEMPSMITH MANUFACTURING CO.

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Engineers, Manufacturers and Founders
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Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.

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Sheet Metal Working Machinery
THE D. H. STOLL CO., INC.
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Bryant Chucking Grinder Company
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Builders of
Hole, Hole and Face and Deep Hole Grinders

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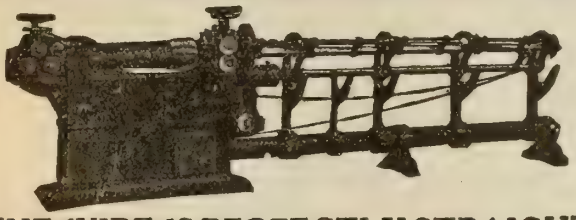
BRISTOL'S REG. U.S. PAT. OFFICE
ELECTRIC PYROMETERS
FOR EVERY SERVICE

Bristol's Recording Pyrometer furnished with patented frictionless smoked chart recording system, especially valuable for processes requiring continuous heat treatment.
Simplicity of construction and ruggedness make them ideal shop pyrometers. The ONLY pyrometer equipped with Weston milli-voltmeter movement.
Write for Bulletin I-205.

THE BRISTOL CO.
WATERBURY, CONN., U.S.A.



THE WIRE IS PERFECTLY STRAIGHT
and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.
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Formerly John Adt & Son. Established 1866.
Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

Greenfield
Trade Mark Reg. U. S. Pat. Office
A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.
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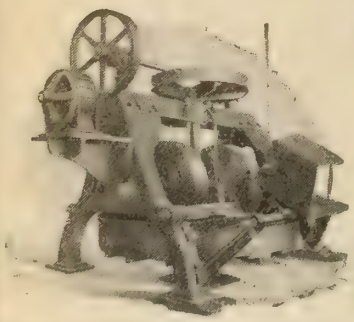
Greenfield Machine Co.
Greenfield, Mass., U.S.A.

Canadian Steel Foundries Need Frost Improved Sand Mills



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Unloading Device
Motor or Belt Drive
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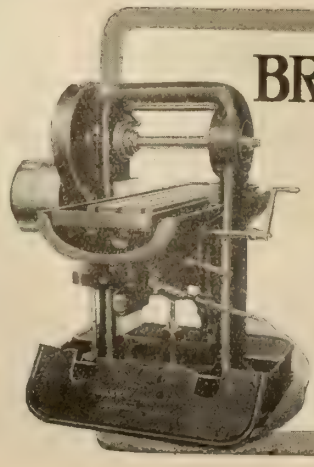

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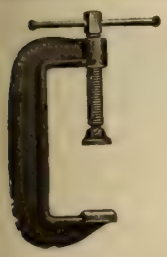

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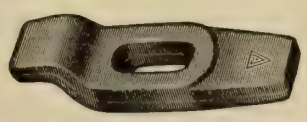

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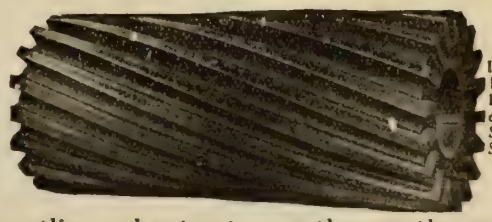
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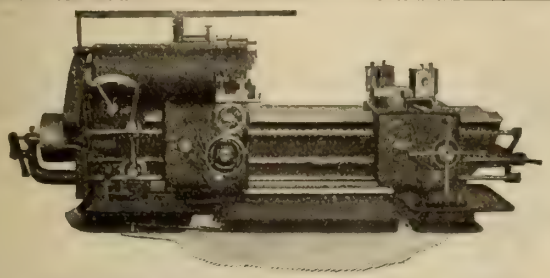

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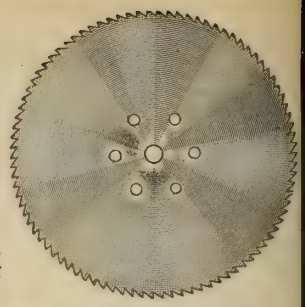

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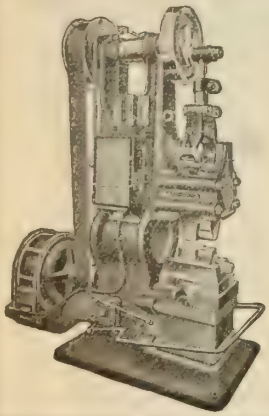

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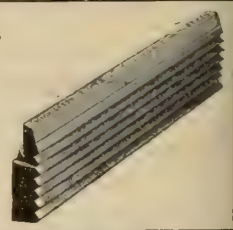

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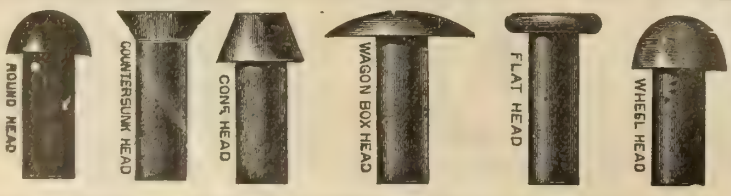

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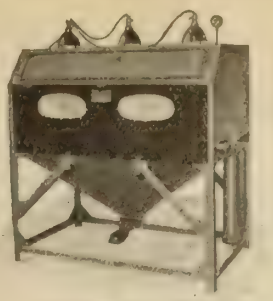

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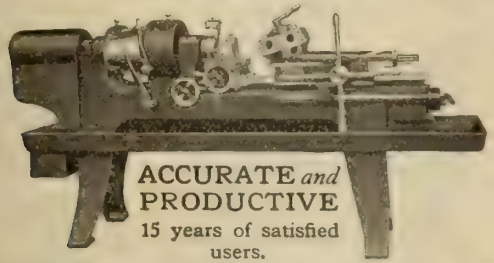

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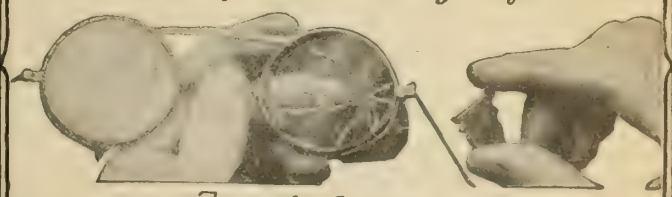

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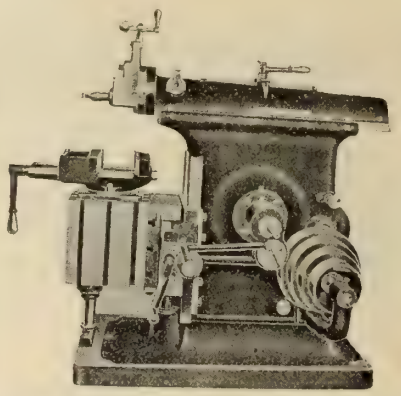

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William Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.
Wickes Bros., Saginaw, Mich.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield, Mass

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOILER BREECHINGS
William Hamilton Co., Peterboro, Ont.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canadian Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co. Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.

BUYERS' DIRECTORY

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS
BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

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Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

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Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

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Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

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John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt, Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT, IRON
Warmington & Co., J. N., Montreal, P.Q.

CEMENT, ELASTIC JOINTING
Warmington & Co., J. N., Montreal, P.Q.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MACHINE MILLING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAMPS, BELT
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.

Positive Clutch & Pulley Wks., Auburn, Ont.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blancke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.

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Brown & Sharpe Machinists' Tools

Accurate to such a degree that they are considered standard. Reliable to a degree that has earned for them the endorsement of the world.

Brown & Sharpe Mfg. Company
Providence, R.I., J.S.A.

If interested tear out this page and place with letters to be answered.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville.

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found'g & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co.,Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Davis-Bournonville Co., Jersey City, N.Y.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING
B. F. Sturtevant Co, Galt, Ont.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIES, CUTTING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, METAL STAMPING
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

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MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal.

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Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Garlock-Walker Mach. Co., Toronto, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

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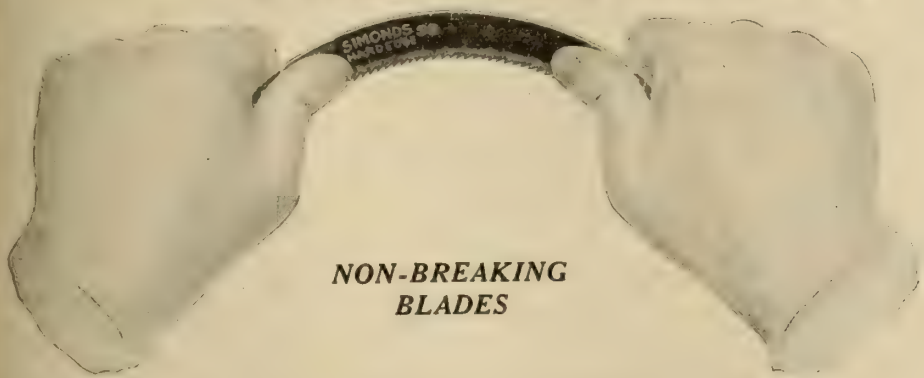

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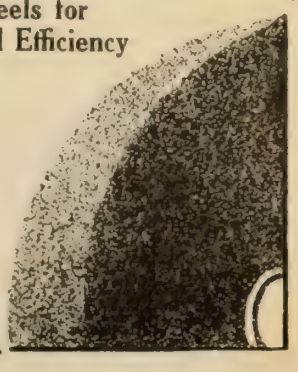

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Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

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Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

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Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

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Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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Ford-Smith Machine Co., Hamilton, Ont.

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Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

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Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

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Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Foundries & Forgings, Ltd., Welland, Ont.

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Willson & Co., Inc., T. A., Reading, Pa.

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Page Steel & Wire Co., Adrian, Mich.

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FACTORY SITES
City of St. John, Quebec.

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Can. Blower & Forge Co., Kitchener, Ont.

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Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

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Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

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FORGINGS
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Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Blancke Co., L. C., New York City.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

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Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Armstrong-Whitworth of Can., Montreal.
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Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

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Gilbert & Barker Mfg. Co., Springfield.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
W. S. Rockwell Co., New York, N.Y.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit.
W. S. Rockwell Co., New York, N.Y.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield.
W. S. Rockwell Co., New York, N.Y.

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Armstrong Bros. Tool Co., Chicago.

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GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

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Wells Bros. of Can., Galt, Ont.

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Toronto Tool Works, Toronto, Ont.
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Worth Engineering Co., Toronto, Ont.

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Bicknell-Thomas Co., Greenfield, Mass.

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Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

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Fellows Gear & Shaper Co., Springfield, V.
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Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochester

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Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

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Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia.
A. R. Williams Machy. Co., Toronto.

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Morse Chain Co., Ithaca, New York.

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Standard Optical Co., Geneva, N.Y.
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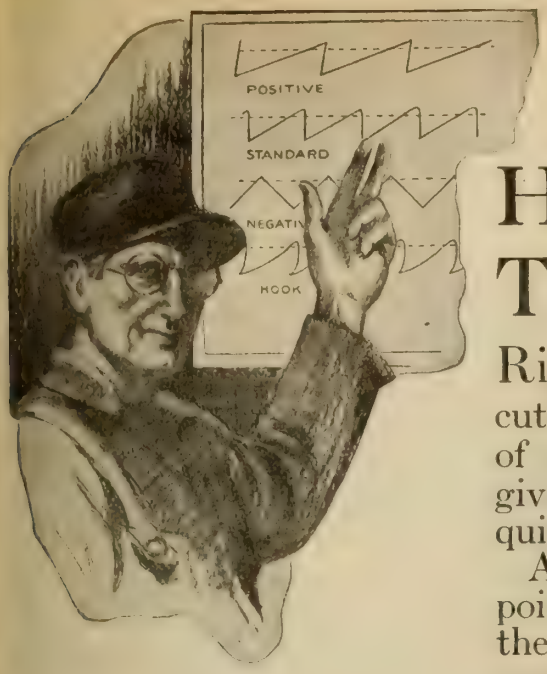

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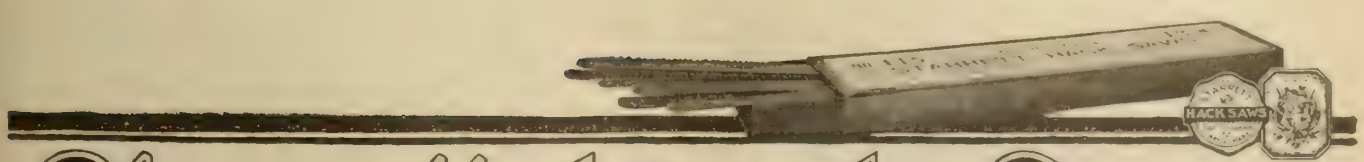

Starrett Hack Saws

If interested tear out this page and place with letters to be answered.

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Toledo Machine & Tool Co., Toledo.
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INDEX CENTRES

Brown & Sharpe Mfg. Co., Providence, R.I.
Dickow, Fred. C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
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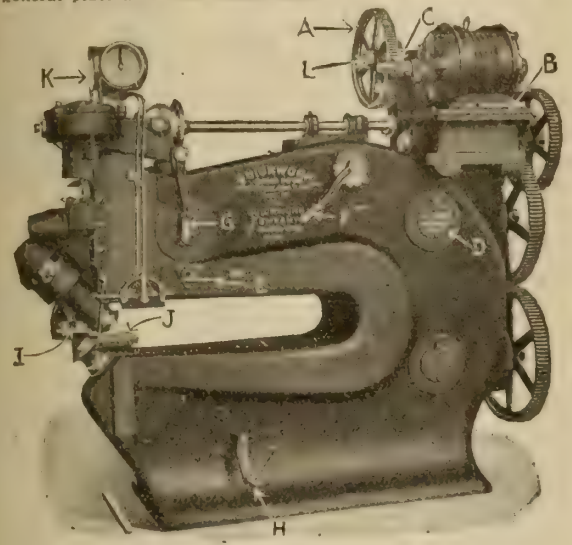

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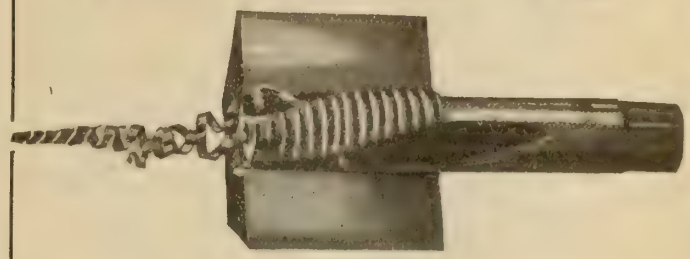

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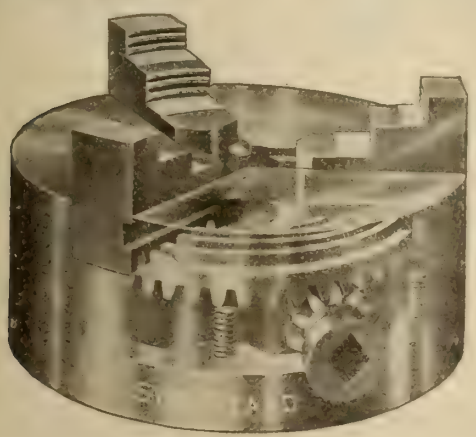

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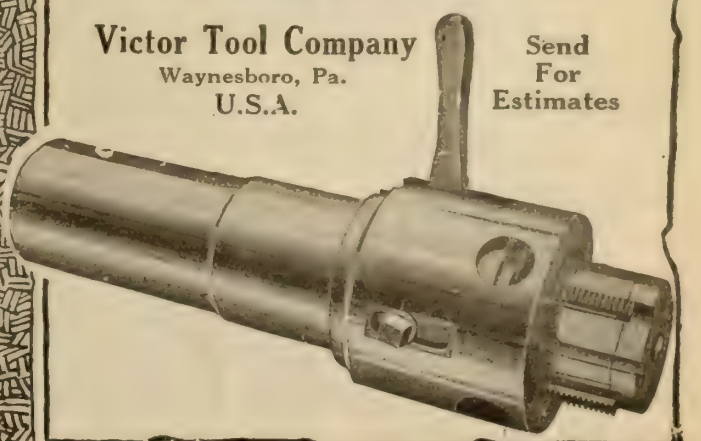

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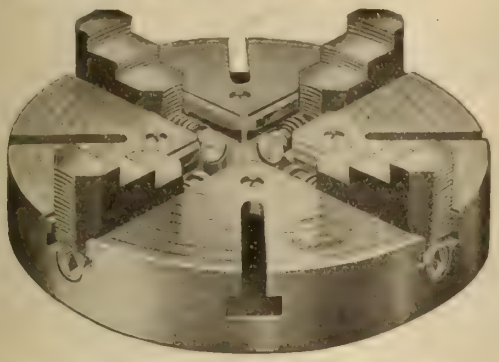

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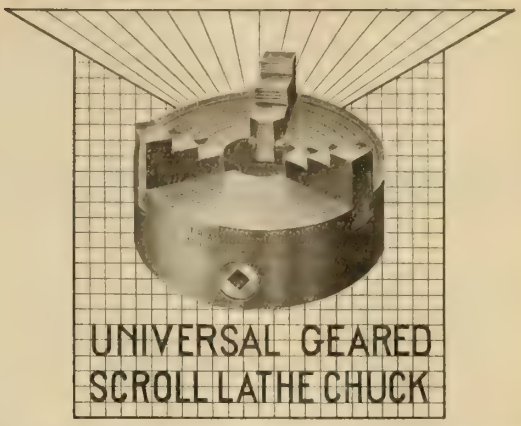

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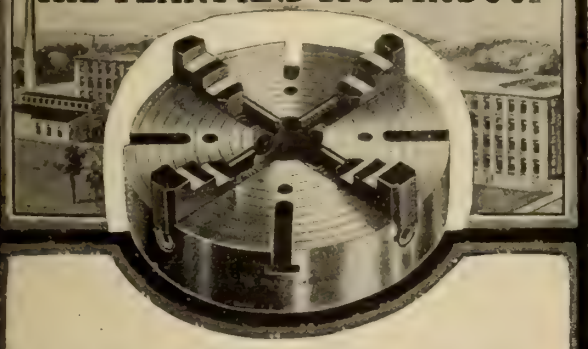

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Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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MacGovern & Co., Montreal, Que.
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Can. Billings & Spencer, Ltd., Welland.
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Int. Mach. & Supply Co., Ltd., Montreal.
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Ford-Smith Machine Co., Hamilton, Ont.
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Wells Bros. of Canada, Galt, Ont.
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Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
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Toledo Machine & Tool Co. Toledo.
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Niles-Bement-Pond Co., New York.
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West Tire Setter Co., Rochester, N.Y.
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Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

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Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
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Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
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Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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PULLEYS, FRICTION, CLUTCH
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Bernard Industrial Co., A., Fortierville, Q.
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Williams & Wilson, Ltd., Montreal, Que.

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Can. Ingersoll-Rand Co., Montreal, Que.
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Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
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PUMPS, HIGH PRESSURE
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PUMPS, HYDRAULIC
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Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Bowser Co., Ltd., S. F., Toronto, Ont.

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Bowser Co., Ltd., S. F., Toronto, Ont.

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Can. Fairbanks-Morse Co., Montreal.
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Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
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Pratt & Whitney Co., Dundas, Ont.
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Toledo Machine & Tool Co., Toledo, O.
Whitman & Barnes Co., St. Catharines.
Williams & Wilson, Ltd., Montreal, Que.

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Brown, Boggs Co., Ltd, Hamilton, Ont.
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Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Bertrams & Sons, John, Dundas, Ont.
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Garlock-Walker Mach'y. Co., Toronto.
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Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Shore Instrument & Mfg. Co., New York.
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Niles-Bement-Pond Co., New York.

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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

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Keystone Mfg. Co., Buffalo, N.Y.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
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Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
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Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
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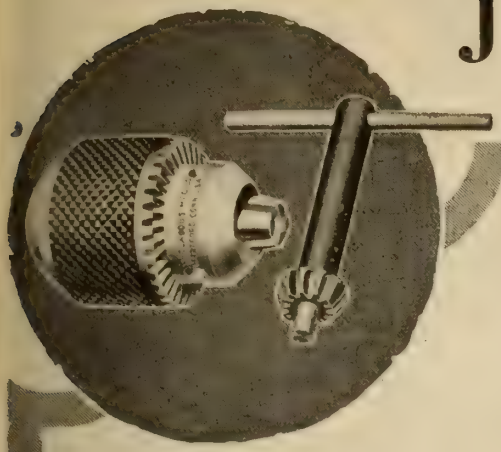

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Garvin Machine Co., New York.
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Morse Twist Drill & Mach. Co., New Bedford, Mass.
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J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

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Hamilton Mach. Tool Co., Hamilton.
Milwaukee Shaper Co., Milwaukee, Wis.
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Williams & Wilson, Ltd., Montreal.

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Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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The Hendey Machine Company, Torrington, Conn., U.S.A.

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CANADIAN MACHINERY AND MANUFACTURING NEWS

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The BERTRAM Page

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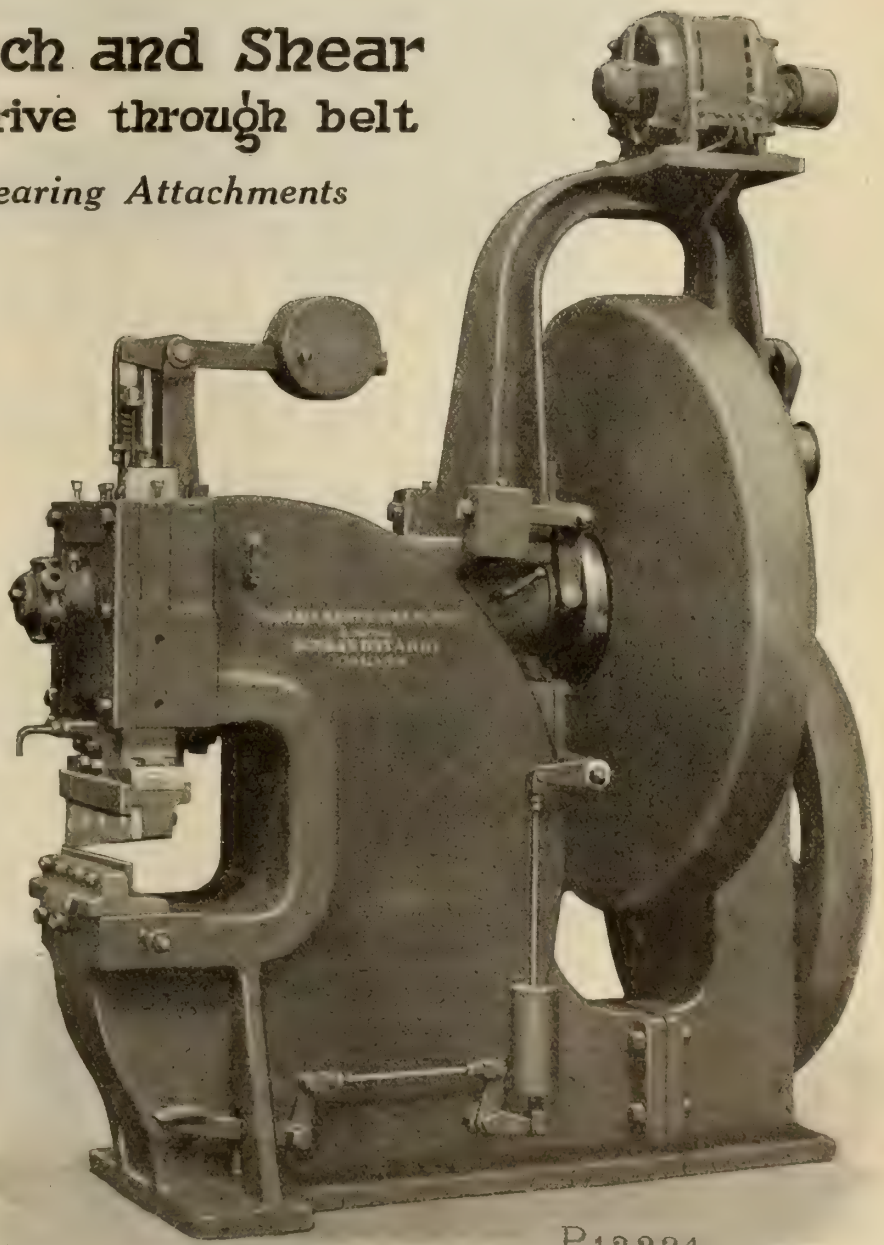

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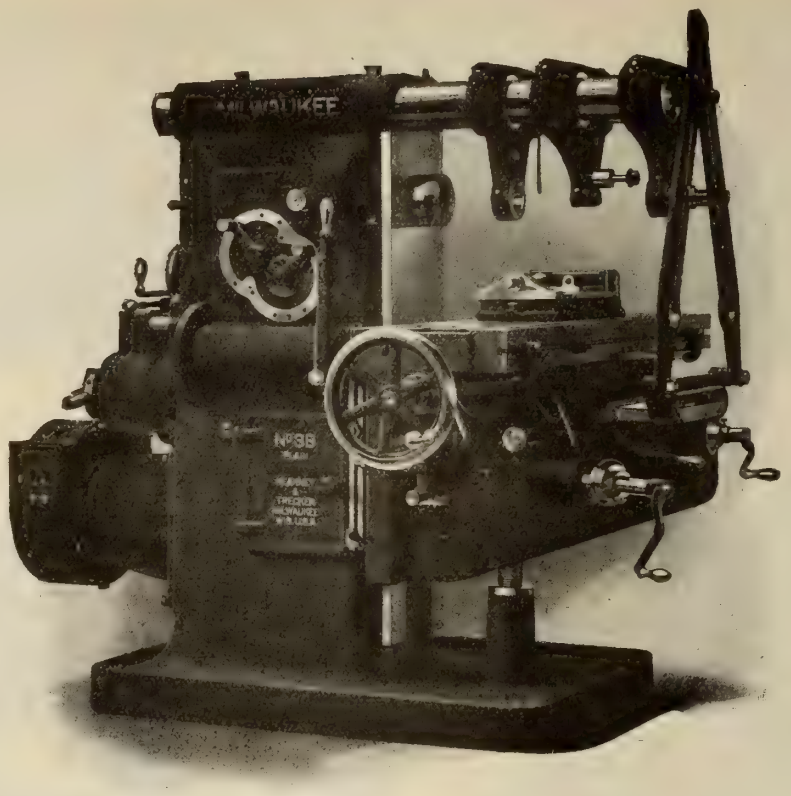

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2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

CHANNELS—
15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
2 11/16 x 3 x 2 11/16 x ¼"
2¾ x 3 1/16 x 2¾ x 5/16"

ROUNDS—
All sizes from ½" up to and including 4".

SQUARES—
All sizes from ½" up to and including 3".

FLATS—
All sizes from 1 x ¼" up to and including 14" wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

PIG IRON—
Machine cast FOUNDRY MALLEABLE and BASIC.

SULPHATE OF AMMONIA.
NITRE CAKE.

For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.
Your enquiries and business will be appreciated.

ALGOMA STEEL CORPORATION

SAULT STE. MARIE, ONTARIO

WILT

HIGH SPEED AND CARBON
TWIST DRILLS
REAMERS AND MILLING CUTTERS

Quality First

The Keystone Upon Which All WILT Products Are Built

A high standard of perfection is maintained throughout the various processes of manufacturing **WILT High Speed and Carbon Twist Drills, Reamers and Milling Cutters. WILT** products improve production! This is no theory, no untested statement, but an established fact backed by many of the largest manufacturers throughout Canada. For steady, reliable output of work that is satisfactory from the standpoint both of quantity and quality there is no better choice than **WILT Products.**

Put Them to the Test

WILT TWIST DRILL COMPANY

OF CANADA, LTD. WALKERVILLE, ONT.

London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England.

"Where there's a WILT — there's the Way"

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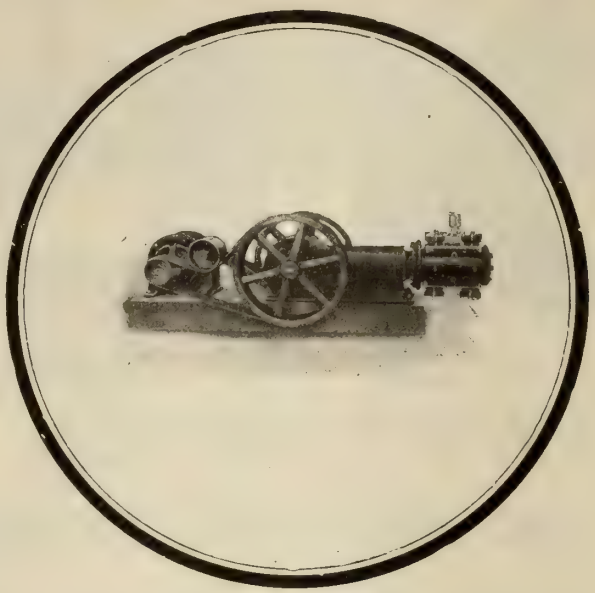
The Air Compressor for Cramped Quarters

The short-belt drive for air compressors is long past the experimental stage. It is the ideal drive for a compressor installed where space is at a premium. The total floor space occupied by motor and compressor is reduced to a minimum, the belt expense is cut down—running is smooth and quiet. In our own power house we have three two-stage compressors with this drive; we would not have installed them if the short-belt drive were not satisfactory.



All C-I-R-Co compressors are built to carefully determined standards of quality and design. Not only is all material subject to inspection, all shop operations have to secure the O.K. of the chief inspector; finally comes the running test which every compressor undergoes before shipment. The C-I-R-Co has been building air compressors for over twenty years and has a reputation to maintain. Our compressor bulletins will interest you.

CANADIAN INGERSOLL-RAND COMPANY, LIMITED

Sydney Sherbrooke Montreal Toronto Cobalt
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Swedish Steel & Importing Co., Limited

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Direct representatives of foremost Swedish mills; makers of

Tool Steels

ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

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PROMPT SHIPMENTS from large stock

Electrite

Electric furnaces, automatically regulated, the most modern methods, and the introduction of Uranium — make this a steel of truly remarkable cutting properties.

We know "Electrite" cannot be bettered — and stand ready to prove it to you.

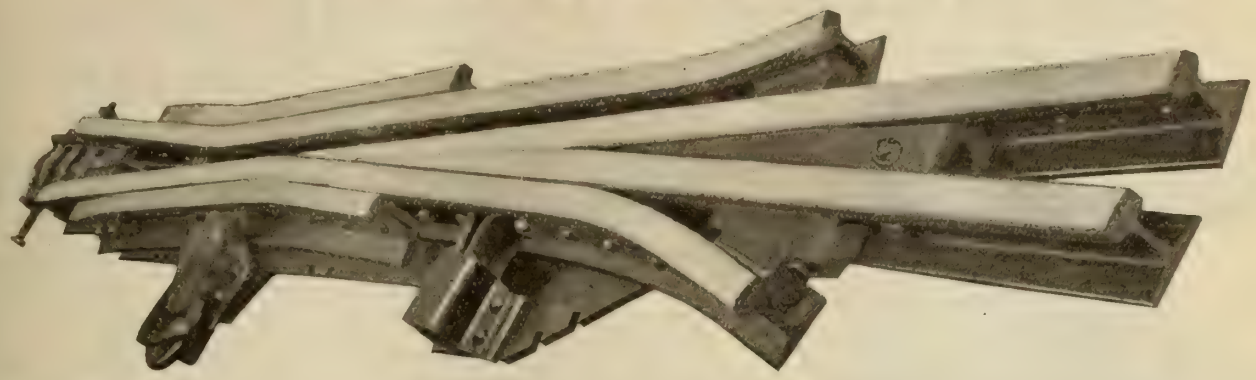
LATROBE ELECTRIC STEEL CO.
LATROBE, PA.

High Speed Steel

Uranium

TRACKWORK

For Steam and Electric Railways

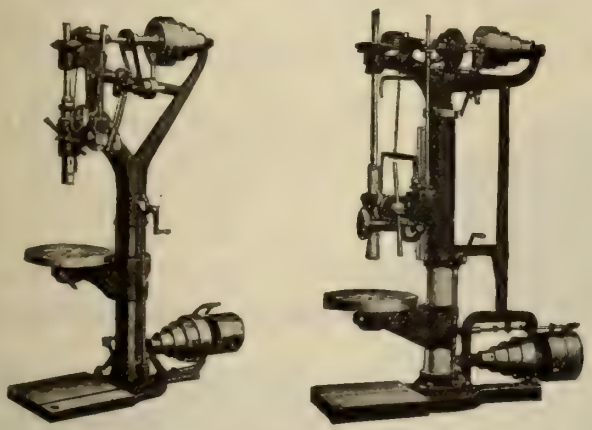


Built-Up Intersections Hard-Centre Intersections Manganese-Steel Intersections
Frogs Switches Mates Diamonds Crosses Switchstands

CANADIAN STEEL FOUNDRIES LIMITED

Transportation Building, Montreal

SILVER



20- and 25-Inch Drills

Built for speed, accuracy and service.

They represent sixty-five years of specialization, and our intimate knowledge of machine shop requirements.

Our 20-inch drills are made in four distinct styles, plain lever feed, lever and wheel feed, power feed and automatic stop and back gearing.

See our booklet for data.

The Silver Mfg. Co., 290 Broadway Salem, Ohio

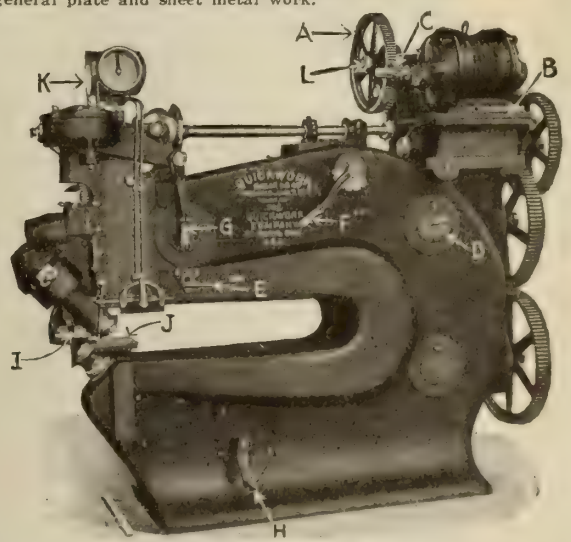
"QUICKWORK"

Registered in U.S. and Foreign Countries.

ROTARY SHEARS

MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing.
Write for Catalogue No. 60.

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S.A.

Cable address: "QUICKWORK."
Codes: W. U. and General.

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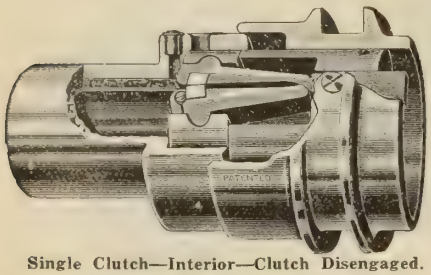
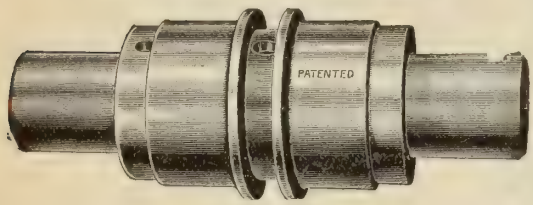
THE JOHNSON FRICTION CLUTCH

The Clutch for Your Machine Made to Order



Single Clutch—Interior—Clutch Disengaged.



Double Clutch.

Where space is limited and conditions are exacting, the clutch problem presents difficulties—unless you know about Johnson clutches. We offer you an efficient clutch made in any size or form that your machine requires. When you are designing a new machine, it will be worth while to consult us. Our facilities are at your disposal without any obligation to you.

THE JOHNSON FRICTION CLUTCH
THE CLUTCH OF A THOUSAND USES

WRITE TO-DAY FOR OUR YELLOW DATA SHEETS

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Victoria FOUNDRY & MALLEABLE
Made by The Canadian Furnace Co.
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FIRTH'S Speedicut HIGH SPEED Steel
Insures Maximum Production

FIRTH'S CARBON TOOL STEELS
Standard Brands Highest Quality

THOS. FIRTH & SONS, Limited, Sheffield, England

CANADIAN WAREHOUSES 449 St. Paul St. West, MONTREAL
79 West Adelaide St., TORONTO
J. A. SHERWOOD
Canadian Manager

Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
HAMILTON, ONTARIO
Alfred Herbert, Limited, Coventry, Agent for Great Britain

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

Our Guarantee is Back of Every Pound of Babbitt Metal We Make

Manufactured by
The Canada Metal Company, Limited

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STEEL *for*

Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

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MONTREAL

Steel Ingots
by the
HARMET
Liquid Process

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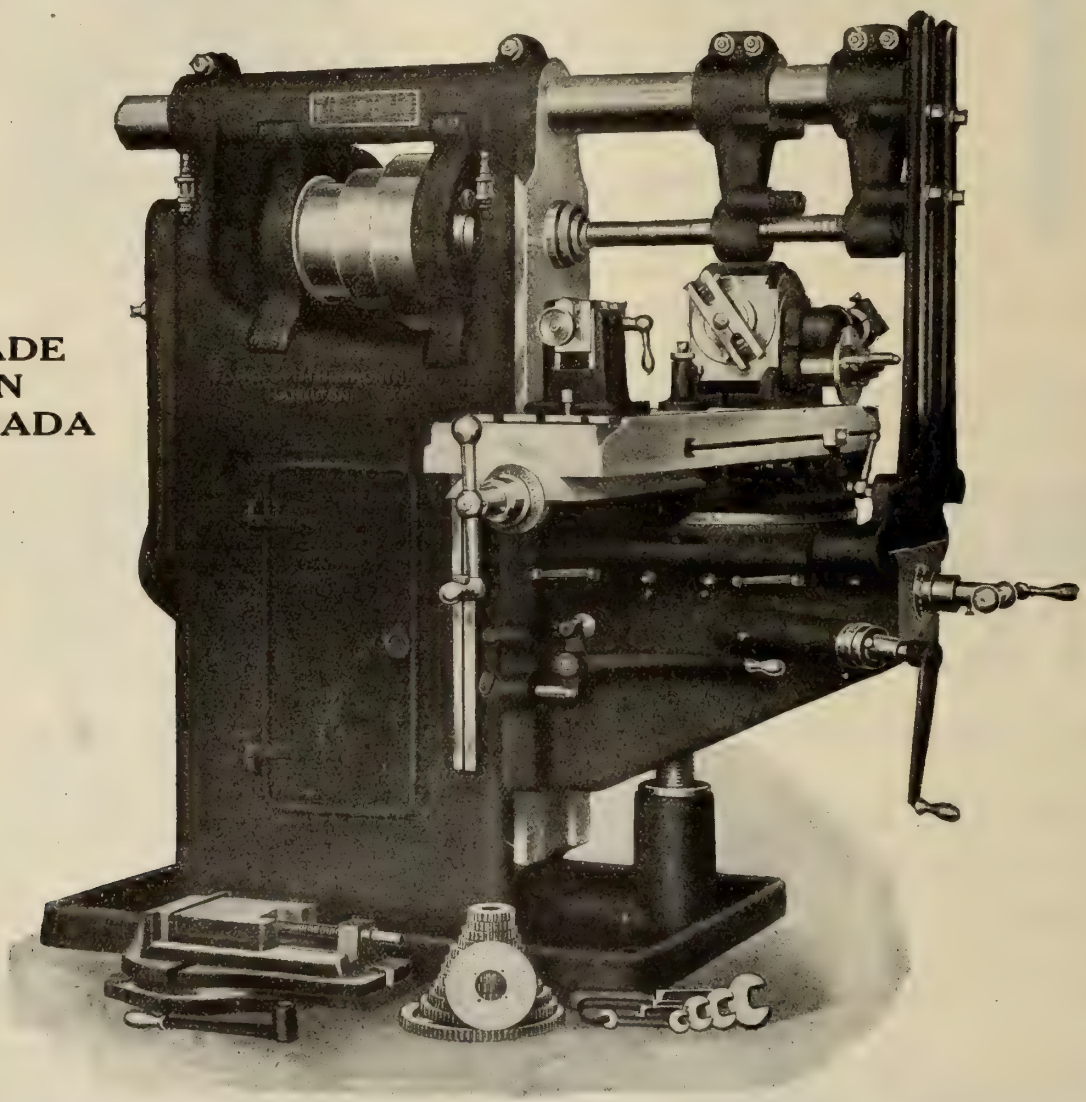
FORD-SMITH MILLING MACHINES

MADE IN CANADA



No. 3 Universal Miller

By their continuous and accurate performance under the strenuous wartime conditions, FORD-SMITH MILLERS have added a distinctive page to their reputation.

MANUFACTURED BY

THE FORD-SMITH MACHINE COMPANY, LIMITED
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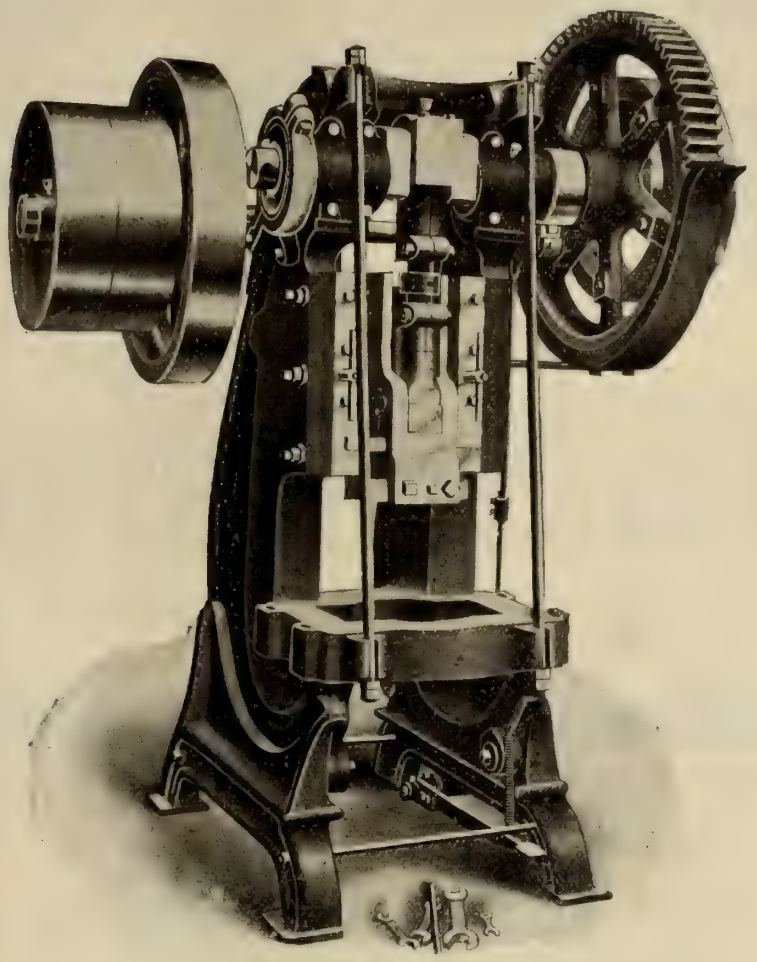
For Your Pressing Needs



No. 215 Inclinable Geared Press

Quality that is **"Built In"** stands out on all B.B. Power Presses.

The long slides insure accurate work and long life to your dies. The steel pitman screw gives added strength at a vital point.

The Crankshafts are made from high carbon steel forgings and are **"Heat Treated"** so as to give the maximum shock-resisting qualities and prevent crystallization. This is a feature no other press manufacturer can claim.

Let us quote on your next presses. The machines are the best that can be produced and our prices are low in comparison with the value you will get.

The Brown Boggs Co., Limited

Hamilton, Canada

Manufacturers of Presses, Shears, Rolls, etc., also Tinsmiths' Tools and Sheet Metal Working Machinery of every description.

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KE

BRANDS OF ALLOY & TOOL STEELS

In Billets, Bars, Sheets, Hot and Cold Rolled Strips, Cold Drawn Cast Steel, Wire and Drill Rods

HIGH GRADE STEEL FOR ALL PURPOSES

Our Principal Trade Marks

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ESTABLISHED 1825 SHEFFIELD, ENG.

Complete Stock - Montreal Warehouse

RALPH B NORTON

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CANADA
FOUNDRIES & FORGINGS
LIMITED

ENDURANCE TOOLS
NEVER WEAR OUT

PIPE THE WRENCH—WRENCH THE PIPE

Canadian Billings & Spencer Plant
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LOCOMOTIVE AND CAR
WHEEL TYRES

HIGH-SPEED AND CARBON
TOOL STEEL

MISCELLANEOUS SHOP TOOLS

MADE IN CANADA

ARMSTRONG WHITWORTH
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Head Office :
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Works :
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Branches :
126 Wellington St. W. TORONTO
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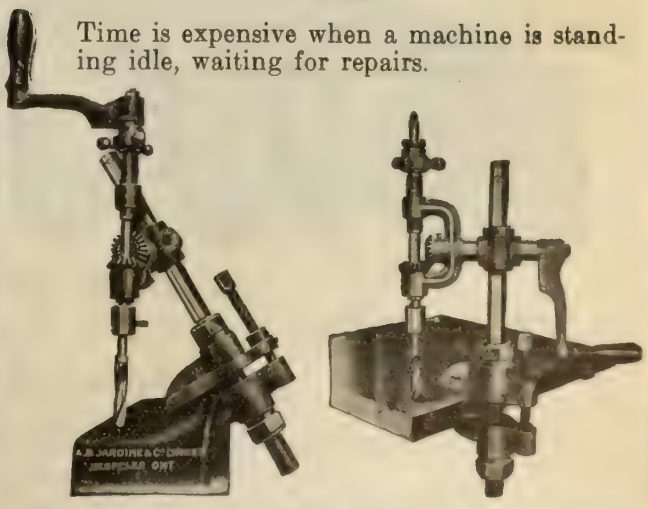
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

A. B. JARDINE & CO., Limited
HESPELER, ONTARIO

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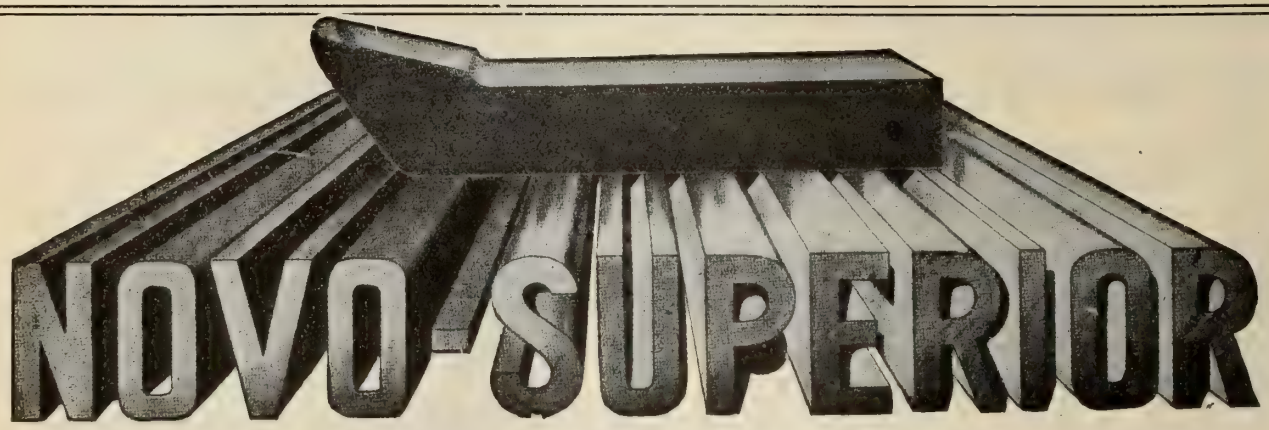
"WACO"

THE HIGH SPEED STEEL

MARSHALL, SON & BUNNEY
39 Richmond Street East TORONTO, ONT.

SOLE CANADIAN AGENTS FOR
WM. ATKINS & CO., LIMITED
SHEFFIELD - - ENGLAND

ALL SIZES
IN STOCK



HIGH SPEED STEEL
INTRA STEEL *GIBRALTAR STEEL*
Tool Steel for Every Purpose
SWEDISH LANCASHIRE IRON.

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.
Music Wire for Springs, Steel Balls
Cold Rolled Tool Steel in Strips and Sheets.

We call to your particular attention that we make a specialty of and solicit your inquiries for
Circular Saws—for wood and for hot or cold metal cutting
Machine Knives—for cutting wood, paper, tobacco, agricultural.

PILOT STEEL & TOOL COMPANY, Limited, 322 St. James St., MONTREAL

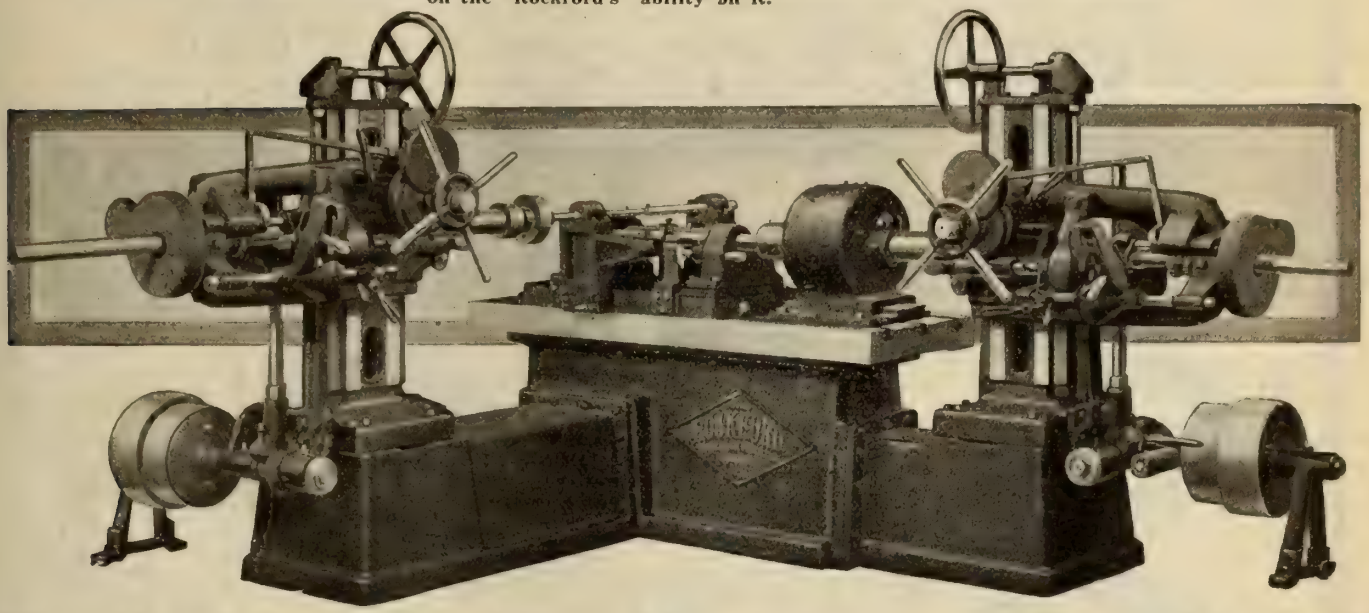
Sole Agents for JONAS & COLVER, LIMITED Novo and Continental Steel Works, Sheffield, Eng
H. BOKER & CO., Inc. New York, N.Y.

Rockford Horizontal Boring Machine

For Automobile Manufacture

This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



The Rockford Drilling Machine Co., Rockford, Ill.

SUCH attachments as draw in chuck, taper attachment, milling and gear cutting attachment, thread chasing dial, which may be obtained for this lathe, enable it to handle a wide range of work in an accurate and satisfactory manner.

The "Star" is so accurate and so rigid that it is repeatedly replacing heavier and more costly equipment.

May we send our catalogue?

9" x 4' "Star" Lathe

A tool particularly well adapted for model work, experimental laboratory and fine scientific work as well as for the individual in his own shop.

STAR

The Seneca Falls Mfg. Company, Inc.

366 W. Fall St., SENECA FALLS, N.Y.

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Mr. Safety Engineer, don't wait for an eye accident before ordering STOCO SAFETY GOGGLES "CELOGLAS"

SHATTER-PROOF LENS

The proverb anent a stitch in time—not to mention the one about an ounce of prevention—is very applicable to the prevention of eye accidents. The protection afforded by STOCO Safety Goggles is fast becoming proverbial in industrial fields.

PRICE

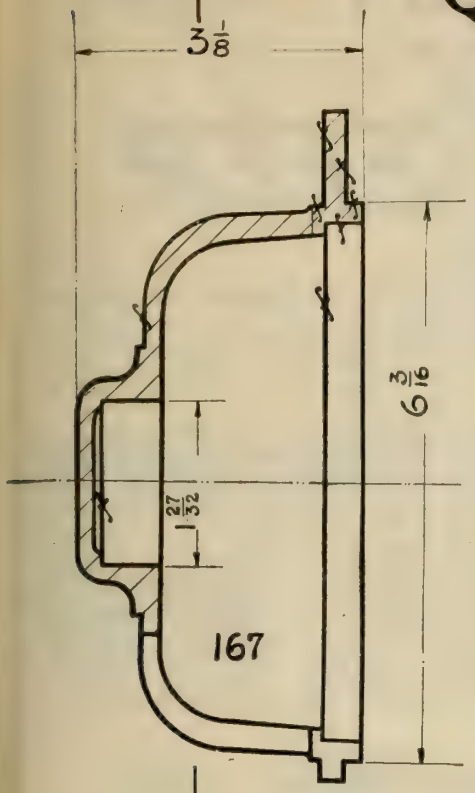
(With either easy cable earbows or black elastic headband)	Per 100
With Clear Glass Lenses	$115.00
With Celoglas "Shatter-Proof" Lenses	$150.00

A sample of the STOCO Safety Goggle will be sent without charge to Safety Engineers, Purchasing Agents and Superintendents on receipt of request on letterhead.

STANDARD OPTICAL CO.

GENEVA, N. Y.

Quality and Quantity Production



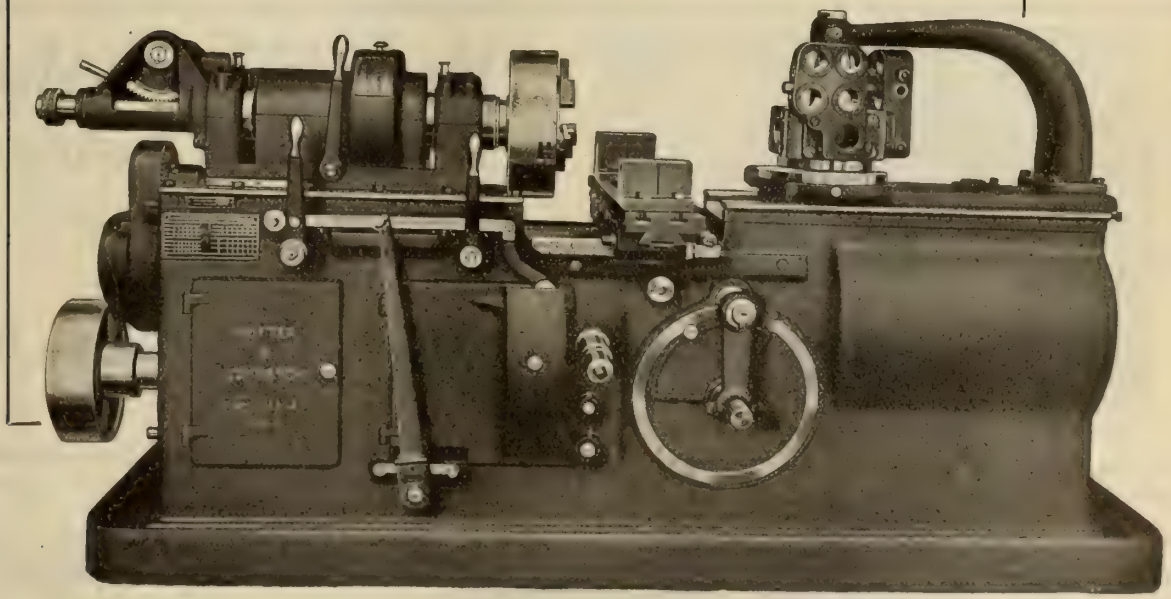
This piece is a cast iron front end plate, and was finished on the Potter & Johnston Manufacturing Chucking and Turning Machines in two chucking operations.

On a job of this nature one man can easily attend to anywhere up to six machines, and all he has to do is to put work in the chuck and take it out again when the machine has finished it.

Nothing could be simpler.

Why don't you send samples or blue prints, then we can tell you what P. & J. Automatics can do on your work?

Bulletin 41



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 1501 Royal Bank Building Toronto, Canada
Works and Warehouse: Galt, Ontario, Canada

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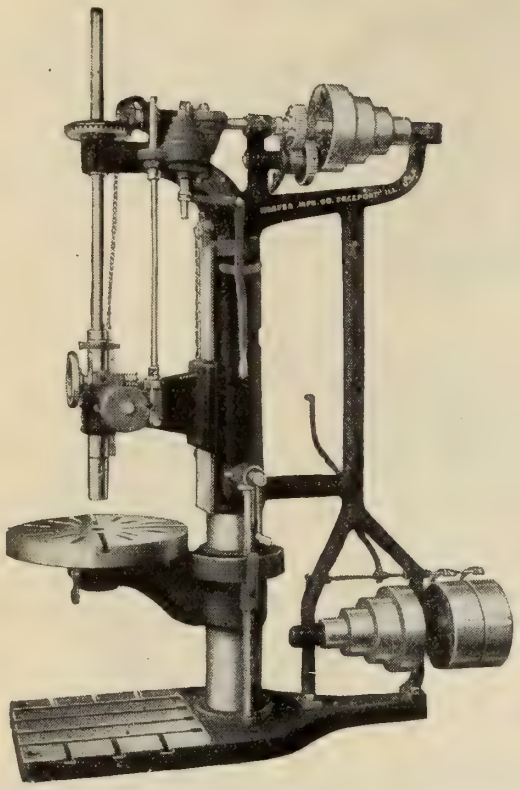
The Driller for Exact Work



HŒFER

Enable Your Workmen to Eliminate Spoilage

The Hoefer Driller is pre-eminently the one to be found in the best plants. "It's almost as good as a Hoefer," so often heard in the machine and tool trade, indicates the position held by Hoefer Drillers.

Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

Twenty-five Years on Market

Twenty-five years making drillers has given Hoefer the "Know-how." The Hoefer Drillers are used by many of America's leading manufacturers. Equip your factory the Hoefer way. Take any kind of a drilling problem you have to the Hoefer Manufacturing Company, and the Company's experts can tell you how it was solved by other men, some of whom you may know.

Investigate now. Write to-day for catalog. The Hoefer engineers are at your service.

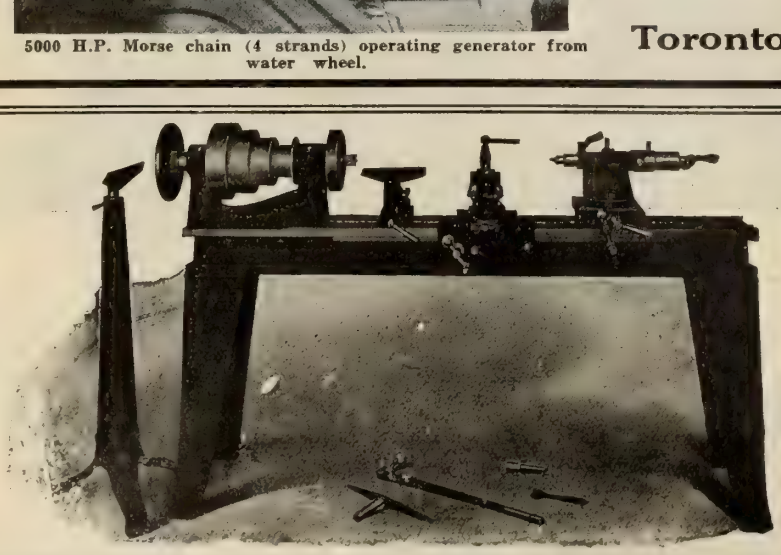
HOEFER MFG. CO.
FREEPORT, ILL.

5000 H.P. Morse chain (4 strands) operating generator from water wheel.

"Renold" or "Morse"
Silent Chains

are employed throughout Canada on **Main Drives, Municipal Fire Pumps, etc., Evidencing Absolute Reliability.**

Jones & Glassco, Regd.
Canadian Agents
Toronto - Montreal

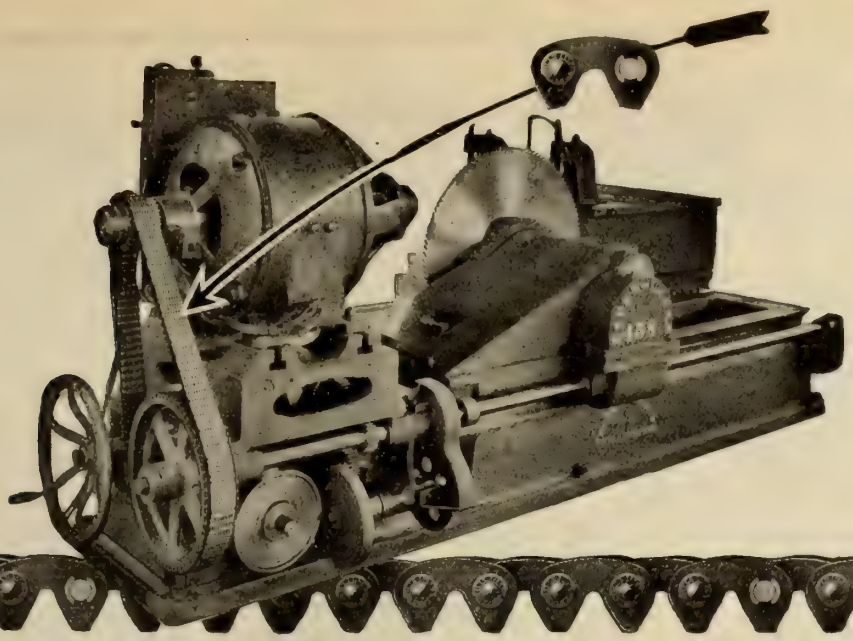


A Favorite—
Blount Pattern-makers' Lathe

FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY
EVERETT, MASS., U.S.A.



98.2% Efficient
On Actual Test

This is what an actual test proved the efficiency of Link-Belt Silent Chain Drives

IT is one of the reasons why the Machine Tool Builders of this country are making it a standard means of transmitting power, and maintaining a higher standard of efficiency. Link-Belt Silent Chain Drives combine the flexibility of the leather belt with the positive action of cut gearing, eliminating the disadvantages of both and maintaining a higher efficiency than either. You need this drive for your new machine tool, for line shafting throughout your factory or any place where you must transmit power without slip or loss. Write for Data Book No. 125.

CANADIAN LINK-BELT COMPANY, LIMITED

WELLINGTON AND PETER STS., TORONTO, ONT.

LINK-BELT
SILENT CHAIN DRIVES

We Also Make

- ☐ Elevators and Conveyors
- ☐ Link-Belt and Sprockets
- ☐ Silent Chain Drives
- ☐ Truck and Tractor Chains
- ☐ Electric Hoists
- ☐ Locomotive Cranes
- ☐ Portable Loaders
- ☐ Coal and Ashes Systems
- ☐ Coal Pockets

Write for Catalogs
Place X in Square

If interested tear out this page and place with letters to be answered.

If You Want Production--

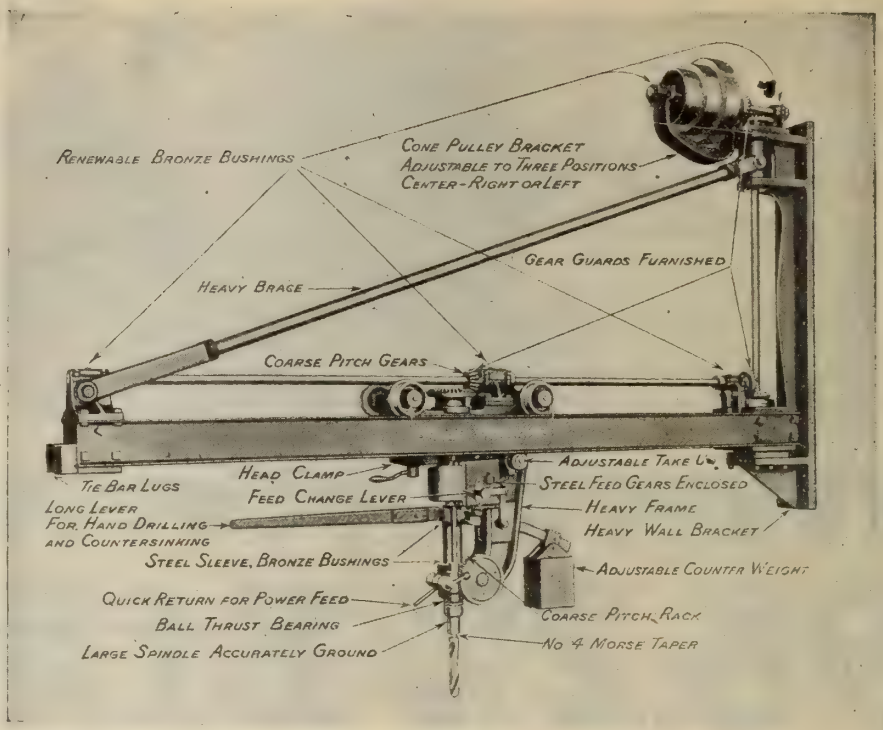
You can't do better than install this Wall Radial Drill in your plant. We'll say you won't have it in operation more than a month before you will begin to congratulate yourself on your judgment in adding this machine to your equipment. Materials and workmanship that you can depend upon to the limit are features of the construction, and our bulletin will give full details.

GET IT TO-DAY!

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



LYND-FARQUHAR COMPANY

419-425 Atlantic Avenue Dept. B BOSTON, MASS.

Built for Service

The Canadian Radial Drill is designed particularly for work in structural shops. For seaming and countersinking large surfaces such as structural shapes, boiler plates, long beams, etc.

Specifications:

Spindle 2 3/16" diameter No. 2 or 3 Morse Taper Spindle travel 8½".
All gears accurately cut and fitted.
Carriage wheels equipped with roller bearings.
14" x 14" tight and loose pulleys or single pulley for belt drive to motor, or direct connected to motor.
15 ft. Beam will drill to 13' 6" centre.
12 ft. Beam will drill to 10' 6" centre.
7 ft. Beam will drill to 5' 6" centre.

Write Dept. 16 for Literature.

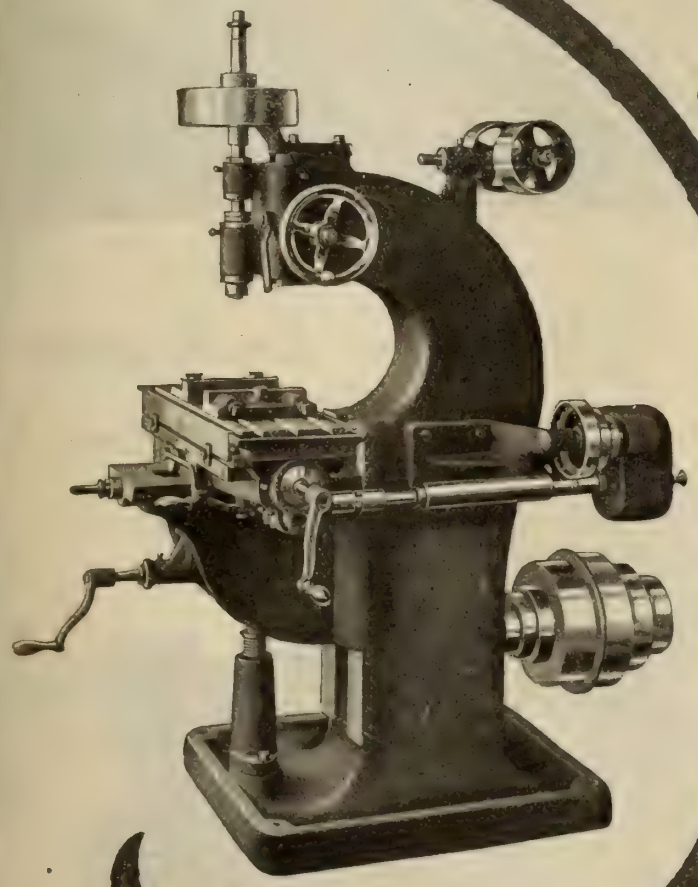
Canadian Blower & Forge Co., Limited

KITCHENER, ONTARIO

BRISTOOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

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Whitcomb-Blaisdell Planers

WHITCOMB-BLAISDELL LATHES AND PLANERS PLAY SOME PART IN THE MOST OF THE HIGH-GRADE MACHINE TOOLS MADE ON THE CONTINENT.

ALL-ROUND machines for high grade work, they are equipped with special labor-saving attachments that add to their convenience and enable the operator to "speed up" without endangering accuracy.

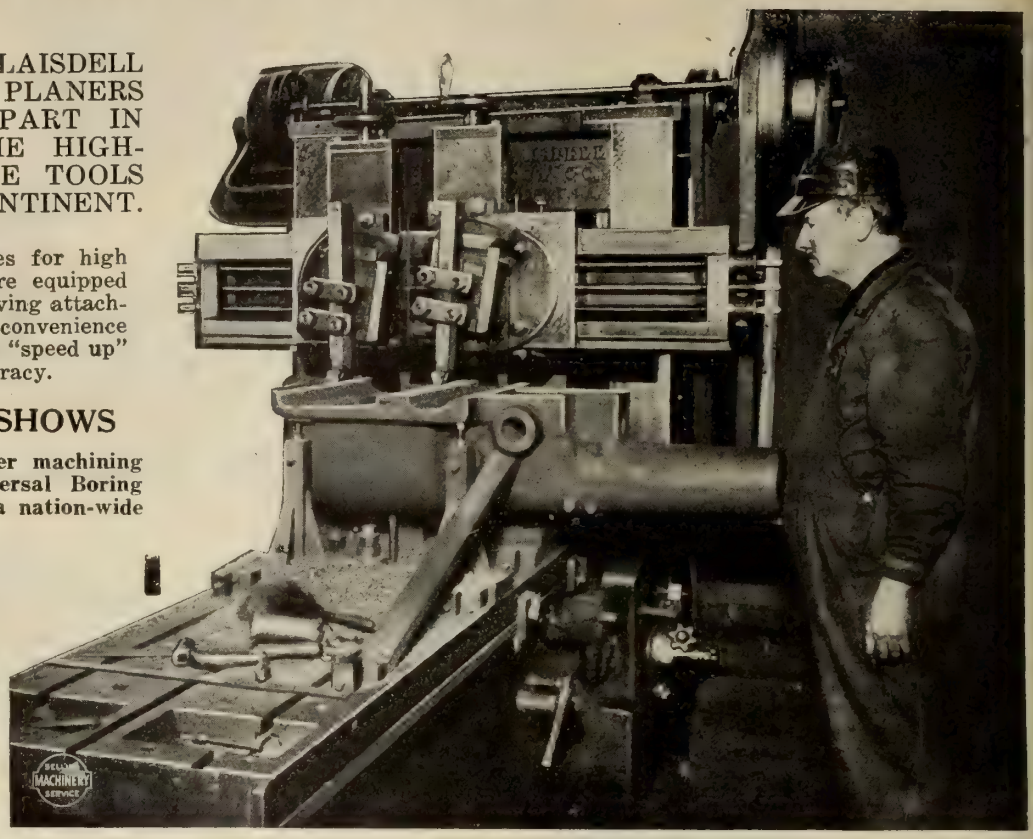
ILLUSTRATION SHOWS

a Whitcomb-Blaisdell Planer machining the head post of a Universal Boring Machine—a machine with a nation-wide reputation for accuracy.

May we send you our catalogue giving full particulars?

Whitcomb-Blaisdell Machine Tool Co.

WORCESTER, MASS. U.S.A.



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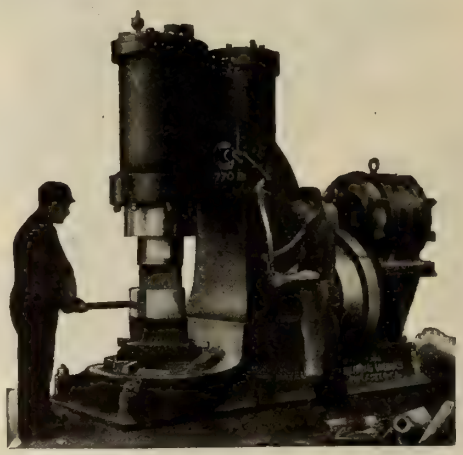

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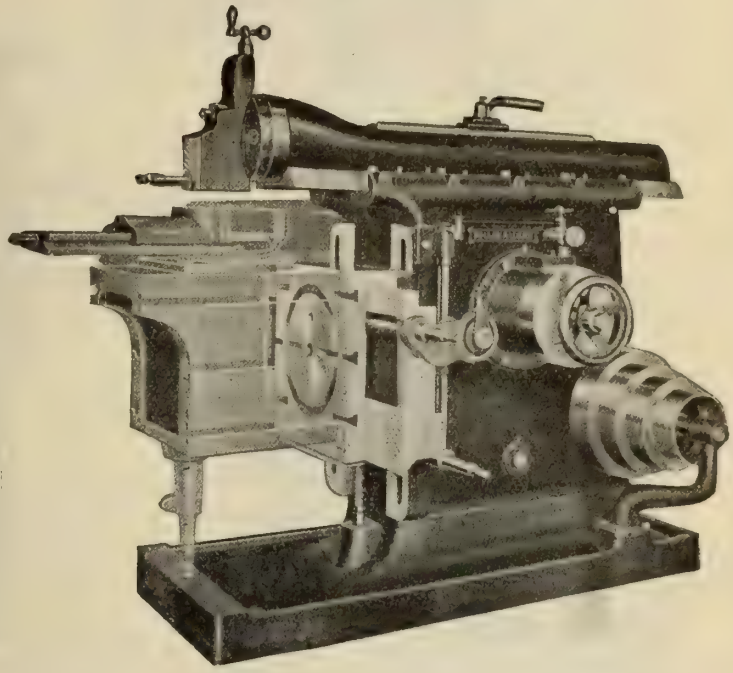

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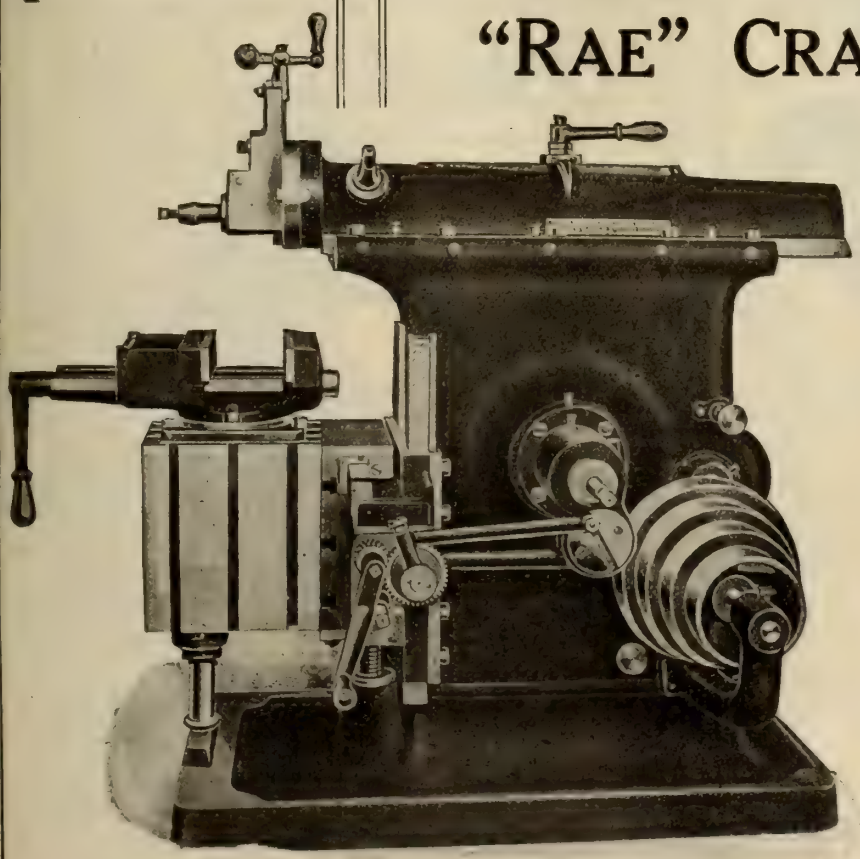

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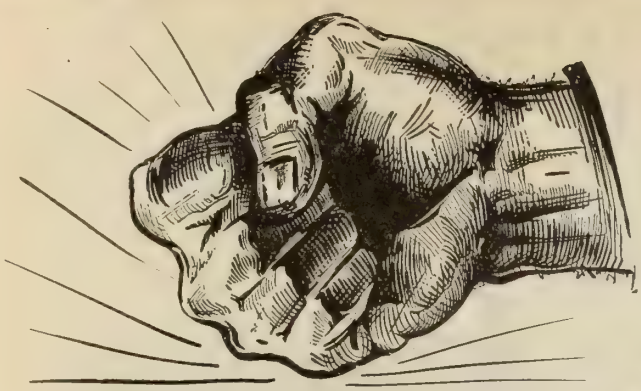

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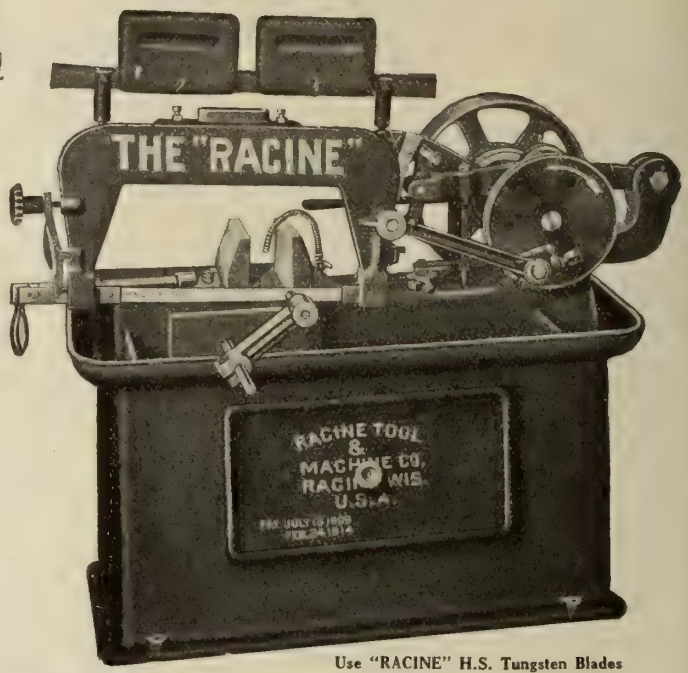

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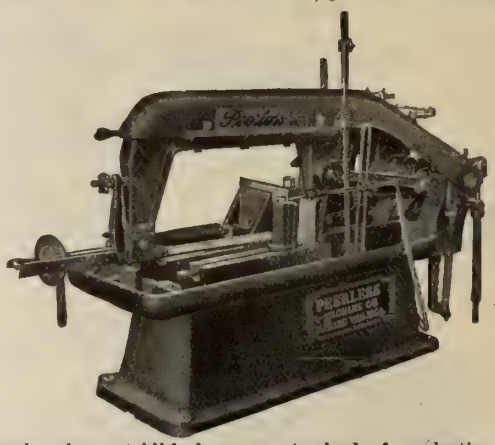

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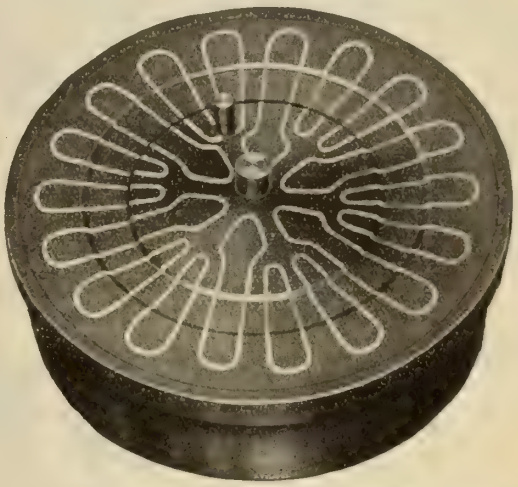
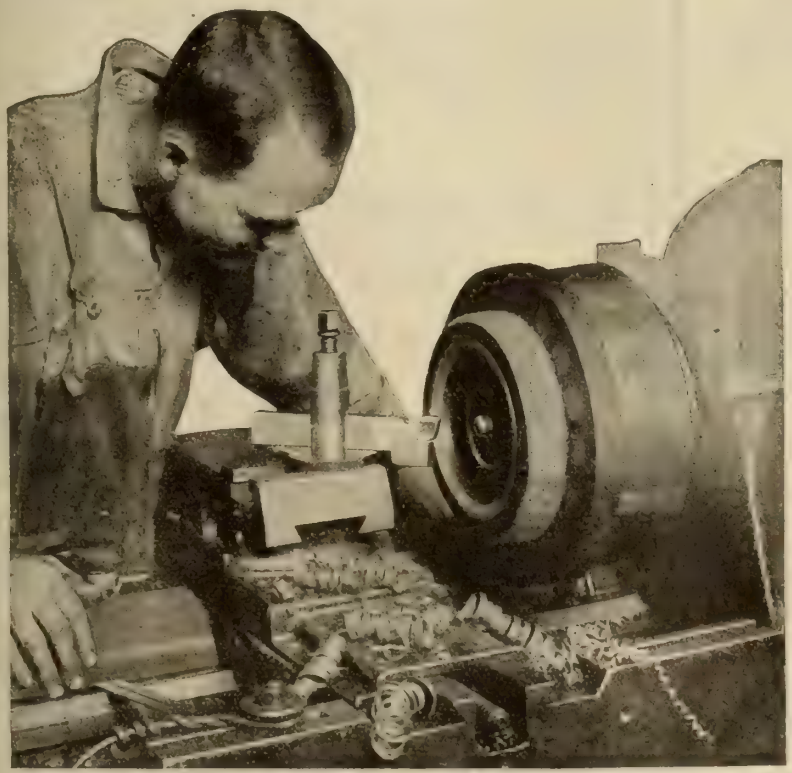


Chuck as arranged with centering plug and driving pin



Not every lathe job can be handled with a magnetic chuck, but a large majority can, especially where it is not necessary to take an extremely heavy cut.

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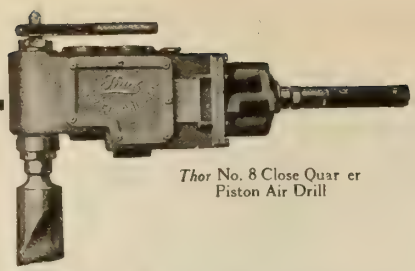

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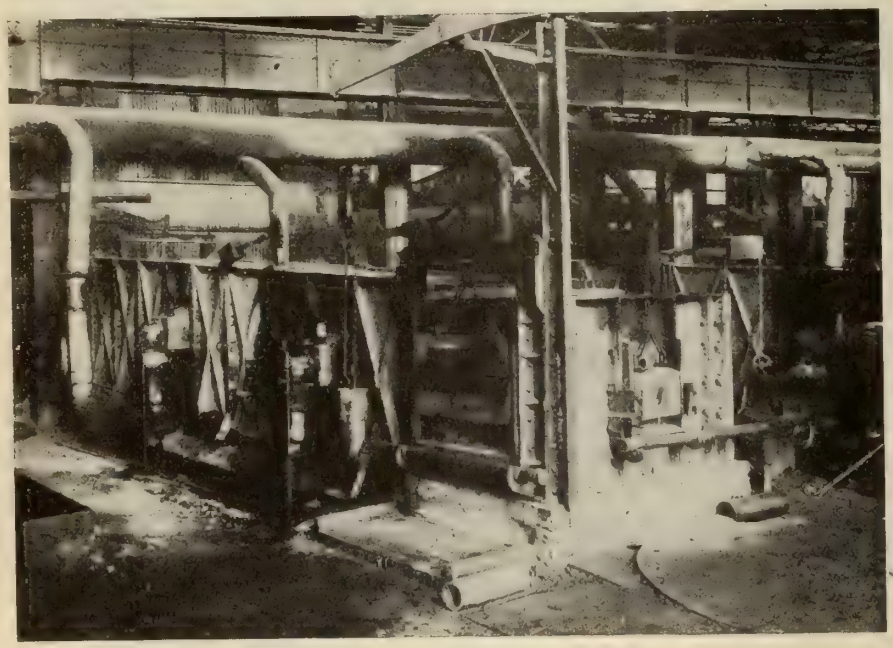

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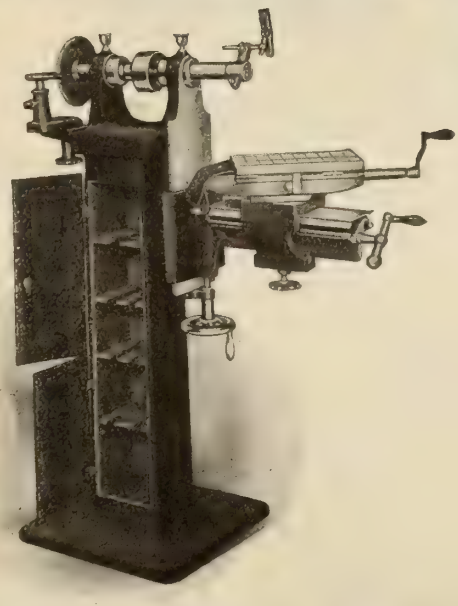

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Use Code—Banish

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

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Machine is designed to keep its original factory accuracy.

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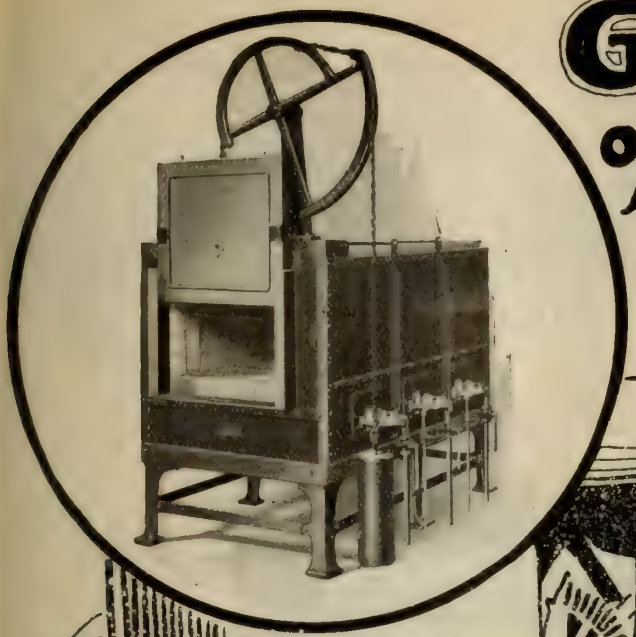

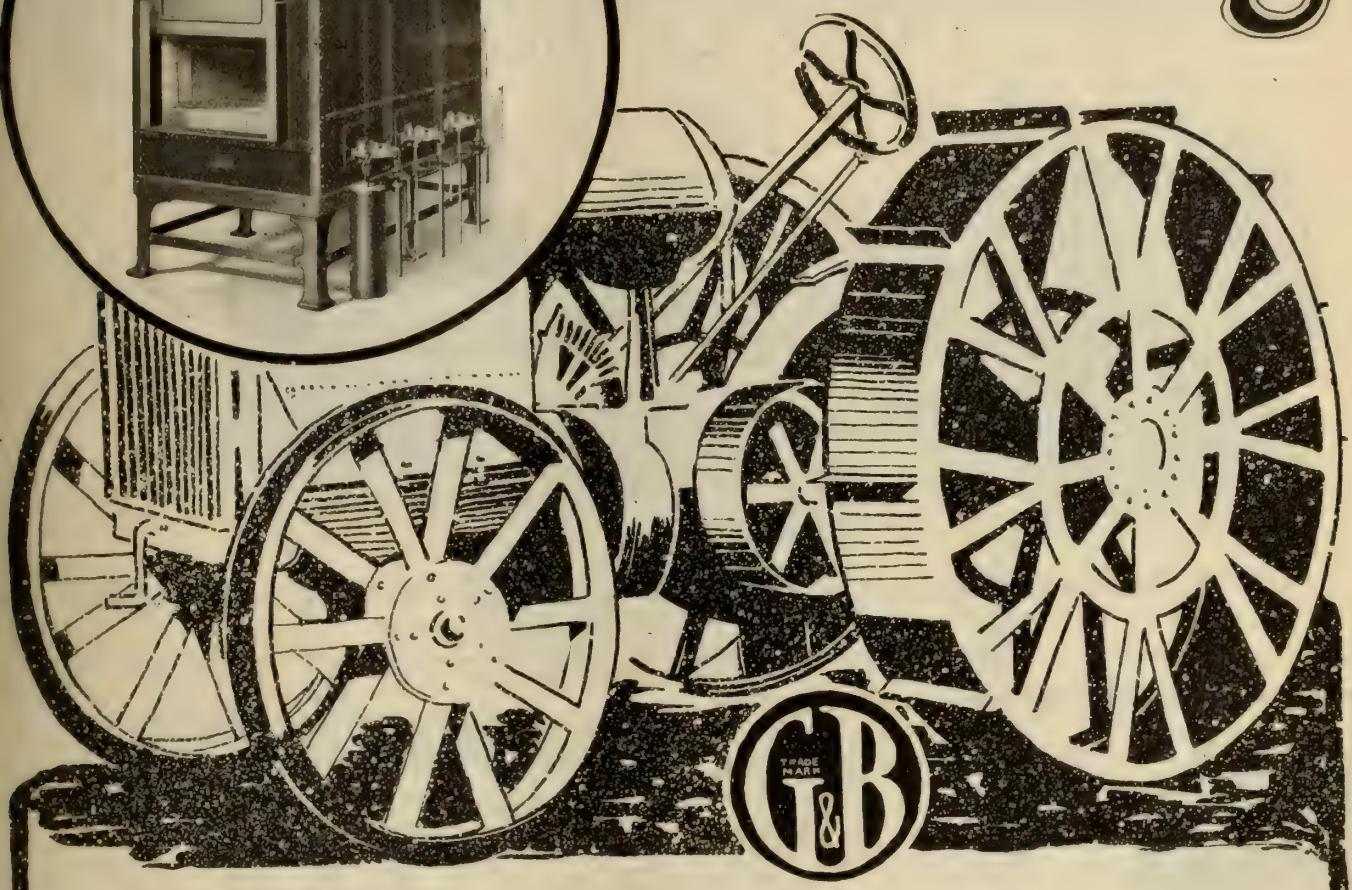

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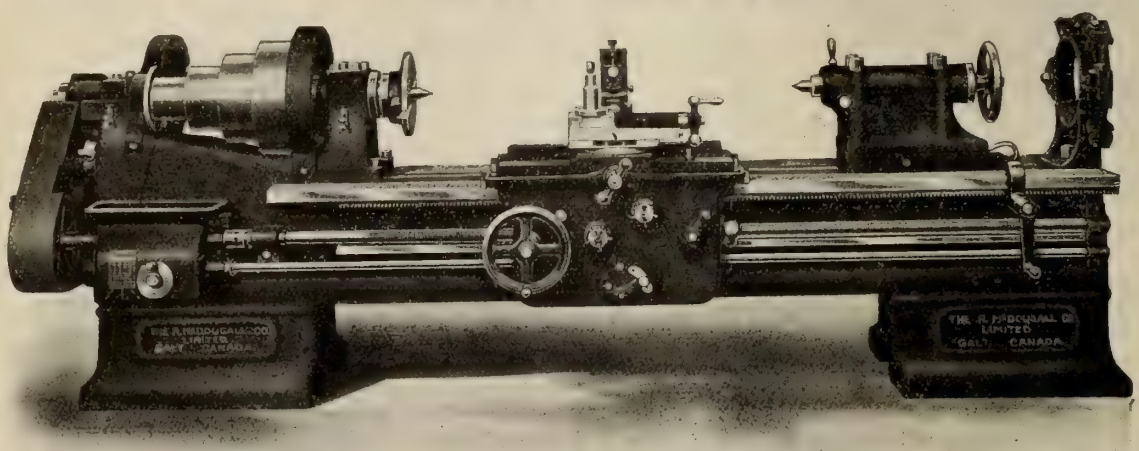

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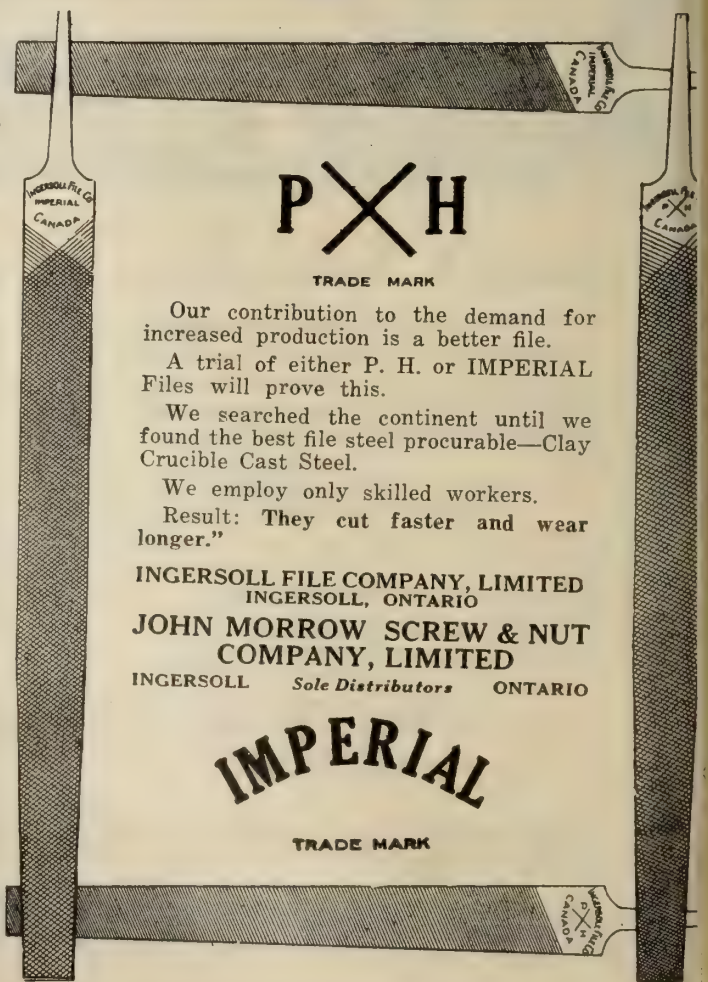

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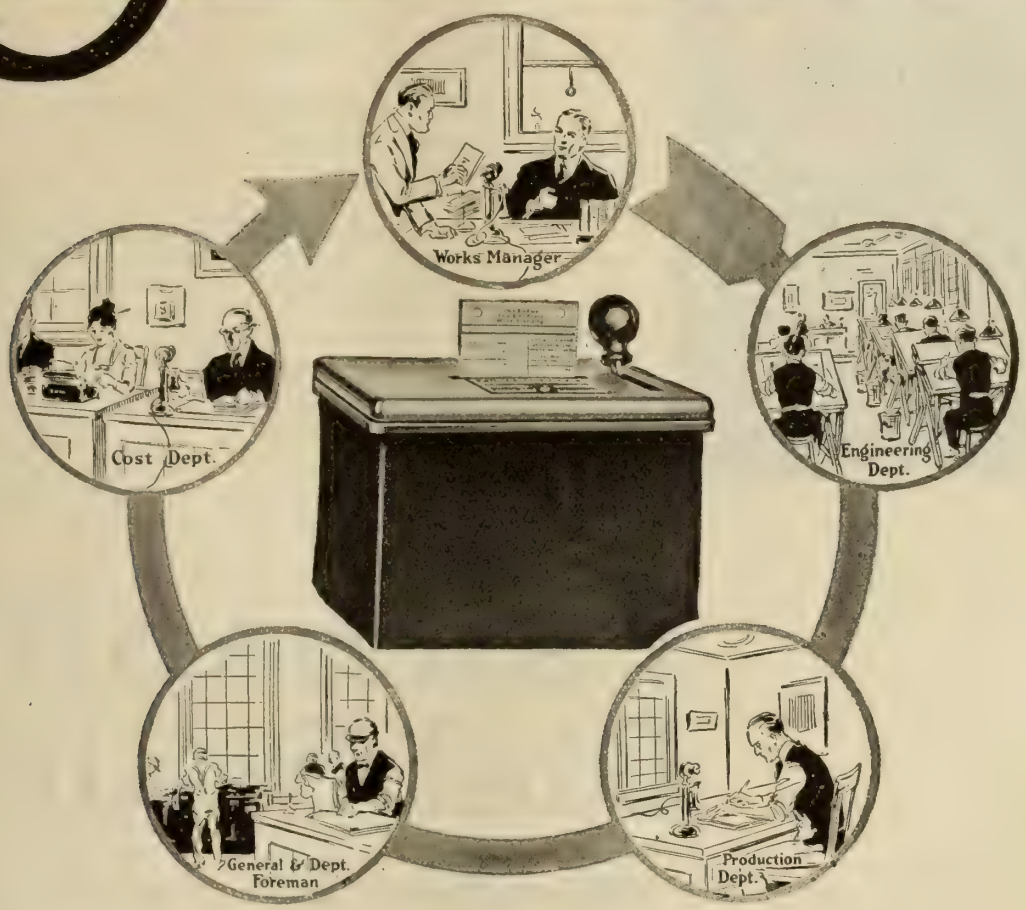

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 20 November 20, 1919

Do Not Shroud Business in Too Much Secrecy

Sane Influences Must be Set at Work to Combat the Revolutionary Doctrines That Are Being Spread in This Country—Production the Proper Basis for Payment

MORE and more large employers of labor are discussing in a public way their problems. It used to be considered that matters of policy, of employment and management were closed books as far as any but a few on the inside were concerned.

The time has arrived when those in positions of responsibility must speak out. They cannot afford to stand pat and let the agitators go ahead and do their worst.

It is high time that leaders in our industrial world were putting in their rebuttal evidence. The man who hears only one side of the story, who is told times without number that he is being robbed and plundered by his employer, who hears whisperings that he earns his wages in two or three hours every day—he should be brought face to face seriously with real facts. Let him hear that there are responsibilities as well as privileges in operating industry, and that those who would shirk the former have no right to claim the latter.

Mr. Charles Piez, president of the Link-Belt Company, of Chicago, a firm that has a pay-roll of over 2,200 men, recently spoke to a gathering of the Associated Business Papers, and in his address said:—

I believe in, and always have believed in the technical and trade papers, declared Mr. Piez. I believe that they have exerted and are exerting a very powerful and beneficial influence in advancing industry, and I believe they have a larger mission still ahead of them, a mission that will call for every bit of energy and intelligence that you gentlemen are capable of.

I am glad, too, that you have joined together for the purpose of furthering your common aims. My interest in the technical and trade press has not been of an indefinite or abstract character. It has been direct and concrete, for, in spite of many arguments from my own men, and much pressure from the outside, I have continued to believe that the technical and trade press is the most direct and the least diluted and the most satisfactory medium of advertising our goods.

I believe you gentlemen have solved very well the problem of the technical development of the industries. You have been a big factor in making industry, American industry, what it is to-day. I am not going to confine myself to the title of the address that is put down, because I feel that what I ought to do to-day is to enlist your co-operation in a considerably broader field than you have heretofore occupied.

The Menace in the Labor World

IF there is any cloud on the horizon of American business, if there is any menace to the continued prosperity of American industry, it lies in the present day labor unrest. No matter where it has had its origin—the war has brought about some of it, the rising cost of living has brought about much of it, unfulfilled expectations have caused other parts of it—but the unrest is being capitalized to-day by a group who are not aiming at a mere improvement in the conditions and hours of labor, but who are aiming at the control of industry and the control of our great Government as well.

I don't know how many of you gentlemen are familiar with the propaganda that is going on, particularly through the foreign newspapers. There are some seven or eight hundred publications, all of them containing poisoned articles against the fairness of the distribution of the profits of industry, against the fairness of our system of government. There are something like 2,500 paid lecturers, drawn from foreign-born and native intellectuals, who put up a continuous story of the wrongs of the present wage system and the present social regime. Perhaps the biggest cause of unrest, and I have met this not only in my own business repeatedly, but also in my experience with the Fleet Corporation, is the exaggerated notion which the men have of the profits of industry.

How One Strike Was Stopped in the Bud

SOME six years ago we were threatened with a strike at our Indianapolis plant. We have there something like 2,200 men. The superintendent called me up and asked me if I wouldn't come down and address the men. I have been in the habit of getting all our workmen together and talking to them collectively for many years. I have found this to be highly effective. I hurried to Indianapolis and found when I got there that the strike was threatened not by any conditions inside of our plant, but because of some grudge against another plant in the city, with which we had nothing to do, and over which we had no control. The strike involved the machinists and tool-makers, two of the very vital crafts in our industry.

We called them together and I gave them a talk. After I got through, I asked them whether they had any questions to ask, and told them I would be very glad to answer any they might raise. One man who had been with us many years, a very able tool-maker, said, "Mr. Piez, don't we earn our day's pay in two hours' work?" And I said, "Well, now, let's examine that. How many hours a day do you work? Nine a day, don't you?" He said, "Yes."

"What do you get?"

"Sixty cents an hour."

"Then your proposition is, that you earn $5.40 in two hours' work, for which we pay you $1.20."

He said, "Yes, that is right."

I said, "That means that we are making a profit of $4.20 a day out of your labor. Four dollars and twenty cents for two hours, or $2.10 per hour profit out of your

labor. That is three and one-half times your hourly rate, and if we carried this same argument through, our profits must be equal to something like three and one-half times our total pay-roll."

I got a blackboard and went through the figures, demonstrated that if his conception of his earnings and the value of his earnings and our profits, was right, the profits of the concern would have to be something like three and one-half times our pay-roll.

This happened in March, soon after our annual meeting. I sent for our annual report, and then demonstrated that our profits for that particular man were less than a dollar per man per day, about 25% of the pay-roll instead of 350% of the pay-roll, and the expression of that man, which I can't repeat because it had some profane emphasis in it, was that he never knew our profit was so small.

Making the Most Absurd Claims

THE radical preachings in the foreign press constantly emphasize the fact that between 80 and 90% of the earnings of the individual go to the master as profit.

In the Seattle strike—and I dwelt upon that incident in a talk last week—the feeling was that the earnings of the owners were 90% of the total earnings of the man. The company got $60.00, out of which they paid him $6.00. Yet a very simple and quick calculation showed the absolute fallacy of that; showed that the profits computed on that conception were between four and five times the value of the annual output.

Now, that statement was repeated to me at a conference held in Washington where there were 120 representatives of labor of the Western Coast. I am giving emphasis to it at the present time because I believe that, after all, the fact that the sane-minded American workmen, intelligent workmen, have the idea that they are being treated unfairly and are receiving too small a share of the profit, lies at the very bottom of the general unrest.

I have no fear that they are going to lead the American workmen into the camp of Bolshevism, but I do fear they are going to change their perspective, because these statements are insidiously made and never refuted.

Don't Use the Shroud of Secrecy

THE manufacturers shroud their business in too much secrecy. They don't talk it over with their men. I would feel like a thief if I felt that part of the earnings of our company were filched from the men by withholding from them a just part of the earnings they have made. And on that account I am prepared at any time to discuss it with them, to be converted to their side, or convert them to mine if that is possible. I don't believe that it is wise for the industries and the employers generally to permit a misconception like that to stay unrefuted, because it is so easy to prove it to be wrong.

Now, it struck me—and I have tried to solve the question of unrest in our own industry, and I am talking to you gentlemen because I think you can be factors in settling this unrest—I have thought that the best way to reach our men, because they have grown so in numbers I can no longer reach them personally, is to reach them through our superintendents, our foremen and sub-foremen. I find that mose of these men are intelligent, active, alert Americans, typically good citizens, upon whose judgment we rely to create sound public opinion, and they must be the judges of the correctness of our theories and our methods and serve as our champions.

Pays Wages on Production Basis

I APPRECIATE the remarks you gentlemen have made concerning partnership with business. I want partnership with our men, but recognize there are many ways of securing it. Partnership must be based on fairness, and must involve acceptance of risk, as well as participation in profit. It must, therefore, be confined, in many cases in industry, to the immediate work which is under the control of the partner, and he must not be held responsible for the failure or success of policies or theories with which he had nothing to do. You can't make a partner of the man who is not responsible for the risk the partnership involves, and you can't expect a workman to sacrifice a part of his income in such a partnership. You must, therefore, confine his interest to the work under his control, and give him part of the profits which extra effort or intelligence on his part brings about.

My company has been paying on a production basis for many years, and we have had no labor troubles. We try to keep step with the conditions, but we always adhere to the policy of paying on the basis of production. It is the only fair way; it is the way every man in business, from the top down, ought to be paid.

During the war the principle was laid down that the rising cost of living should be taken account of in the payment of wages, and while this was perhaps sound doctrine several years ago, when coupled with the other restrictions with which it was surrounded, it is now pretty generally held by our labor friends that the cost of living should be the sole basis of wages, production being entirely omitted. If the cost of living is to be the basis of wages, why apply it to any particular group of workmen? Why not apply it to all? Why not determine the per cent. of advance at certain specified times, and then by fiat of the executive, raise all wages and salaries simultaneously, by the per cent. of increase? That would soon show the absurdity of the principle, for you cannot take more out of the pot than you put in it.

Gentlemen, the demands that some of the radicals are making cannot be satisfied with increased wages, for they demand nothing less than turning industry over to them. There is no justification for that kind of partnership, for the only kind that is successful in business is that which is earned and paid for.

I have bought Link-Belt stock ever since I came with the company, and I have acquired what interest I have because I sacrificed a very considerable part of a very meagre income for many years in order to buy it and hold on to it. There are 180 of our employees among our stockholders to-day, because they helped us conduct the business and helped us develop it. For years we have insisted that the older interests as they retire, surrender part of their stock for distribution and sale to the younger men. That is my idea of a partnership. It has worked well in our case and in many other plants. It is a very sound policy.

It occurred to me that you gentlemen might help very much in stilling the present day unrest. I think after all it is but a phase of after-war conditions—but a result of a transition from war to peace. It is of temporary duration, but it has to be handled well. What we have to do is to bring back the proper perspective of our men, and not let them go off on a tangent.

Now, the radicals reach the men, not after hours, but during hours. They reach them by planting in your works men who have been especially coached for the job. We had some planted in the 39th Street plant not more than nine or ten months ago. Those men talk to the other men when the foreman isn't looking, and pour into them radical ideas about the wage scale and shop conditions, and when they find a man who has a pet grievance they fill him full of the seeds of distrust. And they plant men successively who develop and spread this distrust. That is their game. Our method of meeting it is through the foreman.

The foreman isn't a good foreman unless he has the respect and confidence of the men. They must respect his ability as a mechanic, his character as a man. It is the foreman and the sub-foreman whom we ought to coach up and prepare to meet this insidious doctrine that is being spread to the detriment of the industry.

What Do We Know Regarding Hydraulics?

The Subject of Hydraulics From Both a Theoretical and Practical Standpoint is Described, Particular Stress Being Laid on the Application of This Knowledge to Fire Service

By DONALD A. HAMPSON, Associate Member A.S.M.E.

MOST men can trace their interest in the active work of fire departments back to boyhood days and the delirious joy of going to a fire with all the thrilling and noisy accompaniment. Men in the mechanical field are naturally interested in modern apparatus, its performances, and advances in the protection of life and property. In smaller cities with their volunteer fire departments and in private plants which maintain some sort of a department or other means of protection of their own, the engineering features such as the selection of new apparatus, repairs, hydraulic problems, etc., demand the assistance of someone with special training—and that someone is usually selected because of machine shop, engine room, drafting or surveying experience. With a good working knowledge of hydraulics to guide them,

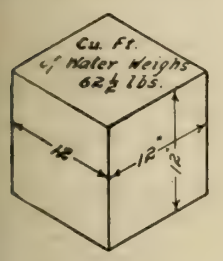


FIG. 1.

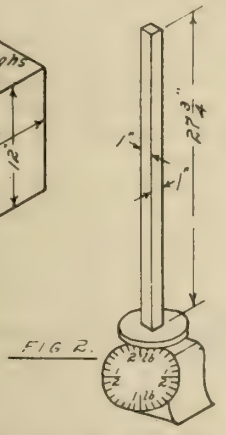


FIG 2.

FIG. 1—ILLUSTRATING THE WEIGHT OF WATER.

FIG. 2—SHOWING COLUMN OF WATER THAT GIVES 1 LB. PRESSURE PER SQUARE INCH.

men of the machine trades are particularly well fitted to assist in this work—often at the same time gaining an unusual opportunity to appear in public life, where their business habits of getting quick, definite results in an economical manner make a unique showing alongside of the average municipal proceedings.

The Water Supply

Back of the fire department there must be a water supply. Viewed from several angles, the supply is of vital importance to all residents of a community. Except in new communities, a means of water supply has been provided, it serving for domestic, fire, and industrial uses. Many plants have their own water supply, either to assure better and quicker results in conjunction with city service or, in the case of isolated plants, to provide the only means of fire protection that is available. Whether public or private, an adequate or a seemingly too adequate supply is a measure of economy, figured in terms of insurance premiums, if in no other. Incidentally, it may be stated that the fire loss of the world in times of peace is approximately two hundred and fifty million dollars per year!

There are three common sources of water supply, i.e., the gravity system which delivers water from a reservoir on a higher elevation; standpipes which furnish a substitute for the higher elevation and into which the water must be pumped, and some arrangement of cisterns or wells from which the water is pumped into the mains. This latter system is in very limited use—the constant expense of pumping and the restricted quantity of water available making such a system of value only in special cases, though for industrial fire purposes where a positive source of power is to be had, pumps are recommended.

Villages that are not in a position to instal a gravity system, either from geographical or financial reasons, find the standpipe admirably adapted to their needs; pumps of some sort are required to keep the supply full, but it is often possible to arrange the installation in connection with some other work, thereby decreasing the maintenance expense. Standpipes are tanks, generally of metal, set upon a solid foundation on the highest elevation near at hand. Before the general introduction of elevated tanks, standpipes were often used for factory protection.

But the most widely adopted and satisfactory water supply is the reservoir, fed by rainfall alone or in conjunction with springs and streams. Its location is selected from a number of possible sites in which elevation, watershed, distance from the community it is to serve, cost of reservoir and pipe lines, and further expansion of the system are the factors weighed in making the selection. Maintenance is but a small item if the work is well done in the beginning, and it might be added that such a water system will not only pay dividends, but it will have the distinction of being the one self-supporting department in the community. A well-laid-out system will provide an abundance of water at all times, and this at a pressure that is not so high as to cause serious leaks in the piping and yet is ample for all needs.

The Part of Gravity

Gravity plays the leading part in the great drama of water. The reservoir, or gravity system depends upon this phenomenon for its action. Nearly all hydraulic calculations contain the factor of gravity or one that is deduced from it or is a substitution. The force with which the stream of water issues from the faucet is due to gravity and is the same in amount as if the water had fallen from directly overhead the same height instead of having come through long lines of pipe—there is, however, some loss in coming through pipes and around bends.

Hydraulic measurements are not made by weight but by pressure, though as just stated the weight (gravity) is the basis of pressure. In Fig. 1 we see the familiar cubic foot of water that weighs 62½ lbs. Weights of all other substances are taken from this as unity—steel, for instance, having a "specific gravity" of about 8 and weighing about 500 lbs. for a cubic foot. If we could shape water into a rod 1 in. square and have that rod 27¾ in. high, its weight upon the scales, Fig. 2, would be 1 lb.; this is an important point—it should be memorized because the length ex-

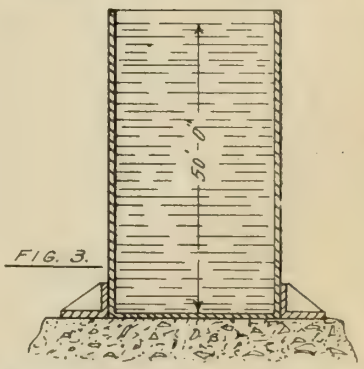


FIG. 3.

FIG. 3—TYPICAL STAND PIPE. THIS DEPTH OF WATER PRODUCES A WEIGHT AND PRESSURE OF 22 LBS. ON EVERY SQUARE INCH OF THE BOTTOM.

pressed as 2.3 feet is a frequently used factor in conversion. Our standpipe, Fig. 3, has 50 ft. of water in it—therefore the pressure on the bottom is 50 ÷ 2.3—22 lbs. per sq. in.

That water has weight every fireman can testify, but he seldom knows how much weight. A length of filled hose is heavier than most persons would guess; a one foot section of 2½ in. hose weighs 1½ lbs., and the water it holds, 2 lbs., making a total of 3½ lbs. as seen at Fig. 6—this is 175 lbs. for a 50 ft. length of hose without fittings! Water can be compressed but a fraction of one per cent. This property makes it invaluable in hydraulic machinery where thousands of tons pressure must be maintained. Water pressure is distributed equally in all directions as may be seen by reference to Fig. 4, where the piston in the left hand cylinder compresses the water, distributing the pres-

sure equally in all directions against the walls, as contrasted to the right hand piston which bears on a block of wood which transmits the same pressure directly and solely to the bottom.

The vertical height determines the pressure at the point of issuance. This height is called the "pressure head" or just "head"—it does not matter whether the points are directly over one another or miles distant, the vertical height

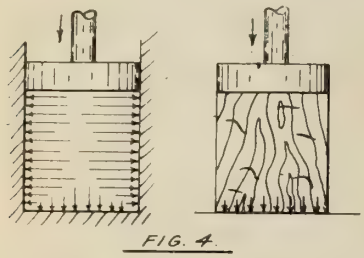


FIG. 4—AT LEFT WE SEE THAT WATER PRESSURE IS TRANSMITTED EQUALLY IN ALL DIRECTIONS. AT RIGHT WE NOTE THAT PRESSURE ON A BLOCK OF WOOD OR METAL IS NOT EQUAL.

remaining the same, the outlet pressure will remain the same, barring certain losses in the flow. Fig. 5 illustrates this point by an actual case from one city. Two hydrants were selected, one but an eighth of a mile from the reservoir and the other two miles away, but both having the same elevation, i.e., 150 feet below the surface of the water. Both hydrants are on the same 24 in. main, and according to the law of "head," both should show the same pressure, which they did without about one per cent.

Filters as a part of the municipal water system cut off some of the pressure—that because they are situated below the level of the reservoirs about ten to twenty feet and the water going into the mains partakes of a head based on the elevation of the filters. This means a loss of five to ten pounds pressure in the mains which may cut down the effective pressure for fire or high sections served so that pressure filters have to be installed, these being filters which have the pressure put back (so to speak) by pumps.

Besides weight and pressure, the factors of friction, velocity, and discharge figure largely in hydraulics. It is often said that water seeks its own level and rough calculations (?) are made upon such action. Water does seek its level but it never reaches it in any but a closed system, i.e., one where there are no discharges and where the water has time to adjust itself—the level is not reached until motion has ceased. The factors mentioned at the beginning of this paragraph are responsible for failure to reach the level in an open system.

The Hydraulic Grade Line

The height to which water will rise in a flowing system is shown by what is called the "hydraulic grade line," an imaginary line drawn from the surface of the supply to the last point of discharge; if at any point along the main, a tube were erected, the water would rise to that line—also if any part of the main rises above the line or some part of the city is above it, water will not flow there unless pumped or siphoned. Knowledge of the principle of the hydraulic grade line is of interest to firemen in noting the greater pressure at some locations than others. Fig. 7 shows an easily constructed model to illustrate and prove the principle; it will be seen that the water rises to the line; but if the outlets were plugged, the water from the tubes would spurt as high as the level in the tank.

The fireman must take the water at the hydrant as it is. The path from the main to the nozzle is usually shown as by Fig. 8, and the relative areas and capacities as shown at Fig. 9. The 4 in. pipe leading into the hydrant looks much too large for the 1 in. nozzle which the fireman uses—and it would be if the rate of flow were the same in each, which it is not, a nozzle being a device to increase the speed of delivery and thus needing a large feed pipe.

The fireman works with movable equipment—pumps, hose, and nozzles. Special formulae have been worked out for use in this connection because the standard formulae of hydraulics do not fit these special conditions. In big pipes, water flows along easily—the water in the 24 in. main at Fig. 5 loses but 1 lb. pressure in two miles of travel and it discharges over 16,000 gals. per min. (constrast this with a 3 in. pipe laid over the same stretch which would discharge only 20 gals. per min. to see the efficiency of large pipes). A familiar formula for discharge is:

$$\text{Gals. per min.} = \sqrt{\frac{D^5 \times H}{L}}$$

D in inches, H in feet, and L in yards.

Water is restricted in its flow by a number of factors such as—the resistance it offers to entering the pipe at the reservoir, friction in running through the pipe due to rough interior and confinement, bends in the pipe, branches leading off, and changes in the size of the pipe.

Friction

Friction is the big item of loss both in pipes and hose. Iron pipes are subject to a disease called tuberculation, a raising up of lumps on the interior, hastened and aggravated by an imperfect protecting coating at the time of manufacture. Tuberculation not only decreases the effective area but it makes this roughness which is the cause of so much friction. There is friction of liquids just as there is friction of solids and just as a weight is more easily shoved over a glass surface than an unplaned board, so water moves more easily through smooth vessels.

Fire hose is lined with rubber to make the interior smooth, as well as to make it waterproof. The friction of water moving inside good rubber lined hose is fully one-third less than through iron pipe of the same inside diameter. But when the lining gets worn, the friction may rise 50 per cent., showing that to get the required discharge worn hose must be replaced. This friction on the interior has been termed "skin friction."

The usual way of stating friction is to speak of it as so much loss of pressure in lbs. per sq. in. or as the pressure lost in 100 ft. of hose or pipe. In passing through a hydrant there is a loss of pressure of from 2 to 3 lbs.; and in connection with this it might be added that that is less than the friction loss in a hundred feet of good hose carrying only 150 gals. per min., showing that it is false economy to space hydrants too far apart.

Friction varies:

(1) Increases directly with an increase in length of pipe or hose.

(2) Increases directly as the inside diameter gets smaller.

(3) Increases as the square of the velocity.

(4) Increases with the flow.

Rule 4 is not commonly stated because it follows from rule 3, but it has been added here to emphasize the point, for firemen are apt to expect greater discharge than is actually realized by trying to increase velocity. As velocity is simply rate of speed, naturally more water will pass through with increased velocity, but a proportionate increase is retarded because the friction increases so rapidly. Table 1 gives the friction loss in 2½ in. hose for several rates of flow; considering eight or ten lengths of hose with a given flow and with twice that flow, we see that very little pressure can survive by the time the water reaches the nozzle.

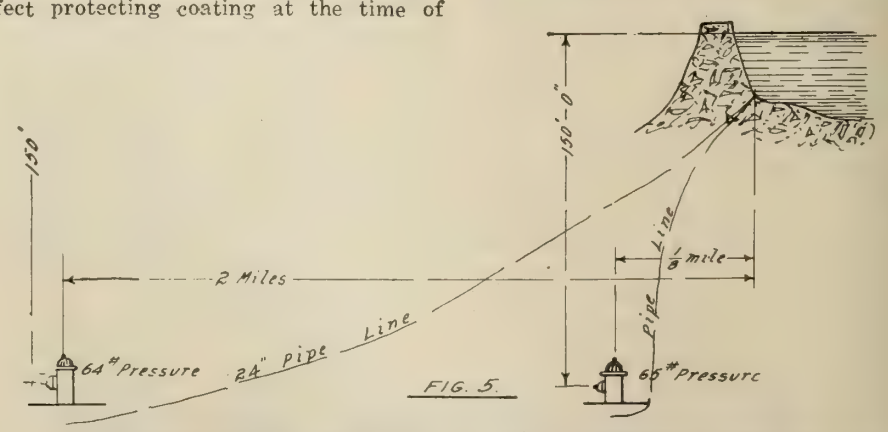


FIG. 5—ILLUSTRATING LAW THAT THE HEAD DETERMINES PRESSURE AND DISTANCE HAS VERY LITTLE EFFECT.

At the fire, the fireman has little time for hydraulic calculations. He is concerned with water where he wants, when he wants it, and with the most speed, and to attain his ends he must practise applied hydraulics, either knowingly or not. The Siamese is a device to get the same amount of water to a

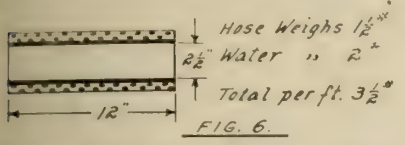


FIG. 6—SECTION OF FIRE HOSE AND ITS WORKING WEIGHT.

given point without such a great friction loss as obtains with a single line, that means more water because the velocity will not have been reduced to such a great extent. A study of the right hand column of table 1 shows at once the gain resulting from the Siamese—not to know the value of the Siamese may mean defeat at a big fire or when water is limited.

Returning now to the four rules of friction we find other chances for their practical application. Rule 1 shows why long hose lines should be avoided—thus, if there is a loss of 5 lbs. pressure in one length of hose, there will be a loss of 50 lbs. in ten lengths, which may absorb the entire pressure from the hydrant. Long lines of hose have no excuse for their existence, in most cases, except to furnish work for firemen.

Rule 2 does not affect the fireman because the size of hose and water mains have been fixed long before he arrives. Two and one-half inch hose has become standard except for the high pressure service in big cities, where 3 in. hose is used. For information it will be stated that the friction loss in 3 in. hose is less than half that in 2½ in. hose.

Rule 3 shows that if the water is forced through faster, the friction increases at an alarming rate. As previously stated in connection with flow, increasing the velocity is not always a good policy for a point is reached where the friction actually holds the water back and no gain is realized.

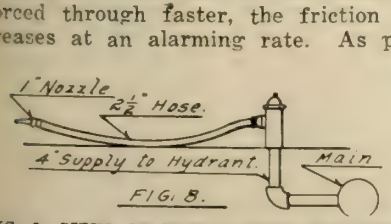


FIG. 8—SIZES OF USUAL FIRE EQUIPMENT.

Our knowledge of friction, then, tells us that more water is obtained for fire use—by keeping the lines short, by having only hose with smooth lining, and by limiting the velocity to, say, that corresponding to a nozzle pressure of 70 lbs.

Velocity

Velocity, as a rate of movement, may be expressed as feet per sec. for water, or in the case of a train, as miles per hour. There are two sources of velocity of the fire stream—"head" and pumps, which create an artificial head. Then we have nozzles which are a device to increase velocity.

Either by reason of the heat or of inaccessibility, it is seldom possible for a fireman to get within anywhere from ten to a hundred feet of the blaze—his stream of water must bridge this space and to do that effectively it must have some force to carry there. An effective fire stream is one that will pass through a ten inch circle at the point of consideration, that has not broken up into spray at that point. The effectiveness of a stream depends upon its velocity and its discharge. If a fireman pointed the open end of a length of hose toward a fire, the hose would discharge just as much water as if it had a nozzle attached, but the water would never reach the fire, it would fall but a few feet from the open butt. The reason for this and for the use of nozzles will be made clearer by a little elementary hydraulics.

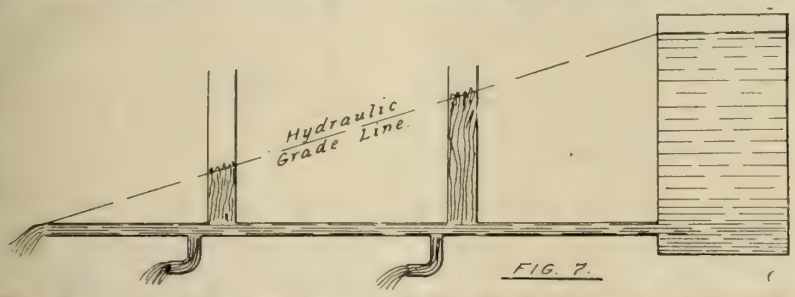


FIG. 7—MODEL USED BY AUTHOR TO SHOW THAT WATER DOES NOT RISE TO ITS LEVEL WHEN DISCHARGING. PIPES ERECTED AT ANY POINT WILL FILL ONLY TO HYDRAULIC GRADE LINE.

The common formula for a velocity is $V=\sqrt{2gh}$ where V is in ft. per sec. and h is the head in feet, while g is of course 32.16 (gravity). The principal use for this formula is in finding the velocity at a nozzle when the pressure is known, altering the formula to terms ob lbs. per sq. in., as $V=\sqrt{4.6gp}$. As an example a nozzle pressure of 70 lbs. gives a velocity of $\sqrt{4.6\times32\times70}=101$ ft. per sec., which is at the rate of 70 miles per hour. A 40 lb. nozzle pressure equals 51 miles per hour, showing that a fire stream travels at a high rate. The velocity from a pipe line is effected by conditions previously named, one formula for this being

$$2.3\sqrt{\frac{h\times d}{.02\times1}}$$

Based on this formula, the pipe line of Fig. 5 should show a theoretical velocity of 98 ft. per sec., but actual tests showed it to be only 86 ft. per sec. during the day time.

FLOW IN GALLONS PER MINUTE.	1 – 2½" LINE.	2 – 2½" LINES SIAMESED.
150	5·9	1·8
200	10·1	2·8
250		
300	21·2	5·9
400	36·2	10·1
500		

TABLE 1.

Nozzles convert volume into speed, just as the narrow ravine forces the brook to travel faster than when flowing through the wide meadow channel—the flow is practically the same in either case. The shape of the nozzle has much to do with keeping up the volume; thus in Fig. 10 if a hole is cut in the side of the standpipe as at A, the flow will be less than three-fourths what it would if a nozzle were applied as at B. The loss at A has been termed the "contracted vein." The velocity at the point of issuance is the same as it would be if the water had fallen a height equal to the head.

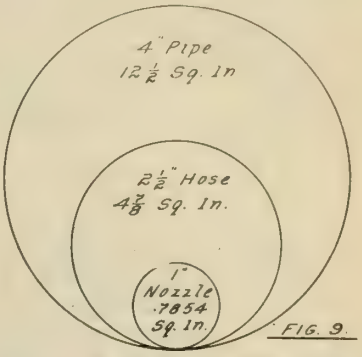


FIG. 9—ACTUAL SIZES, SHOWING ALSO RELATIVE CARRYING CAPACITY AT THE SAME VELOCITY.

As the velocity is the "get there" of the fire stream, anything that decreases it should be avoided as much as possible. Velocity is reduced by sharp bends, roughness inside the line, fittings, and changes in size. To what survives, we owe the activity of our fire streams. The range of a stream of water discharging horizontally is illustrated by Fig. 11, and calculated by the formula $R=\sqrt{4hy}$. In fire work, the streams are seldom horizontal and there is seldom any means of knowing the head, therefore, the range—or "reach"—as it is called is found from the pressure at the nozzle, and the latter determined by a gauge applied to the stream close to the point of issuance. Nozzle pressures and fire distances vary so much that tables have been prepared showing the maximum reach on an effective stream at many

NOZZLE PRESSURE.	20	25	30	40	45	50	55	60	65	70	80	90
V.	35	43	51	64	69	73	76	79	82	85	89	92
H.	37	42	47	55	58	61	64	67	70	72	76	80

TABLE 2.

different pressures, of which the Table 2 is an abbreviation. What are called "horizontal" and "vertical" distances in the table are shown by Fig. 12. The figures of Mr. John R. Freeman, determined nearly thirty years ago, have been the recognized standard for fire streams—he fastened his hose to heavy planks for his experiments and directed them at the angles of Fig. 12.

It will be noticed from the table that

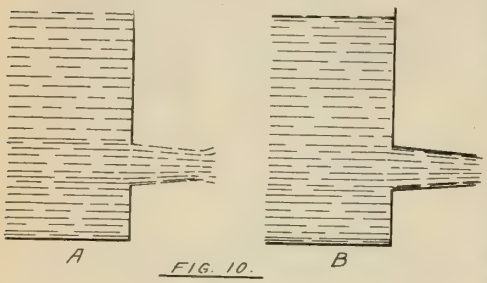


FIG. 10.

FIG. 10.

the increase in nozzle pressure is not accompanied by a proportionate increase in reach—this shows us the folly of trying to get more water, and that further, by increasing the pressure—somewhere around 50 lbs. at the nozzle is the most efficient stream. It will be also noticed that the vertical reach is greater than the horizontal. Table 2 is the reach with a 1 inch nozzle, the reach with other sizes up to 1½ inches do not vary 2 per cent. from this, showing that size of nozzle has nothing to do with reach.

Discharge

The discharge from a pipe is found from the formula to be Q=gals. per min.=.04d^2×vel. Greater velocity means greater discharge both from a pipe and a nozzle. To obtain the discharge from a nozzle when the pressure is known, the formula is D=29.7$d^2\sqrt{p}$. As an example a 1 inch nozzle at 60 lbs. gives 216 gals. per min. This formula is near enough for practical results, but differs from actual discharges calibrated and compiled into tables—the tables give 229 gals. for the conditions named in the last sentence—the use of co-efficients brings the computed discharge up to the tables, but as it is difficult to remember these for all conditions, D=30$d^2\sqrt{p}$ is sufficiently accurate for field work. Due to the contraction named and shown by Fig. 10, an opening of the sort at A or the flow from a hose end—open butt—is materially reduced from that if some form of nozzle is provided, the open butt showing a discharge of only 70 per cent.

It is often desirable to know the discharge, but the nozzle pressure is not known though the pressure at the hydrant or the pump is. The discharge through lines of hose depends upon their layout—long lines of hose, hose carried up ladders, and sharp bends cutting down the discharge very much; in such cases the pressure at the hydrant or at the pump, if one is being used, does not indicate the ratio of discharge—it indicates certain operating conditions which build up the pressure at that point. This pressure may be used to find the discharge by the use of a formula in which N.P. is the nozzle pressure, E.P. is the pump or hydrant pressure, L the number of 50 ft. lengths of hose, and K a constant from the table 3.

$$\text{Then N.P.} = \frac{\text{E.P.}}{1.1+KL}.$$

An example is 2 lines of 2½ inch hose Siamesed into a 1½ inch nozzle with the pump showing 140 lbs. The N.P. then will be

$$\frac{140}{1.1+135\times 2} = 104 \text{ lbs.}$$

Knowing the nozzle pressure and the size bore, the discharge can always be found by the formula previously given, for our example D=30×1½$^2\sqrt{104}$=681 gals. per min.

The constant K has to be selected according to the number and size of lines and the bore of the nozzle. Only values for 2½ inch hose have been given in this table. Sometimes the nozzle pressure is known and the hydrant pressure is not and it is desired to form an idea of the latter; in such a case the discharge formula is translated into E.P.=N.P.×1.1.+KL.

It takes pressure to get water through long lines of hose with their friction and up ladders with the loss of head and weight of water and through small nozzles converting to velocity. A few localities have sufficient pressure for any fire demands, but most cities do not and the water in the mains has from 20 lbs. to 60 lbs. pressure. Pumps of the stream or motor-driven variety must then be employed for fire departments and power pumps for industrials. Pumps increase pressure—they are usually capable of increasing it beyond what hose will stand for long.

As has been said, the gauge on a pumping engine is indicative of the work the machine is doing—not of the amount of water the firemen are getting. That should be firmly fixed in mind. Enthusiasm in volunteer departments turns often to getting a high pressure at the machine instead of water on the fire. A couple of good, effective streams on the fire are better than a dozen poor ones. The same enthusiasm frequently leads to the laying of so many lines that none delivers an effective stream. The writer has seen first-class pumpers virtually useless because placed where the supply had already been tapped by many hand lines of hose—the pumper could get but little water, and this it was distributing through long lines to fearless men who couldn't reach above the first flo Very likely the taxpayers of that co munity would be asked to enlarge t water supply, when the whole troub is lack of knowledge of hydraulics those in charge.

Lines which are carried up ladders through water towers or standpipes not discharge the amounts of the fo mulas given unless first the engine pre sure is decreased by an amount whi is the height of rise multiplied by .43 The gain in carrying a line up a ladd or in a building is that of obtaining better point for play of the stream-there is no gain of velocity or discharg

Where there is a pumper, it is of i terest to know its capacity as compare to the delivery of the main from t reservoir or as compared with so stream that may flow through the tow and which might be called upon to su ply water for a serious fire. Very fe streams of size that have not had the flow measured at some time or other-suppose that it was found to be 31,0 gallons per minute—that would equ the rated capacity of thirty-one pumpe of standard 1,000 gallon capacity;

NOZZLE SIZE.	1 – 2½" LINE.	2 – 2½" LINES SIAMESED	3 – 2½" LINES.
1"	.105	.025	
1⅛"	.167	.043	
1¼"	.248	.066	.028
1⅜"	.505	.135	.061
1¾"	.907	.242	.115
2"	1.55	.413	.190

TABLE 3.

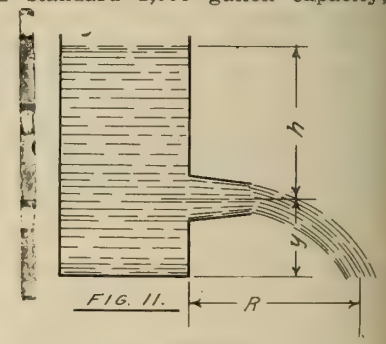


FIG. 11.

FIG. 11.

considering the main in Fig. 5, that wil deliver about 10,000 gallons per minute which equals the delivery of ten ma chines of the assumed capacity.

The selection of the best kind of pum is a matter of local conditions. A pum for stationary fire service may be of the gear type, centrifugal, or piston pump the triplex pump of the latter type be ing highly in favor with the under-writers. The matter of drive for the pump has much to do with the type selected; for instance, the centrifugal pump makes a good outfit in combination with either an electric motor or a steam turbine for the drive is direct connected, and such a set is compact and efficient.

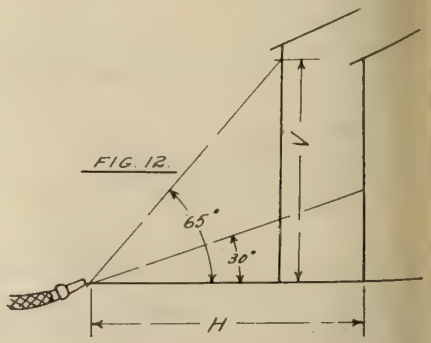


FIG. 12.

FIG. 12.

For use of the fire department, the modern trend is almost wholly toward motorizing. The steamer which has served so faithfully in the past has been outclassed by the gasoline pumper, which by this time is thoroughly reliable, and which has far greater capacity and speed than the steamer of the same weight. Only in Northern localities is there raised an objection to motor apparatus—that of inability to negotiate snow of depth. However, at time of the heaviest snow falls it is impossible for horses to draw any but light loads, and for a team to pull a heavy steamer is practically the same. During the severe blizzard of 1915, one third-class city was so tied up that not a vehicle of any sort moved for three days, except a seven-ton motor-driven pumper, newly purchased, which the driver in his enthusiasm took from the house against orders and successfully made a round of the town.

There is the usual three types, gear, centrifugal, and piston, to select from in the purchase of a motor pump. The gear pump is used by the most manufacturers, and is well and favorably known. Its objections may be summed up as pulsations of the stream and of the hose (not serious), wear of the gear teeth, and trouble with foreign matter if drafting from open water. The centrifugal pump has all the good qualities of stationary centrifugals; the centrifugal is a velocity pump, the pressure it delivers increases with the square of the velocity of the impellers. As there are no close-fitting parts it does not deliver a positive amount of water at all times, and it will not pump at pressures much over 200 pounds per sq. in.; having no fitting parts, it cannot create a vacuum, and when drafting, has to be primed. Its efficiency is the lowest of all the pumps, 65 to 70 per cent. on the verage, but its freedom from trouble and ever ready qualities make it desirable for fire service. Stationary pumps of this type are used for the high-pressure systems in all the big cities.

The piston pump, gasoline driven, has proven quite successful, one make (Ahrens-Fox) having performed a feat never attainable with the steam-driven piston pump, i.e., that of pumping water to the top of the Woolworth Building in New York.

Canadian Machinery Drafting Course—Part VII

We Now Take Up Orthographic Projection, Showing Proper Representation of Objects. These Are All Simple Pieces Found in General Working Practice and Should be Carefully Studied

By J. H. Moore, Associate Editor, Canadian Machinery

THE subject of projection drawing (or orthographic projection as it should be properly termed) is one of very vital importance, and one which, to make a success of this course, must be given fairly good space and treatment. In order to make the same interesting to the students in general, we will use (as far as possible) objects with which the machine apprentice is entirely familiar. In this way the subject becomes more interesting, and the fact that the machine apprentice knows from actual experience that such objects really exist, guarantees that the apprentice in the drafting room will likewise be well aware of their existence. Perhaps a good heading to begin with would be the statement as follows:

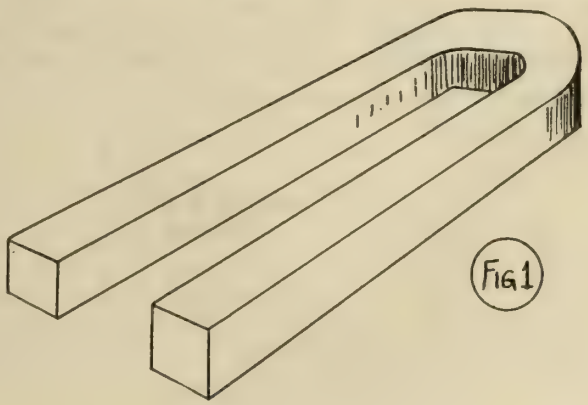
The Representation of Objects

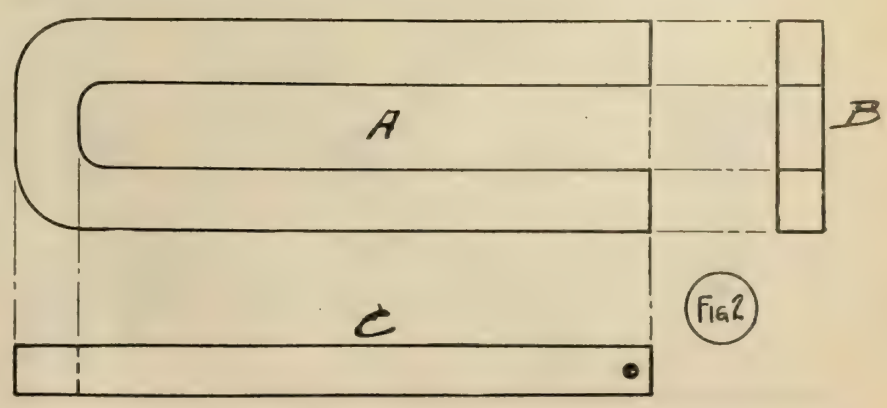
In Fig. 1 we will illustrate a clamp of the usual nature found in most machine shops. Its uses are varied, as far as the various styles of machines used on, but as is well known, its main function is to clamp. This object is drawn as it actually appears when the eye of the observer is in some certain position. As can be well understood, this sketch at Fig. 1 does not show the true length of the various lines, in fact this sketch is simply known as a perspective drawing. Such a sketch is of no practical value to the machinist or tool maker, except to show what the object looks like. Of course, on a simple piece, such as this illustrated, one could easily work from the same if dimensions be placed on it, but without dimensions it is useless as an actual working drawing, for in no way can you measure the true length of the lines.

In order to represent this object in such a manner that any line can be measured directly we employ the method called projection drawing. In a perspective drawing various sides are shown but in a projection drawing only one side is shown at a time, the others being hidden.

Let us illustrate this point by referring to Fig. 2, which shows the same clamp drawn up by the projection method. First let us consider the view A. This view is what is termed a top view, or plan view, namely a drawing which represents the object as if it were resting on a horizontal plane, and the observer looking at it from above.

But from this view we get no idea





how thick this clamp is, and if the slot runs clear through its thickness. In other words we must have a front view, or front elevation. To get a complete idea of the side appearance of the clamp we need a side view or side elevation, so we will now proceed to view B at Fig. 2, where we see the front elevation, that is the view drawn by imagining the eye to be so situated that the observer looks directly at the front of the object. The result is clearly shown.

The side elevation is now drawn, as if it were projected on a vertical plane at right angles to the horizontal plane. The projection of such a view would look like that shown at C.

In order to show these various views in a manner that one view cannot be mistaken for another, they are always arranged on the drawing in a certain fixed and invariable manner. Fig. 3 illustrates another well-known object, namely an angle plate. To illustrate the principle clearly we give dimensions on the perspective sketch, from which we will proceed to make a projection drawing.

Starting at the plan, we draw the view shown at A. We next project the two elevations as illustrated. It is a matter of taste which of these three views you start on, for it makes no difference which is drawn first, but the general arrangement is always as shown.

Any departure from this standard arrangement should be guarded against, but should for some reason or other, the draughtsman decide to change the relation of these views, he should state clearly on his drawing the change made and why.

The broken centre lines are used to show the connection existing between the different views of the object, and to

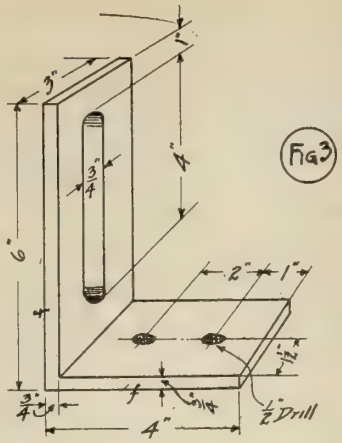
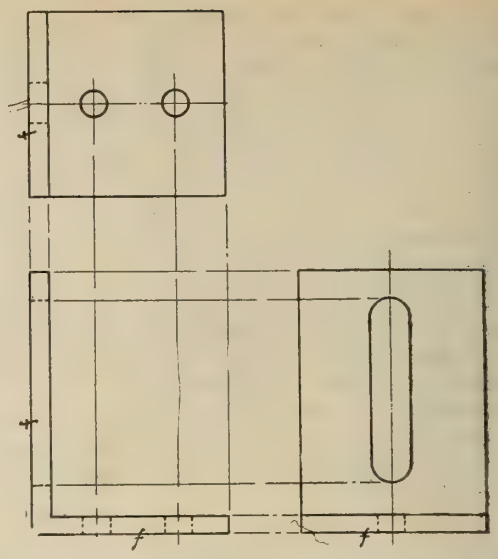


Fig 3



indicate axis of cylindrical surfaces of any kind, but as the best method of following out a subject of this nature is by an actual study of the objects, let us go on to discuss plate No. 7.

As per usual, 9 x 13 in. is to be the actual drawing size, and 9½ x 13½ in. the trimming sizes. Preserve the 1 in. space at the bottom for title purposes as usual.

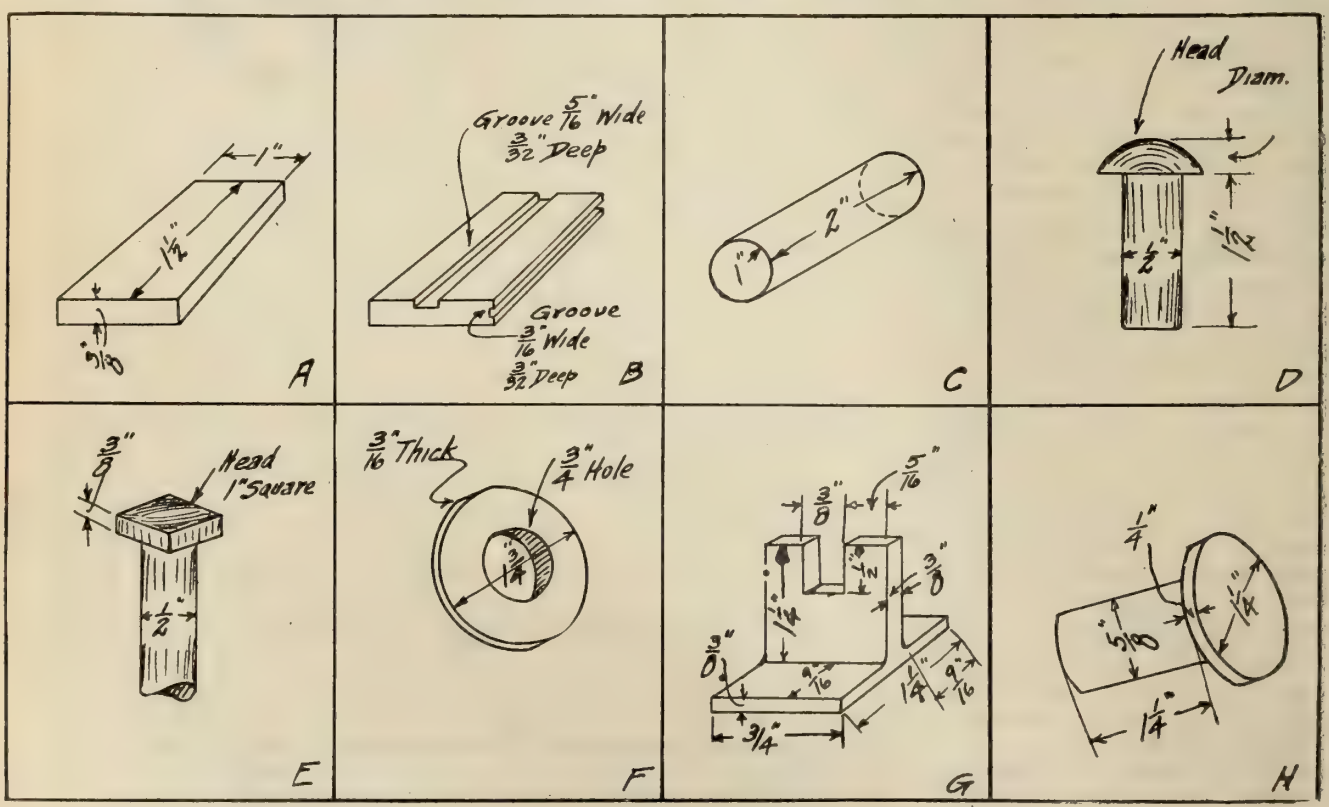
To aid the student we illustrate a chart at Fig. 4, showing rough sketches of the various objects about to be discussed for projection drawing on this plate.

A, the first object, represents a tool steel block 1½ in. long, 1 in. wide and ⅜ in. thick. B represents this same block after a groove had been cut on two of its sides as shown, these grooves being 5-16 in. wide on top, and 3-16 in. wide on side, each being 3-32 in. deep.

At C is illustrated a cylindrical piece of tool steel, while D represents a rivet of the round button head type. E shows a square head bolt, while F represents a round washer, numbers of which can always be seen around a machine shop, of all thicknesses.

In each case dimensions are given, so that to transfer from the perspective to projection becomes an easy matter.

Students will notice that for the objects, C. D, E and F, only two views are given. The reason for this is no doubt self apparent, namely that were we to draw a third view of these pieces, it would be simply a repeat of the side elevation, for the pieces being round the front and side elevations are similar. This, of course, does not always apply, for in the more difficult cases of projec-



tion more views than even the three already spoken of are required, owing to the intricate nature of the object, but as this is really a more advanced subject, we will keep for the present to the three views, or two as the case may be.

We have divided this plate No. 7 into 8 parts as shown, leaving the last two spaces vacant, for a good reason.

In order to make sure that students have grasped the principle of projection, we have illustrated on Fig. 4 two objects G and H. These objects are well known, namely, first G is a small, simple bracket from a machine. All dimensions are plainly marked. H represents a flanged piece of work, usually made up in most machine shops for various types of work.

Now, the object is as follows: Study these sketches carefully, then draw up your idea of what a projection drawing of these pieces would look like.

Put all dimensions on the various views on this plate, and use the illustration of plate No. 7 as shown with this article for a guide. Above all stick to it, and send us your work. The long winter evenings are here, so you have plenty of time and by following up this course you are building up something which will bring you returns at some future date well worth the present sacrifice.

INTERESTING EXHIBIT

The Exhibit of the Black & Decker Mfg. Company, at the November Jobbers' Convention in Chicago will consist of a complete line of the Black & Decker Lectroflater electric air compressors, portable electric drills, electric valve grinders.

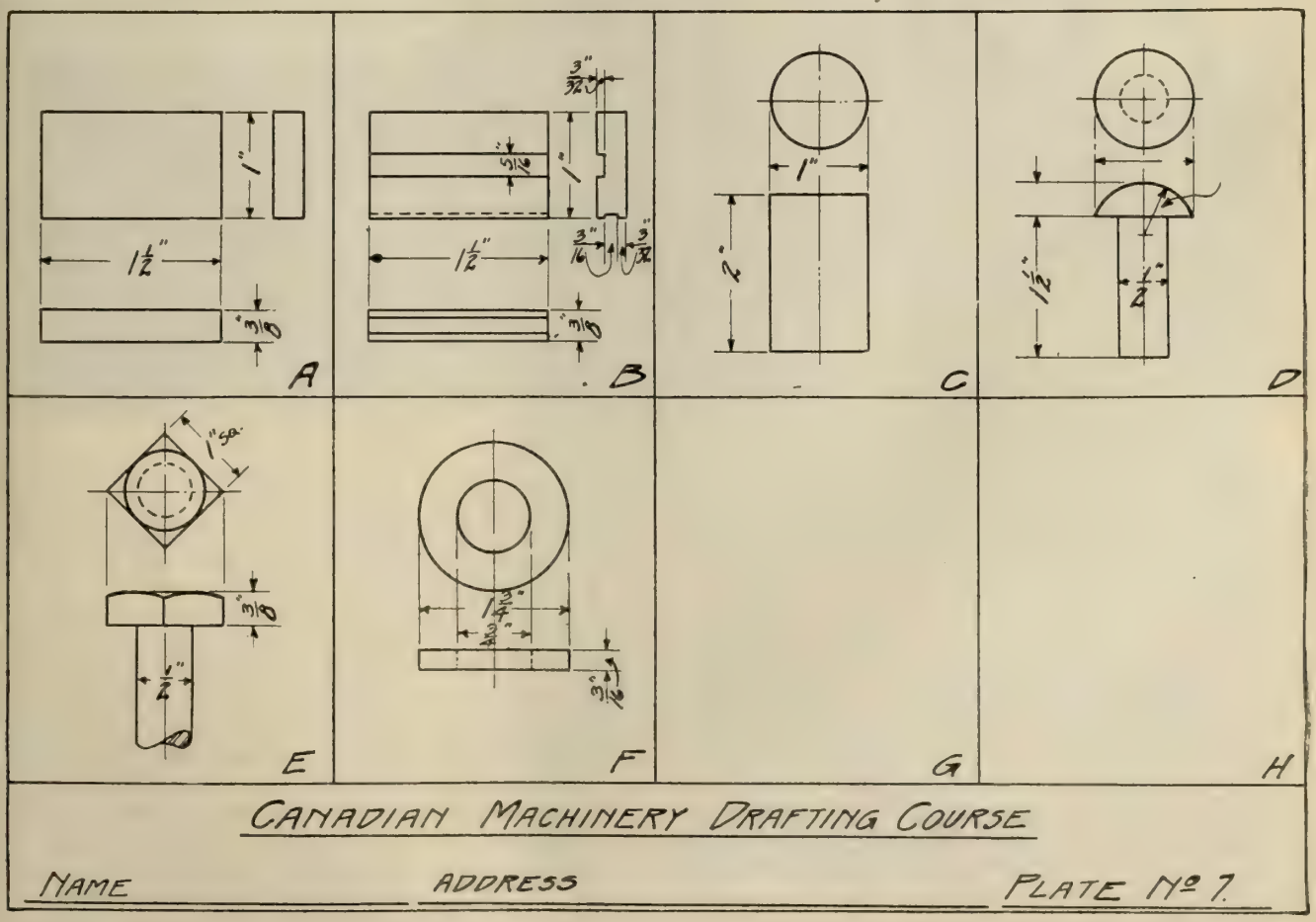
The outstanding characteristics of the electric air compressors is their unit construction, the motor gearing and compressor being built into one housing. The portable electric drills and electric valve grinder are unusually attractive in appearance and are distinguished by "The Pistol Grip and Trigger Switch," a patented method of control similar to an automatic pistol.

The display racks on which the Black & Decker valve grinders and drills will be shown are the same as are being given to the company's stock jobbers for displaying these goods effectively in their stores. They are quite elaborate metal racks nearly six feet high and hold one electric valve grinder and four different size electric drills. They are black enamel and at the top of each is an enamel sign bearing the company's name and arranged with holders for circulars. The supplying of these racks in large numbers to company's stock jobbers throughout the country and in fact all over the world, is an interesting example of advanced merchandising.

Actual electric air compressors, electric drills and electric valve grinders, cut out to show their construction and operation, will be attractively mounted on hexagonal display boards—(the company's trademark being hexagonal in shape)—and the various cut-out models will operate under their own power at slow speeds in order to demonstrate the actual functioning of each part. Complete sets of parts for the different machines will be shown, also mounted on hexagonal boards. Elaborate preparations have been made for next year's campaign, the details of which will be disclosed at the shows by those in charge. For this purpose elaborate portfolios have been prepared, showing the products and going into some detail in regard to their merchandising, showing the type of advertising which the company has been doing and the various sales helps which they have prepared for their jobbers.

It is hoped to make the exhibit unusually attractive, interesting and instructive, and it will doubtless create considerable favorable comment, as it is more than an aggregation of products miscellaneously displayed.

New Bridge Over Niagara. — The C.P.R. has been surveying a route for a new bridge to carry their tracks over the Niagara River. The bridge would be located about one and a half miles above Black Creek. The survey has had the effect of raising property values along the route, and large sums have been paid for farms.



A Unique Ore Unloader for Lake Steamers

This Device, Known as the W.S.M. Automatic Ore Unloader, Has Many Points of Interest Which Will Appeal to Our Readers in General

THE automatic unloader shown in the accompanying illustration is unique in design and has proved through many years of service to be a most successful device for unloading ore cargoes from lake steamers. Although of immense proportions, the design has been simplified and the control perfected to such a point that the machine is the last word in delicacy of control and operation.

The unloader consists of a main framework mounted on trucks which travel along the runway rails which are located approximately as shown in the photograph. The main framework extends back to the rear runway over a temporary storage pile where the ore can be discharged if desired. Between the front and rear runways space is provided for railroad tracks where ore-carrying cars are placed under the machines and loaded with ore for transportation to the furnace plants. The girders of the main framework form a support for runway rails on which a trolley travels. This trolley supports a balanced walking beam, from the outer end of which a stiff bucket leg depends. At the lower end of this leg is the bucket, which is operated by machinery located on the walking beam. All horizontal movements of the bucket are accomplished by means of moving the trolley backward and forward on the girders. The vertical movements of the bucket are accomplished by the operation of the walking beam. The forward portion of the beam being out of balance, the bucket descending by gravity as soon as the brakes of the hoisting mechanism are released.

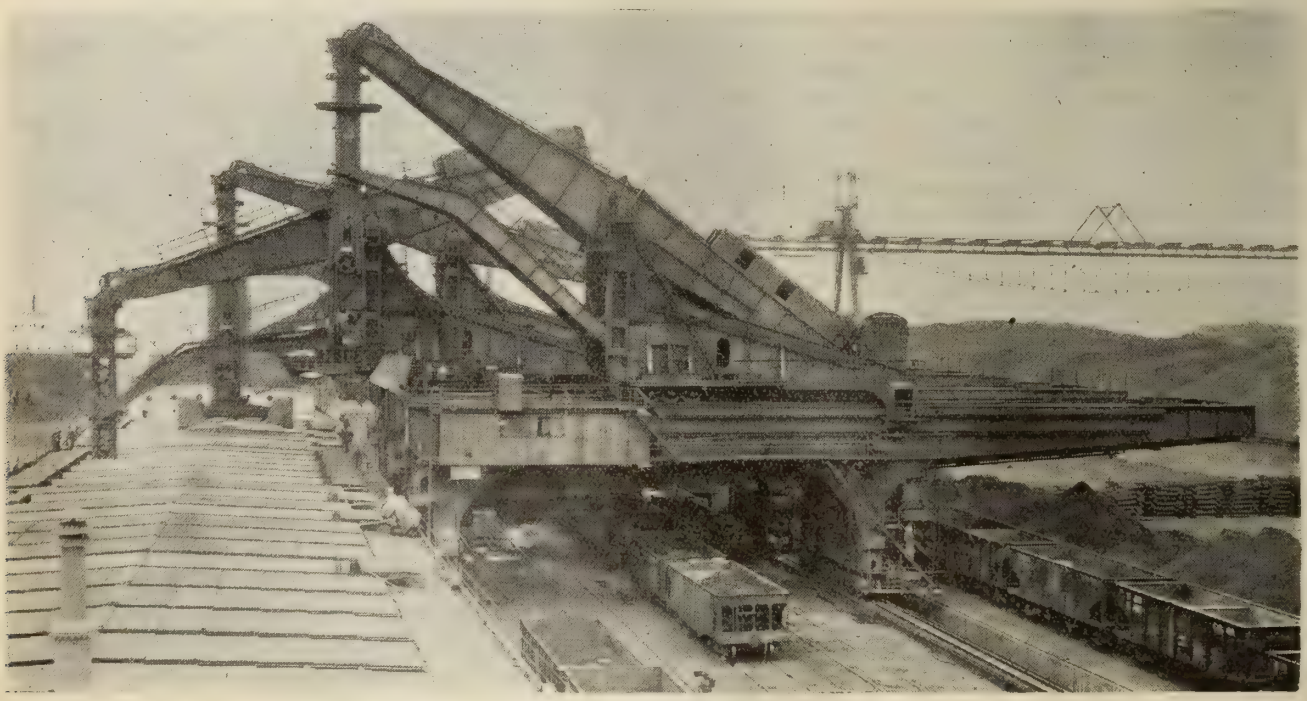
The hoisting mechanism controlling this operation is located in the enclosed house at the rear end of the walking beam. Ropes from the winding drums of this mechanism pass around sheaves located in the rear end of the trolley and are anchored to the rear end of the walking beam.

In addition to the main parts of the machine which we have described, there is also a receiving hopper located at the forward end of the main framework and between the main girders, provided for the purpose of receiving the ore discharged from the bucket. The capacity of this hopper is about three full bucket loads and its purpose is to act as a balancing point for the ore between the bucket and the cars or storage as the case may be. The bottom of the hopper is provided with outlet gates, and the contents discharged as required into a lorry, which runs on an auxiliary track suspended from the under side of the main girders.

The larry, after receiving its load from the main hopper, moves to a point so that its contents can be discharged either into the cars standing on the railroad tracks beneath the main span of the girders or into a temporary storage pile under the cantilever at the rear of the machines. The ore so placed in this temporary stock pile cannot be reclaimed by means of these machines as their function is solely one of unloading the cargo from the ships.

Machines of this type have been made in two sizes, the smaller size having a capacity of ten tons, and the larger size (such as is shown in the photographs) having a capacity of seventeen tons in the bucket shells. The machine shown here is electrically operated throughout and its speeds are regulated so as to operate through a complete cycle in about 50 seconds.

Some idea of the capacities of unloading by this method may be derived from a record which was made in Ashtabula by eight machines of this type having a capacity of fifteen tons each, unloading seven boats having a capacity of 70,000 tons in twenty-two hours' actual time. At other points four machines working in boats having capacities up to 13,000 tons have unloaded these cargoes in about three hours and twenty-five minutes.



CLOSE UP VIEW OF THE UNLOADERS AT WORK.

The operation of the machine is as follows:

After the boat has been placed alongside of the dock, the machine is moved opposite one of the hatches and the bucket is lowered through the hatch into the ore. After filling the bucket the walking beam hoist mechanism is put in operation and the bucket hoisted out of the boat. At the same time, the trolley is traveled back so that the bucket is brought over the main hopper between the girders in the main framework and its contents is discharged into this hop-

per. The bucket is then immediately returned to the boat for another load. The ore in the main hopper is discharged into the larry which has been brought to a point directly underneath the discharge gates of the hopper. The larry hopper is filled and the larry is moved into position so as to be handled by the bucket.

The motor for operating and closing of the bucket is located in the machinery house at the back of the walking beam. Ropes from this bucket-closing mechanism are carried through the walking beam and the bucket leg and attached to a power drum in the bucket leg directly over the operator. This power drum is geared to the closing chain drums, one of which is shown on this photograph. The bucket is opened by reversing the motor and the bucket shells are forced open by means of an opening chain located in the centre of the bucket leg between the two closing chains.

DOCKS AT ASHTABULA. EIGHT UNLOADERS ARE USED, EACH WITH 15-TON BUCKET. 76,000 TONS IN 24 HOURS IN CAPACITY OF THESE DOCKS.

over the desired discharge point and the gates of the larry hopper are opened, discharging the ore as required. The larry hopper is provided with scales so that the contents is accurately weighed and recorded. In this way a car can be loaded to its allowable capacity and an accurate record kept of the amount of ore so discharged into the car, thus eliminating the necessity for the use of track scales.

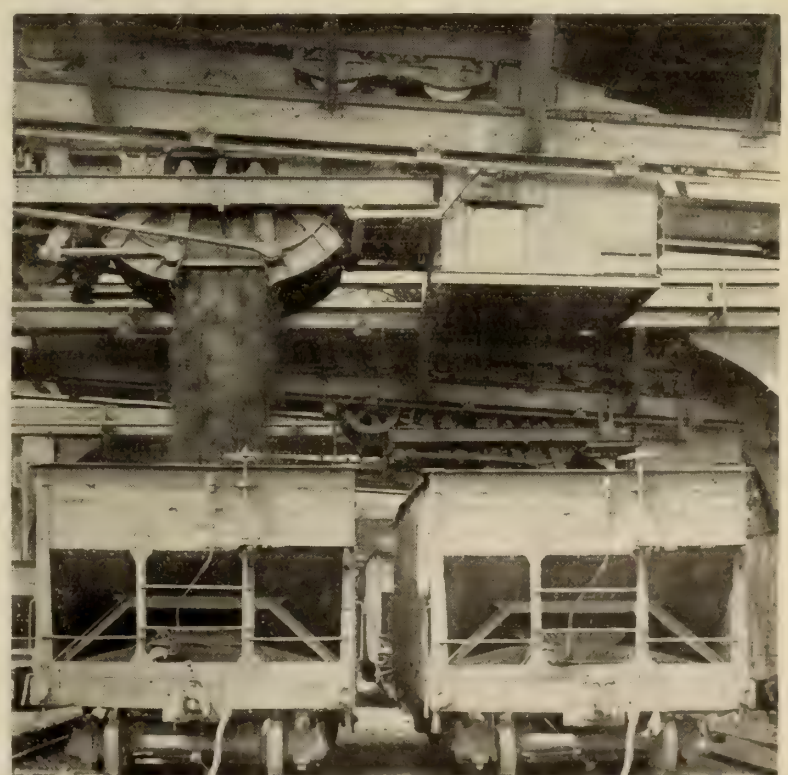
If railroad cars are not available for immediate shipment the larry is traveled to a position on the rear cantilever and its contents discharged into a temporary storage pile, from which it is usually reclaimed for shipment or storage by means of a bridge located on the runway at the rear of the unloader.

Only two operators are required for the entire operation of one of these machines. One of the operators, whose station is in the bucket leg directly over the bucket shells, controls all of the motions of raising and lowering the bucket, of traveling the trolley back and forth and moving the machine along the dock from one hatch to another. The second operator is stationed in a cab on the larry and from this station he controls the movement of the larry, the operation of this larry gates and the weighing of the ore.

The bucket shells are each made of a single piece of plate formed to the shape as shown on this photograph. These bucket shells are usually provided with manganese steel cutting lips, which are essential to resist the abrasive action of the ore. The bucket shells themselves are carried on heavy cast steel arms mounted on rollers traveling in guides in the fixed portion of the lower end of the bucket leg. The position of the operator who controls the operation of the bucket, etc., as previously described, is also shown on this photograph. The view shows the bucket in operation in the hold of the modern ore carrier after most of the ore has been removed and the balance of the ore has been scraped bucket leg itself, the ropes being carried back in the walking beam to a rotating mechanism which is located adjacent to the bucket-closing mechanism. The bucket leg itself is carried on a roller bearing which is attached to the top end of the leg. This motion is introduced for the purpose of turning the bucket at right angles to the hatchway in order to secure as great a reach lengthwise of the boat as possible, thus the bucket is enabled to reach out under the hatches and remove ore which is not directly beneath the hatch opening. The distance from point to point of the bucket shells when open is approximately 21 feet.

The scale larry, into which the main hopper discharges, has a capacity of between 35 and 45 tons, and two larry loads are intended to constitute a full carload of ore. The arrangement of the discharge gates of the larry is clearly shown on this photograph. They are suspended from the sides of the larry frame and operated by connecting rods which attach to cranks, also connected to the main larry frame, these gates being operated by means of a small motor which is carried at the rear of the larry. The gates are so arranged that all or a portion of the contents of the larry may be discharged. The hopper of the larry is suspended in the larry frame on scales so that the contents of the larry may be wholly or partially discharged and be accurately recorded.

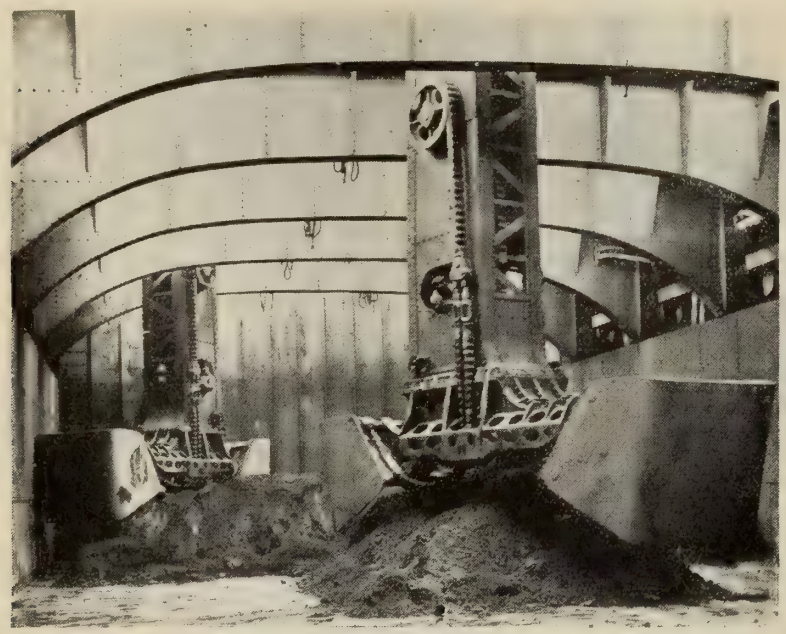
The mechanism for moving the larry back and forth on its track is also located on the larry and consists of winding drums upon which ropes are wound, the end of the rope being attached to the rear end of the cantilever on the main framework. The larry track is in-



Scale larry, into which the main hopper discharges the ore. This larry accurately weighs the ore and discharges it into storage. Cars thus loaded are ready for shipment as they do not require reweighing.

clined and the larry is pulled up the incline by means of these ropes and descends by gravity.

As previously stated, these machines are usually electrically operated through-



Unloader Leg and Bucket at work in the hold of a modern boat are shown above. The leg is so mounted in the walking beam that it can rotate in a circle, allowing the bucket to reach out in all directions. These machines have often unloaded 97 per cent. of a cargo without the help of shovelers. The position of the operator who controls the movements of the bucket is shown above. The distance from point to point of the bucket shell when open is 31 feet.

out. In some cases, however, machines of the same general type have been made to operate by steam and hydraulic cylinders, water being supplied to the operating cylinders by means of a steam accumulator, which furnishes water at a pressure of 1,000 pounds per square inch. Electrically operated machines are usually designed for a 220-volt direct current. Alternating current is never used. The motors required for the equipment of one of these machines are as follows:

	Motor	H.P.
Beam hoist	1	275
Bucket closing	1	120
Bucket rotating	1	25
Trolley travel	1	120
Hopper gates	1	100
Longitudinal travel	1	100
Larry travel	1	150
Larry gates	1	40

The control equipment for these motors is of the magnetic switch type throughout, having master controllers in the operators' cabs in the bucket leg and on the larry.

Electric current is supplied to these machines by means of insulated conductor rails running the length of the main runways. The current is collected from these rails by means of pickup shoes and distributed to the various portions of the machine. A similar collecting device is also employed for supplying the main current to the trolley. Conductor rails are attached to the main framework of the machine and the current collected from these rails by means of pickup shoes attached to the trolley.

Points of superiority claimed for this Wellman-Seaver-Morgan Ore Unloader are as follows:

The design is very heavy; there is little to get out of order, resulting in low maintenance cost per ton of material handled.

The control is accurate and positive, and manual labor is reduced to a minimum.

The bucket is positively guided in passing through the hatches of ships, thus eliminating the danger of damage either to the boat or to the machines, arising from the use of rope-suspended buckets.

The operator travels with the bucket into the boat, and can always see exactly what he is doing.

The bucket is of extremely large capacity, but is so suspended from the walking beam that the weight resting on the tank top of a boat is less than one-third of the weight of a rope-suspended bucket of equal capacity. In fact it is impracticable to use a rope-operated bucket of anything like the size attained on these unloaders.

One particularly important point to be considered is the extremely low cost obtainable with these machines. Records extending over long periods show unloading cost ranging from 2½ to 4½ cents per ton, which includes superintendence, labor, repairs and materials on the machines, as well as the cost for power and light.

On account of the high capacity of these machines, the number of units required is less by a considerable margin than of a smaller type lighter machine, which results immediately in a decreased cost of operation for the reason that a fewer number of skilled operators is required.

Again, on account of the extreme reach of the bucket, it is possible for the machine to discharge a very much higher percentage of a ship's cargo than can be accomplished by ordinary rope-operated buckets. The bucket can be rotated at right angles to the hatch and reach out for ore which would be entirely inaccessible to an ordinary bucket.

It can be conclusively shown in plants where large tonnages are to be handled that there is a distinct saving in first cost as well as a yearly saving in the cost of operation over any other type of machine.

This unloader is not a combined machine. It is an unloader pure and simple, and it accomplishes its work well.

The Canadian Engineering Standard Association

IT IS not generally known that we have in Canada an association known as the Canadian Engineering Standards Association.

The Purpose of the Association

The Canadian Engineering Standards Association was formed in 1919 with the object of carrying out in Canada, for the benefit of Canadian industry, work similar to that done in England by the British Engineering Standards Association, which has proved of such great industrial value. The Canadian Engineering Standards Association is not a Government institution, although it is recognized by the Canadian Government. The members, who serve on its committees gratuitously, are qualified by their technical and industrial standing to represent the interests of manufacturers, engineers and users, and are nominated by such bodies as the Canadian Manufacturers' Association, the Canadian Mining Institute, the Engineering Institute of Canada, the engineering schools of the universities, the railway services, important industrial firms and the great purchasing departments of the Canadian Government.

The association has now been incorporated by Dominion charter.

The association is supported by contributions from the technical and industrial societies interested, as well as from individual firms, and these are supplemented by a grant from the Dominion Government.

Method of Work

When a request or suggestion is received from some responsible firm or person to the effect that the formulation or revision of a Canadian standard is desirable, the association confers with the various interests likely to be affected by the establishment of such a stand-

ard, and arranges for the organization of a committee to consider the matter. This committee includes representatives of the producers and users of the standard in question together with such technical advisers as may be considered desirable. The selection of such a working committee is accomplished through the proper sectional committee of the association under the chairmanship of a member of the association. If the committee so formed recommends the adoption or modification of a standard, its findings are reviewed by the association, the main committee of which must be thoroughly satisfied that full consideration has been given to the subject before it authorizes publication by the association.

The actual discussions as regards technical details are thus carried out by specially chosen representatives of the manufacturers and purchasers, and the various interests, whether of the producer, the user, or the engineer, are safeguarded, since all these parties have a voice in the decisions reached. In this way it is clear that before a report, defining a Canadian standard is issued or modified, the effective approval of all concerned will have been obtained.

The services of the various sectional and sub-committees are of course available for the periodic revision of their reports, this being necessary in order to avoid any risk of retaining a standard in use after improvements or changes of practice have rendered it obsolete in any respect.

There is reason to believe that the success of the work done by the British Engineering Standards Association in the past has been largely due to the careful way in which its main committee has reviewed the work of its various sectional and other committees.

The C.E.S.A. standard specifications will, as a rule, contain simply the technical clauses necessary for the purchase of the product to which the specification relates, together with such tables and diagrams as may be required for their explanation.

Meaning of Standardization

In order to avoid misunderstanding it may be pointed out that the term "standardization" refers primarily to the preparation of such designs, dimensions or specifications in industrial, manufacturing, or construction work as will be generally accepted and worked to by all concerned. In the case, for instance, of a machine component, if its principal dimensions and characteristics are standardized, the number of types or patterns to be made or kept in stock commercially is at once reduced, lessening accordingly the cost of manufacture and handling, with corresponding saving and convenience to users.

An example of economy attained in this manner would be afforded if the various Canadian railway administrations would agree with the steel makers to adopt a standard Canadian section and specification for rails and track fastenings. This action would not only reduce the number of different rolls to be cut and used by the rail mills, but would enable material to be rolled for stock direct from the billets at less cost and with a certainty that they would be acceptable to any railway. The railways would simplify their practice, avoiding the use of rails and fastenings differing in form and material only in comparatively unimportant details, and would benefit by the higher and more uniform quality of the product. Some progress towards this desirable result has already been made.

Similar opportunities for substantial saving in the cost of manufactured products and for protecting the interests of the user now occur in many other Canadian manufacturing industries wherever articles and materials may be so standardized by common agreement between the producer and user as to permit their production in economical quantities while still satisfying the requirements of the purchasers. No organization has hitherto existed in Canada for bringing these various interests together and inducing them to agree on a mutually satisfactory design or specification.

The Canadian Engineering Standards Association, like the British Engineering Standards Association, does not as a body decide upon the details of its standards, but organizes and reviews the findings of a representative committee for each particular standard suggested, thus insuring that all interests are properly considered and making certain that any recommended standard has been carefully investigated before it is issued. No standard that is not based on mutual agreement arrived at in this manner is likely to receive general endorsement and adoption.

Since the commencement of their activities three months ago, great progress has been made.

Requests for action have been received and committees have been formed, or are in process of formation, dealing with the following subjects: Aircraft parts, electrical work, rails and track, wire rope, steel bridges and construction, with the view of obtaining agreement on Canadian specifications or standards which will be acceptable to all concerned.

In this work, consideration will of course first be given to any existing specifications or standards which have proved satisfactory in Canada, Great Britain, and the United States for similar work.

This association has been requested by the British Engineering Standards Association (the corresponding organization in Great Britain) to undertake the distribution of its publications in Canada, and for this purpose has been furnished with most of the reports of the British Engineering Standards Association. The list to follow does not include all the publications of the British Engineering Standards Association, but covers those of most recent issue. Copies are for sale at the prices stated.

Report No. C L 3750. "Interim Memorandum on French Metric Screw Threads for Aircraft Purposes," 15c net.

Report No. 10-1904. Revised July, 1918. "British Standard Tables of Pipe Flanges," 25c net.

Report No. 15-1912. Revised August, 1912. "British Standard Specification for Structural Steel for Bridges, etc., and General Building Construction," 25c net.

Report No. 21-1909. Revised November, 1909. "Report on British Standard Pipe Threads for Iron or Steel Pipes and Tubes," 25c net.

Report No. 37-1919. Revised January, 1919. "British Standard Specification for Electricity Meters," 25c net.

Report No. 41-1908. "British Standard Specification for Cast Iron Spigot and Socket Flue or Smoke Pipes," 25c net.

Report No. 44-1909. "British Standard Specification for Cast Iron Pipes for Hydraulic Power," 25c net.

Report No. 45-1917. Revised September, 1917. "Report on British Standard Dimensions for Sparking Plugs for Internal Combustion Engines," 25c net.

Report No. 46-1909. "British Standard Specifications for Keys and Keyways," 25c net.

Report No. 63-1913. "British Standard Specifications for Sizes of Broken Stone and Chippings," 25c net.

Report No. 65-1914. "British Standard Specification for Salt-Glazed Ware Pipes," 25c net.

Report No. 71-1917. "Report on British Standard Dimensions of Wheel Rims and Tyre Bands for Solid Rubber Tyres for Automobiles," 25c net.

Report No. 72-1917. Revised September, 1917. "British Standard Rules for Electrical Machinery." (Excluding motors for traction purposes), 25c.

Report No. 74-1917. Revised September, 1917. "British Standard Specification for Charging Plug and Socket, for Vehicles Propelled by Electric Secondary Batteries," 25c net.

Report No. 75-1916. "British Standard Specifications for Wrought Steel for Automobiles," 25c net.

Report No. 76-1916. "British Standard Nomenclature of Tars, Pitches, Bitumens and Asphalts When Used for Road Purposes and British Standard Specification for Tar and Pitch for Road Purposes," 25c net.

Report No. 82-1919. "British Standard Specification for Starters for Electric Motors." (Face-plate type), 25c net.

Report No. 84-1918. "Report on British Standard Fine (B.S.F.) Screw Threads and Their Tolerances," 25c net.

Report No. 88-1919. "British Standard Specification for Electric Cut-Outs for Low Pressure, Type O," 25c net.

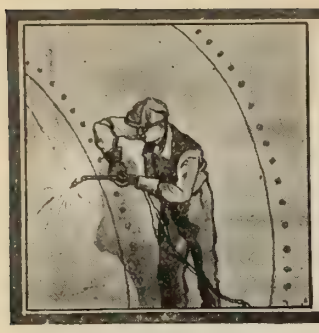
These reports are concise and complete and well worth the price.

Requests for copies of any of the above should be addressed to:

The Secretary.
Canadian Engineering Standards Assoc.,
Room 112 West Block, Ottawa,

and should be accompanied by money order payable to the:

Canadian Engineering Standards Assoc.,
Ottawa.



WELDING AND CUTTING

Army Welding Schools*

By R. J. KEHL†

ORIGINALLY the shop work of the Ordnance Department was planned to come under two heads: namely, mobile repair shops and base shops.

The mobile shops organized quite elaborate courses of instruction, which were given at the Rock Island Arsenal, at Peoria, Illinois, Clintonville, Wisconsin and Kenosha, Wisconsin. Because those shops were to be sent to France one at a time, it was quite possible to arrange good courses of training for their men. Men who had some welding experience and when who were good mechanics, but who had had no previous experience in oxy-acetylene welding were given instruction at these schools.

In the case of base shops, conditions were entirely different. It was expected that all the base equipment and personnel would arrive in France early in the spring of 1918. These shops, therefore, endeavored to enlist men who had had considerable experience in oxy-acetylene welding, as well as for the other trades required for the shops. It was, of course, understood that there would not be enough first-class operators, but it was thought that we would be able to train men in France, using them as helpers to the experienced welders.

When I arrived in France, in March, I went immediately to Advance Depot No. 1. The first machine shop, which had been erected in December, had been burned down, and the second shop was just about ready to commence operating. Considerable machinery had been damaged in the fire, and in transportation, and a great deal of welding work had to be done before the shop could be run in good shape. When I inquired as to why a welder had not been put on the job, I was told that they did not have one. They had had a blacksmith who claimed to know quite a bit about welding, but he had made a failure of every job which he had attempted, so, although they knew that their only hope for getting the shop running was to employ the oxy-acetylene process, nevertheless they had very little faith in its ability.

The only equipment at the depot was a French combination welding and cutting blowpipe, which operated off a portable acetylene generator of about 25 pounds carbide capacity. There was no oxygen regulator with the outfit. A copper tube about ⅛-inch in diameter carried the oxygen to the blowpipe at cylinder pressure. Four cylinders of oxygen, and two of acetylene, of about 150 cubic feet each; about 10 pounds cast iron rods, all square, and most of them larger than ⅜ inch, and about 5 pounds square aluminum rod over ½ inch, were all the supplies on hand.

Lump carbide was the only size available, so it was necessary to break carbide to charge the generator, as the instructions said, to "the size of coffee."

After the generator had been put in operation and the blowpipe started, it was apparent that a new beginner could not be trusted with that apparatus on work that could not be allowed to fail. Therefore I had to do practically all the welding myself, using the men only as helpers, except for a few cutting jobs, for the first five weeks.

About the first of May we received in salvage, a good French outfit, consisting of a welding blowpipe, a cutting blowpipe, oxygen regulators, and an acetylene regulator. With this better equipment we were able to get along quite well.

Soon the mobile shops commenced coming through the depot to receive final instruction in artillery material and other work for which the men were to be specialists with their particular shop. Some of the welders with these shops were excellent operators, some had had instruction in the mobile classes in the States, but a great many, although they were classed as welders, knew practically nothing about welding, or at least good welding practice.

Most of the work up to July was repairs to broken machinery and equipment for our own shop, the local railroad repair shop, and other branches of the service at the depot, and some artillery repairs.

To give instruction on work of this sort was a pretty difficult proposition. Men who were good mechanics and adapted themselves readily to welding, received considerable training, and quite a few good operators were turned out. But those who did not adapt themselves to welding readily, and should have been given the most attention and practice, did not receive it, because they could not be trusted to do anything but the simplest jobs.

The work covered a broad range of repairs and included jobs which ordinarily would not have been attempted. Such parts as typewriter arms, typewriter carriage ways, various small arms parts, automobile springs and very badly broken castings were attempted and successfully handled. The only job which failed was a small white metal casting.

Dozens of levers, arms, hand-wheels, brackets and pulleys for various machine tools were welded for our own shops each week. For the Air Service, a broken shaper base, aluminum magneto brackets for generator sets were repaired, and some lead burning was done. For the Railroad Shop, only locomotive brackets, levers, and other small work was welded by us, the larger repair work being sent to the main railroad repair shops, about 150 miles back. For the Motor Transportation Corps, cracked engine cylinders, motorcycle forks, worn valves, and other automobile and motorcycle repairs were made. Even several dozen automobile springs were welded because of the inability to obtain new springs to replace them. Broken truck and tractor parts were repaired for vehicles received from the States and uncrated at the depot. Hot water heater sections and automobile repairs were handled for the Red Cross.

Perhaps the most complicated job was a three-step pulley for a 16-inch lathe, which had fallen down from the shafting and was broken into 15 parts, all the way from small pieces to one piece about one-third of the pulley. This job required considerable patch work and scheming to insure the pieces being true and to avoid cracking as each little piece was gradually added to the main part.

Various parts of gun mounts, gun carriages, and other caissons were repaired. Many of these were bronze. Machine gun tripods which had come in in salvage with corners shot off, holes pierced through them, and otherwise damaged, were welded, straightened and put back in service. Upon several occasions, advantage was taken of the oxy-acetylene blowpipe to apply local heat to trails which had been distorted in action.

The cutting blowpipe was used to cut I-beams for shafting stringers and to rough out large quantities of wrenches for the 75-millimeter gun repair tool

*Paper read at Annual Convention International Acetylene Association, N.Y.

†Engineer Oxweld Acetylene Co., formerly First Lieut. Ordnance Dept., A.E.F.

sets, to save time, machining. The ball and the base of railroad rails were sliced off so that the machine shops could use the stock to make lathe and shaper tools. By careful manipulation of the cutting blowpipe, gun cradles were notched or split as the case required, to permit the removal of the gun and recoil mechanism from field pieces which had been badly damaged in action.

In July the shops received orders to make up about 200 Howitzer mounts, each of which required two butt welds on 2-inch round steel bars, and two corner welds, each 15 inches long, on ¾ in. plate. After the shops had been on this work for about a week the welders were falling behind because of lack of equipment. At that time the engineers at the depot received a 100-pound portable Oxweld generator, with welding and cutting equipment. After considerable negotiations they finally consented to loan us their generator and equipment on the basis that we would handle all their repair work. When I say that we had eight men doing nothing but break lump carbide down to the size required for the generator you will realize that the generator was being heavily taxed.

Because most of the men were to go out with mobile shops, and would have to depend upon their own ability and skill, an effort was made to have them appreciate that the success of welding depends more upon the correct handling of the work than just upon running in the filling rod. They were instructed to study the different possible methods of a job and to then select the method which would ensure the best results. They were trained to watch the whole work, while doing the actual welding, and be able to reason out the cause of any difficulty they might encounter and be able to overcome or counteract the cause.

It was quite difficult to obtain supplies from the French, both rods, fluxes and gas supplies, and as a matter of fact most of our supplies came from the Quartermaster's Department, and we had to taken woven wire and unwind it for welding wire. Hundreds of tons of supplies for the different departments did not get to France until August and September. The initial supply, from twenty-five to fifty pounds, that came with each outfit, was used up within a couple of weeks after outfit was put into service, and we had to depend on the French as far as we could for our supply, and they were not very generous with it. An order for five pounds of rods had to go through the Minister of Munitions at Paris.

SOLDERING FOR SHOP MEN

By Donald A. Hampson

Repair and maintenance work calls for ability to turn one's hand to many a trick that is foreign to every-day machine shop practice. Soldering is one of these tricks, yet a great many machinists are totally unfamiliar with such work, or have only seen it done, while still others despise such a method of making repairs. Soldering is not to be despised—it fills a very definite place—a good soldered joint is better than a poorly welded one. Many jobs that could easily be fixed up with solder are repaired by more expensive methods and by renewals. It is not a hard matter to make a good job of soldering if a few essentials are understood, nor is there required any expensive equipment.

Cleanliness is the first and last requisite for a successful job. The surface of the work must be mechanically and chemically clean. Mechanical cleanness is obtained by machining, filing, and scraping, together with the use of emery cloth that has not been contaminated with dirt and grease. Brass castings may be soldered on the surface if clean, but with cast iron it is necessary to cut or file off the outer surface or skin to expose the fresh metal. Cleaning should be carried a quarter of an inch beyond any part which the solder will touch so that by no chance will be work be retarded by the iron's slipping on to an unclean spot and thus carry dirt back to the joint being made.

The chemical cleanliness is obtained by the application of muriatic acid to the surfaces being joined. This provides for all necessary cleaning and prevents oxidation of the surface during the work. If it happens that the work pieces are galvanized or of zinc, then the commercial acid is used just as it is, but if any other metals are being handled (and the majority of jobs are such) then the acid must have dissolved in it all the zinc which can be absorbed by the acid; this "cut" acid is ready for use and is preferably prepared in small quantities so as to have always fresh acid on hand, and that as clean as such things can be kept which are being dipped into and exposed to air and swabs.

Sal-ammoniac is the most commonly used flux for soldering. Rubbing the hot iron over the surface of this is sufficient. Some men imbed a small amount of solder in a cake of sal-ammoniac and tin the iron by rolling the iron around in this hole, but it cannot be said to be good practice, for the hole gets constantly bigger and less efficient, finally getting bored clear through the cake, spoiling a chunk that at present prices may be worth two or three dollars. Tinsmiths invariably keep the surface of such a cake flat on top and use a holder or container that allows the greatest wear from the rather expensive chemical in use, a couple of movements per side of the iron is all sufficient.

Both the iron and the work must be "tinned" before any kind of a job can be done. This is the second great law of soldering. Oil, grease, dirt, all these prevent the tinning of iron and work, and they have to be removed. Tinning is the process of coating the surface with a thin layer of solder. So far as the work is concerned tinning may be done as a separate operation previous to joining the two pieces, or it may be done as a part of the work with the pieces clamped together. The iron, however, is always tinned before it is applied to the work. Soldering jobs are usually either joining two separate pieces together or filling up cracks, and in both cases it is preferable to tin the surfaces separately because when that is once done it is an easy matter to place more solder in the form of a bond between the two in whatever form or amount is desired.

Some materials resist tinning more than others. With those that offer greater resistance, patience is required to secure the coating, and the iron must be rubbed for some time on the surface before the result is secured, in the meantime keeping dirt and oxidation from accumulating. It is a help in tinning cast iron to coat the surface with a thin layer of copper by rubbing on blue vitriol, the surface having first been machined or filed.

Lack of heat is a detriment to soldering, in fact, most beginners fall down on this one point, and they try to solder with a cold iron and to make solder stick to a cold surface. The iron itself, however, should not be overheated; this is a common mistake around machine shops where the forge fire is used to heat, and where it is very easy to raise the iron to red heat. Soldering "irons" are made with a copper bit, and the red heat is injurious to copper; moreover the red heat burns off the tinned surface of the iron, necessitating doing this part of the work over again. A temperature of 400° Fahr. will melt solder, and there is no need to go a great deal above this.

The function of the iron is three-fold: to carry the solder to the work, to heat the work, and to distribute, or place the solder where wanted. If the iron consisted of the point only, it would fail in the first two functions, but it does not, and we have a large mass of copper back of the point which feeds the heat down to where it is used. Where sheet metal is being soldered the heat from the iron is sufficient, but where the parts are bulky it is preferable and quicker to heat the work in some sort of a clean flame, bringing the work up to about a straw color on steel.

Cast iron requires more heat than steel or brass. Aluminum requires a hotter iron than the other metals and also a special aluminum solder. Ordinary solder will not stick to aluminum; usually aluminum is soldered without any flux, or if any is used it is a specially prepared composition.

Separate parts being jointed by soldering require some sort of fastening to keep them together and in true relation until the bond has cooled. The work may be clamped on a surface plate or held in a vise, or it may be screwed and riveted together, or it may be wired.

Shelburne. — The Shelburne Shipbuilders, Limited, launched a fine three-masted schooner from their yards recently. She was built for the W. & T. Hollett interest, of Burin, Nfld., for their fleet of coasting vessels. The new vessel was christened Donald II, registers 230 tons, and has the 12 years' classification in Bureau Veritas. The keel for an auxiliary schooner is laid in the same yard.

DEVELOPMENTS IN SHOP EQUIPMENT

A "NEW CRANE" 40 YEARS OLD ENTERS THE FIELD

The Lane Manufacturing Co., Montpelier, Vt., established for 70 years, built their first rope-driven overhead travelling crane about 40 years ago. Many of these cranes installed in the early eighties are still rendering full service.

Until this year, all efforts of this firm have been confined principally to the stone working field. About 1893, with the increased development of electric power, the Lane Crane was adapted to electric drive, and during the past twenty years a large number of these electrically driven cranes have been installed largely in their original field—the stone-working field—throughout the country. Although most of the installations have been in the New England States, Lane Cranes are now in service in many states from the Atlantic to the Pacific.

Hence, although so long established, it is easy to understand why this type of crane has not been better known in fields outside of the stone-working trade.

They have now appointed as their sole crane agents, N. B. Payne & Co., 25 Church street, N.Y., who will make it their business to give this crane a broad distribution throughout the United States—wherever cranes are needed. Herewith, are a few of the arguments that are being presented by N. B. Payne & Co.

Two Motors Give Three Movements

A notable characteristic of the Lane Electric Crane is the employment of two motors for three movements. Both motors are the constant speed, non-reversing type, which eliminates the use of controllers and complex wiring. Control of all movements, including that of direction, by means of a series of friction cones, is mechanical.

This design effects a saving in electric power which is ordinarily lost in frequent quick stops and reversals, and speeding up or slowing down of variable speed reversing motors.

Originally Lane Cranes were furnished with timber bridge girders, stayed with steel truss rods fastened to cast iron bridge trucks and having a safety factor of about 7. This construction has the advantage of being exceptionally light for a given capacity. Where desired timber bridge girders, as shown in Fig. 1, are still furnished. In fact, bridges are now supplied in three styles:

No. 1.—For short spans; rolled steel I beams, reinforced with inverted channels riveted to the top flanges when necessary.

No. 2.—Steel girders of the lattice box section type for long spans, Fig. 2.

No. 3.—Heavy timbers of long leaf yellow pine, reinforced by large steel truss rods, as shown by Fig. 1.

In all cases, these bridges are designed with a large factor of safety—at least 5, and with ample strength to sustain the load without undue deflection, horizontally or vertically.

The bridge girders of this crane are supported by cast iron end trucks, provided with cast iron double flange chilled wheels, which have steel axles running in renewable bearings. The trolley is made of cast iron, is designed for rigidity, compactness, accessibility of all parts, and is suitably reinforced with steel tension rods. The sides are joined together by several large steel shafts. Power for hoist and trolley movements is transmitted by friction cones through steel worms, engaging bronze gears running in oil. These friction cones are plainly visible in Fig. 3.

The worm-gear drive is a simple and effective load brake, being controlled by a convenient hand wheel. Two speeds of the hook are furnished with one part of rope. A luff block is provided with a hook and hinged housed sheave, so that by running the line through this sheave and attaching the single rope hook to a girt on the underside of the trolley a two-part reaving of the rope is effected, thereby dividing the first two speeds by 2 and doubling the power, supplying 4 hoist speeds.

For example: The following are approximately the speeds for a 10-ton standard crane.

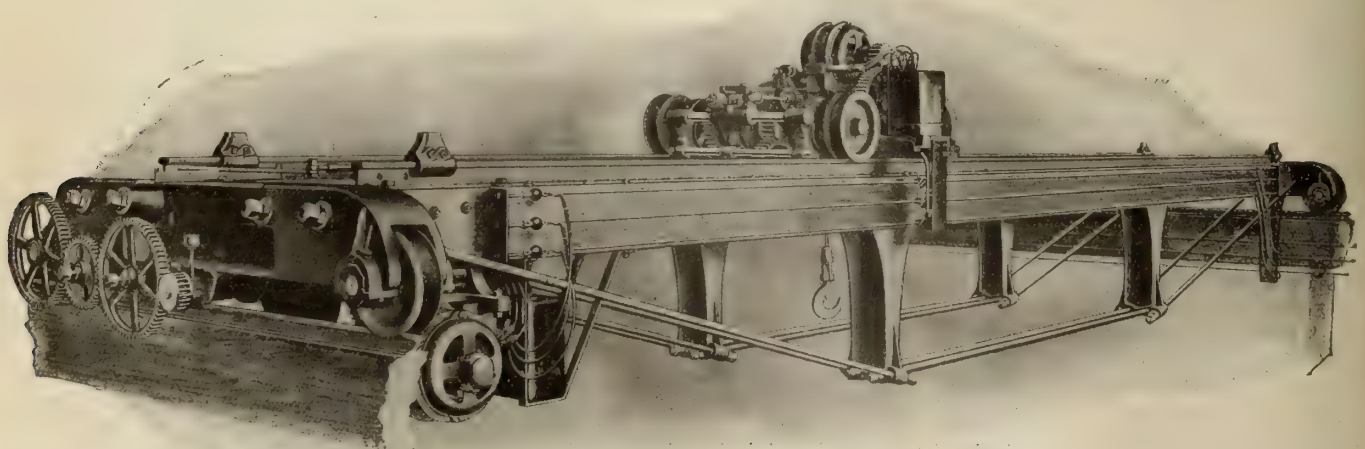
No load—40 feet per minute with one part of rope.

2½ tons—20 feet per minute with one part of rope.

5 tons—10 feet per minute with two parts of rope.

10 tons—5 feet per minute, with two parts of rope.

The hoist motor, through the same power cones, operates the trolley motion on the bridge at approximately 100



GENERAL VIEW OF LANE OVERHEAD ELECTRIC CRANE.

feet per minute. The reverse is obtained in the same manner as with the hoist movement. All movements are controlled by hand wheels. There is no complicated wiring, there are no large controllers and there are no hot resistances, hence, no ability to handle delicate electrical equipment is required of the operator.

The bridge motor drives a friction disc by transmission through a pair of opposed cones; alternately contacting therewith. Control of the bridge travel movement in either direction is effected by shifting the cones by means of a lever connected to a rod running the full length of the bridge convenient to the operator's left hand.

A distinctive feature inherent in this crane is the control of all movements by the operator while seated on the trolley. There he always has a clear view over the hook as well as of all other points below the crane.

In practice, expert crane users have found that the operator is able to place the load quickly and with accuracy, also effecting a saving of considerable time in placing the hook for attachment to the load. The comfort of the operator in sitting at his work is a feature worthy of consideration.

Readers may be interested in a book of testimonial letters on Lane Cranes in the possession of N. B. Payne & Co., which is available to anyone intereted.

In summing up, it is claimed by the manufacturers that this crane has five special points of superior merit, as follows:

1st: Maximum longevity of service—a record of 30 years.

2nd: Minimum power and repair cost.

3rd: Great overload capacity.

4th: High return value on capital investment: and

5th: The crane can be operated by inexperienced labor.

ATTRACTIVE CATALOGUE

The Canadian Foundries and Forgings have issued a very attractive catalogue, No. 4, on their line of drop forgings and drop-forged tools, produced at the Canadian Billings and Spencer plant, Welland, Ont.

In this catalogue is shown a full line of forged steel wrenches of all kinds, also illustrating their display board for such tools.

Machine, engineers', double head S, 15° double head, and general service wrenches are shown, also various adjustable and automobile types. Knife handle wrenches, Stilson wrenches, screw-drivers, pliers, hammers, turnbuckles, thumb nut blanks, weldless eye nuts, eye bolts, forged steel nuts, drop-forged crank shafts, connecting rods, etc., etc., are shown throughout this book.

To anyone interested in drop forgings or wrenches, this catalogue will be a splendid addition to their library.

NEW BULLETINS

The Hergi Manufacturing Co., 75 Third Street, Bridgeport, Conn., have issued attractive bulletins Nos. 10, 11, 12 and 13 on their line of portable electric machinery.

Various grinding wheels, die sinking outfit, scraping outfit, and screw-driving outfit are described in detail. To anyone interested in such a line of machinery, this booklet will prove well worth while.

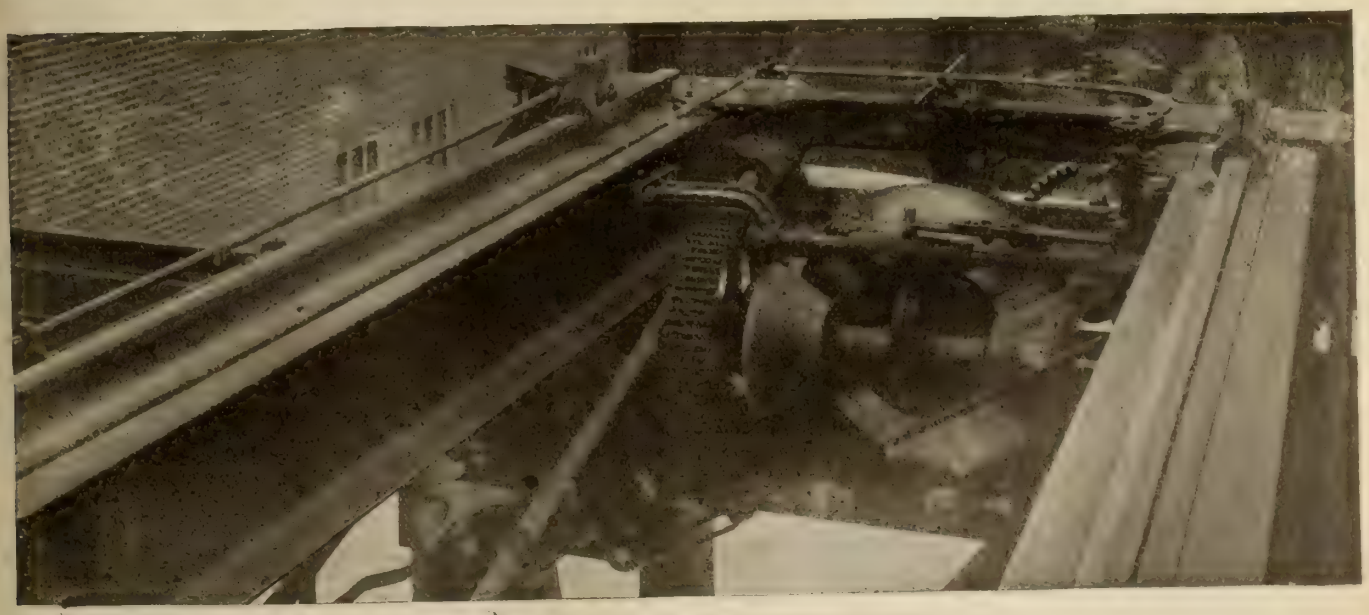
FORGED CUTTER TOOL HOLDERS

J. H. Williams & Co., with works at Brooklyn and Buffalo, N.Y., have added to their well-known line of "Agrippa" tool holders, their new system of cutting tools, Williams' "Vulcan" forged cutter tool holders. Holders which embodied this principle, making possible the use of what is practically a solid tool without its expense, were first designed and used in their shops many years ago; they have been developed and perfected to meet the demands of those who prefer the solid, forged type of tool. This construction eliminates the great cost of the old, solid tool and at the same time retains its advantages; each holder, by the mere insertion of small high-speed forged cutters, is adapted to the heaviest service in any regular machining operation on lathe, planer, shaper, etc. Consequently the economy and convenience of this line, when installed as standard shop equipment, is at once apparent, as all blacksmith work, to say nothing of the very considerable investment necessitated by heavy, solid forged tools of costly high-speed steel, is eliminated.

The supply of cutters for such a shop can be maintained in readiness for instant service by the man in charge of the tool room at practically no expense for grinding, so that the machine operator may have constantly available an ample stock for all regular needs. Duplicate lines of important shapes and sizes with but slight additional investment will insure the operator against interruption; he may thus devote his entire attention to production only.

The holders are all drop-forged from a fine grade of special steel, so heat-treated as to develop its maximum toughness and stiffness. They are very simple in construction, being composed of but three parts: holder proper, square head cam, and locking pin, all of unusual strength and exceptional wearing quality; they hold the cutter in an immovably rigid grip. The construction is shown by phantom cut.

The cutters, extra heavy in design, are drop-forged from "Agrippa" high-speed steel, and are finished and hardened ready for use. They are furnished in a wide range of sizes and types: Side, diamond point, roughing, hog nose, flat nose, threading, etc., etc. The method of locking provides the necessary bearing to support the cutting pressure and prevents all rocking movement of the cutter itself.



VIEW SHOWING THE FRICTION CONES.

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Is the Victory Loan Secure?

NOW that the people of Canada have given to the Government of the country over $600,000,000, the question arises, "What are they going to do with it?"

It is not a very hard matter to finance a country or an institution or an individual as long as the money hangs out. A good way to judge the effect of this sort of business on a nation is to judge it on an individual, for after all, a nation is simply a collection of individuals.

Take any man and hand over to him plenty of money, and he will get along nicely—for a time.

Take any country and hand over to its Government plenty of money and it will get along nicely—for a time.

What develops men is to get out and work and plan and sacrifice.

And the same things that develop men will develop nations.

It is a good thing for a Government, if it must owe money, to owe that money to its own people. The payments of interest go to our own people, and the holder of bonds feels a new and a greater interest in his country, It may be selfishness, but he realizes that the country must pay him back his money, and it is up to him to make the country able to discharge that obligation. Everything he can do to make the country more capable of paying its debts is increasing the security that he likes to see surrounding his investment.

Canada's ability to pay back her debts is not going to be increased by an adherence to the idea that your part in the work is cutting down output and increasing costs.

Canada's ability to pay is going to come from her applied ability to produce, to grow, to manufacture and to sell, and also by her determination to get down to national brass tacks and live nationally within her means.

Floating a great national loan is all right for exceptional and pressing circumstances, but it cannot be continued. It would simply mean tying an additional financial millstone around our national neck every year, until we had defied the laws of strength and resistance to such an extent that the whole superstructure toppled over.

If you are going to live in this country, you have got to look at the future of this country in a big way. If not it will be doing the country a kindness if you get out.

Canadians must realize now that the hurrahs of the Victory Loan have subsided, that with this accomplishment they have taken on a very serious responsibility. The people of Canada owe themselves millions upon millions of dollars, and it is the people of the Dominion who have to pay this money back to themselves. That may be a homely way of stating the case, but it is the view that should be brought home to the people now, from the apprentice right on through to the president and the general manager.

Always in the Student Period

HAVE you stopped your studies? Have you gone ahead very far since you passed from the apprentice or improver stage to that of the full-fledged journeyman? Has anything grown except your pay envelope and the cost of living?

There's many a man who has made the fatal mistake of stopping just when he was getting into a good stride. There's a lot of them who have gone in on some switch with a blind end, and a car shunter to stop them from going any farther.

Never be too old or too busy to learn. If there were things you missed during your apprenticeship, get after them now whenever the opportunity comes to do so. Do not, for instance, if you are a man on the machine or the bench, imagine that drafting is good only for the man in the drafting office.

Writing to CANADIAN MACHINERY a few days ago, Mr. A. M. Lount, master mechanic of the Massey-Harris Co., Toronto, brought this point out in speaking of the drafting course that is running in this paper:—

"In comment of the same, would say that the writer has found several of his men are following this course, and is very pleased with the idea, but would suggest that some little article might be prepared which would call attention strongly to the point that a course of this nature is particularly valuable to the man on the machine or the bench just as much as it is to the beginner in the drawing office.

"With reference to the course itself, would say that so far it appears to have been very cleverly designed, and is just about the thing that is needed."

Never try to get in behind the excuse that you never had a chance when you were a boy. Do not rehash that yarn about having to leave school early and go to work. Thousands have had to do that, and from these thousands many have gone ahead in spite of conditions, rather than with their assistance. What others have done you can do. In fact the same words that appeared in this page last week can well be used again, "You can make yourself what you want to be."

A COMMA is a little thing, but so is a cinder in your eye. In the wrong place, little things can cause a great deal of trouble. A certain poor woman, whose husband was going to sea, handed through the clerk to the minister this notice, which she desired him to read in church: "A man going to sea, his wife desires the prayers of the congregation." The minister, punctuating it in his own way, read it thus—to the obvious amusement of his flock: "A man going to see his wife, desires the prayers of the congregation."

WIRELESS AT THE RATE OF 200 WORDS A MINUTE

Remarkable Developments Have Taken Place — Messages Sent Over 12,000 Miles

AT a recent meeting of the Montreal branch of the Engineering Institute of Canada, a paper on "Recent Progress in Wireless Telegraphy" was the subject of the evening, and the speaker was J. O. G. Cann, chief engineer of the Marconi Wireless Company of Canada, in Montreal. During the address Mr. Cann spoke on the widespread use of wireless by the Germans and the enterprise of the British and other allies in the destruction of many stations in various parts of the world that had been utilized for enemy war purposes. Mr. Cann outlined the different systems now in use, describing briefly the operation of each, stating that the spark method of the Marconi Company was the one generally used throughout the world. Some conception of the efficiency of wireless may be gathered from the fact that signals from Carnarvon, in Wales, have been regularly copied at Sydney, Australia, a distance of 12,000 miles. Mr. Cann read two of these messages that had been transmitted during the period of the war.

Wonderful advancement has also been made in wireless telephony, and sets are now available which will permit of telephonic speech from one airship to another, or from the plane to the ground. Sets are also made for conversation between ship and ship. Mr. Cann also spoke on the progress of direction finding and the advantages that had been derived by its use in minimizing or eliminating many of the Zeppelin raids over France and England. This feature was also extensively used in locating enemy submarines and subsequently destroying them. Some idea of the progress of wireless may be had in the speed that is now possible in transmitting messages. The hand-sending method, with a speed of about 20 words per minute, is being replaced by apparatus with a capacity of over 100 words per minute, and special machines are now under construction, at Montreal, that will be capable of transmitting 200 words per minute. Signals from this new device will be transferred direct to the land circuit and from there taken off on a tape passing through a printing telegraph. Samples of these messages were on exhibit, and it is interesting to state that one of these was recorded when the operator was absent from the office. In addition to the address, Mr. Cann had with him some modern wireless equipment, and illustrated with a number of slides, some of the essential mechanism of a wireless station.

Men and Machines

A WELL-KNOWN Canadian firm, advertising its lines, uses the phrase, "If you can't get the men, get the machines."

There is something more than a mere catch phrase for selling in that statement. It tells an industrial necessity in a blunt and forceful way.

There are foundries filled with moulding machines to-day, partly because they refused to be strike-tied, and because the competition the firm had to meet called for production the most efficient way.

There are special purpose machines lined up in production departments all over the country to-day working on operations that a few years ago were considered as grist for a standard or general purpose machine.

The whole atmosphere of the mechanical world is changing. When our forefathers wanted nails they went to the blacksmith shop and the smithy hammered them out. To-day nails come out so rapidly that it keeps a man busy carting them away.

Likewise when in need of clothing they sheared the flock, and laboriously spun the wool to yarn to cloth. To-day ponderous and intricate textile machinery performs the same operations with so much more rapidity and precision that the old process seems unthinkably slow and cumbersome.

Not many years ago the compositor in the printing office set type, one letter at a time. They used to attain what was reckoned as speed in those days, but to-day one operator fingering a keyboard, will readily produce five times as much type.

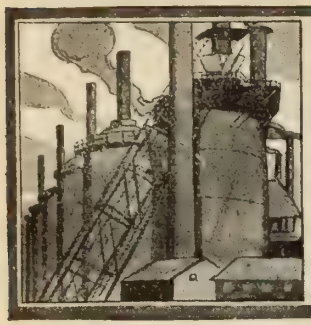
Such great strides have been made in the past that we, at times, may be inclined to think that mechanical progress belongs to the past. That's wrong. New machines are coming out now. There are more reasons than ever before. There is the element of absolute necessity. Firms must put in labor-saving machines or go down and out in the pace of active and unrelenting opposition. If they can't get the men they must get the machines.

French Names For Tools and Machines

THE Assistant to the Commissioner-General in Paris writes under date of October 10: When Canadian manufacturers are writing to customers in France it is well to use, so far as possible, the nomenclature current in the trade in France. Following are translations of the French names of some of the tools and machines in demand in France:—

Machines-outils.	Machine tools.
1. Alésoirs	Reamers.
2. Appareils de levage	Lifting machinery.
3. Boulons	Bolts.
4. Chaines de sureté	Safety chains.
5. Cisailles	Shearing machines.
6. Coussinet	Bearing.
7. Coussinets a billes	Ball bearings.
8. Coussinets de filière	Cutters (screw plate).
9. Crochets	Hooks
10. Ecrous	Nuts.
11. Etaux limeurs	Shaping machines or shapers.
12. Filières	(Screw plates) making (Threading plates)thread on bolt.
13. Forets	Drills.
14. Fraises	Milling cutter
15. Fraiseuses	Milling machines.
16. Grues	Cranes.
17. Machines a affuter les outils	Tool grinders.
18. Machine a fraiser	Milling machine.
19. Machines a meuler	Grinders.
20. Machines a meuler a meule émeri	Emery grinders.
21. Machines a outil pour chemins de fer	Railroad machine tools.
22. Machines a polir	Polishing machines.
23. Machines a rectifier	Precision grinding machines.
24. Machines a tarauder les tubes	Pipe threading machine.
25. Machines a laminer	Rolling mills machinery.
26. Machines de toleries et chaudronneries	Boilermaking machinery.
27. Machines d'extraction	Excavating machines.
28. Mèches	Bits.
29. Mèches pour percer le bois	Auger bits.
30. Mortaiseuses	Slotting machines.
31. Perceuses	Boring machines.
32. Poinconneuses	Punching machines.
33. Cisailles poinconneuses	Punching shears.
34. Raboteuses	Planing machines or planers.
35. Robinets	Valves.
35a. Scies a métaux	Metal saws.
36. Tampons	Buffers.
37. Taraudeur	Threading.
38. Tarauds	Taps (making thread in nut).
39. Tendeurs	Layers.
40. Tours	Lathes.
41. Tours a fileter	Thread-cutting lathes.
42. Tours automatiques	Automatic lathes.
43. Tours verticaux	Vertical lathes.
44. Treuils	Windlass.
45. Tube	Pipe.

Canadian firms desiring to sell any of the above articles in France may write for information to the Commissioner-General for Canada in France, 17-19 Boulevard des Capucines, Paris, France.



MARKET DEVELOPMENTS

High Premiums Being Offered for Auto Sheets

Strike Conditions Still Exert a Very Marked Effect on the Markets —Hard to Satisfy the Customer Who Wants to Secure a Quick Delivery in the Tool Market

WHILE it is a fact that the larger producers of steel are adhering to their old prices, that does not speak for the jobbers and the premium mills. Sales that are made now in sheets, plates, etc., are on the merits and urgency of the case. It is reported that in some points where makers of automobile bodies are hard up for supplies they are offering premiums as high as $30 per ton in excess of the regular price to secure the wanted metal.

Fortunately for the shipbuilding industry in this section a nice tonnage has arrived during the week. This was placed on the books some time ago, but it has been rolled in the strike zone since the strike was called. Some of the producers' books are becoming rather top-heavy with future business, and it would cause no surprise were some of them who do considerable booking in Canada to announce that they are out of the market for the time, especially on bars and hoop steel. There are warehouses in this district that have not seen a shipment of sheet or plate for almost a month now, and their customers are not faring any better.

The market for machine tools remains satisfactory. There is a good volume of business passing, the only trouble being in looking after the man who wants an immediate delivery. His only recourse for the time being is in turning to the used machinery market.

Improvement is seen in the scrap metal market, there being increased prices offered for stove plate and No. 1 machinery scrap. The coming of Baldwin's Limited to Toronto will mean that there will be a large purchaser in that firm for scrap material, as they will operate their electric furnaces largely from scrap.

MONTREAL DEALERS HARD UP FOR SOME WAREHOUSE LINES

Special to CANADIAN MACHINERY.

MONTREAL, Nov. 20.—There is still considerable pressure required in obtaining shipments of steel commodities from the United States mills. Dealers here, so far, have not been pinched for supplies, but have experienced no little difficulty in securing certain lines from American producers. The lines most affected have been plates, tubes and sheets, the latter in particular being almost impossible to get, especially for stock. With the coal miners gradually going back to work and the steel mills slowly coming back to normal operation, dealers here anticipate an early resumption to regular business. Some of the steel producing centres in the States have experienced considerable difficulty in securing raw materials and operations have been interfered with, but late reports indicate a better condition. However, the situation is not yet one that would change the mind of a pessimist, but is, nevertheless, moving toward a satisfactory adjustment. Dealers here are watching the developments across the line, and while reluctant to meet the advances that have taken place on some lines, there is a possibility that advances on some of the semi-finished materials will be found necessary. General trading continues normal in those lines when the warehouse can supply the material.

The inquiry for machine tools is still of an encouraging character, but the situation in the States prevents dealers from stating when delivery of tools can be made. Dealers of old material report a gradual improvement in steel requirements.

Coppers Down and Others Up

Apart from the strength that is noted in price quotations the market is relatively unchanged. A steady business is carried on in all of the metals, but is not of large volume. With the exception of coppers, which are easier, and spelter and aluminum, which are unchanged, the stronger tone of the American market has resulted in dealers here advancing prices. Lake copper at 24¾ cents is lower by ¼ cent. Electro is down ½ cent at 24 cents. Castings has declined 1 cent to 23½ cents per lb. Tin is ½ cent higher at 58½ cents. Lead has advanced ¼ cent to 8 cents per lb. Antimony at 10½ cents shows an advance of ½ cent per lb.

Fair Movement in Tools

From the reports that are gathered from the dealers and the trade, it is apparent that a fairly active demand still prevails for all lines of machine tool equipment. Inquiry seems to prove that the requirements are of a general character, and although few large single sales are recorded, the aggregate business compares favorably with that of the past few months. The situation as regards the delivery of tools from American manufacturers shows little change, and the delayed receipt of machines from United States points continues to be a factor of present trading. Dealers are reporting a good business in used machinery, but intimate that the visible movement of munitions machinery is considerably less and the second-hand trading is showing an increasing decline in this direction. One large tool dealer here has been overhauling used tools for the past 8 months, and equipment purchased on this basis is virtually rebuilt before it is offered for resale, so that the buyer is assured of a first-class tool when a sale is made. It has been learned that the Belgian Government has an option on a large portion of American tools now in Canadian plants that are the property of the American Government.

Strength in Steel Scraps

While there is little of a feature character in the local scrap situation, there is, nevertheless, a slight improvement in some directions. Non-ferrous metals are steady, but not active, and the demand is normal, with promise of gradual betterment. Dealers state that a better tone is developing in the steel end, as the past week has seen heavier trading than for some time. On the whole, the market is still quiet, but the better inquiry denotes increased buying in the near future. American mills are again in the market and shipments from this district are again in evidence. Steel foundries and stove plants are fairly busy and strength is also noted in general foundry requirements. Machine shop turnings are now quoted at $7.00, an advance of $1 per ton. Stove plate has jumped from $15.00 to $21.00, the price now ruling. Cast iron borings at $9.00 is an advance of $2.00 per ton.

SHIPMENTS OF STEEL BADLY NEEDED IN THIS DISTRICT NOW

TORONTO.—The fact that the coal strike has been called off in United States does not mean that there is going to be a good supply coming to this country. There are many firms who would like more definite information regarding their fuel stores, and it tends to create a little uncertainty in spots. The steel strike in United States, while it may be over in many of the plants, is still a very real thing in this country, because supplies are still seriously interfered with and curtailment of operation is resulting.

The Machinery Market

If one had told you, at the close of the war, that the Canadian market for machine tools was good enough to absorb thousands of dollars' worth of business every week for an unlimited time, there might have been some doubt in accepting the statement. But that is what has happened and is happening. The reports from dealers are all the same. The business offering is good, and the only fly in the ointment at the present moment is trying to look after the chap who wants to get a quick delivery on his purchases. The only dealers who can look after this sort of business very successfully are those with stock or used tools, and the former—stock—is not a plentiful thing.

Machine tool firms are making a study of the selling problems as they have not done for some years back, and they are going to put a lot more steam into the business in certain lines. They aim to make their representatives in smaller centres real salesmen. Doing this will save a lot of running around on the part of men from the head office.

Some Shipments of Steel

Conditions do not improve in regard to the amount of plate and sheets entering Canada. Fortunately some of the industries have had their business on the books of the steel companies for some time back, and now shipments against these previous orders are starting to come through and they really stand the firms in good stead, as otherwise they would have to close down entirely or curtail their output to a very large extent. The larger steel companies, such as the Steel Corporation, stick to the price that was in force when the strike broke out, and they are not going to change that as $30 per ton premium for auto material. It is only a matter of time, if things keep up there as they have been for the present at least. But of course that does not govern all the mills nor does it have much to do with the jobbers who are fortunate enough to secure a supply of material. Premiums are paid on all sides, and any material that may be had is based on the merits of the particular case as far as price is concerned. Reports from some points in the United States have it that automobile makers are now paying as high for the past month or so, before some of the agents for the large U. S. mills will have to go out of the market in certain lines, as their bookings are getting to be so far in advance that they become unsatisfactory and uncertain. The lines that will be affected by this move will probably be bars and hoop steel, for both of which there is a great demand and a correspondingly great scarcity.

Fortunately some of the shipbuilding concerns have a nice tonnage coming through at present, quite a lot of which arrived during the week. This business has been on the books for some weeks, but it has all been rolled since the strike has been on at the mills. They have received their material in good rotation, that is the keels have come along in good time in advance of the rest, so that work has not been retarded.

Warehouses in many departments are pretty well stripped of material. A shipment of sheets or plate would look wonderfully good to a number of such institutions. Their customers are also hard up, as far as being able to secure anything, and time does not improve matters. The season has been exceptionally favorable for rushing along material for outside work, and transportation has also been the best. The regret expressed on many sides is that in the face of these favorable circumstances, there should be happenings of such a disappointing nature.

A Better Scrap Market

For the first time in some weeks local dealers in scrap metals are willing to pay better figures for some of the whites. Stove plate, for instance, has advances from $13 to $18 per ton, while No. 1 machinery scrap is up from $18 to $22 per ton. The reason is that there is an acute shortage. Grey iron foundries are buying, and so are the markers of stoves and light sand castings. There is only a very limited supply coming in. This class of material comes mostly from the run of scrap heaps all over the country. The demand is just as keen in United States as here, and in many places more so. The demand is not unusual, especially at this season of the year. During the war nearly all the available material of this sort is gathered up and melted, and there has not been a very great deal of it coming into the market since.

Coppers are fairly strong and the same may be said of the brass sections. There is nothing coming across from the Old Country and nothing going out as freight rates are prohibitive.

There is considerable interest being taken in the coming of the well-known Welsh firm, Baldwin's, Limited, to the

POINTS IN WEEK'S MARKETING NOTES

It is reported from some American points that automobile body makers are paying premiums as high as $30 per ton in addition to the market price for sheet material.

—

Owing to the tremendous 1920 bookings some of the larger producers may shortly withdraw from the market. This refers especially to bars and hooping, which are hard to secure now.

—

The scrap metal market is showing more strength. There is an acute shortage of stove plate and No. 1 machinery scrap, and prices for these sorts strengthened several dollars per ton during the week.

—

It is now almost a month since some of the Toronto warehouses received a shipment of either plate or sheets. Some of the shipbuilding firms that had orders in some months ago received nice deliveries during the week.

—

The U. S. Ordnance Board is asking Canadian machine tool dealers for a refund of profits charged on duty on machines coming to Canada. In some cases the dealer's money has been tied up for as long as six months, so they consider they are entitled to charge their profit on the total selling price of the machine, including the duty.

—

There is a brisk demand for machine tools, and selling is general—the only exception being that it is hard to satisfy the man who wants immediate delivery.

—

Baldwin's Ltd., purchasers of the British Forgings plant, intend to rush work on their finishing plant, and should secure production by July of next year. They will be in the market for large tonnages of scrap metal.

plant of British Forgings, where there is a very large capacity for electric steel production. For the present this plant will operate largely from scrap material, and so it is seen that they will be very large buyers of this material. Work is being rushed on the finishing mill there now, and when production is secured there will be a large tonnage of scrap moved to that yard daily.

U.S. MAKERS OF MACHINE TOOLS SOLD AHEAD FOR SEVERAL MONTHS

Special to CANADIAN MACHINERY.

NEW YORK, Nov. 20.—One of the largest buyers of machine tools in the past week is the General Electric Co., Schenectady, N.Y., whose purchases have totalled about 100 machines. Another list calling for quotations on about 25 tools has also been issued by this company. Other companies which are buying or enquiring for equipment are the Worthington Pump and Machinery Corporation, N.Y.; the Bartlett Hayward Co., Baltimore, Md.; the Autocar Co., Ardmore, Pa.; the Lamb Knitting Machine Co., Chicopee Falls, Mass.; the National Scale Co., Chicopee Falls, Mass., and the American Locomotive Co., N.Y.

There is a slightly better demand for cranes, two large enquiries being in the market, one from the Bethlehem Steel Co., calling for bids on eleven cranes for its Lebanon, Pa., plant, and the other from the Sun Shipbuilding Co. asking for bids on five cranes for its shipyard at Chester, Pa., which will be enlarged by the addition of two ways.

The United States Shipping Board has cancelled a number of contracts with shipbuilding companies which took contracts during the war, and some of these companies are engaging in private work, with the result that a much improved demand for machine tools and plate-working machines from shipyards has developed. For more than a year builders of equipment have been waiting for a settlement of claims aggregating $650,000 against the Atlantic Corporation, Portsmouth, N.H., which built a shipyard at the behest of the Shipping Board during the war. No ships were constructed, however, because of differences which arose between the company and the Shipping Board relative to the contract. Now the Government has agreed to pay all claims, and the shipbuilding company will proceed on a new contract.

There is a good demand for second-hand tools because of delays in deliveries of new tools. The demand for new milling machines has been particularly good for some months, with the result that the milling machine manufacturers are well sold up. One large company will, however, soon increase its production to 500 milling machines a month and expects to be able to deliver machines from stock at all times. The country has absorbed a large amount of new machinery since the first of the year in addition to very large numbers of used tools from war plants. One large machine-tool concern had early in the year about $1,500,000 worth of its machines in stock, but now this stock has been entirely exhausted, in addition to all the machines that have been made since that time.

AUTO MAKER OFFERS PREMIUM OF $30 TON FOR BODY MATERIAL

Special to CANADIAN MACHINERY.

PITTSBURGH, Nov. 19.—Few union coal miners have returned to work since the officials of the United Mine Workers recalled their strike order under compulsion of the Federal court, but the steel industry is no longer seriously concerned since it is regarded as settled that enough coal will be mined to enable consumers to get along. There are stocks of coal of considerable magnitude, and there is heavy production at the non-union mines, this including the whole Connellsville district, which ships as much coal now as it makes into coke. Coal which the railroads have held instead of delivering it to consignees is likely to be released as occasion requires.

Steel Strike End in Sight

The virtual end of the steel strike is in sight. The strike is now in its ninth week, and in the past three weeks men have been returning to work more and more rapidly in all but one of the affected districts that remain, the exception being the Wheeling district, which remains tightly closed. Operations are increasing rapidly in the Mahoning valley, more than 50 per cent. of the blast furnace capacity being in operation, against about 90 per cent. just before the strike, while in Eastern Pennsylvania nearly as good a proportion. The Chicago-Gary district is rapidly approaching normal, while at Cleveland and Buffalo operations are increasing at a good rate. Western Pennsylvania has been practically free from strike for several weeks except in two spots, New Kensington and Monessen. The entire south has been running full throughout the strike, while in Eastern Pennsylvania the same is true with two or three trifling exceptions.

Supplies of Steel

Of course the steel market presents some appearance of there being a great shortage. Consumers are paying premiums for early deliveries of several descriptions of finished steel, and some buyers, particularly foreign buyers, find it almost impossible to make any purchases. The United States Steel Products Company, the export organization of the Steel Corporation, withdrew from the export market about a fortnight ago, and since then the Consolidated Steel Company, the company formed under the Webb Act and representing almost all the large independents, has likewise withdrawn from the export market. One of the large automobile makers is reported to have offered $30 a ton premium for steel sheets for bodies. Sales of black sheets on the basis of $4.50 to $4.65 for 28 gauge, or $2 to $5 a ton premium, have been common. Bars, which are officially 2.35c have readily brought 2.50c and more.

Making a general survey of the situation, however, and counting up the tonnage sought to be bought in proportion to the tonnage being produced, there is no wide scarcity of steel products. It is rather a small scarcity, very acute where it exists at all. In other words, a close estimate can be made that from the date of the strike, September 22, to date, the production of finished rolled steel has been between 2,000,000 and 2,500,000 gross tons less than it would have been if the rate of production in the first three weeks of September had been continued, and there is no dmand in the market for anything like such a tonnage of steel.

It does not follow by any means, however, that steel would have become a drug on the market if no strike had occurred. Jobbers and consumers had stocks, partly normal stocks and partly stocks built up in anticipation of a strike, for it must be understood that this strike, perhaps a much greater one than occurred, was expected, though nothing was said publicly about it beforehand by either manufacturers or consumers. Furthermore, the existence of the strike has caused many who would otherwise have been in the market to hold back, this applying particularly to those who had building projects. Finally, the strike occurred at the best time of year for producers and consumers in many lines. Thus the canning season was over and mill shipments of wire products for the usual fall distribution were ended. The pressure for deliveries of automobiles had begun to ease off, and the best time of the year for the inception of building operations had passed.

The strike, as a strike, will probably be practically over in two or three weeks, except possibly for the Wheeling district, but steel production will be restricted for a long time to come, through working forces being so disorganized. There will be after the strike, as there was before the strike, labor shortage, and there will be a desire on the part of the manufacturers to establish an eight-hour turn in place of the present twelve-hour turn, something that would require many more men if the entire mill and furnace capacity were to be operated.

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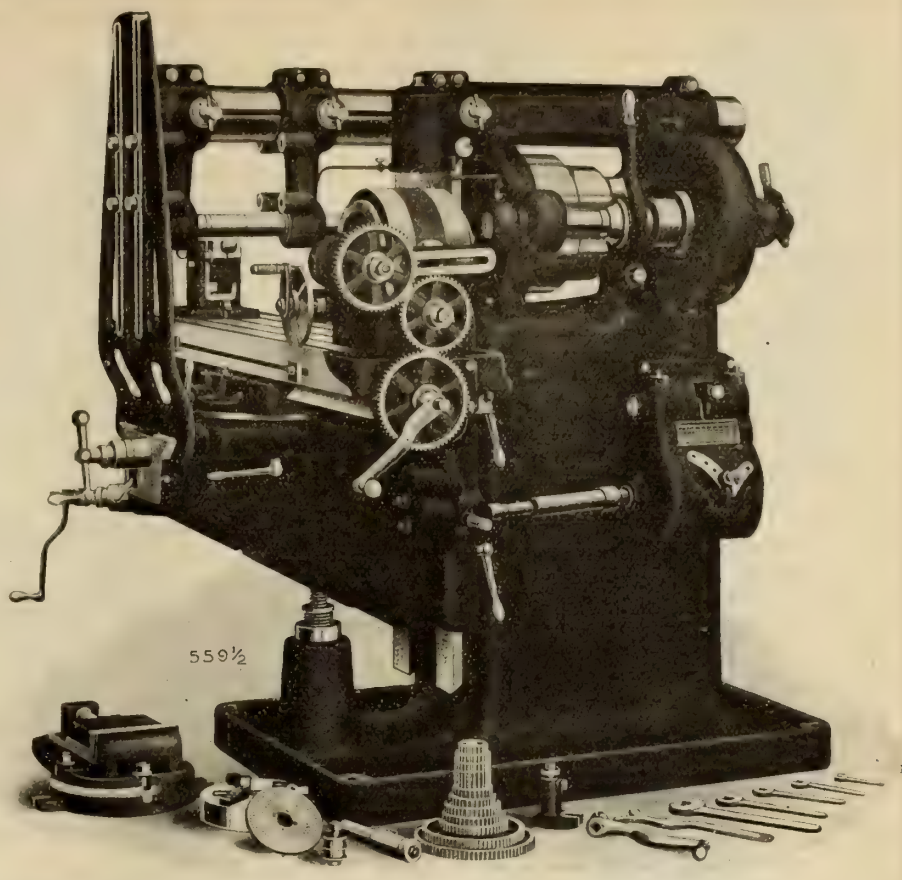

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MORROW NUTS MORROW

If interested tear out this page and place with letters to be answered.

line and with various industries requiring much more steel in spring than in winter, and with the railroads likely to enter the market after their long absence, there is bound to be a very heavy demand for steel, a demand greater than can be supplied. The lucky consumers are those who are recognized regular customers of those large mills that are adhering to the March 21 schedule of prices and are willing to book their customers for additional tonnages, for 1920, as shipments are made on their present contracts. The casual buyer, or the buyer who has been in the habit of shopping around among mills seeking the most favorable turns and buying now from one mill and now from another, has practically no chance in the market at present, and is not likely to have much chance for months to come.

Many of the smaller independent mills have advanced prices. This means in substance that they are charging delivery premiums, as long as there are other sellers who will take business from old customers at March 21 prices. To what extent the large independents will do the latter is not known, but what the Steel Corporation has done is shown in its unfilled tonnage statement for October, made public last week. This statement showed unfilled obligations at the end of October of 6,473,668 tons, representing an increase of 188,030 tons during October. As the Corporation's shipments in October were between 700,000 and 800,000 tons, probably close to the latter, its bookings in the month were nearly a million tons, and it is positively certain that none of this business was done at above the March 21 prices.

Except to an extent in Bessemer and basic iron there is no restraining influence in pig iron as there is in steel, and foundry pig iron continues to advance apace. A prominent merchant firm which buys and sells pig iron and also acts as agent, calls the valley market on foundry iron $34 at furnace for silicon 1.75 to 2.25 per cent. and $26 for silicon 2.25 to 2.75 per cent., with malleable at $33. The The $34 compares with $26.75 for the same kind of iron by the March 21 schedule. A prominent producing interest calls basic iron $27.25, valley, and Bessemer $28.50, but one would have to be a customer of long standing, no doubt, to be able to buy at such prices.

The prices for foundry and malleable quoted above are, it is true, for early deliveries, and thus they might be considered premium prices, for delivery, were it not that there are no sellers for extended delivery and it is difficult to call a price a premium price when it cannot be stated over what price it is a premium. It appears to be a case of team work among the furnaces, to get a prompt market established and then endeavor to sell for extended delivery at the same prices.

New York.—Practically every grade of scrap is in active demand, and prices are moving upward. Heaving melting is moving freely at $16.50 to $17 f.o.b. New York. Clean cast borings are at $15 to $16.

CANADIAN MACHINE TOOL MEN ASKED TO REFUND PROFIT ON DUTY

MACHINERY dealers in Canada are particularly interested in a move that is being made now by the U. S. Ordnance Department, in the asking for a rebate of profits paid on the duty of the machines imported from United States for carrying on U. S. contracts in this country. For instance, suppose a machine cost $1,000 in United States, and the duty was 35 per cent. The dealers reckon the resale price of that outfit as $1,350, and collect their profits in proportion. The claim of the Ordnance Department now is that there should have been profit charged on only the price of the machine, and that dealers should refund the profit they collected on the duty.

"From our standpoint," stated one dealer to CANADIAN MACHINERY this week, "the thing amounts to this. We have always looked upon our selling price as the price laid down to the buyer here. If he sent to United States for that machine it would cost him $1,350. We admit there is a good talking point in it, but there are other considerations. If a buyer came in here and said to me, "The duty on that machine is going to be $350, I will give you a cheque for that the day it is called for by the customs," we would be pleased to call his purchase $1,000 and base our earnings on that. But there are many cases where we have our money tied up for six months, and we simply have to maintain our balance of profit, or else we could not stay in business. As far as we are concerned now the deals have all been closed up long ago. When United States contracts first came over here we were dealing directly with the Canadian contractors, but a short time after that the U. S. Ordnance Department notified us that in future dealings would be direct with them. As far as the dealers are concerned I do not see how they can do anything about it."

Asked if there would be much involved in the controversy, our informant stated that he believed the claim, were it allowed, would amount to a considerable sum, as practically all the machine tool dealers in Canada are affected by the claim now being put forward by the U. S. Ordnance Department.

CONFERENCE WEEK FOR C.F.M. PEOPLE

Two Gatherings Held, One of Them to Make Better Salesmen Out Of Dealers

The Canadian Fairbanks-Morse Co. held a dealers' conference at the Bloor Street plant on the 18th and 19th, and on the 21st and 22nd a department managers' and salesmen's conference at the offices on Front Street. About 75 dealers were in attendance at the dealers' conference, the idea being to make more efficient salesmen out of the dealers. Mr. F. W. Evans, the Toronto manager, addressed the men, pointing out that the successful dealer to-day must not depend on the company sending salesmen from the head office to close sales in their districts. A dealer must aim to become a salesman, not only to locate the prospective buyer of an engine, but to show him what kind of an engine and what equipment he needed. By so doing, the men attached to the sales force of the head office would have greater time at their disposal to develop new territory. Another point made by Mr. Evans was that the one sure way to enable Canada to regain her strong financial position was by greater production in this country, by having more things to sell, and a strong appeal was made to the dealers along these lines.

Pittsburgh.—All grades of scrap have advanced sharply this week. Heavy melting has been sold at $21.50, cast borings $20, and machine shop turnings $17 delivered. Iron axles have brought $40 and cast iron car wheels $29.

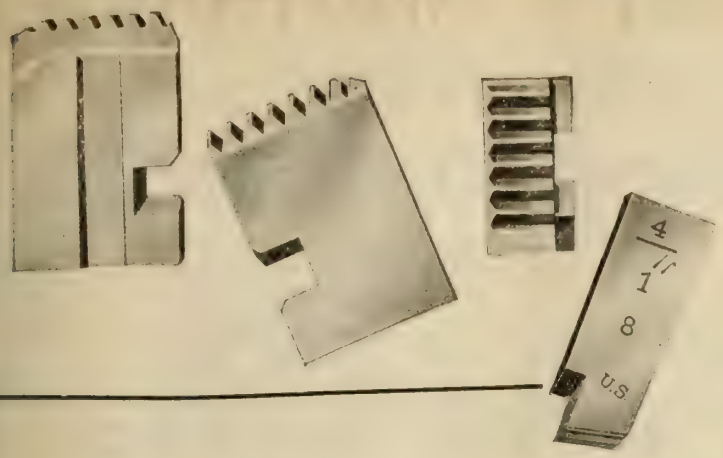
SARNIA PLANT MAKES A START

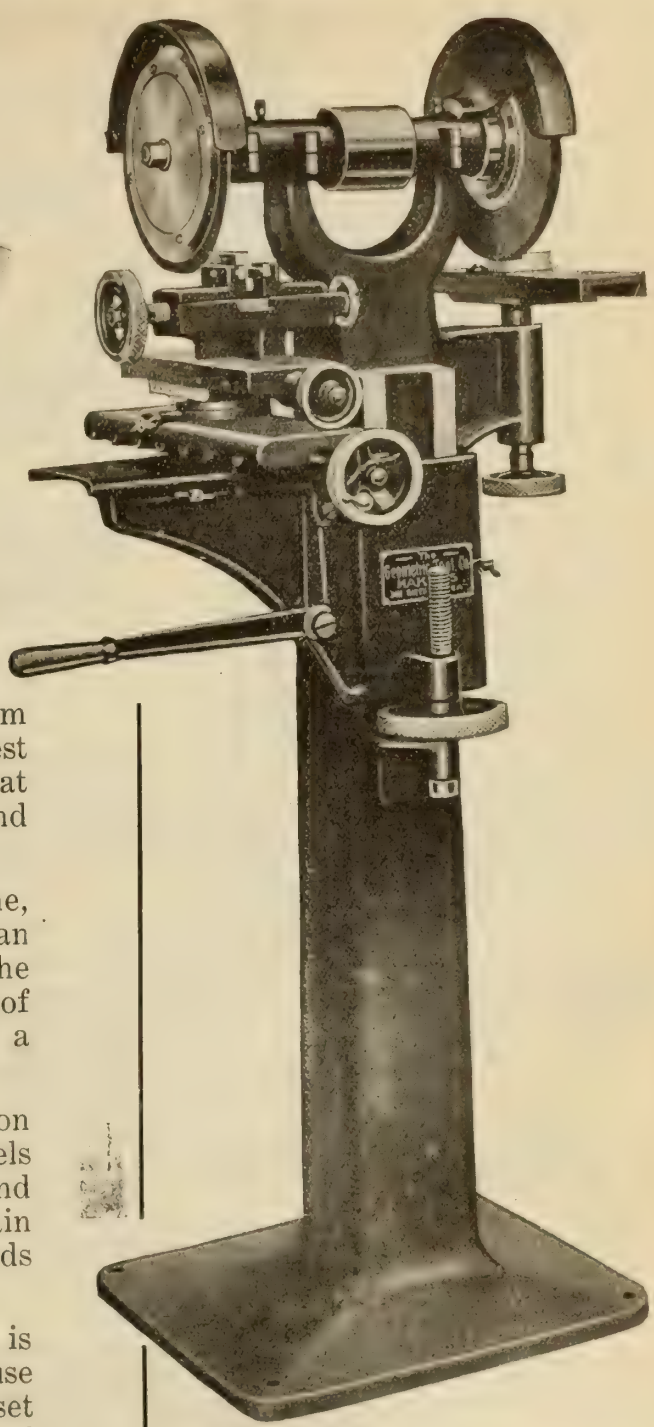
H. H. Robertson, Ltd., Turning Out Asbestos Protected Metals for Building Purposes

H. H. Robertson, Ltd., Sarnia, manufacturers of asbestos-protected metals for building purposes, are now operating their plant, the first of its kind in Canada. The building which they are occupying had to be remodelled in many respects to receive the necessary equipment. This process is one which renders absolutely weatherproof metal employed in the construction of practically any kind of factory or storage building. It has a wide use in the United States not only for manufacturing plants, mine buildings, elevators, power houses, etc., but has also been used satisfactorily on buildings in which fine architectural effect has been more or less of a factor. The management of the Sarnia plant intimates that the outlook for their product is exceptionally encouraging. A further development will be the manufacture of good roads material.

ERRATA

We stated in our Oct. 23rd issue that the Cincinnati Lathe and Tool Company of Oakley, Cincinnati, formerly made a 15-in. lathe. This was an error in the reading matter, for this company does not manufacture, nor never has manufactured a lathe of such size. They supply their machines in the following sizes: 16, 18, 20, 22, 24, 26 and 28 inch sizes, and in two-foot lengths of bed from six to thirty feet long, either cone type, belt drive, or geared head for belt or motor drive.





Sharp Chasers Cut Clean Threads

Accurate, uniform threads result only from dies which are maintained in the highest state of cutting efficiency. This means that chasers must be kept sharp, and ground uniformly.

Even if just touched up from time to time, the chasers respond splendidly, with clean threads. And with this machine — the Geometric Chaser Grinder—the matter of keeping threading tools up to scratch is a comparatively simple matter.

Various makes of chasers can be ground on this adaptable machine. The two wheels permit the easy grinding of both milled and tapped chasers. In addition, the plain wheel lends itself readily to various kinds of tool grinding.

Uniform grinding of a set of chasers is purely a mechanical matter through the use of adjustments which can be accurately set to govern the grinding of an entire set of chasers.

The Catalogue describing this machine is a mine of information on chaser grinding. Write for it

THE GEOMETRIC TOOL COMPANY

NEW HAVEN **CONNECTICUT**

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Toronto, Winnipeg, St. John, N.B.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta

If interested tear out this page and place with letters to be answered.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

Pittsburgh to Following Points	Per 100 Pounds. C.L.	L.C.L.
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$24 25	$25 00
Electro copper	24 00	25 00
Castings, copper	23 50	25 00
Tin	58 50	58 00
Spelter	10 00	10 50
Lead	8 50	8 50
Antimony	10 50	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 75
Plates, 3-16 in.	4 90	5 25

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	14 50	13 50
Malleable scrap	15 00	17 00
No. 1 machine cast iron	21 00	22 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	6 00	7 00
Stove plate	18 00	21 00
Cast boring	7 00	9 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 7
Nuts, square, tapped	add 1 0
Nuts, hex., blank	add 1 0
Nuts, hex., tapped	add 1 2
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and
Boiler rivets, base ¾" and larger	$8 5
Structural rivets, as above	8 4
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

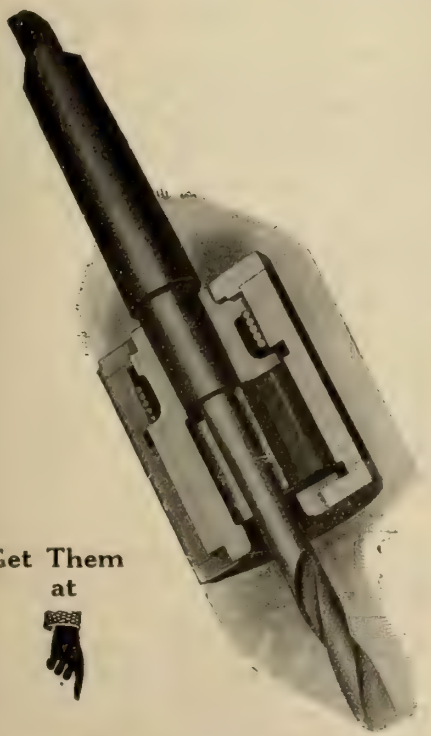
Secure Your
Starrett Tools
at
Aikenhead's

Complete Line of These Tools Always Carried in Stock

For almost forty years Starrett Tools have gauged the accuracy of the world's work. Micrometers, calipers, hack saws, tapes—whatever the tool, if it bears the Starrett trade mark, machinists recognize it as standard.

Every machine shop mechanic and owner knows Starrett Tools. Their superior merits need no recommendation, and when you are in need of anything in the Starrett line you can order it from AIKENHEAD'S with assurance of getting it quickly.

AIKENHEAD HARDWARE, LIMITED
17 Temperance St., Toronto



Get Them at

WAHLSTROM Automatic Drill Chucks Save Time

You can remove the tool in a second without stopping the work. They are centred automatically. No slipping, no chewed-up shanks.

Your work often requires more spindles than your drill press possesses. The Wahlstrom Automatic enables you to drill any number of holes of various diameters, regardless of the number of spindles in your drill press, at a MINIMUM cost.

As we carry a full line of Wahlstrom Chucks in stock we are able to meet your requirements at a moment's notice. Remember AIKENHEAD'S when you need a Wahlstrom.

Aikenhead's

AIKENHEAD HARDWARE, LIMITED
17 Temperance St., Toronto

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 75
Sheets, black, No. 10	5 15	5 65
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	8 20
Premier, 10¾ oz.	....	8 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot. Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08¼
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$11 50
Sheets, 3½ lbs. sq. ft.	10 50	11 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.03

Prices per lb. unless otherwise stated

Announcement of Special Interest

to users of

Drop Forgings

THE Dominion Forge & Stamping Company have sold their two Stamping Plants.

This means that the entire resources and energies of the Company will be devoted to the Drop Forge Industry.

Extensive additions are being made to their Forge Plant to take care of the increasing demand for drop forgings in Canada.

This Plant is one of the largest and best equipped drop forge plants on the continent; and to maintain this position in the industry the company decided on this policy of concentration.

Forgings are made to customer's blue prints and specifications. Inquiries are solicited.

Dominion Forge & Stamping Co., Ltd.

Walkerville, Ontario

Toronto Office: 206 Excelsior Life Bldg.

If interested tear out this page and place with letters to be answered.

Rushing Work on Baldwin's Finishing Mill

British Forgings Plant to be Greatly Enlarged—Expect to Operate Furnaces From Scrap Material—Operation Should be Secured at Toronto Plant by July of Next Year

TORONTO is in a fair way to take its first step toward becoming a centre of basic industries—or to be more correct, the step is being taken for her by Baldwin's, Limited, the Welsh tin plate manufacturers. Already progress is being made on the finishing plant that is being added to the British Forgings, and if present progress is maintained production should be secured by the middle of 1920. The new finishing shop, it may be mentioned, is 800 feet long by 70 feet across, and in this will be housed the rolling mills which will turn out the product that has heretofore been supplied from Wales, as far as the Baldwin business was concerned.

Speaking to a representative of CANADIAN MACHINERY this week, Mr. J. C. Davies, managing director of the company, stated that in coming to Canada, and locating in Toronto, he believed a business was being established that would have a great influence on the manufacturing industries in this community. "We want the support and the co-operation of the people of Toronto and the whole district. We are willing to establish here one of the heavy or basic industries, one that will turn out a large tonnage of material that is now imported. The securing of power is one of the chief items in our arrangements. We have not yet secured the arrangement we want, but there is not a great deal between ourselves and the Hydro Commission."

Something of the Plant

It might be well to mention here that the Baldwin plant has a capacity that will take care of 22,000 h.p. There are ten six-ton electric furnaces of the Heroult type. It is, as far as we know, the largest electric furnace installation of that type in the world, although there is one in course of erection in Norway or Sweden of equal, if not greater, capacity. The power comes to the plant at 13,200 volts, and for the purpose of carrying this line a duct run was laid across the city from Strachan avenue to Cherry, after which the line is overhead. Around the premises there are seven miles of standard gauge railway track. Shortly after the signing of the armistice the forge shop was destroyed by fire. For a time there was a fear in engineering circles that the plant was going to be dismantled. Mr. Russell, who had been representing the Baldwin interests in Canada for some time before, interested the principals of the concern to such an extent that in April some of them, including Mr. Davies, visited this country, with the result that after seeing the possibilities of trade in this country, and the capacity to which the plant could be developed, Mr. Davies opened negotiations, which have since resulted in the acquiring of the property.

No Blast Furnace Yet

The report has been published in some papers that Baldwin's, Limited, intend to work from the ore, which means the installation of blast furnaces and perhaps a coking plant. When asked regarding this, Mr. Davies said, "For the present we intend to operate the furnaces, depending largely on scrap metal, for the turning of which into steel ingots the works are admirably fitted. We will be purchasers of very large tonnages of scrap material, much of which I am given to understand goes out of the country at present. Our decision regarding the installation of furnaces later on to produce our own iron from the ore will depend on the development of the business and the conditions of the market. We believe that the operation of our plant here will be a good thing for numerous other industries, for there are many lines affected by the operation of a plant that is turning out tin plate, and our other lines. Above all else for the present, though, we want to secure the co-operation and good-will of the Canadian people. We want that more than anything. We are taking a big step in coming to Canada, for many of our friends urged us to keep on supplying the trade here from our Swansea plant in Wales. We have taken the big step and we certainly are not going to turn back now."

Production by July, 1920

"What will be the first lines you will turn out?" asked CANADIAN MACHINERY.

"We expect to put the finishing mill in operation, and then all lines can be turned out. Of course there is a great forging capacity at the works, as you know, that was utilized to such good advantage in war work. We shall likely use that to turn out some of the heavy castings for our rolling mill. Some of the rest of it we shall secure in United States and some will come from the Old Country. As far as we can see there should be easily a market now for 200,000 tons annually of tin plate, black sheets and black plate (black plate for enamel work), galvanized sheets, etc. We also intend to develop the forging plant."

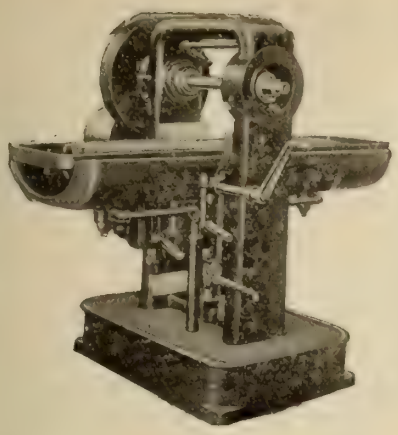
Mr. Davies is returning to the Old Country shortly, expecting to sail on the 25th of this month. He is enthusiastic about the future of this country, providing good relations can be maintained between the employers and labor. It is worth noting, in this respect, that the Baldwin plant, which employed at Swansea some fourteen or fifteen thousand hands, had no strikes during the war nor since, and good relations are maintained between the company and its men. It will be necessary for the Baldwin organization to bring to this country a number of skilled workmen, including those who will be in executive capacities. Their processes and methods must of necessity be followed very closely from the start if the best results are to be secured.

Roger Miller & Sons are putting in the foundation work for the finishing plant, and are making rapid progress. "If things keep moving as they are at present," said Mr. Davies in conclusion, "we should have production in several lines by July of next year."

SUCCESSFUL INDUSTRIAL CONCERNS GREW FROM SMALL BEGINNINGS

KITCHENER at the present time is hard put to it to accommodate the workmen who are flocking thither for employment in the city's factories or on construction work of the various plants now in process of erection. About one hundred and fifty houses have been built during the past season, and the Dominion Tire Co., by next spring, will have completed the erection of 300 houses for their employees. The manufacturers hope gradually to have the problem well in hand.

It is fairly well known that many of the large concerns now thriving in Kitchener had very modest beginnings. Discussing the unrest that is apparent among workingmen, and the persistent feeling that there should be some more generous division of profits, Mr. J. P. Scully, secretary of the Manufacturers' Association, Kitchener, said to CANADIAN MACHINERY: "When possible, and reasonable and advisable there will certainly be such a divison, but it is the privilege of every man to do just as many of our manufacturers did. The country is still young. The opportunity is there. Why not start in a small way and develop with the country? Let us look at some of our concerns. Here is one man who started in by making one or two articles at a time. Had no capital to speak of and had to sell as he went along in order to get the wherewithal to make a few more. To-day it's a large concern. There's another man who used to work for $1.75 a day on the railroad. To-day by hard work he is the head of a big industry. Another man and



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IN THE "HUDSON" PLANT

Many of the foremost manufacturing concerns of the country have learned that differentiating between Milling and "Briggs" Milling is a profitable departure. They've found that over a wide range of application "Briggs" means better work and more of it, greater economy and larger service. In the Hudson Motor Car Co.'s plant, Detroit, Mich., "Briggs" Millers are making a particularly fine showing, being used exclusively on many operations requiring the closest limitations. It'll pay you to investigate "Briggs" possibilities on your work.

Several of these machines in stock at Toronto

Garlock-Walker Machinery Company, Limited

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"Everything in Woodworking and Metal Working Machinery"

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If that old machine is not earning you money, then it's losing money, see!

Sell it to the firm who can use it, and both of you will make money.

ADVERTISE IT IN THE CLASSIFIED SECTION OF
CANADIAN MACHINERY

The Hughes Owens Co., Limited

MONTREAL TORONTO OTTAWA WINNIPEG

Manufacturers

Blue and Black Print Papers
Drawing Office Supplies for Students,
Architects and Engineers.

If interested tear out this page and place with letters to be answered.

his five sons toiled as no man ever did to develop a struggling industry. Dad and the boys stuck together—an unusual thing. To-day nobody will say they are not entitled to the fruits of success.

Still Another Example

'One of the largest and most successful shirt and collar concerns on this continent is located here and had a very small beginning. These things were not achieved by any six or eight-hour day process—not by "sudden flight, but by toiling upward in the night." And it is a fact that all of these men did toil upward both day and night. And the head of many a concern to-day is working and worrying for the welfare of his employees while the latter are sleeping."

The Kitchener citizen pointed out, however, that it is believed that in no other city in Canada was there a more sincere desire to give the workingman a square deal. Up to a short time ago, when certain trouble makers appeared on the scene, no employee seemed to find it necessary to ask for better wages or conditions—all were satisfied. When any subsequent protest had been made it had been given fair consideration."But the point we have to remember," said he, "is, that if Canada does not produce as she should, other countries will do so, the market will be supplied and Canadian industry will have fallen short. I believe as others do, that the Canadian future will be sure of big business."

The Week's Events in Montreal Industry

J. H. Barnes, who, for the past three years has been on the production staff of Darling Bros., Montreal, has been appointed purchasing agent for the company.

The American Smelting and Refining Company of Cincinnati, Ohio, are in the market to purchase large quantities of old materials, especially non-ferrous metals.

The Standard Equipment and Tool Works, 179 St. James St., Montreal, are in the market for a good universal milling machine, equivalent to No. 1 or No. 2; also a planer, shaper, and a bolt cutter.

The large dam recently constructed on the St. Maurice River will henceforth be known as the Gouin Dam. This enterprise is the largest of its kind in the world, and is capable of developing millions of hydro-electric horsepower.

Several large steel castings, weighing from 30 to 50 tons each, are being made at the Longue Point plant of the Canadian Steel Foundries for a 2,000-ton hydraulic press that will be erected at the Turcot works of the company for heavy flanging and bending in connection with their car construction.

An aftermath of the war was recently given to the residents of Quebec, when three scows laden with Lee-Enfield rifle cartridges were towed into the middle of the Rover St. Lawrence by order of the military authorities, and dumped into the water. The ammunition formed a large portion of the high surplus stock on hand, and for which there has been little need now that the range practice is discontinued.

J. R. Binning has been appointed manager of the Furness-Withy Company for Canada and Newfoundland. The appointment was made by Sir Frederick Lewis, Bart., the chairman of the company, during his recent visit to Canada. Mr. Binning has been with the shipping company since 1898, when he resigned from his position in the foreign freight department of the C.P.R. to join the Furness-Withy Company as assistant manager in Montreal, being appointed manager in 1903. Mr. Binning has been active in marine circles for many years and has been identified with the work of the Shipping Federation of Canada since its inception.

The Canadian Railway Board has announced an agreement that provides for wage increases and certain changes in working conditions for approximately 35,000 Caadian railway shopmen. Negotiations to this end have been carried on for the past six months, and the wage increases will be retroactive to May 1 last. Changes pertaining to regulation of working conditions will come into effect on December 1. The agreement was signed on behalf of the board by the chairman of its administration committee, Mr. Grant Hall, and for the employees by Messrs. R. J. Tallon, Frank McKenna, and Chas. Dickie, president, vice-president and secretary respectively, of the labor organization.

Continual development in the Canadian pulp and paper industry has been a feature of the past few years, and now we have the announcement that Price Bros. & Co. anticipate extensive expansion to their present activities. This firm has definitely decided to commence operations on a large newsprint mill in the Saguenay district, which, when completed, will have a capacity of over 400 tons per day. Additional equipment has already been installed at the Kenogami mill, so that the present output of Price Bros.' mills has been raised to 325 tons per day, of paper and board. When the new plant is operating, the capacity of the three mills will be about 800 tons per day. The advent of the new mill will mean a new town site, and it will bear the name of "Saguenay."

There is every reason to believe that Canada will participate, in a large measure, in the reconstruction work that will be carried out in Belgium. Senator Beaubien, director of the Canadian Car and Foundry Company, who has been in Belgium for some time past, negotiating with the Government there for the relief of transportation difficulties, expects favorable consideration of the project. Hon. Philippe Paradis, president of the Asbestos Manufacturing Company of Montreal, has also been in conference with Belgian and French officials, with the purpose of obtaining further contracts for cement products for use in reconstruction. Many other Canadian firms anticipate extensive trade development with Belgium. It is not unlikely that Belgian interests may establish a linen-weaving industry in Canada.

The plant of the National Electro Products Ltd., on Morreau Street, Montreal, is just about completed, and it is expected that active operations will be started before the New Year. In addition to the reconstruction of the plant that was acquired from the Beaver Engineering Company, a new building has been erected on the adjoining property that will give a total factory area of 100 by 100 feet, and situated directly opposite the C.N.R. freight sheds, which offers excellent shipping facilities for their product. Generating equipment has been installed for a capacity production of 60,000 cu. ft. of electrolytic oxygen per day. It has been learned that the company intend to establish a chain of factories from coast to coast; the Toronto plant is now in operation and the third factory will be erected in Hamilton. W. J. Cluff, of Toronto, is president of the company.

U.S. SCRAP METAL

Scrap prices are firmer all round. From all districts reports of better conditions are received. Following are some of the principal U. S. district reports:

Philadelphia.—There is a good demand for scrap, and purchasers cannot fill all their requirements. Borings and turnings are now being taken at the rate of 90,000 tons monthly. Rerolling rails sold at $28, and 1,000 tons of axles for export at $32 New York.

Boston.—Cast scrap stocks are being heavily drawn upon, and big advances are expected very shortly. Borings are very scarce, and some small lots have changed hands at $21 delivered. Heavy melting sold at $20.50 delivered.

Cincinnati.—With an improvement in the car situation, dealers have been able to ship material out, and all prices have advanced. All grades are in good demand, and conditions look better than for some time past.

TRADE GOSSIP

Making Changes.—Since November 1, all shipments made by Acme Stamping and Tool Works, Ltd., Allith Mfg. Co., and Safety Door Hanger Co., are being invoiced by Slater and Barnard Limited, who own and operate these three companies. All purchases made by any of these three companies will also be changed to Slater & Barnard Ltd.

Quebec.—It is stated that the Davey Shipbuilding Company, Lauzon, has obtained contracts for a number of vessels, which will keep the yard busy for some months to come. The National Shipbuilding Company, a newly formed concern, has taken over some old yards at Levis, and will commence on the construction of a number of vessels for which they have secured contracts.

Need for Care.—If Canadian factories are going to be kept running all winter, the utmost care in the consumption of steam coal will be necessary. Production in the United States is far from normal, and will likely remain so for some time. The amount of bituminous coal brought into Canada from April 1 to Oct. 31 was only 70 per cent. of the amount received in the same period last year, and none has been shipped in since November 1.

Engineers Wish to Close Ranks.—The Provincial Executive of the New Brunswick Association of Professional Engineers at a recent meeting held a discussion on the subject of the making engineering a closed profession. A bill will be presented to the Legislature at the next session, which will seek to prevent any civil, mechanical, electrical, mining or any engineer practising his profession in New Brunswick until he had established his qualifications and been registered according to the Act.

Yarmouth.—There have been two launches recently in this district, both of schooners. One was at Belliveau's Cove, where the three-masted schooner Rosanne Belliveau was launched, fully rigged and ready for sea. The second was at Meteghan River, where the Doucett Shipbuilding Company launched the tern schooner Celeste D. This latter vessel is fitted with a 15 h.p. Fairbanks-Morse oil engine for hoisting purposes. This can be applied to the hoisting of sails and anchors, and if necessary connected with the pumps.

British Firms First.—The Secretary of State for India made a statement recently on the subject of locomotives for the Indian Government. A scheme had been proposed by the Armstrong-Whitworth Co. whereby that firm would establish an Indian company for the purpose of manufacturing locomotives. The Indian Government in turn would engage to buy from the new firm one-third of the English boilers it requires. A counter proposition will be considered from the Locomotive Manufacturers' Association. No invitation has been sent to American firms to compete.

SALE OF MILITARY STORES, ETC.

DRY GOODS, HOSPITAL FURNITURE, BEDDING, HARDWARE, LEATHER GOODS, JUNK, ETC.

SALES WILL BE MADE BY SEALED TENDER

Persons desiring to tender are requested to register their names and addresses with the

SECRETARY OF THE WAR PURCHASING COMMISSION, BOOTH BUILDING, OTTAWA

stating the class of goods in which they are interested, whether new or second-hand or both.

Tender forms with full details of the goods and places at which samples may be seen, will be mailed when ready to those who have registered as requested above.

Special Terms to Hospitals, Etc.

Dominion, Provincial, and Municipal departments, hospitals, charitable, philanthropic, and similar institutions which are conducted for the benefit of the public and not for profit may purchase goods without tender at prices established by the War Purchasing Commission.

Returned Soldiers and Sailors and Widows and Dependents of Soldiers and Sailors killed in the War may obtain supplies, for their own personal use and not for re-sale, through the nearest branch of the Great War Veterans' Association who will combine individual orders and forward to the War Purchasing Commission through the Dominion Command of the Great War Veterans' Association. These services are rendered by the Great War Veterans' Association to all parties in the classes named, whether members of the Great War Veterans' Association or not.

All communiations should be addressed to the Secretary, War Purchasing Commission, Booth Building, Ottawa, who will be glad to supply lists and further details to those interested.

Ross Rifle Claim. — The Exchequer Court is to adjudicate upon the claim of Sir Charles Ross for compensation for the compulsory taking by the Government of the Ross rifle factory in 1916. Subsequent to the expropriation Sir Charles filed a claim for about $18,000,000 compensation and damages for cancellation of contracts. The Government refused the necessary fiat on the ground that in the order of expropriation the maximum value of the property was fixed at $3,000,000. On the latter basis the case now goes to the Exchequer Court to determine the actual amount to be paid with three millions as the outside limit.

Sale of Military Stores.—The War Purchasing Commission, Ottawa, is announcing a sale of military stores, etc., dry goods, hospital, furniture, bedding, hardware, leather goods, junk, etc., and inviting tenders for the same. Those desiring to tender are requested to register their names and addresses with the secretary of the War Purchasing Commission, Booth Building, Ottawa, stating the class of goods in which they are interested, new or used. Returned soldiers

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What you will pay for a few ordinary drinking cups will meet the cost of the

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DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15% to 35% in water bill.

"PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.

Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."

Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

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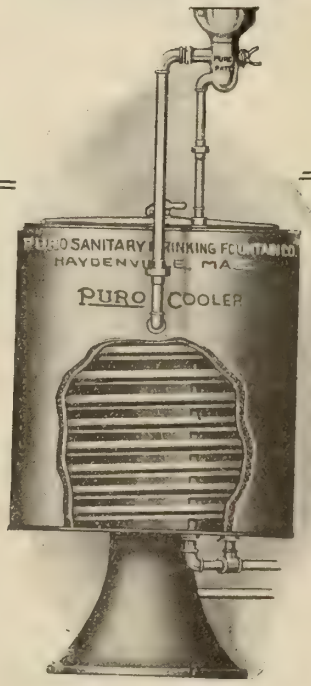

and sailors and widows and dependents of soldiers and sailors may club together to obtain supplies for their own personal use by applying for particulars to the nearest branch of the G. W. V. A.

Trouble in Shipping.—The transportation department of the Canadian Manufacturers' Association is sending out the following circular: "Complaints recently received from manufacturers and shippers would indicate that the freight service on the L. C. L. shipments to points east of Montreal in Quebec and the Maritime Provinces is again falling down badly and we propose conducting a thorough investigation with a view to effecting an improvement. We shall be obliged, therefore, if you will advise as early as convenient if you have experienced any annoyance in this respect; and, if so, furnish us with full particulars. The information desired should include the following data: date of shipment; description of goods; consignee; destination, and, if possible, the carriers' way bill of reference, which you should be able to obtain from the local freight agent.

Busier at the Soo.—During the past few days there has been a great improvement in the industrial outlook at Sault Ste. Marie. It was announced that sufficient orders for rails and structural steel had been received by the Algoma Steel Company, a subsidiary of the Lake Superior Corporation, to keep the mill going all winter, or for six months. Several good orders for rails have been received lately from Canadian railways, being part of the work of replacement and repair so long delayed by the war. On October 21 the structural mill, recently completed as an addition to the rail mill, commenced operations, making structural shapes up to 15 inches, where formerly six inches had been the limit in Canada. Since then orders have been coming in rapidly. The manufacture of alloy steel for the first time in Canada has also been begun, and it is expected that this product will find its main market among the automobile factories of Ontario.

Sydney, N.S.—That better consideration would be given to the question of employment of returned soldiers, was the assurance given by Steel and Coal Company officials to E. R. Roberts of the advisory board of the G. W. V. A., Ottawa, and Dan McDougall, vice-president of the provincial command yesterday. A meeting between the above-named officers and Mr. McCann of the Steel Company and A. W. McDonald, employment agent, was held, and Mr. McDougall met a representative of the coal company. The many problems affecting the re-employment of returned men were thoroughly discussed. The delegation from the "Vets" were given a most attentive hearing, and they received the assurance that the returned man would be given every assistance to re-establish himself at the company's works. Mr. Roberts and Mr. McDougall both expressed themselves as extremely well pleased over the interview, and the promised betterment of conditions for their comrades.

PERSONAL

Walter Lambert, A.M.I.N.A., naval architect and marine surveyor, of Montreal, is leaving for Europe early in December to re-establish business connections with Old Country shipping interests, returning early in February.

The death is announced in Toronto of Capt. James McMaugh, who sailed the Lakes for upwards of fifty years. The deceased passed away at the home of his daughter, Mrs. D. R. McKenzie, 1307 King Street W. He was born in Quebec 78 years ago, and went to sea early in life. He was a veteran of the Fenian raid.

A. C. McKenzie has been appointed Engineer Maintenance of Way on the C. P. R., with headquarters at Montreal, succeeding Mr. Frank Lee, transferred.

Do right and you will fear no man.

Don't write and you will fear no woman.

PIG IRON TRADE

The pig iron market still is on the up grade. An added feature is that of basic, which is now figuring in the buying quite largely. Following are reports from U. S. points:

Philadelphia.—The market price for basic is now $33 furnace. The advance was sudden, the $6 jump occurring during the week. One lot of 20,000 tons was sold at $30, the next sale being at $33. Foundry iron is also higher, No. 2X selling at $35.50 Central Pennsylvania furnace.

Boston.—The scarcity of pig iron has turned New England buyers to Southern fields. Prices are higher, and there is considerable resale iron coming into the market. Sales for the week in Boston were around 6,000 tons.

New York.—There is not much tonnage available for this year's shipment, and prices are advancing with each sale almost. Next year sales are being confined to special customers of melters. There is good export enquiry but not much available.

Pittsburgh.—After a period of inactivity basic is getting into the procession. Quotations are being made for this year delivery from $27.70 to $29. Bessemer has been sold up to $29.50 valley furnace. Foundries are buying the steel-making grades to replace foundry grades that are unobtainable..

Buffalo. — Considerable tonnage on higher schedule announced some weeks ago has been sold this week. The prices are $34 for No. 2 plain; $35.25 for No. 2X and $37 for No. 1X. These prices are being generally quoted now. Malleable sold during the week at $33.

Cleveland.—Prompt iron is still very scarce and prices naturally high. Some Buffalo iron was sold at $36.10 delivered Cleveland. There is an enquiry in the market for 15,000 to 20,000 tons foundry and malleable for the General Motor Corporation; 1,000 tons 1.75 to 2.25 silicon foundry for first quarter delivery was sold at $31 to $32 Ohio furnace.

Chicago.—There are a number of enquiries out for foundry and malleable, but most of the makers are out of the market. There is some spot iron available from outside centres which is taken up as soon as offered.

Cincinnati.—Southern producers have withdrawn from the market on foundry iron. Malleable is in demand, and some has been sold at $34 valley furnace. There is little spot foundry iron to be got, and no iron is being offered for first half.

St. Louis.—First quarter iron is quoted at $30. Spot iron is in good demand, and $35 has been paid for Southern iron 1.75 to 2.25 silicon content. Foundries have enough business to keep them going for the remainder of the year.

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AN INTERESTING BOOK

"One of the best things I have seen for some time," is the way one might describe the book issued by the Pangborn Corporation of Hagerstown, Md., descriptive of the works and the men behind the organization. In an introductory chapter is explained the manner in which Thomas W. Pangborn, fifteen years ago a salesman for foundry supplies, perfected his machines for sandblasting and successfully put them on the market. Subsequent pages show views of the plant and offices, and numerous products turned out at the plant, as well as a number of interesting installations at various plants.

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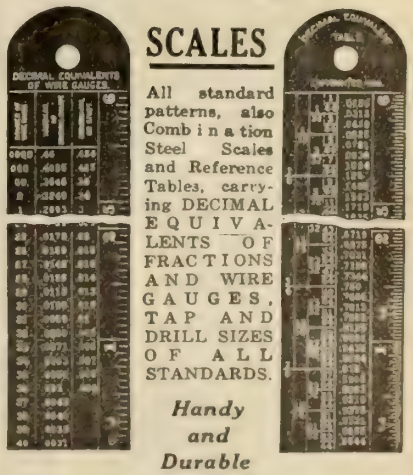
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CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

HELP WANTED

DRAFTSMAN WANTED — GOOD GENERAL draftsman used to designing and drafting. State experience and salary expected. William Hamilton Company, Limited, Peterboro, Ont. (c23m)

BY WELL-KNOWN BRITISH MANUFACturer, young unmarried man to act as sales representative. Must be keen, aggressive, steady business getter, resourcesful and absolutely reliable. To such a man a good future will open up. The line is high grade textile belting, paper makers' felts and linen fire hose, and a stock will be carried. Box 638, Canadian Machinery. (c24m)

POSITIONS WANTED

POSITION WANTED BY A FIRST-CLASS mechanic with a large experience in making gauges, dies, jigs and fixtures for small work, and small tools; can take charge of department. Know how to handle screws; have been working in some of the best shops in the U.S. Is an inventor, also improver and designer. Aged 50 years; good health; steady worker. In answering please mention the class of work and mention the highest wages, with all particulars. A position wanted for his son, also a first-class mechanic. Apply during the week of November 15th. L.E.J., 38 Glenelg Street W., Lindsay, Ont. (c26m)

MACHINERY WANTED

WANTED — SECOND-HAND ALLIGATOR Shears for cutting steel bars—in good condition. Send particulars to Dillon Crucibue Alloys, Limited, Welland. (c21m)

FOR SALE

FOR SALE—BRAND NEW INGERSOLL-RAND After-cooler, never used, for compressor up to 14 x 14". London Mfg. & Machine Co., Ltd., London, Ont. (ctfm)

ONE 23-FOOT GAP LATHE, 30" OVERSHEARS. One 20" Back Geared Drill. Apply The Vulcan Co., Ltd., London, Ont. (c22m)

AGENCIES WANTED

WANTED—AGENCY OF SPECIALTIES FOR hardware trade, factories, and mills, for Quebec City and district. Best connections and references. Reply to G. A. Vandry, 28 St. Joseph St., Quebec. (c21m)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (efm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

Mining Machinery for Sale

Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 2 phase 60 cycle 550 volts.
Ingersoll-Rand 800 ft. Air Compressor.
1 Tube Mill Fraser & Chalmers 5 x 22.
1 Power & Mining 5 x 22.
Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

Zenith Coal & Steel Products Limited
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The "want ad." has grown from a little used force in business life into one of the great necessities of the present day.

Business men nowadays turn to the "want ad." as a matter of course for a hundred small services.

The "want ad." gets work for workers and workers for work.

It gets clerks for employers and finds employers for clerks. It brings together buyer and seller, and enables them to do business though they may be thousands of miles apart.

The "want ad." is the great force in the small affairs and incidents of daily life.

One of the things we all do well is to forget.

Names that were household words yesterday are gone to-day.

Because people knew your Name and your Line a year ago it is no sign they do to-day. They forget easily.

Keep yourself in the public mind by advertising. It is just as important to make old friends remember as it is to win new friends. Advertising does both.

NEW MITRE BOX PATENT

If you are interested in buying a patent for the latest labor-saving device in mitre boxes, address Box 636, Canadian Machinery. (c22m)

Full line of
Honestly Rebuilt Machine Tools at bargain prices.

Special price on 20 inch x 8 ft. C.M.C. Lathe.

STANDARD EQUIPMENT & TOOL WORKS
179 St. James St. - MONTREAL

Manufacturers desirous of selling in Great Britain are asked to give particulars to

Furniss Clarke & Co.
Room 63
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WANTED

the following used Equipment

Draw-Bench
Gang Slitter
Welding and Cutting Plant

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CANADIAN MACHINERY
153 University Ave.
TORONTO

OVER $225,000 SPECIAL OFFERING!!!

NEW MACHINES

Attractive Prices

Prompt Delivery from our Jersey City Warehouse

2—20″ x 12′ American Tool Works Engine Lathes, quick change, motor drive.
20—20″ x 8′ Walcott Engine Lathes, double back geared, quick change.
2—14″ x 8′ American Tool Works Engine Lathes, geared head, motor drive, taper attachment.
35—Rahn Larmon Co. make, Engine Lathes, 16″ x 8′, quick change, double back geared, friction head.
30—16″ x 6′ American Tool Works Engine Lathes, quick change.
6—17″ x 10′ LeBlond Engine Lathes, heavy duty, double friction geared, quick change, taper attachment.
42—16″ x 6′ Cleveland Engine Lathes, 5 with pan beds and taper attachment.
2—12″ x 5′ Reed Prentice Engine Lathes, quick change.
25—Bardons & Oliver No. 4½ Ontario Screw Machines, friction geared head, with regular equipment.
2—No. 2 Becker Vertical Milling Machines with rotary attachments.
3—No. 3 Becker Vertical Milling Machines with rotary attachments.
1—No. 2 LeBlond Universal Milling Machine, single pulley drive.
19—Garvin No. 13 Back Geared Plain Milling Machines.
2—Rockford 14″ Shapers, variable speed motors, D.C., 220 volts.
1—Van Norman No. 4 Internal Grinder with attachments.
1—Norton 6″ x 30″ Plain Grinder with full equipment.
4—LeBlond Cutter Grinders with power feed and all attachments.
1—Rogers 34″ Vertical Boring Mill, turret head.
2—American No. 1½ Plain Milling Machines.
3—U.S. Sensitive Drill Presses.
1—Norton Crankshaft Grinder, 20″ x 96″.
1—Norton Crankshaft Grinder, 14″ x 72″.
2—Wilmarth & Morman Grinders.

In Rebuilt Machine Tools we have in stock:—18 Boring Mills, 24 Milling Machines, 15 Planers, 11 Slotters, 34 Drill Presses, 20 Grinders, 66 Engine Lathes, 10 Shapers, 5 Saws, 18 Presses, 9 Hammers, 15 Screw Machines, 9 Gear Cutters, 15 Punches and Shears, 20 Turret Lathes, etc., etc.

For full particulars write to:—

NEW YORK MACHINERY EXCHANGE

50 Church Street
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United States Government Surplus Property For Sale

By Toronto District Salvage Board, Ordnance Department, U.S. Army.

Miscellaneous Machinery—Shop Equipment—Miscellaneous Tools—Electrical Equipment—Testing Equipment—Miscellaneous Hardware, etc.

Comprising

MISCELLANEOUS MACHINERY

Lathes—Millers—Grinders—Shapers—Planers—Presses—Boring Mills—Drillers—Sand Blasts—Screw Machines—Thread Millers—Varnishing Machines—Hack Saws—Forging Equipment—Centering Machines, Etc.

SHOP EQUIPMENT

Forges—Furnaces—Blowers—Air Compressors—Accumulators—Pumps—Trucks—Shafting—Tanks, Oil—Tanks, Quenching—Tanks, Storage—Scales—Welding Equipment—Cranes—Hoists—Pulleys—Blowers—Chain Blocks—Vises—Conveyors—Runways — Belting — Miscellaneous Hardware—Etc.

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Boring Bars—Chucks—Reamers—Tool Holders—Twist Drills—Taps and Dies—Micrometers—Etc.

ELECTRICAL EQUIPMENT

Generators—Motors—Transformers—Switch Boxes—Miscellaneous Supplies—Etc.

TESTING EQUIPMENT

Pyrometers—Testing Machines—Brinell Machines—Etc.

Information regarding above may be obtained by applying to

Chairman, Sub-Committee on Buildings and Equipment
District Salvage Board, Ordnance Department

39 ADELAIDE STREET EAST TORONTO, ONTARIO

SURPLUS EQUIPMENT FOR SALE

PRESSES

	Stroke Inches	Width Bed	Approx. Cap. Tons
2—No. 666 Toledo Embossing Presses	2	32	1,200
1—No. 26 Bliss Embossing Press	2	30	800
2—No. 27 Bliss Embossing Presses	2	32	1,000
2—No. 77½ Bliss Crank Presses, double back geared	18	30	350
2—No. 87 Bliss Crank Presses, double back geared	16	27	250
2—No. 60½ Bliss Rack and Pinion Drawing Presses	60	21	100
10—No. 60½ Bliss Rack and Pinion Drawing Presses	42	21	100
1—No. 857 Toledo Rack and Pinion Drawing Press	48	25	100
1—Robertson Hydraulic Press with pump and extra set of columns	24	27	800

LATHES

35—Special Cartridge Case Bullard Turret Lathes.

FURNACES

5—25′ x 8′ Rockwell Double Door Annealing Furnaces.

2—16′ x 8′ Rockwell Double Door Annealing Furnaces.

Above equipped with combination oil and gas burners, recording and indicating pyrometers, air rams and air pullers, etc.

1—Gas Furnace for annealing brass turnings.

Hardening Furnaces and Tanks.

3—Conveyor Type Annealing Furnaces. Could be used for annealing automobile pistons or other similar work.

MISCELLANEOUS

1—Metal Band Saw.

1—Gray Metal Cutter.

1—No. 1 Quick Work Rotary Shear, 60″ throat.

1—Tinius Olsen Testing Machine, 10,000 lbs.

1—Brinell Testing Machine.

1—Boland Sand Blast Machine (new).

1—Sauveur Boylston Photo Micrograph Outfit.

1—No. 2 Garvin Vertical Tapping Machine (new).

Number of Speed Lathes.

Connersville Positive Blowers.

Sheleton Blowers.

Sturtevant Blowers.

Platform Scales.

Wood and Iron Pulleys, Shafting, Hangers, Bearings, Couplings, etc.

Motors—10 to 75 h.p., 25 and 60 cycle, 220 volt, 3-phase.

Air Hoists, 4 and 6″.

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HAMILTON, CANADA

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in
Railway, Marine and Industrial Supplies

Duntley Dayton Pneumatic Tools.
Daniel's P.P.P. Packing.
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Pump Valves.
International High Pressure Sheet Packing.
International Red Rubber Packing.
Plastic Metallic Packing for Piston Rods and Valve Stems.
Paxton & Mitchell Locomotive Rod Packing.
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International Machinery and Supply Company, Limited
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A Little Act of Courtesy That is Good Business

BY simply mentioning CANADIAN MACHINERY when writing to our advertisers you will be doing something which will prove of three-fold benefit.

First—It will benefit you because it enables the advertiser to immediately associate your enquiry with the product advertised, resulting frequently in quicker service.

Second—It will benefit the advertiser because it enables him to identify and classify enquiries and to give credit where credit is due.

Third—It will benefit **your** paper because in the records of the advertiser it will receive the credit for your enquiry, instead, perhaps, of some less deserving medium.

We are always grateful for favors of this kind. It costs the reader nothing, and yet as we said before, it is of three-fold benefit.

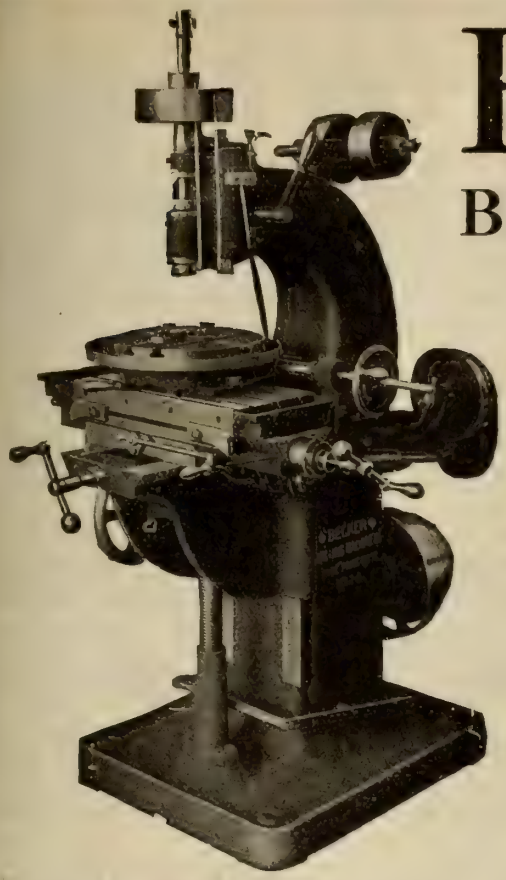
"The Marshalltown Throatless Shears"

guarantee perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.



BECKER
BELT DRIVEN MILLERS

are machine shop necessities; they do work that formerly required planers, shapers, boring mills and other machine tools of this class, and do it quicker, better and cheaper than did the tools they displace.

The micrometer stop gauge, in the spindle head, enables the operator to work to thousandths. This is a distinct advantage, because it eliminates the possibility of spoilage in setting-up.

Your next machine tool should be a Becker Belt-Driven Milling Machine. They are efficient.

Let us tell you more about them.

BECKER MILLING MACHINE CO.
HYDE PARK, BOSTON, MASS.

Rudel-Belnap Machinery Co., 137 McGill St., Montreal.
A. R. Williams Machinery Co., 64 Front St., Toronto.

The Hammer With The Human Stroke

HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to 5/16".
A rivet in three seconds, size 7/16" to ½".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
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MORSE DRIVES

Flexible as a belt Positive as gears
Longer life than either

Our engineers, experts in the art of designing chain drives, will gladly call and assist in solving any power plant transmission problem without obligation.

We are always glad to furnish special information pertaining to our field, and welcome inquiries.

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FACTS will Surprise You

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ASSISTANCE FREE

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KEEP IN MIND THAT

The back of the OX

is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

Tullis
LEATHER BELTING
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is made entirely from this portion of the hide.

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BELTING SPECIALISTS
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Established 1834

Canadian Agents:
UNIVERSAL SUPPLIES Limited
Room 25, 204 St. James Street
MONTREAL

Six Post Readers in New Cabinet

FORMER Finance Minister Cashen, who, following the crisis which led to the resignation of Premier Lloyd, of Newfoundland, has been called upon to form a Ministry, has already selected nine members to act with him.

Six of these, including the Premier himself, have been regular readers of THE FINANCIAL POST for some time.

This does not only indicate the quality as well as the extent of our circulation, but indicates also that men who carry big responsibilities find THE POST of value to them. It indicates, therefore, the approval which is meeting the effort of our editors and the great importance and value of the business information to which subscribers have access through the columns of THE FINANCIAL POST.

When the Government of Newfoundland was recently arranging the flotation of a $5,000,000 bond issue THE POST'S opinion as regards some methods of marketing was quoted by members of the Cabinet.

The Financial Post at Ottawa

IN the Dominion House of Commons the other week the attention of the Government was drawn to an article in THE FINANCIAL POST containing a reference to the financing of Roumanian orders through an agency established in London by Sir Clifford Sifton. Sir Thomas White mentioned that in reading his FINANCIAL POST that week, he had formed the opinion that the reference was to private marketing of bonds.

Keen Business Men and Cabinet Ministers Read the Post

SIR THOMAS WHITE, with other Cabinet Ministers and prominent Canadian men of affairs, have found THE FINANCIAL POST of swift and sure business service. When you "get down to business" you want the plain facts—all of them—without frills—and quickly. You get them like that in THE POST. THE FINANCIAL POST will keep you informed on Canadian business matters in a way unrivalled by any other publication. Send for a subscription to-day. The price is $3.00 per year, and you have only to fill in this form:

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Send me THE FINANCIAL POST every week till further ordered. I will pay subscription price, $3.00 per year, on receipt of bill, or you may draw on me for this.

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Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

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THE
ST. LAWRENCE WELDING CO., Ltd.
138-140 Inspector Street, Montreal, Que.

WE CAN WELD ANYTHING ANYWHERE

WELDING APPARATUS AND . . . SUPPLIES

The REGO 100% Efficient Welding Torch

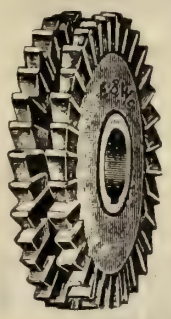
Saves Oxygen Eliminates Flash-Back Better Welding

Write to us for anything and everything you need.

WELDING & SUPPLIES COMPANY
C. ROYER, Manager 1142 Ontario Street East, Montreal

Elliott & Whitehall Machine & Tool Co.
GALT, ONTARIO, CANADA

MILLING CUTTERS AND SMALL TOOLS



We manufacture the following tools, etc.

Standard and Special Milling Cutters of all descriptions, Gear Cutters, Hand Reamers, Shell Reamers, Chucking Reamers and Taper Pin Reamers, Lathe Mandrels and Arbors, Metal Stamping Dies, Gauges, Jigs and Fixtures, Etc.

All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.

ASK FOR OUR NEW CATALOGUE No. 10.

ACCURACY

When you want Cap and Set Screws and Semi-finished or Finished Hexagon Nuts for your rush jobs send your order to us. Prompt service with accurate goods.

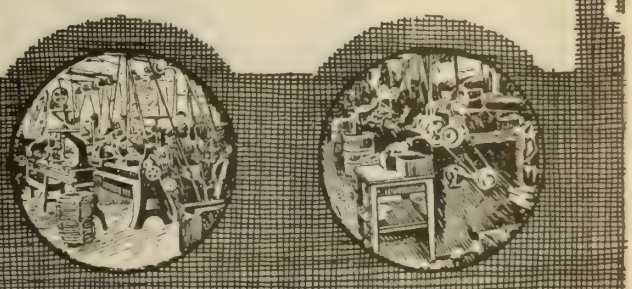
THE
GALT MACHINE SCREW CO., LIMITED
GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company Limited, 49 Common St., Montreal, Que.

SPECIAL TOOLS

Automatic Machinery
for all purposes
Punch Press Work
Screw Machine Products
Consult us on your machine problems

Toronto Tool Company
516 Richmond St. West Phone Adel. 1181



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Plain Cylindrical Grinders

Built by

Fitchburg Grinding Machine Co.
FITCHBURG, MASS., U.S.A.

BATH Universal Manufacturing Grinders

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THE
TORONTO IRON WORKS
LIMITED

HEAD OFFICE: ROYAL BANK BLDG. **TORONTO** *WORKS: CHERRY STREET*

Oil Storage, Gasoline Tanks, Air Receivers, Pneumatic Water Supply Tanks, Smoke Stacks, Boiler Breeching, Riveted Steel Pipe, Bins and Hoppers. Heavy and light steel plate construction erected anywhere.

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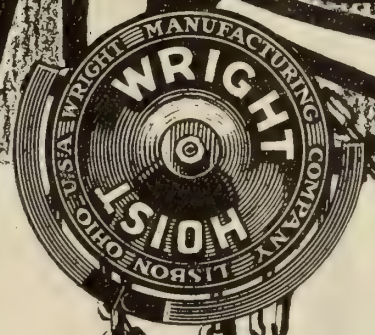

ANYTHING TO LIFT?

and it goes with Speed, Strength and Safety

Different Capacities 1 to 30 tons

HOOK IT ON!

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Canadian Distributors:
The A. R. Williams Machinery Co.
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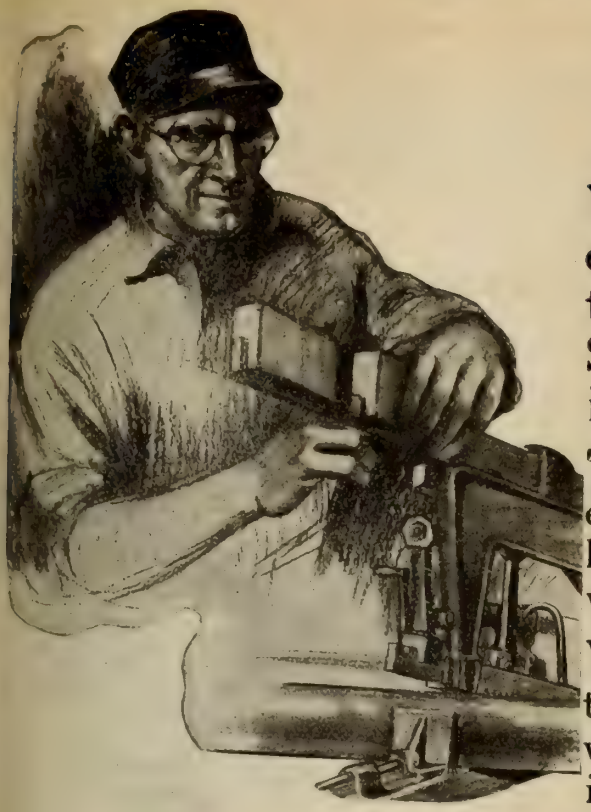

Weight, pressure on the blade, is one of the biggest factors in getting everything out of a Hack Saw that the manufacturer put into it.

Too little weight is just as uneconomical as too much—and it doesn't have even the advantage of cutting quickly while the blade lasts.

Where too light pressure is used the teeth of the saw slip and slide over the work without cutting. If too much weight is put on, the saw may strip and, in any case, the teeth are worn off in a short space of time, out of all proportion to the work accomplished.

The surest, safest way to get Hack Saw economy is to use Starrett Blades according to the Starrett Hack Saw Chart. Both the blade and the method are sure to be correct if you follow the chart.

Send for Catalog No. 21"3."

THE L. S. STARRETT CO.

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

ATHOL, MASSACHUSETTS

NEW YORK LONDON CHICAGO

42-1

Starrett Hack Saws

Why use makeshifts?

WHY waste time and energy with makeshift devices for boring operations when Williams' "Agrippa" Adjustable Boring-Tool Posts offer convenience and efficiency developed to the nth power?

Each post accommodates a wide range of Bars, the height of which is readily adjusted; a turn of the Knurled Ring raises or lowers the base on which they rest. The whole device is instantly and rigidly locked by tightening the Set Screw.

Four sizes for ½ to 2¼" diameter Bars—furnished with or without Bars.

Ask for Machinists' Tools Booklet.

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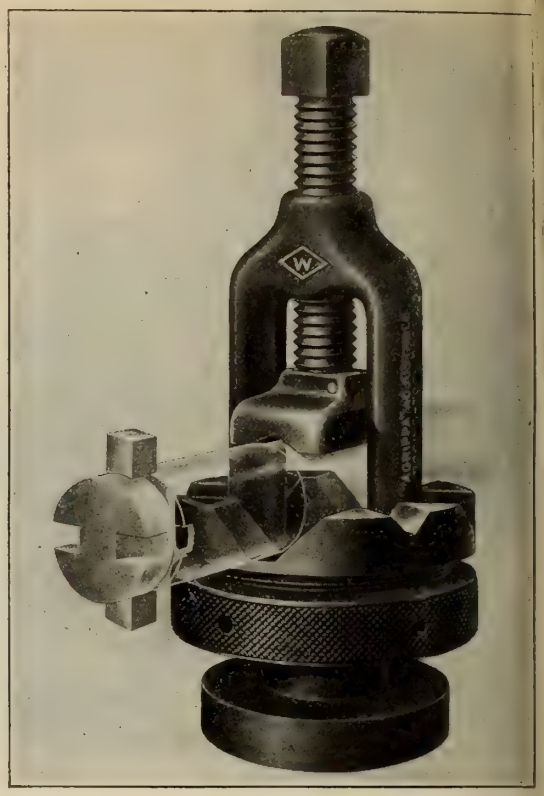
"The Drop-Forging People"
45 Richards St., Brooklyn, N.Y.

The A. G. Low Co., Ltd.,
45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Alberta, Saskatchewan and British Columbia.



Williams' "Agrippa" Adjustable Boring-Tool Posts

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8. hole.

EMERY FLOUR AND WASHED FLOUR

EMERY, GLASS, FLINT, GARNET, CORUNDUM, CARBORUNDUM — PAPER AND CLOTH — IN SHEETS, ROLLS, DISCS, BANDS, STRIPS and TAPES, &c.

John Oakey & Sons

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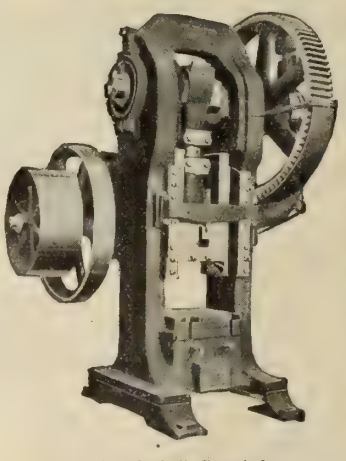
WELLINGTON MILLS

LONDON, S.E. 1., ENGLAND

The "TOLEDO"

Straight Column Presses



The "Toledo" Straight Column Presses

Designed for successfully withstanding the most severe working conditions.

Connections are massive and of improved design.

Slides are extra long moving in equally long and heavy gibs. Every detail is given the most expert thought and supervision so that these presses may prove pre-eminently dependable for working the heavier gauges of metal. Sixty-five sizes weighing from 3,000 to over 400,000 lbs.

The Toledo Machine & Tool Co.

Toledo, Ohio

Representatives: Allied Machinery Co. of America, 19 Rue de Rocroy, Paris, France; Via XX Settembre 12, Turin, Italy; 16 Seidengasse, Zurich, Switzerland.

INTRODUCING

National Electro Products,
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OXYGEN

Supplied in 100 or 200 Cubic Feet Cylinders.

IMPERIAL CARBIDE

For Welding Cutting and Lighting

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

Manufactured by

Union Carbide Co. of Canada, Ltd.

Head Office: Dominion Bank Bldg. TORONTO, ONT.

Works: WELLAND ONT.

Large Stocks maintained at convenient distributing centres throughout Canada

PURE OXYGEN

Save money by using

Electrolytic Oxygen 99.80 Pure

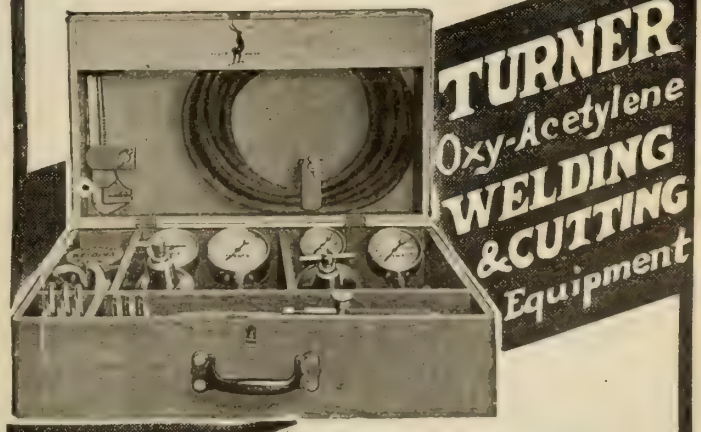
Write for particulars and prices, also samples gladly given for testing purposes.

We also handle Pure Acetylene.

Carter Welding Co. of Toronto LIMITED

7-11 Sheppard St.

For Repairing Broken Machinery or Tools of Medium Size



These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

The Turner Brass Works
SYCAMORE, ILLINOIS, U.S.A.

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CLINTON CEMENT

Did You Ever See Two Postage Stamps Stuck Back to Back?

Well, that's the way two bricks stick together when our cement is used.

The greatest loss in your furnace efficiency occurs as the result of leakage, cold air pouring in and interfering with proper combustion.

We Have Got This Licked!

Fireclay dries up and sifts out from between the bricks like powder.

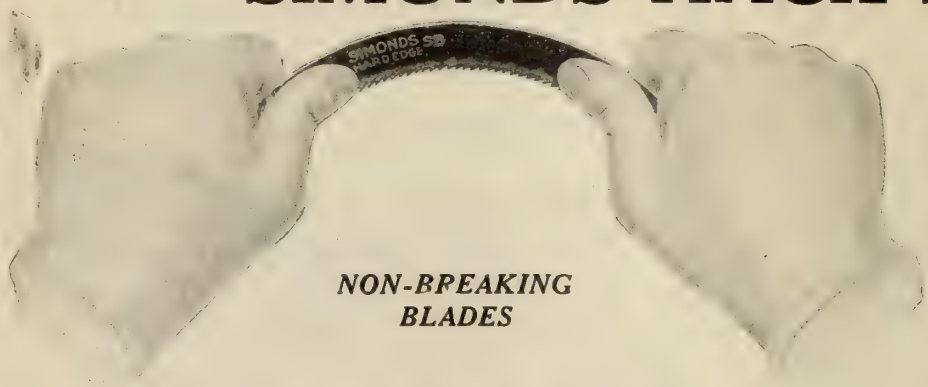
But our cement sets and makes a surface like glass yet allowing for expansion and contraction. It sets hot or cold and stands a heat up to 3,000 degrees Fahrenheit.

This cement makes a joint that is stronger than the bricks themselves, and that is itself the strongest part of the whole furnace.

A five-pound tin of **Clinton Super-Heat Cement** will be sent to you free and all charges prepaid, if you write the

Standard Machinery & Supplies Limited
261 Notre Dame St. West **Montreal**

SIMONDS HACK SAWS



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Any Size or Length

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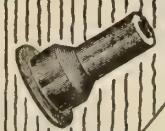

We have the equipment to make the tools and produce the stamping. Let us quote on your requirements.

HOMER & WILSON
Stamping and Tool Works
1-5 Lancaster St., Hamilton

THE FELLOWS GEAR SHAPER

is used by the Largest Manufacturers in the Gear Industry. Catalog and Engineering Literature sent to those interested.

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DESIGNS PATTERNS
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For Heavy Exacting Work

LABOR-SAVING, time-saving, waste-saving machines such as SMALLEY-GENERAL THREAD MILLERS offer the manufacturers the best solution of the problem of increased production costs.

The No. 1 Model illustrated above represents our latest achievement. This sturdy, powerful Miller is designed to do the heaviest and most exacting work. It will mill threads with **greater accuracy** and **speed** and at a **lower cost** than is possible by any other method.

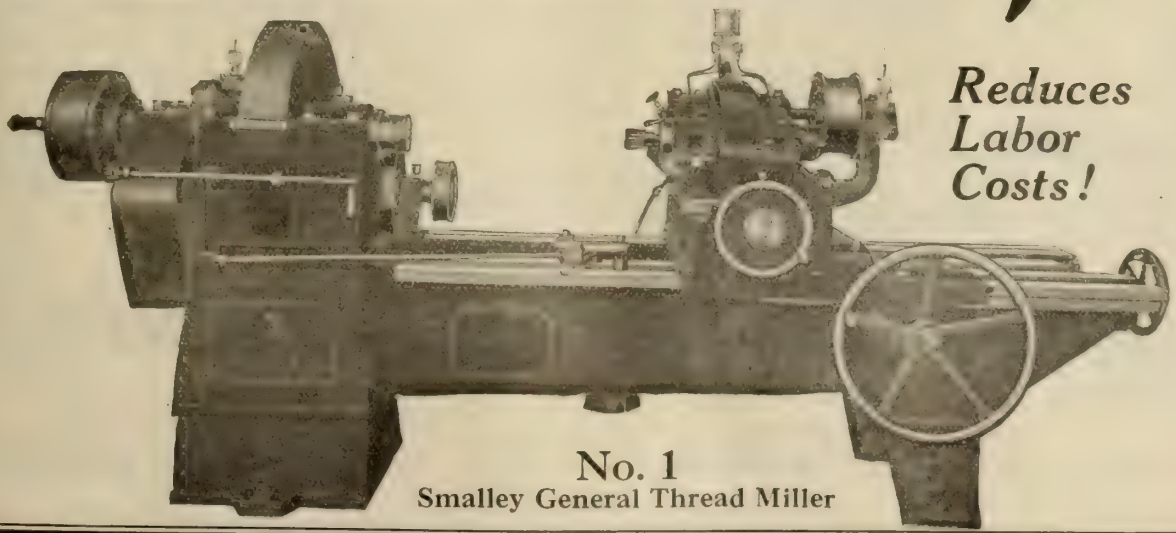
One revolution of the work and the thread is milled.

For automobile parts, pipe fittings, flanges, oil and gas well supplies, in tool rooms and all kinds of commercial work, this machine will be found a **booster** of production and a **reducer** of costs.

Investigate the possibilities of the Smalley General Thread Miller in your shop. Full description upon request.

SMALLEY GENERAL CO., Inc.
BAY CITY, MICHIGAN

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto



Reduces Labor Costs!

No. 1
Smalley General Thread Miller

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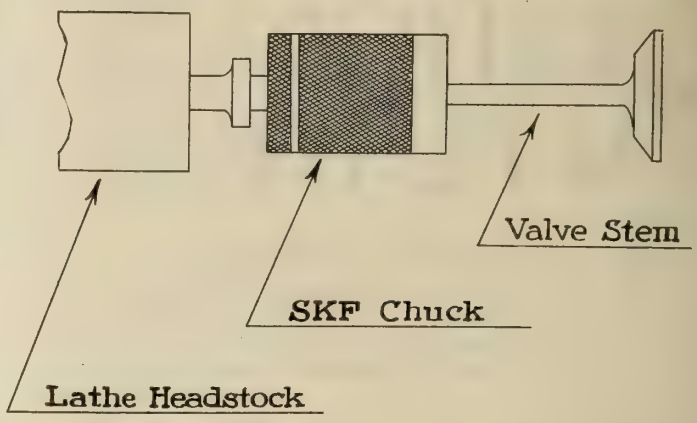
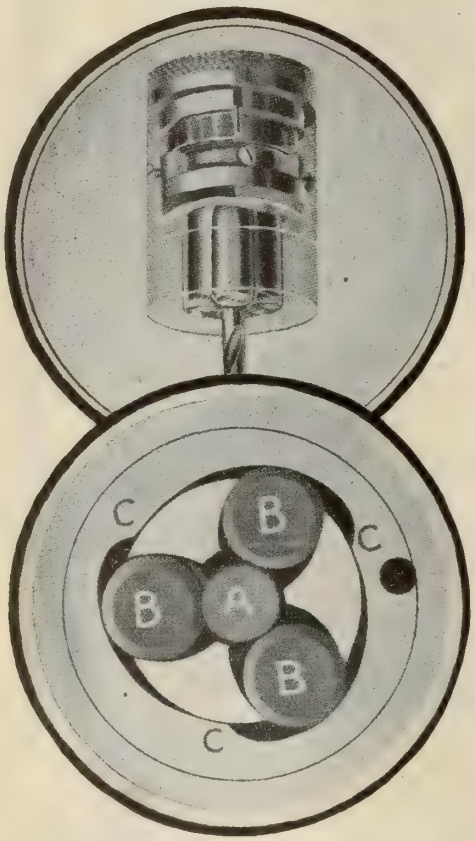
SKF AUTOMATIC-QUICK ACTING SELF-CENTERING DRILL CHUCKS

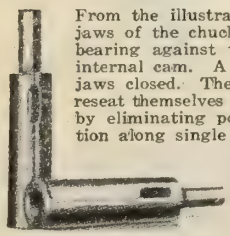
Suggestion No. 4 →

For Grinding and Polishing Valve Stems





A—*Drill Shank*
B—*Roller Jaws*
C—*Cam Surfaces*



Increase Size Range by using Adapters

From the illustration it will be seen that the jaws of the chuck are formed by three rollers bearing against the surfaces of a three-lobed internal cam. A coiled spring holds the roller jaws closed. The rollers are free to turn and reseat themselves with every drill release, thereby eliminating possibility of wear or indentation along single line of contact. The drilling resistance forces these rollers up the cam surfaces, causing them to close upon and grip the drill shank with a power always proportionate to the drilling stress, thereby precluding slipping of the drill under any conditions whatsoever.

No Saw-Edged Jaws to Injure Valve Stems in Grinding

JUST three smooth rollers, operating against an internal cam in the S K F Chuck, hold this delicate valve stem for grinding and polishing. The rollers grip just sufficiently to hold the stems, increasing their grip only and as the resistance caused by the polishing or grinding increases.

These automatic jaws are just one feature of the S K F Chuck, just as its use in grinding and polishing valve stems is only one of its many applications. The full story of the mechanical features of the S K F Chuck is contained in the new Chuck Booklet, and our engineering department will suggest special applications to meet your needs. Ask for both.

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HEAD OFFICE :
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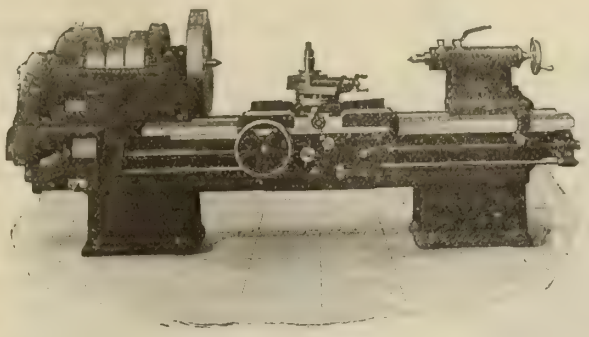
Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double brake gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 ft.

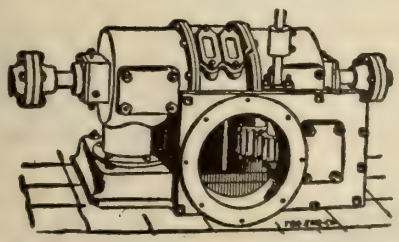
The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: Yeates Machinery & Supply Co., Montreal, Que.
H. W. Petrie, Limited, Toronto, Ontario

WATER POWER DEVELOPMENT



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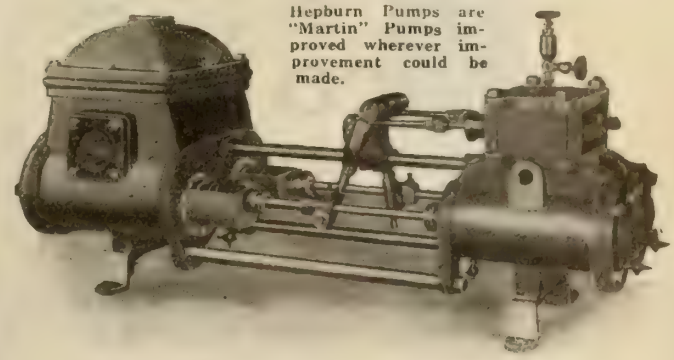
Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

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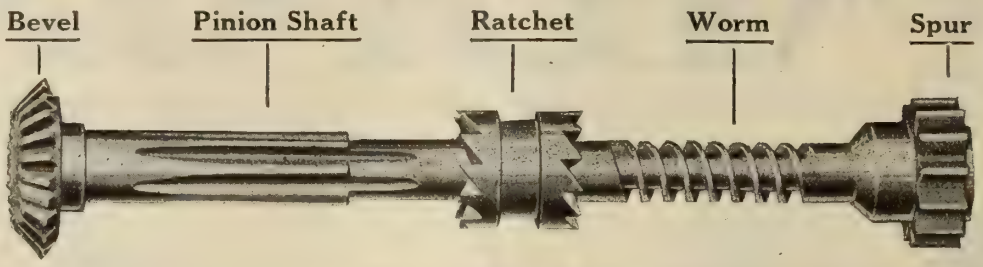
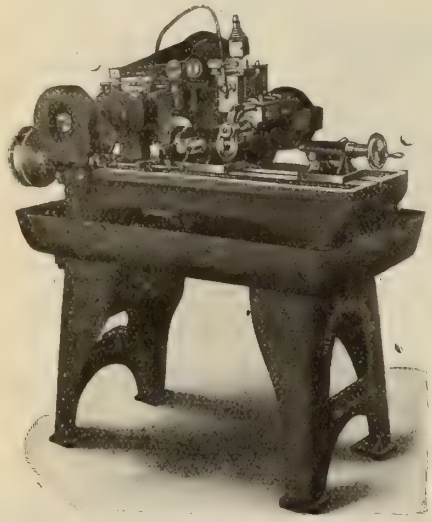
All Done On One Machine





Five distinctive operations, entailing a remarkable range of milling, are shown on this piece.

This case fully illustrates the versatility of the

BILTON GEAR MILLER

Remember, the action in every case is full automatic, requiring no attention after the machine is started. This machine presents remarkable commercial possibilities on a wonderful variety of work.

Ask us what it can do for you.

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Plain or Geared Head—Belt or Motor Driven

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Quality Perfection in Cylindrical Grinding

The quality of the finish alone will determine the life of a motor. One imperfectly finished part may cause the failure of the whole mechanism; possibly with disastrous results.

LANDIS finished motor parts—valves, valve stems, pistons, piston pins, cranks, shafts and axles—are quality parts, accurate and reliable.

LANDIS cylindrical grinding machine output is very close to perfection. These machines possess all the refinements of thirty years of continuous development: they are accurate, powerful, and speedy producers.

Particular manufacturers have standardized on LANDIS finished parts.

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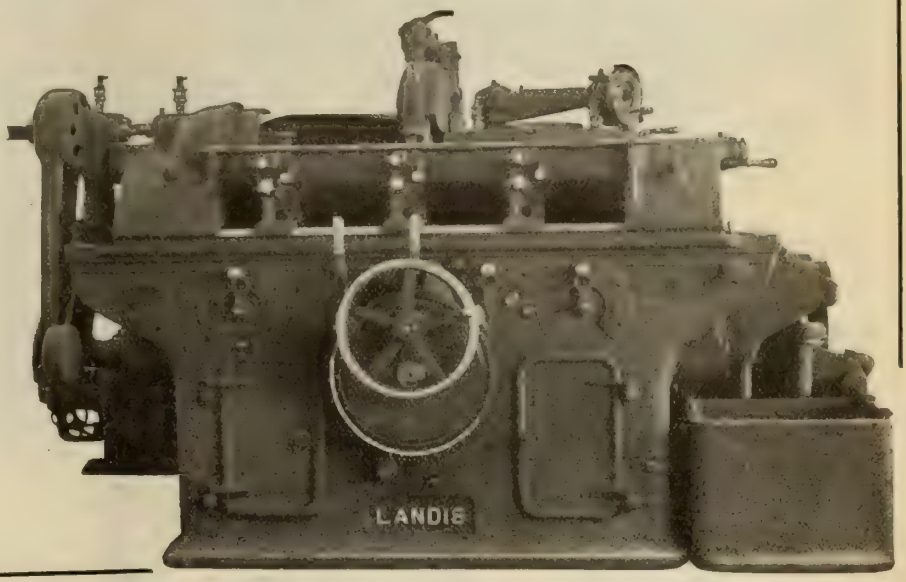

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Faster if the work can be fed faster.
But at least 60 every minute.
And in tightest corners just as fast. Every head just as smooth. Not a bent shank; not a tool mark on either rivet head or casting.

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handle any rivet up to ¼-in. shank.
If Grant-made, every hard steel rivet is finished as smooth and as true as every rivet of soft brass.
The Grant Book called "Perfect Riveting" tells how to give an extra appearance of quality to your product. For your copy

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The Whitney

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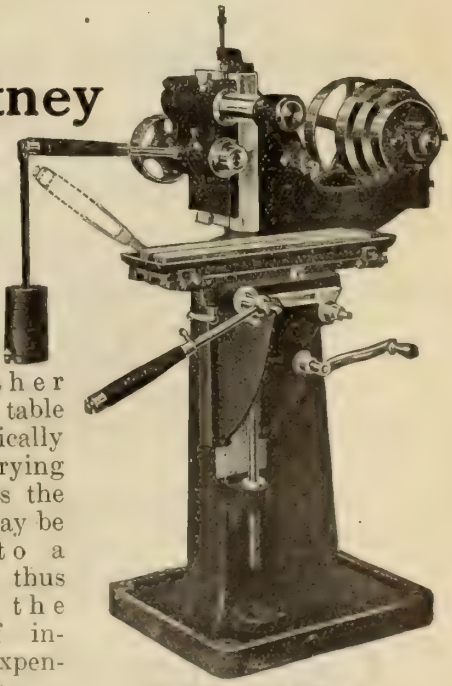
The Weight Attachment

feeds either head or table automatically and by varying the weights the pressure may be adjusted to a nicety, thus avoiding the danger of injury to expensive cutters.



Send for Catalogue A.

The Whitney Mfg. Co.

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Chains—Keys and Cutters—Hand Milling Machines.

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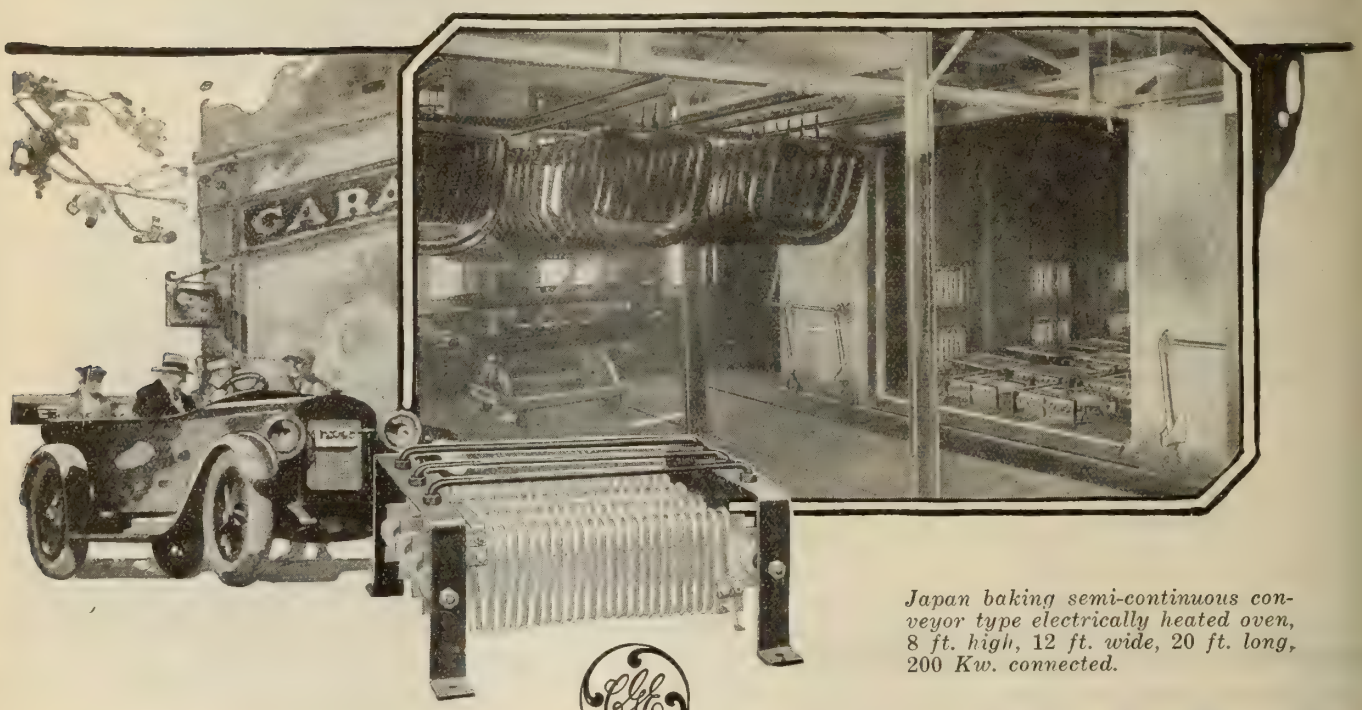
The cheapest method of heating is that which reduces to a minimum the total cost of a satisfactory product.



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MANY of the principal manufacturers of automobiles have installed electrically heated ovens and in all cases great improvement in results has been realized.

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The electric way is the modern way—the proven economical way.

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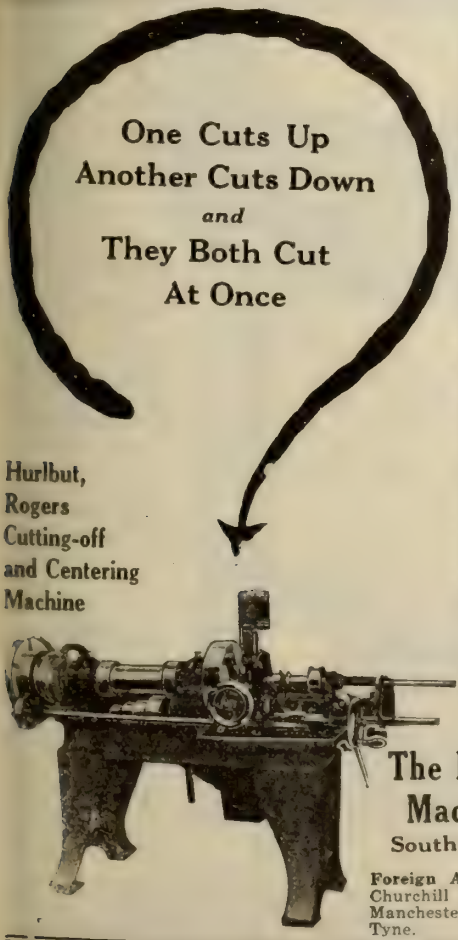

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This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools—one cutting up and the other cutting down, each holding the work against the other. What is the result?—**the production is doubled and the cost is cut in half.** Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

Let us hear from you and we will give you the full story of its ability.

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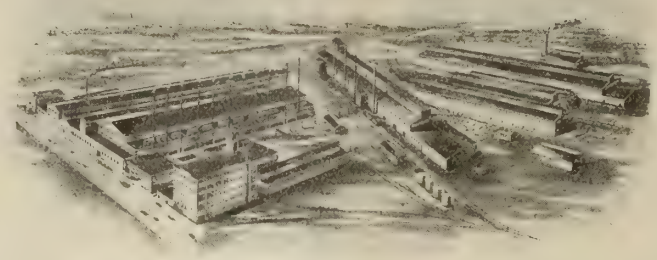

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Type B
Guaranteed to 80,000 lb. pressure.

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Manhattan Screw Press

A great time-saver for the tool-maker, offers utility in the highest degree.

A one-man machine—tool-maker requires no help in handling the dies.

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5

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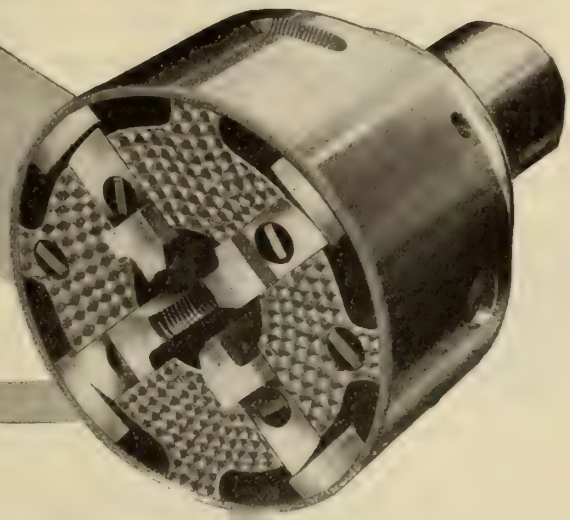
WITH ONE SET OF CHASERS IN A NAMCO DIE



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"The Chasers returned were used continuously for a period of better than 6 months and produced an average of 12,500 pieces in 22 hours, 5 days per week, thread .219"—36, ¼" long on Bottom Closing Plug American Time Fuse." (name on request)

This means not only a million and a half threads from one set of chasers,—it mean that the NAMCO Die Head which held the chasers opened and closed more than 3 million times on the one job, and it is still in operation.

Dosen't this justify our claim that after all, it's the simple design, correct materials and careful assembly in NAMCO Dies that have gained them the reputation of accurate and long lived threading equipment?

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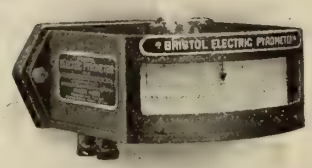

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are compensated to eliminate errors due to cold and temperature changes of the thermo-couples.
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Laboratory Accuracy During Shop Use.
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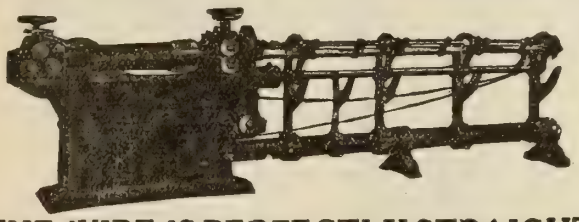

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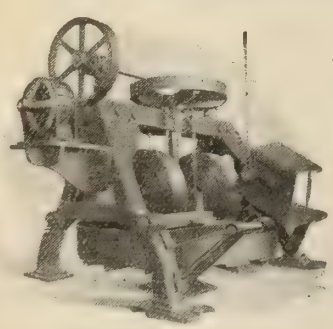

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Unloading Device
Motor or Belt Drive
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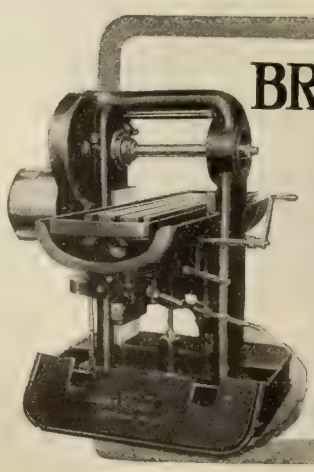

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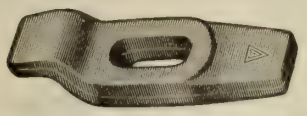

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"The Tool Holder People"
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Fast Cutting
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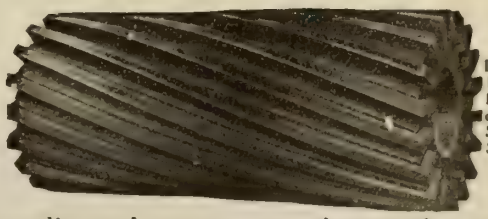

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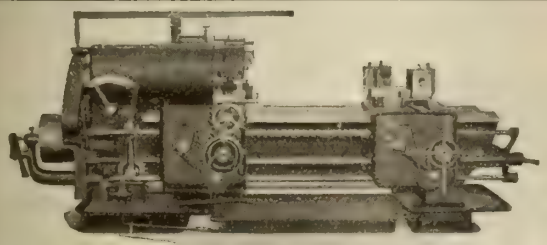

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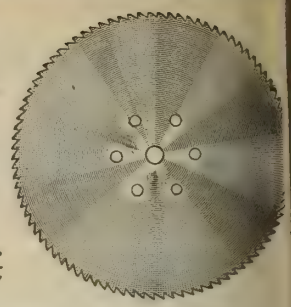

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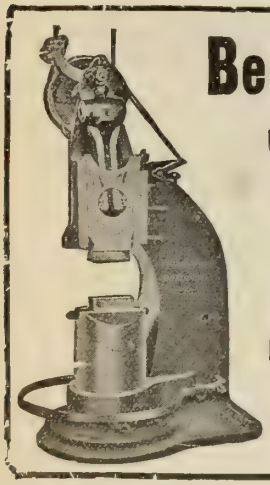

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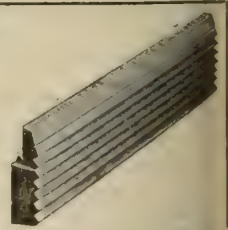

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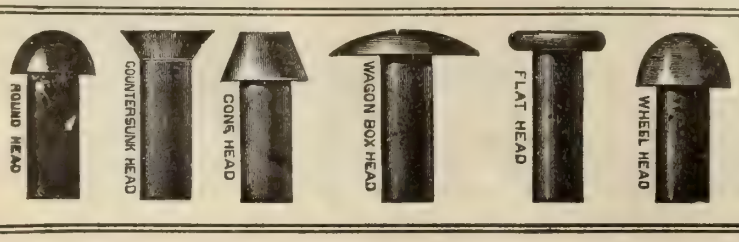

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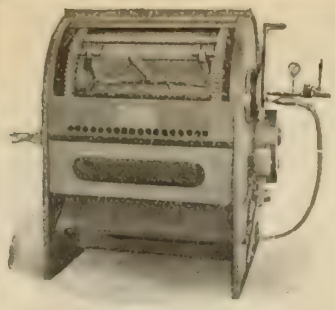

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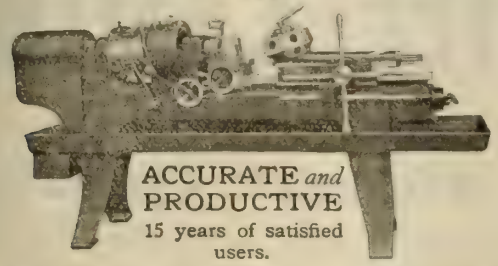

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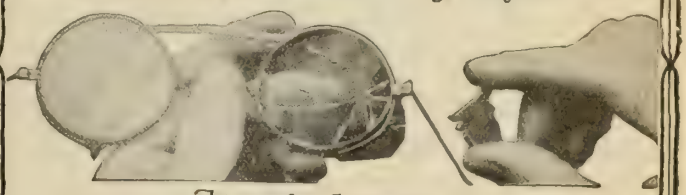

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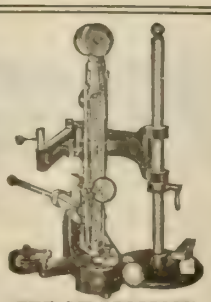

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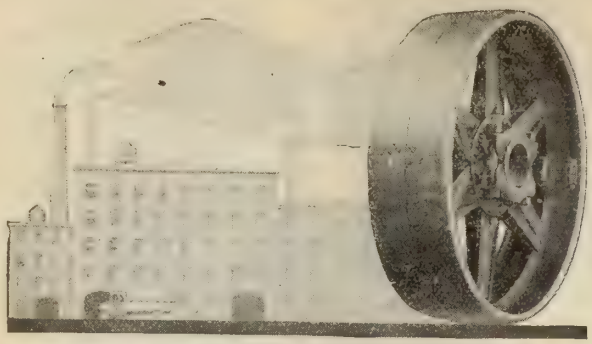

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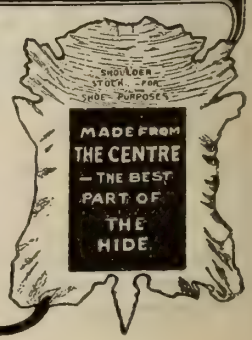

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Rice, Lewis & Son, Toronto, Ont.
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Wilkinson & Kompass, Hamilton, Ont.
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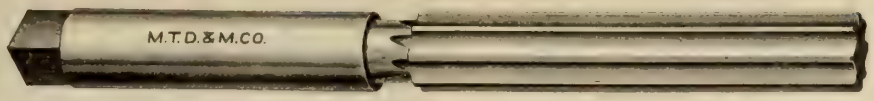

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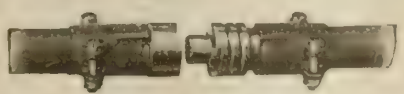

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Kennedy & Sons, Wm., Owen Sound.
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RALPH CONNOR

On "The New Canada and Its Needs"

RALPH CONNOR, the famous Canadian novelist, who served for several years at the front and saw the war from many angles, is convinced that Canada must be prepared to make important changes if she is to profit by the lessons of the war. He has written a series of articles embodying his views and calling vigorously on patriotic Canadians to awake to the needs of the hour. The articles, which deal with economic, social and Imperial topics, were written for MACLEAN'S MAGAZINE and the first appears in the November issue, under the title: "The New Canada and Its Needs."

Every Mother Who Lost a Son at the Front

will read with deepest feeling Nellie McClung's wonderful story, "Men and Money," which also appears in November MACLEAN'S. Mrs. McClung wrote this story with a purpose—to show the ease with which the world forgets the contribution these mothers made. But it is also a very fine story—real, human and gripping.

"The Idle Hands at Ottawa"

By J. K. MUNRO

The recent session of the Dominion House was in many respects an idle one. There was not a great deal done, so the members had a lot of time to stir up things, and the result was some hugely interesting political situations. All of which J. K. Munro tells about in his usual unsparing and tersely humorous way.

Remarkable Features of a Remarkable Number

The November MACLEAN'S is cram full of other big features—famous writers on vital subjects and everything Canadian. Look over this list:

Baroness Orczy—The author of "The Scarlet Pimpernel," best seller of best sellers, is represented by a serial story, "His Majesty's Well Beloved."

Robert W. Service.—The great poet of the Yukon and the battle front contributes a strong poem, "The Outlaw."

Basil King.—This great novelist who lives abroad contributes an interesting discussion on "Why I Remain a Canadian."

Janey Canuck.—An article on Mrs. Murphy's experiences as the first woman magistrate in the whole of Canada.

Camilla Kenyon.—A new novelist who promises to become a great favorite, tells a humorous story of adventure, and treasure, "Spanish Doubloons."

Stephen Leacock.—A humorous sketch entitled, "My Memories and Miseries as a School Master."

"Two Men and an Idea That Grew and Grew and Grew."—By Charles Christopher Jenkins.—A sketch of two remarkable and practically unknown Western millionaires.

"A Little Bit of Chicken Feed."—By Allen C. Shore.—A bright story combining love and business themes.

"The Rainbow Death."—By Madge Macbeth. An interesting detective story.

"The Search for Missing Men."—By Gertrude Arnold. An article on hospital experiences at the front by a young Canadian V.A.D.

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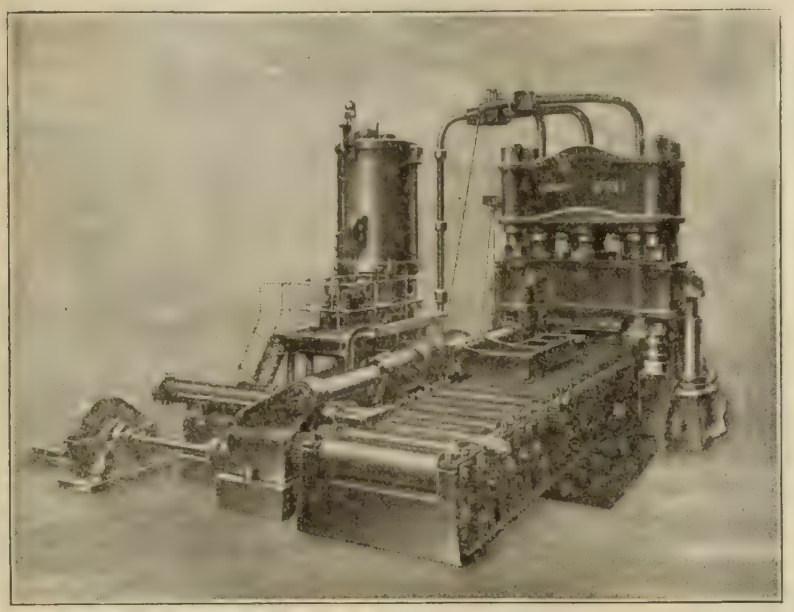

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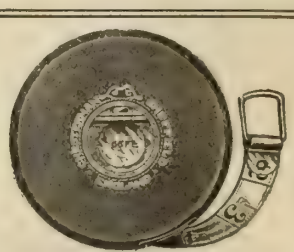

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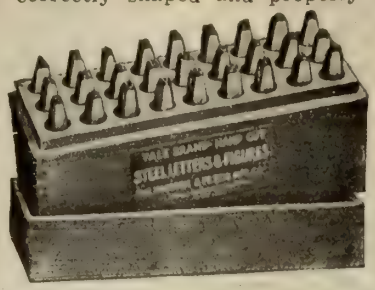
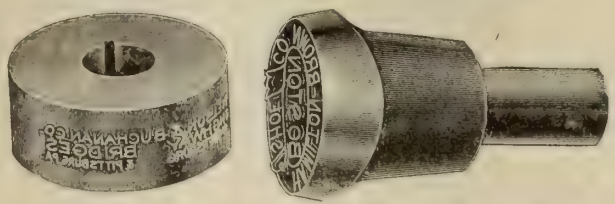


Marking Rolls and Machine Stamps



Estimates cheerfully given for Machine Stamps and Marking Rolls, complete or for cutting same only. Also for fancy lettering and special designs; stamps for difficult places and shapes.

The Hoggson & Pettis Mfg. Co.
New Haven, Connecticut, U.S.A.
Sold by GEO. F. FOSS MACHINERY & SUPPLY CO., LTD.
305 St. James Street, Montreal

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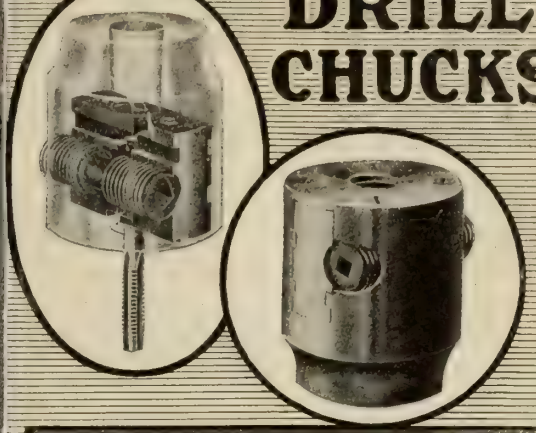

Built For Production—Not For Price

Skinner Drill Chucks—best for accurate work. These chucks will firmly hold drills or taps accurately on centre under the most difficult and continuous operating conditions.
The Jaws are correctly adjusted, tempered, hardened and accurately ground.

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New Britain, Conn.

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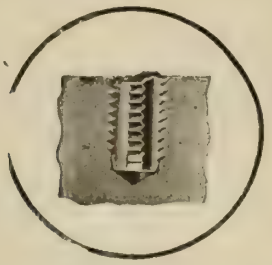

Take It Out

In two or three minutes—that broken tap buried in a costly forging. Without a mark on the forging, a scratch on the thread, take it out

With a

Walton Tap Fxtractor

as easily as you'd pull a cork from a pop bottle.

Fingers of the Walton Tap Extractor are made of special analysis steel. These fingers grip the grooves of the tap farther from the axis of the tap than is any solid portion of the tap itself; consequently greater leverage is in their favor, and it's a simple matter to back out the broken, buried tap.

Ask for particulars of 60-day trial offer.

The Walton Company, Hartford Conn.

"CUSHMAN"
CHUCKS
1862

LATHE CHUCKS DRILL CHUCKS
FACE PLATE JAWS

Three Generations of Skilled Mechanics have made them and have used them

THE CUSHMAN CHUCK CO.
HARTFORD, CONN., U.S.A.

If interested tear out this page and place with letters to be answered.

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Hendey Machine Co., Torrington, Conn.
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Williams & Wilson, Ltd., Montreal, Que.
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Wood Turret Machine Co., Brazil, Ind.

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Elliott & Whitehall, Galt, Ont.

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Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Hepburn Ltd., John T., Toronto, Ont.
Niles-Bement-Pond Co., New York.
Rae Mach. Tool Co., Ramilton.
Seneca Falls Mfg. Co., Seneca Falls, N.Y.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
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Williams Machy. Co., A. R., Toronto.
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Williams & Wilson, Ltd., Montreal, Que.

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Frost Mfg. Co., Chicago, Ill.

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Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Mach. Co., Torrington, Conn.
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Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
Whitney Mfg. Co., Hartford, Conn.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Canada Machinery Corp., Galt, Ont.
Cleveland Milling Machine Co., Cleveland.
Cincinnati Milling Machine Co., Cincinnati
Ford-Smith Mach. Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
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Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Tabor Mfg. Co., Philadelphia, Pa.
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Dominion Bridge Co., Montreal, Que.
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MacKinnon Steel Co., Sherbrooke, Que.
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Pritchard-Andrews Co., Ottawa, Ont.
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NICKEL STEEL

See Steel.

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Williams & Wilson, Ltd., Montreal, Que.

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Landis Machine Co., Waynesboro, Pa.
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MacKinnon Steel Co., Sherbooke, Que

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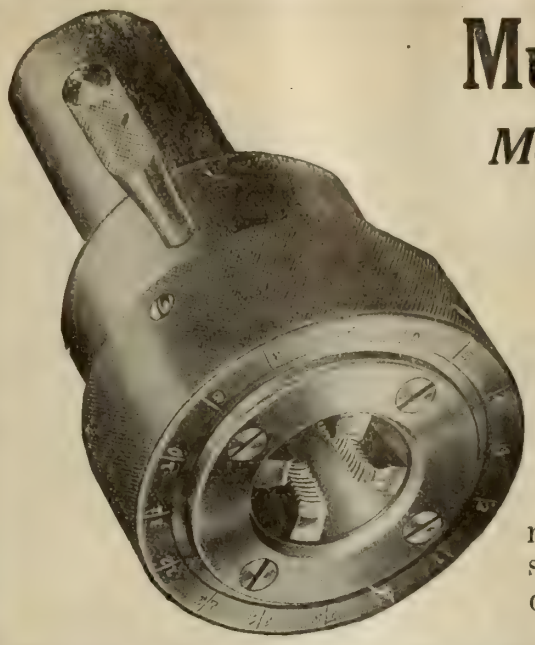
OXYGEN PLANTS (ELECTROLYTIC)

Davis-Bournonville Co., Jersey City, N.J.

PACKINGS, ASBESTOS

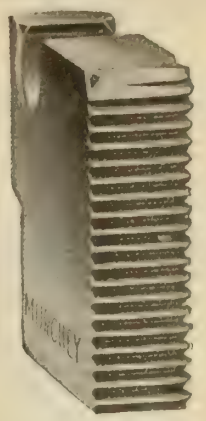
Cleveland Wire Spring Co., Cleveland.

PACKINGS, LEATHER, HYDRAULICS, ETC.

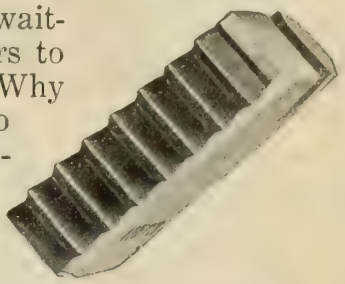


Murchey Chasers

Mean Quick Deliveries



Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?



Send for a Murchey Tap or Die on approval and give it a trial. You will then secure actual proof of its value to you.

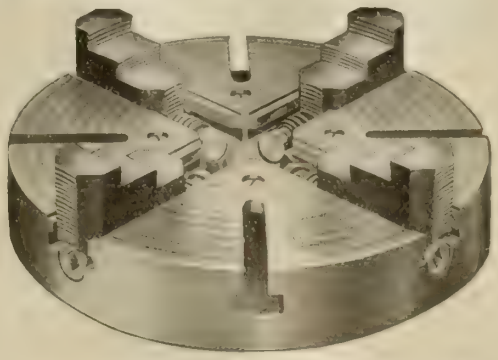
Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne,
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

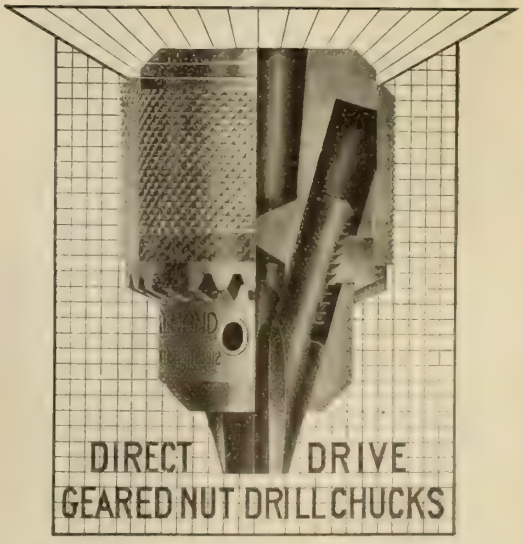
UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

ALMOND



TEETH cut on the nut giving DIRECT DRIVE and the hardened steel Pinion Bushings which prevent wear, insure long life.

OTHER ALMOND PRODUCTS

LATHE CHUCKS, RIGHT ANGLE TRANSMISSIONS, MICROMETER CALIPERS, FLEXIBLE STEEL TUBING

T. R. Almond Mfg. Co., Ashburnham, Mass.

If interested tear out this page and place with letters to be answered.

Perrin, Ltd., William, Toronto.

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Frost Mfg. Co., Chicago, Ill.

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Bertrams, Ltd., Edinburgh, Scotland.
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

PARTITIONS, WIRE
See Guards

PAPER MILL MACHINERY
Garlock-Walker Machinery Co., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.

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Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES
See Lathes.

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Marion & Marion, Montreal.
Ridout & Maybee, Toronto.
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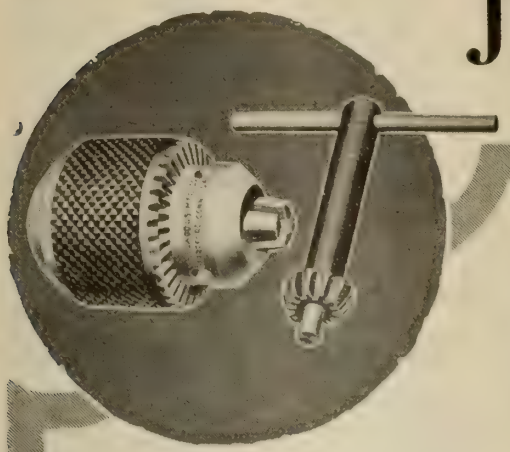

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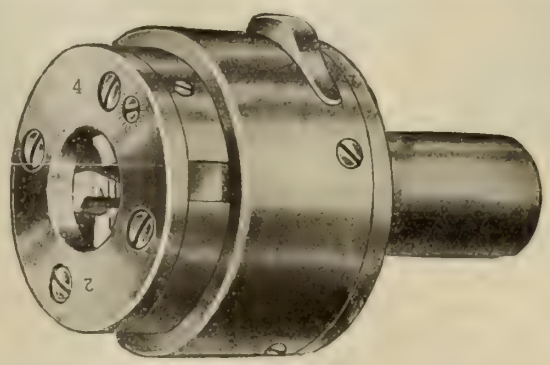

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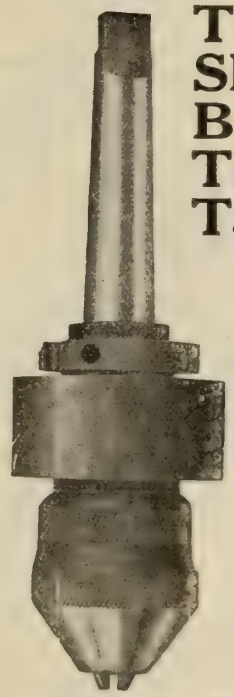

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Wiarman & Barnes Co., St. Catharines.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co. Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Milwaukee Shaper Co., Milwaukee, Wis.
Rae Mach. Tool Co., Ramilton.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

SHARPENING STONES
Norton Co. Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co. Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
Marshalltown Mfg. Co., Marshalltown, Ia.
The Quickwork Co., St Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEET METAL ROLLING MACHINES
Peck, Stow & Wilcox Co., Southington.

SHEETS, NICKEL, RESIST ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHEARS, PLATE CUTTING, SLITTING
Marshalltown Mfg. Co., Marshalltown, Ia.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Marshalltown Mfg. Co., Marshalltown, Ia.
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL MACHINERY
Peck, Stow & Wilcox Co., Southington, C.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal.

SHEETS, CRUCIBLE, CAST
Kayser-Ellison & Co., Ltd., Montreal.
Ralph B. Norton, Agent, Montreal.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

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Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

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J. Morrow Screw & Nut Co., Ingersoll, Ont.

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Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

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Peck, Stow & Wilcox Co., Southington, Conn.

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Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dunbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.
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Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Marten Machine Co., Hamilton, Ont.
Rae Mach. Tool Co., Ramilton.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Wilson & Co., J. C. Belleville, Ont.
William R. Perrin, Ltd., Toronto.
Warmington & Co., J. N., Montreal, P.Q.

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Hoggson & Pettis Mfg. Co., New Haven, Conn.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

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Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia.
Wilson & Co., J. C., Belleville, Ont.

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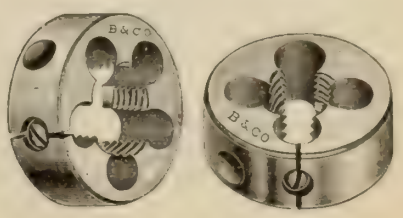

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Toronto Office: 220 King St. West

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Oliver Mach. Co., Grand Rapids, Mich.

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Oliver Mach. Co., Grand Rapids, Mich.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS, SHEET BRASS, COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

STAMPS AND DIES, STEEL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Matthews, Jas. H & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

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Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
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See Balls Steel.

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Atkins & Co., Ltd., Wm. Sheffield, Eng.
Illingworth Steel Co., John, New York.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

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Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL CHROME VANADIUM
Blancke Co., L. C., New York City.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto.

STEEL CHROME NICKEL
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

STEEL CASTINGS
Joilette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
Swedish Crucible Steel Co., Windsor.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Drawn Steel Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.
Warmington & Co., J. N., Montreal, P.Q.

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Blancke Co., L. C., New York City.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

STEEL, HIGH SPEED
Armstrong-Whitworth of Can., Montreal.
Blancke Co., L. C., New York City.
Wm. Atkins & Co., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., J., New York.
Kayser Ellison & Co., Sheffield, Eng.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Ralph B. Norton, Montreal, Que.
Plewes, Ltd. Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Joilette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York.

STEEL, CRUSHED
Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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Algoma Steel Corp., Sault Ste. Marie.
MacKinnon Steel Co., Sherbrooke, Que.

STEEL, TOOL
Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Wm., Sheffield, Eng.
Blancke Co., L. C., New York City.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Drury Co., H. A., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto, Ont.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, VANADIUM
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Armstrong, Whitworth of Can., Montreal.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

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Hoggson & Pettis Mfg. Co., New Haven, Conn.

STOCK RACKS FOR BARS, PIPING, ETC.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES
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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

STOCKS, PIPE
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Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
Brown & Sharpe Mfg. Co., Providence, R.I.

STRUCTURAL STEEL WORKS
William Hamilton Co., Peterboro, Ont.

SUPPLIES, RUBBER MFRS.
Hoggson & Pettis Mfg. Co., New Haven, Conn.

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Whitman & Barnes Co., St. Catharines.

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Can. General Electric Co., Toronto. Ont.

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Can. Steel Foundries, Ltd., Montreal.

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MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.

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Bowser Co., Ltd., S. F., Toronto, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
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TANK WAGONS
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal.
Toronto Iron Works, Ltd., Toronto.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

TAPER PINS
Galt Machine Screw Co., Ltd., Galt, Ont.

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Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchy Machine & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
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TAPES, POCKET
Lufkin Rule Co. of Can., Windsor, Ont.

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Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Pa.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can. Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

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TAPS, STAYBOLT, TAPPER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

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Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Foss Mchy. & Sply. Co., G. F., Montreal.
Geometric Tool Co., New Haven.
Greenfield Tap & Die Corp., Greenfield.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Morse Twist Drill & Mchy. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Starrett Co., L. S., Athol, Mass.
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Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Bristol Co., Waterbury, Conn., U.S.A.
Taylor Instrument Co., Rochester, N.Y.

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Shore Instrument & Mfg. Co., New York.

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Toronto Testing Laboratory, Toronto.

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Geometric Tool Co., New Haven.
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National-Acme Co., Cleveland, Ohio.
National Machy. Co., Tiffin, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co. of Canada, Galt., Ont.
Williams & Wilson, Ltd., Montreal, Que.

THREADING TOOLS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Landis Machine Co., Waynesboro, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

THREADING MACHINES FOR BOLTS, NUTS AND PIPES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. Co. of Canada, Galt., Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Taft-Pierce Mfg. Co., New York, N.Y.
Gray Ball Bearing Co., Ltd., Toronto.
Smalley-General Co., Bay City, Mich.

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See Screws.

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Brown, Boggs & Co., Hamilton, Can.
Williams & Wilson, Ltd., Montreal, Que.

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West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice Lewis & Son, Toronto. Ont.

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Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BENDING
Peck, Stow & Wilcox Co., Southington.

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A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING
Kelly Reamer Co., Cleveland, O.
Williams & Wilson, Ltd., Montreal, Que.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago.
Williams Machy. Co., A. R., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
U. S. Electrical Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TOOLS, SPECIAL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

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TRACK SYSTEMS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

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Shipman & Co., H. C., Ottawa.

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Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Coventry Chain Co., Coventry, England.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
Wilson & Co., J. C., Belleville, Ont.
Williams Machinery Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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TROLLEYS
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Canada Machinery Corp., Galt, Ont.
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Rice Lewis & Son, Toronto, Ont.

TRUCKS, FLOOR
Beatty Bros., Fergus, Ont.

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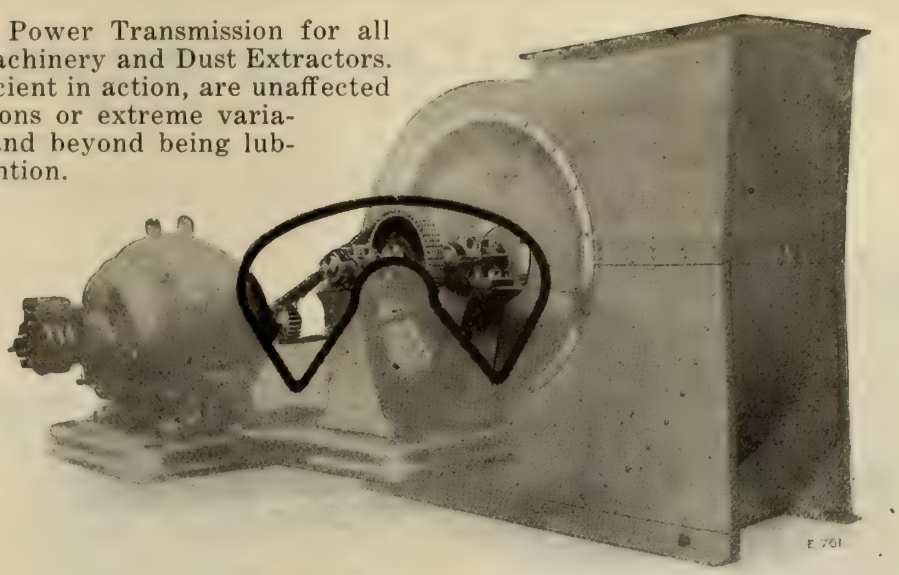
are the ideal form of Power Transmission for all kinds of Ventilating Machinery and Dust Extractors. They are silent and efficient in action, are unaffected by atmospheric conditions or extreme variations of temperature, and beyond being lubricated, require no attention.



A 25" Keith fan, driven by "The Coventry" Noiseless Chain Motor of 7½ h.p., running at 950 r.p.m., fan 400 r.p.m. This illustration shows how floor space is saved by using chain transmission.

"The Coventry" Chain Company, Ltd., Coventry, England

CANADIAN AGENTS—TAYLOR & ARNOLD, LIMITED, Bank of Toronto Building, MONTREAL

Let them know it's there

In complimenting us upon the results secured from their advertisement in the classified section, one advertiser said:

> **"Of course we would not have sold it without letting people know it was here, that is obvious, and thanks are due you for letting the people know it was for sale."**

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Canadian Machinery

Classified Advertising Section

143 University Ave., TORONTO

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All of these requisites will be found in the TRAHERN.

Trahern Pump Co. Rockford, Illinois.

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Improved Centering Machine

ASSURES perfect results at low cost. The distribution of metal insures the maximum strength with the least weight of machine; in this manner we have conserved on material and hence on machine cost. Here are a few of the **Hendey** Improved Centering Machine features:—

The head is rigidly clamped to the bed, giving permanent alignment of spindle. Spindle is large in diameter with ample bearings, having felt oilers; front journal is made taper, after the well-known pattern of our lathe and milling machine spindles.

Jaws of vise and supporting block are made of steel, hardened and ground.

Jaws are aligned from spindle by proof bar carried in spindle. This care in alignment is exercised in order to enable machine to accurately center stock for finishing purposes after coming from turret lathe or screw machine.

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Saddles are gibbed and fitted to bed, and provided with binding handles for ready clamping in position.
Capacity of machine is from 5-16 to 4 inches inclusive.

Let us send our circular

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TORRINGTON, CONN., U.S.A.

Hendey centering machine on centering work in plant of Can. General Electric Co. on all sorts of portions of their product.

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Foss QUALITY Foss SERVICE Foss

FRASER No. 1 Universal Convertible Grinder

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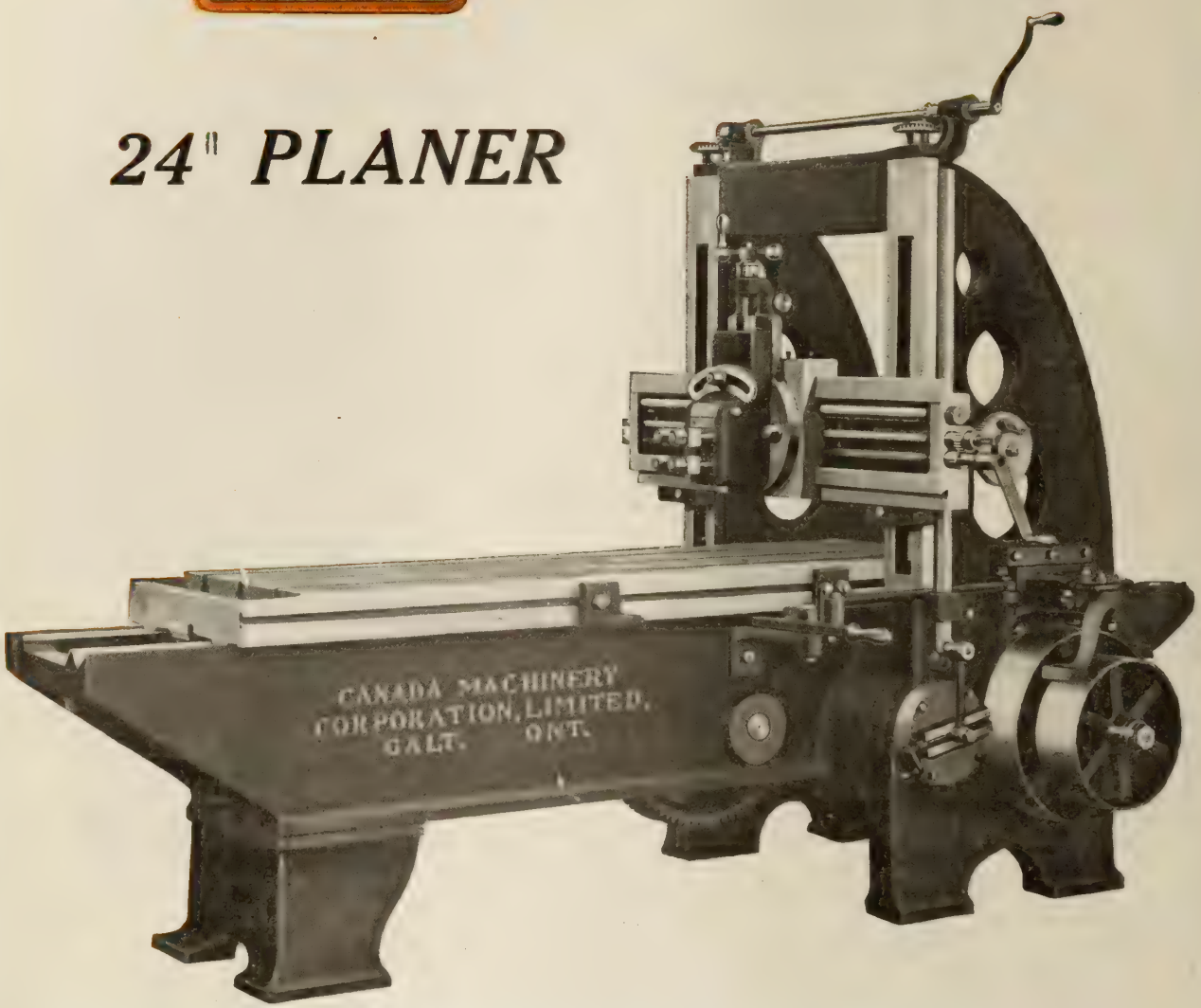
C.M.C.

24" PLANER



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a limited number of 24" x 24" x 6' Planers as illustrated with right angle drive and one head on cross rail which is our standard machine in this size.

Our Planer is unequalled for solidity, accuracy, convenience or speed and embodies all the latest features and improvements.

Full description sent upon application.

CANADA MACHINERY CORPORATION, GALT, ONTARIO
LIMITED

Toronto Office and Warerooms: Brock Avenue Subway

EDITORIAL INDEX—PAGE 531 BUYERS' DIRECTORY—PAGE 57 ADVERTISING INDEX—PAGE 101

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII., No. 22 Publication Office: Toronto, November 27, 1919 Subscription Price $3.00 per year.

BERTRAM
MACHINE TOOLS

Illustration shows our No. 8 Double Angle Shear on plain base. Capacity, 8" x 8" x 1¼" angles. Motor drive, 15 H. P. motor.
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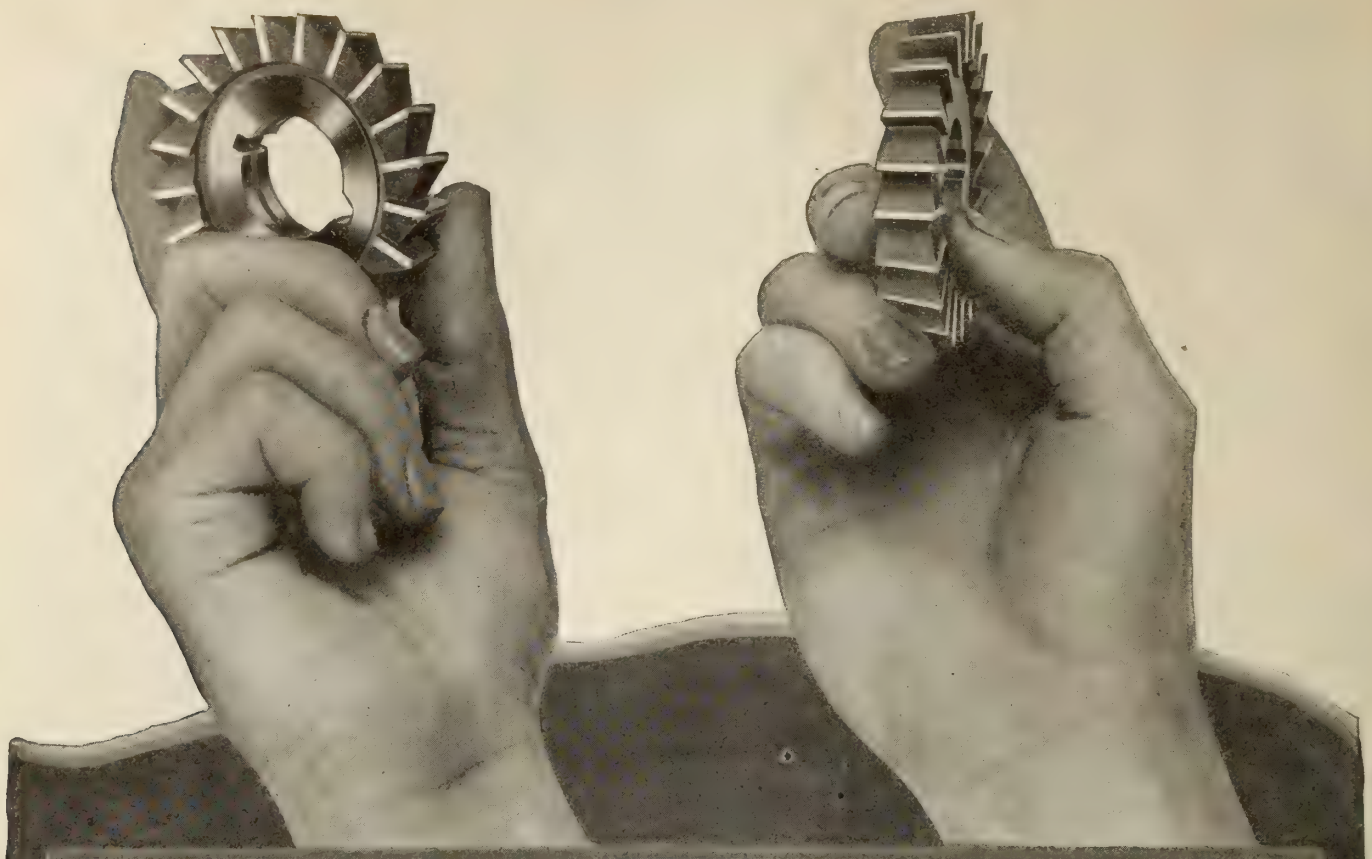

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The BERTRAM Page

MACHINE TOOLS

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18-inch Crank Slotting Machine

A. C. Motor Drive Through Speed Box

10 H.P. Motor--1,000 R.P.M.

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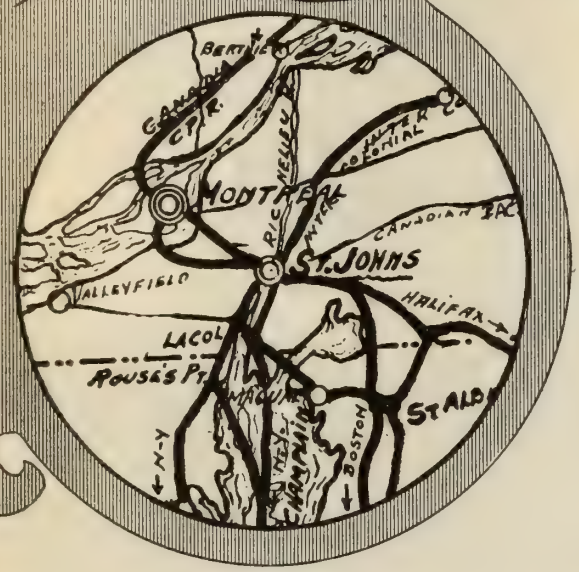
DUNDAS. ONTARIO.

Montreal, 733 Drummond Bldg.; Toronto, 1002 C.P.R. Bldg.; Vancouver, 609 Bank of Ottawa Bldg.; Winnipeg, 1205 McArthur Bldg.; Halifax, Davidson Bldg.

Canadian Machinery and Manufacturing News, November 27th, 1919. Vol. 22, No. 22. Published weekly at 143-153 University Ave., Toronto, Canada. Subscription price in Canada, $3; United States, $3.50. Entered as second-class matter at the Post Office Department, Ottawa, Canada. Entered as second-class matter July 1, 1912, at the Post Office at Buffalo, under the Act of March 3rd, 1879.

The City of ST. JOHNS, QUEBEC



ITS LOCATION It is located in the Province of Quebec which, as regards industries, is to Canada what New England is to the United States. (It is 27 miles, or 45 minutes, from Montreal).

ITS RAILWAYS

The two big railroad systems (double track) of Canada, the Canadian Pacific and the Grand Trunk Railways, pass through St. Johns, where merchandise can be shipped and exported anywhere upon the globe with dispatch. These railways are connected by a terminal switching system: charges at exceedingly low rate. All Eastern U.S. railroads are connected with St. Johns.

Direct Connections with Docks at Montreal

Goods can be exported direct by steamers to European, South African, South American and West Indian Ports.

St. Johns has long been recognized as the cheapest labor centre in Canada. Reasonable rents and living costs are keeping it so even in these times.

No other locality offers the following inducements to new industries---but we do

Exemption of taxes for fifteen years' period that is subject to extension. All public improvements which you may require, such as extension of streets, sidewalks, waterworks and sewerage; five per cent. bonus to you on your payroll for five years and if you wish we will advance this to you to be applied to the purchase or erection of any building suitable to your purpose.

For more specific information write to

The Secretary of the City Council

St. Johns, Quebec, Canada

By Product Coke

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Iron Bars

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Pole Line
Hardware

Screws & Nails

Bolts Nuts & Washers

Wire & Wire Products

If interested tear out this page and place with letters to be answered.

General View of the Plant of the Algoma Steel Corporation from the Waterfront.

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼" x 1¼", ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14" wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process. and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

MARK OF ALGOMA O.H. QUALITY

The following are the sections which will be rolled:---

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6 x 6"—5 x 5"—4 x 4"
3½ x 3½"—3 x 3"
2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

CHANNELS—
15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
2 11/16 x 3 x 2 11/16 x ¼"
2¾ x 3 1/16 x 2¾ x 5/16"

ROUNDS—
All sizes from ½" up to and including 4".

SQUARES—
All sizes from ½" up to and including 3".

FLATS—
All sizes from 1 x ¼" up to and including 14" wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

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Machine cast FOUNDRY MALLEABLE and BASIC.

SULPHATE OF AMMONIA.
NITRE CAKE.

For the better convenience of customers who may find it necessary to secure rush shipments of particular items, they contemplate keeping a large stock of all the various standard sections constantly on hand, and to this end extensive warehouse facilities are being prepared.
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SAULT STE. MARIE, ONTARIO

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TWIST DRILLS
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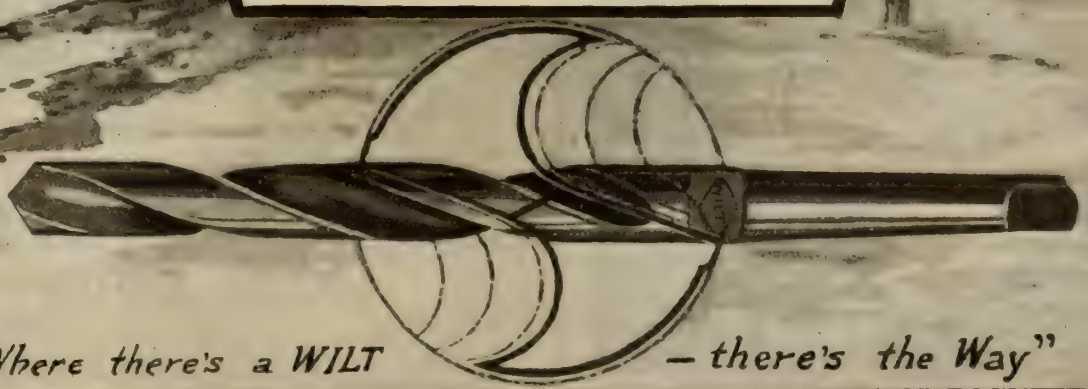
London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E.C. 2, England.



"Where there's a WILT — there's the Way"

The Air Compressor for Cramped Quarters

The short-belt drive for air compressors is long past the experimental stage. It is the ideal drive for a compressor installed where space is at a premium. The total floor space occupied by motor and compressor is reduced to a minimum, the belt expense is cut down—running is smooth and quiet. In our own power house we have three two-stage compressors with this drive; we would not have installed them if the short-belt drive were not satisfactory.

All C-I-R-Co compressors are built to carefully determined standards of quality and design. Not only is all material subject to inspection, all shop operations have to secure the O.K. of the chief inspector; finally comes the running test which every compressor undergoes before shipment. The C-I-R-Co has been building air compressors for over twenty years and has a reputation to maintain. Our compressor bulletins will interest you.

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Winnipeg Nelson Vancouver

Swedish Steel & Importing Co., Limited

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Direct representatives of foremost Swedish mills; makers of

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ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

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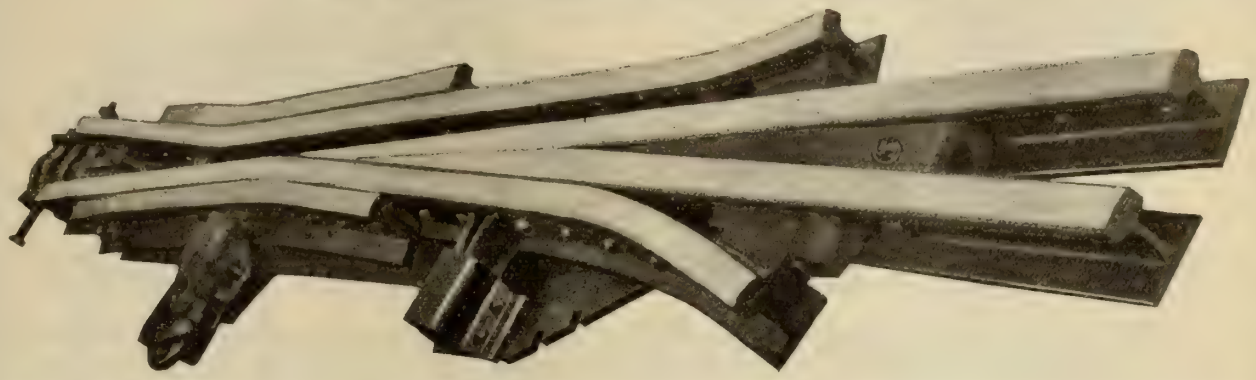
For Steam and Electric Railways



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Frogs Switches Mates Diamonds Crosses Switchstands

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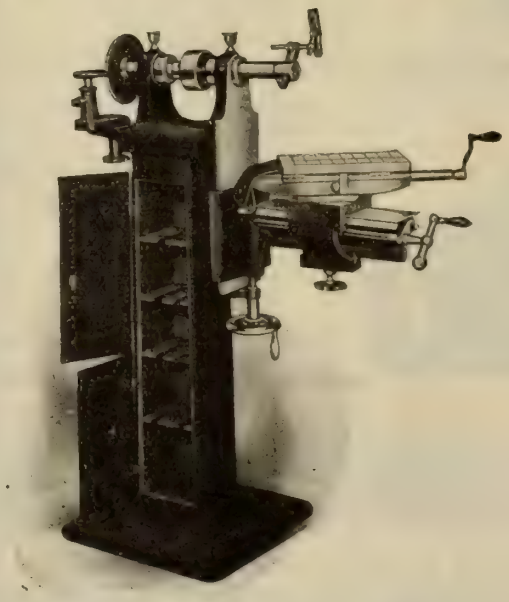

GARVIN No. 3, Universal Cutter and Surface Grinder
Use Code—Banish

From Cutters and Tools Kept Sharp on

GARVIN No. 3 UNIVERSAL

CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14" x 6"; SURFACES, 9½" x 6"

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IMMEDIATE DELIVERIES

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Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (*Visitors Welcome*) **50 Years New York City**

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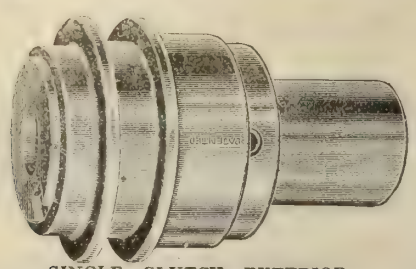
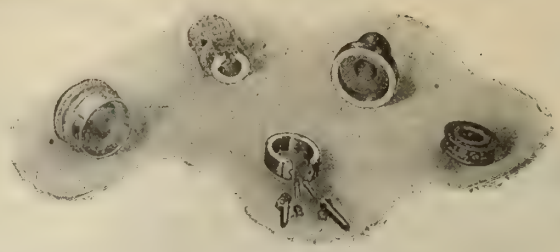


SINGLE CLUTCH—EXTERIOR



THE SIMPLEST WAY—AND THE BEST

In a clutch or any other mechanical device, unnecessary complication means trouble. Make a single part serve where two have been used before, and you have reduced by one-half the places that can break, wear or get out of adjustment. Put the cost of extra material into **better** material, and you have doubled the length of service.
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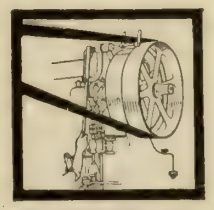
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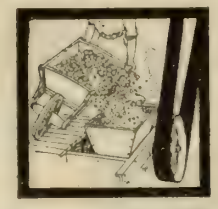
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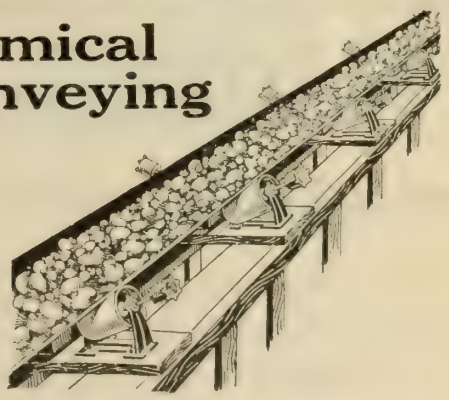

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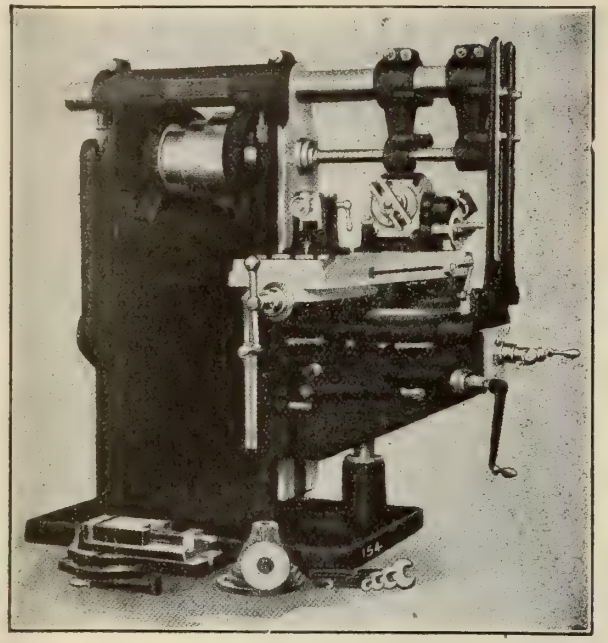

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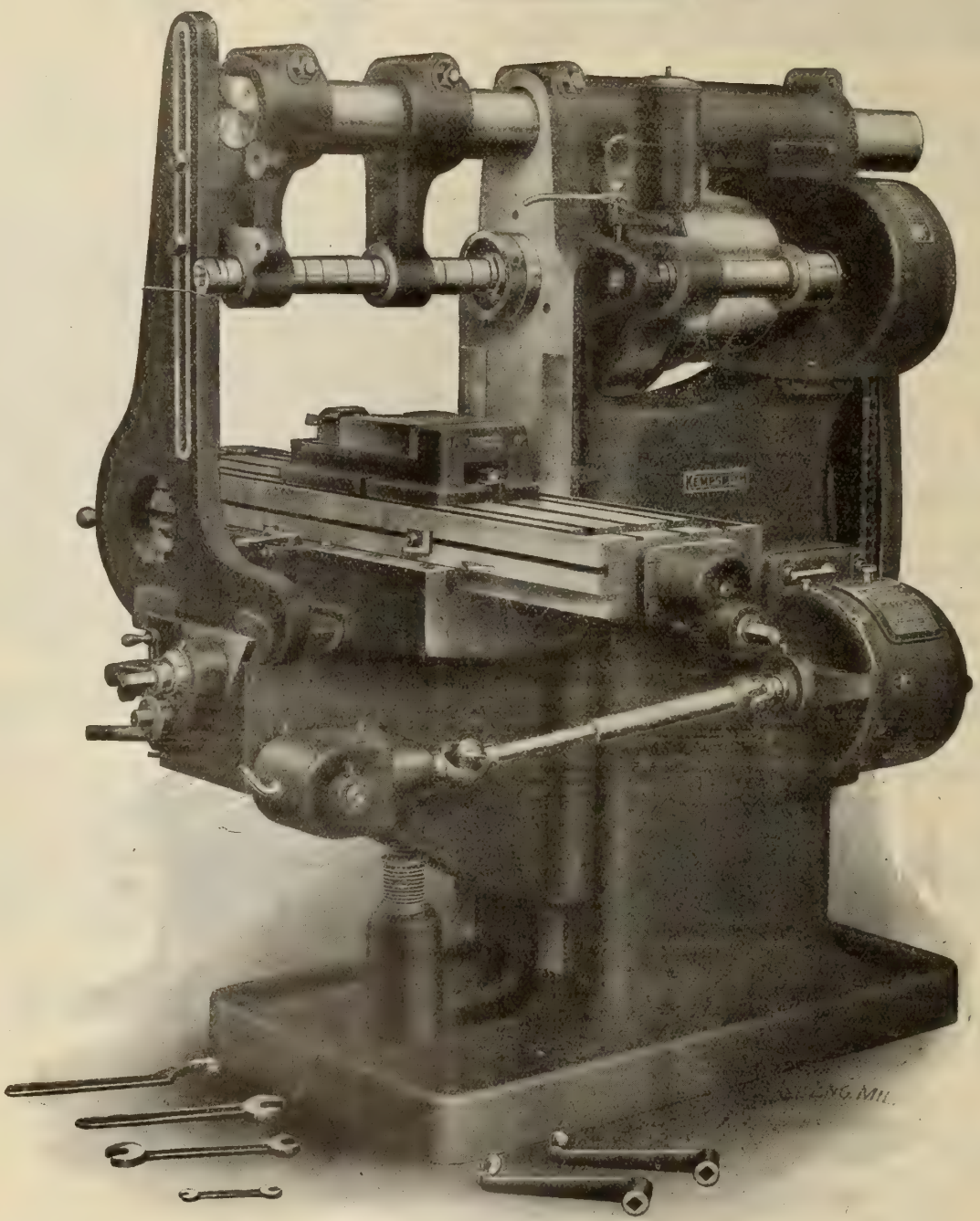

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A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

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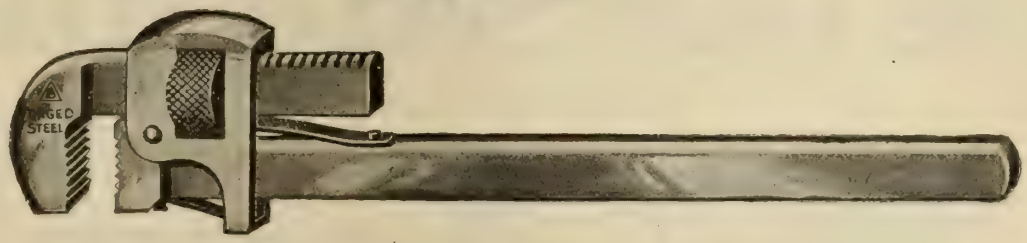

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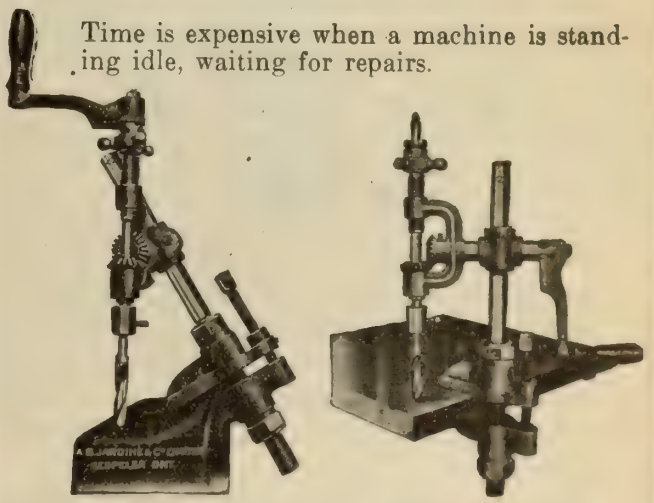
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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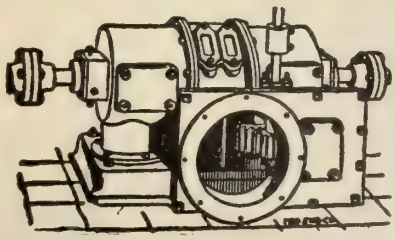

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Can supply complete equipment, including flume, turbine and power transmission.
Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

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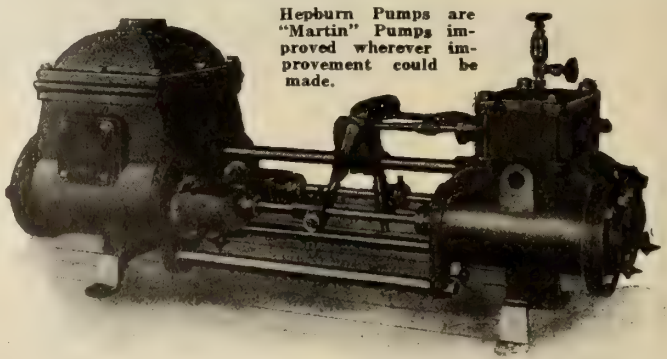
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

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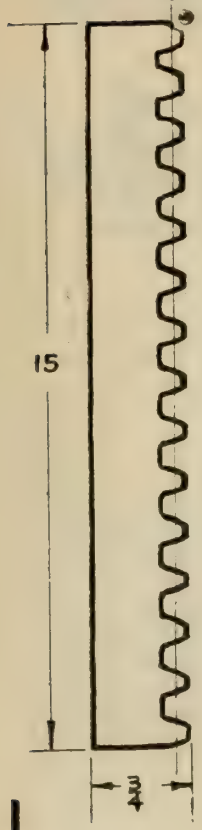
Production Milling
on the
Potter & Johnston
Automatic Milling Machine



The illustration herewith shows the method employed for cutting of racks in one of the largest shops in the country.

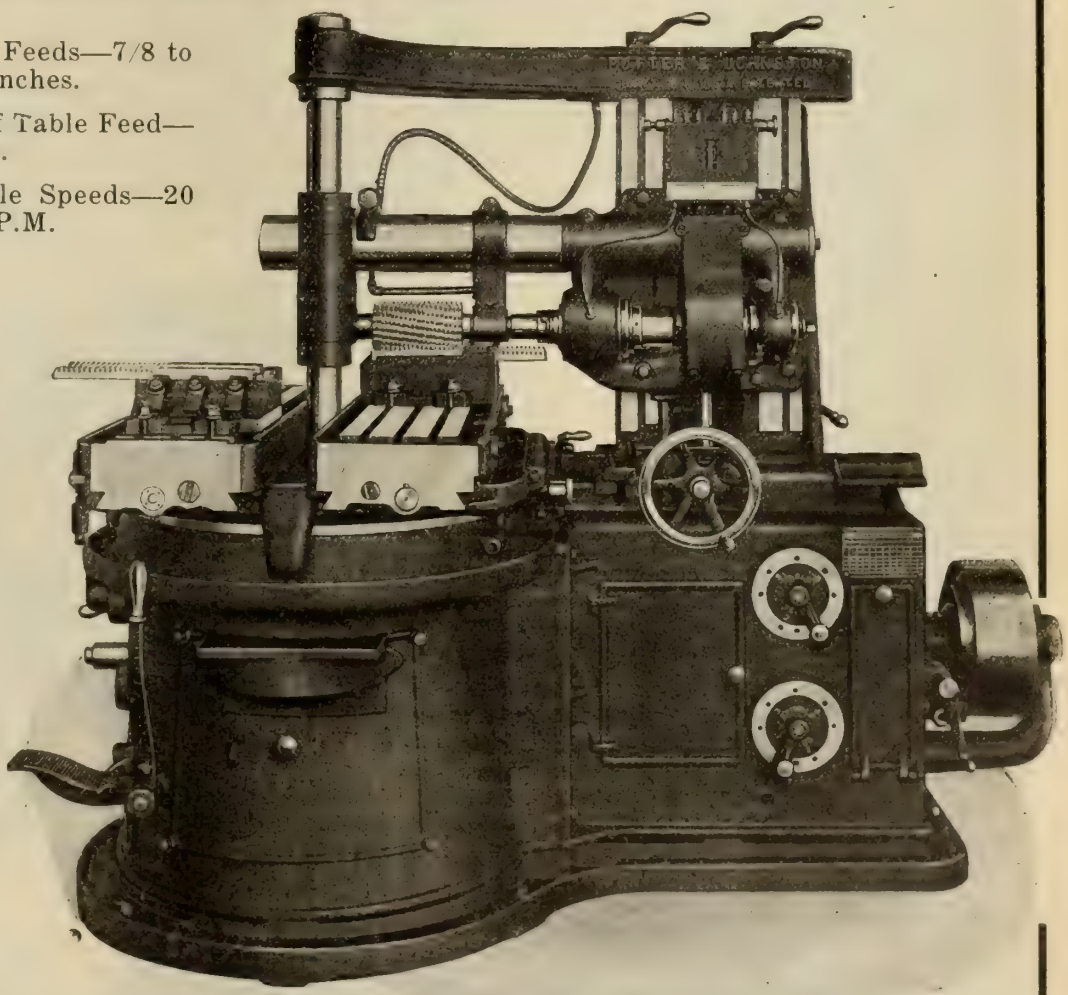
Two pieces are held in each fixture and the operation is carried out as follows:

Pieces are placed in fixture and the teeth are cut for half the length of the rack, the table then revolves to the loading position and while the cutter is working on the racks just placed in the fixture, the operator is reversing the pieces in the other fixture ready to complete the rack, when the table revolves to its next station.

16 Table Feeds—7/8 to 12 5/16 inches.

Length of Table Feed—29 inches.

16 Spindle Speeds—20 to 180 R.P.M.



Compare this method with yours. Maybe we can help you. We want you to know more about this Production Milling.

Write us to-day.

Bulletin 40

Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

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Where there are acid and alkali fumes, where there is smoke, gas and dust, where there is moisture and salt air, *where there is need for building protection, within or without*—there Robertson Process Metal will give sure and lasting service.

What Robertson Process Metal Is

By the Robertson Process, three impervious coatings—(1) asphalt, (2) asbestos, (3) waterproofing are built up on specially annealed steel. These coatings are so thoroughly incorporated with each other and so firmly adhered to every part of the steel as to present a most enduring and weather-gas-fume repellent surface. It is both corrosion-proof and rust-proof; it minimizes condensation and is unaffected by natural or artificial elements.

This process of protection is applied to the steel in sheets, and bars for use in roofing, siding, ridge-caps, gutters, downspouts and general building trim. Robertson Ventilators and Skylights owe their long life to the fact that they are made of Robertson Process Metal.

Special bulletins covering technical details relating to the three Robertson basic materials, Robertson Process Metal, Robertson Process Gypsum, Robertson Process Asphalt, and a General Booklet in which there are brief descriptions of all Robertson Products, will be gladly sent upon request.

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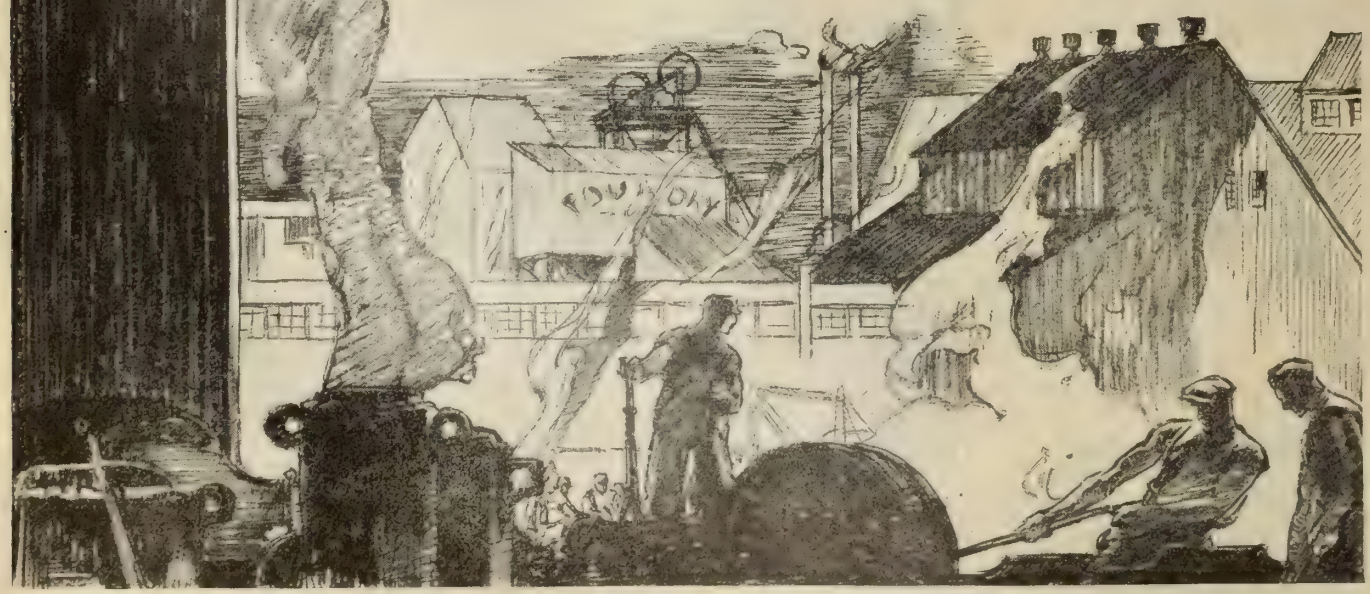
Sarnia, Ontario

Branch Offices: Toronto, Montreal, Vancouver



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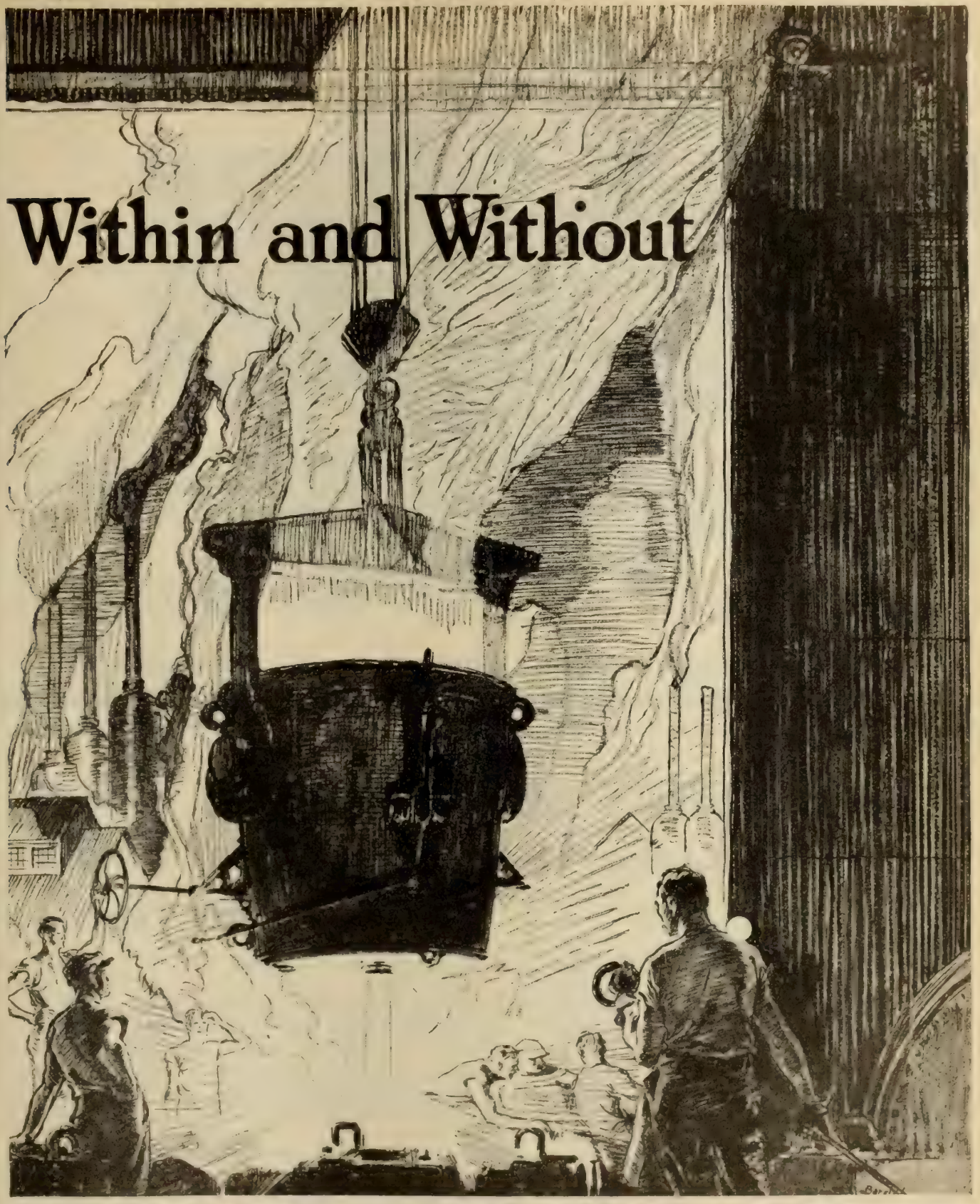

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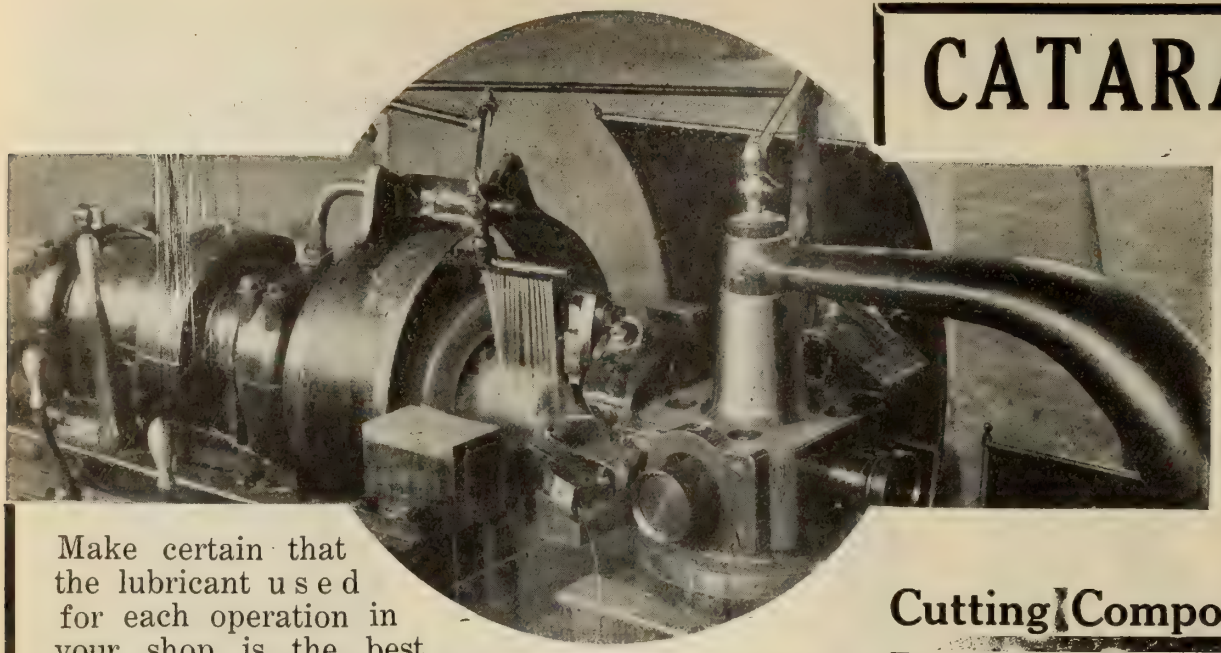

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SPECIAL

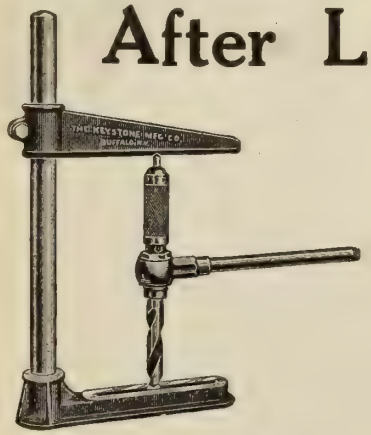
Make certain that the lubricant used for each operation in your shop is the best obtainable for the purpose. Otherwise your men and your tools and your machines work at a disadvantage.

Write us to-day that we may demonstrate how Cataract Lubricants can increase production and reduce cost in your plant.

Cutting Compounds
Drawing Compounds
Cutting Oils
Quenching Oils

Cataract Refining Company, Limited - Toronto, Ont.

"Keystone Quality" Will Still be There After Long Use Has Worn Away The Name



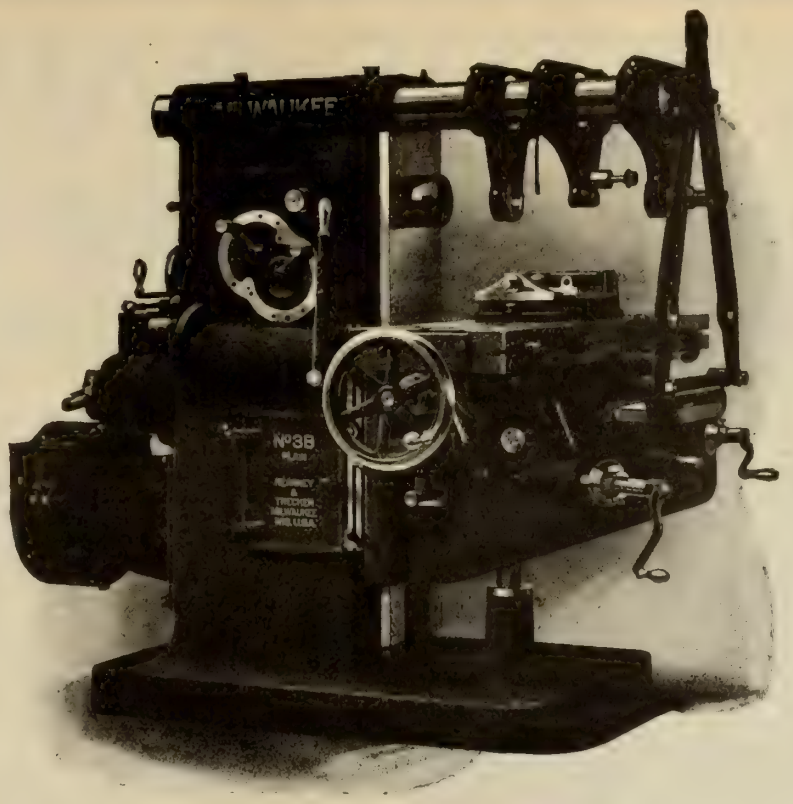
We like to think of that.

We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

Write for name of nearest dealer.

The Keystone Mfg. Company

Buffalo, N.Y., U.S.A.



MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

KEARNEY & TRECKER CO.

MILWAUKEE, WIS. U.S.A.

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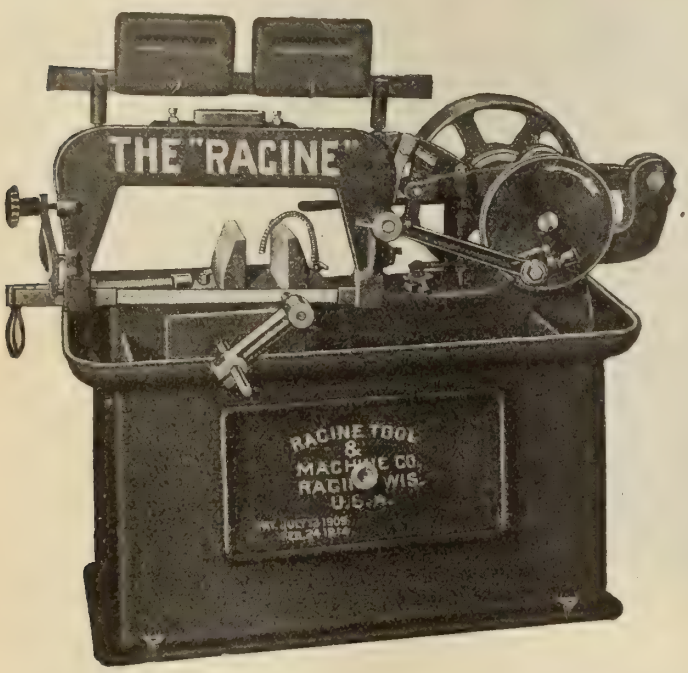
Standard the World Over

"THE RACINE"

HIGH SPEED METAL CUTTING MACHINE



Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

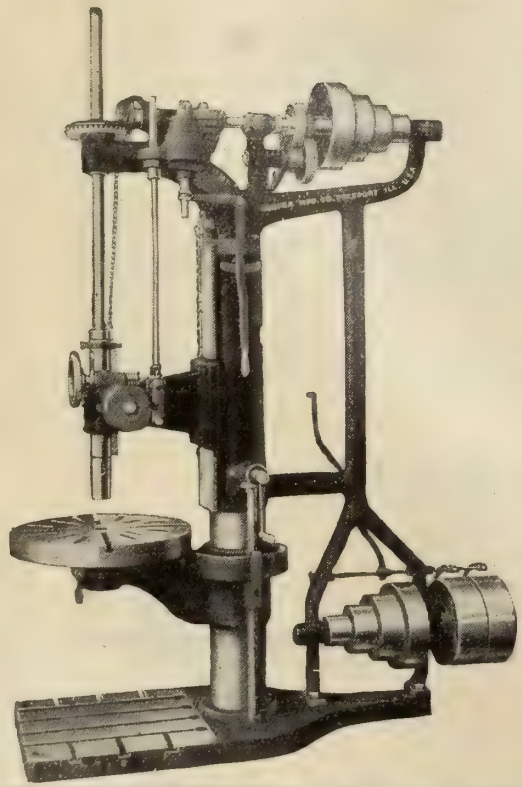
Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.

Melbourne Avenue - RACINE, WIS., U.S.A.

The Driller for Exact Work

HŒFER



Enable Your Workmen to Eliminate Spoilage

The Hoefer Driller is pre-eminently the one to be found in the best plants. "It's almost as good as a Hoefer," so often heard in the machine and tool trade, indicates the position held by Hoefer Drillers.

Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

Twenty-five Years on Market

Twenty-five years making drillers has given Hoefer the "Know-how." The Hoefer Drillers are used by many of America's leading manufacturers. Equip your factory the Hoefer way. Take any kind of a drilling problem you have to the Hoefer Manufacturing Company, and the Company's experts can tell you how it was solved by other men, some of whom you may know.

Investigate now. Write to-day for catalog. The Hoefer engineers are at your service.

HOEFER MFG. CO.

FREEPORT, ILL.

Perfect Riveting

Provided its cost is the lowest possible, riveting so well done that it can't be improved upon, is perfect riveting.

Boys on Grant Riveters accomplish two and three times as much perfect riveting as an equal number of men using ordinary machines.

With the

GRANT
ROTARY
VIBRATING RIVETER

rivets placed close up to the shoulder of the work are as rapidly spun perfectly smooth as are rivets in easy-to-reach spots.

The Grant Mfg. and Machine Company
Holland Ave.
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Send for "Perfect Riveting"

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

Our Guarantee is Back of Every Pound of Babbitt Metal We Make

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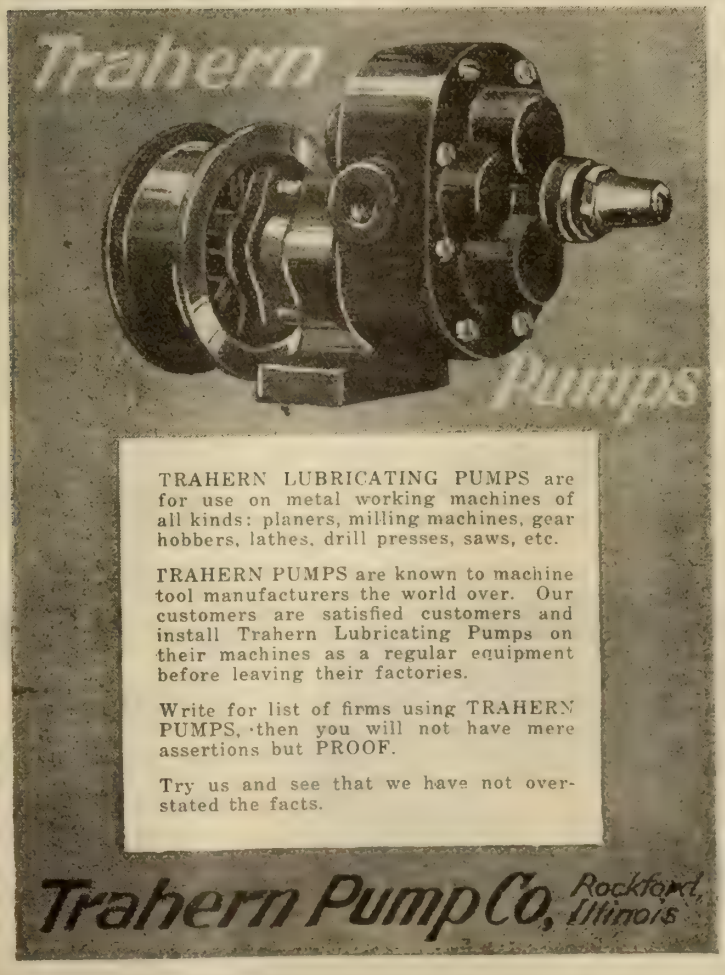


TRAHERN LUBRICATING PUMPS are for use on metal working machines of all kinds: planers, milling machines, gear hobbers, lathes, drill presses, saws, etc.

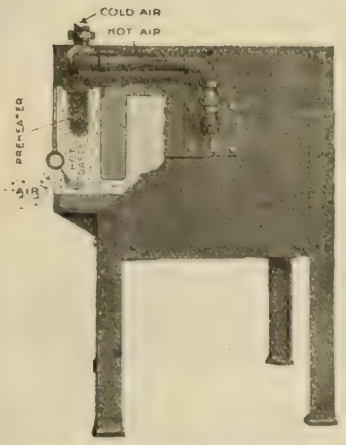
TRAHERN PUMPS are known to machine tool manufacturers the world over. Our customers are satisfied customers and install Trahern Lubricating Pumps on their machines as a regular equipment before leaving their factories.

Write for list of firms using TRAHERN PUMPS, then you will not have mere assertions but PROOF.

Try us and see that we have not overstated the facts.

Trahern Pump Co. Rockford, Illinois

ECONOMIZER FORGE



Showing deflection of hot gases with induced air *toward* the furnace, and the preheating of air for combustion.

It is economical in fuel, air and power; protects workmen from flame and hot gases and the heated material from oxidation or scale; increases the quantity and improves the quality of heated products; prevents smoke, flame and heat escaping into the forge shop.

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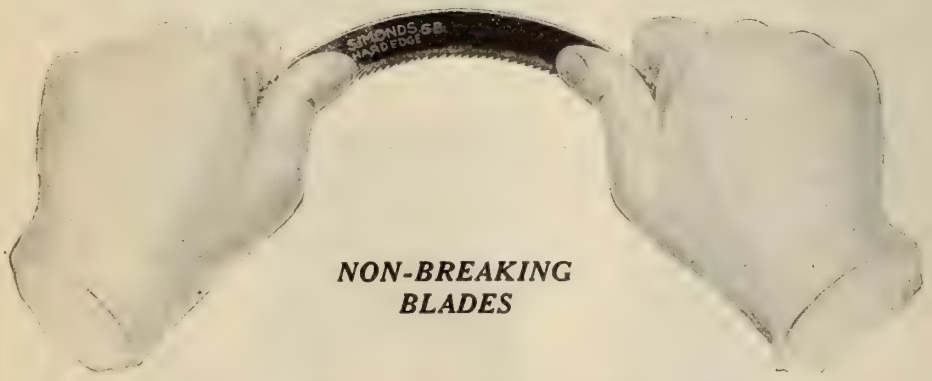

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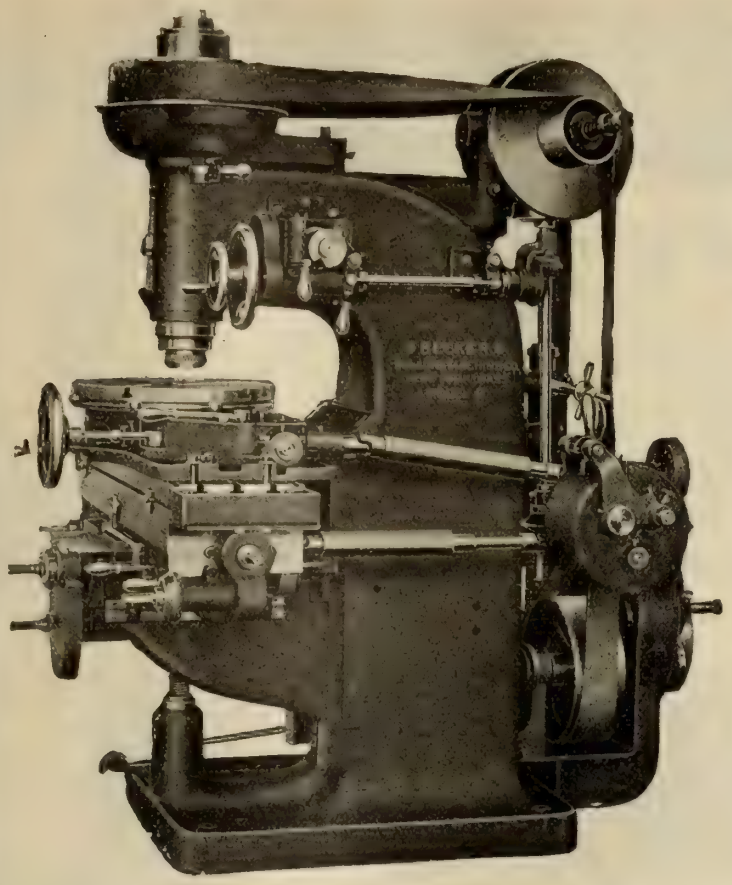

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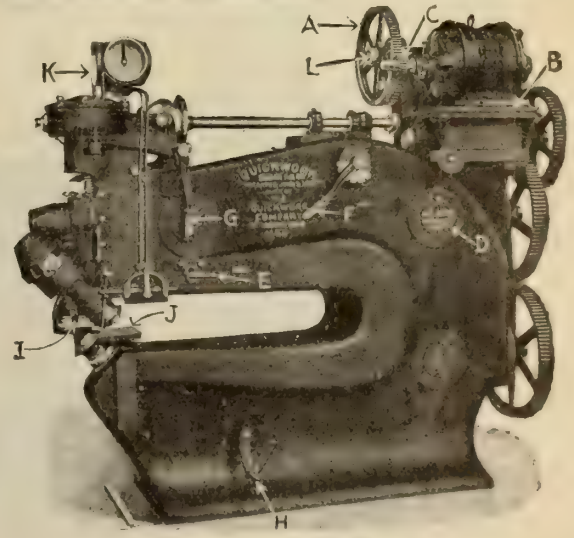

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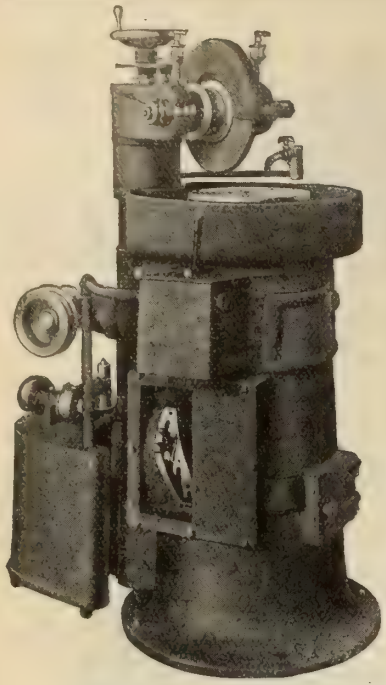

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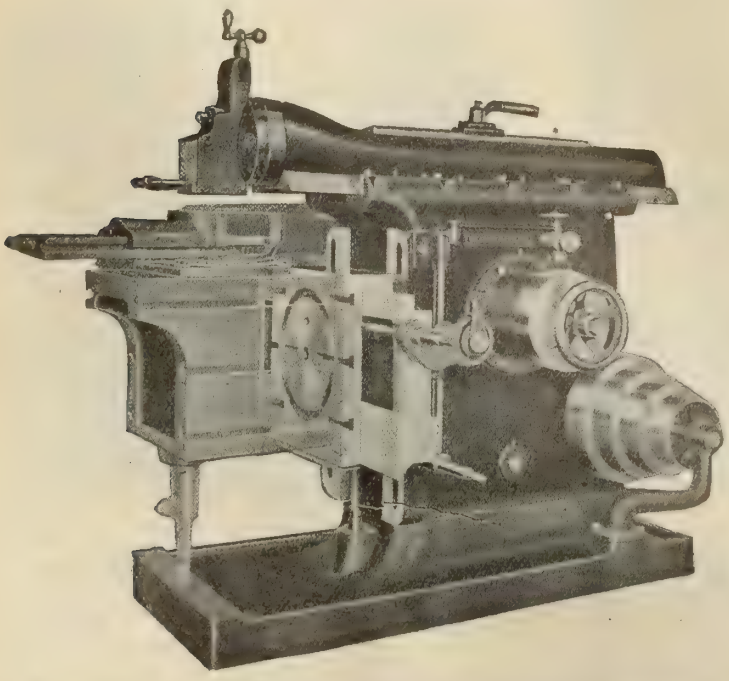

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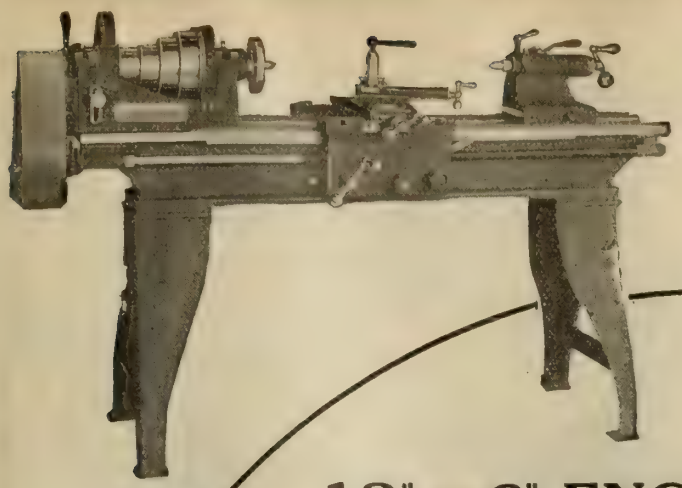

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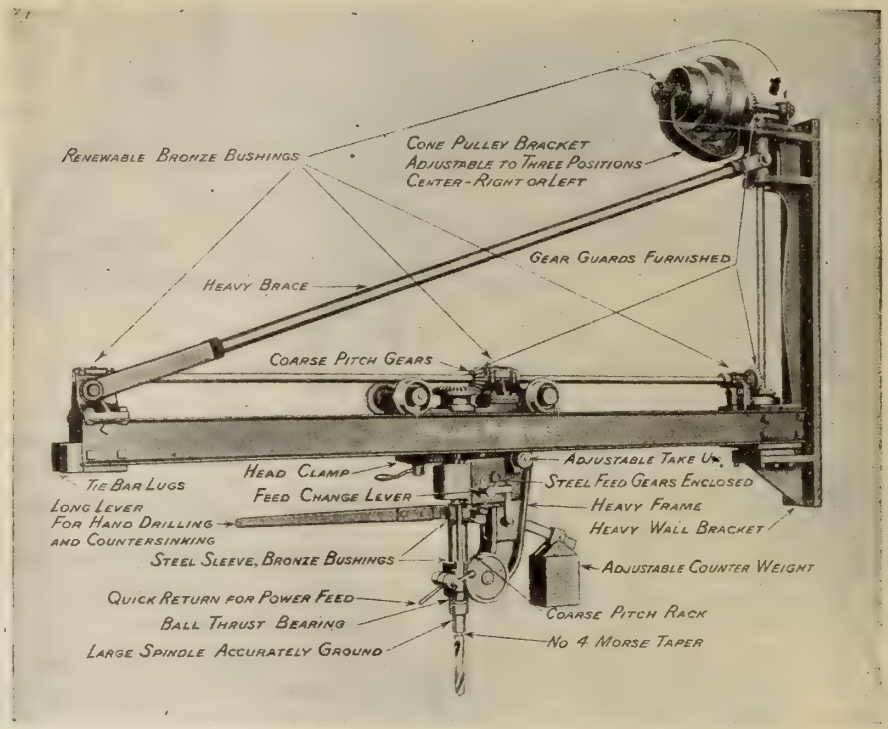

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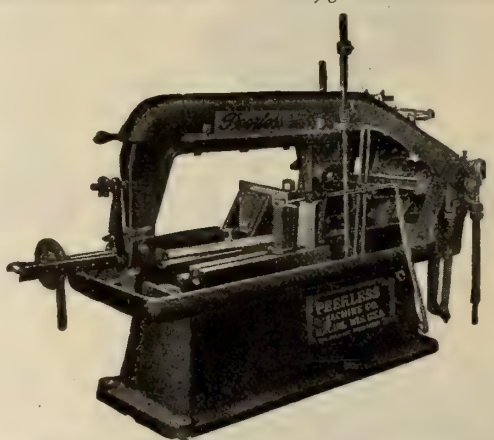

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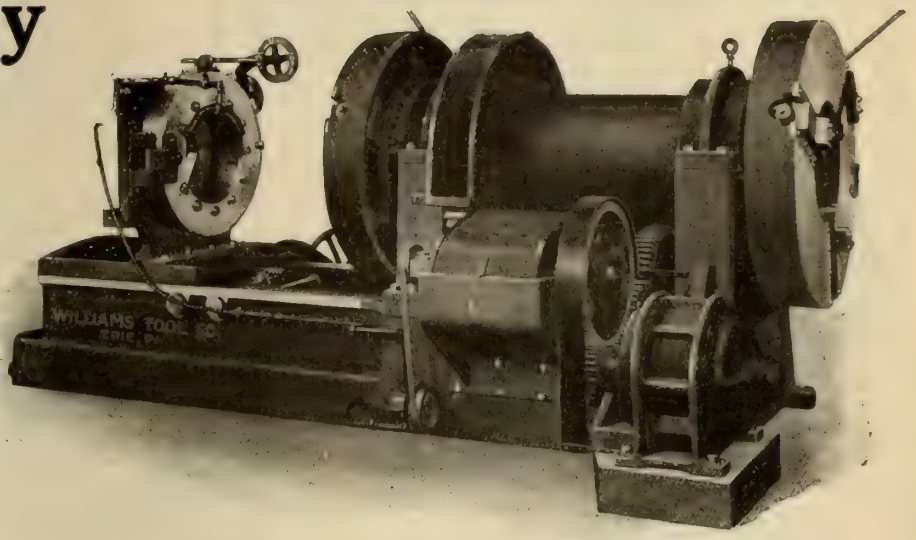

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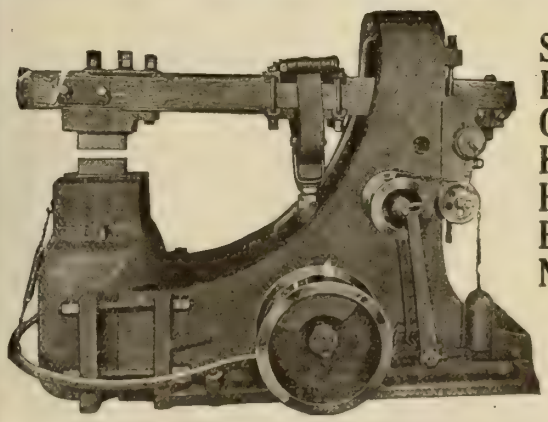

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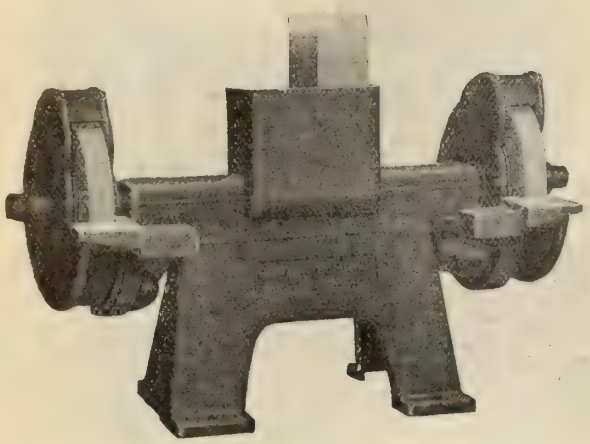

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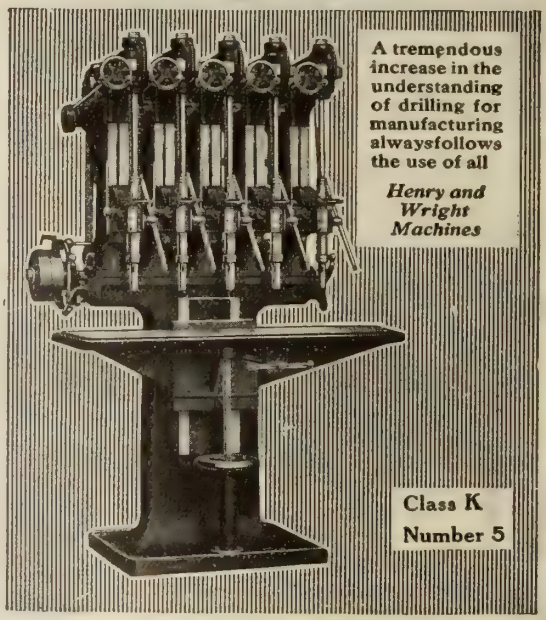

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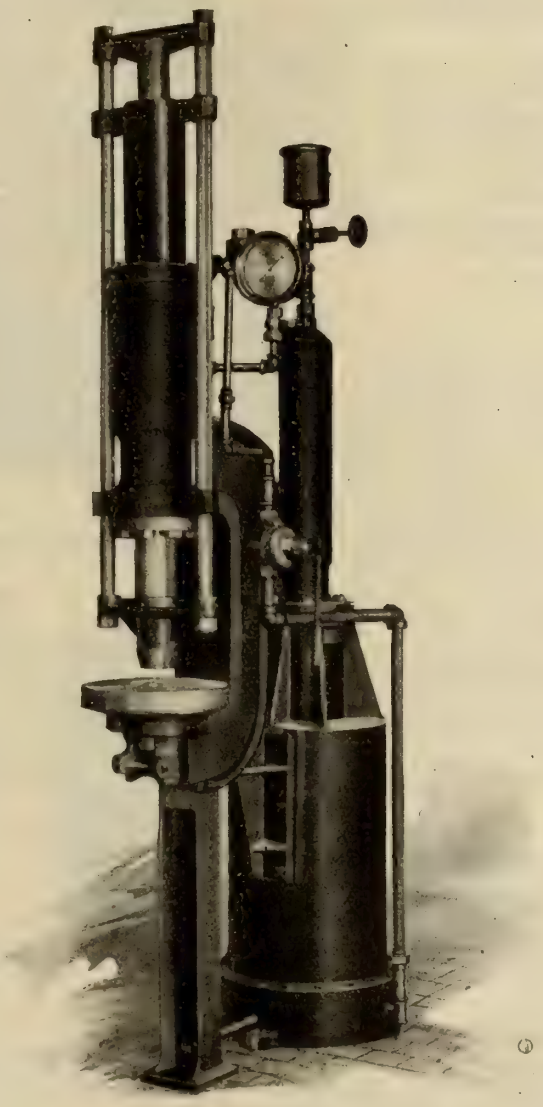

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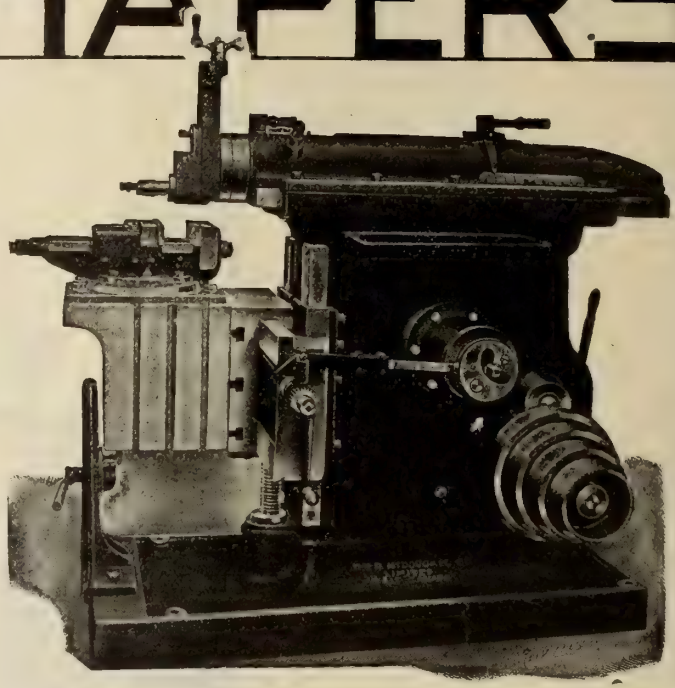

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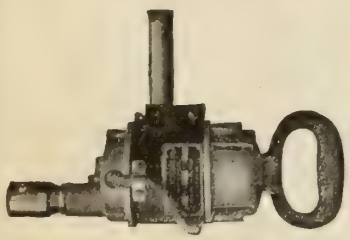

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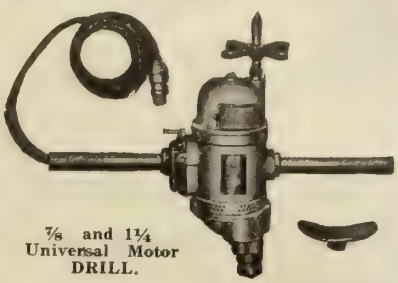

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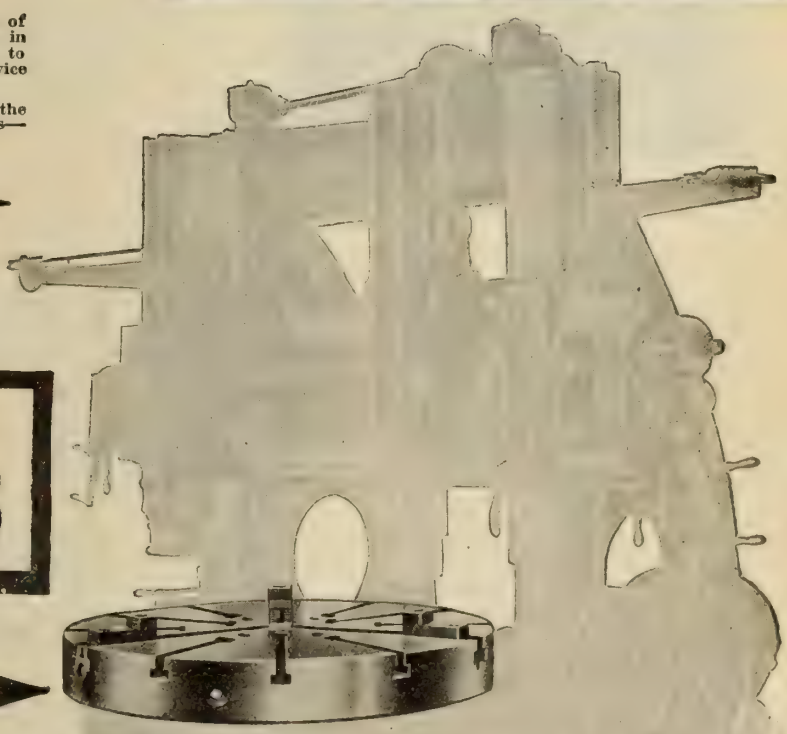

THE TABLES

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXI. No. 21 November 27, 1919

Broaching as an Aid to Greater Production

The First of a Series on the Above-Mentioned Subject. The Tools Used on Such Work, Together With Definite Practical Data Concerning the Same Will be Given

By FRANK H. MAYOH

BROACHING holes and broaching outside or inside shapes is now the most economical method of machining many parts which were formally considered of impractical design. Taking advantage of this, it is possible for a designer to make many parts which have had a tendency to slip of such a shape that they are positive in their action without additional cost to manufacture, and in fact these are often manufactured more economically.

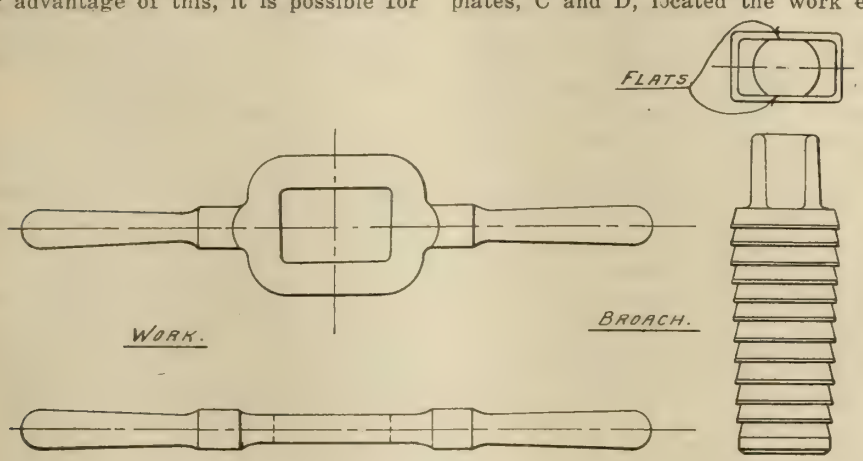


FIG. 1—WORK AND TYPE OF TOOL USED FOR PUSH BROACHING.

The Old Style Machine

Drifting back into ancient history I recall a big, rugged machine, formidable in appearance, placed out of the way, that was run about one month a year and shook the whole shop. No one knew much about this machine, it was something of a mystery, but it was nothing more than a big, clumsy press, used for push broaching the part shown by Fig. I. The press had a short stroke and, of course, the broaches were short and stubby, as shown, but nevertheless they did a good job, and by referring to Fig. 2, some idea of the class of tools used for this purpose may be had.

The fixture for holding the work is made of cast steel and is bolted to the platen of the press in the usual manner, while two plates, A and B, locate the work sideways and square it up, two plates, C and D, located the work endwise. At the right of this illustration the broach holder is shown, this fits into the ram of the press and is held there by a wedge. The shank of the broach (illustrated with the work in Fig. I), fits into the hole of this holder, while two plates, E and F, square the broach with the work holder, when these are properly located on the machine. Five short broaches were used for trimming out this hole from the forging size.

As a general thing, push broaching is not as satisfactory as pulling the broach through the work, and most broaching machines are based on the latter principle.

Designing the Broach

The correct design of broaches is a high-grade art, requiring good judgment, and one of the purposes of this article is to present examples and constructional details used in their manufacture and operation.

Referring to Fig. 3, the tools necessary for pull broaching a key-way are shown. These consist of a broach A and a work bushing B, while oftentimes it is necessary to make a broach holder having a substantial means for gripping the broach in the tool slide of the machine. The amount of stock to be removed by each tooth of the broach must be decided upon, and likewise in deciding the pitch of the broach teeth it must be coarse enough to allow the chips to lie in the space between the teeth, this

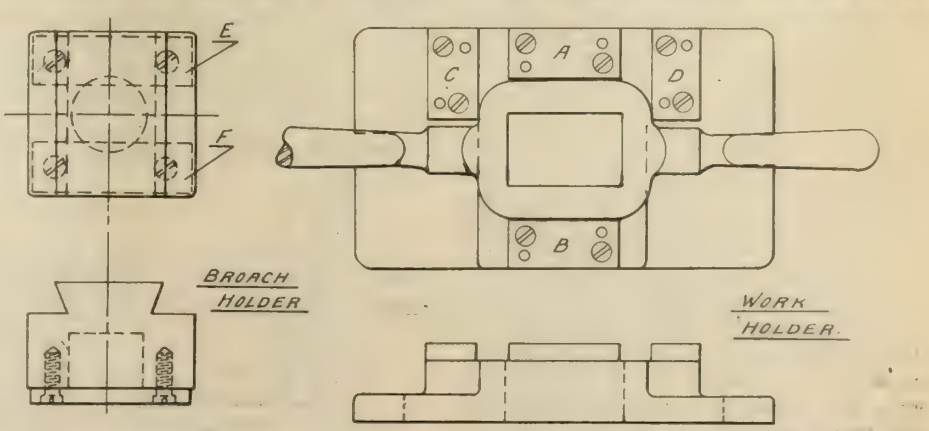


FIG .2—TOOLS USED IN CONNECTION WITH BROACHING THE PART SHOWN IN FIG. 1.

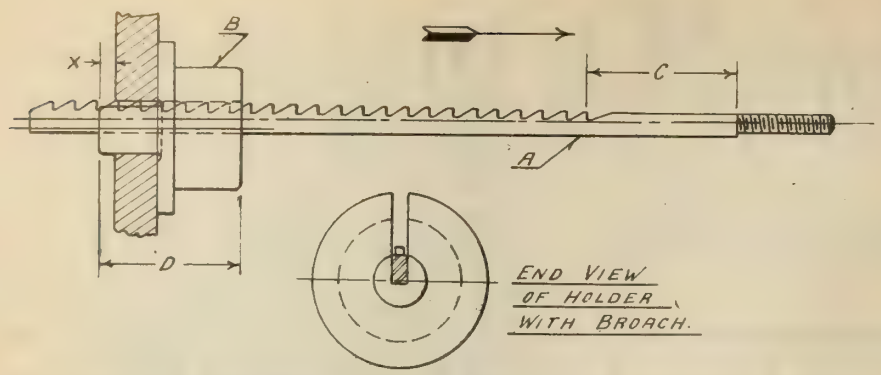


FIG. 3—TOOLS FOR BROACHING A KEYWAY, USED ON DRAW BROACHING MACHINE.

depending on the length of the work. Having determined on the broach teeth the length of the broach is governed by the depth of the key-way, but in addition to this there are two other conditions which are quite apt to be overlooked, either of which might prove fatal to the operation of the broach. The first of these is the length C, which must be added to the length of the broach and is at least equal to the length of the work bushing D. This permits the broach to be passed through the work and into the holder without the teeth of the broach interfering or coming in contact with the work. It will be noticed on the illustration that there is a distance X between the work and the end of the work bushing. The importance of this added length is often overlooked, but as a protection against broken broaches it is "insurance" at its best. The reason for this is apparent from the diagrams, Fig. 4. For if the work bushing comes flush with the end of the work, when a tooth of the broach starts to cut, there is a breaking point X directly opposite the tooth; should the work bushing be shorter than the work, the tendency to break the broach at this point is aggravated, while if the work bushing is longer than the work, as shown at the right in Fig. 4, the broach is properly backed up while cutting and consequently is not apt to break from bending strain.

A common error in laying out work which is to be broached is to assume that because a broach is listed to cut a key-way so wide and so deep, it will do it, for if the broach was designed for short work and an attempt is made to use it on long work, the chances are the broach will be broken, although the operator can not be blamed for doing what the operation list called for, and therefore lists of broaches should specify the maximum and minimum length of work for which best adapted.

Various Styles of Holders

The illustrations, Figs. 5, 6, 7 and 8 show a number of pull bushings or broach holders which are adaptable for most work, the object of these being to grip the shank or threaded portion of the broach securely, so the same may be pulled through the work.

Referring to Fig. 5, the upper views show a plain holder having a screw A with a shoe B in a holder C, which are used for locking the broach in position after it has been screwed into the holder. This holder is gripped by the large threaded end in the tool slide of the machine.

Below this is what is known as a floating holder and the portion D of this is similar to the one above, except that the shank, instead of being threaded, has a bell-mouthed hole E in it. This shank is a floating fit in the holder F, which has a pin G in it to keep the holder D in place. The holder F is attached to the tool slide of the machine and this whole arrangement makes a suitable means for allowing the broach to fit in a bushing at the work end of the machine without being rigidly attached to the drawing end of the machine, where such an arrangement is desirable. An arrangement for pulling the broach which may be used when the broach is very small and the cutting is light is indicated in Fig. 5, as "Holder with binding screw," and the construction of this is obvious from the illustration as the shank of the broach is simply flatted at H against which the screw J is caused to bear.

The illustration below this also shows a holder suitable for light work and besides the threaded end for holding it in the tool slide two pivot point screws K and L are provided, which are adjustable and hold the broach while it is pulled through the work. A good rugged arrangement for holding the broach is the wedge construction shown in this illustration. In this an elongated hole is cut through the broach and an elongated hole is cut through the holder, through these a tapered wedge is passed, from which it is almost impossible for the broach to pull away. Some very substantial broach-holding arrangements are illustrated in Fig. 6, the first of which, with the split bushing arrangement being a very simple means of securing good results, as it combines a solid pull arrangement with easy removal of the broach. It is necessary in this construction to have the distance A greater than the length of the bushing B, and the broach C is provided with a head D. In operation the two halves of the bushing are put over the shank of the broach through the hole A; the broach with the bushing in place is then pulled back until the bushing is in the hole, as shown, and takes the pull of the cut.

The view in the centre makes a neat arrangement of a substantial floating holder and is constructed as follows:

The broach E is threaded at the end and a nut F is screwed thereon; this nut has a radius at one end which comes against the screw bushing G; this screw bushing, after being screwed in place by means of the squared end, is locked by the screw and shoe H, while the holder itself, J, is held to the tool slide in the usual manner. The hole in the threaded bushing is slightly larger than the broach shank, which with the radius on the nut makes a holder having a little float.

Revolving Broach Holder

A revolving broach holder suitable for use where it is necessary that the broach revolve, as in broaching spiral keyways, has been shown at the lower part of Fig. 6. The broach holding portion proper is designated as K and the broach L is threaded into this; to prevent the broach from unscrewing out of this holder a key M is provided and a screw N forces this key down into the keyway and binds it there, thus locking the broach securely. The holding portion K has a head on it, P, which bears against a thrust washer, Q; a ball bearing, R, then takes the thrust of the cut, while the plate S holds these in place in the holder T, the plate being held in by the screws U. In pulling a spiral broach through work it is customary to cause the broach to revolve at the work end of the machine, which makes it necessary to arrange the holder so it will pull the broach and revolve at the same time, which condition is very well taken care of by the ball bearing thrust washer and the arrangement shown, while the principle involved will

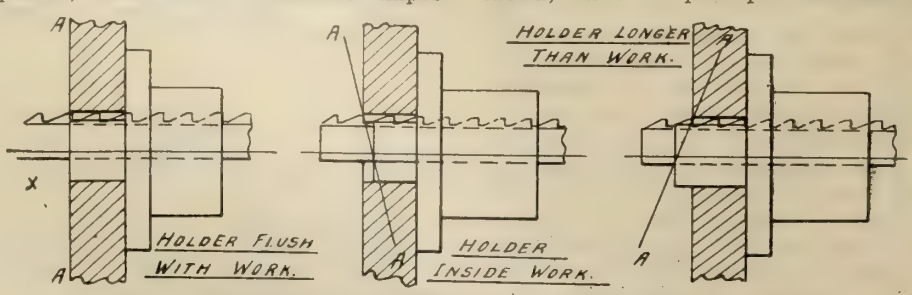


FIG. 4—THREE EVTMPLES OF WORK HOLDERS.

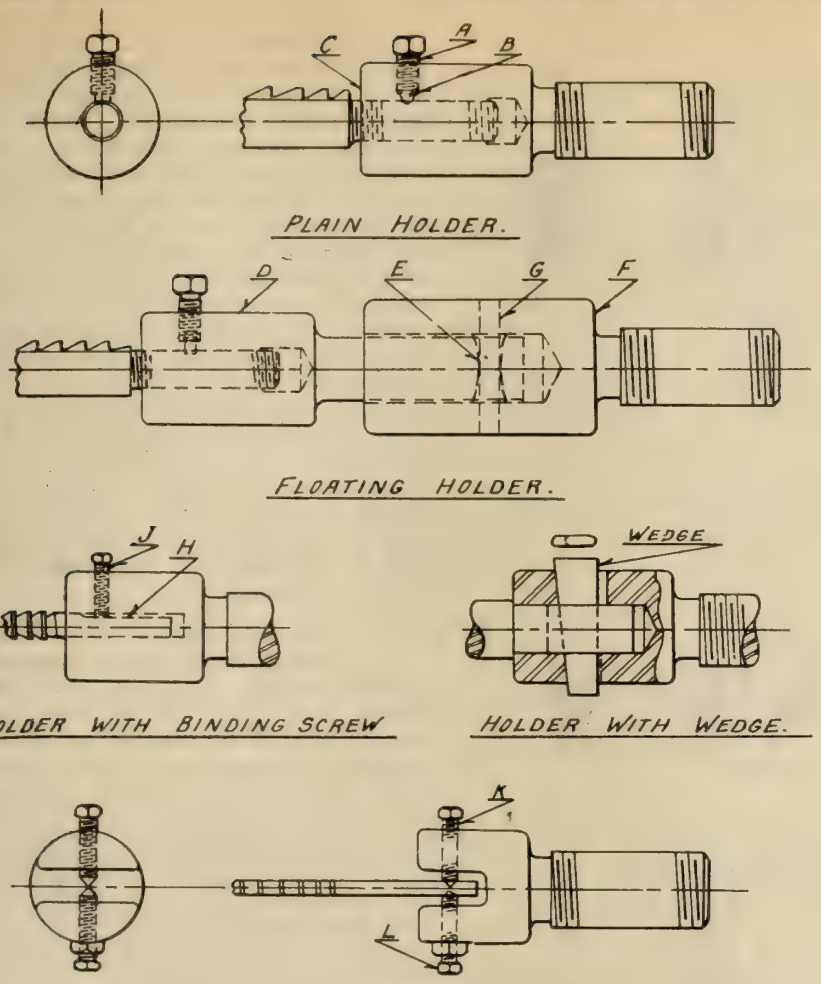


FIG. 5—A GROUP OF BROACH HOLDERS.

be illustrated in an example of spiral broaching in a later illustration.

Figure 7 shows a split pin arrangement for holding a broach and this pin is best likened to a clothes pin, as it slips over two flats on the shank of a broach in much the same manner as a clothes pin would over a line. Referring to the illustration, A is the broach, B is the split pin, C is a pin used for pulling the split pin in and out of the hole, while D represents the flat on the broach, and E the broach holder proper. In operating this, the broach is slid through the work and work bushing into position in the holder, the split pin B is then pushed in place over the flats D, where it takes the thrust of broaching.

In the lower portion of Fig. 7 a holder where the broach F is threaded directly into the holder is illustrated. This holder is split at G and ring H, with a screw J, is used to pinch this holder together and bind the shank of the broach.

Another example of a split pin arrangement is illustrated in Fig. 8, where the pin and holding means are the same as that shown in Fig. 7, except that at the closed end a spring is located in place of a pin. This spring X is made of flat stock and is used to hold the pin in place and it is particularly useful where the holder has to revolve as the spring clinging to the holder keeps it in position, even though the spring end should be on the under side.

The lower illustration in Fig. 8 shows a latch method of holding a broach while it is drawn through the work; this method, while not as rigid as some, is quick operating where the broaches have to be removed continually. The broach A has a notch B cut in it and the holder C is constructed with a cap D on it, a slot E in the holder contains a lever F, which is free to pivot on the pin G; four screws, H, hold the cap in place. Other features of this holder are the spring pin J and the binding screw K, which has a handwheel L on it, while a screw M keeps the spring N in place to operate the spring pin. In operation, when the screw K is released, the spring pin J forces the hooked end of the lever out of the slot in the broach and the broach can then be pulled out of the holder, while the reverse of this, of course, locks the broach in place.

In push-broaching the broach holder may usually be of very simple design, such as a pad to fit in the hole of a press, as shown at A, Fig. 9, which pushes the broach through the work, or the holder may have a groove for locating the broach in its proper radial position, as shown at B. For some jobs it is desirable to support the upper end of the broach in a holder similar to C, Fig. 9, while a ball bearing pad, which revolves when a spiral broach is being forced through a hole, is illustrated at D.

Work holders for broaching are, of

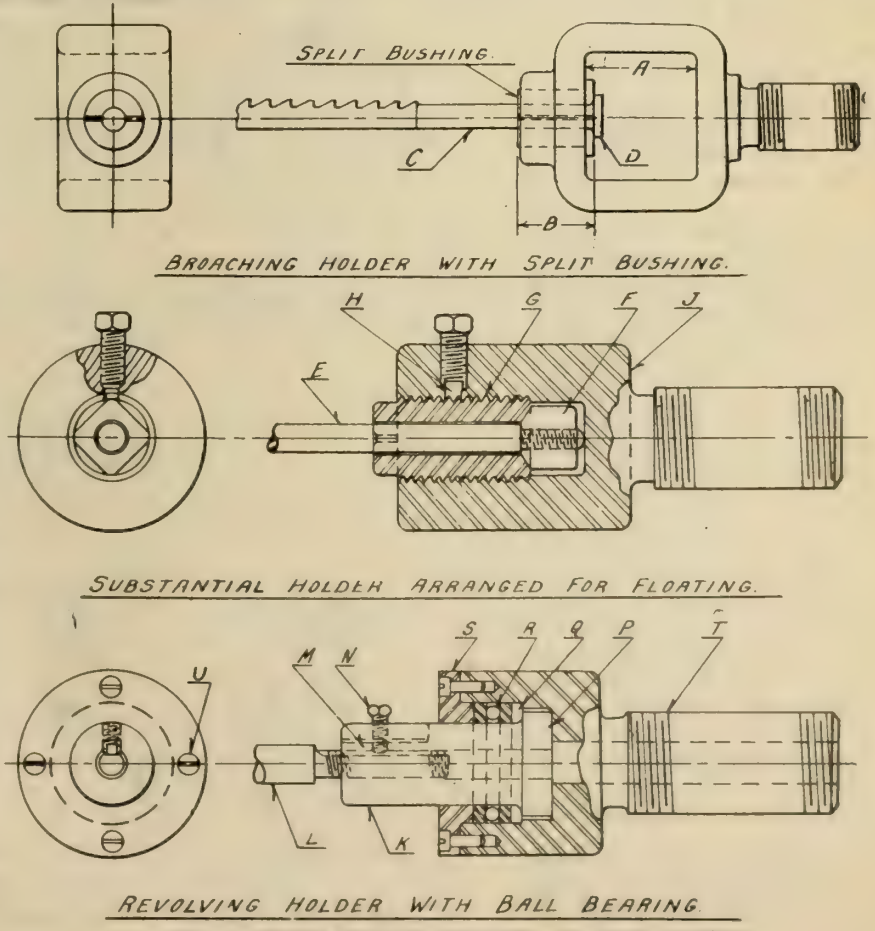
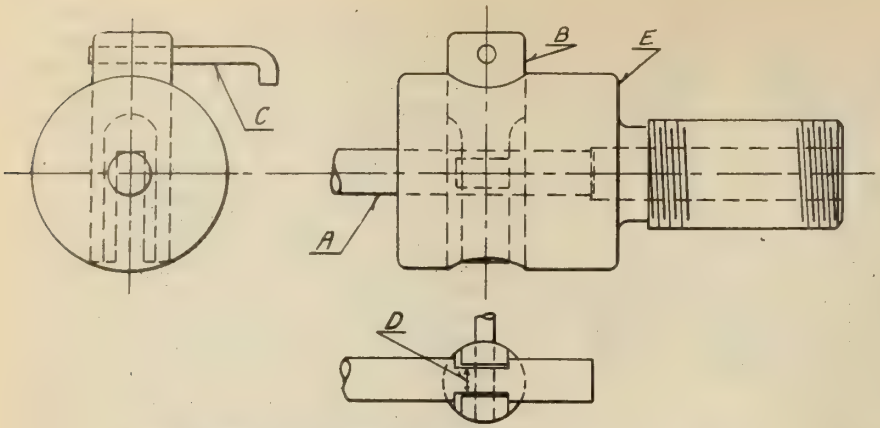
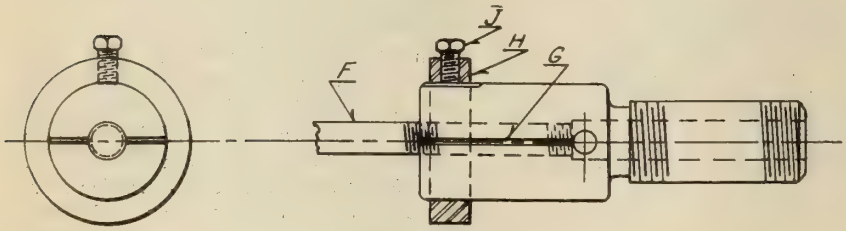


FIG. 6—THREE BROACH HOLDERS OF GOOD DESIGN.



METHOD OF HOLDING BROACH WITH PIN.



SPLIT CLAMP BROACH HOLDER.

FIG. 7—SLIP PIN AND THREAD BINDING BROACH HOLDERS.

course, quite numerous, they being designed to suit individual and varied conditions, and therefore a few typical examples covering general requirements are all that will be shown here.

Basic Features Involved

The basic features of a work holder are that it must support and locate the work, guide and often back up the broach, while economical production demands that it be as simple as possible, consistent with the required accuracy of the work.

Referring to Fig. 10, the first illustration shows a work holder for broaching a plain bushing. This holder consists of portion A, which fits the machine and a stem B, upon which the work is placed, while the slot, of course, guides and backs up the broach. Where the work broached is small, this work holder is usually made in two parts, and such a holder is shown below the one just described, where C fits the machine and D holds the work. In the view at the upper right-hand corner the bushing E also has a small work bushing F inserted in it, this latter bushing being set below the centre, so as to bring the broaching tool in line with the screw of the machine. The view below this shows a bushing for broaching a keyway in a tapered hole, where it will be noticed the end of the holder G is machined so as to hold the work on an angle so the keyway will be broached in line with the hole.

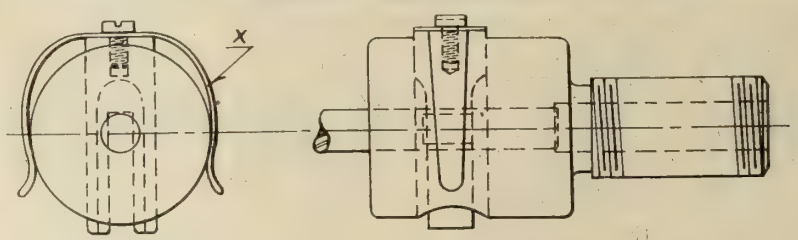
The lower illustration shows a large holder, H, in which is held six small holders, J, upon which are placed six parts, while keyways are simultaneously broached in them.

In Fig. II, a complete work holder for handling the part shown consists of a cast iron portion A, in which is inserted a steel locating bushing B, while two pins, C, locate the arm, so the keyway will be broached in the proper relation to match with this arm when assembled in place. Having determined on the method of holding the work and the means of pulling the broach, the design and proportioning of the broach is the next consideration, and while a faulty work or broach holder will often break a broach, the design of the broach determines the quality of the work produced and the wearing qualities of the broach to a large extent.

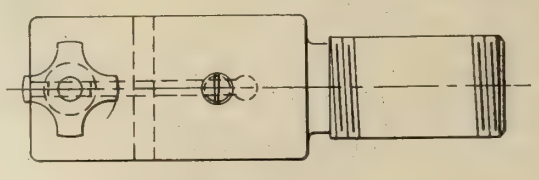
In describing broaches the object will be to show successive steps in their design, as the broach cuts up to the form desired from a blanked or starting hole, and as a prelude to this reference is made to Fig. 12, which shows proportions for broaches that have been quite generally accepted.

The Teeth

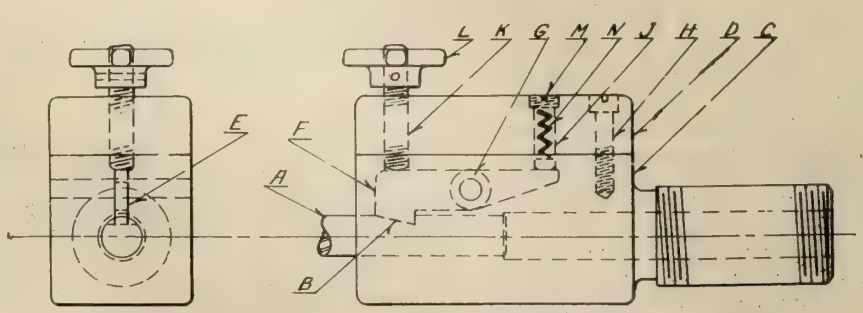
As a general thing, broach teeth are undercut slightly unless they are machining very soft material, while the average pitch of broach teeth would be equal to the square root of the length of the hole multiplied by the constant 0.35, thus: $P = \sqrt{L} \times 0.35$, in which P equals the pitch and L equals the length of hole broached. There should be a large fillet at R, while D must be deep enough to give chip space for the longest hole broached, this, of course, depending on the amount of metal removed by each tooth and no general rule can be given governing this, as it



PIN HELD IN WITH SPRING FOR HOLDING BROACH



GRIPPING LEVER.



A LATCH METHOD FOR HOLDING BROACH.

FIG. 8—PIN AND LATCH ARRANGEMENTS FOR HOLDING BROACHES.

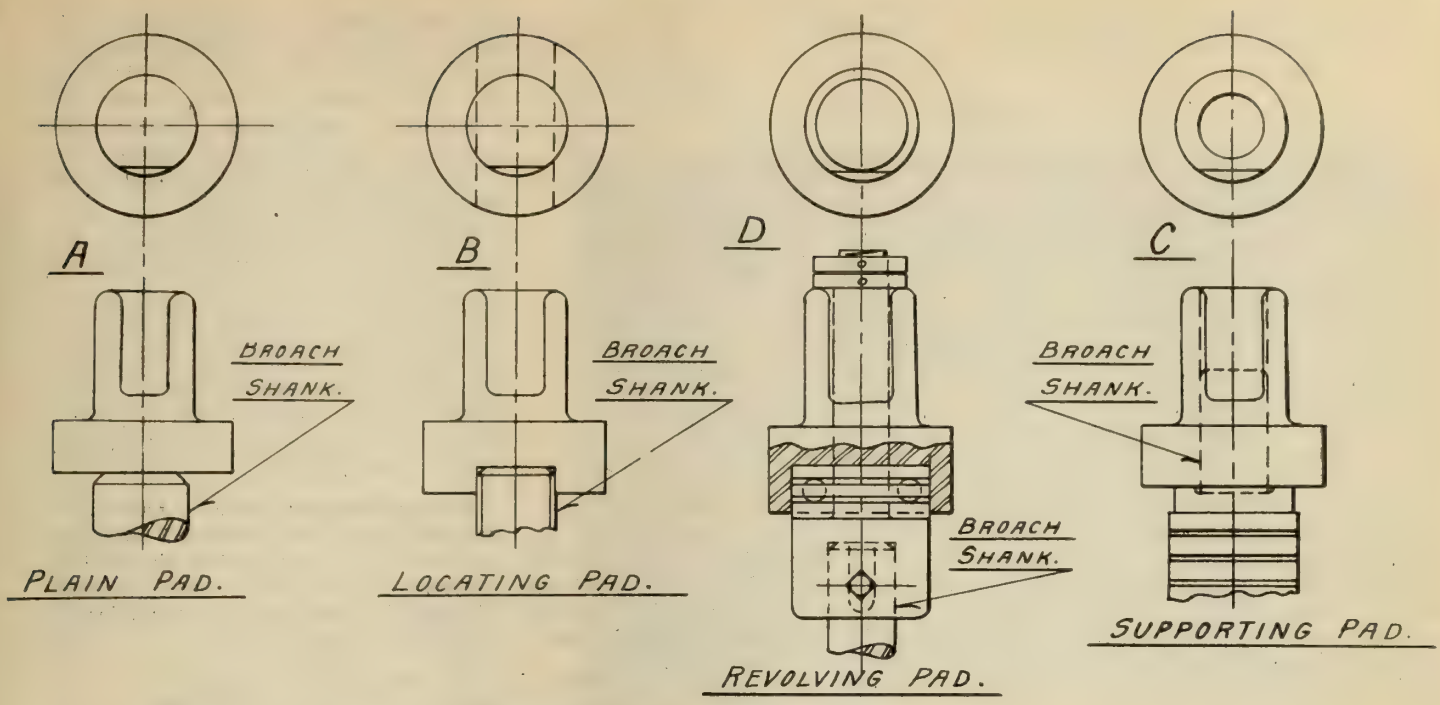


FIG. 9—FOUR TYPES OF PUSH BROACHING PADS.

will depend on the toughness of the metal, as, for instance, cast iron, bronze, soft or hard steel etc., would vary this amount and there are other conditions which will be taken up later.

The rule given above for determining the pitch of the teeth must not be unqualifiedly taken, however, for, if the teeth are too close together too much power will be required to pull the broach through the work, also the pitch should never be coarse enough to allow the teeth to straddle the work, or in other words the pitch should never be greater than the thickness of the work and two teeth should be in contact with the work at all times.

Various Broach Designs

In Fig. 13 a number of diagrams of broach design are shown, of which the first is a broach for a square hole. Considering the upper row of diagrams only, the first shows a section through the shank of a broach which enters the hole, the second shows a section part way up the broach, the third shows a section near the finishing end of the broach, while the last illustrates how the finishing teeth would look. It will be noticed in all of these views that the diameter A remains the same, while the dimension B is increased successively to square out the corners of the hole. The row of illustrations below show successive stages in the construction of a hexagonal broach, while below a typical broach drawing is shown where Y is the broach shank or holding portion, X is the starting portion equal to the length of the work bushing and the remaining portions describe how the teeth are to be proportioned at various parts of the broach. The design of a broach is largely a matter of experience, and Fig. 13 simply gives an idea of what this experience leads to. A broach designer will try to have all his working teeth do an equal amount of work, therefore as a broach starts to cut out a square from a round hole the teeth will be working on a greater- radius at the start than

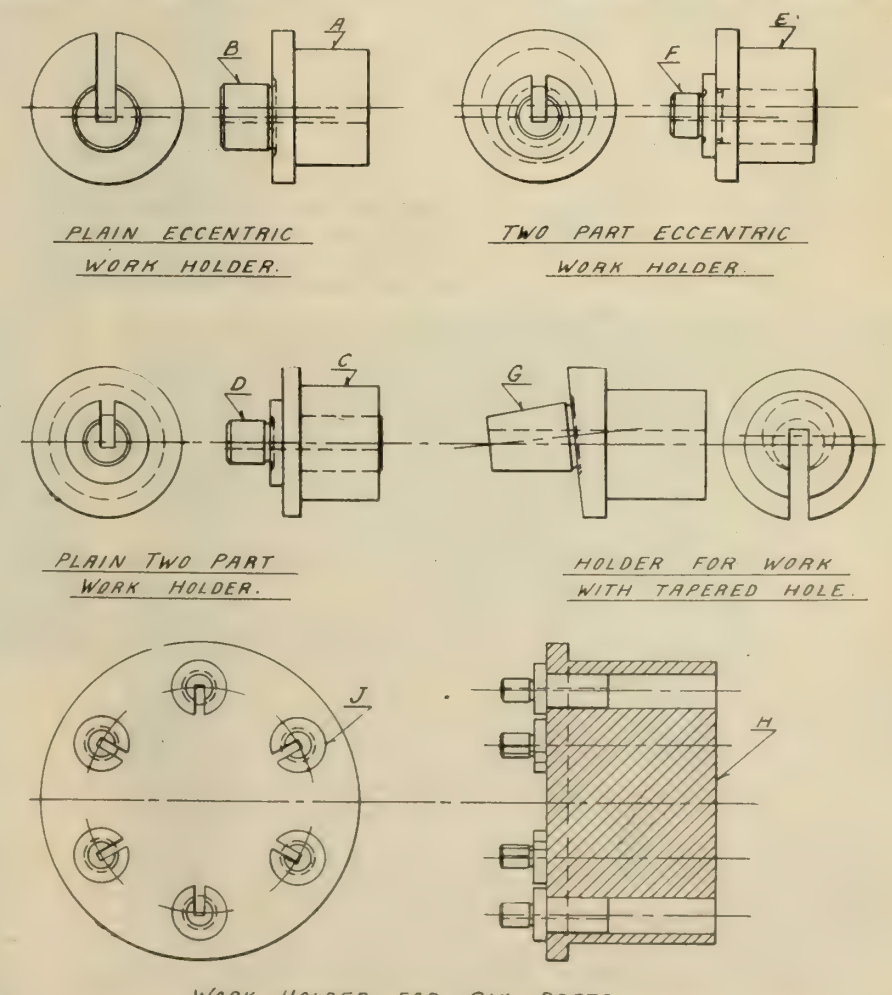


FIG. 10—A GROUP OF SIMPLE WORK HOLDERS.

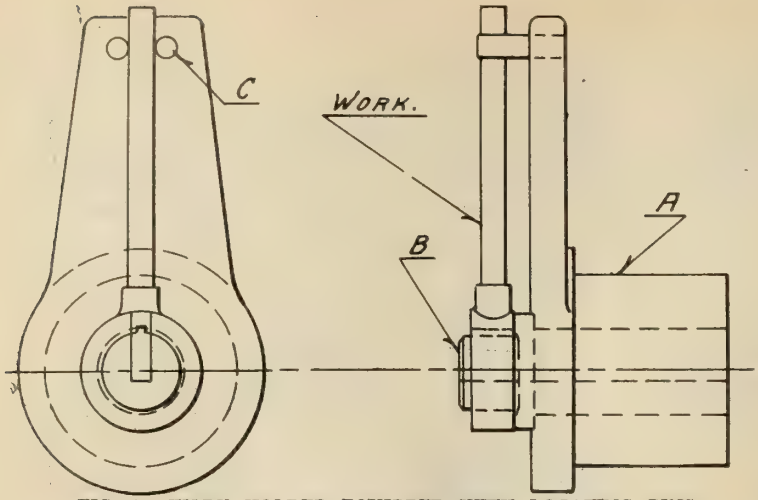


FIG. 11—WORK HOLDER EQUIPPED WITH LOCATING PINS.

when part way up the broach, as indicated at C and D in the upper illustrations. To counteract this the teeth which first start to cut on the broach are made to take lighter cuts as regards depth than those further along, as will be noticed from the notes, .002 rise, .003 rise, etc., on the lower illustration, while a number of teeth at the end of the broach are made equal rise in order to maintain the size. Various shaped broaches require different treatment in this regard, and no general rule can be given which would cover this phase of broach design.

Among the features often met in pull broaching are two or more parts being broached together by placing them one against the other, or a number of parts will often be broached simultaneously by grouping them on a suitable work plate and using a group of broaches. On some classes of work broaching is supplanting reaming, as it is claimed that the broach will hold its size for a much longer period than a reamer, will make straighter holes and smoother holes at increased production.

Broaches are also used to some extent for correcting inequalities caused by the hardening of some parts; the practice in such cases being to pull a broach slightly larger than the hole required through the work after hardening. The broach in this case has no teeth, the operation being one of compressing the metal and a lubricant is, of course, used at this time to prevent tearing the metal.

Another type of broach used for enlarging holes in soft material instead of reaming is made up with a series of spaces and steps, which are rounded slightly on top and highly polished; these are forced or drawn through the work and compress the soft metal, thus forming a glassed surface, which is oftener superior to reaming on soft white metal, babbitt, bronze, etc.

Having dealt at some length with general details of broach construction and operation in the next section of this article, reference will be made to types of broaching machine and examples of broaching practice.

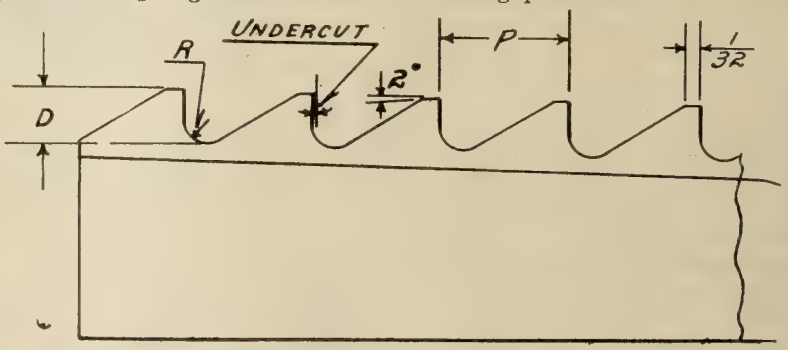
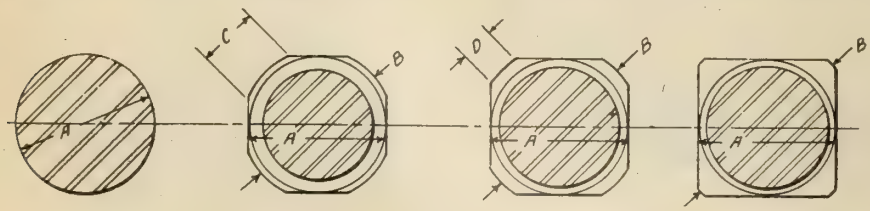
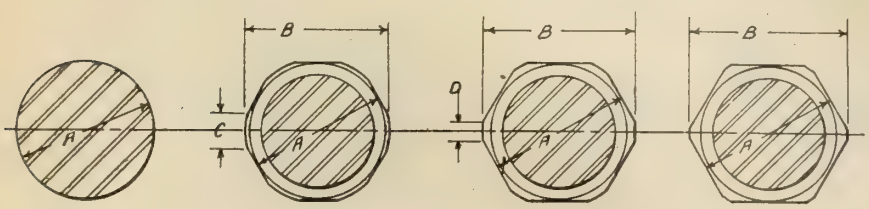


FIG. 12—DIAGRAM SHOWING CONSTRUCTION OF BROACH TEETH.



SUCCESSIVE STEPS IN MAKING UP A SQUARE BROACH.



SUCCESSIVE STEPS IN MAKING UP A HEXAGON BROACH.

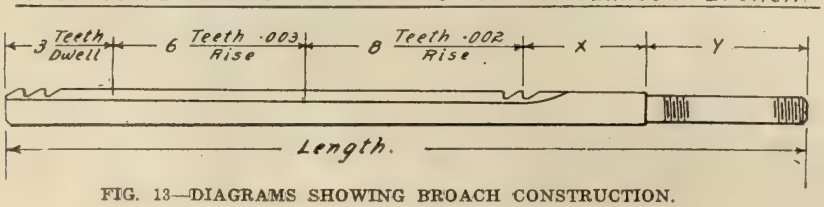


FIG. 13—DIAGRAMS SHOWING BROACH CONSTRUCTION.

Vancouver.—The shipping interests of Vancouver are petitioning the Dominion Government to construct a floating drydock here. While it is felt that a permanent drydock would be more desirable, the cost of construction and the time required would be much higher than for a floating dock. The latter could be built and finished in about a year, while a permanent dock would require about three years at the least.

A new high-speed steel known as chrobaltic alloy, which can be cast into intricate shapes, is mentioned in the "Iron Age" as being used as a substitute for tungsten and vanadium steel by a Chicago company in the manufacture of milling cutters and other tools having multiple cutting edges. The castings have the appearance of smooth forgings and are said to be practically non-rusting and acid-resisting, and the heat-resisting qualities of the alloy are such that it does not scale in the fire, thus adapting it to milling cutters having thin edges. The steel may be hardened in oil or air, and it is explained that the processes of annealing and rehardening may be repeated without the steel losing any of it properties. Annealing is effected at 1832 deg. Fahr. in a closed muffle. Cooling is allowed to proceed slowly.

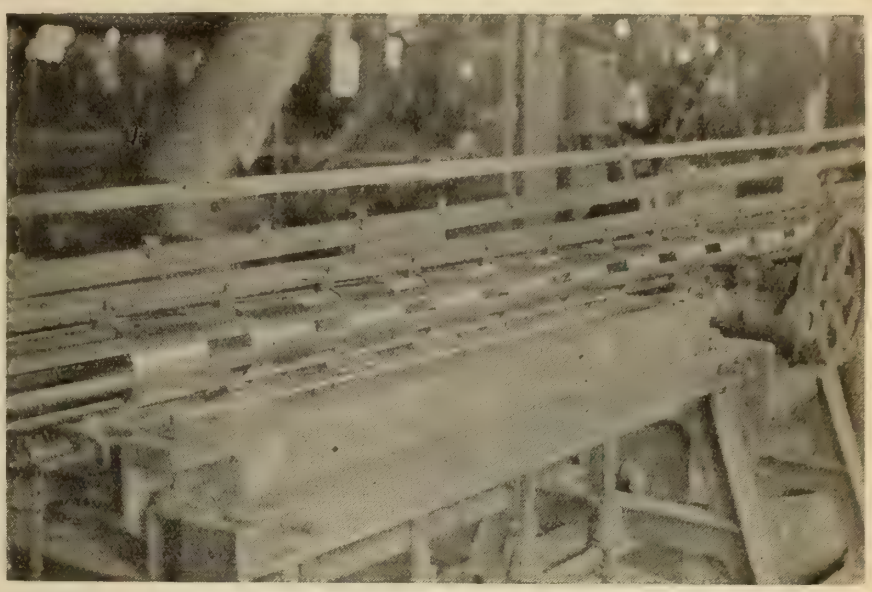
Various Conveyors Used in Canning Industry

By J. H. MOORE

CONVEYORS to right of them, conveyors to left of them, volleyed and thundered, could well apply to the plant of the American Can Co. of Hamilton, Canada, who, as readers well know, manufacture almost any size and shape of tin can, and a considerable variety of paper can as well.

In work of such nature it is absolutely imperative that the work proceed at a regular gait from operation to operation, until the completed can, so that conveyors form a large part of this plant's equipment.

To show by photograph all these conveyors would take a volume. There are all sizes and types to be seen on every side, some in the form of endless belts, while others take the shape of chain conveyors. Then there is the ordinary chute style, down which the cam comes from either some other machine on the same floor, or on the one above. These conveyors even go out direct to the cars which are loaded at a surprising rate of speed.



THE CHAIN TYPE OF CONVEYOR USED FOR PULLING CANS THROUGH SOLDERING TANK.

FIG. 1—WIRE LEAF CONVEYOR USED IN CONJUNCTION WITH PRINTING PRESS.

In addition to these various style cans, this firm manufacture shoe polish boxes, which are first of all lithographed in their flat state before being stamped and drawn, or punched into shape. These lithographed sheets go direct from the press to a drying oven by means of a novel conveyor, which is illustrated at Fig. 1.

This conveyor is made up of rod iron compartments or shelves, which keep each sheet of lithographed tin away from the other. The complete arrangement moves slowly through the drying oven, and on reaching the other end is dry and ready for handling. The girl placing one of these sheets in position shown in the photograph needs no comment since the action is self-apparent.

At Fig. 2 we illustrate the chain type of conveyor. This chain has a series of lugs on it which come in contact with the cans, pulling them through (at correct speed) the soldering tank. On reaching the other end of the machine they are soldered down the vertical seam and pass on to the next operation.

Last, but not least, we illustrate the common or garden variety of chute. Readers will note the close proximity of the two chutes A and B. This is one

(Continued on page 529)

FIG. 3—THE SIMPLE CHUTE CONVEYOR FEEDING VARIOUS OTHER OPERATIONS.

The Terrific Punch of a Small Boiler

Explosion in Small Shop Where Vulcanizing Was Done Opens Up a Question of Interest—Terrific Power Released Does Great Damage

By T. H. FENNER

IF there are still sceptics on the subject of the dangers of small vessels containing water and steam under pressure and temperature conditions it is surely not through lack of object lessons.

The latest of these demonstrations occurred in Toronto very recently, much to the detriment of the building in which it occurred. Fortunately, or we might say, almost miraculously, it was not accompanied by any loss of life or limb. The case referred to was the explosion of a small cast-iron vessel used for vulcanizing automobile tires, and it was situated on the second floor of a garage and service station on Jarvis Street, Toronto.

The apparatus consists of a cast-iron vessel of square cross-section in the lower part, the upper part being made a semi-circular shape, to conform to the shape of the tire. There are three sections, so that three tires can be handled at once, and the vulcanizing is performed by the heat of steam circulating round the inner surface of the moulds. This steam is generated from the water contained in the lower portion of the apparatus, and the necessary heat is applied by a gas flame on the bottom. The lower part, which is practically a cast-iron boiler, is filled with water through a funnel, and holds probably 50 lbs. of water. After filling, the funnel is removed and the hole plugged. A safety valve set to blow off at about 40 lbs. per square inch, and a steam gauge are fitted.

Where the Valve Stops Work

The pressure used will, of course, never exceed the pressure at which the valve is set, unless something prevents the valve from working. Evidently something of that nature happened in this case, for while the attendant, fortunately for himself, was temporarily absent, an explosion occurred. The result was the complete demolition of the vulcanizer itself, the shattering of every window on the second floor, and the splitting of the front wall of the building from top to bottom.

A very respectable effort for a couple of pails of water, was it not?

As a bystander remarked, one would wonder how such a little thing could do such enormous damage. However, a little study will dispel the wonder, and probably bring home to many more or less complacent users of boilers the nature of the forces they are handling.

We may fill a boiler, or other vessel, with water and then, by means of a pump, produce pressure high enough to rupture the tank. No explosion happens. Why? Because there is no latent energy contained in the water to cause one. The vessel ruptures, and the pressure disappears. The energy contained in the water has been used up in overcoming the resistance of the material to rupture. That is why testing of boilers is always done by means of hydraulic pressure. Water being practically incompressible, a stroke or two of the pump is sufficient to increase the pressure after the vessel is once filled.

But When Heat is Applied!

Now, let us take a vessel, and partially fill it with water, which we proceed to heat, until some of it evaporates, and steam is formed. Instead of the water possessing no latent energy it will possess an enormous amount. To raise one pound of water one degree requires one heat unit, and this heat unit represents the same amount of work as the raising of 778 lbs. one foot high. In other words, the heat unit, known as the British Thermal Unit equals 778 ft. lbs. Now, to change one pound of water at 40 degrees Fahrenheit into one pound of steam at 40 lbs. per square inch gauge pressure requires approximately 1,161 B.T.U's, equivalent to 903,258 ft. lbs., or energy sufficient to raise 1,000 pounds 903 feet high. Now, to come back to our little vulcanizer, which seemed so small as to be harmless. Assuming it held 50 pounds water, and 10% of this had become steam at 40 lbs. per square inch gauge pressure. We would have 5 lbs. steam containing 5,805 B.T.U's. We would have 45 pounds of water at 40 lbs. pressure, the temperature corresponding being 285°F.

Let's See Just What Happens

As the initial temperature of the water is taken at 40°, the quantity of heat in the water would be $45 \times (285-40) = 45 \times 245 = 11,025$ B.T.U. Now, we can neglect the energy lost in breaking the vessel, as we have no means of estimating it, and we will assume that all the energy of the steam and water is available to do its worst to whatever obstructs it. Steam occupies, roughly, 1,600 times the volume of the water from which it is formed at atmospheric pressure. The first thing that happens when the vessel breaks is the reduction of pressure. Now, the water, which is at a temperature of 285° at 40 lbs. pressure, is considerably above the temperature of steam at atmospheric pressure. Therefore, a considerable amount of water will become steam, and will want to increase its volume 1,600 times when it does so. Let us see how much. We have available altogether $5,805 + 11,025 = 16,830$ B.T.U's. Each pound of water in becoming steam at atmospheric pressure will absorb 966 B.T.U's. Therefore, 16,830 divided by 966 will give us the amount of water that becomes steam at atmospheric pressure, roughly, 17½ lbs. One pound of steam at atmospheric pressure contains 1,146 B.T.U's. and 17½ lbs. contains 20,055. All this heat energy is available to remove anything that wishes to prevent the expansion.

See What We Have Now

Translated into foot pounds, the energy is 15,602,790. That is, enough to raise 7,800 tons one foot high, or 1 ton 7,800 feet high. The volume of 17½ lbs. steam at atmospheric pressure is 460.25 cubic feet. That means that in order to occupy that volume that much air had to be displaced, and anything that tried to confine it had to go. Luckily there were plenty of windows, which yielded easily, but not enough, as witness the broken wall. It is no wonder that the place looks as though it had been struck by a shell.

Do not despise the boiler because it is only a small one!

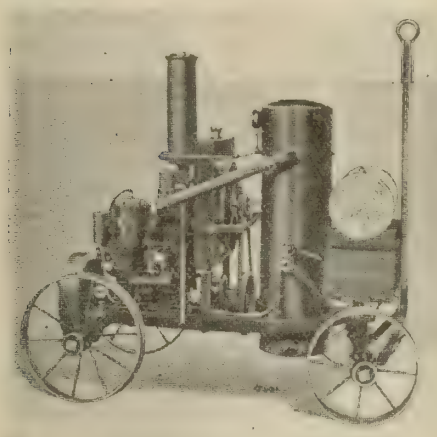
TEN times as much alcohol to be used under prohibition than formerly. This is the prognostication of a member of the American Chemical Society, at a symposium held on the question of alcohol. However, this quantity will not be made up into seductive cocktails, or sympathetic gin rickies. It will be used to propel vehicles, boats, and other power-users when the petroleum supplies become less. There are a number of new sources for the supply of alcohol, one of them being the nippa palm. This palm yields about 15% sugar, which can be fermented. This source alone would give 50,000,000 gallons of alcohol a year.

Some New Styles of Compressing Machinery

By A. W. SWAN

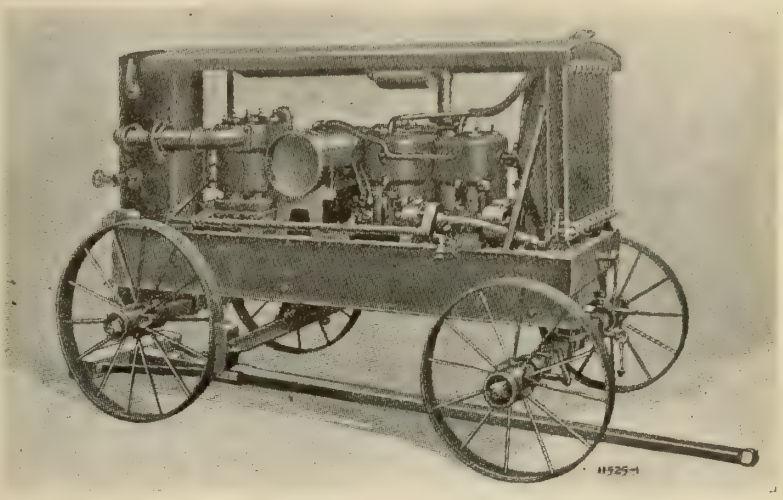
THE Ingersoll-Rand Company has recently added to its large line of air compressing machinery a light-weight portable gasoline engine-driven unit built in three sizes, known as the "Imperial Fourteen" portable compressor, the "Imperial Junior" compressor and the "Imperial Baby" compressor. These are of all steel construction, the larger sizes being provided with steel canopies or housings for protection against the weather. The power plant of the largest machine, consists of a high speed gasoline engine driving a vertical duplex compressor, while in the "Baby" a single cylinder vertical compressor driven by a single cylinder two-cycle engine is used.

The largest machine has a capacity of 210 cubic feet at 100 pounds pressure to the square inch and weighs 6,000 pounds, while the "Junior" has a capacity of 118 cubic feet at the same pressure and weighs 4,000 pounds. The "Baby" weighs 1,500 pounds and displaces 45 cubic feet at 90 pounds to the square inch. The gasoline motor provides an economical source of power and tends to simplify the mechanism to such an extent, that it may be safely entrusted to a laborer of average ability, who has a slight knowledge of gasoline engines. Such men are at present readily available and make excellent operators for an outfit of this type.



BABY IMPERIAL PORTABLE AIR COMPRESSOR.

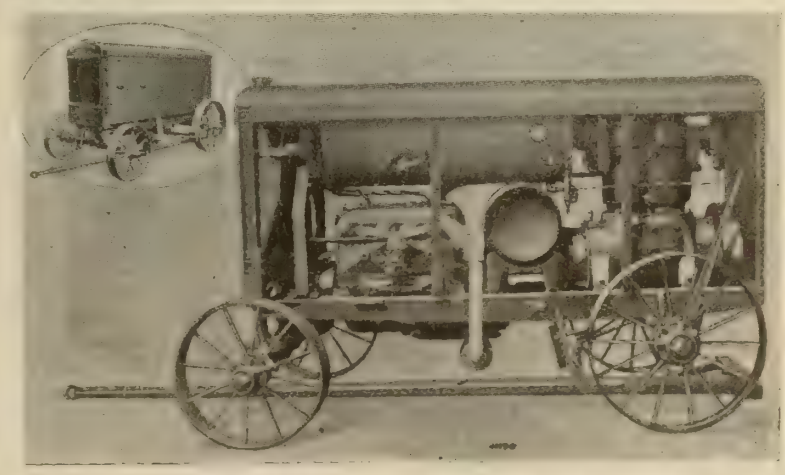
The larger compressors have both cylinders cast en bloc, with heads, valve chambers, and water jackets integral, while the smallest size is fitted with a removable cylinder head. Plate inlet and discharge valves are used on all three sizes, located directly over the cylinder bore, with the exception of the "Baby," in which the inlet valve is located in the top of the piston. The crankshafts and connecting rods are drop forgings. The compressor pistons are fitted with three-piece rings and in addition with an oil wiper ring, which returns surplus oil to the sump in the crank case and obviates any difficulty which might be caused by the air carrying an excessive amount of oil into the receiver. All bearings are die castings of antifriction metal and are adjustable for wear. Access to the main bearings and those of the crank pins is provided for by means of conveniently located handholes in the crank case. All working parts are lubricated by splash from the oil reservoir in the lower part of the crank case, with the exception of the smallest size, in which the main bearings are lubricated by compression grease cups, and the compressor cylinder by a sight feed lubricator placed on the intake. The starting crank is located at the front of the machines under the radiator.



IMPERIAL JUNIOR COMPRESSOR.

Both the compressor and driving motor are water cooled by a circulating system with a centrifugal pump, large radiator and powerful blast fan. A point worthy of particular notice is the fact that, except in the case of the smallest machine, the radiators are made up of a number of removable sections, a type of construction which allows a damaged section to be removed and repaired without taking off the entire radiator, or putting the outfit out of commission while repairs are being made. Each unit is equipped with an automatic intake unloader which maintains a constant pressure in the receiver and permits the motor to be started easily. The receivers are tested to a Hydrostatic pressure of 300 pounds to the square inch, and are fitted with safety valve, pressure gauge, drain cock, and two service valves, to which the air supply hose line may be attached, with the exception of the "Baby," on which only one service valve is mounted.

An interesting feature in the construction of the smallest machine is the use of a two-cycle motor in place of the single-cylinder four-cycle motor usually



IMPERIAL FOURTEEN PORTABLE COMPRESSOR.

found on machines of this class. Through the employment of the two-cycle type, the machine is more thoroughly balanced in regard to both reciprocating parts and power impulses than would be possible were a four-cycle single cylinder motor used, and the increased weight and cost of a multi-cylinder engine are eliminated.

The absence of valves in the combustion chamber and their accompanying cams, push rods, and tappets, simplifies the motor to a large extent and contributes in a large measure to the reliability of the equipment in the hands of men with little or no experience with gasoline engines. A double throw crankshaft, common to both the compressor and the motor, suspended in three bearings—formed by bolting the crank cases together by means of a distance piece—does away with all external couplings and provides an efficient and compact unit.

The largest compressor is driven through the medium of a fibre-faced cone clutch (controlled by a crank outside the truck frame) which delivers power from the motor to a transmission shaft carrying a case-hardened chrome vanadium pinion engaging with a hardened steel gear pressed on the compressor shaft, while in the "Junior" the fly-wheels of both the compressor and motor are placed in line and connected by a number of steel pins passing through holes bored in each fly-wheel, making a strong and positive coupling, which can be readily taken apart.

The method of mounting the machines is worth attention, particularly the swivelled front axle, which moves freely in both a horizontal and a vertical plane. This arrangement, together with the rigidly attached rear axle, gives a three-point suspension and permits the outfit to be hauled over very rough ground without any racking effect on the alignment of the power plant. When the fuel tank has been filled, lubricating oil provided, and the radiator supplied with water, the outfits are all ready for use. In the larger sizes they are adaptable to a wide range of service in engineering and construction work, such as operating a number of rock drills, portable air hoists, pneumatic drills, chipping, riveting and caulking hammers, drift bolt drivers, pile hammers, tie-tampers, wood borers, etc., while the smallest outfit may be used to operate one or two air tools, or for cleaning electric motors and machinery, sand blasting, spraying paint, whitewish or other liquids, and many other odd jobs around the power station and industrial plant.

IT DEPENDS

Mrs. Flatbush: "What does your husband call your dog?"

Mrs. Bensonhurst: "When he's calling him into the house, do you mean, or chasing him out?"

ARC WELDING MAKES GOOD

By Robert E. Kinkead

Considerable savings may be effected by welding defective castings, according to Robert E. Kinkead, in a paper presented at the annual meeting of the American Foundryman's Association in Philadelphia, Sept. 29 to Oct. 3. In describing methods of welding castings, the author calls attention to the fact that electric arc welding has been used in steel foundries for about ten years, and during that period the sentiment toward salvaging defective castings has changed in a most remarkable manner. The repairing of defective castings by arc welding is said now to be standard foundry practice. The paper continues, in part, as follows:

The field in which the metal electrode process is best applied is in dealing with small steel castings where the defect is of minor importance and in larger castings where the defect occurs in a section which is thin, and on which the heat must be extremely localized.

Good foundry practice indicates that steel castings which have been welded by the carbon electrode process should subsequently be annealed to relieve any local internal strains which may be introduced by the application of the heat of the arc. There are occasions, however, when it is extremely inconvenient and expensive to reanneal a casting which shows a slight defect. On such occasions the application of the metal electrode process, owing to the very great localization of the heat, will permit the correction of the defect without the necessity of reannealing.

Until recently 5-32-inch diameter metal electrode was as large as was ordinarily used in this work. Investigations have recently shown that ¼-inch electrode, and even ⅜-inch diameter rod, may be used in the metal electrode process to good advantage on steel castings.

The welding of malleable iron castings is difficult. The most important application of the metal electrode welding process in malleable castings is in the plugging of sand holes in castings which are to hold oil. A large number of the castings encountered in automobile work are of this nature. The welding on malleable iron is always done after the casting has been annealed. If the casting is to be machined at the point at which the weld is made it should be reannealed.

There are two classes of work which can be done in the gray iron foundry with the metal electrode process. In the first class are large castings which come from the sand with shrinkage cracks or low spots in parts of the casting which are not to be machined. In the case of a crack, it may be opened up by a chipping tool, and steel filled in to give a measure of strength and complete pressure tightness.

The welding can be handled with a low current, and should not be done continuously. The operator should weld for possibly 20 per cent. of the time; the remainder of the time being divided up into intervals to permit the heat to be distributed throughout the locality of the weld. This practice will not harden the cast iron in the vicinity of the weld with the exception of the iron which is within 1-16-inch of the line of fusion. The steel added will not be hardened by the absorption of carbon from the cast iron for a distance greater than 1-16-inch from the line of fusion. If the welder works intermittently he will avoid having the steel shrink away from the gray iron. The difficulty in machining such a weld arises from the hard area 1-16-inch on either side of the weld.

The second class of work which can be done with the electric arc on gray iron is in the correction of small sand holes and sand spots on surfaces which are to be machined. In work of this nature the sand hole is opened up and a nickel electrode fused into the hole by the heat of the arc. The nickel is not welded to the cast iron, but at the high temperature produced by the arc makes an intimate contact with the gray iron, which resembles an amalgamation. The nickel is then peened and the excess metal filed away. The job may be made pressure tight, and the application is entirely successful in the correction of sand spots in the bore of engine or pump cylinders. This process is not used for the repair of breaks in a casting, but is merely a method of plugging a crack or sand hole.

According to the "Weser Zeitung," Dr. Armo Relizi of Danzig and Dr. Walter Geister intend to start on an Arctic expedition by airplanes. The purpose of the expedition is to make topographical, oceanographical and meteorological surveys, and to test the value of aircraft in the Far North. The expedition will start from a vessel going as far north as possible, which will serve as the base for the operations which will be conducted north of the 58th degree of latitude. The machines will be biplanes of two types: light scouts of great speed, and heavy machines for the expedition proper. They will be fitted with floats with flat bottoms to enable them to land on water and on ice.

There is an electric light and power company located 200 feet from the Patapsco River, near Baltimore, Md. A cableway carries coal from the river to the power house and coal is also stored in the space between the power house and the river bank. Recently the power company started the erection of a new hoisting tower and bridge to handle coal, but the weight of the stored coal had started a movement of the ground toward the river and it was realized that the construction of the tower foundation in this shifting ground would be carried on with difficulty. It was decided to sink caissons at an angle so as to allow for the movement of the ground and this was done by suspending the caissons from a timber framework by means of cables. By letting out certain cables faster than others the desired tilt was obtained. After the caissons had

been carried down through the shifting soil (a distance of about 50 feet), they were brought to plumb and the excavation proceeded under air through a twenty-foot layer of sand to hard bottom.

TWIST DRILL BREAKAGES

A writer in an Old Country publication has the following to say on the breakage of twist drills: "With the increasing use of twist and fluted drills in the small repair shop and the ironmongers' workshop, come a greater number of complaints concerning the frequency of drill breakages. One such shop I know had, as a matter of fact, all but decided upon a discontinuance of their use, and averred that what was gained in point of drilling speed, was more than lost by the extra cost of twist drills over the flat-lipped kind, which could be made to any size and by any ordinary mechanic. I looked into the matter at the wish of the firm in question, and found that high as was the breakage list, the cause could be traced almost wholly to the conditions of the machines, and to the—yes, I must say it—to the ignorance of the men who operated them. In the first place the drilling machines were, I found, in an execrable condition, the spindles had a deal of lateral play in the centre bushings, and endwise the wear was such that the spindle could be lifted vertically a distance of more than ¼-inch. Most of the drill disasters occurred at the point where the drill is just breaking through the metal; this being attributable to the sudden drop of the spindle and the drill being forced to clear out too great a portion of metal. Then spindle looseness also permitted the drill to wobble unduly in the hole, and reduced stiffness, thus putting abnormal strain upon it. Further, I found that drill grinding was such a slovenly, unscientific operation that a deal more pressure than was necessary had to be exerted in order to make it cut. Incorrect and unsuitable rotative speeds were also a factor entering largely into the question of excessive drill breakages."

The Mournful Wail of an Old-Time Planer

By ITSELF

I AM a planer. True, I should not be ashamed of that fact, but I am an old planer, which explains the reason for my confession of shame. My more up-to-date brothers lord it over me every day of my life. Merrily their tables go back and forth eight hours each day, while I stand in a poorly-lighted corner, sometimes for a week at a stretch, receiving no material to work on whatsoever. It is on such days as these that I feel especially blue.

About an hour ago I felt that at last a real job was coming my way. The plant engineer was discussing with the superintendent the advisability of placing a certain piece of work on my bed. "Take no chances on that old contraption," said the plant engineer, "but put it on No. 39." This No. 39 spoken of is a big planer two machines up from me, in fact one of my worst enemies, for he is working day and night, purring to me all the time in an oily tone, "Oooooooh—go do some work."

I tried to attract their attention by rattling my pulleys, which are somewhat slack, but they paid no heed and continued their conversation.

The plant engineer was again talking. I listened closely. "You know, John (that was the super's name) I'd toss that old bird out on the scrap heap if I were you." Scrap heap! I fairly shook with rage, and rattled my pulleys in such alarming fashion that they both looked around as if actually afraid I was about to fall on them.

"I'll admit she's a little old," remarked the super, in answer to the former suggestion, "but I hardly think she's ready for the scrap heap yet."

Would that a planer had the power of speech! I felt like blessing that super., who still remained my friend—but what was this?—he seemed to be still talking.

"As I said before, she's not yet ready for the scrap heap, but mighty near it, I'll admit. Bill Smith tried a job on it a week ago, and would you credit it, he claims that the noise from the thing nearly deafened him."

The traitor! Once more I shook with rage. This time I must have rattled worse than usual, for they both looked at me, and then looked at each other.

"Guess you're right," said the super, finally, "she's about done for. I've rebabbitted those bearings about 140 times it seems to me, but she is all shot; out she goes after the shop shuts down on Saturday."

They moved off with this final decision, which was practically the same as the judge's final decision regarding any murderer.

I am no murderer, although I have heard some smart chaps around the shop say I murder any job I ever get—still I'm asking for a reprieve. I'm rattling worse than ever these days in order to attract attention to the fact that I firmly believe I'm not receiving a square deal, but all they do is laugh at me and say: "Thank goodness, she's going at the end of the week."

It is now Friday night, and the time grows near when I'll be merely a portion of the scrap heap. Who can tell but what my bed will be lying amongst some dirty, broken-up junk, while my framework is being broken up by some fool with a sledge, with nothing else to do but pound at me.

Would that I could tell machinists in general to be kind to the old-timers who worked for you so faithfully before these new fandangled machines came into being! Why not show us old-timers at least some consideration, even if it is only an odd job now and again? Still I suppose we must make room for the new blood. The space we occupy on the floor is even grudged us, so its off to the scrap heap for us.

I was moved to-day to the scrap heap, and it's just as I suspected. They took my bed away from me. They even took away my innards and placed them elsewhere, leaving only my framework. I felt positively naked. Then along came the chap with the hammer; not a mere sledge as I expected, but a huge magnetic affair, which was taken to a great height, then released.

Oh, could I but describe my feelings when I saw that weight coming rushing towards me! This was worse than I had ever dreamt of in my wildest moments.

Crash—It had reached me, and oh, I feel so weak now that I'm afraid I will not be able to speak much longer!

They have lifted the weight once more. Down it comes ————. I'm ruined now. I'm in at least a dozen pieces. Goodbye friends, I'm a gonner; no longer a planer, but just a part, yes, just a part of the scrap heap.

According to the United States Geological Survey, shaft 3 of the Tamarack Mine, Houghton County, Michigan, is the deepest mine in the world, with a depth of 5,200 feet. Other shafts of the Tamarack and of the Calumet and Hecla Mine in the Lake Superior region reach depths of between 4,000 and 5,000 feet. Three shafts of the Prizbram silver mines, Austria, have penetrated to depths of 3,300 feet. The Victoria quartz mine, at Bendigo, Australia, is 4,300 feet deep, and a number of shafts in the Transvaal gold region have been sunk to depths of nearly 4,000 feet.

VARIOUS CONVEYORS USED

Continued from page 525

feature which makes such chutes so handy as the space they occupy is not only small but they can be placed almost in any position.

This article is not an attempt to cover the conveyor problem, but rather just an illustrated talk on some interesting methods employed.

WHAT OUR READERS THINK AND DO

AN INTERESTING RADIUS PLANING TOOL

By J. H. Moore

The writer on a recent editorial visit came across a very efficient planer or shaper tool, which he believed would interest our readers, so he photographed the tool by itself, with the result shown in the picture accompanying this article.

The tool, while crude in some details, accomplishes the work very nicely, and after all, it is the idea that we offer to the reader.

A general glance shows the tool's construction, the portion A, being the stationary member of the tool. B revolves inside A, by means of the following motion:

The handle C, operates a worm, (not shown) which is at the back portion of the tool. This worm in turn operates a gear fastened to B. This, of course, turns B around in a complete circle if necessary.

The majority of work done with this tool is the planing out of various dies of different radii, and the completed work is very accurate and satisfactory. Of course, the handle C, is turned by the operator at whatever speed he desires.

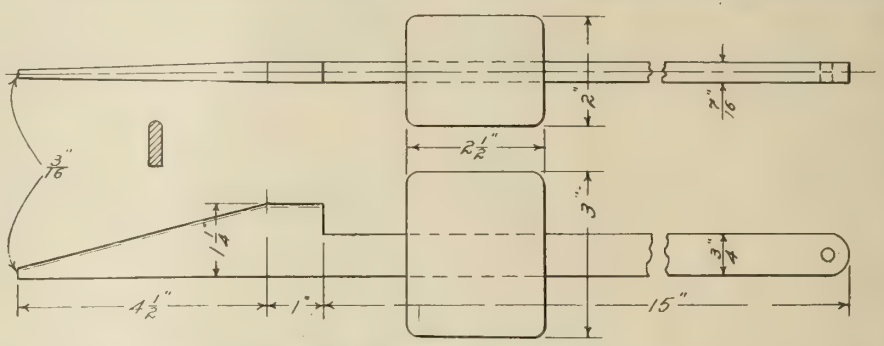
Depending on the radius required, the tool D, is set out—or in from the centre, and the distance from the centre to cutting edge of the tool being the vital point. This feature allows such a tool a wide range, and a attachment of such a nature as described is a mighty handy thing to have around.

NEW STYLE DRIFT KEY

By A. C. McALPINE

How many drill operators, when asked, can immediately lay their hands on the drift key belonging to their machine? The first time you are through the shop just try and see. When there are two shifts the day man generally locks this kind of tool in his cupboard, with the result that the night man loses all kinds of time searching for substitute. There is also the danger of men using files for this purpose, and a good many eye acicdents have been caused by this practice.

The writer of this article stopped at one of the "drills" in the shop to get the thickness and taper of drifts in use and on asking the operator for his drift was quite three minutes in getting it, owing to it being under a pile of drills and other tools. The following device will eliminate this waste of time and is in use at the Canadian Pacific Railway Angus shops. A steel drift is made according to sketch attached. This drift is made tapered on the flat as well as the edge, so that it can be used for all sizes of drills. To this key is welded a piece of mild steel, 15 in. x ¾ in. x 7-16 in., on which a cast iron weight is made to slide. The drift is applied in the usual manner and the weight thrown up to it, giving a blow similar to a hammer blow. Thus you have a drift key and hammer in one tool. A good long chain is attached to this device and fastened to some convenient part of the machine.



DETAIL OF THE DRIFT KEY.

THE EYE AND THE OXY-ACETYLENE FLAME

In commenting on a Government publication on eye protection, Professor Koppins, of Chicago University, says: "There is no doubt that in using the oxy-acetylene flame, and looking at it with the eyes unshielded, the condition is not normal, and some sort of disturbing effects result. Outside the volume or intensity of light, which is a personal matter, since some people feel perfectly comfortable in light of a certain intensity which would make other people feel

GENERAL VIEW OF THE TOOL.

uncomfortable, there is the question of short light waves coming. Normal eyes are so constructed that they can only perceive the light which is contained between rather narrow limits, that is from the longest red to the shortest violet. The longer waves are heated waves, and do not affect the eye in any other way except in intensity, but the shorter waves are the dangerous ones, since they are the chemically active rays, which will affect the eye on that account besides on account of their intensity. Just what the effect is depends upon the intensity and length of exposure. A relatively short exposure causes burns on the skin such as are caused by the sun, in fact sun burns are produced by the short rays in the sun light. Prolonged exposure would, of course, cause more severe burns, and since, of course, the operator usually takes precautions when he is warned, the extreme effects are not known. It is safe to say, however, that the result is similar to that caused by X-ray burns, which, of course, are much more severe, and have cost the lives of careless operators.

Regarding eye strain, that depends upon whether or not the person who wears correct goggles should have any bad effects due to the ultra-violet light. Of course the goggles should be so constructed that any extraneous light cannot enter at the sides, since the sudden change in intensity would undoubtedly strain the eyes.

TORONTO SECTION A.S.M.E. MAKE PLANS FOR THE COMING WINTER

Increased activities in the various branches of the engineering profession and the need for more recognition, to some extent influenced the programme outlined for the ensuing season at a dinner held in the Engineers' Club by the Toronto Section of the American Society of Mechanical Engineers, on November 14. Shop visits will be made to various plants in Toronto and vicinity, informal dinners will be held, and papers of a character calculated to ensure an increased attendance will be read.

A strong effort will be made to increase the membership in this particular section, and it is expected that, with the large body of mechanical engineers resident in Ontario, the Toronto Section will become one of considerable influence.

Brigadier-General C. H. Mitchell addressed the meeting and gave some very interesting reminiscences regarding the mechanical phase of the war both in France and Italy. The Italian power stations, all hydro-electric, had greatly expanded since last seen by the speaker, some years previous.

REMOVING BROKEN TAPS

A tap, broken off in a hole, is often very troublesome to remove, and sometimes it costs less to throw away the part than to remove the broken piece with ordinary means. But the oxy-acetylene torch makes the job easy. The flame, directed against the end of the tap, will heat it so quickly that, generally, the sudden expansion will push back the walls of the tapped hole sufficiently to loosen it when slowly cooled off. If heating alone in this manner does not prove effective it will at least have so softened the hard steel that it can be drilled out. This is one only of the many profitable uses that can be made of oxy-acetylene apparatus in metal-working shops, no matter what the line may be.

IS THIS THE LIMIT?

Motor car thieving appears to be reaching the status of an industry when we discover that the more enterprising of these gentry actually possess lorries fitted with hoisting gear, so that a car can be lifted bodily on to the lorry, covered with a waterproof sheet, and then taken out of the district without leaving a trace. Probably they have been conduced to by carelessness, but when a thief prowls around in a crane-equipped lorry and with an oxy-acetylene blowpipe apparatus, it really does not matter much what care is taken to prevent theft. The car that can be driven away probably will be, but if not, the simulation of a breakdown job is sufficiently reasonable to lull even the peripatetic policeman into an academic interest in the purloining.

A Plea For Model Making

Sir:—Having only been a subscriber to CANADIAN MACHINERY for a short time, I do not know if the subject of model making has ever been discussed in your pages before. If it has not, I for one, think that now would be a good time to make a start, and if you are willing to put this in print, will do so.

My idea is, that a boy apprentice or young man just starting a trade, will take more interest in his work if he is encouraged to make models of machines or engines either whole or in part. It is extremely educational, in that, the man (young or old) who desires to make a machine in miniature has got to know the principles of movement or action of the one he is copying. Because if he be ignorant of such he will have to study the larger one at work, and if at all possible take it apart to study it.

All this calls for a knowledge of machine design and drawing and is in itself of great educational value. The knowledge gained by thousands of model-engineers in Great Britain previous to 1914, was used to a great extent during the war, especially as hundreds who were experimenting with metallic alloys for aeroplane and other models where speed and lightness with great strength was required, gave their knowledge to the use of the country.

The factory where I served my apprenticeship in the '90's in England made complete rolling stock for a railway and all the boys were encouraged to make all their own tools and also models of machines and locomotives, coaches, cars, etc., according to whatever department they were in. A chum of mine who was in the passenger coach department made during his last years a complete passenger train and during the same two years I was busy making a 1/24 scale model of what at that time was the famous 307 passenger engine, winner of the first prize for speed and beauty at the Paris Exposition. I think that my model is still in the Machinery Department of the South Kensington Museum, London, England.

One reason that I am writing this is that I would like to see a society or association of model engineers started in Canada, similar to the one in Great Britain. During a 25 years' ramble 'round the world, working at the mechanical and steam engineering, I have only had the luck to meet 4 brother model makers, knowing them to be such when meeting them.

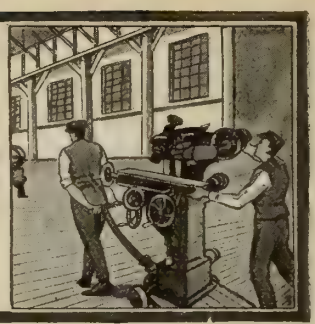
What really caused me to write this, was that I had just started to make a 1/12 scale model of a locomotive jib crane, two-drum electric drive with geared traverse and swing. Some friends who are not mechanics sneered at the simplicity of making such a toy, but to me it certainly is not a toy and I have found that working from memory as I am, it has some very puzzling peculiarities to overcome.

With a very small outlay for tools a man can make some very instructing models. One of the simplest to start on is a box or lattice girder bridge. Whoever starts one, if it is a long span, has got to remember or know quite a bit of side strains and vertical stresses to prevent buckling and so spoiling the finished article.

Trusting that you will print at least a part of the foregoing (picking what you desire).

I beg to remain, yours respectfully,
WM. R. GREEN,
Box 75, Eyebrow, Sask.

DEVELOPMENTS IN SHOP EQUIPMENT



THE STUEBING LIFT TRUCK

By J. H. R.

Local and interdepartment transportation in large manufacturing plants and warehouses, is a problem that has been given a great deal of attention during the past few years, and factory executives are realizing more and more the importance of this essential phase of plant management, not only as a means to greater efficiency, but also as an economic necessity. The method generally adopted for the transfer of material from one location to another is by trucking, in one or other of its many forms.

The truck here illustrated is that made by the Stuebing Truck Company, of Cincinnati, Ohio. It has many features that commend it to the user. It might be classified as a roller-bearing, all-steel lifting truck. The frame proper is made of high grade machinery steel of bridge construction, with spacing braces or saddles made of electric steel castings. This design insures the maximum strength and stability with extreme lightness. The four wheel type of support eliminates the possibility of dislodging the load when turning a sharp corner or when passing over irregular flooring. Both the head that supports the front end of the truck frame and likewise the large forked king bolt that carries the steering wheels are made of high quality electric steel castings, carefully designed to withstand the severest stresses. All four wheels are equipped with Hyatt roller bearings, and are of broad face to prevent tipping and injury to the flooring. Special facilities are provided to protect the roller bearings from dust and dirt. Milled oil reservoirs are provided in each wheel hub, and automatic closing caps are fitted to the oil cups.

The bearing faces on the front head and swivel are accurately machined, which permits of easy and smooth manipulation under heavy loads. The front end construction is designed so that the steering wheels may be turned through a complete circle if desired. The truck may be turned in a space equal to a little more than the square of its length.

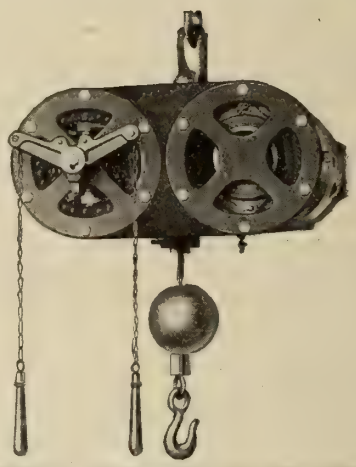
The lift hook, that is attached to the front saddle of the elevating frame, is operated from the lower end of the steering and lifting lever; both of these parts being made of special steel. The operation of the lift hook is semi-automatic in its action, and is controlled by the cast steel pedal that releases the hook from its raised and locked position.

The positive safety hydraulic check is of the double-acting engine cylinder construction, the chamber being accurately machined to fit the piston, which is provided with a closely-fitted ring that permits of automatic adjustment to different degrees of pressure and temperature. The flow of the oil can be regulated to suit the varying loads and conditions under which the machine is to operate.

These Stuebing trucks are made in several sizes, and special ones may be obtained to specifications. All essential parts are standardized and interchangeable. These trucks are being manufactured and sold on the Canadian market by the Canadian Ekron Scale Company, 16 Notre Dame Street East, Montreal.

NEW HOIST ANNOUNCED

After a long period of experimental development, Victor R. Browning & Company, of Cleveland, Ohio, announces the perfection of a new hoist, designed specifically for the severest kind of industrial service. This hoist is specially interesting in that it combines very admirably handling of features considered primarily essential, together with new ideas that are obviously of considerable value. The general shape and low design of this hoist adapts it particularly for use where headroom is limited or the



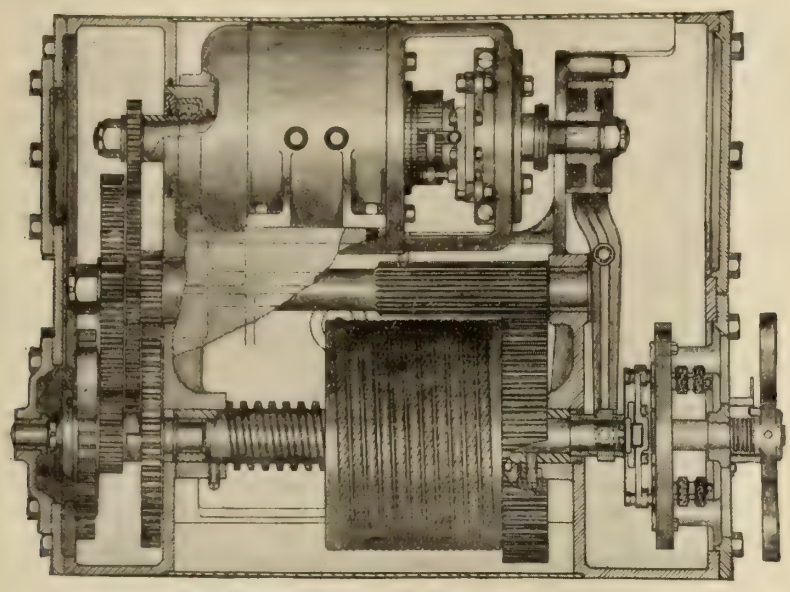
GENERAL APPEARANCE OF THE HOIST.

GENERAL VIEW OF THE TRUCK.

available space otherwise restricted.

The main casing which carries all moving parts, contains individual compartments for the four units, any one of which can be quickly removed if desired.

In one end of the casting heat treates gears and the disc load brake are assembled and revolve in oil. At the reverse end the controller and motor brake are carried in another individual compartment. The entire controller may be quickly removed for inspection or repairs, and the removal of a plate gives access to the gears and load brake.



SECTIONAL PLAN VIEW OF HOIST.

Between the gear and controller units are two long compartments, one of which contains the motor and the other the hoisting drum. The drum is carried on a threaded shaft and travels longitudinally while rotating. This feeds the cable through a bushing in the main housing and directly into the drum groove in rewinding. It is claimed that this adds considerably to the life of cables and maintains perfect balance. Simple but dependable limit attachments are installed at ends of the drum to prevent overtravel of the drum in either direction.

All bearings are large and bushed with phosphor bronze with exception of the motor, the shaft of which revolves on ball bearings. Two of the bearings are provided with grease cups while the other four are lubricated by splash from the gears.

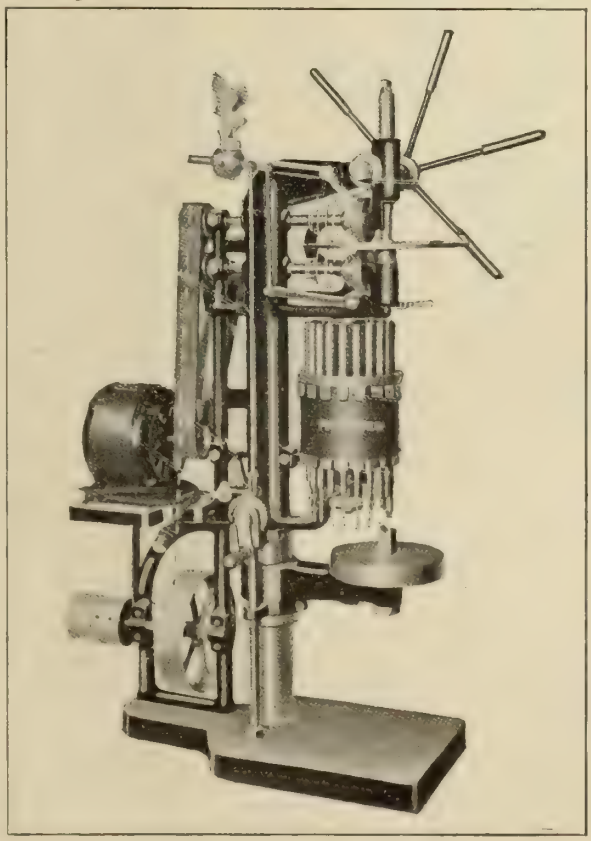
This hoist is furnished with specially designed motor either D.C. or A.C., and provision can be made for suspending it from an overhead trolley, I-beam, or any kind of fixture.

A circular describing this hoist in detail is available to anyone interested.

LIMA MULTIPLE-SPINDLE MAGAZINE DRILLING MACHINE

The multiple-spindle drilling machine, shown in the illustration and manufactured by the Lima Drill Press Co., Lima, Ohio, is known as the magazine type, and has features not common to multiple drilling machines. This machine will be found useful in the toolroom and to the shop man who has use for a number of various size drills, reamers and countersinks, eliminating the necessity of hunting and changing tools for each different operation.

The magazine having 16 spindles acts as a drill rack for 16 different sizes of tools. Each of these can be quickly brought into position for immediate action by simply turning the magazine to the point where the drill to be used is in alignment with the driving shaft. When a spindle is in the correct position for drilling, the magazine is locked by means of a bar, attached to the machine column which engages one of the slots in the bottom of the magazine.



GENERAL VIEW OF THE DRILL.

At the top of the magazine there is provided a convenient combination gauge and index showing at a glance the size of each drill. When a drill is changed, the gauge and index are also changed, which eliminates all delay and guesswork. The drill holders are arranged for straight-shank drills, small split collars being provided for the various sizes. The drills can be removed independently or a drill and spindle together can be lifted out from the top of the magazine. All the drill spindles except the one in position for work are locked in the "up position" and cannot be accidentally forced down. When an operation is completed and the feed wheel is released, the tool is returned to the up position by an internal coil spring which acts similarly on all the spindles. The magazine is automatically unlocked when the friction drive is disengaged, and can be easily turned to right or left when shifting another drill into position for work.

A noteworthy feature is the friction drive which is obtained by means of an aluminum disk 10 in. in diameter and ¼ in. thick. The disk is attached to the driving shaft and is driven by means of two leather covered friction wheels, each being 2½ in. in diameter and ½ in. wide. These driving wheels are directly opposite each other, the one above resting against the upper surface of the disk and the one below about ⅛ in. away from it. When the feed wheel is turned, the lower friction wheel is automatically forced against the under side of the disk, thus causing it to revolve.

The two opposed wheels serve a two-fold purpose by doubling the frictional contact and balancing the thrust.

Speed regulation is automatically obtained for each drill when rotating the magazine into place, as a rack-and-pinion device changes the position of the two friction driving wheels on the disk. When the driving wheels are near the centre of the disk, the disk and spindle will obviously travel at maximum speed, and the drills are so arranged in the magazine that the smallest drill is in alignment for use at that time. The machine is suitable for drilling wood as well as metal, and each spindle works in an adjustable bronze bushing arranged to take up lost motion due to wear. The illustration shows the machine arranged for both motor and countershaft drive.

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Warned of the Shortage

SIX months ago this happened: Salesmen from steel mills went into a good many of the Canadian plants and told the parties concerned that now is a good time to buy. Prices are not going to be lower for a long time and the indications are that business is going to increase, with the result that your orders, if delayed, will have to stand in line and wait. Mills want business now, and they can give you the very best of service in regard to quick shipment.

Now imagine a salesman coming into your office today and saying: "We can ship at once anything you need in plates, sheets, tubes, hoop steel, bars, etc." He would be tossed out as unsound mentally.

Machine tool dealers not many months ago were telling you the same thing. They could get their orders through in a month. They could get you service then that all the money you can scrape up cannot buy now.

Now these are facts. Not only were the dealers trying to drive these matters home, but they were referred to many times in the market sections of this paper. For instance, the Pittsburgh correspondent of CANADIAN MACHINERY knows the steel situation in United States as few men know it. Readers of this paper have the benefit of his weekly review of the situation, and he gives his opinion freely of things as he sees them, and of events that are likely to work out of present conditions. A long time back he spoke of the time when steel would be scarce and premiums demanded.

It pays to read the market news. Buying is one of the greatest departments in the business. A good buyer is as essential as a good salesman, if not more so, for the reason that they are rarer. A good purchaser must know conditions. He cannot visit all the centres where raw material comes from, therefore, he must read them.

Conditions are not comfortable in a number of Canadian plants now, because customers persisted too long in staying out of the market. They were warned, but they did not heed the warning.

New York Papers Strike-tied

CANADIAN MACHINERY extends sympathy to the trade and technical papers of New York for the way in which they have been treated by certain of their mechanical departments. They had an agreement with their pressmen, but when it suited the pressmen to leave the premises, the agreement counted for nothing at all.

As a result such publications as *Iron Age, American Machinist, Machinery, Power, Electrical World,* etc., have had to more or less suspend. They have made an admirable attempt to keep their readers informed by various means regarding marketing and kindred conditions, but the outlay involved in keeping up staffs without any returns from advertising revenue must mean the loss of many thousands of dollars.

As far as the New York papers are concerned they did all they had agreed to do when they signed up. The strike to them was simply a case of gunning in a dark alley.

Canadian trade and technical papers sympathize with the New York publications, and hope that the right of their position will soon be so thoroughly demonstrated that publication under decent and secure conditions can once more be successfully undertaken.

Recommends Coal as Prime Mover

THE possibilities of developing power in Alberta are carefully analyzed by James White, of the Commission of Conservation in a paper now published, but read before the Industrial Congress at Calgary.

While, a little apart from the subject, it is interesting to note that the factories of the world, including electric lighting and street railways, use 75,000,000 horse power; the railways of the world, 21,000,000, and the shipping of the world, 24,000,000, or a total of 120,000,000 horse power. Of the 75,000,000 horse power used in factories and general industrial and municipal activities of the world, about 13,000,000 is used in the United Kingdom, about 29,000,000 in United States, and 6,000,000 in the British Dominions.

There has been more or less of a popular belief, or illusion, that the gas wells of Alberta were the greatest producers of power, and would continue to be. This conception may have come to pass from several reasons, and no doubt the rather extravagant claims of some of the publicity exploiters of the various centres have much to do with it.

Alberta has a great power proposition. This can be proved in several ways. She has, in the first place, 87 per cent. of the coal deposits of the Dominion, a splendid gas supply with a very high B.T.U. grading, while the waterpower of Alberta is by no means lacking.

The report of Mr. White makes it very plain that he considers that the greatest prime mover that Alberta can develop successfully is found in the steam-electric plant. Water power, owing to high labor costs, is laboring under a heavy, permanent handicap. Gas is an uncertain quantity regarding permanency, and depending on it might lead to serious losses. Regarding coal as a source of power, the report says, "Now, the great source to which Alberta must look for power is her coal. During recent years, the great advance made in the art of the production of steam power is phenomenal. This advancement has given coal, as a prime agency for power development in competition with other prime agencies, almost a premier position. Those interested in the furnishing of power on a wholesale scale in Alberta must make their research into, and selection from, the achievements made in recent years in the field of power produced from coal."

Throwing Away Millions

THIS paper has received from Ottawa a report entitled: "Report of the Administrative Chairman of the Honorary Advisory Council for Scientific Research of Canada."

It may be that the title is too ponderous—at least it is not inviting. Is there a chance for classing this very necessary work under a caption not so deep nor heavy nor forbidding?

The average man is not interested in research work. Those who realize the necessity for it have to fight considerable prejudice to get the necessary support to carry on their undertakings.

Research work as such, does not appeal to the popular fancy. It savors of academic routine, or the fancies of a hobbyist.

But let us approach a stage in our national career, when our natural supplies of raw material start to run short, or when it is very hard to secure them from other sources. Men have to admit, when asked what are we going to do about it, that they don't know what to do. They have no idea of what we have in our own land; they have never been mindful of the national stock takings that have been in order by the not overly-encouraged research workers. But they will be willing enough in their extremity to turn to the work they may have been inclined to merely tolerate when the going was good and the supplies of material were coming through without interruption.

The redeeming feature of the case, as far as the men behind the research work are concerned, is the ease with which they can justify their existence as a national necessity. Take, for instance, just this one statement regarding the matters receiving attention:—

> "The value of the fish waste in Canada, if utilized as it is elsewhere, would be very great. The quantity of solids in the three hundred thousand tons annually thrown away, and comprising chiefly fats and proteins is at least one-fourth of that amount and if subjected to appropriate treatment it ought, at the prices which prevail, and have prevailed, for the last four years, to be worth $10,000,000 or about one-fourth of the annual yield from the fisheries of Canada. The oil, contained in this waste should, if separated and purified, be worth on the market as much as $2,000,000."

So it will be seen that the work is not merely in the line of finding out our natural wealth, but in stopping waste and utilizing material that is at present going to the scrap heap. If we are going to move seriously toward national efficiency we must not only utilize our own materials but see that anything thrown away is good for nothing else.

The council for research work should be encouraged to go ahead. Their activities are such as to class them as national necessities.

The Art of Selling

ONE large Canadian establishment, selling machine tools, as well as other lines, had a meeting of its outside men—dealers—with the idea of making salesmen out of these dealers. The idea is good, the only drawback being on the face of it, viz., that it is impossible to make a salesman in two or three days.

The art of selling is not understood in many places. It is a great business. The real salesman never looks for a job. There are men around wondering when he is going to be through with the work he has in hand. They want to get in touch with him.

The real salesman is not the product of imagination, or of bluff or of glib tongue. He is not a shyster. He does not have to resort to sharp practice.

The trouble with us is that we have not made a business of schooling salesmen in this country. In far too many cases the man applies for a job. He says he is a salesman. He takes your line, puts his little bag under his arm and away he goes to blunder along and do the best he can. He has to make a living so he might as well make it out of you as out of any person else.

But did you ever look at it this way—your salesman is your representative. He is what the outside world, the buyer, sees of your firm.

Does the salesman get this broad view of the case—I am to all intents and purposes the firm? The man with whom I do business never meets the president or the general manager. All he has to draw his conclusions on is myself. If I am straight and clean and honorable in my dealings, if I refuse to resort to petty commissions, to little grafts, and if I do business on the dead level my customer is going to have a good opinion of my firm.

Don't let your men get out on the road half-baked. If you have any traditions that you want maintained tell him what they are. If you insist on certain standards being maintained see that he understands the motive. See to it that your salesmen are schooled, trained to go among men and study them, trained to meet with dignity and ease any position they may face.

Selling is an art—not a job.

If that is your end of the business, aim to be a real representative and salesman—there are plenty of travellers.

More Season-end Wrecks

THE end of the shipping season on the Great Lakes is proving again the possibilities of great loss of life in the attempt to extend the shipping season into the period when changes of winds come quickly, and when the seas are very heavy.

It may be an exaggeration to refer to many of the large lake vessels as fair weather craft, but that is not altogether wide of the mark.

They are long and unwieldy. Their power plant is not such as to give them speed to make for port quickly or right themselves at once in a heavy sea.

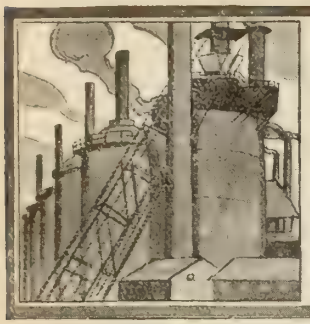
What is the cure? Of suggestions there are no end. Raise the insurance rates? No need to worry about that, as the underwriters will see that that is done as soon as the losses begin to make them lose too much money. Put a deadline on? That is hardly practicable. More signal stations or better service regarding warning vessels of approaching storms? The service that is given on the Great Lakes both by the United States and Canadian departments is good. Very accurate record is kept and displayed of all depressions and warnings are given of anything that may make the lakes dangerous.

The losses that seem to trail along and hang on at the end of the shipping season may be the result of several things. There may be the element of taking a chance. There may be that something that used to make the engineer believe he could make the next switch before the passenger train would get there, or that causes the driver of a flivver to reckon that he can get through between the truck and the street car.

After the great storm of 1913 on the Great Lakes, when the shores were strewn with the bodies of dead men and of wreckage of ships, there was a circular letter sent by the companies urging the captains to consider always the safety of the life and property entrusted to their care.

But warnings have a faculty of getting the edge taken off. That was six years ago, and the storm was an exceptional one. It is not likely to happen again. It's easy to reckon that way, is it not?

It does look as though the one thing that would cut down the tail-end casualty list for the shipping season on the Great Lakes would be the elimination of the "take a chance on one more trip" idea. The Great Lakes, when they get aroused at this season of the year, are no mill ponds. The chances for a lake vessel of low power getting through to safety are mighty small.



MARKET DEVELOPMENTS

Looks Like a Very High Market for Months Yet

Steel Shipments Showing Very Little Improvement—Premiums Are High and Prospects Seem to be That They Will be Higher in the Spring—Deliveries Slow in Tools

IT is hard to figure out anything but a high market for steel products for some time to come. Everything has pointed that way for some time back and things are working out true to form. Production is not at the same stage of efficiency as before the strike. The individual effort on the part of the employee is not the same. In many cases he has been given employment for the moral effect of the employment upon the strikers. He has been spoiled as a good producer.

Again, although the Steel Corporation may set its face against a higher price schedule, there is nothing to hold back the jobbers. The premium business is beginning to flourish now, and by the spring it seems certain that it will be flourishing still more. Some of the dealers also have a suspicion that certain mills will not be inclined to ship as rapidly as they might in the hope that prices will be on a firmer level later on, and they may be able to retard their outgoing material to get caught in this favorable tide.

As far as Canadian industry is concerned the situation is not favorable for the immediate future. There are many places where there have been no shipments coming in for the last six weeks. Dealers contend that they have not retired from the market in certain much-wanted lines, but the effect is much the same. They are so hopelessly overbooked that their delivery schedule runs away on into the second quarter of next year in many cases.

Machine tool dealers face much the same situation. With them it is largely a matter of getting the goods they can sell. There are special machines being brought out and out on the market in the States which are well suited for work that is being done in this country, but there is no chance at all of the Canadian dealers getting any of them because the capacity of the plant making them is in many cases sold out for a year in advance.

Coppers are weaker this week, and so is brass. Other lines in the scrap metal market are fairly firm but there is not much business moving. The Christmas season is always more or less dull with sales away off, and this year is no exception.

WILL THIS DELIVERY QUESTION EVER BE SETTLED FOR KEEPS?

Special to CANADIAN MACHINERY.

MONTREAL, Que., November 27.—Curtailment in production and increased difficulties of transportation, as a result of the delayed settlement of the coal troubles in the States, is now being felt in this locality, not seriously as yet, but nevertheless sufficient to cause some uneasiness as to the winter outlook. While the trade requirements here are not exceptionally heavy, the volume is of such a character that a steady supply is necessary to maintain normal operations in many lines of industry. Actual coal shortage is, so far, not in evidence, but strict conservation will have to be practised to avoid any acute scarcity during the coming months. Where the pressure is felt the most is in the inability to secure material from American producing points, partly due to the shutdown of plants and also to railroad inefficiency. Canadian authorities are doing what they can to relieve the situation, but close co-operation of manufacturers is urgently required to enable the fuel controllers to determine the proportion of coal delivered to this country. There is every reason to believe that Eastern Canada will be able to draw supplies from the Maritime Provinces unless trouble develops in these coal regions. At present there is a strike threatened at the Minto Coal Co., in Sunbury County, N.B. A strike is likely unless a satisfactory settlement is reached within a few days. The chief drawback at the present time is the great difficulty experienced in getting material through from the mills in the States.

In many mills the prices on steel commodities have been advanced, and the impression here appears to be that local quotations willl be raised to conform to the mill advances in the States. Warehouse supplies are being depleted, particularly in sheets and plates. Tubes also are very difficult to obtain. and further supplies are very uncertain.

Normally Sold Until Next June

General disturbances throughout the United States and Europe has resulted in a condition that makes the early future one of marked uncertainty. Outwardly there is little to indicate that the metal situation is other than normal, but apart from the trading in ingot metals, the market is suffering from the inability to obtain sufficient finished materials to take care of the present requirements. Speaking on the existing trade conditions, one dealer stated: "Business in the ingot metals continues steady, but on the finished lines, such as copper and lead sheets, galvanized and black sheets, we are virtually sold until next June. We had a letter from one producer in the States just recently to the effect that they were practically closed down, and for an indefinite period, owing to the shortage of coal and necessary raw materials. We have a number of requests in now for a first chance on any shipments of tin plates and sheets that may come through, but it is seldom that we are in a position to accommodate a customer owing to the material being previously disposed of. In most cases the goods never reach the warehouse, they being transferred direct at the wharf or the freight shed. Warehouse stock on finished sheets and tin plate will continue very low throughout the winter." Ingot quotations are quite firm, with the exception of tin and lead, the former declining one cent. to

57½ cents, and lead ¼ cent to 8¼ cents per pound.

Delivery Affects Business

The thought that is uppermost in the minds of the machine tool dealers is the disturbed character of general conditions, particularly regarding those in the United States, a factor that makes trading very uncertain. Present demand for machine tools and equipment is not heavy, but sufficiently large to sustain the interest of dealers, provided they could assure customers as to the definite date of delivery. Production in the States has been adversely affected by strikes and coal scarcity, a condition that has resulted in curtailment of operations, or as is the case in some places, of temporary suspension. Under the circumstances where new tools are hard to obtain, the inquiry for used equipment is more in evidence, but this field has been pretty well combed of the more desirable machinery. Considerable business is still being done in rebuilt machine tools.

Cast Iron Scrap Up

There is undoubtedly a better market in scrap trading than there has been for some time. The volume of increase is not large, it is true, but dealers are encouraged by the existing inquiry and the sales that are being made. The movement of non-ferrous scrap is steady and normal, but the iron and steel lines are the ones that are putting the new life into the present situation. Foundries in general are quite busy, and it is in the cast iron scraps that the demand is so pronounced. Dealers here state that cast iron scrap is almost impossible to get and the market is exceptionally strong. Quotations are advanced from $1 to $4 per ton. Malleable scrap is quoted at $18 on a $3 advance. Machine cast iron shows a similar rise and is quoted at $24. Machine shop turnings at $7.50 is an advance of 50 cents per ton. Stove plate is again up and dealers are paying $22. Cast borings are in good demand and are listed at $10 per ton.

CONDITIONS LIKE THE BIG WAR YEARS

Doing Business in Machine Tools is Largely a Matter of Making Deliveries

TORONTO.—To one who has done the machinery and steel market in Toronto during war and peace times, it might seem that, during the present, we are back once more to the war-time basis. A couple of years ago, it was largely a case of being able to make deliveries of machinery or steel. To-day, it is the same thing. True, the selling staffs of many concerns are getting drilled and polished for a hard campaign, for there is a realization in many quarters that more vigorous salesmanship is needed to keep things well booked ahead, but for all that, there is the same old problem of deliveries, and it is not improving. It is a safe guess that there will be a tremendous amount of material piled up against the capacity of plants for the coming year.

POINTS IN WEEK'S MARKETING NOTES

The matter of delivery is probably the outstanding feature of either the machinery or steel market at the present moment. Bookings in both lines are extended well into the first and second quarters of 1920.

One line of woodworking machinery sent out notices this week that they were announcing a ten per cent. increase on their special lines.

It is now almost six weeks since shipments of plate and sheet have come to some industrial and warehousing interests.

British machine tool makers, in spite of high costs, are making an attempt to get into the American market. The claim is that they are not suffering any more from high costs than are the U. S. makers.

Pittsburgh reports state that the steel mills, although taking on more men and getting better results, are making slow progress toward a normal production. Some experts figure that with present labor conditions it will not be possible to secure 100 per cent. operation.

Shortage of steel and coal is causing some anxious moments in circles where supplies of these have been allowed to run low in recent months.

The Machine Tool Market

Take the market for machine tools at the present time in Canada. It is a question of deliveries. Only this morning, one of the Toronto dealers showed CANADIAN MACHINERY a list of eleven firms to whom certain machines had been sold. Now he gets word that he has been allotted four out of the December shipment, six out of the February shipment, while no promise is made at all for the eleventh on the list. It is up to the dealer to sit down and try to figure out which four are the most urgent, which six are the least urgent, and which is the eleventh that he can stall for some time to come without cancellation. Now it may appear to be easy business on the face of it, but it is not.

Deliveries made to Canada from some of the American makers are not satisfying the dealers here by any means. They hold that, if their principals want to get into this market for keeps, they should make quicker deliveries here. Dealers who are exclusive agents, find it extremely hard to do anything at all for a prospect who wants anything like quick shipment. As one dealer put it to-day: "We are here to make a living, but just now we find quite a number of cases where we can do nothing for a man who wants his goods promptly. We do not want to handle used machinery, or to have to rebuild it, but what are we going to do?"

Other dealers hold that the present rate of exchange is tending to hold back business, and is quite a factor in favor of the Canadian-made machine. The opinion was also expressed that there should be an effort made so that the U.S. tool would not be, between duty and exchange, fifty per cent. higher to the Canadian buyer than to his competitor in the States.

A Serious Matter

Shipments of plate, sheets and tubes of wanted sizes are eagerly looked for just now in this district. In some cases, it is five weeks since there has been anything that looked like metal of these lines coming toward these premises.

Some interests seem to consider that the present is not the right time to buy, and have for that reason been staying out of the steel market. They may be right, but it is hard to see where they figure out the wisdom of such procedure. While some of the larger selling agencies here deny that they have withdrawn —or their mills—on account of too heavy bookings, the chances seem to point to their having to adopt this policy in some form or other. When those who have been staying out of the market start to come back, we fear that they will find a long line of business drawn up ahead of them at any of the mills. In the face of this condition, it is also hard to figure out where they see any cheaper steel for some time to come.

Scrap Is Not Busy

Copper and brass have fallen off during the week, but not enough to cause dealers to mark down prices which they are willing to pay. No. 1 lake ingot is selling, at this writing, for 19¼ in New York.

Some of the large users of brass are just now feeling the effects of the shortage that took place during the war. For instance, the gentleman who was doing the purchasing for the Linotype Co. of Brooklyn during the war, and prior to it, told CANADIAN MACHINERY a good one that illustrated how small peace-time orders looked when war work was at its height. Mr. Archer said: "We had been purchasers, annually, of a million pounds of brass for the making of matrix. During the war, I went down to the city where we placed our business. I thought that the order I was going to place would entitle me to a pretty fair reception, as the purchaser of a million pounds was doing some

business. The first man I fell in with was connected with the Italian Munitions Department, and he was headed for the same plant as I was. When he informed me that he was going down to see if they couldn't raise their deliveries to him from one to two million pounds PER WEEK, I saw where the chances of my million pounds per year were all faded. We are feeling the effects now of the shortage of brass that took place a couple of years ago, because our stock was heavily drawn upon, and we have not been able to catch up." Other lines where brass is used largely have had similar experiences.

THE PREMIUM MARKET WILL BE IN A FLOURISHING SHAPE BY THE SPRING

Special to CANADIAN MACHINERY.

PITTSBURGH, Nov. 27.—The union coal miners are still out, despite the recall of the strike order required by the Federal court. The officials of the miners' union are enjoined from paying strike benefits or encouraging the strike in any way, but there is room for suspicion that the striking miners are being kept in line by self-constituted committees at the individual mines. Meanwhile, negotiations on a wage scale are proceeding in Washington.

The steel industry has not actually suffered from shortage of coal to any extent, and is likely to get through the whole operation without much difficulty. The mills, as a rule, were well stocked with coal, and there are fairly heavy shipments, notwithstanding the strike, the non-union districts being in full operation, while the "open-shop" mines have been producing more or less. In the first full week of the coal strike, production in the United States was 29 per cent. of the average during the four weeks preceding the strike, when production had been particularly heavy, and 37 per cent. of the average during the first ten months of the year. The Connellsville region is non-union, and this helps greatly, as the region ships large quantities of coal, besides the coal it converts into coke in the region.

Steel Strike Crumbling

Last week was the ninth of the iron and steel strike, and during the week the strike was crumbling, instead of waning gradually, as in preceding weeks. The Wheeling district, the strongest strike region in the country, made a beginning of operations. While the beginning was a small one, it was very important. Last week also saw a resumption at the great plant of the Cambria Steel Company at Johnstown, 100 miles east of Pittsburgh, previously entirely closed. More than half of the men reported for work during the week. In the Mahoning Valley and at Cleveland, the resumption of work continued, and at a somewhat more rapid rate than in previous weeks. The Chicago-Gary district got still nearer to a stage of full operation.

The way the steel producers now look at the situation is that the strike is now so nearly over, and the virtual end so plainly in sight, that the strike itself disappears as an important factor, and the situation after the strike is the important matter. The after-effects of the strike will remain for a long time, probably from three to six months, with a labor shortage, as there was before the strike, with working forces more or less demoralized and requiring fresh lining up for efficient operation, and with the men more or less indisposed to do good work. Losing the strike does not make the men more anxious to render efficient service, and during the strike some of the men in employment have been more or less spoiled, because mill managements were so anxious to keep men on the payroll.

Production of steel in August, the last month for which a report of production has been made, was about 80 per cent. of actual capacity, according to a conservative estimate. In the first three weeks of September, just before the strike, production was probably a shade under 85 per cent. When the strike is entirely over, in the sense of there being no strikers left, production will hardly be more than about 75 per cent. of capacity, and it may be some time before an 85 per cent. rate is reached. Doubts are entertained whether it will ever be possible to reach 100 per cent. production with a general labor shortage in the country, such as exists to-day, and is likely to exist, as long as times remain good.

Steel Shortage

In the early weeks of the strike, it seemed strange that so little shortage of steel was in evidence. From the present viewpoint, it appears that this was due to consumers having stocks to fall back upon, for, with production materially greater than a month ago, steel is scarcer than at that time. Consumptive requirements may not increase materially in the next couple of months, but in early spring it is practically certain that requirements will greatly increase in nearly all lines. In addition, a large amount of building, involving the use of structural and other steel, is contemplated, and the only question is how much of it will have to wait. Already, fabricating interests are being asked to set aside jobs they are on and get to work on new jobs, offered at a premium. The railroads are, of course, certain to be in the market for some material when they have bought practically nothing for so long a time. The roads will be returned to their owners January 1, according to schedule, and in all probability the Government guarantee of earnings will be extended for a short time, while Congress determines the position the roads are to occupy eventually.

Keeping the Lid on Prices

The Steel Corporation's policy, decided upon many months ago, of holding the March 21 price schedule from any advances, is now fully worked out into practice, as the corporation subsidiaries have been selling large tonnages of steel for such deliveries as it can make, and all at not above the March 21 prices. For several weeks it has had no tonnage to sell, except for delivery after January 1. The last lines in which the corporation entered the market for 1920 were sheets and tin plates, the American Sheet & Tin Plate Company having opened its books November 15 for contracts with jobbers covering the first quarter of the year, and with large manufacturers for the first half of the year.

The Steel Corporation's policy will be followed by the large independents, generally speaking, but some of those that have been much affected by the strike, finding that it will be some time in March before they can complete their 1919 obligations, are indisposed to sell at this time for the later period. Possibly they hope that conditions later will be such as to permit them to sell at advanced prices, without incurring criticism of their regular customers for not following the Steel Corporation's policy.

The producers who thus sell far ahead, naturally sell only to regular customers of long standing, and when the prospective tonnage is not sufficient to go around, they must cut down inquiries. Their selling at March 21 prices will not necessarily hold the entire market to that level, for the unsatisfied demand will seek steel where it can be found, and that, undoubtedly, would mean premiums being charged by the smaller mills, such as keep their order books relatively clear, so as to profit by delivery premiums when obtainable. Prospects are that the premiums will increase in size and apply to more products, as the months pass. At present, there are premiums on sheets, merchant bars and wire products, also, in many cases, on tubular goods, particularly on large orders for line pipe. A fair guess seems to be that the premium market will be in very flourishing condition through the spring, and it may last longer.

BRITISH BUILDER OF MACHINE TOOLS ENTERING U.S. MARKET

Special to CANADIAN MACHINERY.

NEW YORK, Nov. 27.—An abundance of machine-tool business confronts Eastern sellers. The General Electric Co., Schenectady, N.Y., continues an active buyer, its inquiries in the past few weeks totalling nearly 200 tools. The Liberty Starters Co., Poughkeepsie, N.Y., a comparatively new concern, is out with a list of about 100 tools, which will be bought soon, and the Empire Cream Separator Co., Bloomfield, N.J., will buy 40 or 50 machines, to increase its output of milking machines. The Crane Co., Bridgeport, Conn., is inquiring for a few machines, and there are numerous other inquiries for small lots and single tools. November will be one of the best, if not the best, month of the year for many sellers in New York .

During the past week there has been considerable improvement, also, in the demand for cranes. The Follansbee Bros. Co., which is to build a new steel plant, with rolling mills, at Toronto, Ohio, has purchased about 25 cranes, at a total cost close to $500,000. The order was divided between the Morgan Engineering Co., Alliance, Ohio, and the Pawling & Harnischfeger Co., Milwaukee, Wis. The Drain Steel Co., Philadelphia, a new concern, has purchased four cranes, one of them a 100-ton ladle crane, for a new open-hearth steel plant at More, Pa. There have been a number of other small orders. Crane prices are stiffening, with improved business. For some time they have been close to cost, as competition has been keen and the capacity of existing crane manufacturing plants has exceeded the demand since the end of the war.

British Want Trade

One of the interesting developments in the American machine-tool trade, is the entrance of English builders into this market. Although handicapped by high-production costs in England, the English tool builders are making a determined effort to succeed in this market. One large company, Alfred Herbert, Ltd., wil make a determined effort, also, to capture a share of the Canadian market, where it should meet with even greater success, owing to the absence of a customs duty. Alfred Herbert, Ltd., has recently opened a display room on the street level at 54 Bay Street, New York, and is contemplating similar display rooms in Montreal and Toronto. At present, it maintains only an office in Toronto. No definite announcement as to its Canadian plans can be made by the company at this time, however, as arrangements have not been completed.

BIG EXHIBITION OF CANADIAN GOODS IN LONDON, JUNE 3 TO 17

Mr. Lloyd Harris, chairman of the Canadian Mission in London, says:

"I was able to arrange with Mr. Montgomery for the use of the Agricultural Hall, Islington, London, for the purpose of holding an exhibition of Canadian goods in June of next year. I am strongly of the opinion that if Canadian manufacturers will support this exhibition, and go there for the purpose of receiving business, that the results will more than justify the effort and expense involved, and I sincerely hope that the Canadian Manufacturers' Association will do everything possible to follow it through to a successful conclusion and thus follow up the pioneer work done by the Canada Mission."

Mr. H. Greville Montgomery has accompanied Mr. Lloyd Harris to Canada, for the purpose of promoting this great Canadian exhibition. He has had twenty-five years experience as a promoter of trade exhibitions.

Place

The Royal Agricultural Hall is London's second largest exhibition building and is near the heart of the city. It has a floor space of 60,000 sq. ft. splendidly adapted for exhibition purposes. Trade exhibitions are most important factors in the United Kingdom for bringing buyers and sellers together. They are promoted for the single purpose of developing trade.

To this exhibition buyers of goods throughout the United Kingdom will be invited by free ticket. It will be advertised in all the trade papers as well as in the London daily and provincial papers. A well-known artist will be engaged to prepare a suitable poster for street hoardings and railway stations throughout the country. The fact that this is the first time that any of the Dominions has had a great exhibition run exclusively in its own interest, will ensure wide publicity and great interest.

Canadian Organization

Mr. Montgomery has appointed Mr. O. C. Pease, 41 Victoria Street, Toronto, as his agent. He will allot space, arrange for transportation, receive monies, and conduct the general business of the exhibition on this side.

It is suggested that the following class of articles, all of which are in great demand in Europe, form the main exhibits: Minerals, chemicals, iron and steel products, railroad equipment, hand tools and shelf hardware, agricultural machinery, road-making machinery, transmission machinery, tin and enamelware, sheet metals, general building materials, textiles, clothing, footwear, pulp and paper, furniture, provisions, canned goods, animal products, confectionery, leather, paints and varnishes, brushes, wood products, rubber goods, carbides, asbestos products, and all other goods of Canadian manufacture which are seeking the world's markets.

Transportation, Storage, Cost of Space

Instructions will be sent to all exhibitors in respect to transportation. It is anticipated, however, that arrangements will be made to assemble all exhibits in Montreal not later than May 1 next, in order that they may be timed to arrive in London about the middle of that month. Each exhibit should bear the name of the exhibitor and other necessary information. They will be shipped direct to the Royal Agricultural Hall and will be placed in their respective positions by the exhibition staff. Mr. Montgomery is charging a flat rate of $1 per square foot of space.

Applications

Inquiries and applications for space should be sent direct to Mr. O. C. Pease, 41 Victoria Street, Toronto. Plans and full particulars will be sent on request.

The Canadian Manufacturers' Association in this regard, state:

"We consider this a splendid opportunity for manufacturers seeking an outlet for their goods in Great Britain and Europe. Those who participate in this exhibition will find that, instead of having to seek their customers, they will be brought to them. They will not only meet the distributors to the United Kingdom, but indent houses who are distributing abroad. Canadian troops have introduced Canada to the world. The Canadian Mission has followed this by obtaining an outlet for Canadian products valued at upwards of $100,000,000. It now rests with Canadian manufacturers to follow up this splendid pioneer work and show the world that we are producing a great variety of articles for which there is a tremendous demand. The association will do everything possible to facilitate this unique opportunity."

Merger Announced.—The Bridgeford Machine Tool Works of Rochester, New York, and the Betts Machine Company, formerly of Wilmington, Delaware, take pleasure in announcing a merger; the consolidation of the two companies, to be known as Betts Machine Company. The Bridgeford Machine Tool Works has specialized in building heavy engine lathes and axle lathes. The Betts Machine Company has been building heavy-duty machine tools for nearly sixty years. Bridgeford lathes and Betts heavy machine tools will hereafter be built by the Betts Machine Company, at their new plant in Rochester, and distributed by the Betts Machine Company, from Rochester and through their offices and representatives in New York, Chicago, Cleveland, and other large cities.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$27 15
Lake Superior, charcoal, Chicago	34 60
Standard low phos., Philadelphia	$38 00-40 00
Bessemer, Pittsburgh	29 35
Basic, Valley furnace	25 75
Toronto price:—	
Silicon..2.25% to 2.75%	$32.75 to $35.75

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	6 50
Chequered floor plate, ¼ in.	6 25
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$24 25	$25 00
Electro copper	24 00	25 00
Castings, copper	23 50	25 00
Tin	57 50	58 00
Spelter	10 00	10 50
Lead	8 25	8 50
Antimony	10 50	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 4 50	$ 4 75
Plates, 3-16 in.	4 90	5 25

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$15 00	$13 75
Copper, crucible	18 00	18 00
Copper, heavy	18 00	18 00
Copper wire	18 00	18 00
No. 1 machine composition	16 50	16 75
New brass cuttings	13 00	10 75
Red brass cuttings	14 50	14 75
Yellow brass turnings	9 00	9 00
Light brass	7 50	7 00
Medium brass	9 00	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	5 25
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton.	Net
Heavy melting steel	13 50	13 50
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	14 50	13 50
Malleable scrap	18 00	17 00
No. 1 machine cast iron	24 00	22 00
Pipe, wrought	10 00	5 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	7 50	7 00
Stove plate	22 00	21 00
Cast boring	10 00	9 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, 7-16 and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$38 50
Open-hearth billets	38 50
O.H. sheet bars	42 00
Forging billets	51 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 75
Sheets, black, No. 10	5 15	5 65
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	8 20
Premier, 10¾ oz.	....	8 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	29 50	26 00
1¾ in.	32 00	26 00
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08¼
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$11 50
Sheets, 3½ lbs. sq. ft.	10 50	11 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

The Week's Events in Montreal Industry

The port of St. John, N.B., is partially tied up owing to the strike of the freight handlers. Temporary inconvenience is expected in the loading and unloading of ocean steamers.

The Hyde Engineering Company, of 175 McCord Street, Montreal, who have been extensively engaged in marine repair work during the past season, are looking about for a manufacturing line for the winter months.

J. A. DeCew, chemical engineer, and president of the Blashill Wire Machinery Company of Montreal, was in the city for a few days last week, and has returned to New York to negotiate new activities in connection with early developments in the company's business.

The Wheeler Life Belt and Fireproofing Company will remove from the present premises, 652 St. Paul Street West, to more commodious quarters as soon as these can be obtained. They purpose going in for the manufacture of mattresses in addition to their present lines.

Work on the Montreal improvements and extensions are progressing favorably. Considerable work has already been done on all of these, and it is expected that the two sheds on Victoria Pier, and the power plant for the electric roads, will be ready for operation next spring.

Frank Morrison, secretary of the American Federation of Labor, was in Montreal this week making arrangements for the annual convention of that body, the convention to be held in the Canadian metropolis next year. The number of delegates will depend on the accommodation facilities of the city.

Two men were killed and quite a number more or less seriously injured as a result of a head-on collision on the C. P. R. near St. Vincent de Paul, on the Island of Montreal last Saturday evening. It is thought that the steamship special overran the signals and collided with the local train.

Geo. E. Leighton, of 136 St. James Street, Montreal, the well-known consulting mining engineer, has recently been appointed vice-president of the Samuel Osborne Company of Canada, with head offices at 145 St. James Street, steel dealers and tool manufacturers. Mr. Leighton has just returned from a two months' business trip to England.

Damage to the extent of about $25,000 was done to the building of the Montreal Warehouse Co. on Wellington Street, Montreal, by a fire that visited the place last week. At the time of the fire the place contained a large quantity of leather hides, hundreds of barrels of pitch tar, automobiles, tractors and motor trucks, many of the latter being badly damaged by fire and water.

The Canada Steamship Company has acquired another 9,000-ton vessel which they intend placing on the route between New York and the West Indies. This vessel was purchased from American interests and the name will be changed from the "Shoshone" to the "Manoa." She has accommodation for 125 first-class passengers and 100 third-class passengers, and about 4,500 tons of freight.

Shortly after nine last Saturday evening fire attacked the main building of the Laval University of Montreal, starting in an upper storey. An explosion of chemicals added to the conflagration, and it was nearly seven the following morning before the fire was declared "out." The main building is completely gutted. The loss will be in the neighborhood of half a million dollars.

E. N. Davey, who has been in charge of the tool room of the United Shoe Machinery Company, of Montreal, has resigned from that position to enter business for himself, as a practical mechanician. He has acquired a small but well-equipped shop at 1227 Ontario Street East, and will go in for the manufacture of small precision tools and fixtures, automobile and general repair work; also oxy-acetylene welding and cutting.

The launch of the "Canadian Planter" last Saturday from the yard of the Canadian Vickers Company, is the seventh vessel to leave this shipyard this season. This most recent addition is one of those constructed for the Canadian Government merchant marine, and is similar in every respect to five others that have been delivered this year by Vickers. She is approximately 400 feet in length, 52 feet beam, and about 31 feet deep. In all probability this will be the last launch of the season, and, should the weather show signs of early winter it may be necessary to send the boat to Quebec for final fitting out. The yard will continue active throughout the winter as they have still six vessels on order, four for the Canadian Government and two for Norwegian interests.

BELIEVES THAT DEALER SHOULD HAVE AN ORGANIZATION HERE

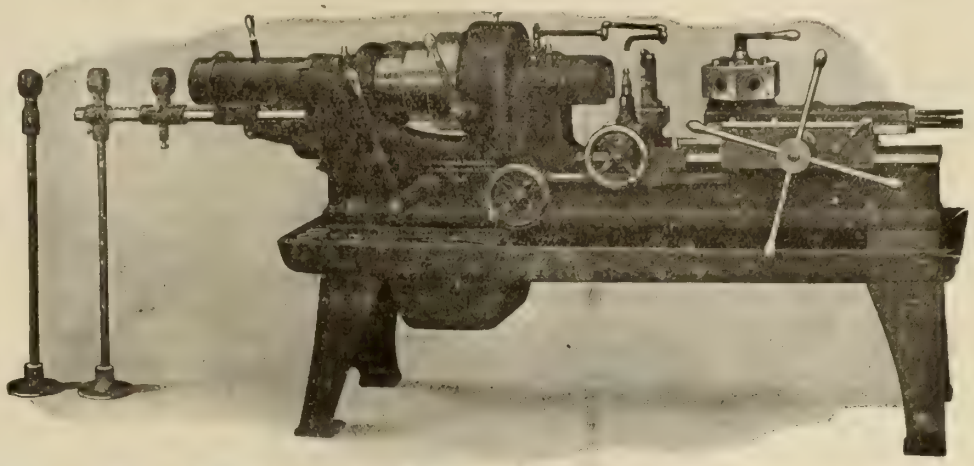
"I think there should be some sort of an organization for the machine tool dealers in Canada, or at least in this district," said the president of one of the machine tool firms in Toronto to CANADIAN MACHINERY this week. "There are a number of matters," he continued, "that could be dealt with to advantage. But for the immediate present, I would suggest that the most important matter is the matter of discounts and general selling policy. To tell you what I mean, let us take a case, and it is not a fictitious case either, but one that does happen time and time again, and any machine-tool man will tell you that he has encountered such instances quite frequently. Smith is the customer, and he has four machine-tool salesmen coming in to call on him at various times. They all have machines that will do the work he wants, and they have good machines, and their prices are the same. Now, in that case, the only thing that should determine the sale would be the matter of delivery, or the ability of some one of the four salesmen to show that his machine has points for the job that will make it a more acceptable machine. But what happens? One of the four sits down and begins to figure out how he can land that order. Now, that is all right. Salesmen are out to sell, and they are expected to show results. So he figures that the machine sells for $1,000 at the factory in the States. He bases his price on $1,000, adds 35 per cent. duty. This should bring the price up to $1,350; but he reckons that he can afford to slip one over by basing the duty on $900, and bring the selling price to $1,315, showing his customer a saving of $35. Not much, you say. Perhaps not, but, in many cases, enough to turn a sale, for you must remember that we are only basing our calculation on $1,000, and the average sale is much in excess of that.

"Well, now, what happens? Smith buys three machines, and the salesman gets away with the business. Smith runs into another manufacturer who has purchased the same machine under less strenuous circumstances. He finds out that Smith has secured a better price than he has, and he immediately wakes up to the fact that he has been soaked, and that is the truth of the matter. He has been soaked, simply because he did not have them all there competing for his business. It is a poor way to carry on, but it is being done. The machine-tool salesmen could settle all that in a few minutes, were they to come together and think the question over seriously. There would be no hold-up, and no need of an increase in prices, but there would be the elimination of one of the worst features in the business, viz., the special concession that is figured out to secure an order, when there is competition for it."

Warner & Swasey Screw Machines

For large output and close limits—If you are figuring on screw machine work you can depend on W. & S. machines being right for the job.

We can supply you from stock immediately.



The A. R. Williams Machinery Company, Limited

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

"If It's Machinery, Write Williams"

64 Front Street West
TORONTO

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited

Steel Foundry Division, Lachine Canal

Head Office: 187 Delisle St. MONTREAL

Phone Victoria 1462

MORROW SCREWS MORROW

MORROW

Set and Cap Screws and Twist Drills may be had of the better jobbers in any part of Canada. The screws are made from material specially made for this purpose and each screw is threaded twice to give accuracy.

DRILLS

are manufactured from Jessops' steel (Sheffield, England). It is the highest quality obtainable. Our special temper gives you the perfect Drill which does more work with less regrinding.

SCREWS

Standard Cap and Set Screws or A.L.A.M. or S.A.E. carried in stock. Shipments **at once.**

WORKS AT INGERSOLL, CANADA

"Ingersoll Files Cut Faster and Wear Longer."

2

DRILLS FILES

MORROW MORROW

NUTS

If interested tear out this page and place with letters to be answered.

Trade Conditions in Old Country Works

In all Scotch steelworks the demand for ship and boiler plates is more urgent than it has been since Government orders ceased, and some makers cannot name a delivery date before January, even for specifications, which formerly would have been run off in a week's time. The extensions of works, meantime, are of no avail in permitting of makers meeting the demands made upon them. One department is standing out as an exception—viz., sectional material—which has fallen appreciably in the general demand. Makers are directing their attention more to meet shipbuilders' requirements. In malleable iron centres there is no cessation of activity, and makers of late have struck a good seam, from which substantial business may be looked for for some time. So many enterprises were hung up during the war that, now that they are being brought to light, makers are being rushed to provide the ways and means. Production could be widened if only labor would realize its national obligations and play the game.

No American Pig Iron

The talk of the prospect of American pig iron being soon dumped down in the Old Land appears to have evaporated, and, so long as freights remain high and facilities so uncertain, Scotch ironmasters have little to disturb their peace of mind with respect to the huge profits accruing to this particular industry. Another point is that the rise and fall in the value of the American dollar checks business.

A Great Wire-rod Mill

The past month has seen the formal starting of the big Morgan continuous wire-rod mill at Templeborough. The only other mill of this type is in South Wales, but it differs from the above in several important particulars, and is not so large. The mill converts a steel billet into a coil of wire rod in a single heat and without handling, all the work being automatic. The plant is capable of rolling nearly 1,500 tons of wire rod per week. The material in question is the raw material of the wire trade, and more than 100,000 tons per annum were imported from the Continent before the war. It is pleasing to learn that this country is now in a position to supply from internal sources all the rods that the wire trade requires. The prices at which the material is being offered also leave no inducement to users to place any of their business abroad. The adoption of improved methods of manufacture has enabled the rod rollers to reduce costs, and it only needs constant output to maintain this favorable condition. Wire makers almost without exception are extremely busy. So great is the demand from the home market that they have little to spare for export, and some amount of foreign trade is being turned away.

The Lot of the Manufacturers

Neither the recent grave disturbances in industry nor the state of the foreign exchanges has checked the inflow inquiries and orders for manufactured steel and steel tools. While the demand omits a number of Sheffield's staple materials, it is sufficient to provide a lot of work for the majority of the manufacturers. The talk about our markets being flooded with foreign merchandise turns out to be a bogey. The quantities which Germany is in a position to export are at present inconsiderable, and the United States, suffering as she is from an epidemic of strikes in all her trades, has little in the way of manufactures to spare for outside customers. Owing to the cause named, the output of steel in America has suffered a heavy drop of late, and it does not suffice for home needs. The British employer has much to contend with, but, bad as things are here, they are far worse in America, Sweden, Germany, and France. As regards British trade, Italy is proving to be a very unsatisfactory market. Her financial position is grave, and many of the works have had to close through inability to trade. Large stocks of steel obtained for war purposes remain in the country. Steel orders from the United States and Canada have been extremely limited for a long period, and not much of this trade which was lost during the war has been recovered up to the present time. Before the war both countries were big buyers of our most expensive tool steel. Formerly, Germany obtained her best razor and cutlery steel from Sheffield. Since the armistice was signed no orders from that country have been received in Sheffield, nor is business possible at the present rate of exchange. Cutlery steel would cost the Germans something like 5s. or 6s. per pound to-day.

THE CARE OF BELTS

(By J. H. WALKER, Mgr. Dominion Belting Co., Ltd.)

There are very few users of belts who give them the proper care. In the first place, they should be put on with clamps, or other means adopted, to take all the stretch possible out before lacing or attaching with other fasteners.

Every belt should have a proper dressing applied occasionally to keep it in condition. By this means drying out is prevented, and belts retain their gripping qualities on pulleys, which means a retention of the original power transmission.

A belt dressing containing resin or mineral oils should not be used, as these ingredients are most detrimental. Never use a belt dressing containing animal oils on rubber, balata, or stitched cotton duck belting.

The proper time to apply belt dressing is when the plant is closed down for a day or so; for instance, Saturday, as by Monday morning it has had a chance to penetrate the belt and keep it soft and pliable.

If kept in this condition there is no excuse for anyone resorting to the questionable remedy of applying resin, or any sticky dressing to get the proper power out of belts.

Belts used in saw mills and other plants that are shut down during the winter months should be taken off, rolled up, and kept in a warm place. If left on the pulleys and exposed to the changeable atmospheric conditions of a Canadian winter they will certainly have deteriorated by the spring.

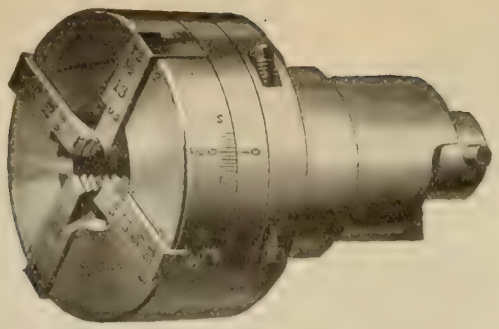
Carelessness in starting up machinery too quickly is liable to cause belts to slip on pulleys, thus injuring them. This can be obviated by putting on the power gradually, which gives belts a chance to get a grip on the pulleys.

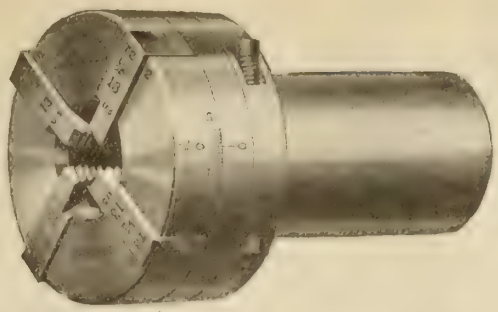
Another important matter is to have proper alignment of pulleys, as many belts give out before their time owing to defects in this respect.

Another mistake made by some belting users is practising false economy in getting belts too light for the work they have to do. While a certain weight of belt may at first do the work required, if it is necessary to keep it on a constant strain to accomplish this, both felt and machinery are going to wear out much faster if there is a "reserve." In other words, heavy enough belts should be used to ensure their not being overstrained. This may cost a little more at first, but pays in the long run.

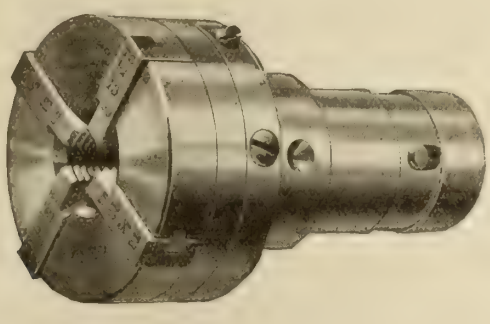
MUNITIONS PLANT OFFERED FOR SALE

The United States Government has been settling with Canadian companies which had entered into contracts for manufacture of war material. The process of making adjustments was rather lengthy in many cases, and there was a good deal of impatience in connection with the delay. The work has been proceeding slowly, however, and several adjustments of importance have been announced. A final settlement was made with the directors of Motor Trucks, Ltd., of Brantford. This plant was built in the final months of the war, and had barely commenced production when the armistice was signed. Expensive equipment was installed, and the plant was regarded as one of the finest of its kind in the province. The United States Government retains the possession of the building, and an effort will be made to dispose of it. An announcement was made in the "Brantford Expositor" that several offers had been made for the building, but that it is still unsold.





Geometric Solid Adjustable Die Heads



When one uses the word "ONLY," he needs to be sure of what he is talking about. With confidence we use the word in saying that a Geometric Solid Adjustable Die Head, fitted with a set of milled dies, is the only solid die head that will back off without stripping the thread.

Geometric Solid Adjustable Die Heads may be fitted with either a releasing shank, plain shank, or with special shank for the Gridley Automatics. The releasing shank permits the head to disengage from the shank upon completion of the thread. The plain shank fits the head for use on the turret of a lathe or on a live spindle, such as a drill press.

Apart from the fact that it is not equipped with the self-opening feature or the roughing and finishing attachment, the Geometric Solid Adjustable Die Head is the same in principle and construction and will do equally as accurate work as the other styles of Geometric Die Heads.

Whatever the requirements, there is a type of Geometric Die Head best adapted to the work.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents:

Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B.

Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

If interested tear out this page and place with letters to be answered.

SHEET SHORTAGE BEING FELT NOW

Kitchener Firm Has Not Had a Shipment for Some Weeks Past

Kitchener.—"Yes, we do feel the effects of it," Manager A. S. Capwell of the Canadian Blower and Forge Company, Ltd., said when asked whether there is any noticeable effect of the steel strike in the United States.

Mr. Capwell said that it is difficult to get shipments of sheets. Orders for sheets which were placed months ago have not been received by the plant. Stocks from which foundries and forging plants have been drawing are running low and in many cases are exhausted. Should the strike not be settled soon the situation will become very serious and many a shop will certainly be up against the inability to get its raw products.

The Canadian Blower and Forge plant is busy with orders and all the raw material available. The company continues to enjoy a good share of export trade. Forges, blowers and other divers lines are being turned out for New Zealand, Australia and South Africa. Orders for heaters also have been received from England. The only difficulty is the scarcity of boats.

The company has about 150 men on its pay roll, more than at any time, not including the period during which the plant was engaged on war orders.

PIG IRON TRADE

The market is steadier than has been the case lately, and the fervid demand for spot iron is easing up. Basic grades have advanced, and are strong. Following are reports from U.S. centres:—

Pittsburgh—The increased demand for steel-making iron has put basic on the same level as other grades, in regard to price. Basic, for December shipment, has been sold at $30 valley furnace, and first quarter Bessemer at $31.50 valley. Foundry iron, prompt delivery, is around $34 furnace.

Boston.—There have been good sales during the week, but mostly for first half delivery, but spot iron has receded somewhat from its high position. A quotation of $37, delivered for 2.25 to 2.75 silicon, was refused by the enquirer.

Birmingham.—There is good enquiry here, and an advance of $1 has been made. Makers are cautious about making sales, fearing a wage adjustment that will increase costs.

Buffalo.—There is a shortage of iron in this district, and Canadian furnace is finding a market here. No. 2 foundry is being bought at $34; No. 2X at $35.25; and No. 1X at $37.

Cleveland.—Furnaces are not very anxious to accept first-half business as yet. This is evidenced by the difficulty the large automobile manufacturers are having in finding makers to undertake their requirements, which are in the neighborhood of 100,000 tons of foundry and malleable. 1.75 to 2.25 silicon foundry-iron for first half has been placed at $32 furnace.

Cincinnati.—There is not much iron available here. A sale of malleable for this year's shipment has been made at $35 furnace. Spot iron is scarce, and no quotation for future iron can be obtained.

St. Louis.—The market is firm, with a tendency to become stronger. Furnace interests are going out of the market, and some good orders have been turned down. Spot iron is bringing fancy prices, and 1920 iron is not being touched.

New York.—There has been considerable 1920 business closed during the past week. About 15,000 tons has been booked by an Eastern Pennsylvania furnace for delivery in this district. High silicon iron is scarce and prices up.

Philadelphia.—The prices in the pig-iron market have receded somewhat during the week. Basic has been sold for 1920 delivery at $31 to $32, delivered. Export enquiries for 22,000 tons basic and 10,000 tons foundry are out.

U.S. SCRAP METAL

There is a strengthening of the scrap iron market all over the country, and enquiry is brisk. Following are reports from various centres in the U.S.:—

St. Louis.—The scarcity of pig iron is reflected in the strong demand for scrap, while rolling mills are also in the market. Stove plate has advanced $2 to $26.50; railroad malleable has advanced from $18 to $25 a ton. Railroad offerings are light.

Boston.—There is a good demand for all grades of scrap, though, owing to its scarcity, there is no great volume of trading. No. 1 machinery has been sold at $32.50, delivered at foundry.

New York.—There has been a general advance in prices of all grades of scrap. Heavy melting is quoted at $17 to $17.50, old steel shafting $24 to $25, machinery cast $25 to $26.

Philadelphia.—A comparatively small volume of business, coupled with a big demand, has caused an advance in all grades here. Advances vary from 50 cents to $2 per ton. There is an inclination on the part of dealers to hold stocks for higher prices.

Pittsburgh.—The market here is advancing, more in sympathy with the eastern pig iron market, than from any particularly strong demand here. Heavy melting is looked to for a sharp advance very shortly, while cast-iron borings are selling round $20. No. 1 cupola cast is $29 to $30.

Buffalo.—There is a very big enquiry for steel-making grades, as well as foundry, and all grades have advanced. The enquiry for heavy melting totals 100,000 tons.

Cleveland.—Foundries are in the market for cast scrap, the supply of which is getting scarce. Increases have taken place in many grades, and dealers are confident of higher prices in all grades. Dealers will not sell steel scrap on contract under $25.

Chicago.—There is a good demand for malleable grades, while heavy melting is comparatively quiet. Some big deals have been closed, including 50,000 tons of shells, in one lot, with two smaller lots of 25,000 tons and 10,000 tons. Malleable sold at $28 per gross ton.

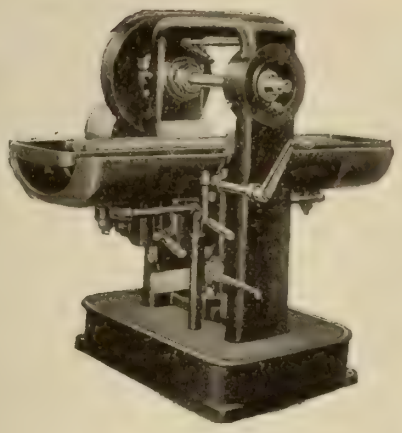
Cincinnati. — There has been no change in prices, but the tone of the market is firm. The car situation is better.

Birmingham.—The demand for cast and stove plate is very strong, with lower grades active. The market is stronger. More material will be available after the end of the year.

While there is reason for believing that no very extensive contracts have been given out yet for work in the devastated regions in France, there are occasional rumors of important undertakings being placed in the hands of foreign firms, and from a German source has come the news that reconstruction work on a very large scale, including the rebuilding of Laon, has been confided to British firms. This news has been officially denied. Not long ago it was stated that Laon was to be rebuilt by the Americans, but, while negotiations are certainly in progress, it is not likely that any very large contracts will be given out until arrangements have been completed with the Germans for the execution of the preliminary work. The chances of British and American participation are much brighter since the Government has come to the conclusion that this must be done if the Allies are to help France in its present sore need.

Speaking on Progress of Aviation in the War Period, before the Royal Aeronautical Society recently, Dr. Leonard Bairstow said that the speed of aeroplanes has increased from 85 to 135 miles per hour in five years, and some further improvements might be expected in the future. No equal addition to the speed range was probable, and economy suggested a reduction. It was not possible to decide from a single estimate of the value of speed in civil aviation, but for fighting it was the last reserve of superiority which was all important.

BRIGGS MILLERS



We Call It the Big Little Milling Machine

And so it is. A man who is unfamiliar with the "Briggs" and the work of which it is capable is always surprised at the power available and the extreme rigidity on any milling operation which is within the range of this tool. It is a small machine; but the solid over-arm construction and the convenience of operation make it a manufacturing machine of unsurpassed production possibilities on all work which it can handle.

The low first cost of the Briggs Miller is another of its surprising features. The floor space required is small. Upkeep is slight. operating cost is low because skilled labor is not required to obtain the best output of which the machine is capable. And there are other advantages, too, which we'll be glad to explain in more detail.

Garlock-Walker Machinery Company, Limited

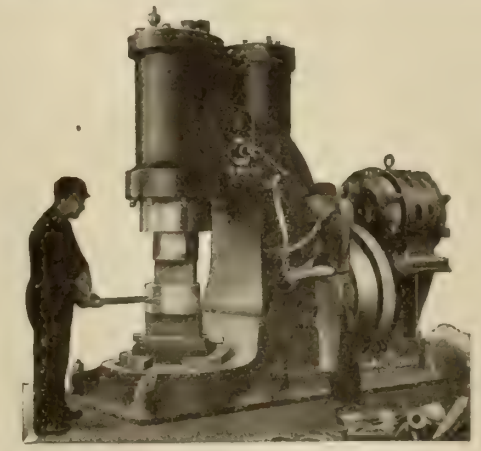
32 Front Street West, Toronto, Canada

MONTREAL TORONTO WINNIPEG

The Nazel Air Hammer

(A Self-Contained Unit)

Noted for Its Blow and Control

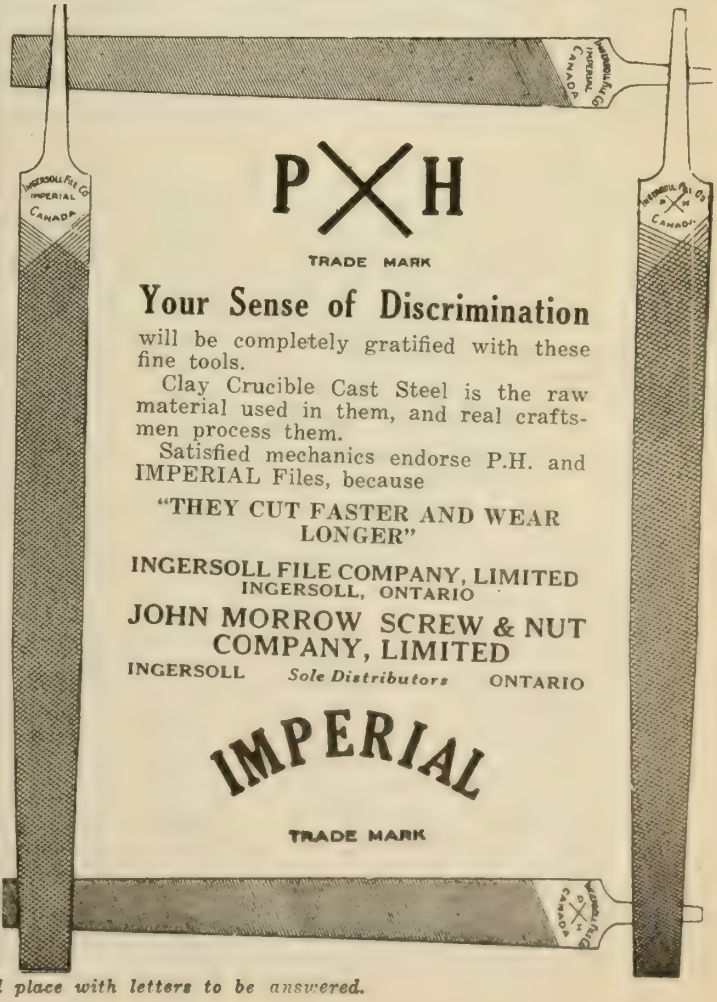


The Most Modern Reliable Power Driven Substitute for the Steam Hammer.

Built in 3 types, 6 sizes, arranged for belt or direct motor drive, with capacities up to 7" square for all manner of jobbing, manufacturing and certain classes of die forging. Write for catalogue.

Nazel Engineering & Machine Works

Dept. F., Philadelphia, Pa.



P⨯H

TRADE MARK

Your Sense of Discrimination

will be completely gratified with these fine tools.

Clay Crucible Cast Steel is the raw material used in them, and real craftsmen process them.

Satisfied mechanics endorse P.H. and IMPERIAL Files, because

"THEY CUT FASTER AND WEAR LONGER"

INGERSOLL FILE COMPANY, LIMITED
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JOHN MORROW SCREW & NUT COMPANY, LIMITED
INGERSOLL *Sole Distributors* ONTARIO

IMPERIAL

TRADE MARK

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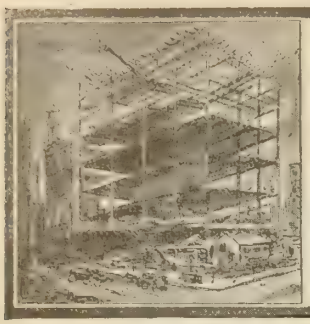

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

PERSONAL

Thos. Firth & Sons, Limited, Sheffield, Eng., announce that Mr. James A. Sherwood, who has for a number of years represented them in Canada, is retiring, and that Mr. John J. Coleman, who has had charge of the Toronto branch, has been appointed as successor to Mr. Sherwood. Mr. Coleman has just returned from Sheffield, England, where he spent the month of September.

TRADE GOSSIP

Want to Buy Furnace.—The Hammond Steel Co., Inc., Syracuse, N.Y., are in the market for a second-hand six-ton Heroult electric furnace, complete with transformers and all equipment necessary to start operations.

Belleville Gets New Mill.—The Judge Jones Milling Company, of Montreal, have transferred their plant from that city to Belleville. The firm, who are manufacturers of cornmeal, oatmeal, rolled oats, and other cereals, are building an elevator with a capacity of 45,000 bushels of grain.

Establish Branch in Woodstock.—Another United States manufacturer, this time the Hook and Eye Company, have established a Canadian branch in Woodstock. Premises have been secured and the production will soon commence of hooks and eyes, safety pins, dome fasteners, etc. This is the second new industry to come in ten days.

Canada's Trade Declines.—The seven months of the fiscal year ending October 31, show a decrease in the country's trade of $33,000,000, as compared with the same period of last year. The total trade for the seven months' period of this year amounted to $1,259,648,374, while for the seven months of 1919 the total was $1,249,493,885.

Moving Office.—The Union Carbide Co. of Canada announce that on November 29 they will conduct their sales office from Welland, where the works are located. The Toronto offices have been located heretofore in the Dominion Bank Building. The firm's reason for taking this step is that they believe they can secure better results by having the sales office and factory together.

New Factory for Willards.—What is claimed to be the largest ice cream factory in the world, will be erected at Dupont Street and Manning Avenue, Toronto, by Willard's Chocolates, Ltd. They will ship ice cream by carloads, daily, to Montreal, Hamilton, etc., in the summer. The ice consumed will amount to 200 tons daily, and a carload of salt per day will be used.

Appoint Separate Boards.—In connection with the disputes in the Sydney coal mining fields, the Department of Labor has agreed to appoint separate conciliation boards for each colliery. The miners wish to have one board to cover all. However, they will appoint the same representative to all the boards, their choice being J. C. Watters of the Trades and Labor Congress.

Gillies Bros.' New Mill.—The new mill which Gillies Bros., of Braeside, are building to replace their lumber mill recently destroyed, is of concrete construction. This is a new departure in sawmill construction in Ontario. The new mill will be 190 feet by 73 feet, facing the Ottawa River. All the machinery wil be electrically driven. A. F. Byers & Co., Montreal, are the builders.

Pumps Have Short Life.—The Board of Control of Toronto were informed by Works Commissioner Harris that the four electrically-driven pumps installed in John Street pumping station in 1911, are in need of renewal. One is at present out of commission, and three others are in such condition that further repairs are not worth making. Provision has been made in the estimates for $75,000 for new pumps.

Making Tractors. — Manufacture of tractors is being commenced in the Cluff Bros. ammunition plant on Atlantic Ave., Toronto. The interests of the Chase Motor Truck Company of Syracuse, N.Y., were purchased recently by the Cluff organization, and the plant headquarters have been moved to Toronto. It is proposed to make a large number of tractors for the season of 1920. The company does not intend to make cheap tractors, but has announced its intention to concentrate on a high-grade machine. After study of the tractor situation they determined that there is need for better tractors rather than for cheaper tractors.

Going to Galt.—It was announced by the Board of Trade that another new industry has been secured for Galt—McCaskey Systems, Ltd., of Carlaw Ave., Toronto, a branch of an American concern of Alliance, Ohio. A special committee of the board has been negotiating with the firm for some time, and a deal has just been closed whereby the concern purchases the modern manufacturing plant of the Roelofson Machine Tool Company on Beverley Street. This industry, which manufactures counter checkbooks, credit registers, and professional systems, will locate there next summer, and will employ about 100 hands, 50 of whom will come from Toronto. The firm has outgrown its Toronto quarters.

Sydney Mines. N.S.—Asked to confirm the report that industrial conditions showed indication of improvement at the Steel Plant a Scotia official spoke optimistically and felt confident that within a short time there would be a change for the better, although he was not in a position to say when business would get back to normal. A considerable quantity of pig iron arrived from the car works, New Glasgow, during the past few weeks, sufficient to keep two open hearth furnaces in operation for a period. There is only a working force of three hundred men employed in the plant. With the blast furnace again going full steam ahead, this force will necessarily be increased, and everybody employed. The steel workers are hopeful that trade conditions will soon be restored to normal.

MARINE

Port Colborne.—During the recent storm about 100 feet of the superstructure of the eastern pier at Port Dalhousie sank. This has left considerable debris, and vessels entering the port are warned to keep as far as possible to the west of the east pier.

Nobel Plant is Sold.—The British Cordite Munitions plant at Nobel, near Parry Sound, has been sold to Mr. I. Cohen, a well-known merchant of Kingston. Nothing is known of what Mr. Cohen's intentions are with regard to the property, which includes buildings, machinery, trackage, etc.

Van Horne Property Sold.—The Realty Service Company have sold the property on the north side of Van Horne Street, west of Dovercourt Road, to Soren Bros., tinware manufacturers, who will erect a new factory there. The property contained 332 feet, and the

price obtained was in the neighborhood of $50,000.

St. John, N.B.—Sir Frederick Lewis, chairman of the Furness, Withy Company, has been looking over the harbor of St. John, and is of the opinion that better facilities are needed. One of the most important requirements was the extension of the breakwater from West St. John to Partridge Island, in order to protect existing and contemplated facilities.

Sault Ste. Marie. — The wooden steamer Myron foundered a mile and a half off White Fish Point, Lake Superior, and her crew of eighteen men with the exception of the captain, who was picked up after floating on top of the pilot house for 20 hours, are feared lost. Several attempts were made by passing steamers to rescue the men, who were in boats and on rafts, but, although lines were thrown to them, they were unable to hang on. The weather conditions were such that the would-be rescuers had to leave the men to their fate.

New York.—The steamer Imperator has been handed over to the British Minister of Shipping by the U.S. Shipping Board. The Imperator will sail for England shortly, and will be used in the Cunard Line service.

Bridgeburg Gets New Plant.—The Reliance Manufacturing Company, with a capital of $500,000, will locate in Bridgeburg. The factory will be on Lewis Street, and the product will be electrical goods, such as fuses, switches, etc. The Brazil Motors Company, of Brazil, Ind., which is considering Welland, Port Colborne or Bridgeburg as sites for a factory, has arrived at no decision yet.

Railway Board Decides Dunnage.—The amount of dunnage that will be allowed on agricultural machinery, implements, stoves, street cars, vehicles, etc., shipped in box or stock cars, has been fixed at 650 pounds by a judgment of the Board of Railway Commissioners. The allowance was formerly 1,000 pounds, and this has now been cancelled.

No Coal From Ontario.—The Fuel Commissioner has issued an order prohibiting the shipping of any bituminous coal from Ontario without a permit from him. This order is to insure the supply of bituminous coal for Ontario needs as the commissioner feared that attempts might be made to ship some of the coal stored here to points outside the province.

Collingwood. — The steamer M. J. Nessen, of Chicago, was seized by the Chief of Police, acting under instruction from Messrs. Burke, of Midland. The vessel is under repair in the yard of the Collingwood Shipbuilding Company, and the seizure is on account of expenses incurred in raising the vessel when sunk at Meaford. The captain of the vessel claims that the charges are excessive, and will give bonds to cover the amount. He will fight the matter in the courts.

Sault Ste Marie.—Tugs searching the lake for traces of the John Owen returned with wreckage bearing the name of "John Owen." This destroys all hope of the steamer not having been lost. Hatches and other movable fittings have been found, but no traces of a lifeboat or life preserver. There is little chance of any of the crew having survived.

TENDERS

The Department of Public Works, Ottawa, are asking for tenders for the reconstruction of the wharf at Owen Sound. Tenders will be received up till noon Friday, December 12. Plans and forms of contract can be seen at the office of the District Engineer, Equity Building, Toronto, and at the Post Office, Owen Sound.

CATALOGUES

Black & Decker, Baltimore, have issued a new catalogue on portable electric tools, electric air compressors and special machinery. The catalogue is an excellent specimen of good typography and presswork. Besides the above-mentioned lines are drills, tapers, sleeves, etc. Black and Decker products are covered by the usual guarantee. The firm warns against having repairs made by unauthorized parties. The catalogue is being issued twice a year by this firm.

BOOK REVIEWS

The University of Illinois Engineering Experiment Station has issued bulletin No. 110 on "Passenger Train Resistance." The department of railway engineering of this university has, for some years, carried on experiments to determine the tractive resistance of steam railway trains and electric railway motor cars. The result relating to steam railways thus far furnished have applied only to freight trains; this bulletin presents for the first time result of experiments with passenger trains. These experiments were begun in 1908 on local trains and were resumed during the spring and summer of 1915 on through passenger service. The results presented in the bulletin define the resistance of trains that move throughout the ordinary range of speed of passenger trains. It is also made clear that in passenger, as in freight trains, the resistance expressed in pounds per ton varies with the average weight of the cars composing the train and works the same for trains made up of heavy cars as of trains made up of light cars.

The University of Illinois Engineering Experiment Station has issued bulletin No. 109 on "The Orifice as a means of measuring the flow of water through a pipe." In this bulletin are given the results of tests made to determine the practicability of measuring the flow of water by means of the thin-plate circular orifice inserted in the pipe, to determine the experimental co-efficients for calculating the velocity of the flow in the pipe and the discharge and to determine the conditions most favorable to the use of such an orifice as a flow measuring device. The theory of the orifice is first developed and tests and results are given in exhaustive form. Further subject matter has to do with the effect of deviation from standard position and the general applicability of the pipe orifice method is thoroughly discussed in the summary. It would seem that this device might well be used, for example, in testing the efficiency of certain forms of pumps in measuring the performance of individual wells of water works systems, in determining the water power for individual purposes in mills and factories, in measuring the discharge through city main and in distributing water for irrigation purposes.

"The Manufacture of Chemicals by Electrolysis," by Arthur J. Hale, B.Sc., F.I.C. Price 6 shillings. Eighty pages. Constable & Co., London.

The manufacture of chemicals by electrolysis is of sufficient importance to justify the appearance of a monograph on the subject. Accordingly the author has given a complete and up-to-date account of processes now in use, and an indication has been given of future developments.

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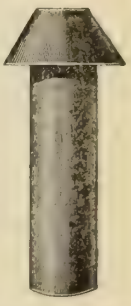

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Contents

Chapter I: Electrolytic hydrogen, oxygen and ozone; Chapter II: The production of per-salts and hydrogen peroxide (per sulphates and persulphuric acid, hydrogen peroxide, per carbonates, potassium permanganates, potassium ferricyanide, electrolytic sulphuric acid); Chapter III: Nitric acid, hydroxylamine, hydrosulphates, fluorine; Chapter IV: Electrolytic preparation of pigments and insoluble substances (precipitation of metallic oxides, lead chromate, lead sulphate, lead peroxide, white lead, zinc white, the separation of the rare earth oxides, pyrophoric alloys, tungsten bronzes; Chapter V: Electro-osmosic and electro-colloidal processes (dehydration, glue, tanning, silicic acid, alumina, lixivation, principles); Chapter VI: Electrolytic production of organic compounds; Chapter VII: Oxidation and substitution of organic compounds.

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Pig iron continues to advance. The valley market now stands as follows: Bessemer, $31.50; basic, $30; malleable, $32 to $33; foundry, $33 to $34, f.o.b. valley furnaces.

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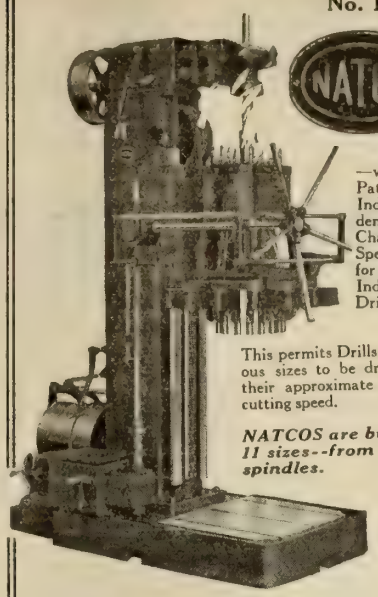

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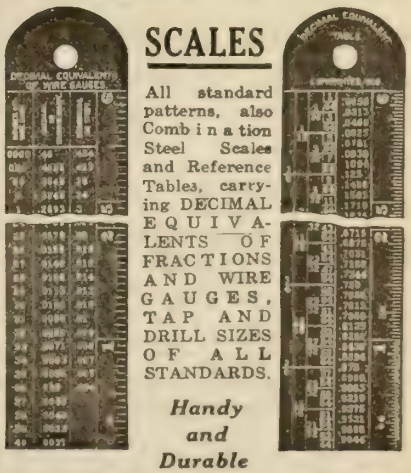

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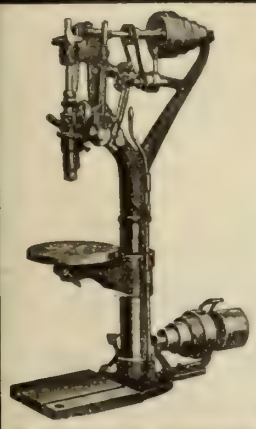

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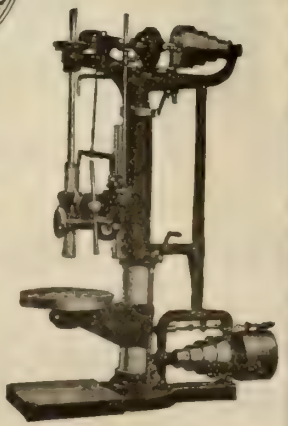

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5	BULLOCK	900	35	GEN. ELECTRIC	560
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7½	WESTINGHOUSE	600/975	40	SPRAGUE	730
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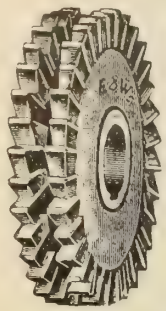

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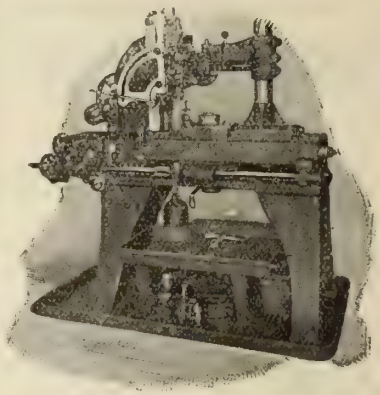

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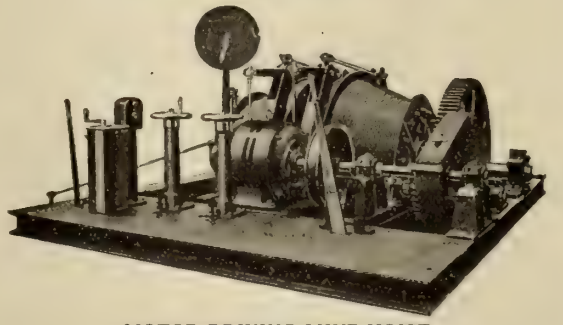

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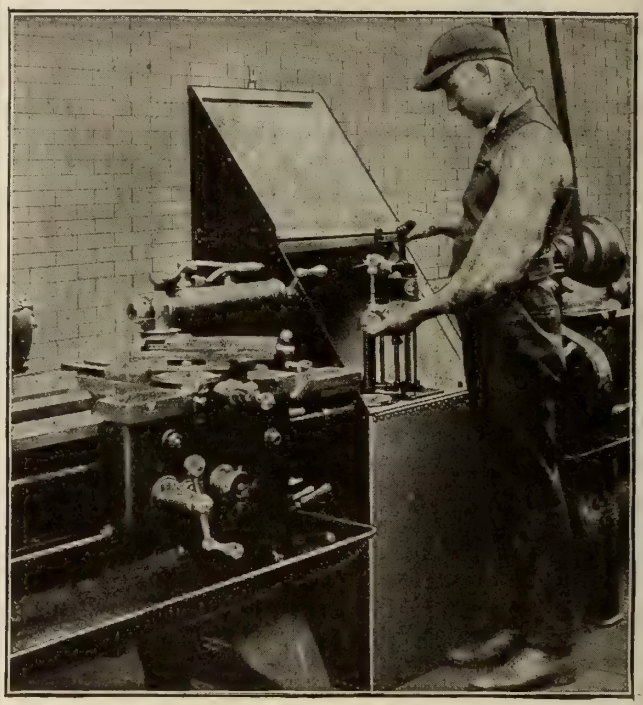

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Every Mother Who Lost a Son at the Front

will read with deepest feeling Nellie McClung's wonderful story, "Men and Money," which also appears in November MACLEAN'S. Mrs. McClung wrote this story with a purpose—to show the ease with which the world forgets the contribution these mothers made. But it is also a very fine story—real, human and gripping.

"The Idle Hands at Ottawa"

By J. K. MUNRO

The recent session of the Dominion House was in many respects an idle one. There was not a great deal done, so the members had a lot of time to stir up things, and the result was some hugely interesting political situations. All of which J. K. Munro tells about in his usual unsparing and tersely humorous way.

Remarkable Features of a Remarkable Number

The November MACLEAN'S is cram full of other big features—famous writers on vital subjects and everything **Canadian.** Look over this list:

Baroness Orczy.—The author of "The Scarlet Pimpernel," best seller of best sellers, is represented by a serial story. "His Majesty's Well Beloved."

Robert W. Service.—The great poet of the Yukon and the battlefront contributes a strong poem, "The Outlaw."

Basil King.—This great novelist who lives abroad contributes an interesting discussion on "Why I Remain a Canadian."

Janey Canuck.—An article on Mrs. Murphy's experiences as the first woman magistrate in the whole of Canada.

Camilla Kenyon.—A new novelist who promises to become a great favorite, tells a humorous story of adventure, and treasure, "Spanish Doubloons."

Stephen Leacock.—A humorous sketch entitled, "My Memories and Miseries as a School Master."

"Two Men and an Idea That Grew and Grew and Grew."—By Charles Christopher Jenkins.—A sketch of two remarkable and practically unknown Western Millionaires.

"A Little Bit of Chicken Feed."—By Allen C. Shore. A bright story combining love and business themes.

"The Rainbow Death."—By Madge Macbeth. An intensely interesting detective story.

"The Search for Missing Men."—By Gertrude Arnold. An article on hospital experiences at the front by a young Canadian V.A.D.

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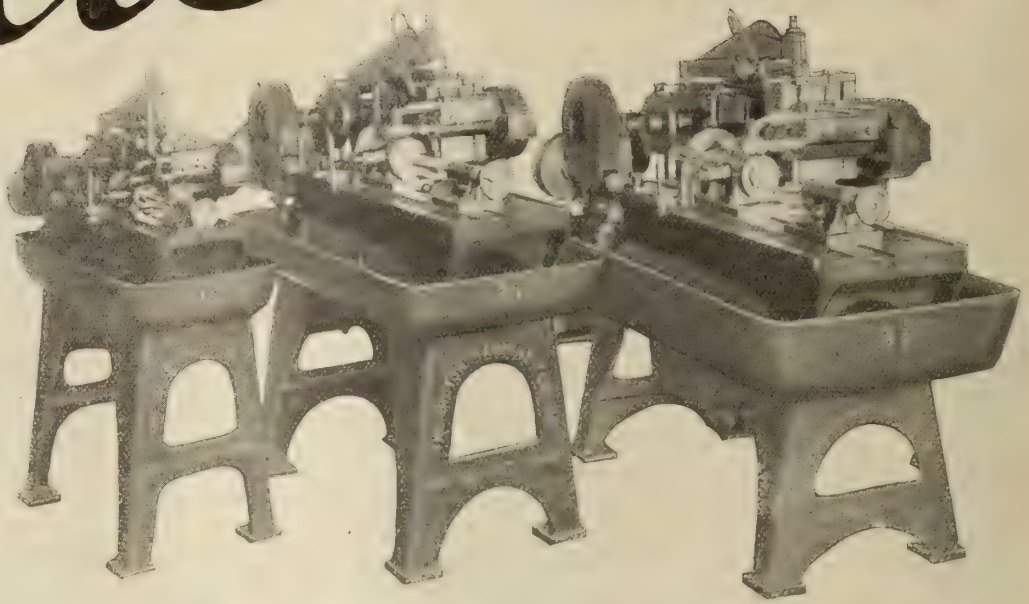

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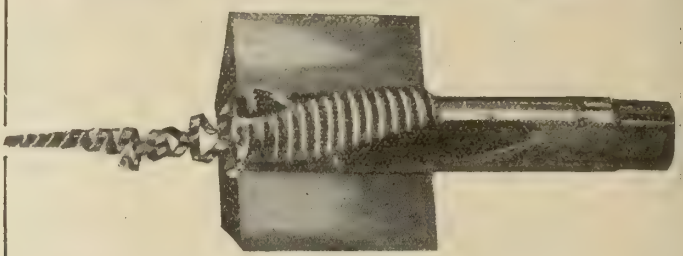

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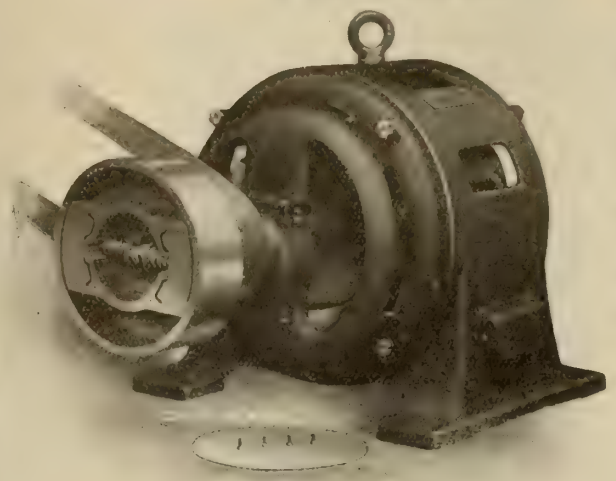

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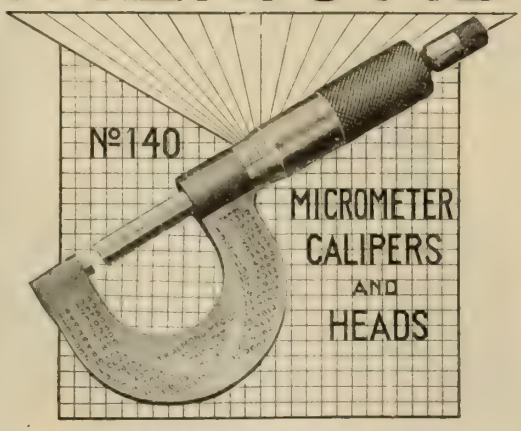

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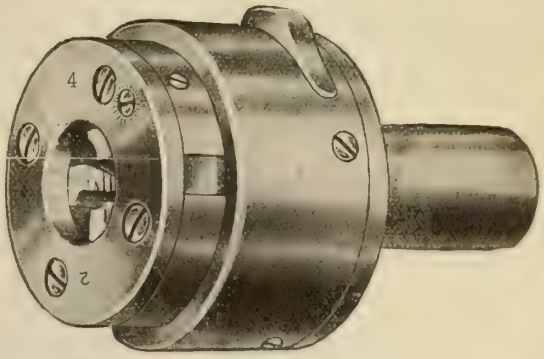

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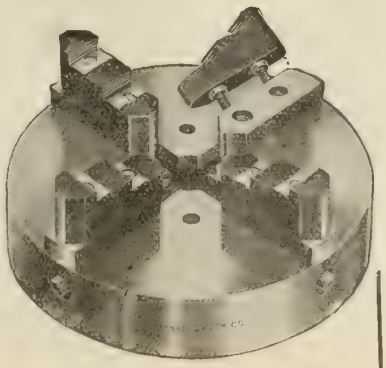

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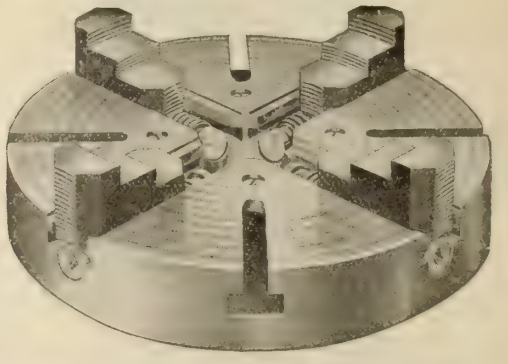

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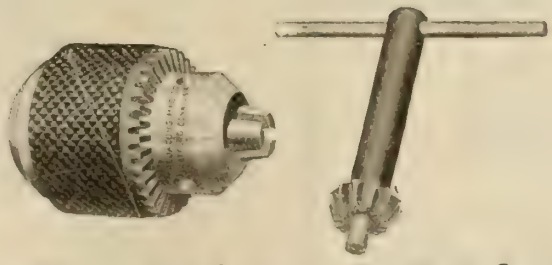

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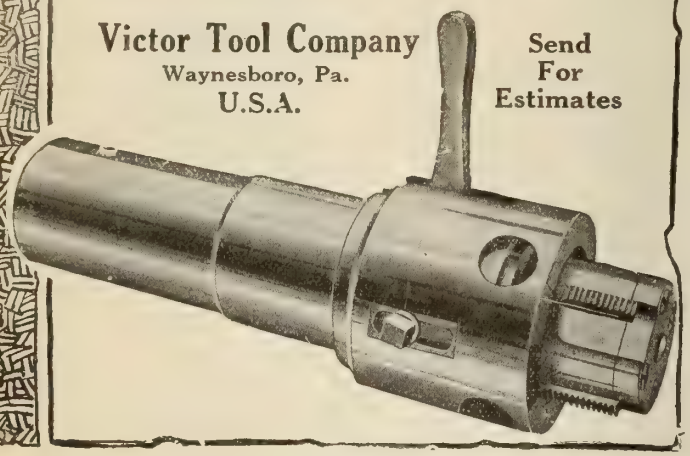

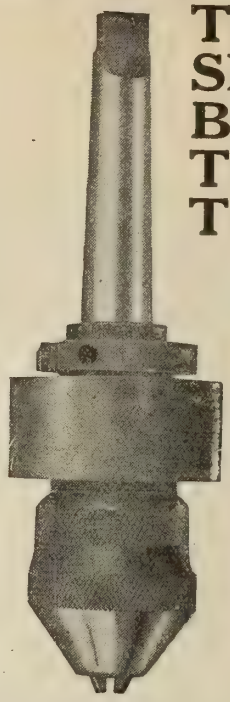

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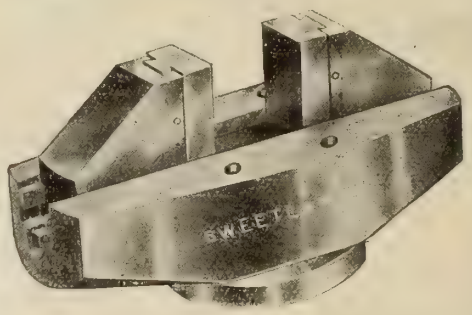

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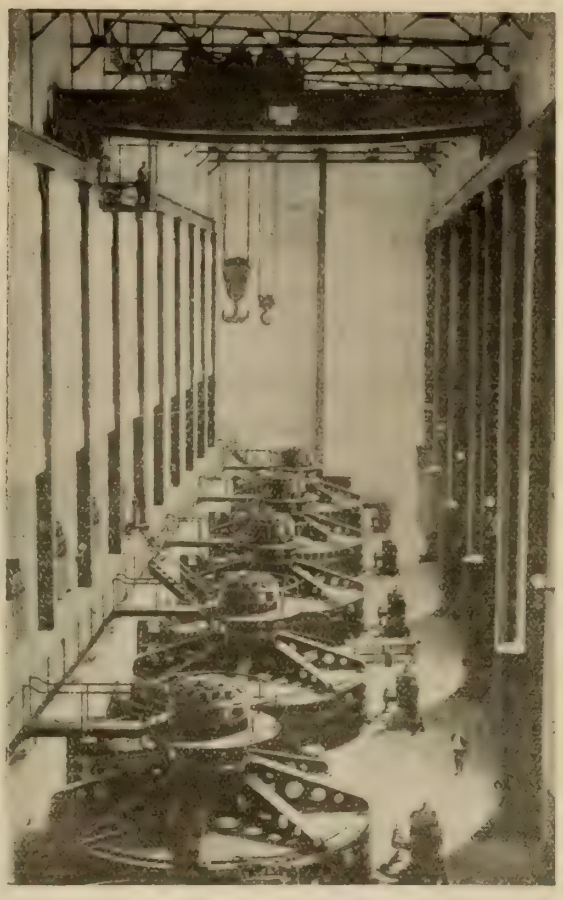

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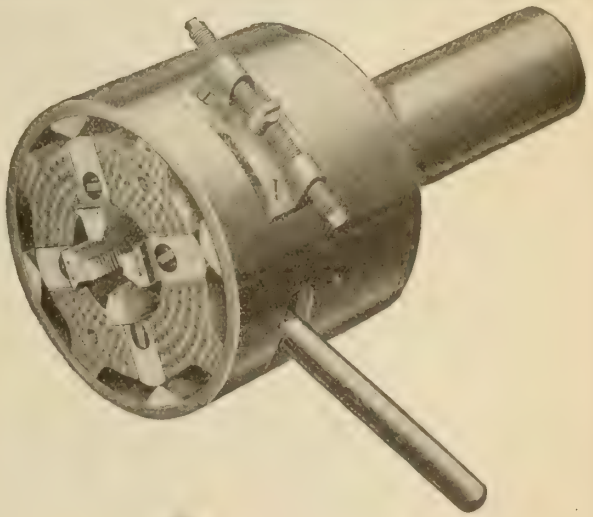

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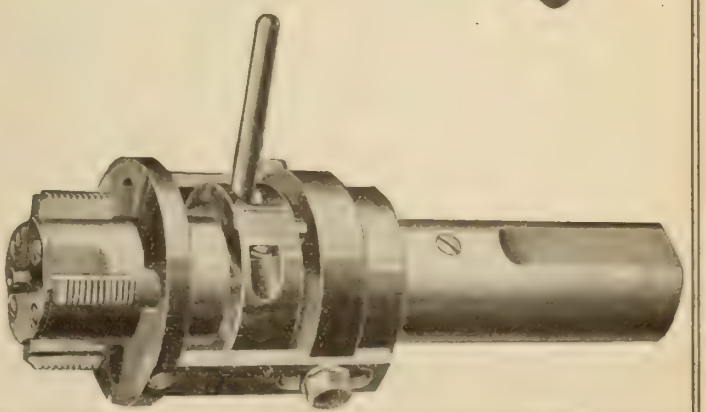

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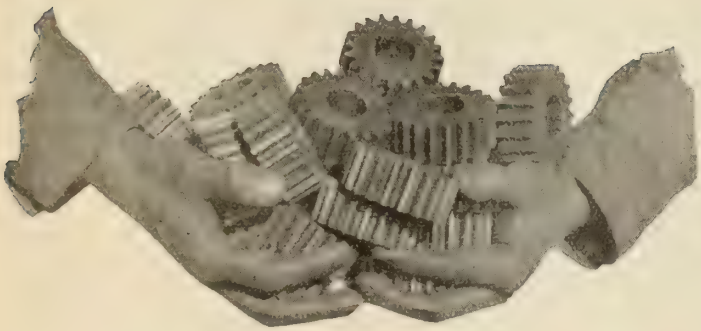

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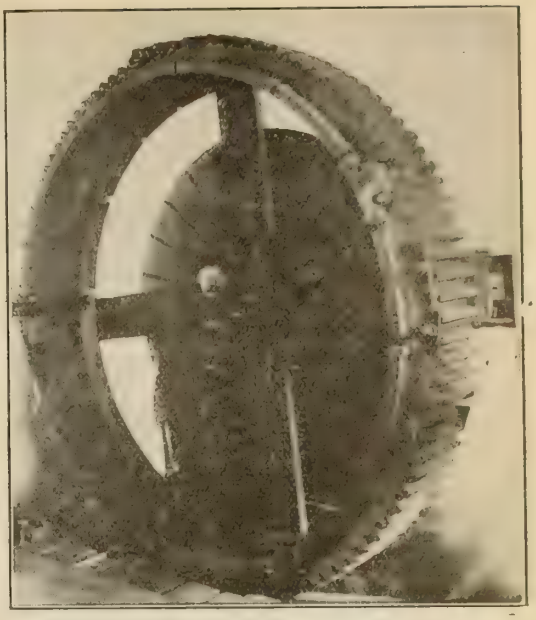

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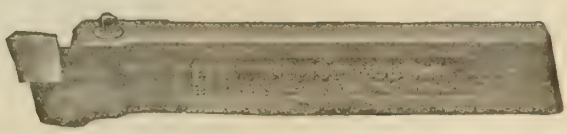

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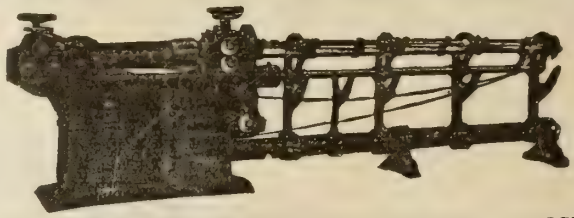

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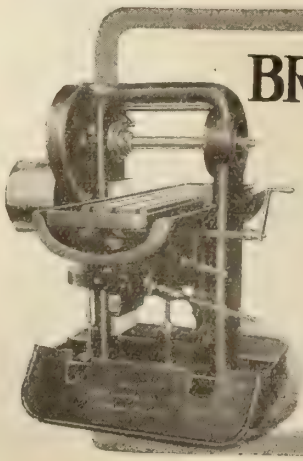

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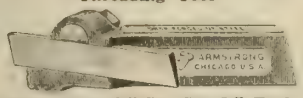

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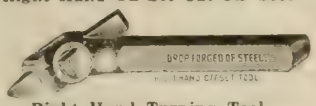

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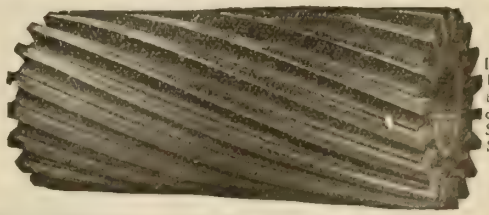

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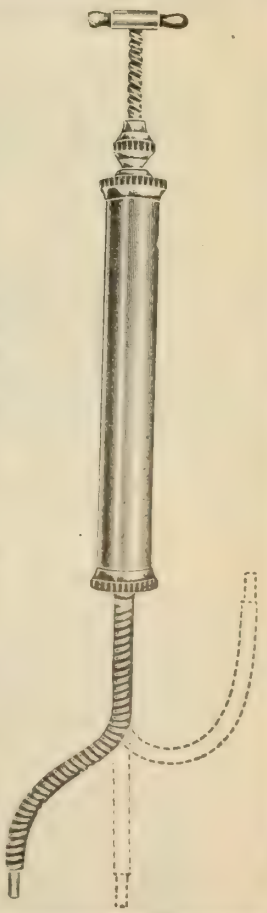

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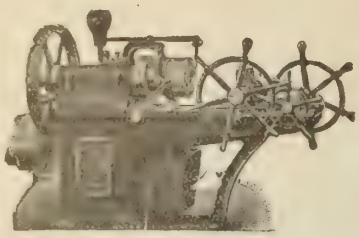

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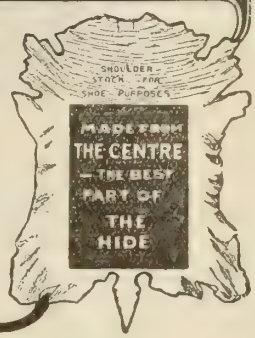

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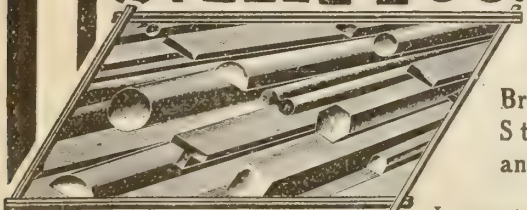

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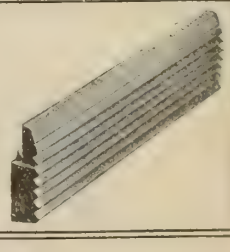

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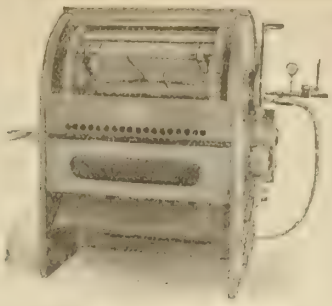

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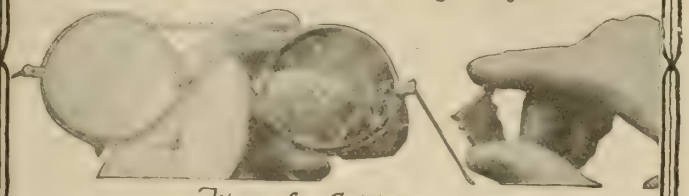

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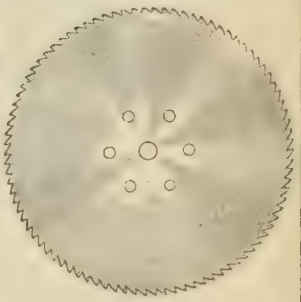

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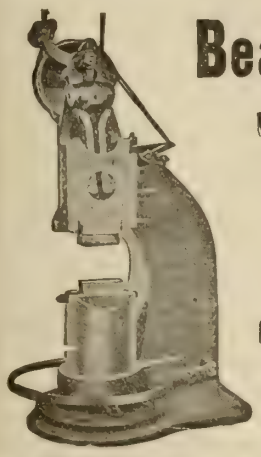

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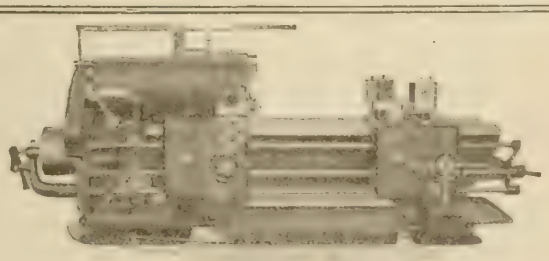

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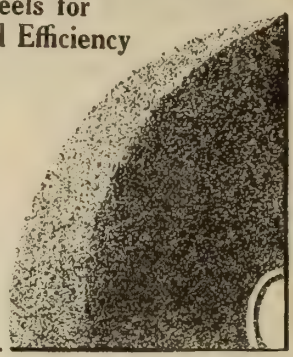

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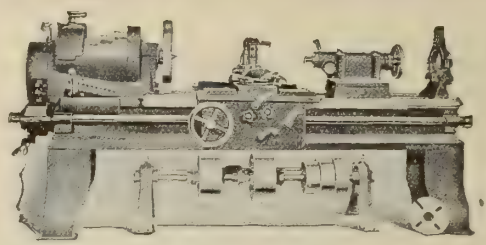

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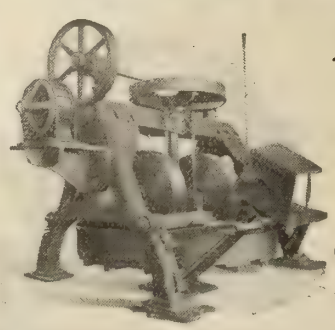

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Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Warnesboro, Pa

CHUCKS, MACHINE MILLING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAMPS, BELT
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

CONVEYORS, OVERHEAD
Beatty Bros., Fergus, Ont.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blaneke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

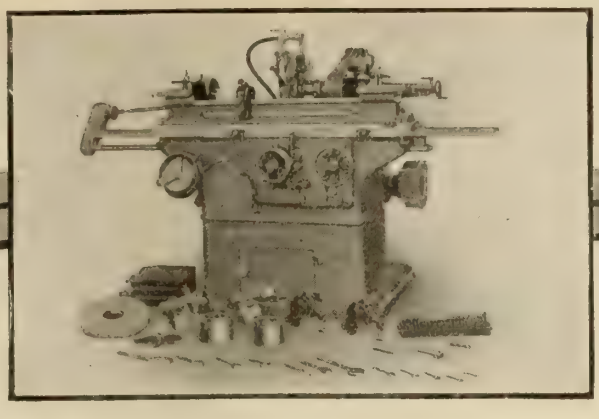
COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.



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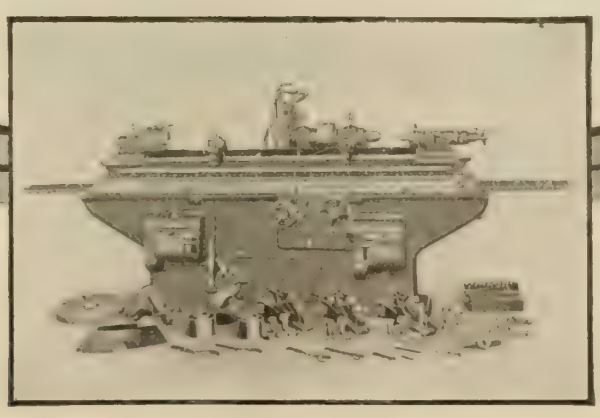

Brown & Sharpe Mfg. Co.

Providence Rhode Island U.S.A.

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found'a & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING
B. F. Sturtevant Co, Galt, Ont.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIES, CUTTING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, METAL STAMPING
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRAWING INSTRUMENTS
Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES
Hughes, Owens Co., Ltd., Montreal, Que.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

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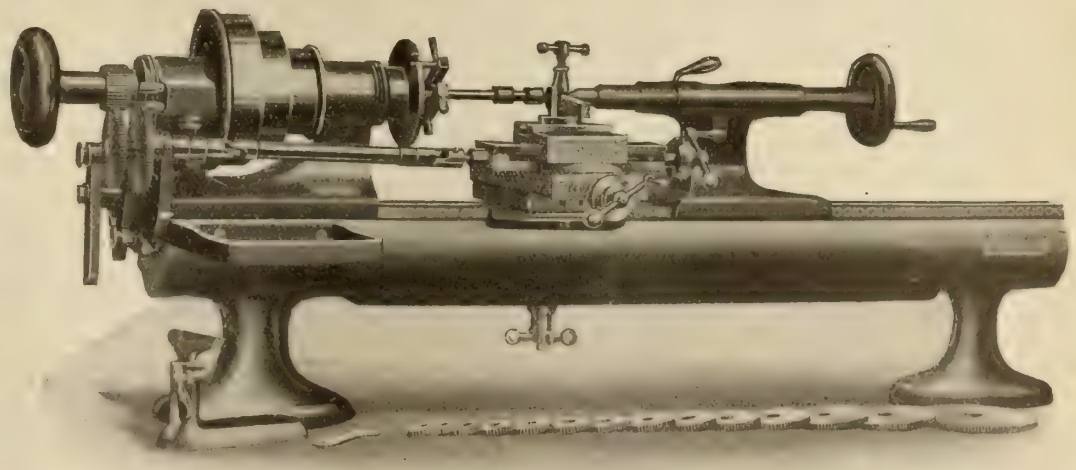

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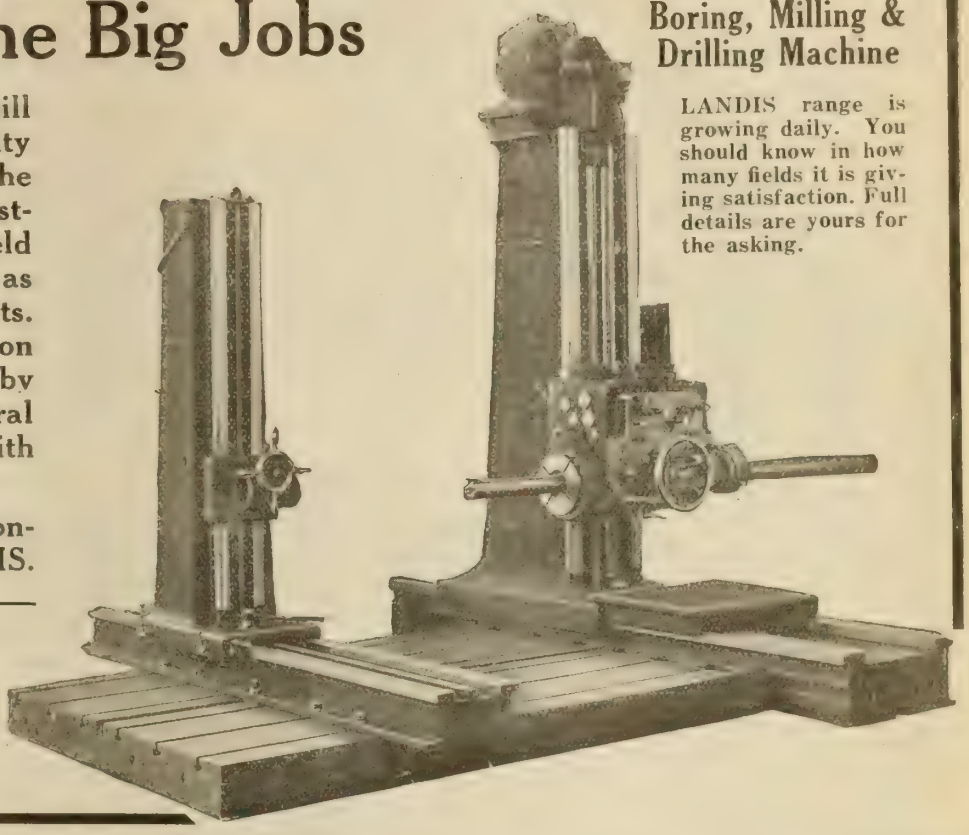

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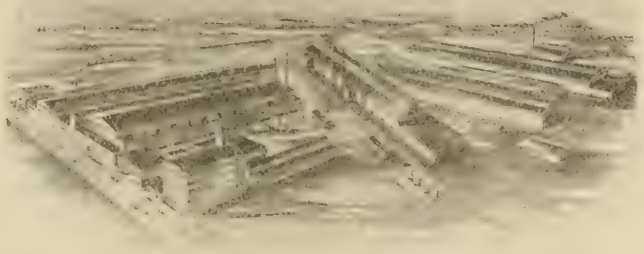

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Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal.

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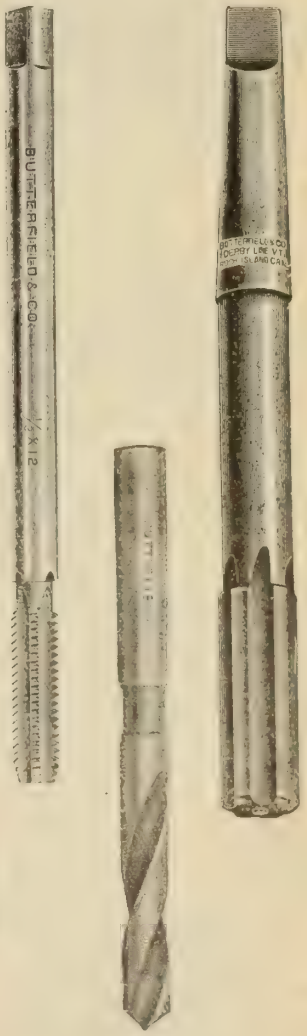

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MOTORS, PNEUMATIC
Cleveland Pneumatic Tool Co., Toronto.

MOULDS, RUBBER
Hoggson & Pettis Mfg. Co., New Haven, Conn.

MULTIPLE INDEX CENTRES
Garvin Machine Co., New York.
Graton & Knight Mfg. Co., Worcester, M.

MULTI-DRILLING, MULTI-BORING, MULTI-TAPPING MACHINERY,
Nat. Automatic Tool Co., Richmond, Ind.

INDUSTRIAL SITES
City of St. John, Quebec.

MUNTZ METAL
Brown's Copper & Brass Roller Mills, New Toronto, Ont.

MUSIC WIRE
Blancke Co., L. C., New York City.

NAIL SETS
Morrow Screw & Nut Co., J., Ingersoll, Ont

NAME PLATES, BRONZE, ETCHED AND STAMPED
Matthews & Co., Jas. H., Pittsburgh, Pa.
Pritchard-Andrews Co., Ottawa, Ont.
Turner Brass Works, Sycamore, Ill.

NICHROME CASTINGS
Can. Driver-Harris Co., Ltd., Walkerville.

NICKEL
Baker & Co., Inc., H., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

NICKEL STEEL
See Steel.

NIPPLE HOLDERS
Curtis & Curtis Co., Bridgeport, Conn.

NIPPLE THREADING MACHINES
Hall & Sons, Ltd., John H., Brantford.
Landis Machine Co., Waynesboro, Pa.

NITROGEN
Carter Welding Co., Toronto, Ont.

NUTS, STEEL, CASTELLATED AND COLD PRESSED
Galt Machine Screw Co., Ltd., Galt, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Williams & Co., J. H., Brooklyn, N.Y.

NUTS, SEMI-FINISH AND FINISHED
Galt Machine Screw Co., Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Wilkinson & Kompass, Hamilton.

NUT BURRING AND NUT MACHINES (HOT)
National Machy. Co., Tiffin, Ohio.

NUT FACING AND BOLT SHAVING MACHINES
Garvin Machine Co., New York.
National Machinery Co., Tiffin, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

NUT TAPPERS
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
Hall & Son, J. H., Brantford, Ont.
Jardine & Co., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

OIL SEPARATORS
Can. Fairbanks-Morse Co., Montreal.

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Aikenhead Hardware Co., Toronto, Ont.
Carborundum Co., Niagara Falls, N.Y.
Norton Co., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

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Oliver Machy. Co., Grand Rapids, Mich.

OIL STORAGE SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.

OPENING DIE HEADS
Greenfield Tap & Die Corp, Greenfield.
Wells Bros. of Canada, Galt, Ont.

OPTICAL SUPPLIES
Consolidated Optical Co., Toronto, Ont.

OSCILLATING VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co. of Canada, Toronto.

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Brantford Oven & Rack Co., Brantford.

OVEN TRUCKS, STEEL
Brantford Oven & Rack Co., Brantford.
MacKinnon Steel Co., Sherbooke, Que.

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Welding & Supplies Co., Montreal, Que.
Brantford Oven & Rack Co., Brantford.

OXY-ACETYLENE WELDING AND CUTTING AND OUTFITS
Carter Welding Co., Toronto, Ont.
Prest-o-Lite Co., Inc. Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
St. Lawrence Welding Co., Montreal, Que.
Welding & Supplies Co., Montreal, Que.

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Nat. Electro Products Ltd., Toronto, Ont.

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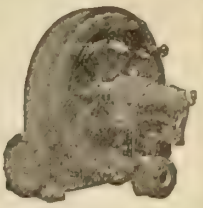
Planing Mill Fan

No. 2 Vacuum Cleaner

Sturtevant (TRADE MARK)

SYSTEMS

Autoforce Ventilator



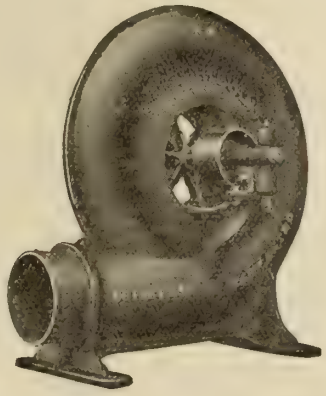
Steam Turbine

Electric Propeller Fan

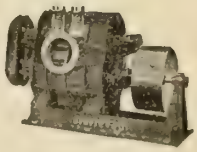
Sturtevant (TRADE MARK)

STEEL PRESSURE BLOWERS

Medium Pressure Blower



Low Pressure Blower

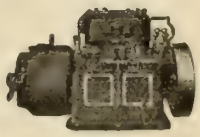


High Pressure Blower

For All Purposes

THO designed originally for supplying air to cupolas and forges Sturtevant steel pressure blowers are now used for all purposes where pressures up to 16 ounces to the square inch are to be maintained; and where air is to be forced for long distances. Regularly built with horizontal discharge but can be readily made for down blast or up blast. Built in all sizes and may be belt, motor, engine, or turbine driven. Operating and upkeep cost is remarkably low as proven by actual performance in many long term (30 years and more) installations. Design and construction are typically Sturtevant—supreme! Blast wheel is made of refined steel and galvanized to prevent rust. Wheels are accurately balanced and run smoothly when driven at high speed. Bearings are each cast in one piece and are lined with highly durable non-heating white metal. Write for catalogue.

Volume Blower and Exhauster



Gasolene Generating Set

Turbo-Blower

Direct Current Motor

B. F. STURTEVANT COMPANY of Canada, Ltd.

Factory and Main Office
Galt, Ontario

Sales Office: Toronto,
Montreal, Winnipeg

Type H Air Washer

Fuel Economizer

Sturtevant (TRADE MARK)

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Heater

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Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

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See Guards

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MacKinnon Steel Co., Sherbrooke, Que.

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Oliver Machy. Co., Grand Rapids, Mich.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PATTERN MAKERS' LATHES
See Lathes.

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Marion & Marion, Montreal.
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Greenleafs, Ltd., Belleville, Ont.
Marten Machine Co., Hamilton, Ont.

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Steel Co. of Canada, Ltd., Hamilton, Ont.

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Morrow Screw & Nut Co., J., Ingersoll, Ont

PINS, BELT-LACING
Clipper Belt Lacer Co., Grand Rapids.

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International Malleable Iron Co., Guelph

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Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
Hall & Sons, John H., Brantford.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
McDougall Co., R., Galt.
Wells Bros. Co. of Canada, Galt, Ont.
Williams Tool Co., Erie, Pa.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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William Hamilton Co., Peterboro, Ont.

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PLANER JACKS
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Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
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Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

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Rice Lewis & Son, Toronto, Ont.
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Ford-Smith Machine Co., Hamilton, Ont.
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Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co. Toledo.
Williams & Wilson, Ltd., Montreal, Que.

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Williams Machy. Co., A. R., Toronto.
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Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
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Williams Machy. Co., A. R., Toronto.
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Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

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Marshall, Son & Blunney, Toronto.
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Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
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Niles-Bement-Pond Co., New York.
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Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
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Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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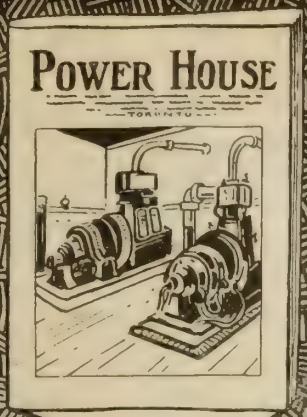
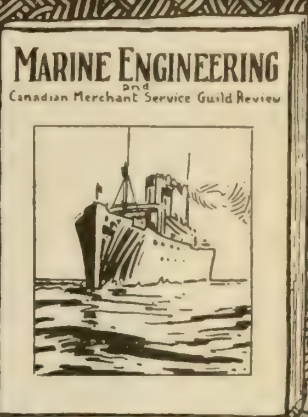
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.





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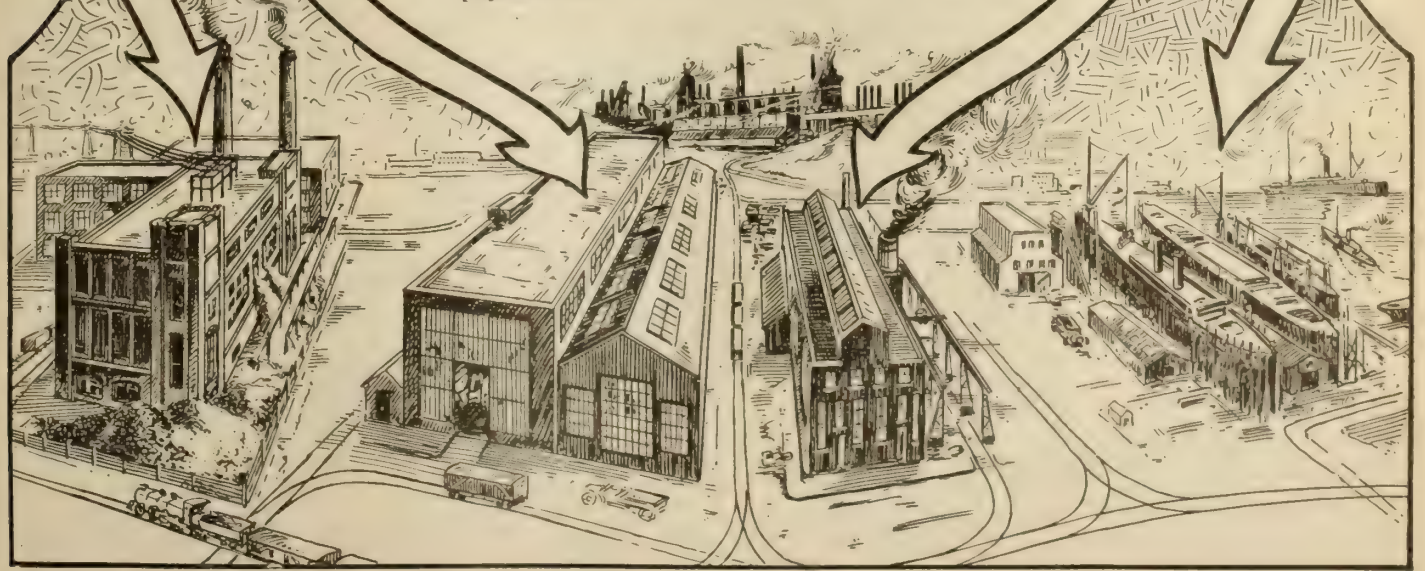

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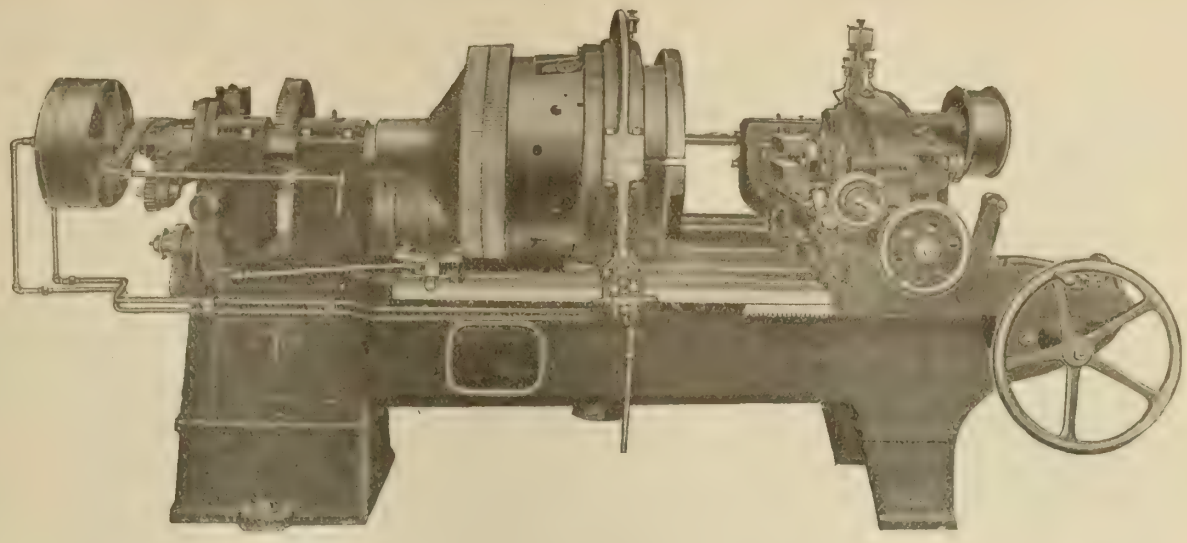

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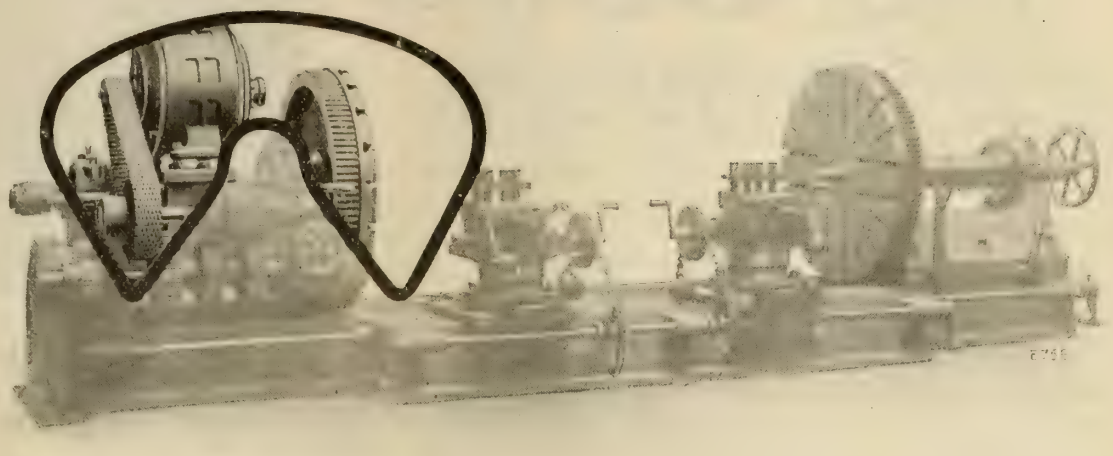

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Foss MACHINERY AND MILL SUPPLIES

Tungsten
Hack Saw Blades

They master all cutting-off difficulties. Efficiency and economy are the two things that every manufacturer is working for to-day, and TUNGSTEN HACK SAW BLADES, from this standpoint, are the best that can be bought.

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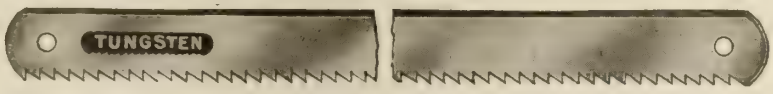

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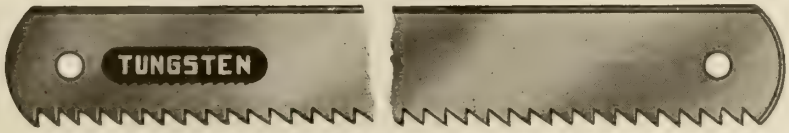
For "Racine" and all heavy duty machines



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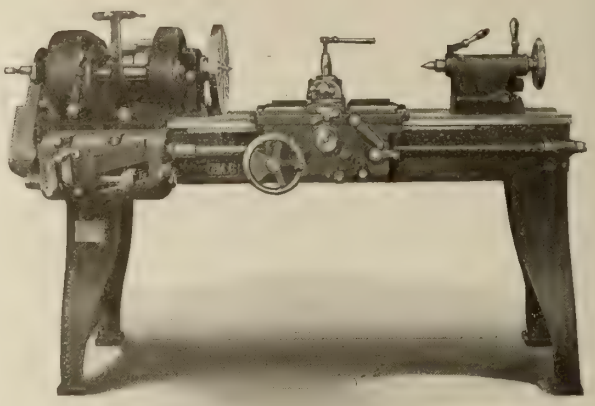

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GREAT and SMALL

Are of the same standard of quality—the best. Our 36″ Engine Lathe shown at the bottom of this advertisement is built with the same care and thoroughness as the fine 14″ tool maker's lathe illustrated above. The smaller lathe has the same proportionate strength and rigidity as the big brother.

Proper design, good material, skilled workmanship and rigid inspection result in that standard of perfection synonymous with our trademark C.M.C.

Intermediate sizes are of equal quality and share in the enviable reputation.

CANADA MACHINERY CORPORATION
LIMITED

GALT **ONTARIO**

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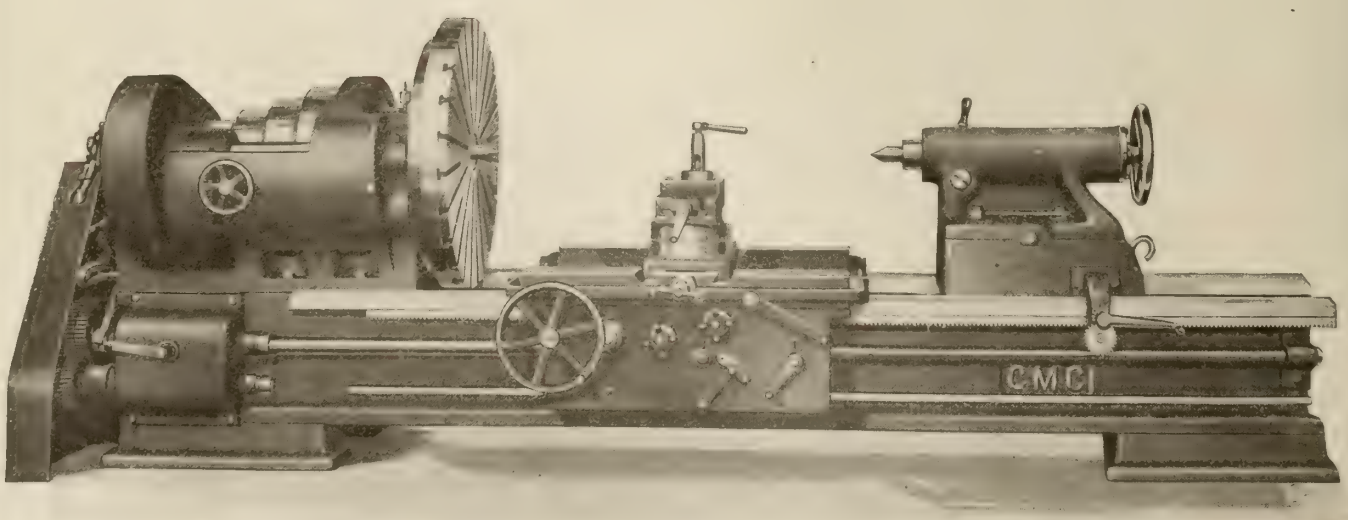

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
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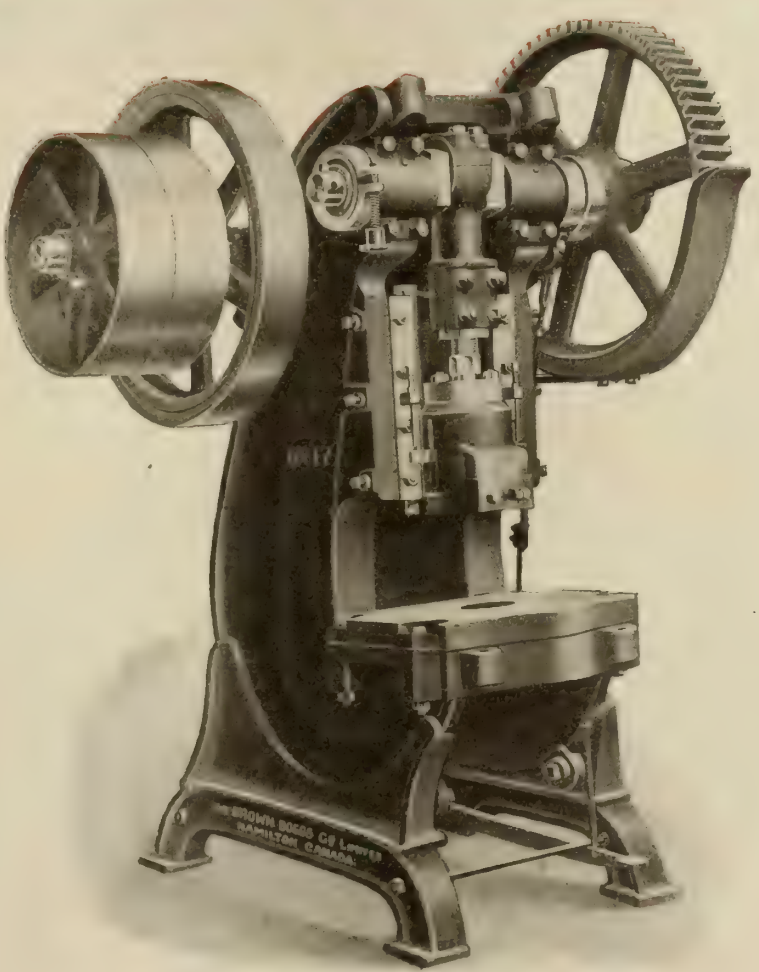

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If you want maximum production install "BB" Presses. Shafts are made from high grade carbon steel forgings carefully heat treated. All wearing parts of clutch are tool steel. Clutch is four point instantaneous type.

The Brown-Boggs Co., Limited
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The Better the Man, the More He Appreciates Them—

Not only good when new, but heat treated and seasoned to maintain this goodness. Can be ground on face of cutting edge without affecting their size. That's why you'll find Pratt and Whitney Stay Bolt Taps on the job long after cheaper "just as good" tools are buried in the scrap pile.

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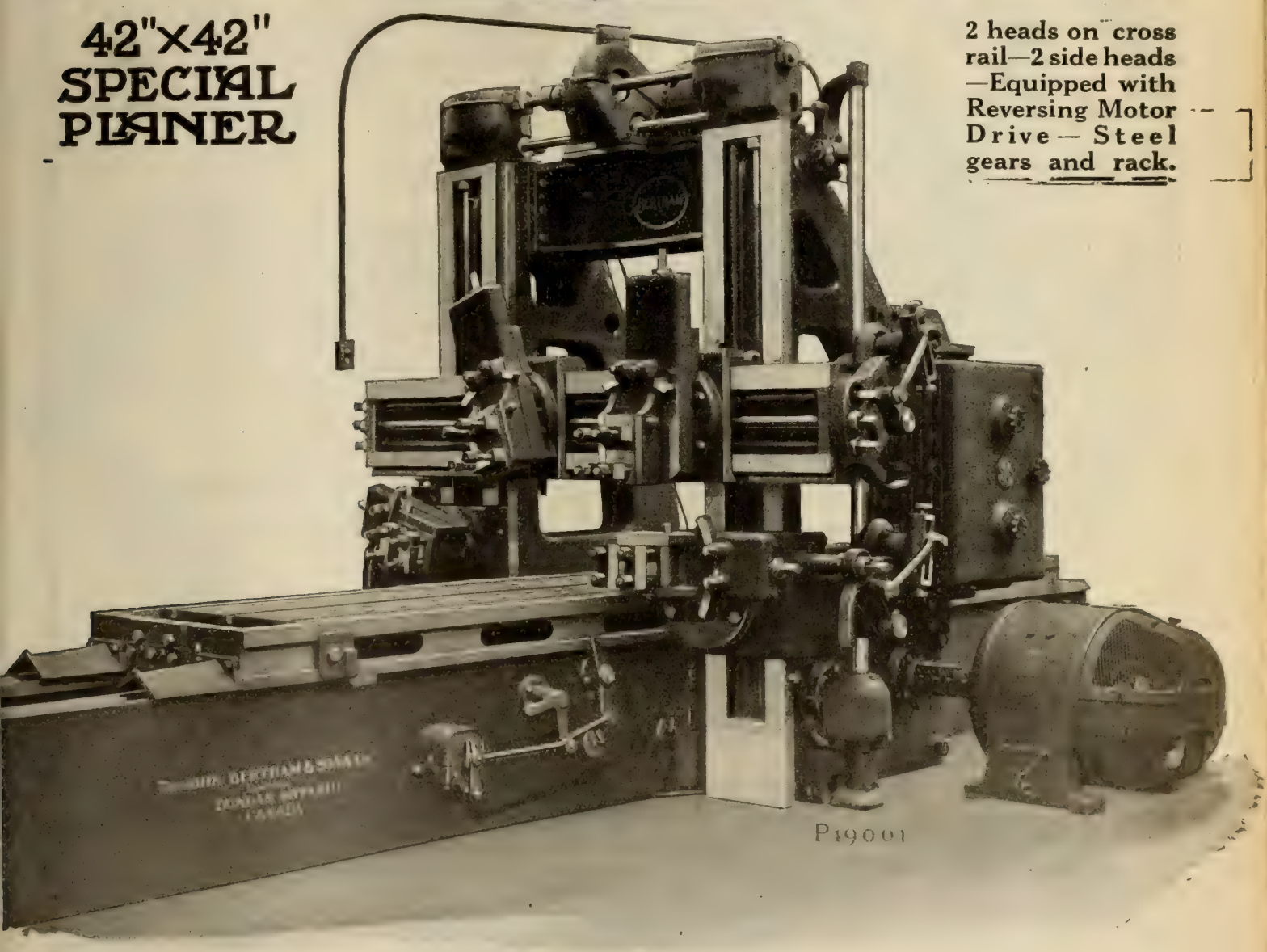
42"x42" SPECIAL PLANER

2 heads on cross rail—2 side heads —Equipped with Reversing Motor Drive — Steel gears and rack.



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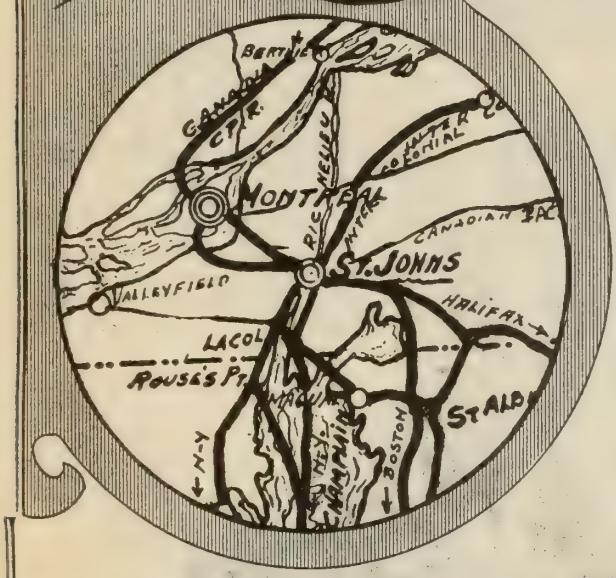
The City of ST. JOHNS, QUEBEC



ITS LOCATION

It is located in the Province of Quebec which, as regards industries, is to Canada what New England is to the United States. (It is 27 miles, or 45 minutes, from Montreal).

ITS RAILWAYS

The two big railroad systems (double track) of Canada, the Canadian Pacific and the Grand Trunk Railways, pass through St. Johns, where merchandise can be shipped and exported anywhere upon the globe with dispatch. These railways are connected by a terminal switching system: charges at exceedingly low rate. All Eastern U.S. railroads are connected with St. Johns.

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For more specific information write to

The Secretary of the City Council
St. Johns, Quebec, Canada

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Steel and
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OF
CANADA
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Railway
Fastenings

Wrought
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Pole Line
Hardware

Screws & Nails

Bolts Nuts & Washers

Wire & Wire Products

If interested tear out this page and place with letters to be answered.

General View of the Plant of the Algoma Steel Corporation from the Waterfront.

ANNOUNCEMENT

THE ALGOMA STEEL CORPORATION, LIMITED, take pleasure in announcing to their customers and the Canadian trade that in accordance with the widespread desire throughout the Dominion that there should be obtained in Canada with Canadian labor, a much larger proportion of the requirements of this country in STEEL SECTIONS for STRUCTURAL PURPOSES, CAR CONSTRUCTION, SHIPBUILDERS' REQUIREMENTS, etc., they are just completing extensive alterations and additions to their rolling mills, and on or about 1ST NOVEMBER, will be ready to produce and ship American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼" x 1¼", ZEE BARS for car builders and general purposes, small and large ROUNDS and SQUARES, and FLAT BARS up to 14" wide. The quality of the product is already well known to the trade, and is exclusively steel made by the Open Hearth process. and can be furnished in all grades from the softest rivet stock to high carbon special spring material.

The following are the sections which will be rolled:---

ANGLES—Equal Leg—
6 x 6"—5 x 5"—4 x 4"
3½ x 3½"—3 x 3"
2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

CHANNELS—
15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
2 11/16 x 3 x 2 11/16 x ¼"
2¾ x 3 1/16 x 2¾ x 5/16"

ROUNDS—
All sizes from ½" up to and including 4".

SQUARES—
All sizes from ½" up to and including 3".

FLATS—
All sizes from 1 x ¼" up to and including 14" wide.

MINE RAILS—
All sections from 12 lbs. up to and including 45 lbs. per yard.

PIG IRON—
Machine cast FOUNDRY MALLEABLE and BASIC.

SULPHATE OF AMMONIA.
NITRE CAKE.

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THE BEST THAT MONEY CAN BUY.

WILT HIGH-SPEED AND CARBON TWIST DRILLS are being used in the majority of the largest plants in Canada —and to a large extent **EXCLUSIVELY.**

IT WILL PAY YOU TO BUY AND SELL THEM.

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"IMPERIAL FOURTEEN"

AIR COMPRESSORS

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"Imperial" Fourteens are made for just such work as this, with the same care and attention to details that have always been characteristic of compressors of our make. May we send you a copy of Bulletin 3039 describing these handy little machines?

CANADIAN INGERSOLL-RAND COMPANY, LIMITED

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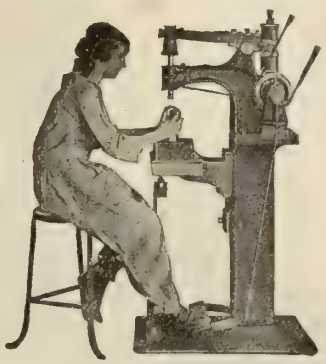
The Hammer With The Human Stroke



HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
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Every Emery Wheel With Its Own Dresser

Desirable, isn't it, now that cost is no objection? For with an inexpensive Desmond-Stephan Dresser for every wheel, every wheel will be touched up frequently and so kept true and equal to its original cutting efficiency.

For all ordinary shop grinding wheels specify **"Diamo-Carbo"** —the perfect diamond substitute.

For large, coarse, hard wheels ask for the **"Desmond-Huntingdon."**

Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

The Desmond-Stephan complete line of Economical Grinding Wheel Dressers is catalogued. Write for copy.

The Canadian Desmond-Stephan Mfg. Company
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Alfred Herbert, Limited, Coventry, Agent for Great Britain

"We have cut our cleaning time more than half"...

"THE OAKITE in that tank does it.

This Advertisement is one of a series based on actual occurrences. M. M.

"The day the Oakite man came here, we were cleaning steel automobile bumpers which were covered with emery and oil. We were about 300 behind and were only turning out about five or six an hour, because we had to brush them.

"The Oakite man made up three tanks with Oakite and we caught up on our back work in *one day*—eliminating brushing—and we have never been a single piece behind since."

In seeking advice on cleaning problems, look for broad experience and ability. It is the surest, safest way to find sound counsel, yes—and plans, methods and materials too, that fit your particular needs.

How may we serve you?

OAKITE MANUFACTURED BY OAKLEY CHEMICAL CO. 44 THAMES STREET · NEW YORK

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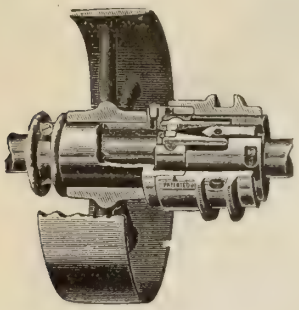
THE JOHNSON FRICTION CLUTCH



Standard Single Clutch with Pulley Mounted on Hub —Clutch Engaged.

MANUFACTURERS who are particular about keeping an established reputation equip all their machines with Johnson clutches. They recognize that superiority must be consistent in order to count. And Johnson clutches assure them of uniformly good service wherever they are installed.

Other clutches might work well in some cases—but Johnson clutches are *sure* for all purposes. We study each application on its own conditions, and build a clutch that is just right for the job.

When you are tired of experimenting, let us have a chance.

WRITE FOR OUR YELLOW DATA SHEETS

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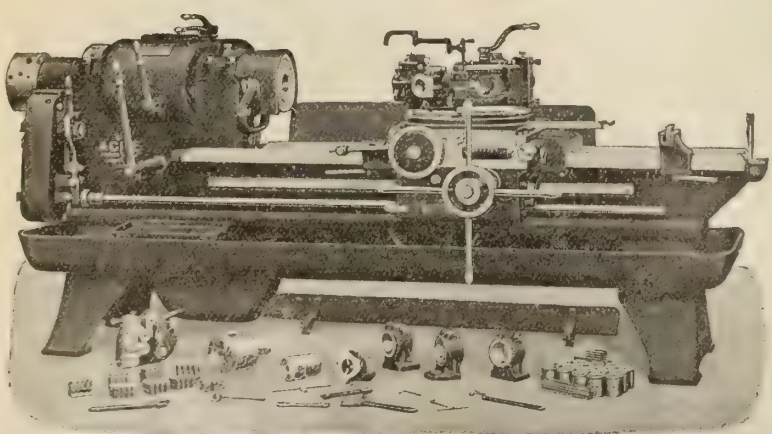
Doubly Efficient—Does Both Bar and Chuck Work

This Cincinnati Acme Flat Turret Lathe is a double-production, geared head machine of the sliding gear type. It operates on minimum power because the only gears running are those doing the actual work.

This machine saves remarkable time and labor machining either bar work or chuck work up to 16 in. diameter.



3¼ in. x 36 in. Flat Turret Lathe, Equipped for Bar Work.

Head is cast solid with the bed. You know what that means: accuracy, rigidity, constant and perfect alignment of spindle with vees, upon which the turret carriage travels.

We also make a full line of Screw Machines and Turret Lathes.

Write for Valuable Bulletin

The Acme Machine Tool Co.
Cincinnati, Ohio

Canadian Agents: Rudel-Belnap Machinery Co., of Montreal and Toronto

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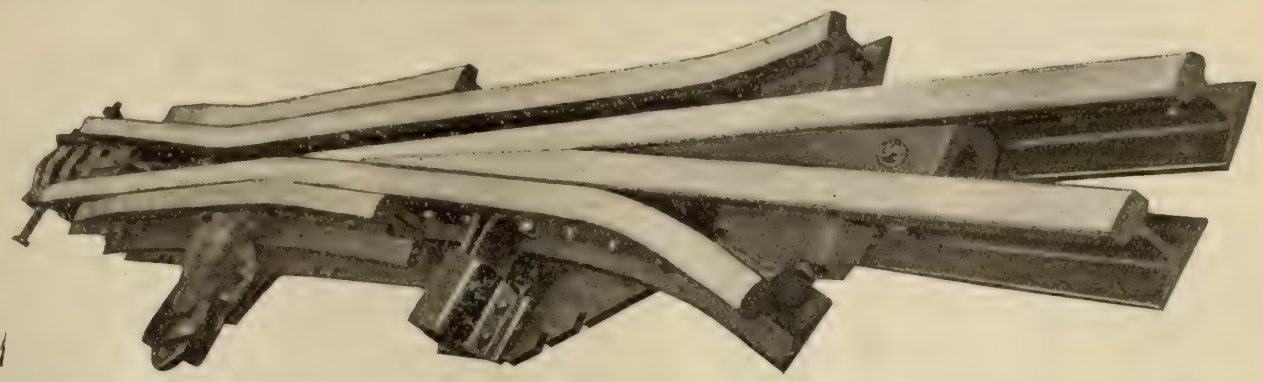
For Steam and Electric Railways



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Manganese-Steel Intersections
Crosses Switchstands

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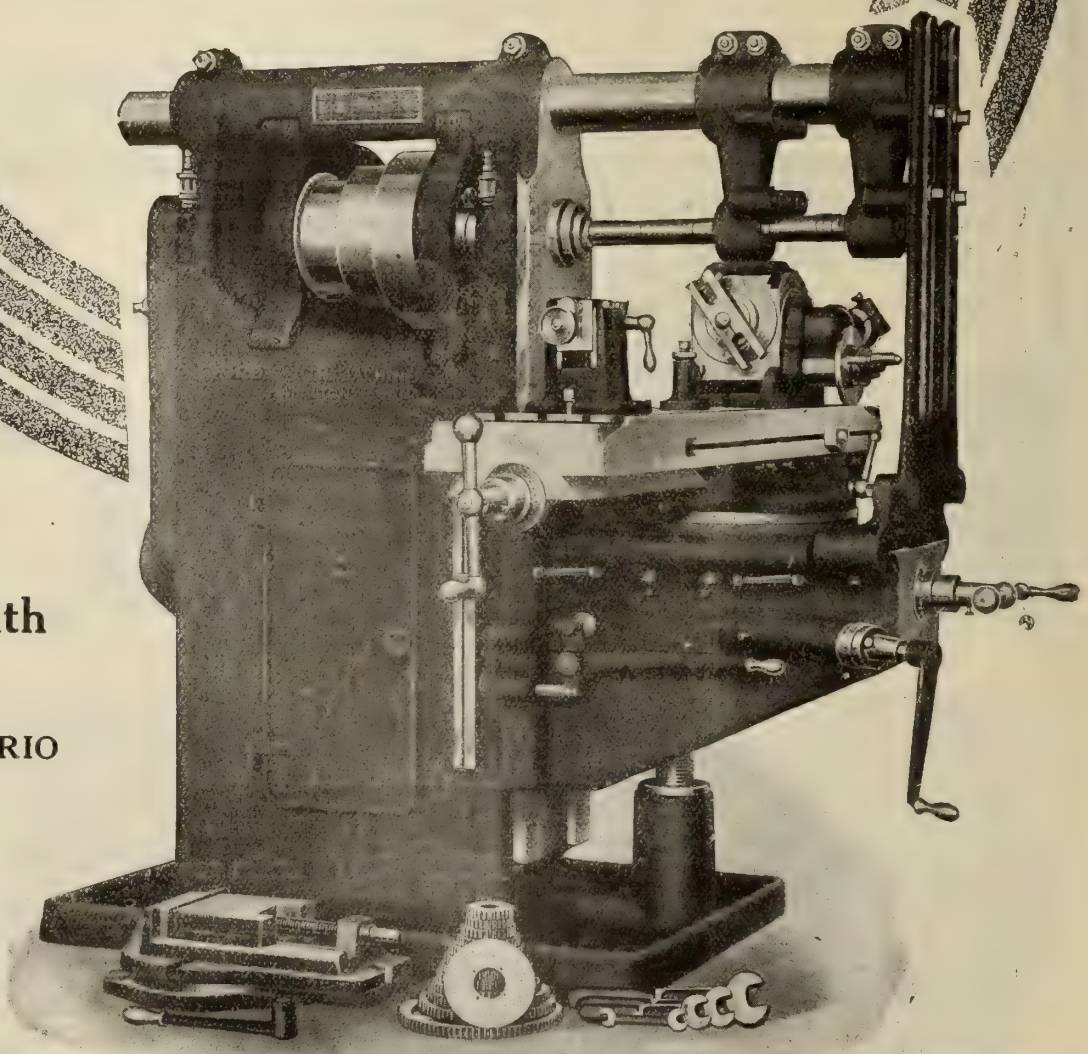
The Miller of high-grade construction—fast, accurate and durable.

Adapted for Heavy Manufacturing or the most exacting tool room service. A suitable Range and Capacity for every class of milling.



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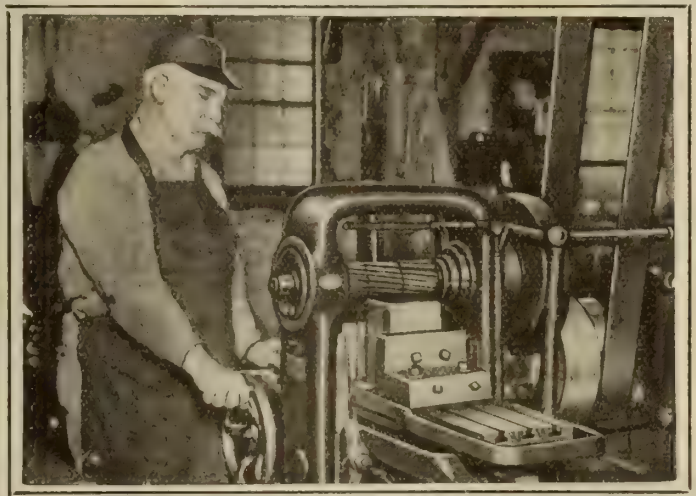
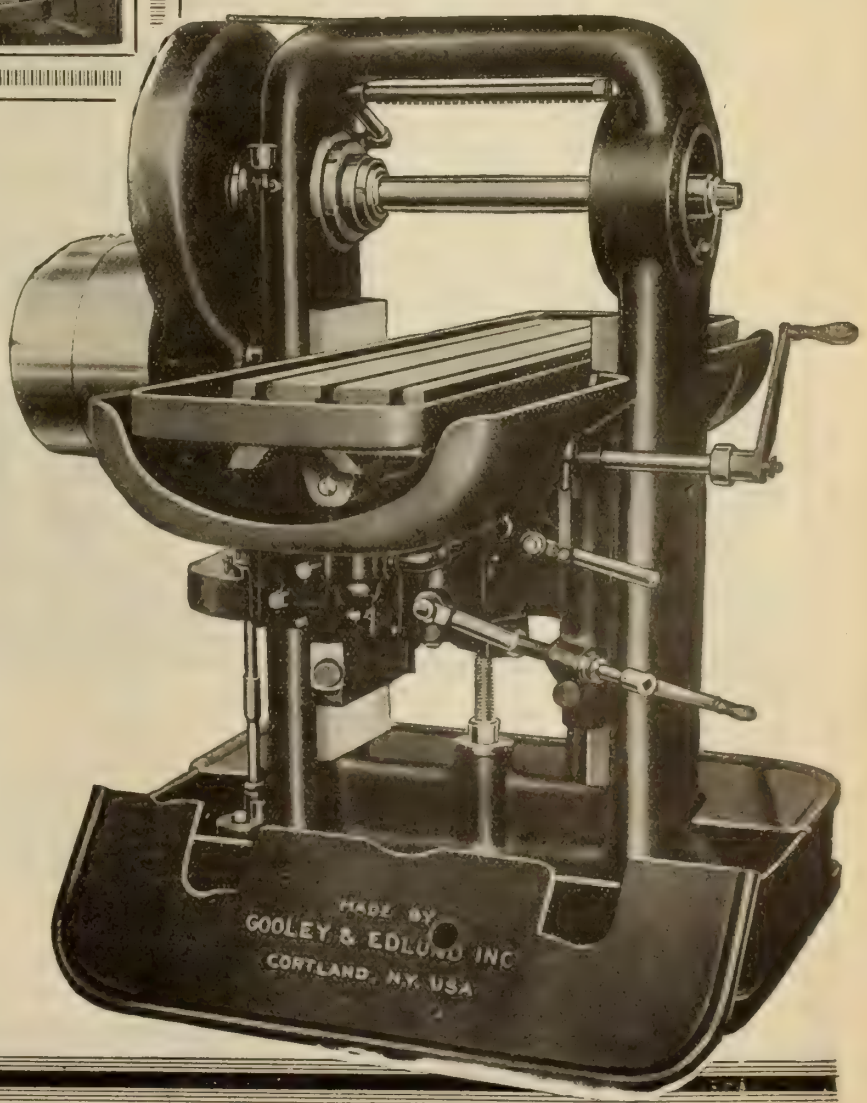
Keeps Five Die Sinkers Going



HERE you see the Briggs Miller Squaring Die-Blocks, and it is working so fast it keeps five die sinkers going.

Some are new, squared from the rough; some are old, annealed, cut down and made over; some are oblong, some square, in sizes up to 9 inches. This Briggs Miller has been squaring blocks for four years; has never given any trouble. When cutters get dull the operator has another gang ready to go on with the work. Unusual rigidity accounts for Briggs' higher efficiency.

Don't you think you could use this tool to advantage in your shop? Write for the details.



Gooley & Edlund, Inc.

Cortland, N.Y., U.S.A.

Garlock Walker Machinery Co., Ltd.
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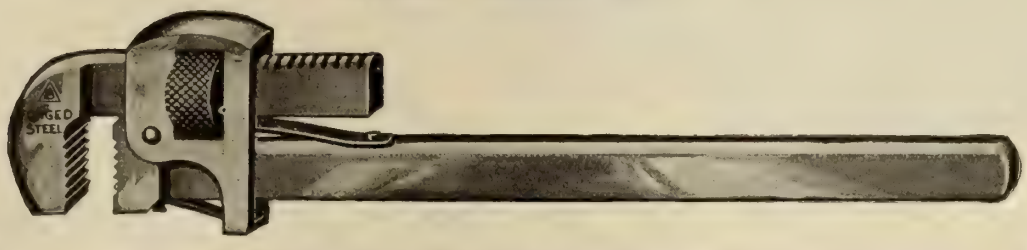
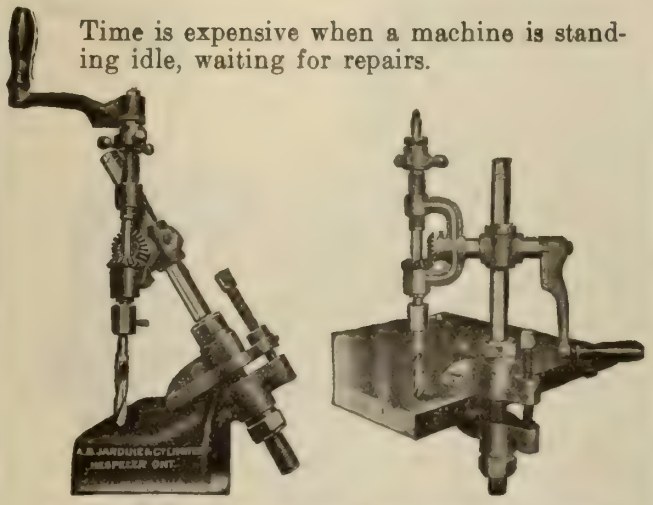


PIPE THE WRENCH—WRENCH THE PIPE

Canadian Billings & Spencer Plant
Welland, Ont.

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net
Sold by all Machinery and Supply Houses

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LOCOMOTIVE AND CAR WHEEL TYRES

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TOOL STEEL

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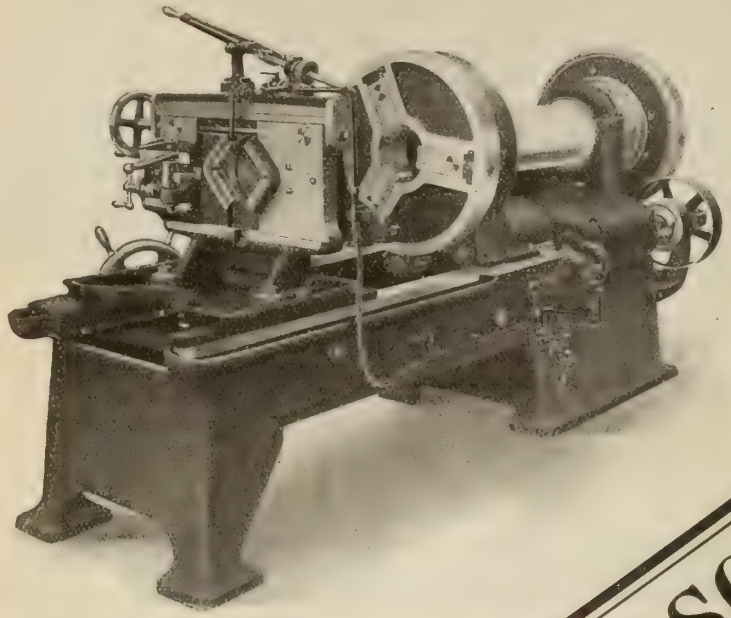

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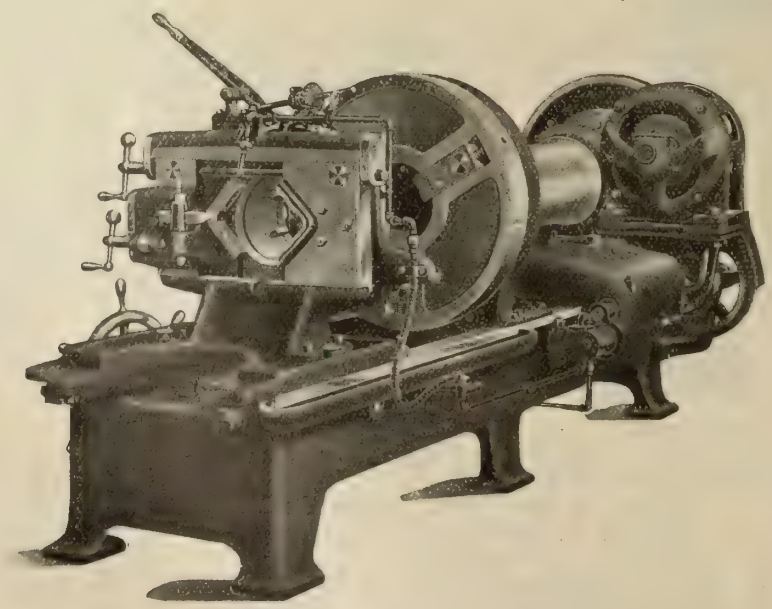

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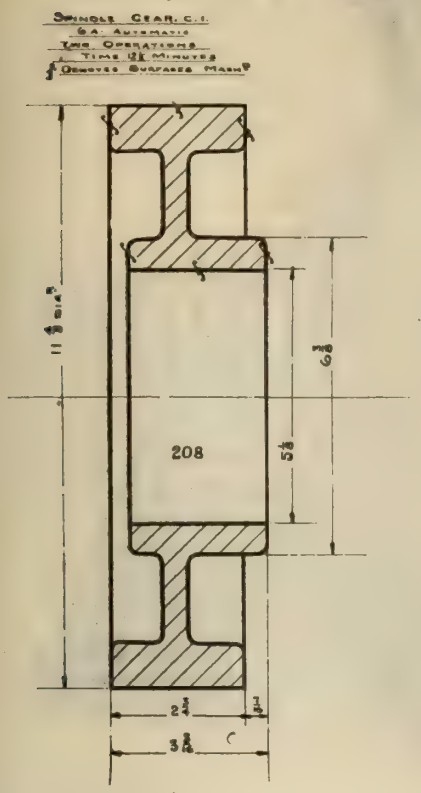


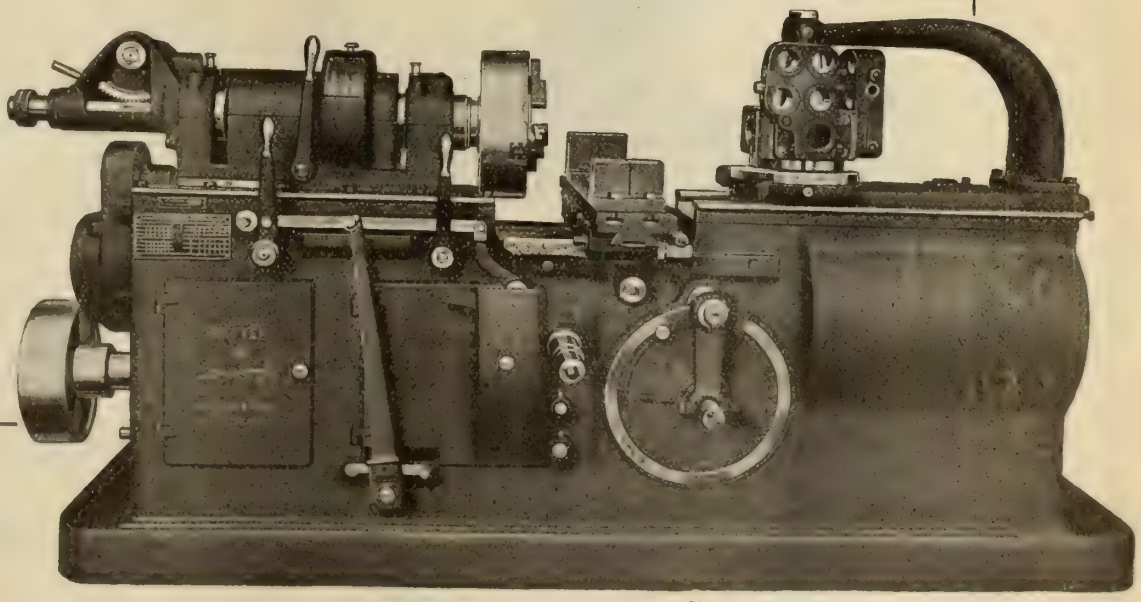
WHETHER you are making gears or flywheels or contemplating doing so, the proposition should look good to you.

The part illustrated is a gear blank and was finished on the Potter & Johnston Manufacturing Automatic Chucking and Turning Machines in two chucking operations.

We could give you the time on this job, but would rather give you figures on some of your own parts.

Send them along.

Bulletin 41



Canadian Offices: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 1501 Royal Bank Building, Toronto, Canada

Works and Warehouse: Galt, Ont., Canada

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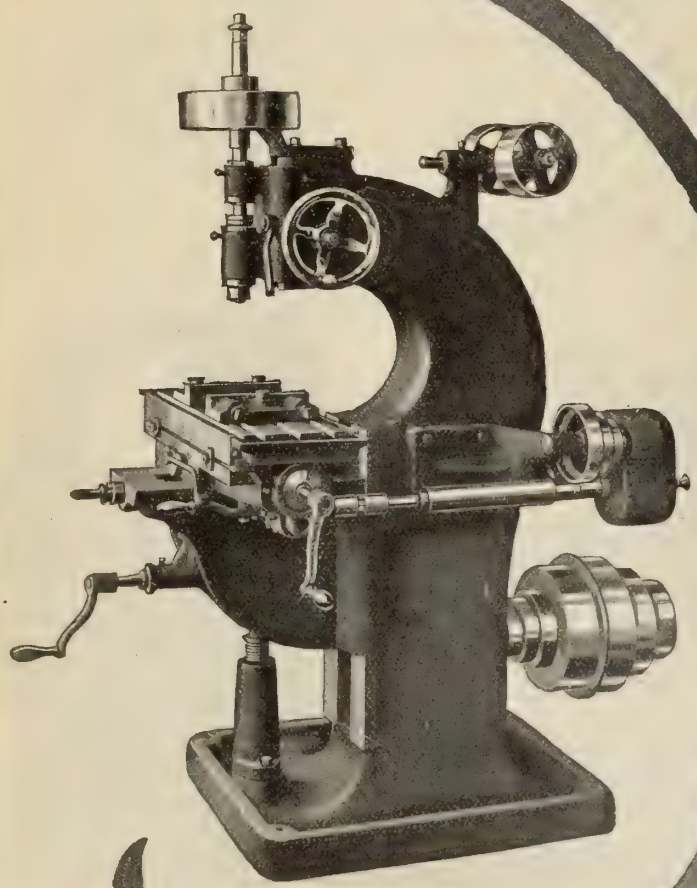
Bristol Vertical Milling Machine

A Tool of Large Capacity



Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
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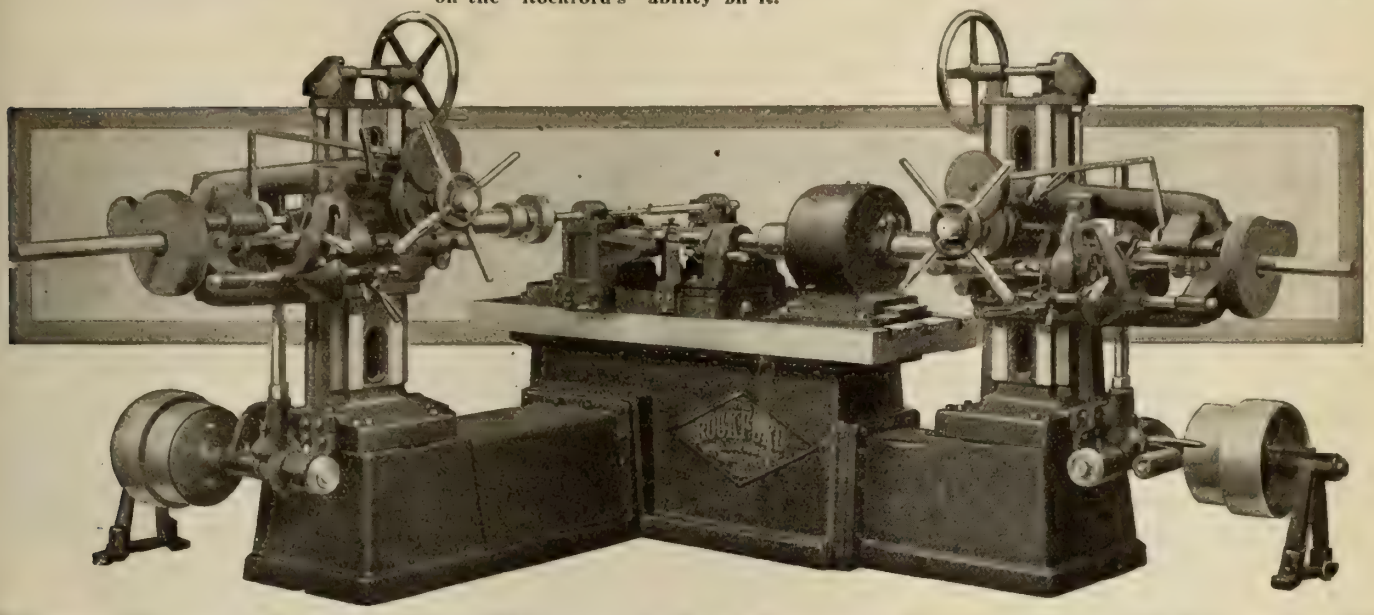
Rockford Horizontal Boring Machine

For Automobiler Manufacture

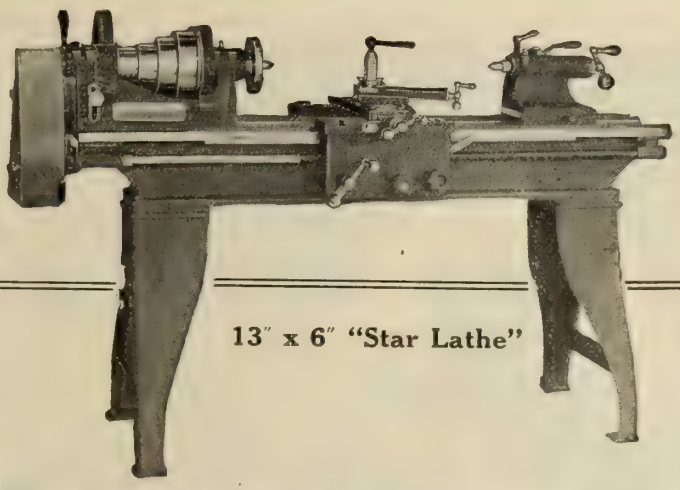
This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



The Rockford Drilling Machine Co., Rockford, Ill.

"STAR" Lathes



13" x 6" "Star Lathe"

The Tool that makes Garage Work and General Repair Work more Profitable

This is a remarkably sturdy lathe for its size, and its ease of operation, handiness, and accuracy all make it an invaluable tool. It does the work of larger and costly machines at a much lower cost.

Write for our new Circular

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Every Commercial Purpose

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ALLOY STEELS, BILLETS, BARS, DISCS, SHEETS, HIGH SPEED STEELS, DRILL RODS, DRAWN BARS, SEAMLESS TUBING, COLD ROLLED STRIP STEEL, WELDING WIRE, WROUGHT AND ROLLED IRON, PIG IRON, STEEL AND IRON ENDS, HOLLOW AND SOLID MINING DRILL STEEL.

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Engineers, Manufacturers and Erectors of Steel Structures

Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.

Structural Steel and Steel Plate Work, and a combination of the two lines.

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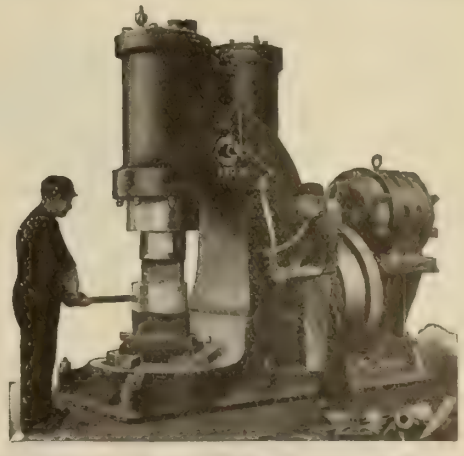
The Nazel Air Hammer

(A Self-Contained Unit)

Noted for Its Blow and Control



The Most Modern Reliable Power Driven Substitute for the Steam Hammer.

Built in 3 types, 6 sizes, arranged for belt or direct motor drive, with capacities up to 7" square for all manner of jobbing, manufacturing and certain classes of die forging. Write for catalogue.

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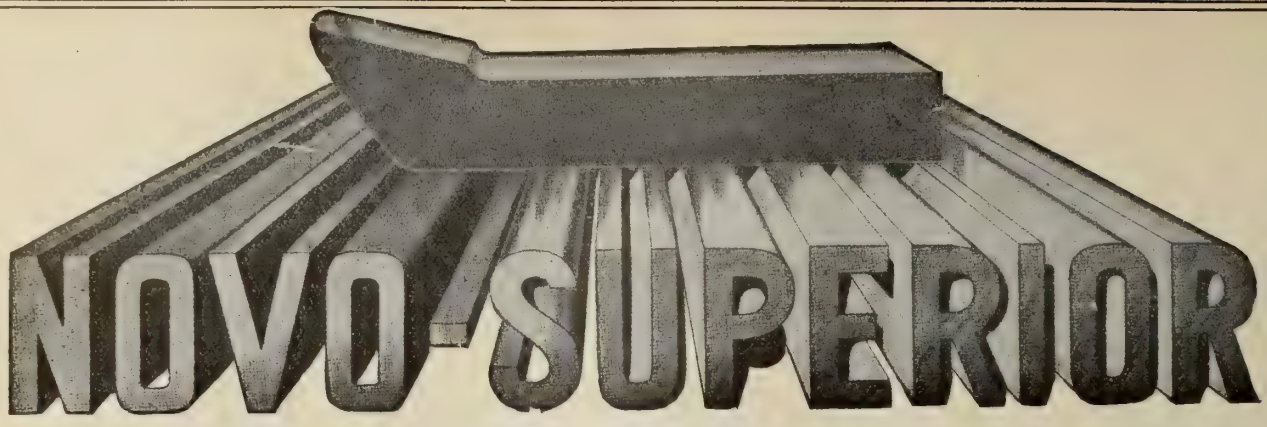

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Tool Steel for Every Purpose

SWEDISH LANCASHIRE IRON.

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.
Music Wire for Springs, Steel Balls
Cold Rolled Tool Steel in Strips and Sheets.

We call to your particular attention that we make a specialty of and solicit your inquiries for
Circular Saws—for wood and for hot or cold metal cutting
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We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and our experts will gladly co-operate to see that you get the design best suited to the purpose.

Dunbar Springs are thoroughly tested for **accuracy** and **quality**. Send us specifications, for estimates.

THE DUNBAR BROS. CO.
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XXX Genuine Arctic Metal

will give satisfactory results in the most troublesome bearings. Will last longer and save many times its cost in repairs. Will reduce your overhead expense.

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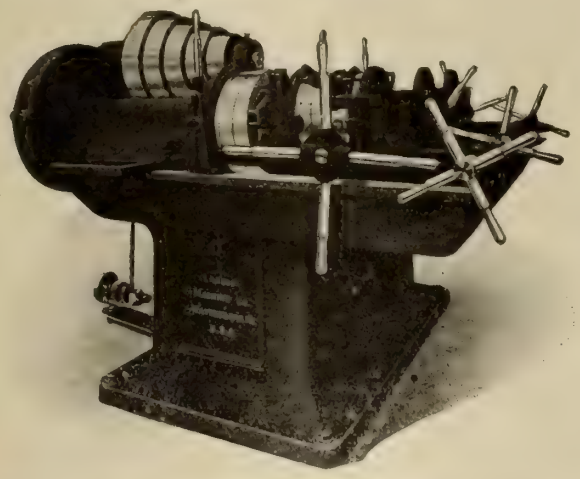
The Landis Die—A Sure Economy Investment

Do you cut threads? If so, are you using the Landis chaser which is tangentially disposed to the stock? This one principle alone makes the Landis entirely distinct from any other threading tool.

The Landis chaser does not rub or push off the thread; it cuts it and the results—more accurate threads, higher production, less consumption of power and less cost per thread.



The chaser is four inches long. When grinding 1/32" is removed, thereby permitting the chaser to be ground from 90 to 120 times. Remember also, that to renew the chaser when dull, grind it only as annealing, hobbing and retempering are never necessary.

A Landis Head or Machine installed in your plant will convince you as it has many others, that it is the correct method of cutting threads, that it is the most productive, and that it is the most economical.

Write for our catalogue—it is free

LANDIS MACHINE COMPANY
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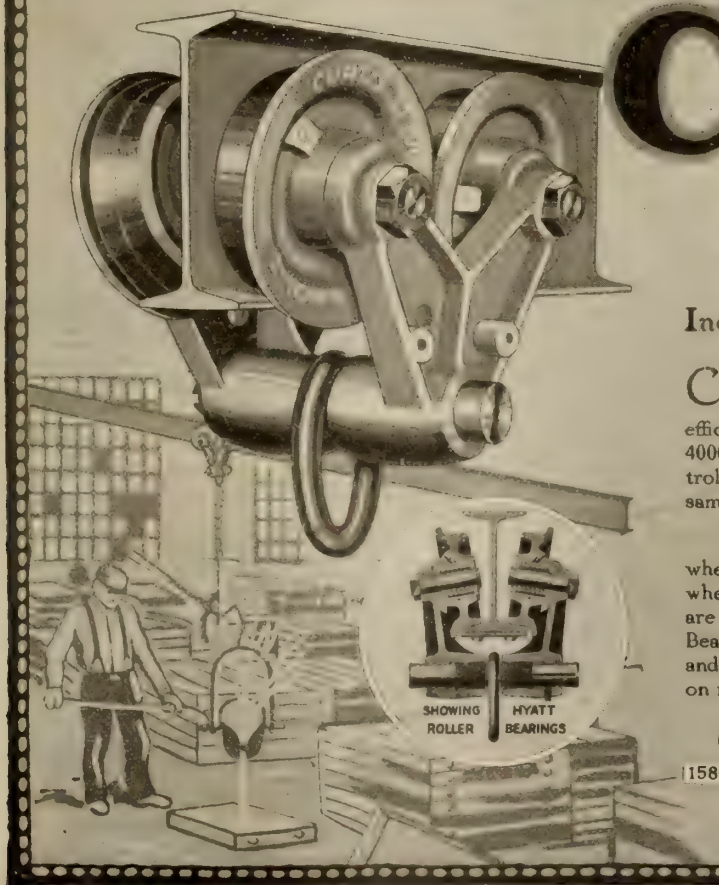

Increase Production—Save Man-Power

CURTIS Single I-Beam Trolleys are being used by progressive firms demanding the highest operative efficiency. A Curtis-Hyatt Roller-Bearing Trolley with a 4000-lb. load can be moved by a 50-lb. pull, while ordinary trolleys require nearly twice as much power to move the same weight.

Curtis Trolleys are constructed with large inclined wheels and self-equalizing steel side-frames—so that each wheel always bears its rightful proportion of the load. They are equipped with shock-absorbing Hyatt flexible Roller Bearings—which make the trolleys easy-starting, easy-rolling and long-lasting. Full information and descriptive literature on request.

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If You Want Production--

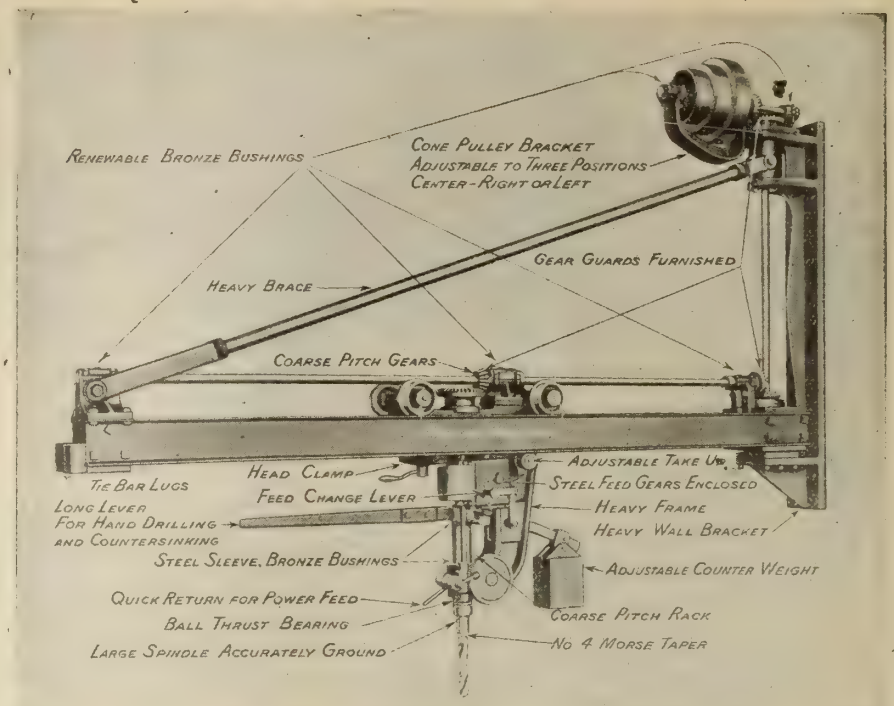
You can't do better than install this Wall Radial Drill in your plant. We'll say you won't have it in operation more than a month before you will begin to congratulate yourself on your judgment in adding this machine to your equipment. Materials and workmanship that you can depend upon to the limit are features of the construction, and our bulletin will give full details.

GET IT TO-DAY!

MADE IN FOUR STANDARD SIZES.

Rated size	Drills to centre of	Wall to end of arm
7 ft.	14 ft. circle	10 ft.
9 ft.	18 ft. circle	12 ft.
11 ft.	22 ft. circle	14 ft.
13 ft.	26 ft. circle	16 ft.

F.O.B. Boston, Mass.



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Built for Service

The Canadian Radial Drill is designed particularly for work in structural shops. For seaming and countersinking large surfaces such as structural shapes, boiler plates, long beams, etc.

Specifications:

Spindle 2 3/16" diameter No. 2 or 3 Morse Taper Spindle travel 8½".
All gears accurately cut and fitted.
Carriage wheels equipped with roller bearings.
14" x 14" tight and loose pulleys or single pulley for belt drive to motor, or direct connected to motor.
15 ft. Beam will drill to 13' 6" centre.
12 ft. Beam will drill to 10' 6" centre.
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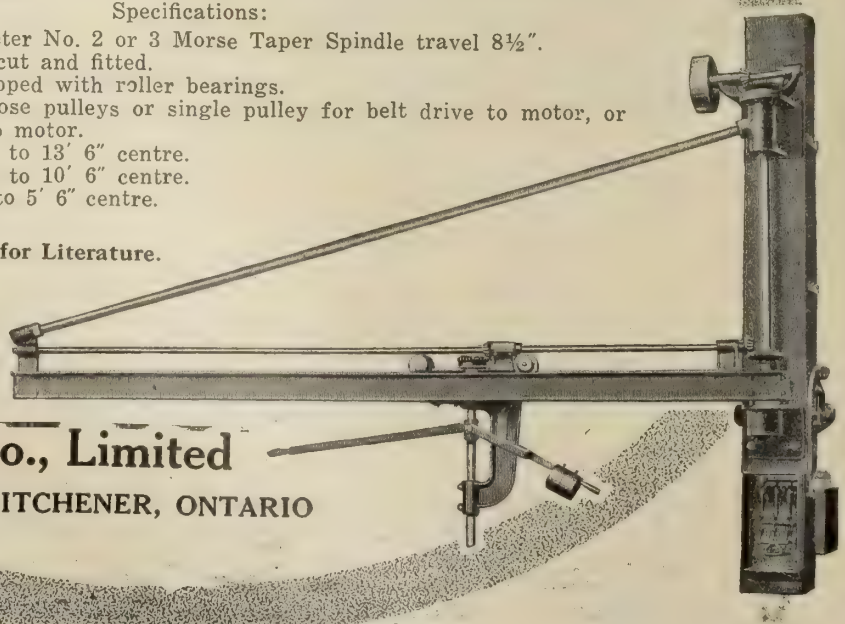
Write Dept. 16 for Literature.



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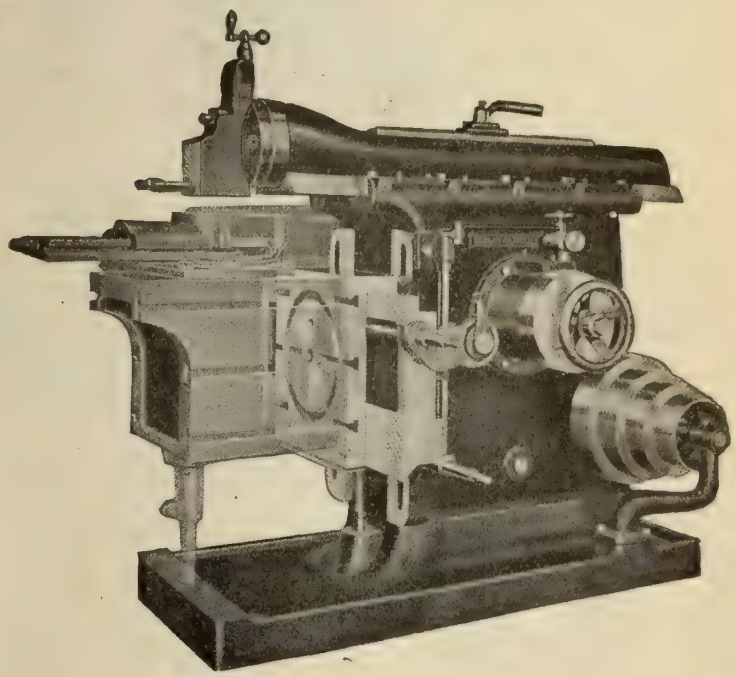
Are needed in Up-to-date Canadian Shops

Milwaukee simplicity, power and accuracy play an important part in turning overhead expense into profitable production.



Milwaukee Back Geared Crank Shapers are built in 16-inch, 20-inch and 24-inch sizes.

MILWAUKEE SHAPER CO.

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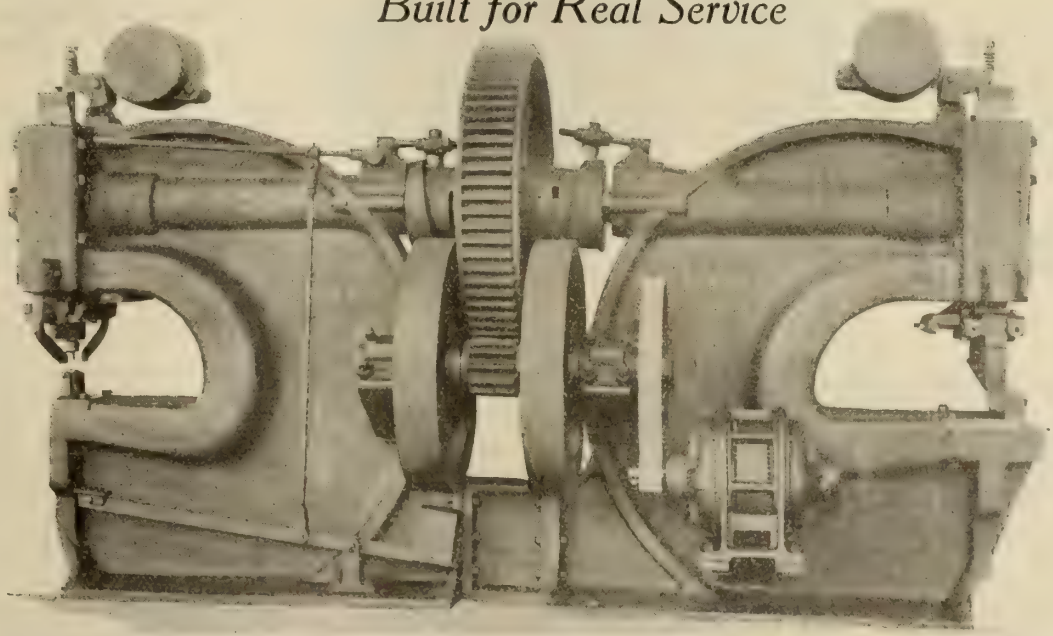
Built for Real Service



We also manufacture High Grade Horizontal and Vertical Rolls, Angle Rolls, Single Punches, Shears, Spruce Cutters Radial Wall Drills or Counter-sinking Machines, Flanging Clamps and Heavy Duty Engine Lathes. *Ask for Catalogue.*

WICKES BROS., SAGINAW, MICH., U.S.A.

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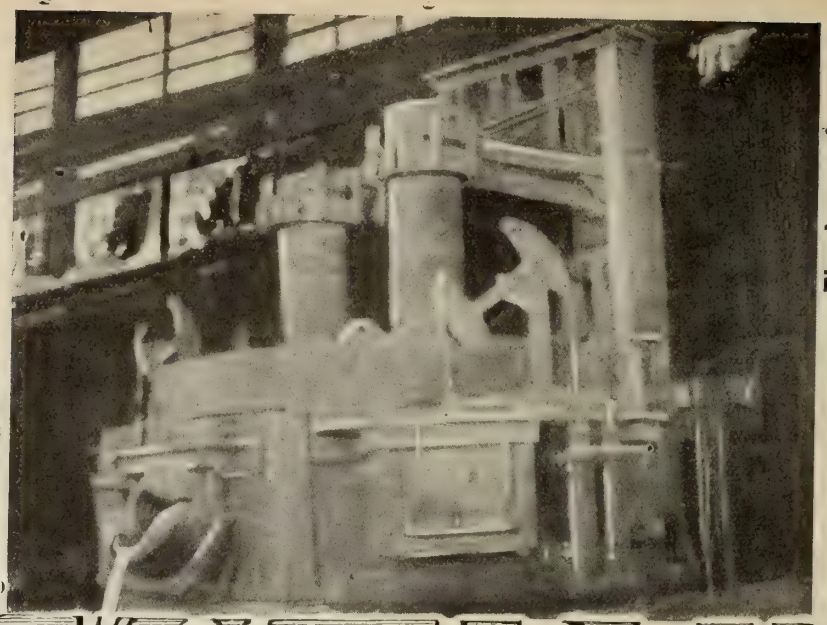

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High Speed Steel

SEVERAL factors combine to make this high-speed steel a triumph of the steel-maker's art; Electric Furnaces — entirely infallible, automatically regulated, delivering the same result time after time.

Uranium — This rare element, cousin to Radium, effects a profound change in the texture and quality of the steel.

Added to these, the constant care and skill of years of steel-making experience make the result of each melt a foregone conclusion.

Latrobe Electric Steel Co.
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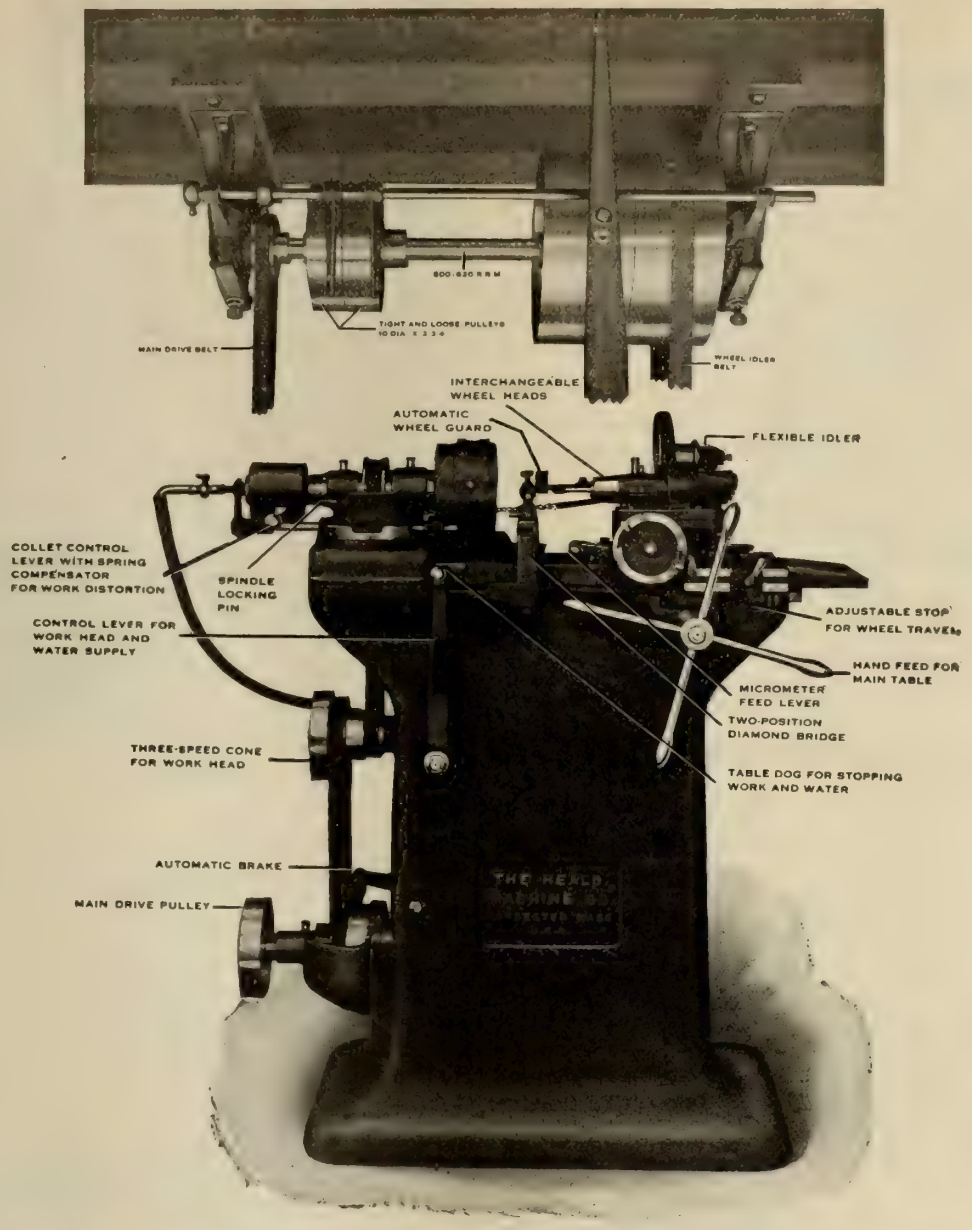

FOR GRINDING SMALL, SHORT WORK

The Heald No. 85 is a new, simple, productive machine for small, short work. It is designed so that movement of the pilot wheel to the right draws the wheel from the work and automatically puts on a brake, stopping the workhead and shutting off the water. It is furnished with a quick-acting collet with a capacity of 3/8″ to 3″ in diameter.

The table is provided with positive stops, enabling the operator to grind up to a shoulder. The machine is also equipped with a flexible idler, automatic wheel guard, water attachments and simple single countershaft.

THE HEALD MACHINE COMPANY

WORCESTER, MASS.

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Why use makeshifts?

WHY waste time and energy with makeshift devices for boring operations when Williams' "Agrippa" Adjustable Boring-Tool Posts offer convenience and efficiency developed to the nth power?

Each post accommodates a wide range of Bars, the height of which is readily adjusted; a turn of the Knurled Ring raises or lowers the base on which they rest. The whole device is instantly and rigidly locked by tightening the Set Screw.

Four sizes for ½ to 2¼" diameter Bars—furnished with or without Bars.

Ask for Machinists' Tools Booklet.

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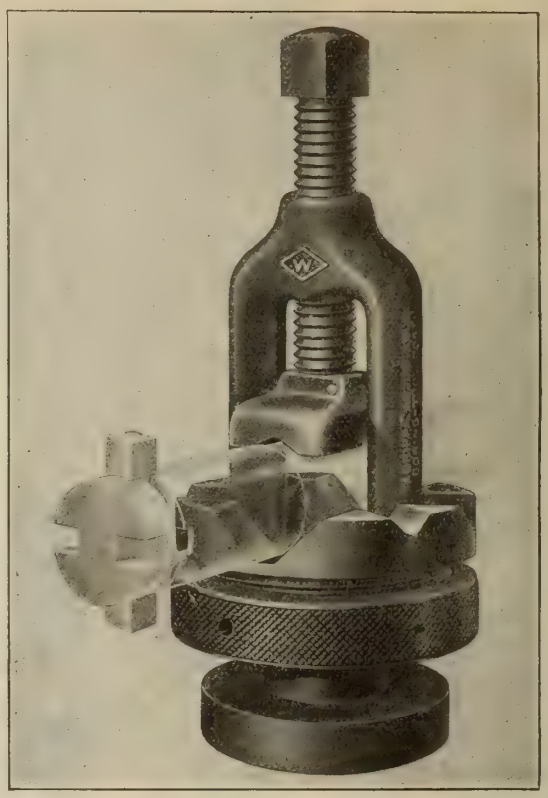
45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Alberta, Saskatchewan and British Columbia.



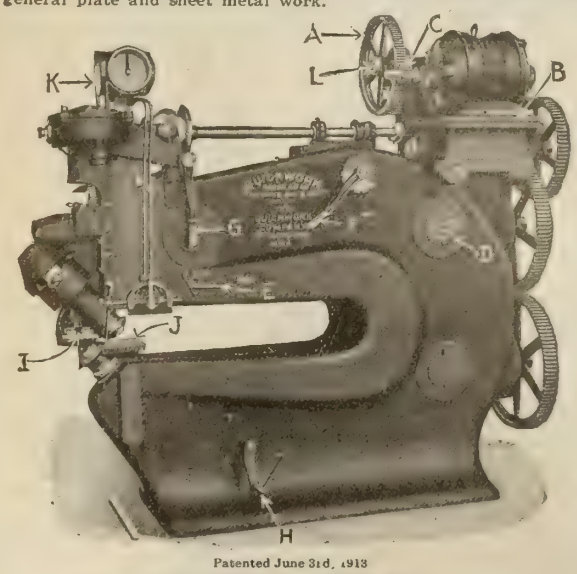
Williams' "Agrippa" Adjustable Boring-Tool Posts

"QUICKWORK"
Registered in U.S. and Foreign Countries.

ROTARY SHEARS

MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing.
Write for Catalogue No. 60.

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Cable address: "QUICKWORK."
Codes: W. U. and General.

Peerless HIGH SPEED

The Standard Metal Saw of TO-DAY

While labor is demanding more and more, manufacturers are demanding machines of greater output. The "Peerless" meets that demand. It is the standard metal saw of TO-DAY.

With its rapid cut and various time-saving features, it easily increases production from 50 to 100 per cent. With its automatic feed, straight line pull, positive blade clamp and general rigidity, it gets the maximum results of which a blade is capable and reduces breakage to a minimum.

OUR SIX-SPEED GEAR BOX

(not shown in cut) further increases output and saves blades wherever soft steel or metals of varying degrees of hardness have to be cut. The "Peerless" is furnished either with or without this feature, also with or without motor.

A trial order at our risk and expense is convincing

PEERLESS MACHINE COMPANY
1607 RACINE STREET **RACINE, WISCONSIN**

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Individuality

RED-CUT SUPERIOR HIGH SPEED STEEL

A GREAT MAN wrote this: "I'm called away by particular business, but I leave my character behind me." And nobody had to guess whose character it was. Even if the familiar Red Cut label should disappear there would be no doubt as to the character of the steel that remained. More than ever would the quality shine forth in the results when it was worked. Adherence to the highest standard with an unvarying uniformity has placed a well merited reputation all its own on

"Red Cut Superior"

The Nationally Known--First Quality

HIGH SPEED STEEL

The Best For All Machine Work

VANADIUM-ALLOYS STEEL CO.

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Works : Latrobe, Pa.

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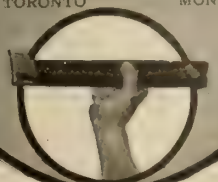

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

Our Guarantee is Back of Every Pound of Babbitt Metal We Make

Manufactured by

The Canada Metal Company, Limited

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Perfect Riveting

Provided its cost is the lowest possible, riveting so well done that it can't be improved upon, is perfect riveting.

Boys on Grant Riveters accomplish two and three times as much perfect riveting as an equal number of men using ordinary machines.

With the

GRANT

ROTARY VIBRATING RIVETER

rivets placed close up to the shoulder of the work are as rapidly spun perfectly smooth as are rivets in easy-to-reach spots.

The Grant Mfg. and Machine Company

Holland Ave.

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Send for "Perfect Riveting"

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The Greenfield Universal Grinder

For General Tool Room Work

This grinder is furnished with attachments for grinding all sorts of milling cutters, reamers, counterbores, and other machine shop tools.

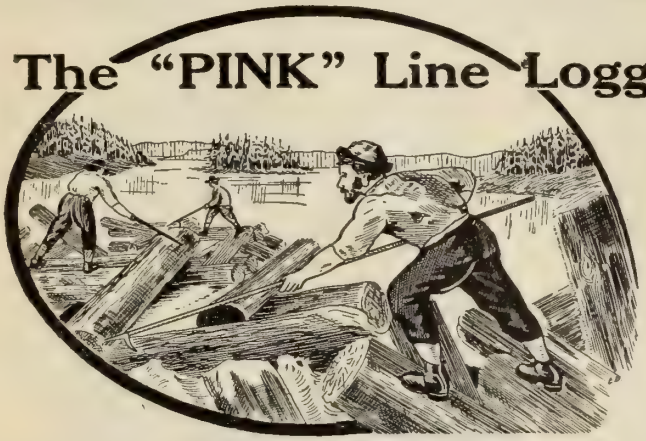
It is also suitable for cylindrical, internal and flat work which frequently turns up in the making of tools and jigs.

These attachments are all very simple in design and easily adjusted upon the machine, being graduated so that any desired angles can be at once obtained.

The whole machine is thoroughly well built, well finished, and will be found a dependable, convenient grinder.

Greenfield Machine Company,
GREENFIELD, MASS., U.S.A.

The "PINK" Line Logging Tools and Handles



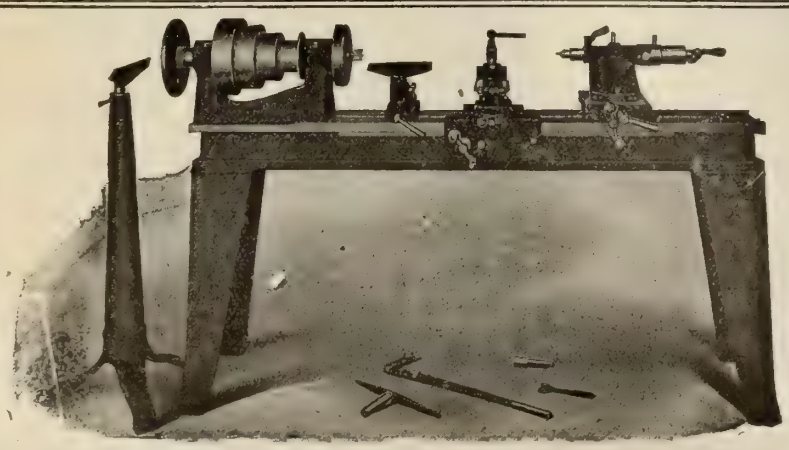
MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

EXPORTERS TO EUROPE

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited
PEMBROKE, ONT., CANADA



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FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catalog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

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Thor Chipping, Calking and Beading Hammer

Thor punch has helped put across many a job

Time is one of the most important items involved in every contract job.

The speed with Thor Hammers, Drills and other Tools work has pulled many a contract through on time.

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Independent Pneumatic Tool Company

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Patent Rolling Mills. All types and sizes.

Bloom, Slab, Billet and Plate Shears, Steam Hydraulic and Electrically Driven.

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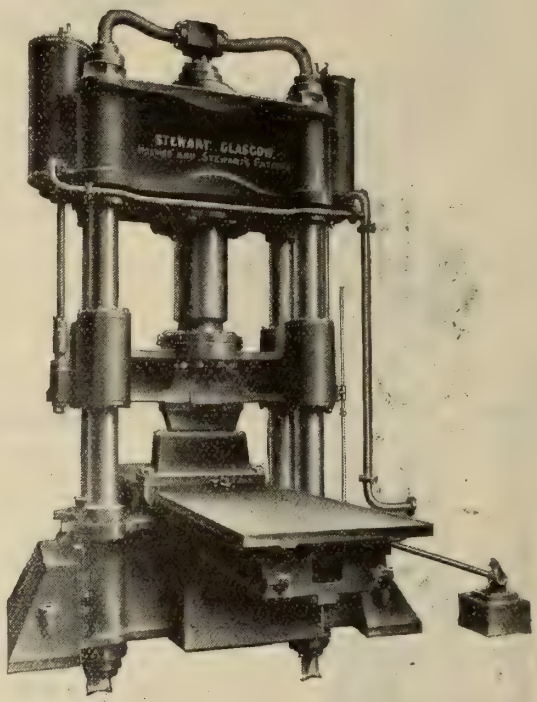
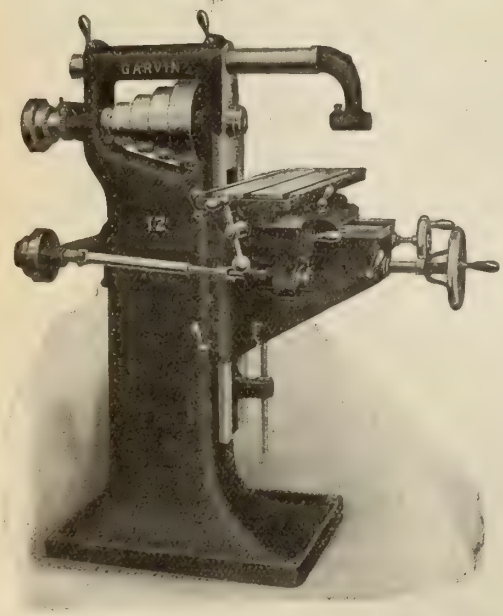


1200-Ton Steam Hydraulic Forging Press

GARVIN



No. 12—Plain Milling Machine—Use Code Abrade

No.12 PLAIN MILLING MACHINE

ALL LIGHT MANUFACTURING

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rigidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments ..... 18 x 6 x 15 in.

For Further Information ASK YOUR DEALER OR WRITE US DIRECT

IMMEDIATE DELIVERIES

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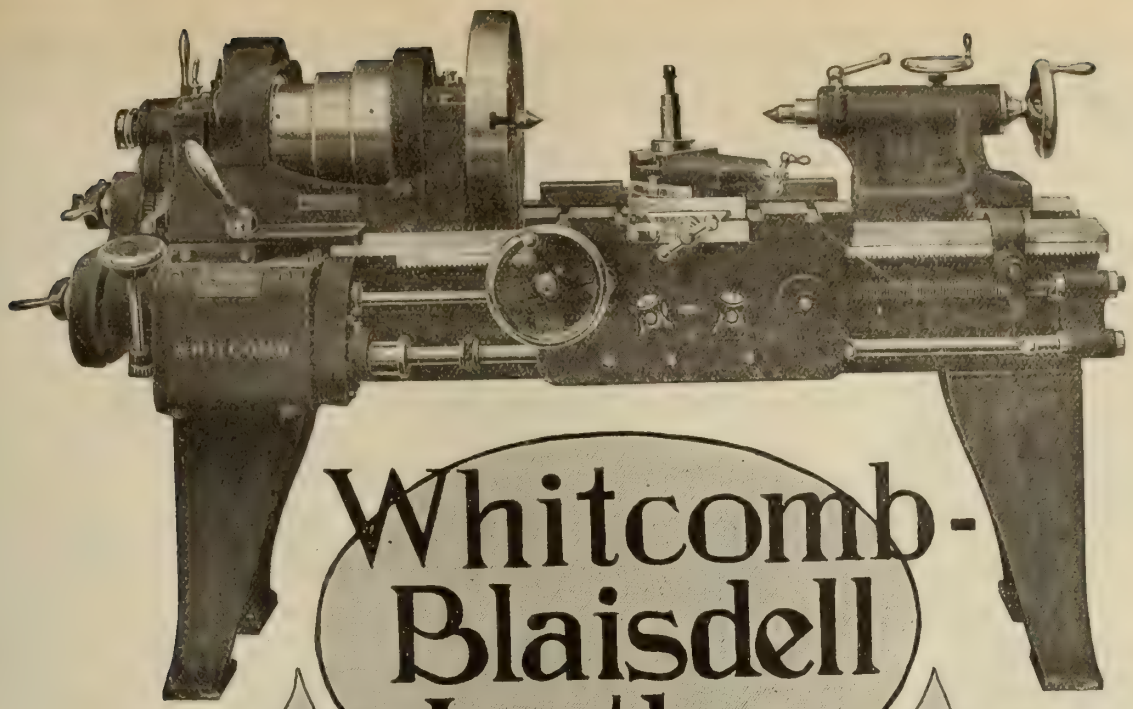
Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets *(Visitors Welcome)* 50 Years New York City



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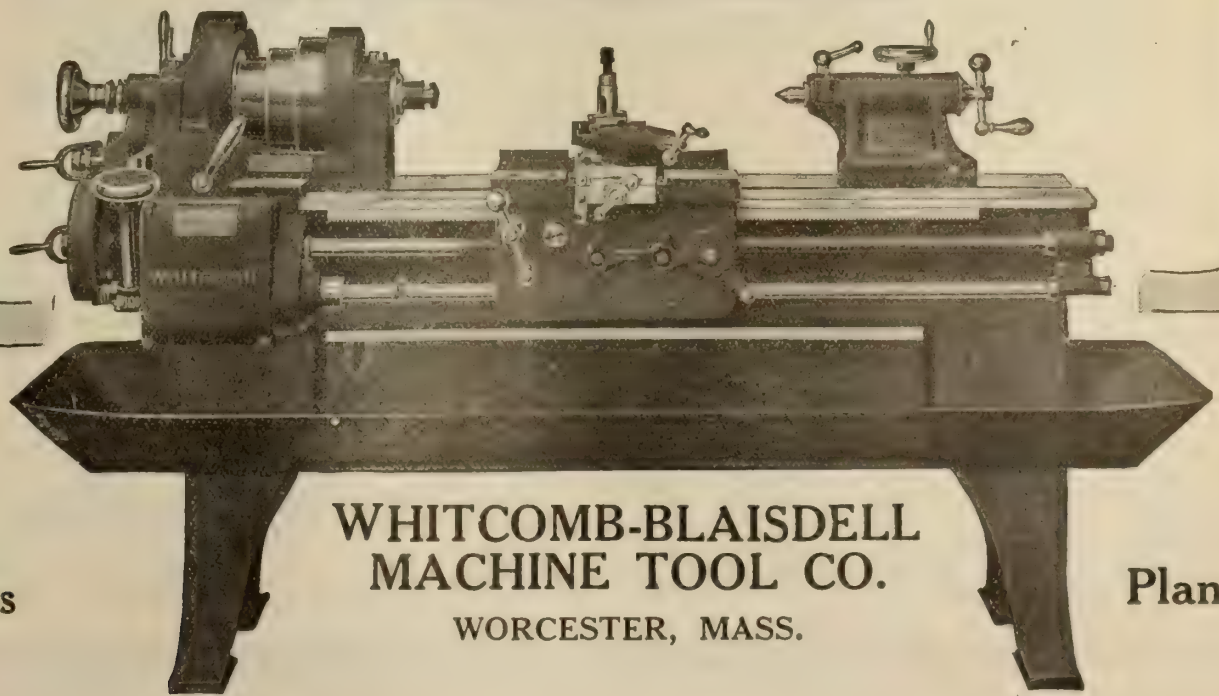
POWERFUL, WELL-BALANCED MACHINES THAT ARE LIGHT-RUNNING AND ADAPTED TO ALL CLASSES OF **RAPID MANUFACTURING.**

Every feature of the W-B Lathe of to-day has been considered from the viewpoint of greatest utility. Materials used embody toughness and durability. Our tests must prove great wearing quality and strength before any material is selected.

The product of an organization that has for sixty years been distinguished for the superior design, workmanship and material of its product

Write for our latest catalog describing all of the good features of Whitcomb-Blaisdell Lathes



Lathes

WHITCOMB-BLAISDELL MACHINE TOOL CO.

WORCESTER, MASS.

Plane

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Stoco SAFETY GOGGLES "CELOGLAS"

SHATTER-PROOF LENS

When you find a man wearing his Safety Goggles in his hip pocket, ask yourself, before you call him, "Are those goggles comfortable? Would I wear them in his place?"

They are—and you would—if they are Stoco Safety Goggles—the goggle that proved that safety goggles can be made to protect eyes comfortably.

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With Celoglas Shatter-Proof Lenses	$150.00
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Safety Engineers, Purchasing Agents and Employers may obtain a sample of the Stoco Safety Goggle without charge by requesting it on their company letter head.

STANDARD OPTICAL Co. GENEVA, N.Y. U.S.A.

Jim you don't seem to have any troubles since you switched to

THE CLEVELAND TWIST DRILL CO., Cleveland. New York, Chicago

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MALLEABLE AND CAST IRON PIPE FITTINGS

The Brand That Has The Quality

"Quality" and "Reliability" are two essentials demanded of *Cast Iron* and *Malleable Fittings*, by all sanitary and heating engineers.

Time and money are lost by improperly made fittings. All our cast iron and malleable fittings are properly recessed and every fitting bears the above trade-mark of quality.

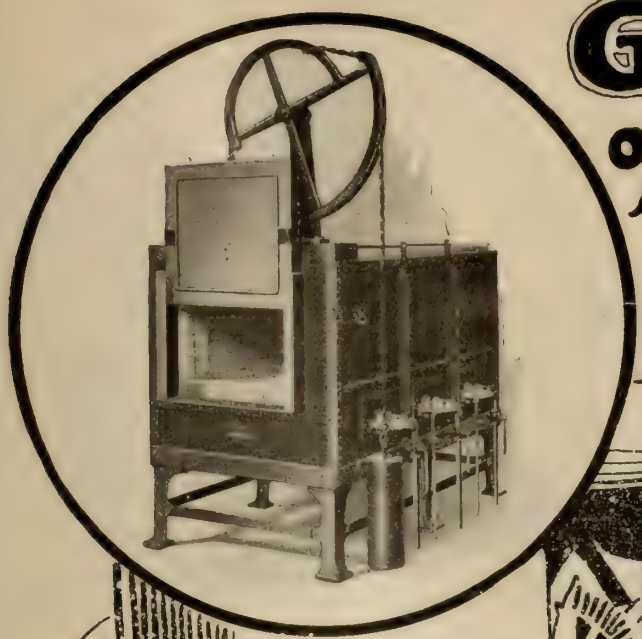
We make a complete and full line of both flanged and threaded fittings from ⅛-inch up, and can make deliveries from stock, both standard and extra heavy.

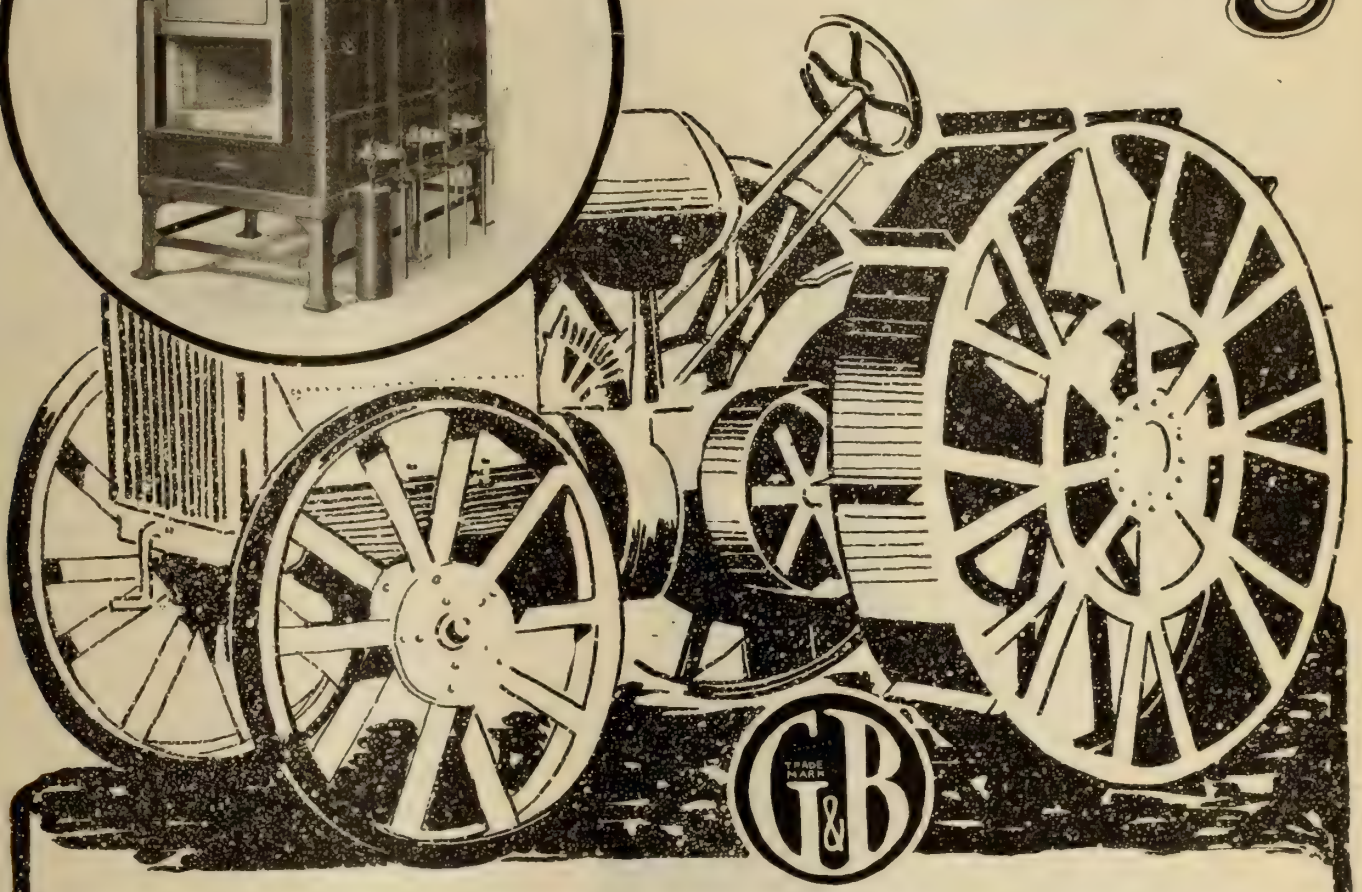
When ordering from your jobber be sure you buy---"the brand that has the quality." They are different. A trial order will convince.

International Malleable Iron Company, Limited

Guelph, Ontario, Canada

G&B Method of Heat-Treating





Gilbert & Barker Method the Right Method of Heat-Treating

Used by the Largest Manufacturers of Autos and Trucks.

Whether you manufacture tractors—automobiles —trucks—crankshafts—camshafts —tools—machine parts or anything else that requires heat-treating unless you have the **right** kind of heat-treating furnace for the purpose, you are defeating your own purpose, that of turning out a first-class product of uniform high quality.

GILBERT & BARKER FURNACES INSURE PERFECT COMBUSTION—ABSOLUTE TEMPERATURE CONTROL UNIFORMITY OF HEAT

the result of which is an exceptionally high grade product which measures up to the best manufacturing standards. There is a G. & B. Furnace exactly suited to your requirements. Let our engineers advise you—write. **To-day is a better day than to-morrow to send for Bulletin 24.**

Gilbert & Barker Manufacturing Company

17 Union Street **Springfield, Mass.**

ESTABLISHED 1865

New York Office: 26 Broadway. Canadian Agents: Williams & Wilson, Limited, Montreal, Que.

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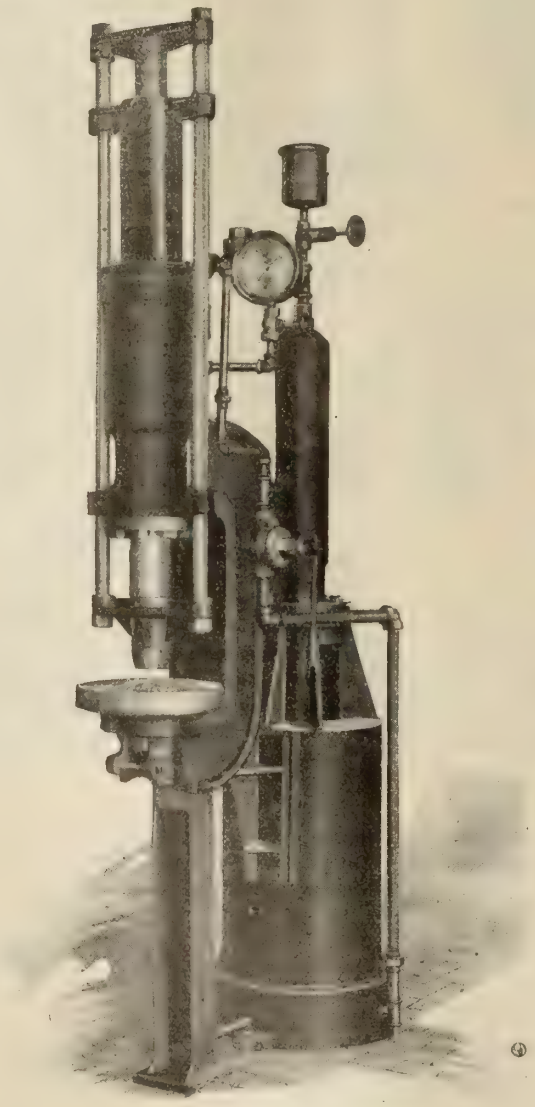
ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and
DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

EXCLUSIVE SALES REPRESENTATIVES:

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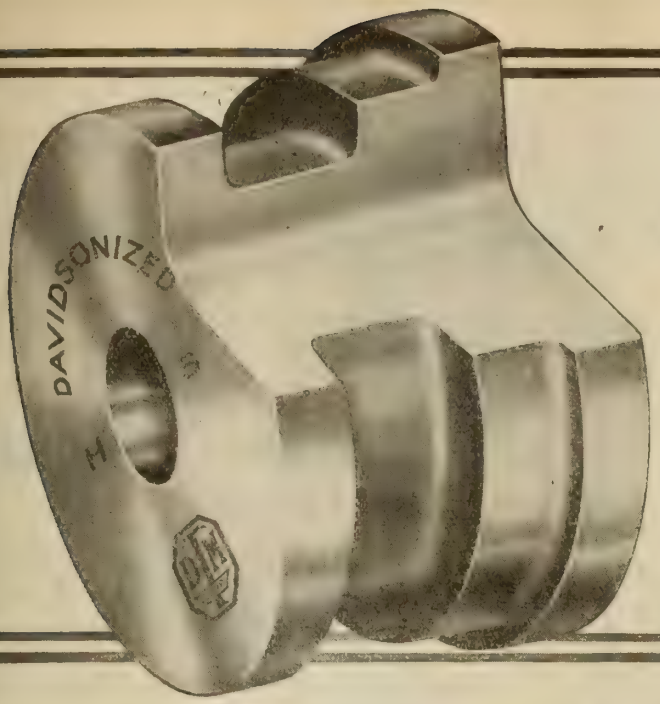

Not Simply "Better" but Eight Times Better

SUPERINTENDENT B---, of a great plant in Central New York, writes us this report on

DAVIDSONIZED Form Tools

"Turning and forming Chrome Vanadium Steel at 80 ft. per minute feed .030 the Davidsonized tools ran for 80 hours as against 10 hours runing with five of the best known brands of Tungsten and Cobalt steel on the market.

"We then increased the speed to 120 ft. per minute with the following results:—

"Davidsonized" cast tools ran for		**22 hours**
No. 1 Competitive tool		**4 "**
No. 2	**"**	**4¼ "**
No. 3	**"**	**3¼ "**
No. 4	**"**	**3¼ "**
No. 5	**"**	**4 "**

"The Davidsonized tools required .002 grinding. The competitive tools required from .007 to .015 grinding."

DAVIDSONIZED FORM TOOLS are as far ahead of competition as DAVIDSONIZED Milling Cutters and other Tools of Davidsonized Steel.

All aside from the increased production, reduced labor costs and reduced overhead made possible by such a performance as the one described above, think of the saving in tool costs through completing the same work with one-fifth to one-eighth as many tools as before!

The plant which is using DAVIDSONIZED TOOLS to-day, is jumping ahead of competition. Soon their use will be so general that the plant which does not use them will be lagging far behind.

Better try them out **now**.

THE DAVIDSON TOOL MFG. CORPORATION

Main Office: 118-122 Maiden Lane, New York
Works: 56-62 North 6th Street, Brooklyn, N.Y.

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864 Woodward Ave.,
Alex. Hart, Jr., Mgr.

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Exclusive Selling Agents.

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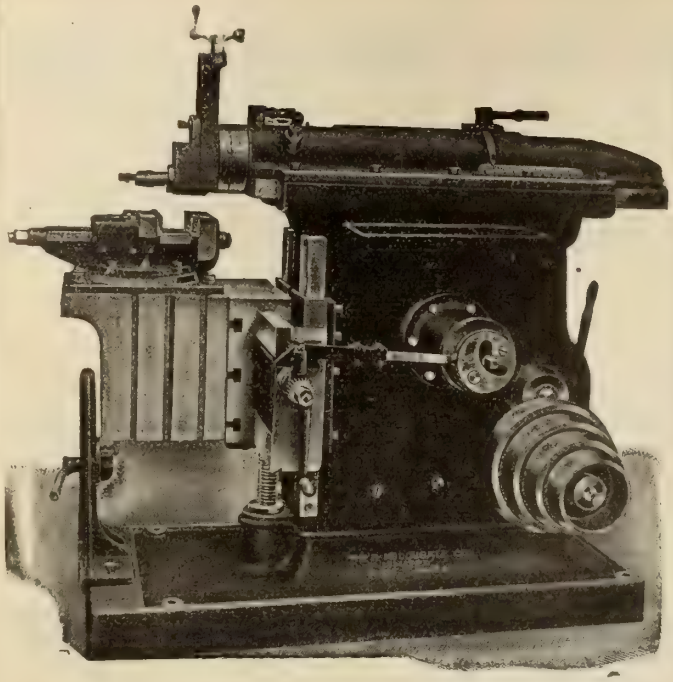
Special Service to Concerns who Make Their Own Tools

We will supply Davidsonized High Speed Steel Blanks, semi-finished to within approximately .015 to .020, either soft annealed or hardened.



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Combine the best features of all machines which have hitherto been placed upon the market, and nothing has been included, except those points which experience has shown to be essential.

An examination of the construction will reveal features that make for increased production, ease of operation and accuracy.

Write for descriptive literature.

The R. McDougall Company Limited

Manufacturers
GALT, ONTARIO, CANADA

ARE-MAC-DEE IS A GUARANTEE

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

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TRADE MARK

Best way to make a thing different—make it better.

Better steel is used and better methods are employed in the manufacture of

PH and Imperial Files.

They are "different" because "They cut faster and wear longer."

INGERSOLL FILE COMPANY, LIMITED
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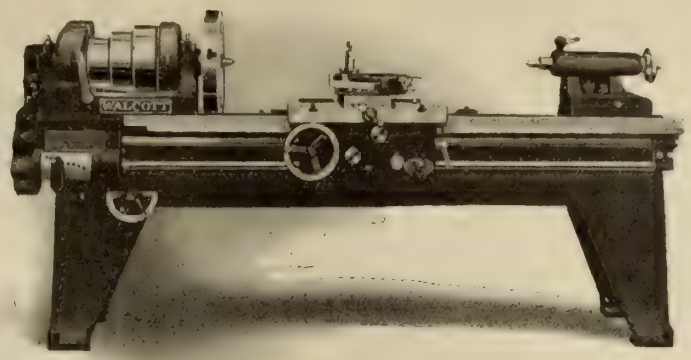
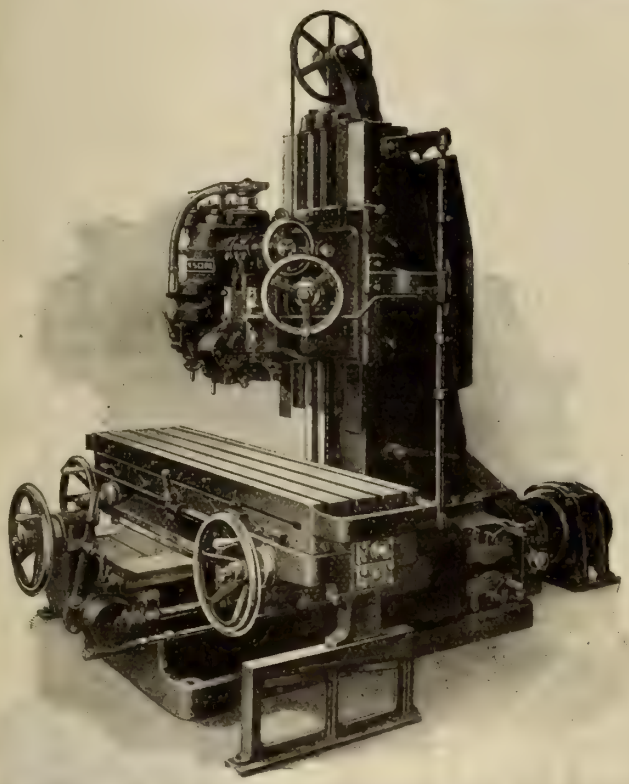


WALCOTT ENGINE LATHE



JACKSON DUPLEX TYPELESS DIE SINKERS

Three Machine Tools Worth Investigating

WALCOTT ENGINE LATHES.

WALCOTT CRANK SHAPERS.

JACKSON DUPLEX TYPELESS DIE SINKERS.

These machines are backed by nearly forty years of machine tool building experience. They are designed in sizes to meet the requirements of your shop, so as to insure the highest production.

Canadian Fairbanks-Morse Company, who have been selling our line of machine tools during the past at Toronto, are so well pleased with their results, they have now taken the agency throughout the Dominion of Canada.

Walcott Lathe Co.

115 Calhoun St. Jackson, Mich.

Est. 1881

THE CANADIAN FAIRBANKS-MORSE CO., LIMITED

Halifax St. John Quebec Montreal Ottawa
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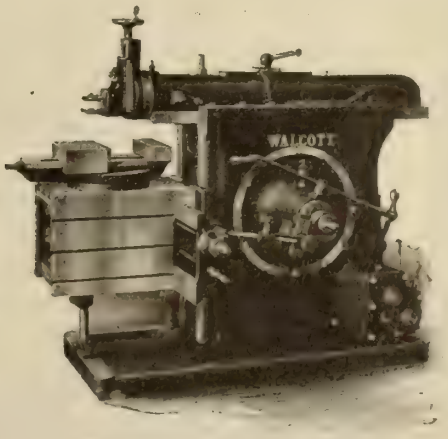

WALCOTT SHAPER

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Notes On Grinding

NORTON COMPANY WORCESTER, MASS.

No. 52A

GETTING THE MOST OUT OF THE WHEEL.

DID YOU EVER stop to reason why one operator on the same work, same machine and same wheel, gets 100 pieces ground with one truing while another only does 50? That is just where the art and knack creep into grinding. You cannot tell any one how to obtain such results; that must come with experience. It is possible, however, to point out a number of little things which, if observed, will form a foundation on which to build such experience. The following is an interesting instance demonstrating this fact.

Noticing that an operator in an automobile factory handled the wrist pins which he was grinding in a very unusual way, a Norton engineer who was present inquired how many he was doing in one hour. When he replied, "Twenty-five," it was evident that something was wrong because on this operation it should be possible to do at least forty or fifty per hour. The operator went a little further than this and stated: "I am in trouble and need help. You know the price on this job is $1.35 per hundred. The boss says I ought to make $5 per day. The company want more parts and I need the money, but I can't make out."

The piece being ground was about 6" long. The operator fed a 1½" face wheel into the work five times, stepping over each time for roughing down the pin. Then when he was ready to finish he stroked the work, using the table power travel. The wheel, he claimed, wore away too rapidly, although it was a 36-K wheel and should be efficient for that particular job. It so happened that he was running the wheel on the fastest work speed and was not using the automatic wheel feed but rather fed the wheel in by hand, and in so feeding did it very irregularly.

It was a simple matter to fix this fellow up by changing the work speed so that it was considerably slower, which had the effect of making the wheel act harder. By stroking the work all the time the wheel cut more uniformly, and secondly lasted longer. Using the automatic wheel feed provided time for him to prepare another piece of work for the grinding machine, placing it on the arbor, and also made the wheel stand up better, not suffering from the abuse of feeding first .001" and then .010". Later in the day the engineer returned and the operator greeted him with a broad grin: "I did 78 pieces since you left." That was at the rate of forty per hour, removing .025" stock to .001" limit, the material being case hardened steel.

This is only one of the many illustrations that could be recorded from actual experiences where the principles of grinding were not thoroughly understood. So many times the wheel is blamed for something which, if properly used, would never cause trouble. Wheel action is a very delicate element in grinding, and responds very rapidly to changes in speeds of either work or wheel, changes in radial depth of cut or arc of contact of wheel with work. A great many fail to attain high efficiency in wheel service because these laws are not observed.

If you suspect that there is something wrong with the production results you are obtaining, why not write to our Sales Engineering department and put the problem up to them? They will be glad to advise you from experience gained in their many years of experimenting with work perhaps quite similar to yours.

NORTON COMPANY.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., Montreal, Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria. F. H. Andrews & Son, Quebec Que.

Grinding Wheel Plants, Worcester, Mass.

Electric Furnace Plants		New York Store	Chicago Store
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MARK YOUR PRODUCTS THE "MATTHEWS" WAY

"Matthews-made" steel stamps and lettering dies make easily read and durable marks on all classes of products. Matthews Champion Type Holders—for flat and convex surfaces—with interchangeable Steel Type, save time and lower marking costs. Matthews Inspection Hammers of best Pittsburgh Steel, are fashioned with the "know how" of over 50 years' experience.

Booklet "For Light and Heavy Marking" sent on request. Write for a copy of it.

Canadian Fairbanks-Morse Co., Limited

Montreal Toronto, St. John, Quebec, Ottawa, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

Jas. H. Matthews & Co. - Pittsburg, Pa.

Steel Lettering Dies and Stamps

1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to

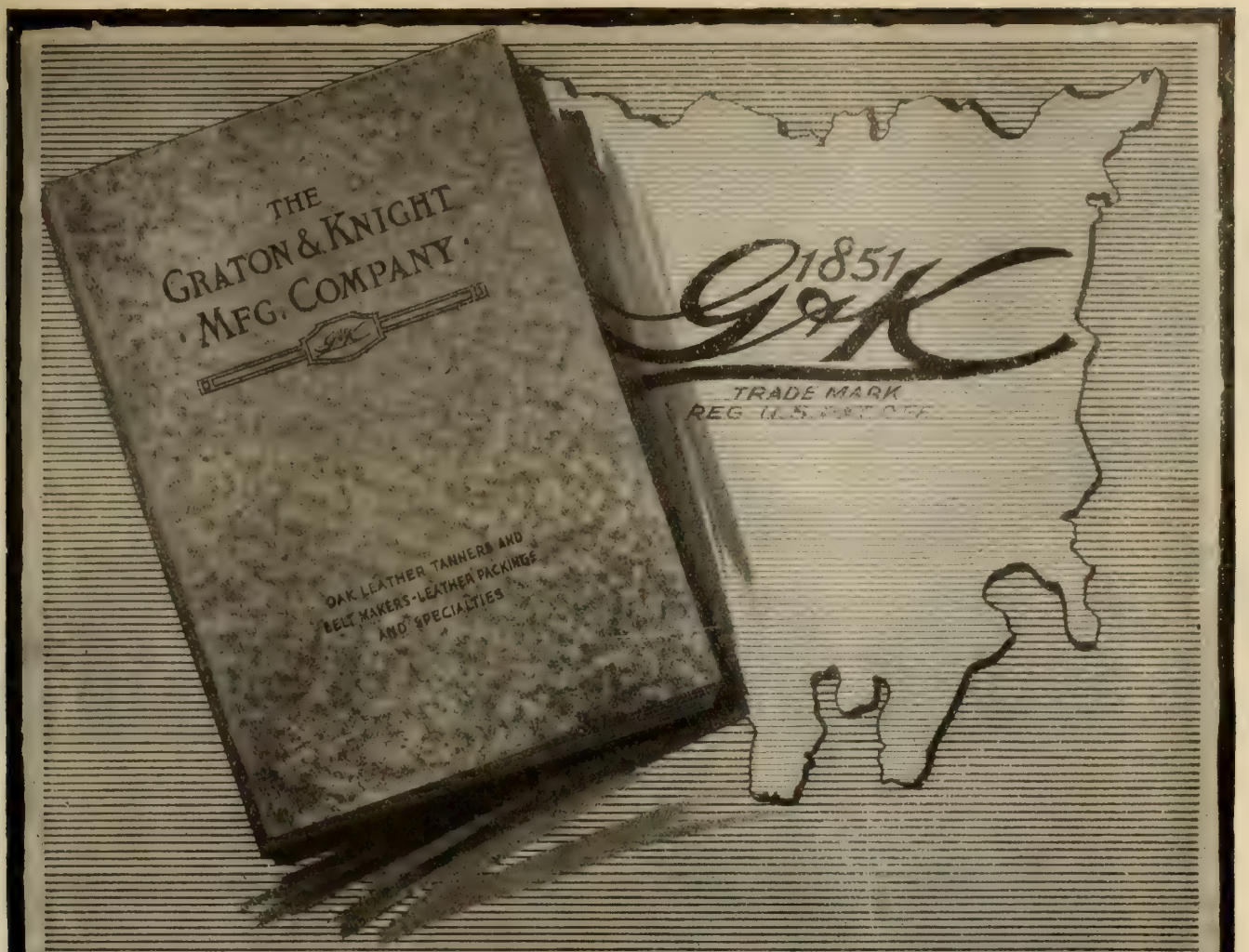
The U. S. MILLER

The Miller for Small Work

A small machine takes up less space, requires less power, is easier to operate and is more accurate. The Paramount Miller of its size. Drop us a line for full details.

United States Machine Tool Company

Cincinnati, Ohio, U.S.A.



More Than A Catalog

This catalog of G & K Standardized Series Leather Belting and Leather Products is practically a handbook of leather tannage and manufacture.

It is carefully compiled and indexed for easy reference to the products you want.

It contains mechanical rules, charts and tables that will help you with your transmission problems.

Belt users find this book invaluable. Write for a copy.

Canadian Graton & Knight, Ltd.

Oak Leather Tanners and Belt Makers.

Montreal, Canada

Canadian Representatives: The Canadian Fairbanks-Morse Co., Ltd., St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Saskatoon, Vancouver, Windsor, Winnipeg, Victoria.

Branches and Distributors in all Principal Cities.

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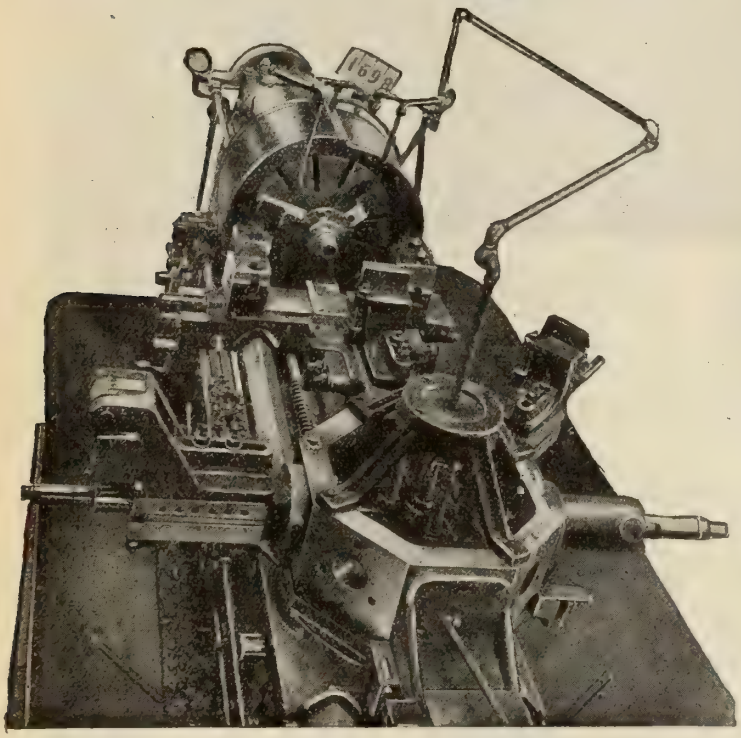
GIS

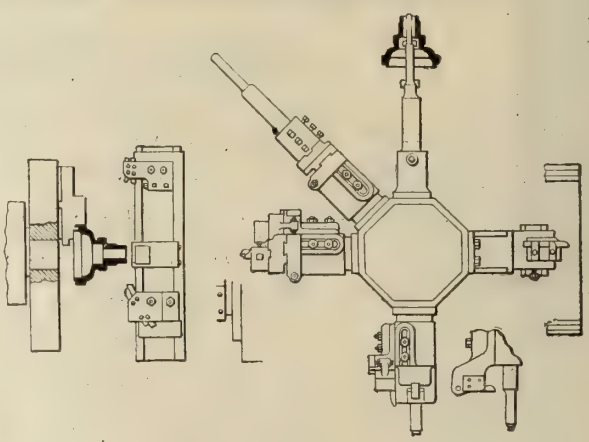
Sample of Gis



This picture shows first operation

From the Gisholt

These pages are worthy of study. They illustrate the way in which Gisholt engineers will help you solve your manufacturing problems.



Showing tooling set-u

GISHOLT MACHINE COMPANY, 1201 EAST

Builders of Standard and Automatic Boring Mills, Tool Grinders,

Eastern Sales Office: 30 Church St., New York.

Canadian Agents: The Canadian Fairbanks-Morse Co., Ltd., St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria.

HOLT

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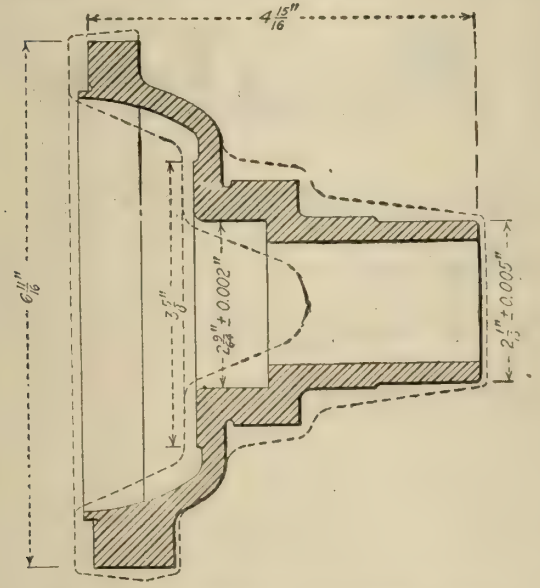

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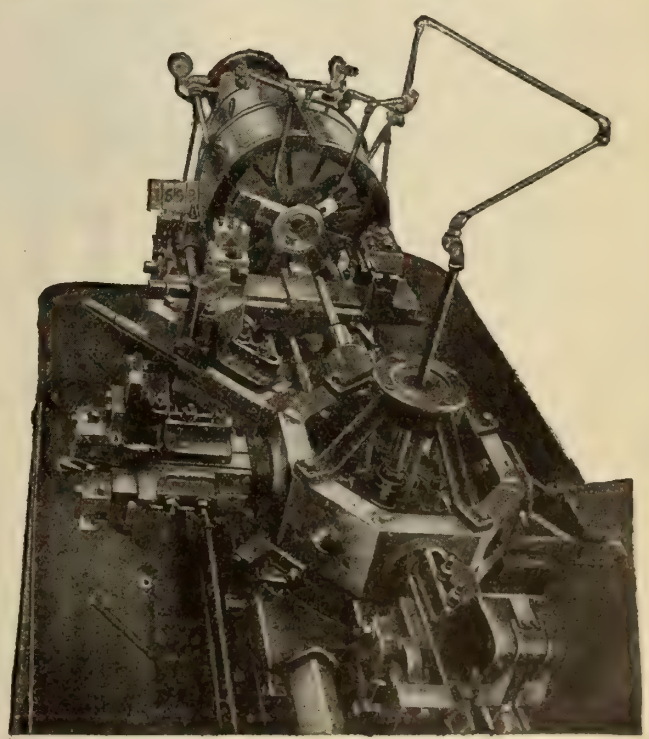

This picture shows second operation. Both of these operations are performed on one machine during one revolution of the turret

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

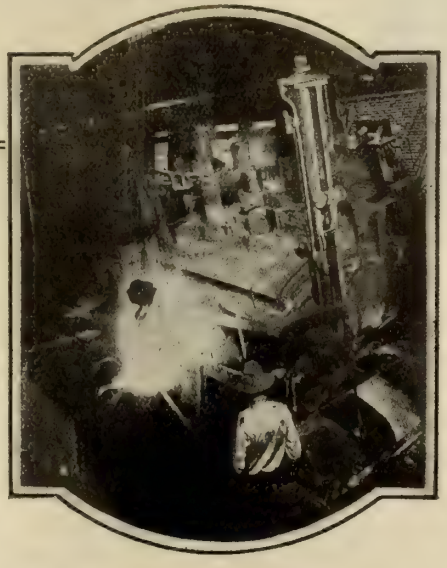
Vol. XXI. No. 23 December 4, 1919

Types of Greaves-Etchells Electric Furnaces

A Percentage of the Total Heat Generated is Released in the Hearth of the Furnace

By W. F. Sutherland

Long Refractory Life, Stirring of Bath and Good Power Control Are Thus Accomplished



THE electric furnace is a metallurgical instrument in which any desired temperature up to the point of fusing of the best refractories obtainable can be attained and perfectly controlled. At these high temperatures chemical reactions take place more rapidly than in other processes and the most refractory metals and alloys can be reduced to fluidity. The flexibility of the electric furnace also gives it a great advantage over former processes and the superior quality of the product is very marked.

Scrap containing valuable alloying metals, such as nickel, chromium, tungsten, vanadium, etc., can be melted without the loss of these elements and works that have sold their steel swarf and scrap, cast iron borings, etc., at very nominal prices are installing electric furnaces and making their own castings formerly purchased. The charge can be made up entirely of scrap and turnings, no expensive raw materials being necessary except additional alloying metals if these are desired.

Steel from the electric furnace is finished off under a reducing atmosphere of carbon monoxide and a slag out of which metallic oxides have been reduced and is therefore singularly free from blow-holes and occluded gases when properly cast. This is due to the elimination of the gases that molten steel usually holds in solution; and the ease with which the steel can be poured into small and intricate castings, flowing smoothly like cream and sitting perfectly quiet in the moulds is largely due to its purity.

An electric arc furnace for steel making usually consists of a steel tank lined inside with refractory materials and fitted with working doors and tilting arrangements for teeming. Carbon or graphite electrodes of a suitable section are inserted through the roof or walls and may be regulated either by hand or automatic control. A high tension supply is brought into a transformer house adjoining the furnace and transformed down to a low pressure alternating current for operating it.

The method by which the heat is introduced into the steel bath of the furnace is of much importance. The heat is generated in most types of furnaces by means of electric arcs formed between the electrodes themselves or between the electrodes and the metal bath. A disadvantage of this type of furnace is that the heat is applied at the top of the charge only, which is superheated, while the bottom may be comparatively cold, causing serious metallurgical difficulties. Several attempts have been made to overcome this objection by the use of conductive hearths and bottom electrodes, but no real improvement was achieved until the invention of the "Greaves-Etchells" system by two Sheffield engineers, H. A. Greaves and H. Etchells, B. Met., who had the advantage of operating both electrically and mechanically the leading types of furnaces installed in Great Britain.

It was the aim of the inventors to produce a furnace which would fulfil the following conditions:

(A) A system which would be applicable to any polyphase supply system, especially those of the higher commercial frequencies and which would maintain a steadier phase balance and higher power factor than furnaces then existing.

(B) The generation of heat in such a manner that it was applied as directly as possible to the metal in the furnace and did not superheat the slag and various portions of the lining more than was essential for maintaining the metallurgical conditions necessary for refining steel.

(C) Rapid melting and uniform heating of the charge.

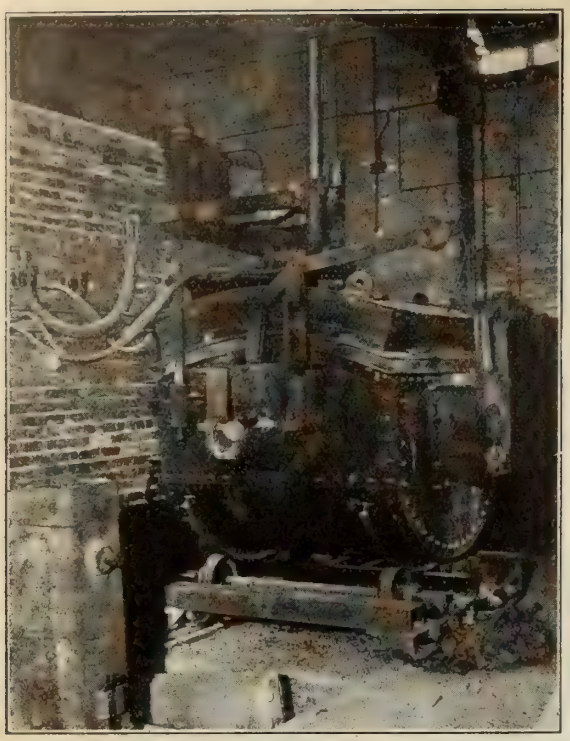
(D) Automatic circulation of the metal—giving uniform quality of steel—and avoiding the constant use of stirrers or rabbling.

(E) The construction of a furnace, which should be free from obvious mechanical defects so common in the earlier days of the electric furnace industry.

Construction of Furnace Hearth

In order to obtain an even temperature throughout the bath of molten metal in the electric furnace, it was realized that heat must be applied below as well as above the bath. Two phases of a three-phase low tension supply are connected to their respective upper graphite or carbon electrodes, while the third phase is connected to the bottom of the hearth. The current flowing through the hearth generates a considerable amount of heat immediately below the liquid in the most efficient manner, while the electric arcs arranged immediately above the bath maintain the slag and surface at the proper temperature.

The hearth lining is of special construction to achieve the above result and is never less than 20 in. thick. It is constructed mainly of dolomite, magnesite and other materials in such a manner that the electrical resistance is



ANOTHER INSTALLATION.

high at the inside of the bath and decreases rapidly to a negligible quantity at the outside. The outside of the furnace bottom remains cold, little or no heat being lost in this direction.

The importance of this special construction may well be emphasized, for if the hearth were constructed of a refractory material of uniform resistance at normal temperature when the inside face became heated by contact with the molten metal, its resistance would be materially lowered and most of the resistance would remain concentrated in the outer face. This would result in a material loss of heat since the heat generated by the passage of an electric current varies as the resistance.

Other furnaces with bottom electrodes are, of course, constructed, but in none of them does the hearth itself act as an electrical resister contributing heat to the underside of the liquid metal.

The results of the application of bottom heat are well worth noting. In the first place, liquid steel always tends to be sluggishly in the hearth of a furnace and if heat is only applied by the use of electric arcs above the steel, the slag and upper layers of metal become greatly superheated over the metal lying in contact with the lining. In order to get the metal at the bottom of the bath to the necessary degree of fluidity, it is necessary to overheat the slag and upper layers of metal to such an extent that great erosion takes place on the lining of the furnace at the slag line. A considerable amount of heat is also radiated upwards from the slag, quickly destroying the roof and upper walls of the furnace.

The use of bottom heating obviates these evils, through the reduction in the amount of energy liberated over the bath by the arcs and, of more importance, by the uniformity in temperature of the metal which results. The metal at the bottom of the furnace tends to reach a higher temperature than the average of the top of the bath and following the same laws on which all hot water radiating systems work the hot metal rises and the cold metal descends. This slow circulation takes place positively and continuously during the whole course of heat.

In furnaces not embodying this feature of bottom heating, it is stated that the lining in the vicinity of the electric arc tends to be damaged to a much greater extent than elsewhere. The enormous concentration of energy in the electric arc greatly superheats the adjacent slag and metal of the bath with the result above noted. By means of the slow circulation of the metal due to bottom heating, the heat supplied in the region of the arc is quickly absorbed by the moving streams of metal and distributed uniformly over the hearth of the furnace. Bottom heating, therefore, operates in the same manner as mechanically stirring or rabbling.

This feature also works to advantage in the manufacture of alloy steels. If lumps of cold metal or additions of alloys so difficult to melt as ferro-chrome or ferro-tungsten are thrown into the bath they will be dissolved at a reasonable rate and will soon be distributed throughout the liquid bath. Where no bottom heating is available much stirring has to be done in order to effect a complete distribution of the alloying materials and labor trouble is sometimes encountered, owing to the arduous nature of the work required from the melters. Another advantage of this slow circulation of the metal from the bottom of the furnace is seen in the rapid refining which is possible, as all parts of the molten bath are automatically brought into contact with the refining slags.

Electrical Features

The use of a three-phase current, two phases of which are connected to the electrodes, while the third is connected to the conducting hearth, introduces a variation in transformer connections which is of some interest and which results also in excellent operating characteristics.

This system of connection at first sight would appear to cause an out-of-balance load on the primary supply, but the system of transformer ratios, which is carefully calculated, is arranged so as to give a perfect balance when the upper electrodes are in equal adjustment. The three secondary transformer windings are arranged in star, while the primaries are in delta. The hearth is connected to ground as well as to one of the transformer windings, the neutral point of the transformer windings thus being above earth potential.

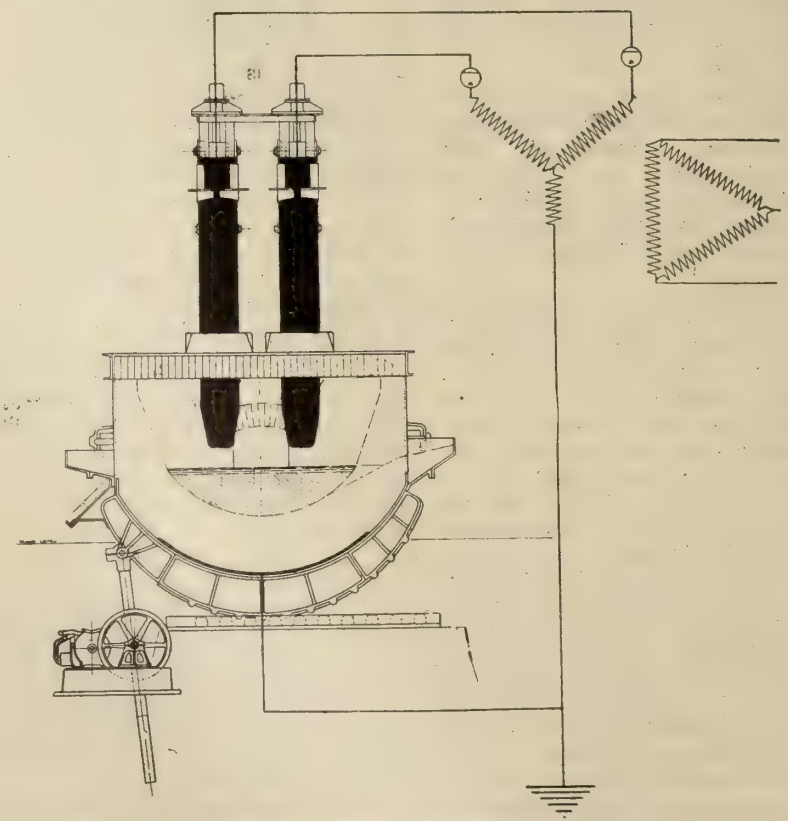
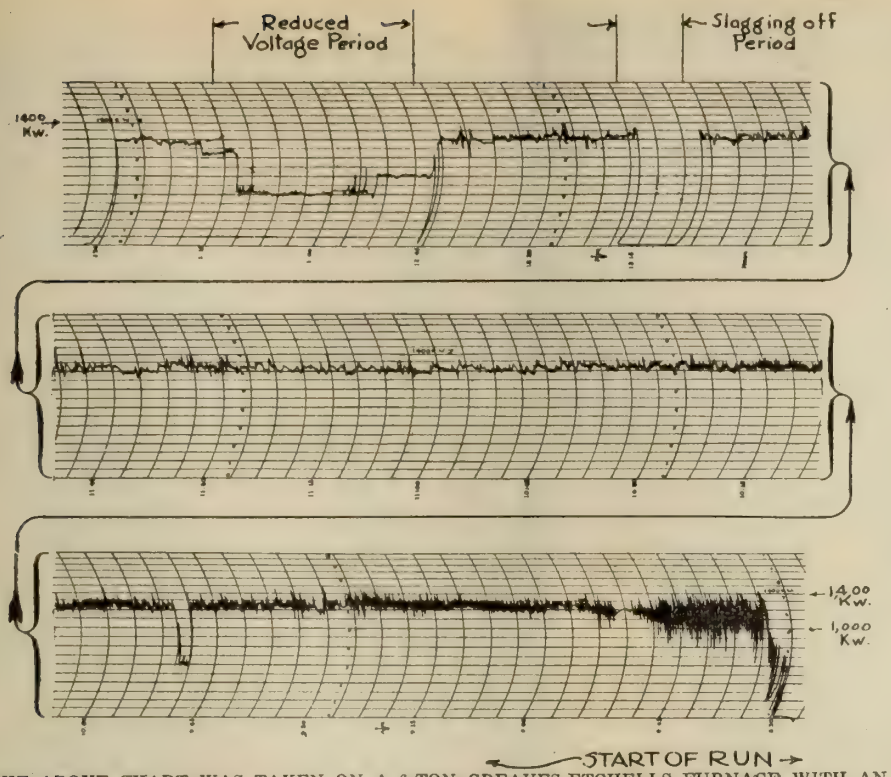


DIAGRAM OF CONNECTIONS.



THE ABOVE CHART WAS TAKEN ON A 6-TON GREAVES-ETCHELLS FURNACE WITH AN ESTERLINE WATTMETER AFTER A SHUT DOWN OF 18 HOURS, USING COLD, MISCELLANEOUS SCRAP, AND REFINING UNDER TWO SLAGS. NOTE THE TIME INTERVALS AND THE ABSENCE OF SUSTAINED PEAKS.

The two electrode arrangement is used in furnaces up to three ton capacity. Above this size four electrodes are employed. This arrangement of the electrical equipment is equivalent to two individual and distinct circuits, such as are employed in the smaller furnaces. Each pair of electrodes with their respective transformer connections can be switched up individually, thus enabling one pair to be kept in operation, while adjustments are being made on the other pair. The total overload of the furnace under short circuit conditions is also considerably limited by this arrangement, because each half of the furnace trips its particular switch when its own pair of electrodes become overloaded, thus halving the percentage overload, which will be necessary to trip the whole adjustment.

The electrical connections possess several other interesting operating features. Close regulation of the load under short conditions is obtained without the use of excessive reactance in the transformers or externally in the form of reactance coils. In this system it is impossible for an electrical circuit to be closed without traversing the secondary windings of two transformers in series. These transformers each have a different phase angle and the short circuit current is opposed by two magnetic fields, neither of which is in phase with it. This automatically lowers the power factor as long as the short circuit persists and is thus equivalent to the momentary introduction of reactance. A strong buffer effect is thus obtained and the fact that there is always a permanent resistance in the path of the current through the hearth also limits the effect of short circuits.

The combination of these factors provides a very effective means of protecting equipment and supply system from the stresses resulting from short circuit conditions, while allowing a high power factor to be obtained on normal load. The sudden overload due to short circuit bumps seldom exceeds 25 per cent. of the load at which the furnace is normally running, as compared with very much higher figures on other types of furnace.

With this system it is also impossible to have any one phase or primary supply unloaded.

The operation of each electrode is independent of all others. The current from any one in passing through the arc completes its circuit through the liquid metal and through the lining of the furnace. It is thus not necessary or possible for the circuit to be completed through another electrode and complete individual control is obtained. This of one electrode dipping into the bath and upsetting its carbon content through the dissolving action of the steel on the tip of the electrode. This is important in the production of steel of accurate composition and it also prevents breakage of electrodes or mechanism when a cold charge is being melted.

The limitation of overloads effects a considerable economy in the cost of electrical equipment necessary.

The energy supplied to the furnace is regulated over a considerable range by raising or lowering the electrodes and this can be done by means of automatic regulators, of the Thury or Seede type, which maintain a current at a pre-determined figure or by means of the motors and controllers or by hand. Arrangements are also provided for varying the voltages across the arcs, in all except the smallest size, and the ratio of heat generated above and below the bath can be regulated over a wide range.

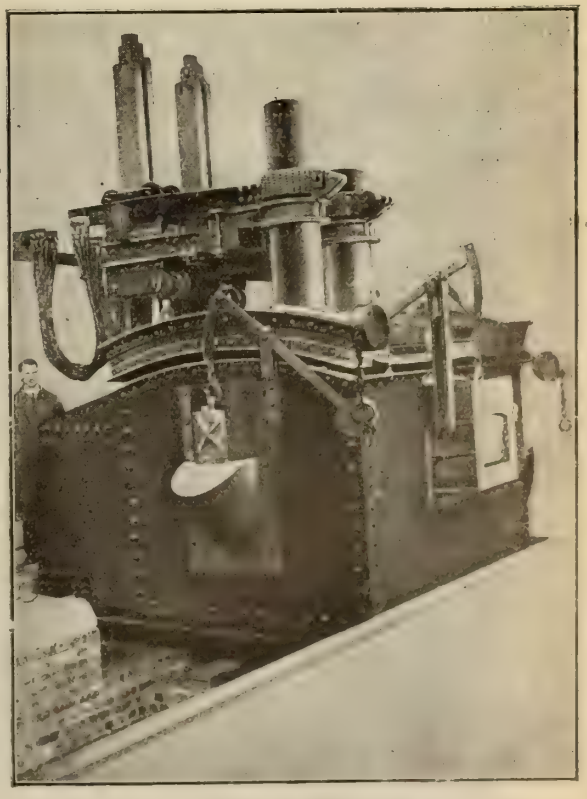
Power Factor and Load Curve

The power factor is high, owing to the elimination of unnecessary reactance. The operating power factor obtained in one plant as a result of over twelve months' running averaged during the melting down period between 85 and 88 per cent., and 92 to 95 per cent. was consistently maintained during refining.

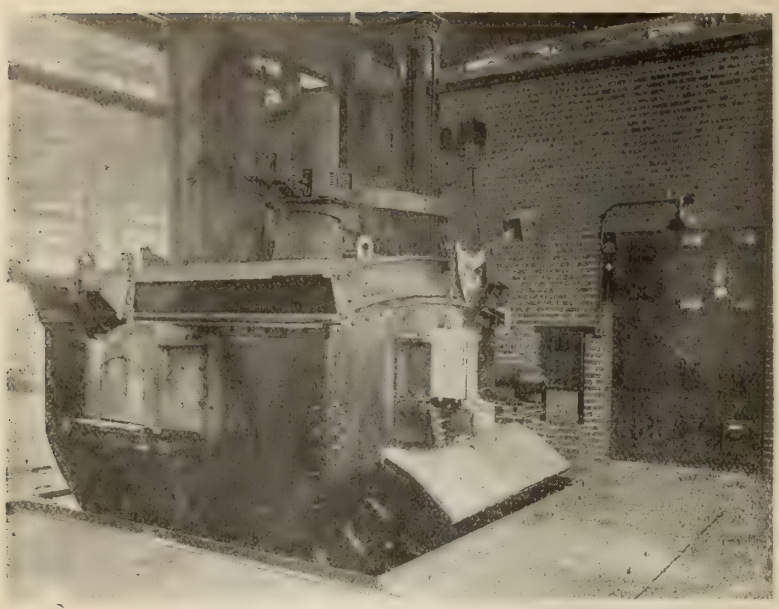
The remarkably even character of the load is well illustrated in the accompanying chart, which was taken on a 6-ton Greaves-Etchells furnace after a shut-down of 18 hours, using cold miscellaneous scrap and refining under two slags.

Mechanical Features

The furnace is of substantial con-



TYPE OF FURNACE.



THREE-TON GREAVES-ETCHELLS FURNACE.

struction and the design is such that ruggedness combined with strength is achieved. Furnaces up to 6,000 lbs. capacity are mounted on rockers operated from the rear of the furnace. The tilting arrangement is so designed that the centre of gravity falls just below the centre of radius of the rockers in any position, making a perfectly safe and well-balanced arrangement, with minimum wear-and-tear on the tilting motor and gearing. The tilting system is provided with limit switches, which give perfect safety in operation. All electrode arms are also provided with limit switches, preventing accidents when in the hands of careless operators.

On the larger furnaces there is a special roof-lifting feature, which takes away entirely the strain on the bricks of a new roof when being put into place.

Operating Characteristics

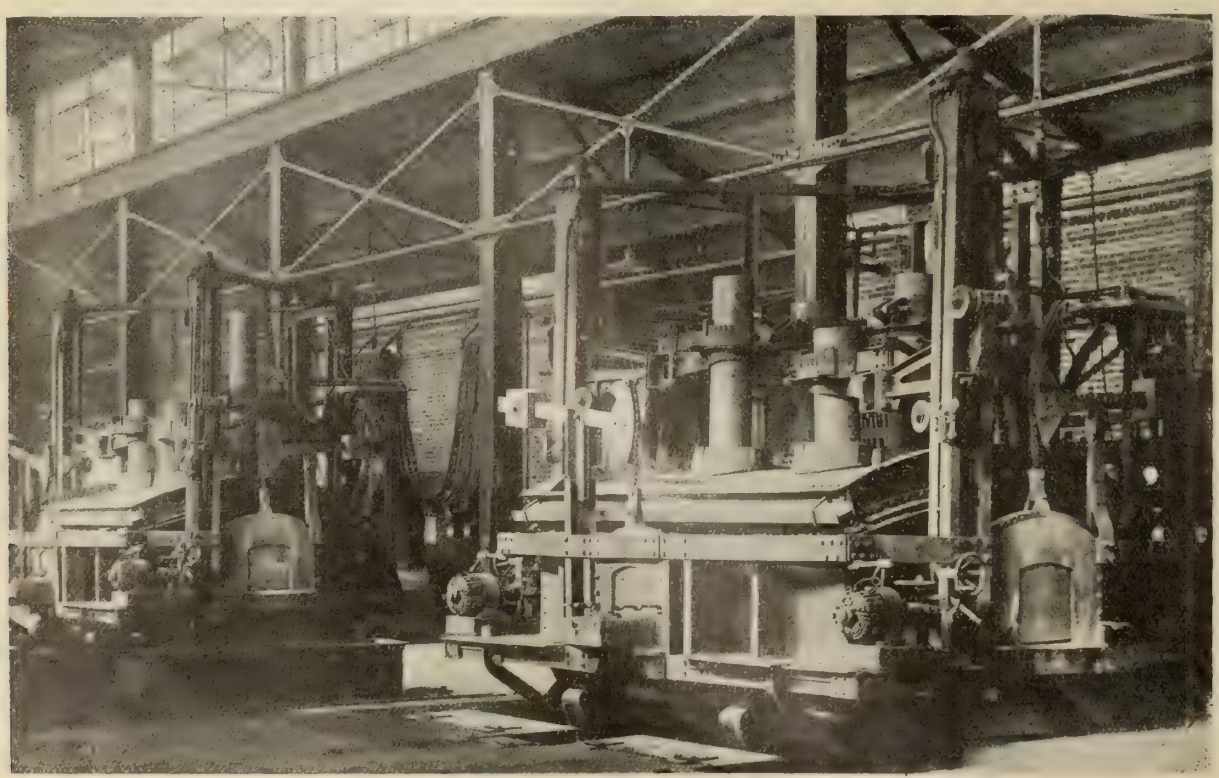
In the electric furnace, steel of any composition made by other processes can be duplicated, and the process lends itself further to the manufacture of steels which would be impossible of manufacture by older methods. Illustrating this point, it is perhaps only necessary to point out that practically all low-carbon steel containing anything from 7 per cent. to 14 per cent. of chrome—generally known as "Rustless Steel" is made in the electric furnace, using low grade high carbon, ferro-chrome and common steel scrap—the elements carbon, sulphur and phosphorus being satisfactorily eliminated.

The electric furnace process is essentially a basic one and the same reactions resulting in the oxidation and removal of phosphorus which are carried out in the basic open-hearth process can be applied in the first stage of melting a charge of common steel scrap in the electric furnace. The electrical process goes further, however. After removing the phosphate slag, another slag can be made up with lime, sand, and fluorspar, which, by closing up the furnace doors and spreading finely powdered coal on the slag, can be worked under reducing conditions. This results in the rapid removal of sulphur and in the reduction of silicon from the slag into the steel. The reduction of silicon can be carried to any desired extent and results in killing or deoxidizing of the steel.

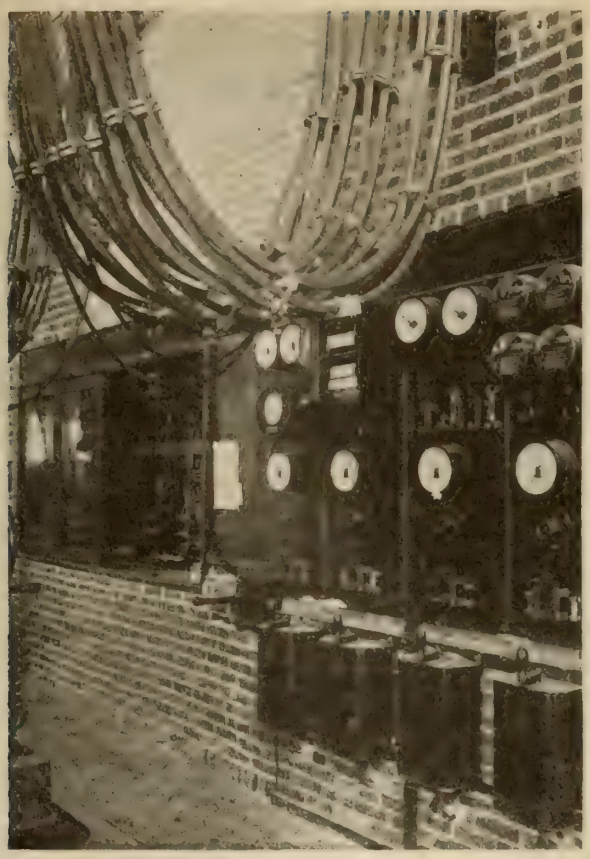
The electric furnace finishing slags are peculiarly light and non-cohesive in nature. The slag rises very quickly to the surface of the steel, and when the steel is teemed into ingots it is consequently free from slag fibre. This property has proved of enormous value, especially in the case of steels, which have to withstand sudden shocks and stresses, such as the driving parts of motors and various bullet-proof steel plates.

The making of steel in the electric furnace may be divided into two periods, the melting or breaking down period and the refining period. Anything which is of advantage in shortening the time taken for these periods manifestly effects a considerable economy in power and results in increased output.

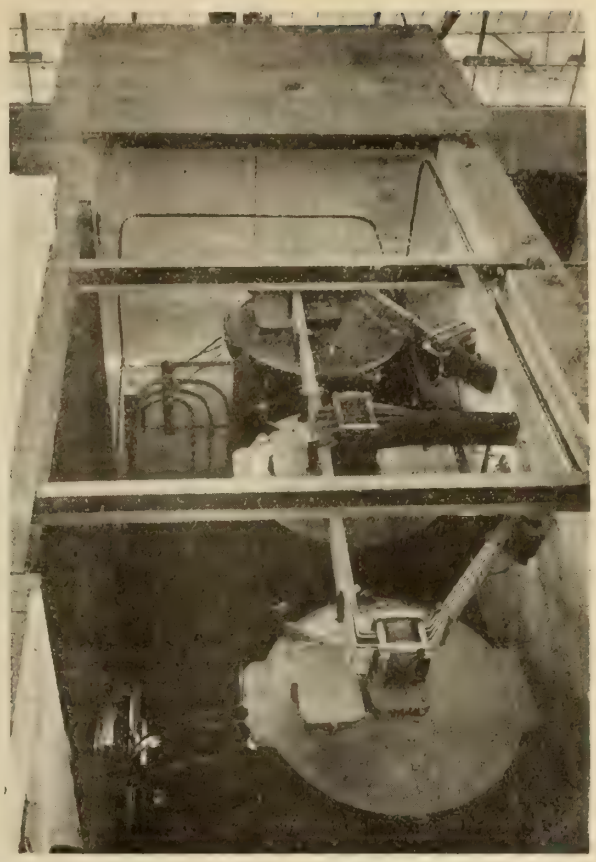
Since the current in the furnace under



TWO 6-TON FURNACES. ONE OF THEM IS IN OPERATION. WHICH?



TYPICAL VIEW OF FURNACE CATENARIES AND CONTROL.



GREAVES-ETCHELLS FURNACE. ARRANGEMENT OF LOW TENSION COPPER.

consideration flows through the metal and hearth, considerable heat is generated in both metal and hearth, as well as in the arcs immediately above. This results in an extremely short melting period. The refining period is also shortened since the slow circulation of the molten metal set up by bottom heating, carries all portions of the bath to top and effects an intimate contact of refining slags with every portion of the metal.

On basic linings, 3-ton furnaces equipped with 900 kv-a. transformer capacity are melting three tons of metal in one hour, forty minutes, and completing the melting and refining of a charge in two and one-half hours. Six-ton furnaces are melting in two and one-half hours and completing the heats in under four hours per charge. On acid lining furnaces these figures have been considerably improved.

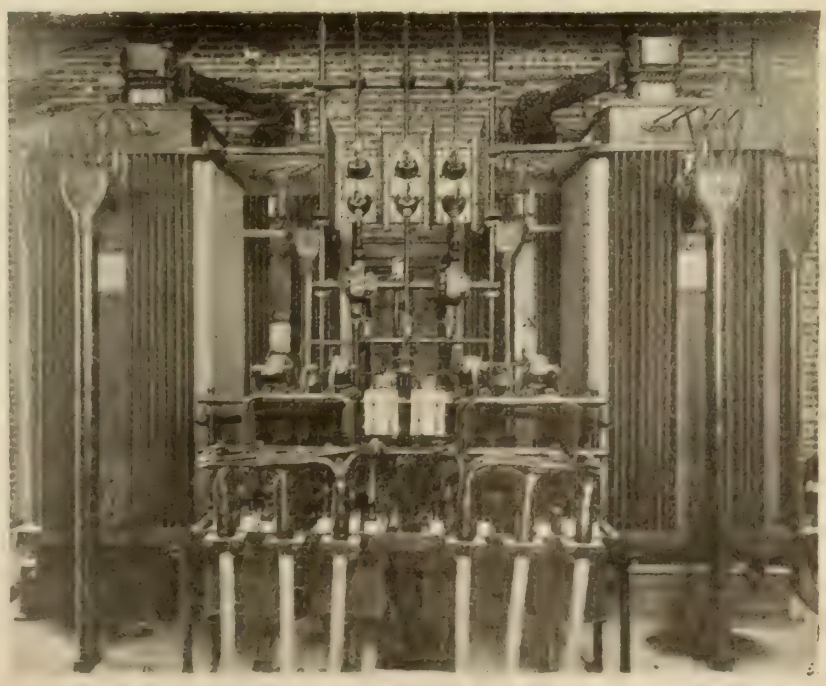
Electrode Consumption and Refractory Life

Conditions under which electric furnaces operate are usually of such a varying nature and the various metallurgical operations carried on in them are so different that it is almost impossible to make any accurate generalization as to the electrode consumption or refractory life.

It might be expected, however, that the operating features of the furnace now under consideration would lend themselves to economy. This is evident when it is considered that the hearth is used not only for the return of the current, but also for heating. Less heat is therefore generated above the bath and less carbon or graphite is consumed from the electrodes.

One user reports a life of 125 heats for roof, walls and bottom; these figures are from time of installation and it was estimated that the roof would last for 25 heats more before repairs would be necessary. Considerable refining was carried out in this instance.

Another furnace of one-half ton size has run for 15 months without repairs of any kind to the lining. During this time 220 heats were run off. This furnace and another of a somewhat similar record was used in the making of nickel-chrome airplane steels of intricate composition. The molten steel had to be held for refining and the proper



TRANSFORMER CONNECTIONS, 6-TON FURNACE, GREAVES-ETCHELLS SYSTEM.

adjustment of carbon, silicon, manganese, chromium and nickel contents.

Two-ton furnaces have consistently given 120 to 130 heats before repairs to the roof were necessary.

The furnace hearths, if properly cared for, seem to last indefinitely, one furnace having made over 3,000 heats on the one hearth.

Electrode consumption varies, of course, with the kind of steel made and with the duration of refining operations. The size of the furnace has also considerable to do with the consumption. By the use of economizers figures of from 9.1 lb. to 11 lb. of graphite per ton of steel are generally obtained.

Properties of Electric Steel

It has been mentioned that electric steel, aside from the properties conferred on it by alloying materials is possessed of marked physical characteristics which render it superior to steels made by other processes. That this is so may be seen from the results of tests made by one firm on the product of their Greaves-Etchells furnace:

	Steel A	Steel H
Yield point long tons	23.78	67.33
Maximum stress long tons	37.44	73.10
Elongation per cent.	32.0	21.50
Reduction of area	47.0	43.76
Brinell hardness No	156.0	
Stanton Impact Fig.	1560.	10200

Steel A was a mild steel with about a carbon of .15 per cent. and the test shows remarkable results.

Steel H was a nickel chrome hardening steel and the elongation is very satisfactory. The makers further stated that the Stanton Impact figure obtained was the highest obtained in their own laboratory.

Greaves-Etchells furnaces are made in ½, 1, 2, 3, 5, 6, 10, 15, 30 ton sizes by the Electric Furnace Construction Co., Finance Building, Philadelphia, and T. H. Watson and Co., Limited, Sheffield, England.

The method of obtaining a balanced primary from either a two or three-phase electrical supply and the method of generating heat in the hearth of the furnace are protected by patents.

At last the corn cob has come to its own. The cob has been relegated to the scrap heap for a great many years as a worthless appendage after it had served its primal purpose. It is true that pipes of peace have been made out of it, but now comes the Department of Agriculture and is ready to utilize it, for it has been found that 35 per cent. of it is transformable into crystalline glucose which has many uses, one of them being the production of alcohol. Another use is adhesive which is used in making fibre boards and paper boxes. This adhesive could be made colorless and would replace the starch, dextrine, flour paste, and only 3 per cent. of the cobs would have to be used to replace all this.

MAKING WOOD MACHINE HANDLES

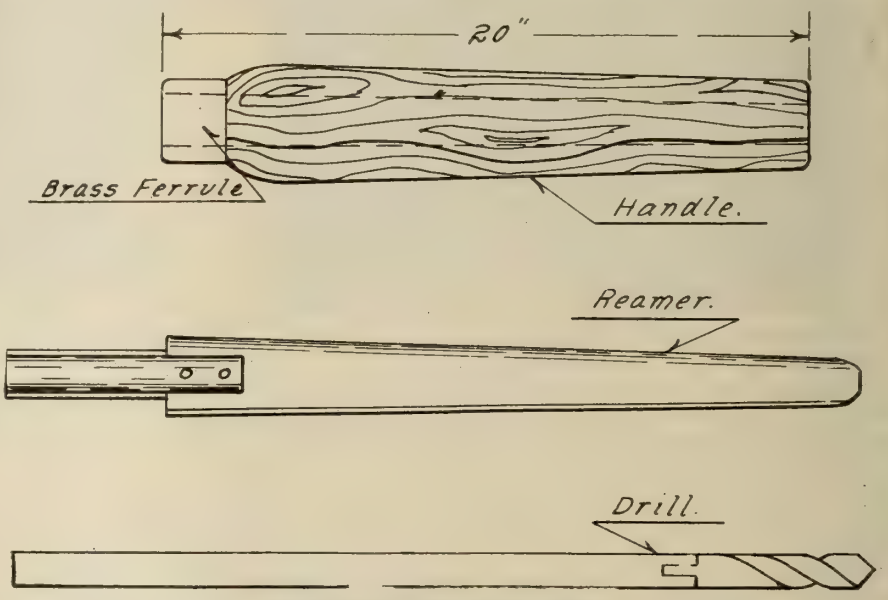
By Donald A. Hampson

We were getting out a line of machines that required a cherry handle of the general shape shown by Fig. 1. The inside had to fit a tapered steel core—the outside was turned to a shape that was pleasing to the eye and comfortable for the hands. We thought any of the wood-working shops in town could make the handles for us, and gave them little thought until almost ready to use them. Then we found nobody cared to undertake the job. In desperation, we asked, "Tell us how you would make them, and we'll try it ourselves." The reply was, "We wouldn't make them." Nothing to do then but apply machine shop methods—all we knew—to the wood-working business and try our luck.

Getting the blocks in squared lengths, they were set up under the drill press and the holes step-drilled, just as is done in roughing out taper holes in steel before using a finishing taper reamer. Our finishing reamer was shop made of a piece of ⅝-inch by 2-inch machine steel planed to right taper and set into a shank. With the shank in the drill press chuck, the taper "bore" was finished very quickly by running the reamer down. The surface was not altogether smooth (round), but it was straight from end to end, which was more important than the absence of chatter marks.

In doing the rough drilling the twist drills gave out at a depth of eleven inches. To reach the remaining distance, pieces of broken 13-16-inch and 1-inch drills were rescued from the scrap pile, softened, and ⅝-inch rods spliced on. These drills did very nicely for the work in wood. As an experiment, holes were drilled with carpenters' bits, but it was shown that they followed the grain of the wood much more than the twist drills, which fault produced crooked holes that did not clear up.

After the bore was finished, a section was turned a driving fit for ferrules of brass. And finally the contour was turned, using a long taper arbor on which the handles were "driven" by a thrust of the hand.



THE HANDLE AND TOOLS USED.

The manager of the Queensland State iron and steel industry enterprise is recommending the Government to establish blast-furnaces and coke ovens for start with a view to turning out pig iron and coke and other by-products, the proceeds of which would assist in financing the larger industry. He estimates a consumption of about 1,000 tons of coal a day and about 500 tons of mixed iron ore from Cloncurry (Mount Leviathan and the Biggerden deposits. It would take about two years to establish the scheme for blast furnaces, etc., and another year and a half to complete the whole scheme.

Dealers in, as well as original sellers of, iron and steel scrap from explosive plants are warned by the Bureau of Explosives, New York, in a special bulletin, to guard against explosions caused by guncotton, picric acid, or T.N.T. inside of pipes or receptacles. The following are instances of such accidents: Damage to a metal plant in the melting down of lead pipe containing picric acid, explosion in a storage yard because of contact of a lighted match with nitrocellulose, the severing of a hand from an explosion resulting from the crushing of pipe between two hammers, killing of employees cutting up pipe from the oil fields of Oklahoma, in which a detonating cartridge had been left. One explosive company makes a double inspection of all pipe leaving its plants; it is first burned in a woodpile and then inspected, each piece being marked with red paint; after it is loaded on cars another inspection is made, markings with blue paint indicating it.

In order to make Switzerland less dependent on imports, the Schmidt-Roost Oerlikon Company have established a steel foundry, where scrap iron is converted into steel in electric furnaces.

The Use of Gauges in the Mechanical Field

A Paper on the Origin of Gauges With Various Systems Used. Allowances and Tolerances. Old Method of Go Gauges and Screw Thread Work

By E. C. PECK
Lieutenant-Colonel P. S. & T. Division, Standardization Section

IT IS a well-known fact that gauges of some description have been used since men first began to contrive conveniences for himself. The standards of weight, measure and volume mentioned in the Bible are gauges. The instruments and appliances used in building the pyramids were gauges. In fact it has been apparent from the beginning of time that standards for determining dimensions, capacity, quantity, force, etc., are not only necessary, but aid materially in conducting all kinds of commerce and business.

In bargaining for a quantity of material it is necessary to have a standard unit acceptable to both buyer and seller to determine whether the quantity bargained for is understood by both, and the bargain carried out.

Tribes, states and countries used gauges originating with themselves, and probably the tribe or state doing the most trading with the neighboring countries succeeded in establishing their standards in other countries, and hence the most used gauges were handed down to us. It certainly would have been much better for the present generation if there had been little more co-operation among the ancients in regard to standardization, then we would not have the heterogeneous collection of gauges or units that we are all familiar with.

It must be evident to everyone that all business and commerce would be conducted with less expense for the service rendered if standard specifications were in use and had the same meaning all over the world. It would seem like a logical statement to say that some one system of standards ought to be enough better to win over the entire world by its greater utility, but this has not proved to be true. The two systems which most concern this country are the English and metric. Both are used extensively, both are legal and each has its advocates. It seems obvious that the outstanding advantages of the metric system have not been sufficient to supplant the English in this country. To me the outstanding advantage of the metric system is that all subdivisions are multiples of 10, and hence in calculations it is only necessary to move the decimal point in the reduction from unit to unit. Great advantage is also claimed in that the units of weight and volume are derived from the unit of measure, but to me this is of little account. For accurate work one does not want to originate his own standards, but prefers to obtain them from the Bureau of Standards, which can compare a standard without regard to its origin.

One advantage claimed for the English system is that most subdivisions are made by successively halving each unit. If these arguments are adhered to by the advocates of each side, they both fail, because their methods result in units the size of which are impracticable, based on experience.

In the English system, beginning with the inch and halving of each subdivision, we finally reach the units: 1-64, 1-128, 1-256, 1-512 and 1-1024—all of which are awkward to handle and not readable on the well-known micrometer without estimating. To obviate this difficulty, the inch is divided into tenths, hundredths, thousandths and ten-thousandths, and all of these decimal units are practicable and usable units.

In the metric system, the first subdivision of the meter is the decimeter, a unit 3.973 in., of no utility and rarely used. The next unit is the centimeter, a unit too large for good work and too small for use in distance measurements. The next is the millimeter, 0.03937 in., the most widely-used unit because of the adaptability of its size value. Many industrial enterprises require no greater accuracy than a millimeter, and therefore, as this unit is about as fine as can be used on a steel scale, it is sufficient for their needs.

For tools and fine accurate mechanisms, the millimeter is too large, and so is the next subdivision, 1-10 millimeter, which is 0.0039. The great bulk of good work in our machine-tool, automobile and the tool-making industries require units between 1-10 and the 1-100 millimeter, as one is too coarse and the other too fine.

The result of this is the halving and quartering of the millimeter and the 1-10 millimeter to get the usable units approximating 1-100, 1-1000 and 2-1000 of an inch. Thus it will be seen that the advocates of both systems use what the other claims as an inherent fundamental of his system.

If when the meter was adopted all romance and sentiment had been left out of the question, and the meter made 10 English inches, the metric system would have been in universal use long ago. The theoretical value of the meter is on a ten-millionth part of the distance from the Equator to the pole, and after this figure was established an error was found in the calculation, so that now we haven't even this sentimental advantage.

If the meter had been 10 inches, metric threads could have been expressed in whole numbers per decimeter, and this would agree with present practice, and would fit in with the United States system.

The First Interchangeable Manufacture

The first interchangeable manufacture attempted was in France in the year 1717, and it failed. Another trial was made in 1785, which also failed. In 1798, Eli Whitney, of cotton-gin fame, took and completed a contract to make ten thousand muskets for the United States Government, and the parts of these guns were interchangeable.

English and French ordnance officers ridiculed and criticized Whitney's ideas to such an extent that Congress became alarmed at the money being used for the purpose. Whitney went to Washington with ten guns and distributed the parts on the floor, assembling repeatedly ten guns from these parts, that operated properly. This remarkable achievement astonished everyone, and it is believed to be the first successful interchangeable manufacture of accurate work. As nearly as can be found out from the records available, this occurred in 1800. In 1808, Simeon North accomplished a like feat on pistols for the Government.

It is also known that John George Bodner began to manufacture guns at St. Blaise in the Black Forest about 1806 by a new method, which is believed to have been partly interchangeable; that is, some of the parts like the lock and stock were made and carried in stock. Interchangeable manufacture is conceded to be an American development, and is described by writers on the continent as an American method. In 1853 a British commission visited the United States to investigate the methods in use, and as a result ordered 20,000 Enfield rifles for the British Government, and later 157 machines for the Government arsenals, and hired James H. Burton to install the machinery and methods.

From this small beginning the practice grew steadily in the armories and arsenals, and later as the advantages became known, it spread to bicycles, typewriters, and various other things, until now it is quite common to speak of interchangeable manufacture. There is no doubt but there is some difference between the exact meaning of the term then and now, just as there is a great difference between manufacture then and now.

There are several degrees of interchangeability, or at least several meanings to the exact interpretation of the term. Strict interchangeability consists in making the different parts of a mechanism so uniform in size and contour that each part will fit and properly function in any one of the whole number of mechanisms, no matter when or where it is made.

In the early days before modern machinery came into use, it was necessary to finish work by hand, and to make it uniform, template filing and finishing were resorted to. For example, gun and

pistol parts would have the holes drilled and reamed in a jig or fixture, and then the contour finishing was done by putting these pieces into a template jig provided with pins to fit the holes. The outside of the jigs would be a duplicate of the shape and size of the model piece and hardened. The workman would then file down to the hardened template, which controlled the shape and size of the piece. Many ingenious devices and schemes were used to facilitate the duplication of parts, and great skill was developed in the workmen.

The great improvement in machine tools, especially as to accuracy of output, was a very great factor in promoting interchangeability, and here again, America had led the world. The refinements, accuracy and efficiency of modern machine tools are strictly American.

American labor costs so much more than foreign that to compete in the world markets, we had to obtain as much product for each dollar of labor as our competitors, therefore, we had to develop machinery to get more product for less labor. This in turn has developed skill in our mechanics, and raised the standard of living so that to-day American skilled workmen are the best paid in the world.

It is a fundamental law that interchangeable manufacture is facilitated by the largest allowable freedom in the fit of mating parts without interfering with the proper functioning.

Allowances and Tolerances

This leads up to the subject of allowances and tolerances, one of the simplest, but least understood in the whole system of interchangeability. As these two words will be used repeatedly, it is well to point out the difference between them.

Allowance is a prescribed difference between the dimensions of two mating parts to produce a desired kind of fit. Example: A standard hole exactly 1 in. in diameter, with a free running shaft, the journal diameter of which is 0.998 in. The difference between this hole and the journal prescribed for the oil is 0.002 in. and this is the allowance.

Tolerance is the prescribed difference in the dimensions to tolerate the unavoidable errors or variations in manufacturing a large number of pieces.

In the above example, if a thousand running fits were to be made, the holes might be dimensioned 1.000 in.

$$+0.005$$
$$-0.0000$$

This half thousandth permissible error is the tolerance.

The shaft journal might be dimensioned 0.997 to 0.998 in. and this permissible error of 0.001 in. is the tolerance. Then the minimum allowance is 0.002 in. and the maximum looseness or the sum of both tolerance and the minimum allowance is 0.0035 inch.

Thus the kind of fit is finally determined by the combination of the allowance and tolerance, and most engineers prefer to use allowance as a minimum value, which is never intentionally encroached upon, the tolerance providing for larger freedom of fits. The reason for this is that the data for minimum allowance is more reliable and has been more clearly demonstrated than the maximum allowance, and as it is vital, it must be unaffected by tolerances. This is plainly evident in the case of free moving parts, as it is well understood that a space must be provided for an oil film, and this space must not be so small as to endanger failure by the parts seizing.

There are many conditions in which maximum looseness determines the strength of the parts or the limits of engagement, and any more freedom of fit would make the parts unsatisfactory. When this is the case, maximum looseness must be the starting point in the calculations, and this must then be unaffected by tolerance. Then if minimum allowance can be determined, the difference between these two, maximum and minimum looseness, will be the sum of the tolerances.

The tolerances are then divided between the mating parts according to the manufacturing ability to produce the parts to uniform size. That is, if the manufacturing ability is such that it is much easier to produce uniform size to one member than the other, the tolerance on the members is divided in direct proportion to this condition.

Very often the allowance has zero value; that is, there is no clearance whatever allowed for the fit, and in a single pair of mating parts, they fit metal to metal. Now if a large number of such parts are to be made, it must be determined whether this zero allowance is for the tightest or the loosest fit permissible.

The term "negative allowance" is often used to indicate that we allow a certain prescribed amount to make a tight or force fit, and is very confusing because it implies being subtracted, and this is not the case. According to present usage, zero allowance indicates that there is no clearance or space allowed between the two mating parts. Positive allowance indicates that there is prescribed a space between the mating parts. Negative allowance indicates that there is less than a space provided for between the mating parts, or an imaginary space displaced by the flow of the metal to make a tight fit.

The minimum allowance or greatest tightness and maximum looseness must be known when the tolerances have been set, and usually they are known at the time tolerances are set. There are, however, cases in which it is known that certain tolerances are the smallest that can be successfully used in manufacture, and then maximum looseness and maximum tightness must be adjusted to obtain the best functioning condition in conjunction with these tolerances.

After determining the maximum and minimum looseness of mating parts and setting the tolerances, it becomes necessary to control the dimensions of the parts so that none of the dimensions will be outside of the limits established, and that is best done at this time, for strictly interchangeable manufacture by the use of proper "go" and "no-go" gauges. First-class gauges are expensive, and soon wear, so that strict interchangeability is sacrificed to keep down gauge cost.

Old Method of Using "Go" Gages

In times past it was common practice to use "go" gauges only, and limit the looseness of fit by the shake of the piece in the gauge, or where a little more refinement was practised, a piece of newspaper was used on one side of the "go" gauge, and if the piece which passed without the paper, was tight with the paper, it was accepted. A piece of newspaper used with each of a pair of mating "go" gauges usually produced a freedom of fit from 0.004 to 0.006 in., and with skilled help, it produced satisfactory results.

For strictly interchangeable quantity-production work of good character, a good gauging system will prove economical. Such a system comprises the minimum number of properly designed gauges to control all the factors of the various parts of a mechanism, so that they will assemble and function properly. This assumes that proper allowances and tolerances have been established.

The designer should always keep before him the fundamental that tolerances should be as large as proper functioning will permit, and he should be well informed what tolerances successful manufacturers actually work to. He should take pains to learn how tight and how loose working parts can actually be, and give satisfactory results.

Once these tolerances are set as large as the designer will risk, they should be rigidly adhered to, and considered a boundary line. The product should always be kept within these boundary lines, and this is best accomplished by making the component drawing dimensions the master-gauge dimensions. Then with all the working and inspection gauges checked against master gauge, and never allowed to wear beyond master-gauge dimensions, the work is bound to be within component dimensions.

An exact duplicate master gauges cannot be made expect at a prohibitive cost, a master-gauge manufacturing tolerance is allowed. This tolerance is usually in good practice from 4 to 6 per cent. of the component tolerance, and is applied in the direction to keep the work within the boundary line defined by component dimensions. This gauge tolerance is treated as a wear limit, and robs the working tolerances by this 4 or 5 per cent.

Inspection gauges are usually of the same design as the working gauges, and after the same as the master gauges, but should have an additional allowance for wear. Inasmuch as the gauges will wear, and as they are expensive, the exact amount to allow for wear is an economic point for each manufacturer to decide, keeping in mind that a small wear limit increases gauge cost, and a large wear limit requires closer attention and work at the machines.

Where experience is lacking, it is good practice to allow 10 per cent. of the com-

ponent tolerance for wear on the "go" gauges; as the "no-go" gauges wear but little, 5 per cent. will be sufficient. The inspection gauge can only represent extreme tolerance limits when worn to master gauge size. The working gauges are those used to check the work as it is machined, and should have liberal wear limits to insure the work being passed by the inspection gages.

Thus is will be seen that this system, if foliowed, wil admit of the acceptance of work that will be interchangeable. It also emphasizes the fundamental that tolerance should be as large as will properly function.

If the tolerances are too small the work will be more costly, because better workmen wil be required, and this always means higher wages. Better tools and machines to produce the close work and more frequent adjustment and attention is also necessary as well as additional gauge cost. Close tolerances cause large rejections of the work, and more or less friction between the inspector and those responsible for the work.

Screw-Thread Work

The examples and descriptions so far have applied to all kinds of interchangeable work with no particular reference to screw-thread work, and while the principles and practice are the same, a great deal more care is required to produce strictly interchangeable screw-thread work than plain work. The problem becomes more difficult because a larger number of factors make up a proper screwthread fit, and a big error in any one of the factors, will prevent a proper fit. A comparison of these factors may help to make the solution more comprehensible. A cylindrical fit depends upon the size, rotundity and parallelism of the mating parts. Rectanguiar sliding fits depend upon size, contour, and parallelism of the mating parts. Of course, they all depend upon size, but in a screw-thread fit, size is affected by the errors of the lead in the mating parts, and the errors in the angle of the thread. Thus the factor contour in a screw thread is made up of the factors of lead and form of thread.

Two mating parts with correct lead require no compensation in size for the lead factor. Two mating parts with an equal lead error in the same direction, either long or short, require no compensation in size for the lead error. Two mating parts with different lead errors or the equivalent, require a compensation in size for this lead difference to enable the mating parts to go together.

Two mating parts in which the contour of the thread is affected by an error in the angle of the flanks of the thread, must also have a compensation in the diameter to offset the angle error, or the metal must flow to make the fit. Thus it will be seen that strictly interchangeable screw-thread product is more difficult to produce, and if good fits are required, close tolerances and good thread-producing tools are necessary. There must be a rigid inspection and means of controlling all factors which make a fit.

Where gauges are used, as at present time, they must be periodically checked against master gauges in order that boundary lines are not encroached upon. It is fundamental that the "go" gauges should check all factors simultaneously, and the "no-go" gauges should check factors separately. Thus it must be obvious when it is remembered that lead and form are compensated for by increasing the diameter, and hence to be sure of the correct relation of all the factors to each other, they must be gauged at once and with a gauge as long as the engagement of the mating parts. The exception to this is the minor diameter of the nut, and the major diameter of the screw. To include these two dimension factors in the "go" gauges, would make cost of the gauges prohibitive, and as these surfaces in the mating parts are intended to be cleared when assembled, it is practicable to get gauge them separately.

Some idea as to the cost of iron castings in America at the beginning of last century may be gained from some extracts from the minutes of the Albany Waterworks Company—published in the "Engineering News Record." On May 1, 1813, the trustees of the company opened the following tenders for cast iron conduits: (1) From Thomas Trenor, of Bennington, 128 dols. per ton, of 3 ft. length; (2) Eliphalet Sturtevant, New York, 140 dols. per ton, of 3 ft. length, or 120 dols. for 2 ft.; (3) Holly and Hoifing, of Salisbury. Conn., $100 per ton, "in joints of one length of 2 ft. each." The contract was awarded the same day to the last-named and lowest bidder, but with the proviso that the bidder supply 200 joints, "carefully cast, as a fair sample of the work, agreeably to a description laid down on paper by the superintendent and enclosed to them (the bidder) in order that a fair experiment may be made of the strength of the pipes according to the proposed dimensions, and that this Board will be ready to enter into a contract on the subject at any day when the parties will attend." Apparently the low bidder gave satisfaction, for on October 4, 1813, the trustees resolved to contract with Holly and Hoffing for 150 to 170 tons additional of cast iron conduit delivered on the dock in Hudson by November 1, 1814, at 100 dols. a ton.

A GLUE JOINT TEST

Glue joints between wood surfaces which have been coated with shellac or varnish have low or very erratic strength. This has been thoroughly demonstrated by a recent test at Forest Products Laboratory, Madison, Wis., U.S.A. Sixty pairs of test blocks were prepared in which one or both wood surfaces were varnished or shellacked, and were joined with either casein or animal glue. A great many of these blocks fell apart before testing, and all which held together long enough to be tested sheared apart in the glue joint and not in the wood. The highest strength value obtained was 1,712 lb. per square inch, which is low for casein glue. The other values were 1,000 lb. per square inch or less. It is evident, therefore, that all shellac or varnish should be carefully cleaned from wood which is to be glued, if high strength is desired. A few blocks were joined using shellac as a glue over surfaces previously coated with shellac. The maximum shear strength obtained was 1,425 lb., the minimum 450 lb., and the average 758 lb. per square inch. These values are low, and do not indicate that shellac has gluing properties which compare favorably with casein or animal glue.

THE AIRPLANE AS A PACKHORSE

The feasibility of transporting machinery and supplies by airplane to the numerous gold and silver mines in the States of Sinaloa, Mexico, is to be investigated by the British Government, according to an article in a recent issue of "Commerce Reports." According to the story, it appears that a British company is prepared to organize and operate an air service between the mines and railway stations for the transportation of machinery and supplies to the mines, which, due to their mountainous location and the absence of roads, at present are practically isolated. At present it is practically impossible to transport heavy machinery tc these mines, and the only machinery which can be transported must oe carried on the backs of burros, whose maximum limit of carrying is about 300 pounds each. It is understood that it would be the purpose of the proposed company to transport machinery weighing several tons.

RECENT INVENTION

A recent British invention has been made whereby the piston of an internal-combustion engine may be cooled by means of a draft of air circulating through a space in the piston. The draft is provided by means of fan blades on the engine flywheel. On either side of the hollow piston are ports which register with corresponding ports in the cylinder walls at the end of the stroke. A draft of air is thus forced through the hollow space in the piston while all the ports are in line.

Certain French financiers are contemplating the establishment of a large institution in Paris, with a view to centralizing trade. The building would contain samples of all the products of the world, classed in groups. Each storey would contain galleries for the sale of all kinds of imports and exports, together with a special staff who would supply information with regard to specialized branches of all trades. There would be information bureaus with interpreters, stenographers, etc., attached, and electric power to work the exhibits.

Canadian Machinery Drafting Course Part VIII

This is the Last Plate in Projection. Study the Principles Carefully, for it is the Underlying Principles That Count. Once You Realize WHY You Do Certain Things, the Rest is Easy

By J. H. MOORE, Associate Editor, Canadian Machinery

BEFORE going into this eighth portion of the course, let us discuss a very important matter, relative to the course and its procedure. As the writer explained when commencing this series of studies, it would be impossible to go very deeply into the various subjects and classifications, without taking up too much of the students' time, and perchance making the course very long and tedious.

For this reason we believe it would be good policy to outline, as it were, what is ahead of the student, to show him that we are keeping in mind the fact that it is not our intention to keep him longer than is absolutely necessary on the theory of drawing and its various underlying principles.

Starting with this portion, which is the last in projection, we will take up one plate on conic sections, one plate on intersections, together with developments, after which we will branch directly into mechanical drawing, so, as readers and students can see, it will not be long before they enter the strictly mechanical field.

After entering the actual drawing of portions of machines, etc., the student will take on an added interest. The writer speaks from personal experience, for he has passed through the mill and knows how it goes. He remembers well that he used to remark when studying all the elementary principles, "But what's all this got to do with mechanical drawing?" He later found out, however, that his time was well spent. His course of study, incidentally speaking, was a long (and to be honest) a tiresome one, stretching over four years, not covering ground as we are attempting to do here in this series of lessons.

Now that we have shown students just what our plans are for this work, let us get on to the present lesson.

Students will easily remember the last plate which illustrated various problems in projection, first showing the sketch, and later the mechanical drawing, or projected view. No doubt the principles underlying the subject were thoroughly mastered, at least we will assume so, and go on to four further problems of an entirely different nature.

The objects on the last plate were all made or drawn under the supposition that either the centre lines, or at least one flat side, was parallel to the plane of the paper. The centre lines of each object were also either vertical or horizontal.

Such conditions are always possible when making detail drawings, where each piece is drawn separately by itself, but in the case of machines, especially intricate machines, where the parts are drawn at different angles, they cannot always be drawn in this manner, which naturally makes it a little more difficult.

The objects shown on this plate are not so difficult in themselves to draw, but they are placed at different angles to illustrate and educate the student into this new condition of projection.

Particular care should be taken to study and understand this plate, in fact, all plates, to follow between this and the actual mechanical drawing, for if the student thoroughly masters the principles of this plate, and those to follow, he will experience no difficulty later on in the course.

To commence with plate No. 8, let us look at Fig. 1.

Here we see a rectangular prism at A, which is 1½ in. long, 1¼ in. width, and ⅝ in. thick.

The problem now consists of constructing this prism, standing in a perpendicular position on one of its small ends, in such a manner that the broad sides form an angle of 30 degrees with the horizontal line.

Of course, the plan in this must be drawn first. To do this, draw the rectangle 1, 2, 3, 4, with the sides 1, 2, and 3, 4, forming 30 degrees with the horizontal. This may be easily done, by means of tee square and 60-30 degree triangle, which readers are, no doubt, well familiar with.

To construct the front elevation, draw a horizontal line, 11, 14, and project down the point 1 upon this horizontal line, thus obtaining the point 11. Now draw 11, 18, 1½ in. in length, namely, the length of the prism. Next, draw the horizontal line 18, 15. Continue to project down the points 2, 3, and 4, from the plan on to the elevation, making the points of intersection at 12, 13, 14, 15, 16, 17, respectively. The line 12, 17 is dotted, because, as is plain to be seen, this point is a projection of the corner 4 in the plan view, which would be hidden in the elevation.

The side elevation is now a simple matter. Project lines 11, 14, and 18, 15, until they reach 22 and 23 respectively. Produce a line from point 2 in the plan till it reaches the point 29; also produce a line from 1 in the plan until it reaches the point 27. Produce another line from point 4 till it reaches point 28, as shown. Now proceed further with your side elevation.

Take your dividers and measure the distance from point 29 to 3. Come down to the side elevation, and lay this distance off as shown at 19 to 20. Next, take distance 29, 27, on plan, bring it down in similar manner, which now is 19 to 21. Last, but not least, take the distance 29, 28, on the plan and mark it off on the elevation, which is, of

What is the Purpose of Our Drawing Course?

A SHORT time ago CANADIAN MACHINERY received a letter from Mr. A. M. Lount, master mechanic of the Massey-Harris Co., Toronto, regarding our course of studies.

To receive a letter from a busy man such as Mr. Lount is proof to us that our efforts are appreciated. He spoke as follows:—

"In comment of your course, would say that the writer has found several of his men who are following this course, and is very pleased with the idea, but would suggest that you call attention strongly to the point that a course of this nature is particularly valuable to the man on the machine, or the bench, just as much as it is to the beginner in the drawing office.

"With reference to the course itself, would say that so far it appears to have been very cleverly designed and is just about the thing that is needed."

WE appreciate Mr. Lount's interest, and can only emphasize what he has already stated, namely, that the man on the bench can make good use of these lessons.

He will become more adept at his daily task, prove of more value to his firm, which, in turn, will prove a means of increasing his salary.

All are welcome, no matter what position they hold. Our only means of knowing how our work is taking root is to hear from you. Let us have both your opinion and your suggestions.

We have an important announcement to make in our Dec. 18th issue relative to this course. Watch for it.

course, 19 to 22. Now construct your side elevation complete, remembering to make the line 21, 24 dotted, because point 1 would be hidden in a side view, such as we have just projected.

Moving to Fig. 2 we also find a rectangle of similar size, but in a different position.

Here the prism is shown with the narrow sides parallel to the plane of the paper, but the object is now tipped until the base makes an angle of 15 degrees with the horizontal.

The procedure is very similar in this case. We start from the titled elevation view, and from this project the side elevation and the plan. Briefly, you project points A, B, C and D as before, these terminating at M, N, O, P, Q, R, S and T, the distance M T being 1½ in. The side elevation is projected as follows: Produce points A, B, C, D till they reach F, H, J and L. The line E F equals M T or 1½ in., the length of the prism. The reason for the lines N S and R H being dotted is self-apparent, they being hidden lines in their respective views.

Fig. 3 is next in order, and represents a hexagonal prism 1½ in. long, 1 in. across the flats. The student is expected to draw at the space B, how such a prism would appear to the eye, just the same as we showed at A, in Fig. 1, how the rectangular prism appeared to the vision.

Starting from the plan view we construct the hexagon 1, 2, 3, 4, 5, 6, in either of the following manners:

Draw a circle 1 in. in diam. and draw both centre lines, projecting the vertical one down to be used in the elevation view. As there are 360 degrees to a circle we can easily see that 6 (the number of sides to the polygon) divided into 360 equals 60 or 60 degrees. You can therefore divide your circle up into sections of 60 degrees, joining with lines tangent to the circle at these points, which, of course, will make your hexagon.

A much easier method, however, and one you will use later on in the course, is as follows: Draw your circle 1 in. diam. as before; then draw your centre lines, and with your 60 degree triangle and T square you can easily accomplish the rest. Run your triangle along the T square until it is tangent with the circle, and draw your lines. This constructs the lines 2, 3, and 5, and 6, 1, 2, and 4, 5. Now draw parallel lines 1, 6, and 3, 4, when your hexagon is complete. The front elevation is a simple matter. Merely project down your points 2, 3, 4, and 5, till they reach the line, 7, 10, which you draw in whatever position to suit your convenience. Next, lay out the line 7, 14, 1½ in. long, and produce this horizontally till it reaches point 11, after which complete the front elevation, 7, 8, 9, 10, 11, 12, 13 and 14. The next step should be watched carefully, for we desire a side elevation as if the vertical prism were looked at in the direction of the arrow, namely, at an angle of 30 degrees with the horizontal.

Proceed as follows: Project from

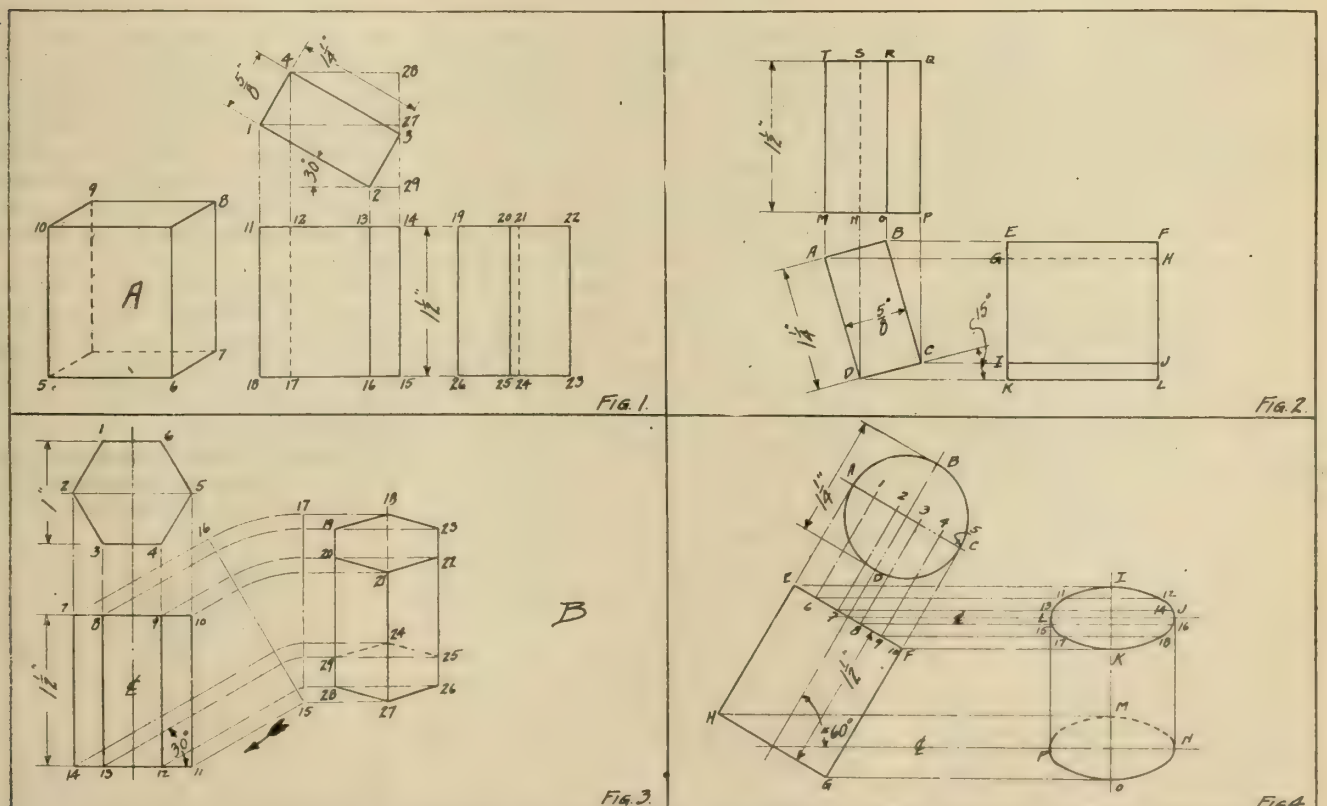
Tear off and send with drawing

Name .....

Address .....

Position .....

Firm's name.....



NOW WE START ON THE WINTERS' WORK—SEND YOUR PLATES IN AS EARLY AS POSSIBLE.

points 7, 8, 9, 10, 11, 12, 13, and 14, a series of lines each at a slope of 30 degrees, as shown. At some point as 15, which can be placed to suit your own convenience construct a line 15, 16, perpendicular to these lines already projected. With the point 15 as a centre, describe arcs from every point where the lines already projected cut the line 15, 16. Continue these arcs until they meet with the line 15, 17, which is a line perpendicular to the horizontal plane.

From these points project horizontal lines as shown till they go to points 18, 23, 22, 25, 26 and 27.

Draw the line 18, 27 as a centre line for your side elevation. This line can also be drawn in any position to suit your convenience. On each side of this line space off distances equal to ½ in., or one-half the width of the hexagon. The rest of the construction is self-apparent, for all that is now necessary is to join the various points together, as shown on the plate. Do not forget to construct at B the prism as you believe it would appear to the eye.

We now come to Fig. 4, the last on this plate. Here we see a cylinder whose axis is parallel to the plane of the paper, but which makes an angle of 60 degrees with the horizontal. In this case it is the vertical side projection which is required. As will be noted, this cylinder is 1¼ in. diam. and 1½ in. long. Construct the plan, and front projection as shown. On the centre line of plan, that is the line A C, space off into 5 equal parts as at 1, 2, 3, 4, and 5. (Note: In this case we only call for five, but this line can be divided into as many parts as desired depending upon the accuracy required).

From these points project the lines until they reach the points 6, 7, 8, 9 and 10 on the line E F. Next project horizontally these lines until they reach the points I, 12, J, 16, 18, and K, likewise at the bottom in similar manner. Now, take point 1 on the plan. Set your dividers on this point and measure off a distance from 1 to where the projected line touches the semi-circle A, D, C. Lay this distance off at the side elevation in this manner:

On each side of the centre line I O, lay off the distance just measured; this will now make the points 11 and 12, also 17 and 18, for a distance from 1 or 4, in the plan to the semi-circle would, of course, be the same.

Next, from the point 2 take a distance to the semi-circle, and lay this out on the side elevation, making the points 13, 14, also 15, 16. Of course, a distance taken on the centre line of the plan at B D will equal the distance L J on the side elevation. The student is left to complete this figure, as he proceeds in an exact similar manner at the bottom portion of the cylinder.

Above all, study this plate carefully and grasp the fundamental principles involved, after which you have nothing to fear.

As before, make your plate 13 x 9 to border lines, and 13½ x 19½ over all. Ink in all the complete work, including dimensions, figures and letters. Add in as usual the title, name, etc., then let us pass on your work, and see if you land one of the prizes. Watch for the next plate on Conic Sections, and remember the sooner we get through the next few plates, the sooner we enter the mechanical drawing in its regular shop form.

Stamped vs. Cast Wheels for Light Railway Cars

Pressed Steel is Lighter Than Cast Iron, but Not So Durable, but Both Have Their Advantages.

IN a recent number of *Canadian Machinery*, there appeared an article on the adaptation of automobile busses to railroad work. The matter of wheels is of greatest importance in the success of an application of this kind and as this may be new to some of those who wish to experiment with such cars, a little information on the subject will be given, though without going into technicalities.

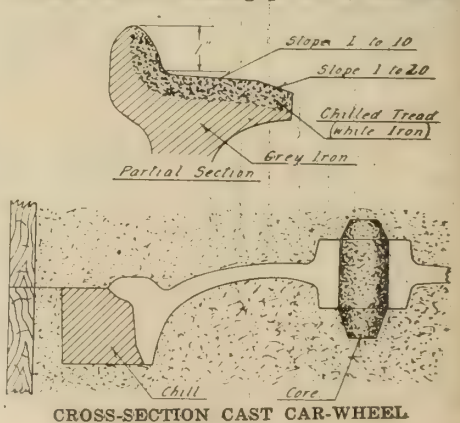
The pressed steel wheel is the lightest that can be secured as well as the most inexpensive in the first place. They are carried in stock in sizes up to 22 in., and may be had on order larger than that. These wheels are tamped and formed out of sheets of steel of 3/16 in. to 5/16 in. thickness, the tread, flange, and spokes being all one piece. Cast iron or steel hubs are riveted to the spokes. These wheels are extensively used on motor cars for workmen's use, their light weight makes them valuable where one man has to go to a distant point to do work and he must alone remove the car from the track while working.

In daily service on a heavier class of work these wheels have only one thing to commend them and that is their availability—as they are carried in stock in standard sizes and can be obtained on short notice (and at low cost). Where the weight on each wheel is as low as 500 lbs., the speed up to 30 miles per hour, and, say, a hundred miles running per day, the wheels will cut through at the base of the flange in three months; as a matter of fact, they are not intended for such severe usage, though they serve the purpose admirably if watched and renewed in time.

The vast majority of wheels in general use are of cast iron with chilled treads and such wheels naturally do unusually well on motor cars. The objection that rises to them is their over-strength and the excess of weight over what is needed for the work. Unlike the pressed steel wheel which is sold by the piece or pair, the chilled wheel is sold on a basis of cents per pound of weight—at this time around 4½ cents per lb.—and in such buying the customer pays for a great deal more weight than he needs. Some foundries have 30 in. patterns and chills but most of them make sizes 33 in. diameter or larger and these wheels weigh 500 lbs. or more and have capacities of eight to ten tons, under which loads they are supposed to give about 70,000 miles of service.

Thus the stock chilled wheel is somewhat expensive and its weight puts additional stresses on running gear parts at high rates of speed on curves. Foundries which cast street car wheels are in a position to supply lighter wheels for motor cars because the street car wheel is spoked which reduces the amount of metal in the "plate," as that part of the wheel between the hub and the rim is called. And the street car wheel is amply strong for any motor car usage. The one disadvantage of the stock street car wheel is its narrow tread, made purposely narrow so the wheel will not ride on the paving bricks laid next to the outside of the rail. Where the gauge of track is not carefully looked after, there may be sections such as on curves where the gauge is so wide that the narrow wheels will drop in between.

The objection to street car wheels noted in the last paragraph may be overcome by making new patterns and chills, but that is expensive unless a large number of wheels are required. As the additional width of tread is used and needed but little, an inexpensive method of getting this width with stock patterns may be resorted to. A temporary piece is added to an existing pattern, building



CROSS-SECTION CAST CAR-WHEEL

the tread out to the standard M.C.B., or any width desired. Then the castings are made as before except that there is a ring of unchilled metal at this one point and this soft ring answers the purpose of a safety—it gets so little service that the wear is negligible.

It is possible for any iron foundry to make car wheels of a sort. If a chill of correct proportions is made up and castings made against this, a certain amount of chill will be apparent on the face; however, it will not be the white iron of the car wheel foundry and the chill, instead of being ⅝ in. deep, will be only 1/16 in. to ⅛ in. deep. Such wheels will give a certain amount of service and have the advantage of being everywhere available. A few words in regard to the work may not be amiss.

The web (plate) or the spokes should not be straight, that is, they should not coincide with the plans of the wheel, but should be curved or reverse curved with liberal fillets at the hub and tread. The shrinkage makes necessary the precaution just named. The wheel pattern does not have to be exactly fitted on the outside, for the chill forms this part of the casting and with this machined out, the wheel should come smooth and true within 1/32 in. A pattern, of course, is required for the chill; it includes only the inner half of the flange; it should be three or four inches thick to provide mass enough of cool metal to cause chilling. Sometimes the foundryman uses water on the chill to assist. With one chill, one wheel a day may be cast.

Regular car wheel foundries use an entirely different mixture of irons from general foundries and this is responsible for the hard face obtained on their wheels. This latter is so hard that the castings have to be annealed for a week in special ovens called "soaking pits" before it is safe to use the wheels.

Metallurgy in the Manufacture of Steel

This Paper Discusses the Introduction of Vanadiaum. The Proper Selection of Raw Material. The Rolling of High Speed Steel and Other Vital Points in Manufacture of High Speed Steel

By ROY C. McKENNA

IT was with some hesitancy that I accepted the invitation of the American Steel Treaters' Society to present this paper. The writer is not a metallurgist; therefore the paper is non-technical.

The manufacturers of tool steels heartily endorse the principles and objects of the American Steel Treaters' Society. For centuries the secret art of making tool steel has been handed down from father to son. The manufacture of tool steel is still an art which, by the aid of science, has lost much of its secrecy.

No industry is more liberal in the use of scientific men, yet tool steel is today made by practical men, skilled as melters, hammer-men and rollers, each knowing his art. These practical men willingly accept guidance from the chemical and metallurgical departments. The success of this co-operation between the practical and scientific men engaged in the manufacture of tool steels demonstrates the need of a society such as this.

There are now in existence perhaps too many strictly scientific societies, several of which could carry on a scientific investigation of the heat-treatment of steel, but the results of these investigations would probably be of no immediate benefit to the practical man who knows the heat-treating of steel from a practical standpoint. The American Steel Treaters' Society recognizes that the scientific man has much to learn from the practical man; also, the practical man has come to recognize that there is not so much difference between theory and practice when discussions are not camouflaged by technical terms.

The success of the society depends upon its ability to accomplish the purpose set forth in its constitution, namely: to secure co-operation between practical steel treaters and metallurgical departments, so that they may understand each other and each benefit thereby to the end that the truth be brought to light.

A knowledge of conditions existing today in the manufacture of high speed steel is essential to steel treaters. As a manufacturer of high-speed steel, I am glad to give in this paper such information as I am able. It is well for the manufacturer to have steel treaters understand some of his troubles and difficulties, so that they will better comprehend the necessity of certain trade customs and practices, and, realizing the manufacturer's desire to co-operate with them, will reciprocate. This understanding will be mutually beneficial.

The manufacturer of high-speed steel knows and appreciates the troubles and difficultics that may sometimes arise in the heat-treating of this product. The manufacturer's aim is to make a uniform high-speed steel which will best meet the requirements of the average machine shop on general work, and at the same time allow the widest variation in heat-treatment to give desired results.

High-speed steel is one of the most complex, complicated alloys known. A representative high-speed steel contains approximately twenty-four per cent. of alloying metals, namely: Tungsten, chromium, vanadium, silicon, manganese, and in addition there is often found Cobalt, molybdenum, uranium, nickel, tin, copper and arsenic.

The selection of a standard analysis by the manufacturer is the result of a series of compromises between various properties imparted to the steel by the addition of different elements. There is a wide range of chemical analyses of various brands of high-speed steel. You will agree that, although there are being manufactured as high-speed steel, brands that do not come within the standard of what is commercially known as high-speed steel, there are certain well-defined limits to the contents of certain elements.

The steel, to be within the range of generally accepted analysis should contain over 16 per cent. and under 20 per cent. tungsten. If of lower tungsten content it should carry proportionately more chromium and vanadium.

Further discussion in this paper is confined to high-speed steels containing approximately 18 per cent. tungsten.

The combined action of tungsten and chromium in steel gives to it the remarkable property of maintaining its cutting edge at relatively high temperature. This property is commonly spoken of as "red-hardness." The percentage of tungsten and chromium present should bear a definite relationship to each other. Chromium imparts to steel a hardening property similar to that given by carbon, although to a less degree. The hardness imparted to steel by chromium is accompanied by brittleness. The chromium content should be between 3½ and 5 per cent.

The Introduction of Vanadium

Vanadium was first introduced in high-speed steel as a "scavenger," thereby producing a more homogeneous product of greater density and physical strength. It soon became evident that vanadium used in larger quantities than necessary as a scavenger imparted to high-speed steel a much greater cutting efficiency. Recently, no less an authority than Professor J. O. Arnold, of the University of Sheffield, England, stated that "high-speed steels containing vanadium have a mean efficiency of 103.9, as against a mean efficiency of 61.9 obtained from high-speed steel without vanadium content." A wide range of vanadium content in high-speed steel, from ½ to 1¼ per cent. is permissible.

An ideal analysis for high-speed steel containing 18 per cent. tungsten is a chromium content of approximately 3.85 pr cent.; vanadium .85 per cent. to 1.10 per cent., and carbon, between .62 and .77 per cent.

Sulphur and phosphorus are two elements known to be detrimental to all steels. Sulphur causes "red-shortness,"

and phosphorus causes "cold-shortness." The detrimental effect of these two elements counteract each other to some extent but the content should be not over .02 sulphur and .025 phosphorus. The serious detrimental effect of small quantities of sulphur and phosphorus is due to their not being uniformly distributed owing to their tendency to segregate.

The contents of manganese and silicon are relatively unimportant in the percentage usually found in high-speed steel.

The detrimental effects of tin, copper and arsenic are not generally realized by the trade. Small quantities of these impurities are exceedingly harmful. These elements are very seldom determined in customers' chemical laboratories and are somewhat difficult for public chemists to analyze for.

In justice to the manufacturer of high-speed steel, attention should be called to the variation in chemical analyses between the best of laboratories. Generally speaking, a steel works laboratory will obtain results much finer and more accurate than is possible by a customer's laboratory, or public chemist. This can reasonably be expected, for the steel works' chemist is a specialist, analyzing the same material for the same elements day in and day out.

The importance of the chemical laboratory to a tool steel plant cannot be overestimated. Every heat of steel is analyzed for each element, and check analyses obtained; also, every substance used in the mix is analyzed for all impurities. The importance of using pure base materials is known to all manufacturers despite chemical evidence that certain detrimental elements are removed in the process of manufacture.

The chemical composition of steel for any purpose is a basic consideration and must be such as will meet the requirements, but the quality of the steel does not depend wholly upon the chemical composition. Assuming the chemical composition to be within the permissible limits, the quality depends upon local conditions surrounding its manufacture. If the quality of steel were entirely dependent upon the chemical composition and not influenced by its "working" and "handling" in accordance with tool steel practice, the tool steel industry would be unable to exist.

The manufacture of high-speed steel represents the highest art in the making of steel by tool steel practice. Some may say, on account of our increased knowledge of chemistry and metallurgy that the making of high-speed steel has ceased to be an art, but has become a science. It is, in fact, an art, aided by science. The human element in the manufacture of high-speed is a decided factor, as will be brought out in the following remarks.

The Selection of Raw Material

The manufacture of high-speed steel begins with the selection of the raw materials which enter into the mix. Reference has already been made to the care taken by having a chemical determination made of all impurities likely to be present in ferro-alloys and also the fact that in order to make a good product, a good low-phosphorous melting iron must be used as the base.

The heat-treatment of steel in its broad aspect may be said to commence with the melting furnace and end with the hardening and tempering of the finished product. High-speed steel is melted by two general types of furnace, known as crucible and electric; the process of operation and construction of which have been completely described in papers delivered before this and other societies. Steel treaters are more vitally interested in the changes that take place in the steel during the various processes of manufacture, rather than a detailed description of these processes, which are more or less familiar to all.

The importance of properly melting high-speed steel is known and recognized by all informed on the subject, but it is not my intention to go into this important subject in this paper.

It must be of correct chemical analysis, properly melted and cast into solid ingots, free from blow-holes and surface defects. Sudden changes of temperature in high-speed steel are to be guarded against at every stage of its manufacture and subsequent treatment. Ingots of high-speed steel are relatively weak, and the tendency to crack, due to cooling strains, is great. For this reason the hot ingots are not allowed to cool quickly, but are placed in furnaces which are of about the same temperature and are allowed to cool gradually before being placed in stock. Good high-speed steel can be made only from good ingots.

Steel treaters should be more vitally interested in the important changes which take place in highspeed steel during the hammering operations than that of any other working the steel receives in the course of its manufacture.

The quality of high-speed steel is dependent to a very great extent upon its structure. I want it understood that by further reference to "structure" of high-speed steel I mean the appearance of a polished and etched specimen under the microscope. By "fracture" will be meant the appearance of the broken surface of a bar or billet to the naked eye. The making of the structure begins under the hammer, and the beneficial effects produced in this stage persist through the subsequent operations, providing they are properly carried out. The massive carbides and tungstides present in the ingot are broken down and uniformly distributed throughout the billet.

To accomplish this the reduction in area must be sufficient and the hammer blows should be heavy, so as to cause compression into the centre of the billet; otherwise undesirable characteristics such as coarse structure and Carbide envelopes will exist and cause the steel treater much trouble. Surface defects invisible in the ingot may be opened up under the hammering operation, in which event they are clipped from the hot billet.

Generally speaking, it may be said that high speed steel of good quality works well under the hammer. Ingots are first hammered into billets. These billets are carefully inspected and all surface defects ground or chipped. The hammered billets are again slowly heated and receive a second hammering, known as "cogging." The billet resulting therefrom is known as a "cogged" billet and is of the proper size for the rolling mill or for the finishing hammer.

Although it is not considered good mill practice, some manufacturers who have a large rolling mill perform the very important cogging operation in the rolling mill instead of under the hammer. Cogging in a rolling mill does not break up and distribute the Carbides and Tungstides as efficiently as cogging under the hammer; another objection to cogging in the rolling mill is that there is no opportunity to clip surface defects developed as they can be under the trained eye of a hammer-man, thereby eliminating such defects in the finished billet.

The Rolling of High Speed Steel

The rolling of high speed steel is an art known to very few. The various factors governing the proper rolling of high speed steel are so numerous that it is necessary for each individual rolling mill to work out a practice that gives the best results upon the particular analysis of high speed steel they make. Important elements entering into the rolling of high speed steel are the heating and finishing temperatures, draft, and speed of the mill. In all of these the element of time must be considered. There is no department of a tool steel plant where the personnel of the actual operators has a greater influence upon the quality of the finished product.

High speed steel should be delivered from the rolling mill to the annealing department free from scale, for scale promotes the formation of a decarbonized surface. In preparation of bars of high speed steel for annealing, the bars are packed in tubes with a mixture of charcoal, lime and other material. The tube is sealed and packed in the annealing furnace. The temperature of the furnace is gradually raised to about 1,650° F. and there held for a sufficient length of time, depending upon the size of the bars. After very slow cooling the bars are removed from the tube. They should then show a Brinnell number of between 235 and 275.

The inspection department of a high speed mill ranks with the chemical and metallurgical departments in safeguarding the quality of the manufacturer's product. They inspect all finished material from the standpoint of surface defects, hardness, size and fracture. They reject such steel as is judged not to meet the manufacturer's standard. The inspection and metallurgical departments work hand-in-hand, and if any department is not functioning properly it will soon become evident to the inspectors, enabling the management to remedy the trouble.

The successful manufacture of high speed steel can only be obtained by those companies who become specialists. The art and skill necessary in the successful working of such steel can be attained

only by a man of natural ability in his chosen trade, and trained under the supervision of experts. To become an expert operator in high speed steel in any department of its manufacture, it is necessary that the operator works almost exclusively in the production of such steel.

As to the heat-treatment of high speed steel, it is customary for the manufacturer to recommend to the user a procedure that will give to his steel a high degree of cutting efficiency. The recommendations of the manufacturer should be conservative, embracing fairly wide limits, as the tendency of the user is to adhere very closely to the manufacturer's recommendations. Unless one of the manufacturer's expert service men has made a detailed study of the customer's problem, the manufacturer is not justified in laying down set rules, for if the customer does a little experimenting he can probably modify the practice so as to produce results that are particularly well adapted to his line of work.

The purpose of heat-treating high speed steel is to produce a tool that will cut so as to give maximum productive efficiency. This cutting efficiency depends upon the thermal stability of the complex hardenites existing in the hardened and tempered high speed steel. The writer finds it extremely difficult to convey the meaning of the word "hardenite" to those that do not have a clear conception of the term. The complex hardenites in high speed steel may be described as that form of solid solution which gives to high speed steel its cutting efficiency. The complex hardenites in high speed steel are produced by heating the steel to a very high temperature, near the melting point, which throws into solution Carbides and Tungstides, provided they have been properly broken up in the hammering process and uniformly distributed throughout the steel. By quenching the steel at correct temperature this solid solution is retained at atmospheric temperature.

It is not the writer's intention to make any definite recommendations as to the heat-treating of high speed steel by the users. It is recognized that such steel can be heat-treated to give satisfactory results by different methods. It is, however, believed that the American practice of hardening and tempering high speed steel is becoming more uniform. This is due largely to the exchange of opinions in meetings such as this. The trend of American practice for hardening high speed steel is towards the following:

First: Slowly and carefully pre-heat the tool to a temperature of approximately 1,500° F., taking care to prevent the formation of excessive scale.

Second: Transfer to a furnace, the temperature of which is approximately 2,250° to 2,400° F., and allow to remain in the furnace until the tool is heated uniformly to the above temperature.

Third: Cool rapidly in oil, dry air blast, or lead bath.

Fourth: Draw back to a temperature to meet the physical requirements of the tool, and allow to cool in air.

It was not very long ago that the desirability of drawing hardened high speed steel to a temperature of 1,100° F. was pointed out, and it is indeed encouraging to learn that comparatively few treaters of high speed steel have failed to make use of this fact. Many steel treaters at first contended that the steel would be soft after drawing to this temperature and it is only recently, since numerous actual tests have demonstrated its value, that the old prejudice has been eliminated.

With an understanding of some of the difficulties inherent in the manufacture of high speed steel, I will try to give you the justification of some of the trade practices and customers which have been generally accepted.

First: SHOULD THE CUSTOMER SPECIFY BY WHAT PROCESS TOOL STEEL IS TO BE MADE?

The customer should not specify by what process tool steel is to be made. The customer is more concerned as to the quality of the tool steel and the service which it gives him. It should be left to the manufacturer to use the process which, in his opinion, produces the most satisfactory product. The customer has a right to know by what process the steel furnished him is made.

Second: SHOULD CUSTOMER SPECIFY ANY LIMITS AS TO CHEMICAL COMPOSITION OF HIGH SPEED STEEL?

The customer should not specify any limits as to the composition of high speed steel. A manufacturer should be willing to co-operate with the trade to the extent of submitting to them his rejection limits of those elements vitally affecting the efficiency of the steel.

Third: WHY SHOULD HIGH SPEED STEEL BE DELIVERED ONLY IN THE ANNEALED CONDITION?

High speed steel should be delivered only in the annealed condition because annealing relieves the internal strain inevitable in the manufacture and puts it in vastly improved physical condition. The manufacturer's inspection after annealing also discloses defects not visible in the unannealed state.

Fourth: IT IS ADVANTAGEOUS FOR THE BUYER TO CONDUCT A TEST ON VARIOUS BRANDS OF HIGH SPEED STEEL BEFORE DECIDING UPON PLACING HIS CONTRACT?

The only true test for a brand of high speed steel is the service that it gives by continued performance month in and month out under actual shop conditions. The average buyer of high speed steel is not justified in conducting a test, but can well continue to purchase his requirements of high speed from a reputable manufacturer of a brand that is nationally known. The manufacturer of high speed steel is always willing to co-operate with the trade in the conducting of a test and is much interested in the information received from a well conducted test. A test of high speed steel, to be valuable, should be conducted in a manner as nearly approaching actual working conditions in the plant in which the test is made, as is practical. In conducting a test a few reputable brands of high speed steel should be allowed to enter. The test should be conducted along lines laid down by customer and all competitors should be treated equally. All tools entered should be of exactly the same size and shape. There is much difference of opinion as to the best practical method of conducting a test, and the decision as to how the test should be conducted should be left to the customer, who should co-operate with the manufacturers in devising a test which would give the best basis for conclusions as to how the particular brands of high speed steel would perform under actual shop conditions.

Fifth: WHAT IS THE VALUE OF TESTING FINISHED TOOLS WITH A FILE? CAN SUCH A TEST BE CONSIDERED RELIABLE?

The value of the file test depends upon the quality of the file and the intelligence and experience of the person using it. The file test is not reliable, but in the hands of an experienced operator, gives some valuable information. The manufacturer of small tools from high speed steel sometimes carries the file test to extremes. Almost every steel treater knows of numerous instances where a lathe tool which could be touched with a file has shown wonderful results as to cutting efficiency.

Sixth. SHOULD SPECIAL LENGTH BARS BE SPECIFIED, OR SHOULD BARS BE OF ORDINARY COMMERCIAL LENGTH? SHOULD IT BE PERMISSIBLE TO DELIVER SHORT BARS?

The customer should not specify special length bars unless for special requirements. The manufacturer should reserve the right to ship bars of commercial length and should also be permitted to deliver short bars. That these conditions are necessary in high speed steel is due to the rejection under final inspection. A physical defect may be found in the middle of finished bar, which must be eliminated. This results in there being finished, two short bars of approximately four or five feet long in place of the usual commercial length, approximately ten feet. For the customer not to permit delivery of short bars would result in excessive, inexcusable waste. Commercially, a bar of standard size should be considered approximately ten feet long, and the manufacturer should have the right to ship the equivalent number of feet, including a percentage of short bars. 24 inches should be the minimum length acceptable to purchaser, and delivery of pieces of this short length should only constitute a small percentage of the quantity furnished. It would be very desirable if the trade would cooperate by giving to the manufacturer multiple lengths to which to work whenever practical. Much loss would be avoided by this co-operation.

Seventh: WHAT DEVIATION IN PERCENTAGES OF WEIGHT OF HIGH SPEED ORDERED SHOULD THE MANUFACTURER BE PERMITTED?

A manufacturer should at all times ship as close to weight as possible without cutting bar to length. A maximum limit of 10 per cent. over or under should be allowed.

Eighth: ARE THE MANUFACTURER'S TERMS OF WARRANTY JUSTIFIED?

The terms of warranty almost universally adopted, with slight variations are as follows: "We will replace or allow credit for any steel which, if properly selected and used, shall prove defective, but we will not allow claims for labor or damage." The universal acceptance of these terms by the buying public would prove their justification. There is no stronger or more equitable form of guarantee in any line of business.

Ninth: WHAT ALLOWANCE SHOULD BE MADE BY BUYER FOR DECARBONIZATION?

The manufacture of high speed steel has progressed to such a point that buyers, in placing their specifications, barely consider allowance for decarbonization. The allowance made by the buyer should be governed by his experience with the brand of high speed steel, and in all cases should be liberal.

Tenth: IN WHAT MANNER SHOULD A CUSTOMER WHO HAS A COMPLAINT AS TO QUALITY OF HIGH SPEED STEEL CO-OPERATE WITH THE MANUFACTURER?

A buyer should invariably ask permission of the manufacturer to return steel claimed defective, or give the manufacturer an opportunity of having one of his experienced service men inspect and examine material claimed defective at his plant. The customer should co-operate with the manufacturer to the extent of giving the manufacturer all information available regarding the details of shipment, order number under which it was shipped, date and time of receipt. This information not only enables the manufacturer to identify the material in question as his own, but gives him an opportunity of investigating the handling of the order in his own plant, and in a well organized tool steel plant it will enable the manufacturer to determine the heat number from which the steel in question was rolled, its analysis, and other valuable data concerning its working through the mill. It is only by carefully following customer's complaints that the manufacturer is able to correct faults and improve his product.

Eleventh: IS THE MANUFACTURER'S MAINTAINING OF EXPERIENCED SERVICE MEN TO HELP SOLVE CUSTOMER'S HEAT-TREATING PROBLEMS AND SECURE FOR THEM MAXIMUM EFFICIENCY AND PRODUCTION JUSTIFIED?

There is no expense incident to the manufacturing, selling and use of high speed steel which has justified itself in actual practice more than the maintaining of an adequate, competent corps of service men. The cost of the very best high speed steel is infinitesimal compared with the value of the finished tool in constant daily service. High speed steel is to-day marketed upon the basis of quality and service. The maintaining of a competent corps of experienced service men helps the manufacturer as nothing else could in maintaining and constantly improving the quality of his product. The assurance given to the buyer by a reputable maker of high speed steel that their service department will stand back of their product is well worth the extra expense.

Twelfth: IS THE PRACTICE OF BUYING HIGH SPEED STEEL BY BRAND NAMES INSTEAD OF PHYSICAL, CHEMICAL AND METALLURGICAL SPECIFICATIONS JUSTIFIABLE?

The practice of buying high speed steel by brand names is justifiable. The guarantee behind high speed steel is the standing and reputation of the manufacturer, who should maintain in his employ metallurgists and experienced service men who will defend the quality of his product and be ready at any time to heat-treat and demonstrate to buyer's satisfaction that the product furnished by him will meet any of his reasonable requirements. The customer's specifying the chemical, physical or metallurgical properties relieves the manufacturer of his responsibility as to quality. Quality is not dependent upon the chemical composition and poor high speed steel can be made within any limits of chemical contents that could be commercially met by a manufacturer of best quality high speed steel. In purchasing high speed steel by brand name the buyer places responsibility for performance clearly with the manufacturer. The specifying of physical, chemical or metallurgical limits by buyer would lead to endless controversy and would positively retard, in fact, completely arrest the progress of the industry.

The manufacturers of high speed steel should co-operate with the members of the American Steel Treaters' Society to the extent of submitting upon request rejection limits as to chemical content of those elements which vitally affect the Steel Treater's work. It is not desirable that the manufacturer's rejection limits be published broadcast. The buyer has the right to demand that high speed steel purchased by him should be within the generally accepted analysis of high speed steel. Chemical composition is a basic consideration, but the quality is dependent upon many other factors, the most important of which is the human element. No steel treater can question the fact that the results obtained from heat-treating depend upon the operator. The operator will use all modern appliances, such as pyrometer, automatic temperature control, quenching machines, etc., but the results obtained depend upon his individual experience and skill. The manufacture of tool steel is and will continue to be a handicraft industry.

Modern tool steel practice has changed from that of the past, not by the use of labor-saving machinery, but by the use of scientific devices which aid and guide the skilled craftsman in producing a steel of higher quality and greater uniformity. It is upon the intelligence, experience and skill of the individual that quality o tool steel depends.

THRUST COLLAR JIG

(Concluded from page 563)

The next operation is to bore an finish to thickness. This is done on Warner & Swasey machine and is hel by a special face plate, Fig. 6, which i made from cast iron with two stee blocks, O and P. These blocks ar bored for locating pins Q, then fitte to face plate and ground on face R, s that the collar will be perfectly cen tred after dropping the locating pins i the yoke pin holes, S and T. To remov collar from face plate all that is re quired is to slacken clamps shown a Fig. 8, then lift the locating pin Q, whic is shown at Fig. 7, the tension of the spring U, Fig. 6, being held by the small pin resting on the periphery of the face plate.

At Issoudan, France, was located America's greatest aviation school abroad. Just before the end of the war, two engineer officers, walking down the principal street, passed three doughboys. None of the three saluted. The younger of the officers grew purple.

"What do you mean by not saluting an officer?" he exploded.

They made no reply at first, and then the more composed of the trio said, "Beg pardon, sir, but we thought you were in the air service."

A novel method of testing automobile tires is employed by a manufacturing tire concern in Denver.

The track is half a mile in circumference, and it represents every feature of good and bad roads. An ingenious machine, with a long arm to which the tire is attached, propels the tire around the track.

A weight equivalent to that of a heavily loaded automobile is suspended over the tire in such a way that the tire itself carries the load. Once started on its journey, the tire continues to roll until it has given up its maximum amount of mileage.

He was a very small boy. Paddy was his dog, and Paddy was nearer to his heart than anything on earth. When Paddy met swift and hideous death on the turnpike road the boy's mother trembled to break the news. But it had to be, and when he came home from school she told him simply:

"Paddy has been run over and killed."

He took it very quietly. All day it was the same. But five minutes after he had gone to bed there echoed through the house a shrill and sudden lamentation. His mother rushed upstairs with solicitude and pity.

"Nurse says," he sobbed, "that Paddy has been run over and killed."

"But, dear, I told you that at dinner, and you didn't seem to be troubled at all."

"No; but—but I didn't know you said Paddy. I—I thought you said daddy!"

—Montreal Journal of Commerce.

How Many Accidents Constitute a Warning?

When You See Some Fellows Hurt in the Shop, Do You Ever Stop to Think if the Cause of the Accident Can be Removed? Prevention is Better Than Cure

By J. H. M.

WE are now living in the age of "safety first." Should this statement be doubted, all one need do is look about him. Here, there, and everywhere we see miscellaneous warnings fairly shrieking out their messages. Street cars, level crossings, factories, and even the daily papers are havens of refuge for such solemn warnings as: "Watch Your Step," "Be Careful," etc., etc.

We are warned of this and warned of that, cautioned to tread carefully at every turn, and still there are accidents.

Granted that the number of these accidents has depreciated to a great extent—and that a large percentage of the remainder can be traced to carelessness, yet the point is this, that in spite of repeated warnings, people will persist in forgetting, and with serious results.

We must admit, however, that in many cases the preventive goes no further than a plastering of the scenery with cards bearing the well-known slogan, "Safety First." This is not safeguarding, but plain downright foolishness. You cannot save anyone from accident by warning only, you must get deeper into the subject, finding out how and why accidents occur. The very words "Safety First" have a deep meaning if one cares to study them. They apply to the owner of a plant just as much as they do to the employee. For example, if the owner of a plant allows such signs to be placed in his plant he must believe in the value of safety. The plant engineer, or superintendent, as the case may be, must also believe in safety, otherwise he would raise an argument regarding the placing of signs throughout the plant, which brings us to the point we are aiming at, namely, that equal responsibility should be shared by all.

Owners and executives should get together for discussion purposes, take periodical visits through their plants, looking for possibilities for safeguarding in a practical manner. It may be only an uncovered gear, an overhead belt, or some apparently simple matter that needs attention. Wherever possible, any moving part of machinery should be protected.

Makers of up-to-date machinery are realizing this truth more and more as time goes on, for the machine tool of to-day is a much better guarded tool than one made even a few years ago.

It would be impossible in a short article of this nature to touch on all the danger points to look out for. Each industry has its own particular dangers, and plant executives must acquaint themselves with these pitfalls before the placarded warnings can hope to have any effect. Workmen as a rule do not take kindly to these cards and consider them wasted money at any time, but this is especially true where danger cards are plastered all over, while moving parts, gears, pulleys, belts, and so on are all deliberately left exposed for the workmen to catch their clothing on.

Readers might be inclined to doubt the existence of such conditions, so, for illustrative purposes two incidents, each of them true, are here related to bear out the above contention.

In a certain machine shop plant at Ottawa, the writer entering the shop "gathered" that this plant at least believed in the safety idea. Cards were plastered everywhere, both in the English and French language. This was encouraging, so he looked further and discovered that all the countershaft collars were equipped with safety setscrews. Again he felt impressed, when suddenly a horrible shout went up from one end of the room, and a general rush of workmen in that direction was the next move. Of course the writer was on the job quickly and found that the trouble was with a radial drill. The operator had broken his arm.

On investigation it was found that his smock had caught on a protruding common or garden variety setscrew and broken his arm. The writer also found that it had been the third time that month that this operator had been caught in this way. In the former two cases he had luckily escaped injury, but the third case proved to be the finishing point.

It is this point which prompted the heading of this article, "How Many Accidents Constitute a Warning?"

Here was a plant using safety setscrews in their countershafts and yet allowing the dangerous type of screw to be used in a place far more dangerous than any countershaft.

The writer on leaving this plant decided that on entering the next shop on his calls he would look at the radial drills there, when, imagine his surprise to find exactly the same conditions. A similar setscrew was used on the main drill spindle to hold certain large sized drills in a home-made chuck.

Are all plants in similar danger? Luckily we can say no, for it has been the writer's pleasure to see drills properly safeguarded in every way in many a plant.

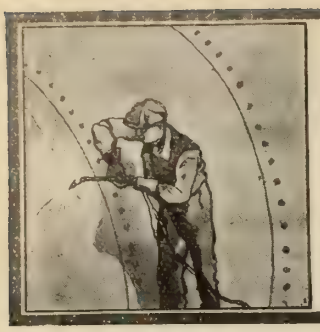
To proceed to the second and last story. This tale concerns a flour mill, which had a separator so placed that the workmen, in passing, had to be careful of exposed gearing. To ensure (?) the workmen being careful a warning sign was placed just beside these gears. In spite of this sign, men would forget, and have some piece of clothing ripped and torn. This went on for years with an average of one man every month forgetting himself and tearing clothing.

No serious accidents occurred, so no guard went up. One day, however, one of the sons of the owner of this mill went on a tour of investigation. In passing this danger point his foot slipped, caught in the gearing, and crushed both his foot and leg. As he fell he also received other injuries which resulted in his death. Of course a suitable guard was afterwards designed, but at what a cost.

We tell this tale, not for the love of repeating a gruesome story, but to impress readers with the necessity of cooperation between employer and employee. Safety signs are all very well in their way, but they must be backed up by intelligent safeguarding of machinery in general.

According to the preliminary report on the water power resources in India, drawn up by Mr. J. W. Meares, M.Inst. C.E., Chief Engineer, Hydro-Electric Survey, India's industries now absorb a matter of over a million horse-power, of which only some 285,000 is supplied by electricity from steam, oil, or water. The water power so far actually in sight amounts to 1¾ million horse-power, but this excludes practically all the great rivers at present uninvestigated. Thus it is stated that the minimum flow of the seven great rivers eastward from the Indus are capable of giving no less than three million horse-power for every thousand feet of their fall from the Himalayas, while similar considerations apply to rivers in other parts. Some doubt, however, is expressed as to the estimate of seven million horse-power in the Irrawaddy and Chindwin Rivers, given in the report of the Conjoint Board of Scientific Societies.

Recently a workman at Pablo Beach, Fla., found a whale measuring 47 ft. 3 in. in length. The monster had been washed ashore and was dead, wounds indicating a ship had struck it, or it had been attacked by sharks. It is said that it was of the arctic or Greenland variety of whale, which when full-grown attains a length of 45 to 50 ft. Since these whales seldom venture beyond the southern limit of drift ice, it probably met with death in nothern waters.



WELDING AND CUTTING

Oxy-Acetylene's Possibilities in Heavy Welding

By J. G. HILL

THE subject of "Possibilities of Oxy-Acetylene in Heavy Welding" is an extremely important one and should be considered by every one in the industry. We are all familiar with the many applications of oxy-acetylene in production work, but how many realize the work that is being done on heavy reclamation work?

It might be well to cite a few of the larger cases. Within the past year three steel plants in the Youngstown district have been able to operate due to repairs by oxy-acetylene on blowing engine cylinders where the fractures measured from twenty to forty feet in three inch thick material and where the welding was continuous for 48 to 64 hours. The time saved on this work was three to six months over the time required for replacement, and the cost of repairs was less than the cost of three hours' shut-down.

During the war rush the frame of a bull-dozer for piercing shell forgings broke. The frame weighed seventy tons and would have required at least 40 days to replace. A section 18 inches by 40 inches was welded, and the machine was out of operation just 48 hours.

Another application, which was really a wonderful repair, was made on the furnace of a steel plant, where the rivets sheared off on the circumferential seam, allowing the furnace, 80 feet in height, to sag on one side. The entire side was packed into place and the leading seam was welded and the furnace running in a remarkably short time.

The cases cited may seem like extreme ones, but such is not the case, for in our own shop for the past two weeks we have handled 16 hammer housings for forging hammers weighing 2 to 4 tons each, 3 steam hammer cylinders of 3 tons each; 1 bull-dozer frame, 3 tons; 1 engine bed, 6 tons, all in one shop during such a short time for repairs by oxy-acetylene. I believe that the heavy work is really just beginning; for instance, half of the castings mentioned above were from concerns that had never had a large casting welded before; if the work done is successful, which we certainly think it is, figure the increased market for heavy welding built up in this short time.

The supervision and inspection on this class of repairs must be far more strict than on ordinary welding job work as one failure will often put the process in bad standing for all time with a customer. I know of one who had not less than 500 heavy welding jobs, where the management prohibited welding for nearly four months because a very important machine was ruined by careless work. He overlooked entirely the good work that had been done prior to the mishap, and only by a change in his office was he "lined up" again.

While the jobs that have been described have been mostly in cast iron, I do not wish to leave the impression that steel work is not in our line for that is not the case. There is a fine example of this class of work in the nitrate plant equipment where many heavy steel welds were made successfully and, in the cases with which I am familiar, were superior to other methods of welding.

A Chicago concern recently welded some converters 11½ feet long by 30 inches in diameter, having 1½ inch plate heads. Although engineers and boiler experts had said it could not be done, and electric welders had taken their word for it, the welding work was remarkably successful. This is a good example of one place where the electric process can be beaten. A galvanizing pot is another place where the results obtained by oxy-acetylene have been superior to other processes as the gas method does not leave the porosity common to the others and cause the work to fall.

An interesting feature of heavy welding which we are doing is the repair of large castings which cannot be removed and preheated in the regular way. For example, the top flange of a low pressure cylinder on a lake vessel cracked through at one of the steam ports while the ship was on a trip. The removal of this cylinder meant tearing out part of the cabin and deck, and to preheat it meant a possible fire and worse fracture, so a screw jack was used to expand the cylinder mechanically, and by a little local heating with welding torches this casting was welded and is now in its second season of service.

Most shops are familiar with sidehand and overhead welding in steel, but cast iron welding has been considered impossible except on a nearly horizontal plane. I believe that practically any first-class shop will now weld cast iron for you in a perpendicular position, and give you a first-class job, too. While it is not recommended to do work in this position there are places on extremely heavy castings, especially when the crane equipment is insufficient, where this advance in the welder's art is very valuable.

While I do not believe that shops in general are in favor of welding large crank shafts, I believe that this field deserves a lot of experiment, as the call for this class of repairs is growing every day.

The steel mills offer another large field for heavy welding in the reclaiming of wabbless rolls. It has been the experience of most of the mills that the welded ends outwear the original ends in nearly every instance. Another heavy repair which has come to the market in the near past is welding rubber plant calender rolls. The difficulty with this job was in holding the alignment, but this has been well handled, and many shops are now doing this particular work.

With all the good work we are doing we should not overlook the bad. I believe that most shop men will agree with me that the absolutely worthless work that is being done by many people on boilers with oxy-acetylene and other processes leaves a field for the greatest improvement in the use of the process. In many districts th inspectors are prohibiting welding on boilers, and when you see some of the work that has been done you cannot be surprised. It is here, I believe, that the greatest possibility for heavy welding exists; it is profitable work, and there is a lot of it. In turning out better welders, the welding schools are helping, and the manufacturers are helping by their booklets, but unfortunately the real boiler welders are still very few.

It is interesting to note along this line that the heads of four large tank and boiler plants have stated to me recently that they have been forced to turn to welding to compete with others who have been using oxy-acetylene in their shop practice and that more than half of their inquiries specify welded tanks, or, if not specified, ask for prices on the welded product. When we consider that boiler makers have been very antagonistic towards welding, we must not overlook this condition, which speaks

*Paper read by Mr. J. C. Hill, of the Great Lakes Welding Co., Cleveland, Ohio, before the convention of the International Acetylene Association, New York City, July 15, 16, 17, 1919.

well for the possibilities of the process.

Locomotive frame welding has been the pet of the Thermit people, but I can honestly say that frames have been welded by oxy-acetylene in much less time and at a lower cost than with Thermit, and to my mind as satisfactorily if not more so.

A point concerning heavy welding which has been brought to my attention by several large customers is the fact that so many shops, which really do fine work, as far as the welding goes, send out their work with the slag and flux adhering to the castings, leaving a very rough looking job. I think that we all can possibly pay a little more attention to cleaning up the work, and it will have its effect with the customer.

Naturally the increased sales of apparatus to the various industries throughout the country cuts down the amount of small repair work materially for the jobbing shops, but these industries do not do the heavy work, and they never will. The shops that are to stay and continue to be successful must go after the big work, for there is lots of it.

THE AUTOGENOUS WELDING OF RAILS

There have already been published articles on the welding of railway rails, and it is one of the big problems in railroad work. The present practice of bolting rails together has two disadvantages; first the joints permit a jarring of the equipment passing over them, which is the cause of a great deal of the fatigue noticeable in the metals used for railway coaches and locomotives, and, second, there is the item of the passengers' comfort. There has been a constant effort made to provide a continuous or as nearly continuous rail as possible and oxy-acetylene, electric and thermit welding have been suggested and tried in the past.

Professor C. F. Keel, director of the Swiss Acetylene Society, has published, during the war, a brochure on the subject giving the results of tests made on welded joints and describing a new method of making the welded joint.

There is given below an abstract of the article.

In Switzerland because of the many tunnels and bridges, the matter of a continuous rail is important, because of the otherwise continuous shock given to the structure by joints. The railways have sought to minimize these shocks by making the rails as long as possible some rails in use have a length of over 100 feet.

The process of rail welding proposed by Professor Keel is as follows:

The base of the rail is welded and the head but the upright section is cut out by means of the torch. It is proposed to use as well the ordinary fish plates as used at present to assist in maintaining the alignment of the rails. . In the past considerable difficulty has been encountered in preserving the alignment of rails welded through the upright section, but in the present process no such difficulty is encountered. In the case of rails already laid, the author recommends that base be welded first and then the head, but if practicable, it is far more advisable to turn the rail over and weld the base from the bottom side in order that the weld may be larger. The base section, of course, is subjected by the passage of trains to a greater strain than the head section, and the weld must be made with the greatest care.

For a welding rod, Prof. Keel proposes to use a metal as nearly like that of the rail as possible. Swedish steel has been used and tests have shown that weld is always softer than the metal of the rail. The welding rods used contained some silicon and some manganese. A flux with a base of sodium carbonate and sodium bicarbonate has been used. Hammering increases the hardness or denseness of the weld. The weld on the base section is hammered when the weld is finished and while still red, the head section is hammered first when the weld is one-half completed and after the completion.

On the subject of the cost of the work, the edges were beveled by the torch and the upright section was cut out by the torch which increased the costs of performing the work. 300 to 400 litres (10.5 to 14 cu. ft.) of oxygen and 150 to 200 litres (5.25 to 7 cu. ft.) of acetylene were used for cutting and beveling each joint. If the work of welding was carried out in a shop the consumption of oxygen would be 1,200 litres (42 cu. ft.) and of acetylene 900 litres (31.5 cu. ft.); if carried out in the open air the consumption would be increased to 1,600 litres (56 cu. ft.) of oxygen and 1,200 litres (42 cu. ft.) of acetylene. One hour to one hour and one-half is required per joint made, one-third of the time is required for preparing the joint and two-thirds for the actual welding. The author suggests as a possibility of cutting down the cost the use of a preheating torch. Professor Keel also advocates the bonding of rails by welding, he makes use of an iron wire of appropriate diameter, to each end of which is fixed a plug. This plug is inserted in a hole provided in the upright section of the rail and the bond is welded in place.—Revue de la Soudure Autogene (Paris).

EVOLUTION OF THE "TANK"

Entirely new problems were involved in the development of the "Tank," as described by Sir Eustace Tennyson d'Eyncourt in his paper before the British Association.

The conditions laid down by the War Office were that the machine had to be capable of crossing gaps at least 5 ft. wide; to carry fuel and water for at least twenty miles; and be able to negotiate parapets five feet thick and 5 ft. high, having an exterior slope of 1 in 1. Weight was limited by the strength of bridges to be crossed; and the dimensions were restricted by the carrying capacity of British railway trucks and by the British and French loading gauges. The machine had to be strong enough to bear the strains to which it would be subjected, and at the same time only exert a moderate pressure per sq. in. on the ground. Further requisites were that it had to be habitable and well ventilated; it had also to be bullet-proof; it must be easily and quickly constructed, using reliable engines and other parts which could be readily produced in bulk after standardization. The combination of these essentials in a machine, which had also to be a low and inconspicuous object, proved a very difficult problem.

It became clear, in working out the general form, that the best plan would be to adopt the naval idea of sponsons on each side of the machine, each sponson carrying a gun, which was thus situated about the middle of the tank between the tracks. It was this which gave the contour to the No. 1 tank, known as "Mother," and also as "Big Willie," to distinguish it from "Little Willie." "Little Willie" was fitted with tracks obtained from America, and had an armored body with a turret mounted at the top. The American track was found to be not nearly substantial enough to stand the strain of the heavy body, armament, etc. It was therefore necessary to design a completely new form of track, and this form was developed and used for the first completed machine.

The author details the process of evolution from Mark I to Mark II and Mark III In the later machines, the aim was to use a more powerful prime mover than the 105 h.p. Daimler engine, which was originally fitted in all cases. In the Mark V type increased power was given by a six-cylinder Ricardo engine of 150 h.p., and a special epicyclic gear was introduced. The Williams-Janney variable speed gear was provided in later types, to be in turn succeeded by an improved form of epicyclic gearing.

When the need arose for a lighter tank, carrying a smaller armament and crew, the "Whippet" was designed. Increased speed was obtained by materially reducing the weight of the machine, which was only 14 tons, as compared with 28 tons of the previous types. Two independent sets of engines and transmission gears were used, each track being driven independently. The engines were of the Taylor four-cylinder type, each giving 45 h.p. These were connected by cone clutches to gear-boxes of the constant mesh type, giving four speeds forward and one reverse, and driving through worm reduction gears to chain drives, direct to the track sprockets. Steering was effected by running one engine faster than the other, or disconnecting it by one of the clutches.

During the last phase of the war, the Mark VIII type was evolved, in conjunction with the United States. Mark VIII. was somewhat larger than any of its predecessors. Except that the engines were placed in an entirely separate compartment, the design was generally similar to that of Mark V, with two 6-pounders in sponsons which were arranged to hinge inboard for transportation. Some time was absorbed in developing the Liberty engine to make it suitable for the Mark VIII tank.

WHAT OUR READERS THINK AND DO

BAYONET LOCK FOR JIGS AND FIXTURES

By ROBERT MAWSON

I had a problem when designing a fixture a short time ago that was solved in a simple and easy manner by the bayonet lock-holding device, shown in the illustration.

The surface of the casting against which I desired to exert the pressure is shown by the line A. At the lower surface of the casting being machined was a flange B, which was about 1¼ inches nearer the wall of the fixture.

It is obvious that to remove the piece from the fixture it was necessary to draw back the holding element at least 1¼ inches or more to provide the desired clearance between the casting and fixture.

It is also easy to imagine the time required to screw these back, as there were a number of such cases on the tool, providing the usual type of screws were used to hold the casting.

To overcome this trouble, in other words, to provide a quick-acting and positive holding device, the one illustrated was designed.

This is made with a threaded body C, which is made a snug fit in the wall of the fixture. On one side of the body is machined a slot D of sufficient length to take care of the distance between A and B.

At the inner end the slot is machined on an arc to an angle of 30 deg. with the vertical centre line. The shank of the pin E is made a good sliding fit in a hole of the body, and a pin F is driven in the shank, as shown.

To operate the device, the pin E is pushed up the slot by means of the knurled head until the inserted pin comes to the forward end of the slot.

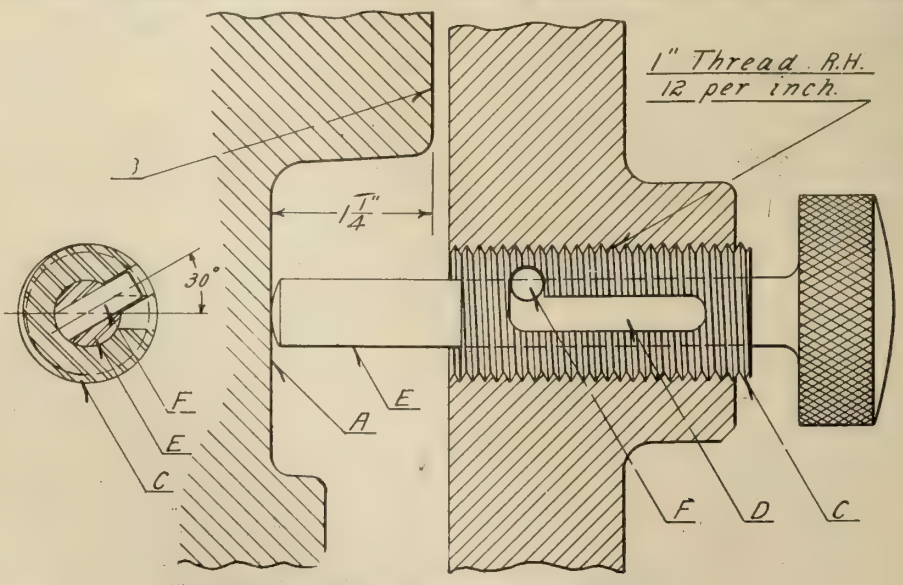
The pin E is then turned by means of the knurled head and this screws the body forward and this motion also carries forward the pin against the wall of the casting, thus exerting the desired pressure.

To remove the casting it is only necessary to turn the pin in a left-hand manner when the small pin will pass into the horizontal portion of the slot and the large pin can then be drawn back by means of the knurled head.

With this device any variations in castings are taken care of with the threaded body, which can be either screwed in or out, as necessary, and further, a solid support is afforded with the large pin as it would have to shear off the small pin before the casting would move from its location.

It might be added that straps were used to hold the casting on the fixture in the usual manner, the device described being designed only for a quick-acting locating medium.

It has now been in service for some time and is giving satisfactory service.

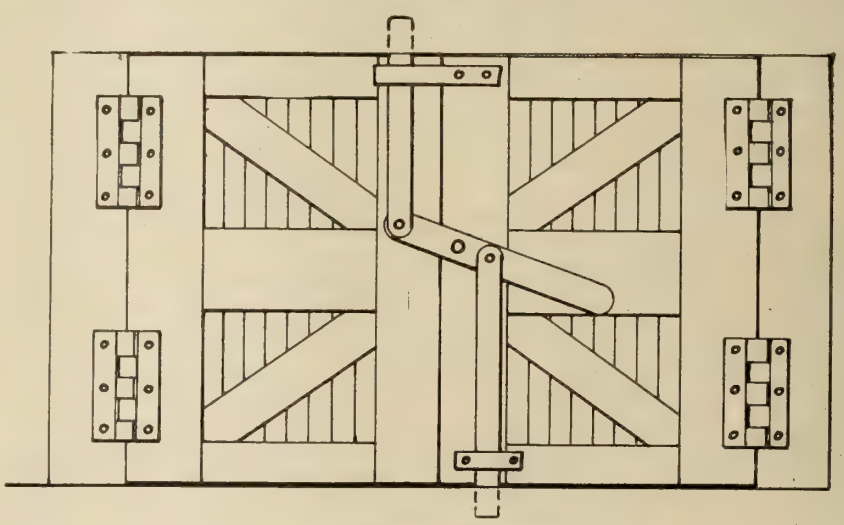


SECTION SHOWING BAYNOT TYPE OF COCK

HANDY FASTENER FOR MACHINE-SHOP DOORS

By W. S. Standiford

With the usual style of latch for machine shop and other double doors that are exposed on one side the weather allows the doors to warp, which makes them difficult to fasten. To avoid this the fastener shown in the sketch was devised, which fills the bill perfectly and keeps them straight. The device consists of a 16 inch long, 2 inch wide, and ¾ inch thick steel lever working



SKETCH SHOWING FASTENER APPLIED.

on a pivot on one door, a washer being placed between the door and the lever. At four inches to the right and left-hand sides of the pivot small holes are bored. Two U-shaped pieces are made out of flat iron bars, they being of sufficient size so as to slide easily along the bar.

Two one-inch round bars are cut to such a length that they will project 1½ inches over the top of one door and the bottom of the other. One end of each bar is then welded to the centre of each U-shaped piece, a hole being bored at right angles to the side of the piece and through the legs. A rivet is inserted through the hole in the round bar and the legs of the U section; the rivet is to be of sufficient tightness so as to allow the bar to move freely up and down. Make a guide out of a piece of a rectangular iron bar; part of the latter should be twisted while hot at a right angle. A hole of sufficient size is bored in one end so as to let the bar slip over the top of the plunger, and screw holes being put through the opposite end. This bar holds the plunger in a vertical position; it also serves to guide the round rod into a hole bored in the casting above the door. To prevent wear on the holes in the casing and sill it is best to have a short flat bar of steel having a hole slightly larger than the round rod bored in its centre, and also having screw holes made near its ends. Make another piece of the same size, and screw them to the top casing and the bottom sill. A guide is also to be made for the bottom plunger; both the top and bottom plunger rods should be tapered slightly at their ends so that they will enter the holes bored in the casing and sill easily. When the handle of the lever is put in a horizontal position, the plunger rods are level with the top and bottom of the doors.

A downward push of the handle fastens both doors, the latter opening inward. A rabbet is nailed to the outside of one door and extending over the joint, making a stormproof joint. It is customary to have a small door equipped with a lock and key (door not shown in sketch) for entering the building made in the large door opposite the one carrying the lever. This is a convenience in the winter time as it keeps the warm air in the shop, the double doors only requiring to be opened for the industrial railway or other cars that enter. Some shops have the small door on the side or the other end of the shop, but it is much more convenient to have it in one of the double doors as it saves time in opening. In conclusion, this device will be found to be a most practical and convenient door fastener and to give good satisfaction.

THRUST COLLAR JIG

By G. BARRETT

The following jigs and fixtures were used to manufacture thrust collars for automobile clutches:

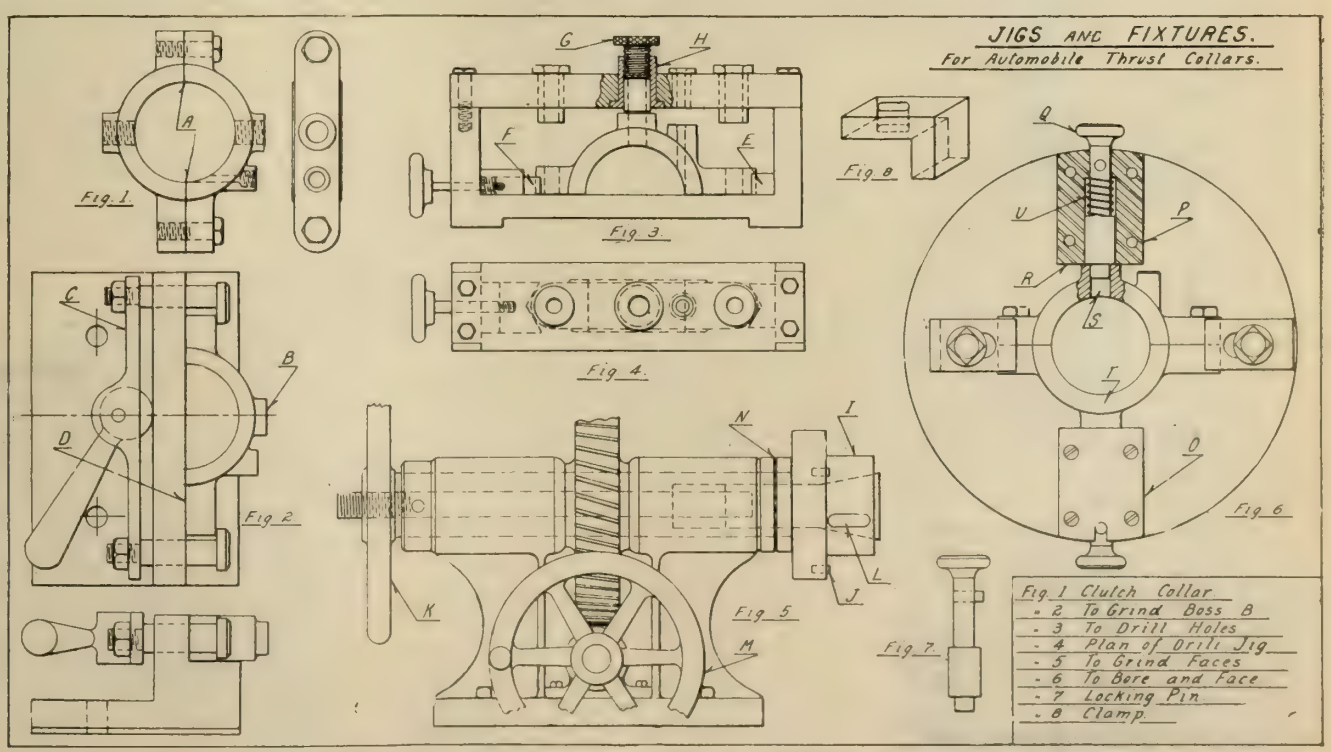
Drawing, Fig. 1, shows thrust collar assembled.

The first operation is to disc-grind one half of collar at parting A, Fig. 1, after which they are placed in fixture, Fig. 2, and ground on boss B. This fixture explains itself from plan view; Fig. 2, and end view, Fig. 3. The clamping device C, Fig. 2, is a good feature and holds the brass casting very firm during grinding; this operation was done previously by straddle milling after the collar had been assembled, but did not prove accurate enough. By the use of this fixture and disc-grinding the lugs and limit, from base D, Fig. 2, to B are kept within .004 and the production is 2,400 in 9 hrs.

The next operation is to drill bolt holes, oil hole, and yoke pin hole. These holes are drilled from jig, Fig. 3. The casting is located in jig vee blocks E and F and held by guide bush G, which is threaded and ground to fit pilot bush H. The other bushes are made a push fit in top plate of jig, so as to be replaced by ones smaller in sizes for drilling tapping hole in opposite half of casting. Fig. 4 shows plan view of drill jig and will give the reader a better idea of the vees for locating the casting and will note that E is stationary and F is made to slide in and out, so as to remove castings from the front of the operator, as there are 3 different sizes of holes to be drilled. We use Modern Magic drill sockets, which are a great time-saver where the multiple can't be used.

After drilling and tapping the castings are assembled and passed back to the disc grinder to be ground on one face; for this operation the fixture, Fig. 5, is used. The clutch collar to be ground is placed on the mandrel at I and held against three steel pins, J, and are held by tightening handwheel K, which expands the jaws L. The table of grinder is then brought forward till the casting is in contact with emery disc, then the spindle is caused to revolve in the fixture by a worm and wheel operated by handwheel M, the thrust from pressure of grinding being overcome by ball bearing collar N. This operation is also 150 per cent. faster than lathe work and more accurate.

(Continued on page 561)



GENERAL DETAILS AND ASSEMBLY VIEW.

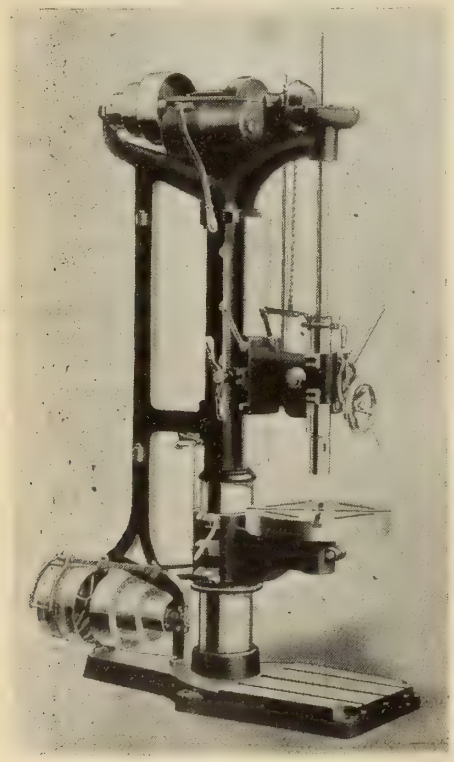
DEVELOPMENTS IN SHOP EQUIPMENT

SIBLEY DRILL PRESS

The Sibley Machine Company, of South Bend, Ind., have recently placed on the market a new sliding head drilling machine with positive geared feed, in which they have incorporated all of the proven features of their older models, with the addition of new and exclusive ones.

This machine is specially designed and built throughout, to meet the requirements of modern production methods—speeds and feeds are selective, and have an unusually wide range. The base is well ribbed and braced with tee slots for clamping work. Increased length of bearings on head and arm and substantial table support give added strength and accuracy. Head and spindle are balanced by a weight supported inside of column, with Diamond chain operating over large diameter sheaves.. Safety of the operator is assured through enclosing of gears. Belt guards can be furnished as special equipment.

One of the new and exclusive features is the fitting of all drive-shaft bearings with die-cast split bushings of a high quality anti-friction metal. These bushings are interchangeable and insure long life to the bearings and easy replacement. Drive pulleys and three step cones carry wide belts, while with the generous bevel and back gear ratios, abundant power is delivered to the spindle. Long range of the head and spindle on column permit the use of large jigs. Back gears are of the sliding type, fully enclosed, and operated by a single lever. Spindle is provided with ball thrust bearings.



SIBLEY DRILL PRESS.

Another feature of this machine is the new geared feed, with four changes and a neutral position. Feed changes are obtained by moving a knob conveniently located in the centre of the hand wheel in connection with a sliding spline, four feeds being provided for each spindle speed. The initial drive of the feed shaft is from the top cone shaft through spur gears and two to one spirals, the latter bronze and steel respectively. This arrangement is very compact, the gears run in an oil bath and are completely enclosed. The steel worm which meshes with the extra large worm gear also runs in an oil pocket. The adjustable automatic stop of new design is quick and positive in action. Hand feed and quick return of spindle is through the medium of a three-lever spider at right of feed box. Hand wheel is of large diameter.

Special attention has been given to the oiling of the machine. All bearings are equipped with oil cups, grooves and channels, insuring proper distribution to the vital points. The loose pulley is self oiling, and will run several months without attention. All feed gears in the feed case are completely enclosed and running in oil.

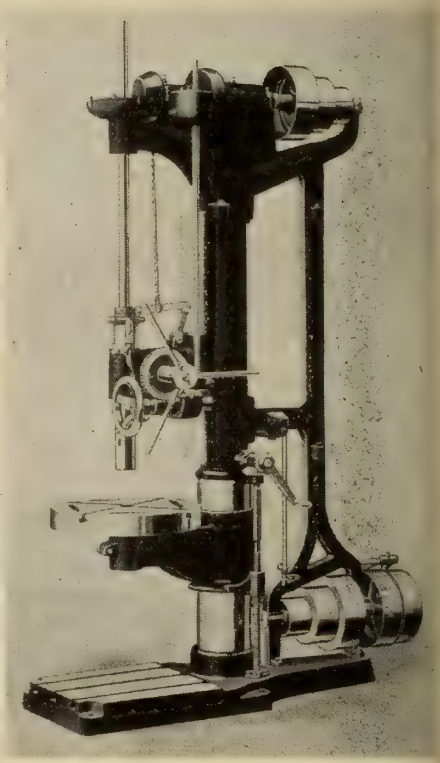
Particular care is given to the finish of this tool, spindle sleeve and all shafts being ground. All machines are thoroughly tested before shipment.

Positive geared tapping attachment, geared or belted motor drive, round or square tables with tee slots and oil pocket, oil pump outfit complete, and quarter-turn countershaft can be furnished as special equipment.

This machine is now being built with 24 in. swing.

WATTS SQUARE OR HEXAGON-HOLE DRILLING DEVICE

The Watts Bros. Tool Works, Turtle Creek, Penn., has placed on the market an arrangement for making square or angular holes. The equipment as shown consists essentially of three parts, a floating type chuck, a special drill and a guide plate.



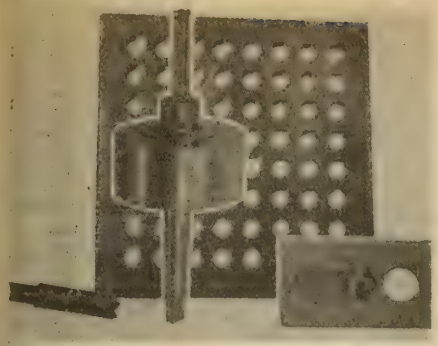
ANOTHER VIEW OF THIS DRILL PRESS.

The equipment is intended for use in any ordinary drilling machine or lathe and is recommended for work that cannot be broached, such as socket wrenches, collets, feed fingers for automatic screw machines, etc.

The tool or drill is an end cutter and works in a similar manner to an end mill. The guide plate is clamped to the work and acts as a jig, the floating chuck simply permitting the necessary lateral motion of the tool when cutting.

In operation a round hole is first drilled, leaving as little stock as possible for the special tool to remove as shown by the large plate in the illustration. The small plate shows the guide with the tool in the guide hole. The holes on each side are bolt holes to clamp the guide plate to the holder or jig.

The device is not recommended for deep holes and is limited to depths of two and a half to three times the diameter of the hole. It is furnished in four sizes with capacities ranging from ¼ to 1½ in. holes. The guide plates are ordinarily made in round shapes but can be furnished in special sizes and shapes for jigs. The chucks can be used on other work when not being used for angular holes.



THE WATTS SQUARE OR HEXAGON DRILLING DEVICE.

The Globe Engineering Co., of Hamilton, Canada, are handling this product in Canada.

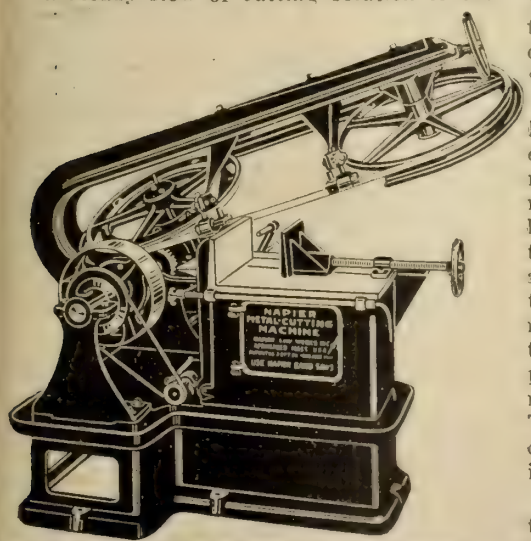
NAPIER BAND SAW, CUTTING-OFF MACHINE

The cut herewith illustrates the new type of Napier Metal Cutting Machine. It is claimed that the band saw principle has many advantages over the ordinary reciprocating hack saw machine, inasmuch as the movement of the saw blade is continuous in one direction.

The plane of the revolving band saw is so inclined that the cutting portion is lower than the return section, a condition that permits of cutting bars of any desired length. An interesting point in this machine design, is the system of counterbalancing the horizontal cutting arm, a factor that provides for gravity feed, and permits of self adjustment to the varying densities and characteristics of the metal encountered. Owing to the inclined position of the saw blade it is necessary to provide some means of bringing the cutting portion of the blade to a vertical position. This is accomplished by two roller guides that can be adjusted on the cutting arm, and these guides may be so located that the cutting section of the blade can be kept at the minimum length when small diameters are being cut. This feature likewise assures very accurate cutting of the bars.

The machine is equipped with a small rotary pump (belt driven) that supplies a steady flow of cutting solution to the work when desired, and the lubricant is delivered in such a way that the saw teeth are washed free of dirt and cuttings, and the blade kept perfectly cool. This cooling of the blade is also assisted by the relatively large wheels that carry the band saw, so that any heat generated by the blade passing through the work, is rapidly decimated into the larger body of cast iron. The wear on the teeth is evenly distributed throughout the entire blade, so that the possibility of drawing the temper is practically eliminated.

One of the most important advantages claimed for the Napier machine is the thinness of the kerf—less than .05 inch—and the resultant small waste of metal. In cutting high speed and alloy steels, this saving is very considerable. These saws have a capacity of 10 by 10 inches on any class of work. These can be supplied in either belt or motor driven types. All bearings are of substantial dimensions to insure long life under severe service.



NAPIER BAND SAW, CUTTING-OFF MACHINE

The saw blades are made in long ribbon strips and may be cut off and brazed to the desired length. The teeth are milled at such an angle as to give maximum cutting efficiency, with a strong broad base or root, that prevents the teeth from losing their set. The teeth and a slight portion below the root, are tempered exceedingly hard, and the remainder carefully toughened, leaving the blade with sufficient flexibility to prevent checking in its endless turning movement around the supporting wheels. The blades are made of high-grade crucible steel, and in widths from ¼ inch to 1 inch.

Lyman Tube and Supply Co., Montreal, are the sole Canadian distributors for these Napier machines.

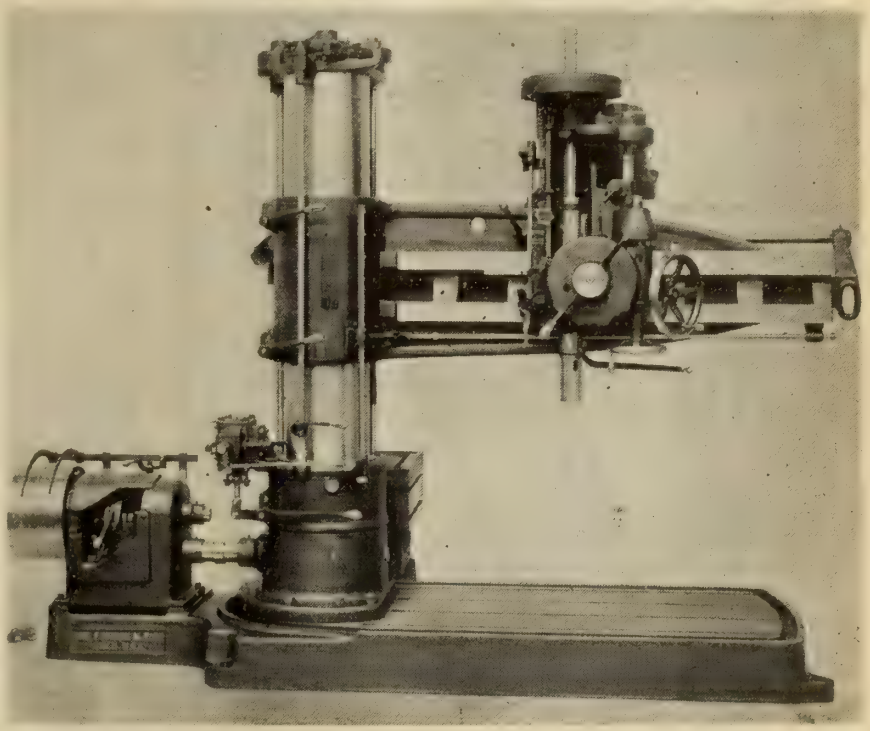
COMBINATION PNEUMATIC AND HAND-CLAMPING DEVICE

A new arrangement for clamping the column of their drills has been recently placed on the market by the Fosdick Machine Tool Co., of Cincinnati, Ohio.

This arrangement is quite different from the usual devices of this kind, in several respects. It is applicable to any of the Fosdick 4, 5 or 6-foot Heavy Duty Radials.

The most noticeable feature is the location of the cylinder, which not only brings the pressure directly to the point of clamping, but eliminates quite a number of the usual working parts.

It will operate equally as well on extremely high or extremely low pressure, and during tests operated very successfully on 45 lbs. pressure.



VIEW SHOWING THE PNEUMATIC CLAMPING DEVICE.

Relief valves are provided for each end of the cylinder, and are regularly set for a pressure of 45 lbs., although 150 lbs. or more will show no shock or jar in clamping or unclamping.

This is accomplished by an air cushion at each end of the cylinder, formed by additional ports in the valve, to cause a compression at the proper termination of each stroke.

The valve (a six-ported flat disk valve) is operated by mechanical connection to a horizontal shifter bar running along the entire length of the radial arm. The advantage of this device is that it has no connection with, and does not interfere with, the moving of the spindle head.

In case of failure of the air, pet cocks at each end of the cylinder are opened, and the ordinary method of clamping by hand is used.

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No Apologies Needed

A MACHINE erector finished up a certain installation running into some thousands of dollars. He was in a hurry to get away to another bit of work, and at the end of the week announced that the machine was ready to operate on Monday morning when the plant started.

"Better stick around until Monday to see that it goes all right," remarked the superintendent. "Last time we had an outside man here we had to bring him back to get his machine started right."

"That machine will run," replied the expert, as he continued to pack his grip, "and there will not be any need to touch it."

"What makes you so certain?" queried the superintendent, "you haven't tested it yet?"

"So?" remarked the expert. "That machine was tested, piece by piece, in the inspection department long before it was ever erected. I know every operation in its make. I was almost going as far as to state that I know every man who attends to every operation. I know that our firm never allows anyone to take a chance. I am so certain that that machine will run on Monday morning without ever having seen it operate in your plant that I will come back at my own expense if you wire for me on account of trouble."

The superintendent was a little doubtful as he saw the expert leave on the Saturday train. Monday came, and the power was turned on the new machine. The superintendent had allotted a good mechanic to run it, thinking to give it a fair trial. He dropped around a couple of times in the morning and again toward five in the afternoon.

"Anything wrong with the new machine?"

"Great. Works exactly to dimension. Never saw anything better."

When the superintendent returned to his office there was a wire from a city some ninety miles off, from the expert who had set up the machine. It said just this: "Why don't you send for me?

"If you are the head of a concern making goods, if you are a foreman, if you are a mechanic, are you backing up the men who are on the road for you in this matter? Have your men got to be good apologists in order to get your lines in the shops? What more does a man who goes out want than to be able to say "That machine will run. It has been tested and inspected piece by piece before it was ever assembled. I know the men who built it, and I know what sort of work they can do. I can stake my entire reputation on its performance."

Accomplishment of that sort will do more to put goods on the market than all the catch-penny slogans that can be pasted and painted on your goods and in your advertising propaganda.

Never ask an outside man to apologize for lack of excellence in your product.

Not a Mechanical Problem?

WITH varying degrees of complacence the residents of the district affected would read in the papers a few days ago, that the price of milk was to be increased for Toronto, and of course that would mean the price of butter as well. The latter expected to get out of its present lowly rut at 65 and 70 cents and march right along until it camps at the 90-cent mark.

Milk is expected to go to 17 or 18 cents a quart. A dollar, it is expected, will soon buy only 11 or 12 pint tickets.

Perhaps you may ask what this has to do with matters in which we are primarily interested, such as mechanical, engineering and selling problems. Just this. Forcing up the price of things that the men in the shops and their families have to eat in order to live means keeping afire the feeling of unrest and discontent.

Every time the man in the shop sees where there has been a meeting of men engaged in a certain line of business, and following that meeting there comes a notice of an increase in the price of something he must buy for his family, that man in the shop is going to set to work to get sufficiently more from his employer to keep pace with the stride being set for him by the producers and dealers.

It is his failure to keep pace with the increasing costs that keeps him on edge.

Although fundamentally not a mechanical problem, the meeting together of men for the purpose of further bolstering up prices of milk and butter, is very much a problem of every mechanic in the region affected.

It is likewise and very directly a problem of every employer of labor.

Another two-cent jump in the price of milk may do damage so great as to be altogether out of keeping with the size of the increase.

AN evangelist who was conducting nightly services announced that on the following evening he would speak on the subject of "Liars." He advised his hearers to read in advance the seventeenth chapter of Mark. The next night he arose and said: "I am going to preach on 'Liars' to-night and I would like to know how many read the chapter I suggested." A hundred hands were upraised. "Now," he said, "you are the very persons I want to talk to—there isn't any seventeenth chapter of Mark."—Boston *Transcript*.

* * *

A CAPTAIN of a lake vessel who was floating around on a piece of wreckage states that he was refused help by a passing ship. A case like that should be sifted to the bitter end to find out all the facts. And if the facts bear out the claim there should be third degree treatment right straight off.

The Old Family Group

IT is not pleasin' unto me, in fact, it grieves me sore, to see some things a-passin' we loved in days of yore—folks seem to be all changed about in this here awful age, a-tearin' here and there, by gum, in one mad, giddy rage.

It causes me to shed a tear the way they've put the boots to them there photos that we called the old-time family groups.

I love to gaze upon them things, their faces and their gowns—their countenance set for the pose, all freed from grins and frowns. They set there lookin' back at me, that group took years ago, poor things not knowin' that them groups was out-of-date and slow.

Why, when they go out nowadays to get their likeness took, folks try to look like some front page from out a "movie" book. The women get a yard or two of fly-nets round their bones, by far too flimsy and too thin to venture from their homes. They gaze up at the rafters, 'cause the photo man says so; they're dressed in some partic'lar style with no place much to go. And when their friends grab off the prints they snicker and they grin; the things they say they constitute a high crime and a sin. But to their faces they cry out, "Oh, excellent! Oh, fine! Prunella, dear, your profile shows a snout that is divine!"

Likewise when Dad goes out to sit before the camera man, he has to have an egg shampoo, also a meal of bran—he looks as great men look each day, as though he'd like to feel just how 'twould be before the night to swing a million deal. Why, if Dad pulled that picture face when trudgin' 'bout the house, we'd swear he was recoverin' slow from some hard cider souse.

Of course, we've got to be in style like all the other folks; it aint no use in laggin' like a lot of has-been blokes. But all the same, them family groups look powerful good to me, when Dad was young and handsome and Maw was twenty-three. I like to look at them, I do, just settin' there, by heck, without no care or worries a-campin' on their neck. No cheese cloth wrapped about Maw's chest, nor yet upon Dad's jaw is fixed an attitude to state he's gone and bust the law.

Ah, yes, I know it's out-of-date to have a family group, but for them photos nowadays I don't care one durned whoop. Lead back the good old family group with pleasant face and sweet, with palm trees rustlin' in the rear and foostools 'round their feet.—ARK.

It is claimed that the best method of utilizing the peat resources of Canada efficiently would be by gasifying it in gas producers, as in this system the valuable by-products contained in the fuel could be recovered. The combined nitrogen of the peat can be economically secured in the form of ammonium sulphate, and the valuable fertilizer, with the peat ash containing potash and phosphoric acid, could be restored to the land from which the peat has been taken. Peat tar is a source of refined pitch and tar, candle wax, lubricating and burning oils, and powerful disinfectants greatly exceeding carbolic acid in germicidal strength. The valuable by-products of methyl, alcohol, acetone, pyridine bases and crude acetic acid, can be recovered from the aqueous distillate from the producer.

* * * *

For a long time the waste steam from steam-engines has been turned to good account, but there have been difficulties in the way of using the exhaust gases from a gas-engine as they readily attack the metal of the conduits. However, the difficulty is being overcome, for a New Jersey candy factory has an installation in connection with a sixty horsepower engine which is used to heat the factory. The gases pass through an economizer made of cast-iron, with the passages to the different sections staggered so that all parts are heated for the whole length. Water circulates in jackets surrounding the gas passages.

Where Industries Will Go

ACCORDING to reports, a number of the industrial centres of Canada, particularly in Ontario, are holding out very plausible looking inducements to firms looking for locations. In some cases it does look as though there were a sort of a competition on, with the competitors tossing up free sites, tax exemptions, free water, cheap power and what not to land the bacon.

The city that sets out seriously to become an industrial centre has to do something deeper than any of these flash-in-the-pan things. Industries do not gallop away for trinkets if they are going to grow well.

The city that has a large part of the battle fought is the city that has conditions that are favorable to the development of a good labor market. And what's that? Simply that it shall be a good, wholesome place for a man to bring up his family; a place where he can own property without having to hand out a slice to every speculator and manipulator; a city where it will pay him to settle with a view of becoming a fixture; a city where the houses have a little land to the sides and rear—in short, a city which, when he has been away for a time, looks powerful good to him on his return.

Don't make any mistake, the firms that are looking for sites for factories in Canada, if they represent worth-while parent concerns, can take these conditions in, and they put them down very close to the top of the list.

A municipality is only fooling with itself and joking with its people when it imagines it can worm itself into being an industrial centre on the strength of a free site and exemption from taxation.

An industry is not like a convention, which goes where it is invited. The worth-while industry is going to locate where it has a chance to grow, and it cannot grow without a well-housed, contented working force.

Can your city line up to these considerations? If not, your first step is in getting your house cleaned and in shape before going out with a beckoning forefinger to worth-while concerns that are seeking locations in this country.

VICTORY Loan workers were dined in a Toronto hotel. The little chap who scrubs along and pays for a bond is the chap worth dining.

* * *

MILK goes up on December 1, according to reports. When we stop to think how we used to try and make calves drink the stuff out of a tin bucket we weep, gentlemen—we weep.

* * *

THE doctrine of decreased production and a bob-tailed work day is not going to put Canada where she belongs in the industrial world.

IF THE REFORM LEAGUES WOULD ONLY GO ON STRIKE!
—New York "World."

MARKET DEVELOPMENTS

Securing Material is the Greatest Problem Now

Shipments of Steel Coming Through at the Rate of About 65 Per Cent. of Normal Times, While the Demand is Very Keen—Canadian Firms in the New York Tool Market

SECURING of supplies is becoming more and more a problem with the industrial world in Canada. Many firms are realizing now that dealers and salesmen of steel and machinery were quite right some months ago when they warned them that there was a serious shortage ahead. Firms that went into the market then and got their business booked are getting deliveries now. Firms that did not have simply to content themselves with getting what they can, and with knowing that any business they may put in now has a great procession ahead of it, making deliveries very uncertain. The premium market is coming to be more and more openly recognized in the steel business, and many mills that have not been known as being in the premium class before are now selling at a price based upon their ability to deliver. There is also a tendency, although hard to locate, that tries to hold back a certain tonnage in prospect of a very active and high market later on.

The shortage of steel, coupled with restriction on the use of coal, has a tendency to make buyers a little more conservative. But for all that there is a nice volume of business moving in the machine tool market, and the business is well scattered, no one industry doing all the buying. Several Canadian firms have fairly large lists in the New York machine tool market this week.

Canadian machinery dealers are recognizing more and more that the day of specialization has arrived and they are preparing to meet this new situation. One firm this week has sent its best man to study production methods in other countries, and he will devote his whole time to pointing out, on his return, where operations that are now done on a general machine should be turned over to a machine built especially for the purpose. It is really applying the single-purpose machine idea, which secured such results during the war.

Copper prices in the scrap market sagged during the week. It is hard to sell copper owing to the rate of U.S. discount, hence there is an accumulation.

MONTREAL MARKET LOOKS FOR FIRM OR HIGHER PRICES IN STEEL

Special to CANADIAN MACHINERY.

MONTREAL, Que., Dec. 4.—There is little doubt in the minds of the local steel men that the industry is gradually returning to a position where higher prices will be the order of the day, and these may not be far short of those prevailing throughout the later years of the war period. It is probably true that the demands were greater a couple of years ago, but production was in accordance to existing requirements. Now we are confronted with abnormal post-war demands for steel, and the attitude of labor prevents the full utilization of production facilities for the relief of a situation that is daily becoming more serious in the resultant effect upon this country in particular and the world in general. While the unreasonable struggle continues, the people at large must continue to wait and suffer patiently. With the near approach of winter the difficulties of transportation will be added to the scarcity of fuel and many factories will likely be faced with a shutdown or curtailed production. The closing of navigation will increase the difficulties of obtaining coal from the Maritimes, so that extreme conservation will require to be exercised to avoid a serious shortage of coal this winter.

Steel Lines Advancing

In view of the conditions that do exist, and which are being constantly aggravated by the coal strike and the general disturbed state of transportation, a factor that will be further pronounced as winter approaches, the possibilities of seeing the prices of steel commodities back to a war level, is becoming more and more certain. The demands for every class of domestic steel is so pressing at the present time that any long duration of under-production would create a serious situation, and one that has little chance of alleviation as long as fighting differences exist between the workers and the operators. It was stated by one dealer here that from the coal mines of one large U. S. steel mill not a ton of coal had been mined in nearly three weeks. Their stock on hand will only last a short time and when this available supply is consumed suspension of mill operations will necessarily have to follow. It is estimated that current production of American mills is 50 per cent. below normal and trade requirements are far above the average mill capacity of the country. Mill refusals to accept bookings are common procedure, and where producers are accepting business, no assurance is given as to when the material will be delivered.

Local warehouse stocks are gradually being depleted of the lines in general demand, and the uncertainty of renewing these stocks is becoming a matter of some concern, and this condition can only have one logical result—a stronger market at advanced prices.

Canadian mills are benefiting by the falling off in American production, particularly in those lines that are within the range of the mills. Dealers here are anticipating a gradual return to higher market levels, and some would not be surprised to see "war" quotations this winter. Local prices on chequered floor

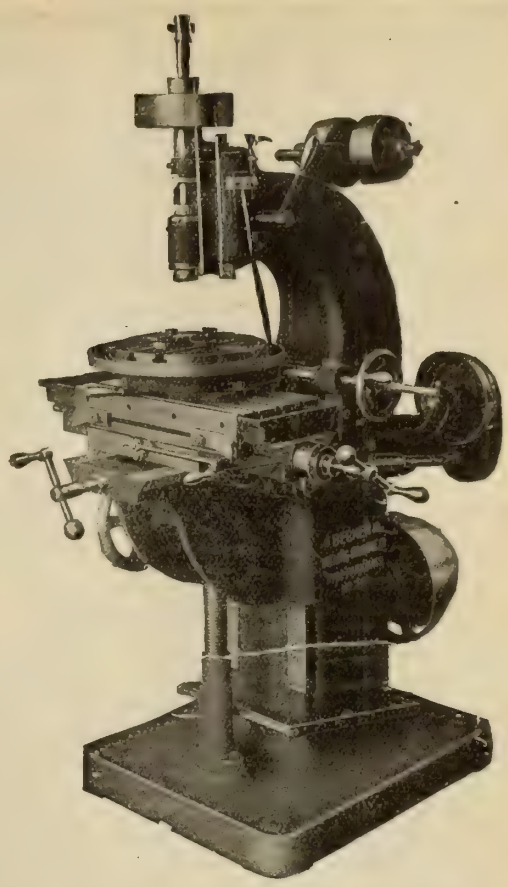
BECKER

Belt Driven Millers

The Machine that Gives the Smooth Finish

Stringent shortage of labor during the war put a premium on machinery of superior productive ability. Never was the capacity and value of Becker Millers better emphasized than during that period. And Becker Millers will always continue to demonstrate their ability to return maximum production for minimum expenditure of manual effort.

Send us blue prints of your work and other data and we will submit estimates on Becker production. Adopt this "safety-first" course; it may mean added profits to you.



The A. R. Williams Machinery Co.
LIMITED, TORONTO

GENUINE EMERY

Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

EMERY FLOUR AND WASHED FLOUR

EMERY, GLASS, FLINT, GARNET, CORUNDUM, CARBORUNDUM — PAPER AND CLOTH — IN SHEETS, ROLLS, DISCS, BANDS, STRIPS and TAPES, &c.

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LIMITED
WELLINGTON MILLS
LONDON, S. E. 1., ENGLAND

MORROW SCREWS MORROW

JOBBERS

of the highest grade goods carry the best set and cap screws and "MORROW" Drills because they know this make will give their customers better service.

CARRY

the Morrow Screws, Nuts and Drills, for their customers even although they don't make as much profit on them. It is in their customers' interest to do so—better value.

MORROWS

A strictly Canadian industry. Canadian workmen and Canadian capital.

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Ingersoll Files equal to English Files. Buy them.

DRILLS FILES MORROW MORROW NUTS MORROW

plates have advanced about one cent per lb., the price quoted being 7½ cents for the 3-16 inch, and 7 cents for the ¼ inch size. Plates have been advanced $7 to $10 per ton, the new quotation being $5.00 per hundred for ½ inch and up, and $5.25 for 3-16 inch. Quotations on billets have been changed to conform to the prices f.o.b. Pittsburgh, and these advances range from $4 to $7.50 per ton. Forging billets are now quoted at $56 per ton. Sheets is one of the products that has been hit by labor troubles, and supplies of this commodity are considerably below the trade demands. No. 10 gauge, black sheets, are now quoted at 6 cents per lb. Boiler tubes are still hard to secure and prices are firmly held. The price on 1½ inch seamless and lapweld, and on 1¾ inch lapweld, has been advanced 50 cents per hundred feet.

No Change in Metal Situation

Scarcity of finished materials still dominates the metal market and uncertain deliveries of these lines is the chief factor of the present disturbed state of affairs. There is a fair demand for ingot metals, but trade requirements for sheets are much larger than production can take care of, and output may be still further affected by the increased shortage of coal for operation of smelters and refineries. Dealers are holding firm to the nominal prices now quoted, but anticipate a stronger market.

Tool Movement Quite Good

The question of shipment is still a factor in tool business, and sales would probably be larger if users could be assured of a definite date for delivery. This, however, the manufacturers or dealers are unable to do, and the uncertainty in this connection will be further evident while labor and transportation troubles occupy the greater attention of industrial executives. Reports of local dealers differ in the extent of business transacted, but the general impression is one of good business, with sales quite fairly divided between new and used machinery. Existing conditions are assisting the Canadian manufacturer of tools, and dealers are doing what they can to induce purchasers to patronize Canadian makers of tools they are in need of. The conditions are such that prices may show advances in the near future.

Non-ferrous Scraps Weaker

The situation has again developed a dull tendency and trading has taken on a quiet trend. The disturbed conditions across the line has been reflected in this district and dealers are not keen to predict what the early conditions will be. The coal strike has not aided the re-establishment of normal industrial activity and curtailment of general enterprise is second only to the inability to meet the country's requirements for steel. The demand for scrap is proportionate to the steel production and with many American mills closed or contemplating closing, the consumption of old material in larger quantities must await the return of the coal and steel workers to their usual employment. The local movement of scrap continues in fair volume in the district, but non-ferrous scraps have weakened as a result of the lighter demand in relation to available supply. Coppers are quoted at from 14 cents for light to 17 cents for heavy and crucible, a decline of one cent per lb. Brass scrap has also developed a weakness and prices are marked down from 1 to 2 cents per lb. Iron and steel scraps are comparatively firm, but the undertone is unsteady. Wrought iron, on a decline of $1.00, is quoted at $9 per ton. Machine shop turnings at $7 shows a drop of 50 cents per ton.

POINTS IN WEEK'S MARKETING NOTES

The scrap market shows the following lines as being stronger and higher in price: Heavy melting steel, steel rails, malleable iron. Coppers, on the other hand, are not so strong, and prices are off compared to recent offerings.

—

An acute shortage in this district exists in bar products and semi-finished steel. Users are pressing the mills pretty hard for delivery, but the response is still short. About 65 per cent. of a normal volume is coming across now.

—

Several large enquiries are in the New York machine tool market now, among them being a couple from Canada.

—

A nice order for carbon drills was placed by the National Railways during the week.

—

A couple of shipments of machine tools came through this week in advance of promises, a thing rather unusual in recent years.

—

Dealers report a very satisfactory volume of business moving. The fact that prices remain high does not seem to interfere with sales at all. Delivery is still the chief consideration.

—

Canadians are quite interested in the sales of machine tools and equipment being held by the U.S. army department, clearing out the war shops. Some who have attended these report that prices run high, in several cases going, under bidding, past the price that would be asked for the machine when new.

DELIVERIES NOW ABOUT 65 PER CENT.

But Not Fast Enough to Keep Up With the Requirements of the Trade

TORONTO.—For the first time in many weeks some of the machine tool dealers in this district are willing to admit that there is some signs of improvement in the deliveries that are being made to them by their principals.

The steel strike may be broken, but it is not showing much yet in the deliveries that are made. It sizes up the situation fairly accurately to state that deliveries are about 65 per cent. of what should be coming through in normal times.

The Machinery Market

Prices are firm in the small tool section, with a good-sized volume of business moving. Toronto dealers received a nice piece of business from the National Railways during the week for carbon drills. Buying at present is becoming more general, although some of the firms that may be affected by the coal shortage are not keen to put in any very great stocks. Plants that are working on automobile parts are increasing their operations almost every day, adding a few more machines to their capacity, and this all means that there is a greater day-to-day call for supplies.

There have been a couple of agreeable surprises during the last few days regarding deliveries of machine tools. Some firms seem to make a specialty of not promising anything very close at hand, and then trying to improve on the delivery schedule that has been tentatively suggested. It is much preferable to the rash promise of a good delivery, which can never be carried out.

According to the New York letter to CANADIAN MACHINERY, appearing on the next page, a couple of Canadian firms are in the market for some rather extensive equipment.

About 65 Per Cent. Now

According to the office of one of the large American corporations in Toronto, the shipments of material from the strike zone in United States entering Canada, are about 65 per cent. of what should come across in normal times. Asked if that was any improvement over the past weeks, the dealer admitted that it was not, and stated his belief that it would be some time before a real improvement would be shown. There are troubles that have not come to the surface in the strike, and apparently a labor shortage is now going to crowd in on the space lately occupied by the strike in the centre of the stage.

Booking is still going on, but many of the companies here are not keen to write more business until the prospects are better for getting outstanding business converted at the mills. There are many manufacturers who are anxious to know when their material is coming in

GEOMETRIC

SELF-OPENING DIE HEADS

"YOU CAN'T BEAT 'EM"!

It is not the manufacturers of Geometric Self-Opening Die Heads who make this statement, but the users of the tools.

This is the reason that besides being the originators, we are known as the

LARGEST AND BEST KNOWN MANUFACTURERS OF AUTOMATIC THREADING TOOLS

The big question is: Have you applied Geometric Screw Thread Cutting Tools to your threading work?

THE GEOMETRIC TOOL COMPANY

NEW HAVEN CONNECTICUT

Canadian Agents: Williams & Wilson, Ltd., Montreal: The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B. Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

There is a marked tendency now, and it will likely increase in the future, to press the companies for material that has been booked now for some months. Bar products and semi-finished goods are away off for the present. There is quite an activity in the premium business just now, in fact the price of a good many sales is really based on the ability to deliver the material within a specified time. It often pays a manufacturer to put up a premium for quick shipment, rather than see his workshop shut down and his organization scattered. In some cases mills are asked a $7 bonus on plate. The Steel Corporation, as far as this paper can learn, has not departed from its schedule that has been in effect for some months. However, the man who has the goods to deliver is apt to get a better hearing than the seller who puts a three to six months' space between the order and the delivery. There is a great deal of premium business being carried on both here and in United States.

It does look as though there were going to be a lot of business piled up against the spring operations of the mills. There has been a lot of business sent in from this district, and it will be months yet before the last of it gets a ride across the border.

The Scrap Metal Trade

Coppers were marked down in the list of what the dealers would pay for old material this week. The chances seem to be that the prices may go still lower. The reason for it seems to be in the much-talked-of rate of exchange, and it comes about in this way. It is becoming a hard matter for United States to sell copper abroad on account of the way in which the money of other nations is discounted at Washington. For instance, taking the present price of No. 1 electrolytic, at 19c, it would cost England about 25c, it would cost France 30½c, while the Germans would have to pay about $2.50. It all means that these people are going to stay out of the United States market for copper supplies. There has been some reduction in output, but not enough to balance the way in which material is piling up, owing, as stated above, to the rate of exchange. The coal strike and the steel strike, now practically over, are still holding back trade.

The ferrous metals are showing up much more favorably, and they are very much in demand. Heavy melting steel went up $2.50 per ton, while advances were noted as follows in other lines:

Steel rails up $2.50 to $16; malleable iron up $3 to $20.

"As things stand at present," said one dealer to-day, "it looks as though malleable were about the cheapest thing on the market. Malleable and cast scrap are very much the same, both of them being governed by the price of pig iron. Although there has been a recent jump of about $4 per ton in pig iron, malleable scrap is selling for $20, and No. 1 scrap at $25." Many foundrymen, though, are not disposed toward using malleable scrap. They claim they cannot get it to work with any other material, as they can do with stove plate. Malleable is hard when first cast, then heat-treated, but when it comes back to be recast it returns to its hard state. It is used mostly in the tail-ends of heats or for casting some job where the analysis of the material is not of much importance.

NOTHING LIKE A CAPACITY OUTPUT OF STEEL FOR MANY MONTHS TO COME

Special to CANADIAN MACHINERY.

PITTSBURGH, Dec. 4.—The iron and steel industry is in the midst of troubles, not being entirely out of its own strike while the coal strike threatens to curtail its operations. There has been scarcely any coal delivered to the steel mills since the coal strike started Nov. 1, most of the coal consigned to mills being held up by the fuel distributing authorities. Mills have been able to get along fairly well with their stocks, but these are now largely depleted. On top of this situation, making it uncertain whether there will be enough coal to enable all mills to continue to operate, comes the danger that the production of coke will be restricted in order to release coal for the most urgent uses. Curtailment in coke production would decrease the make of pig iron, of course, while in addition it would interfere with operation of plants that depend upon blast furnace gas for their power.

Strong hopes are entertained that the coal strike will be broken by the strenuous measures adopted by the Government upon refusal of the miners' officials to accept the 14 per cent. wage advance proposed by Dr. Harry A. Garfield, Fuel Administrator. The Pittsburgh Coal Co., by far the largest coal interest in Western Pennsylvania, promptly announced that it would co-operate with the Government and endeavor to operate its mines. If the strike is ended in this way it will be a victory for the Government and the people, not for either the operators or the miners. The operators had expected to pass to the public any additional cost they might incur through a wage increase, perhaps with an addition on the side, whereas Dr. Garfield prescribes that the 14 per cent. advance is to be absorbed by the operators, with no increase in coal prices.

The Iron and Steel Strike

The iron and steel strike, described in last report as "crumbling," has gone entirely to pieces in Mahoning valley. Men have stampeded back to work, and at the plant that was slowest in resuming during the past few weeks applicants for jobs in some departments are being turned away, as the departments are already fully manned. The entire productive capacity of the valley is not yet in operation, but work is being resumed as rapidly as possible.

In the Wheeling district the strike still hangs on, but there is likely to be a stampede there within a week or two, since the strikers have at last learned that newspaper reports are correct to the effect that various other districts have been working.

There is no disorder anywhere, and except perhaps for the Wheeling district there is no intimidation. Thus, in the main, the men remaining out of employment are actual strikers, whereas early in the strike many men were idle because of intimidation. Taking the industry as a whole the men idle now amount to between 10 and 15 per cent. as many as the maximum number idle when the strike was at its height, in the first week. How many men are in employment is another matter, for there have been gains by some new men coming into the industry and losses by some men drifting away, a few thousand having gone back to the lands of their birth. Before the strike the industry was not fully manned.

The important thing now is not how much of the strike is left, but how well the works can operate, and that depends as much upon morale and efficiency as upon the actual number of workers. The morale, of course, is low at many works, the men knowing that as an aid to breaking the strike the employers were glad to have them in employment on any terms, even if they did not do much work. As to efficiency, there are some new men who must be trained from nothing, and there are many men who have shifted employment and must be trained in their new jobs. Even that is not all, as when the strike is recognized as entirely over many of these men may drift back to their old jobs and thus cause fresh confusion.

Production Prospects

Altogether the prospects are clear that there will be nothing like capacity production for months to come, if at any time in the discernible future. Last January production of steel was at about 90 per cent. of capacity, figuring capacity on a conservatively low basis. The subsequent slump carried the rate down to about 50 per cent. the middle of May, and with continued recovery thereafter the rate just before the strike was about 85 per cent. For a few days the strike cut this in half, making a rate a trifle under 45 per cent. Now the rate is about four-fifths of that just before the strike, a trifle under 70 per cent., and the 85 per cent. rate may not be reached before next March.

In our report for the issue of Oct. 30 it was estimated that even if the strike should recede rapidly thereafter it would, all told, cause a loss in production of more than 2,500,000 gross tons of fin-

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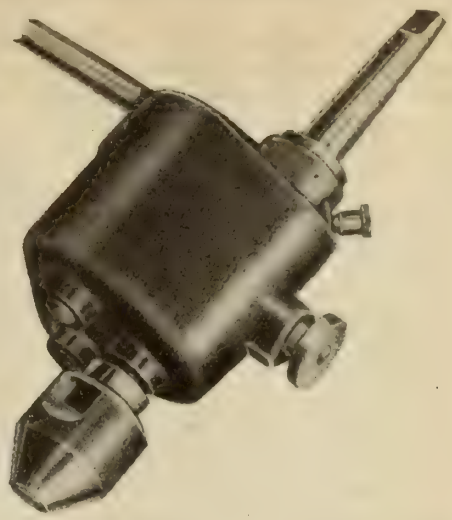
offers you the advantage of hand tapping plus drill press speed



The oscillating movement mechanically imitates hand-tapping, though 10 times faster, and reduces tap breakage to the very minimum.

AND THE WAHLSTROM ATTACHMENT IS ACCURATE. It taps holes as squarely as they could be drilled. Takes taps of all sizes up to ½ inch. **Sent on trial. Money refunded if you are not satisfied.** Write for bulletin.

Attached to any Drill Press will quickly Pay its Cost

Powerful Durable Trouble-proof

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Glue has the Greatest Sticking Strength when maintained at a temperature of 145 to 150 degrees Fahr.

It's easy to maintain this heat with "International" Electric Glue Heaters. They operate on dry heat, utilizing every bit of heat generated because conserving it on the fireless cooker principle. There is no evaporation of water or glue—therefore no waste. There are no burn-outs from evaporation of the bath because no water is used in these heaters. More of the glue is wasted because the electric dry heat principle prevents the formation of skin, scum or dirt on the glue.

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For Woodworking and Pattern Shops

Cost of operation is but a trifle. Less current than an electric flat iron consumes is ample to operate 13 one-quart Electric Glue Heaters.

May we send our latest Bulletin?

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If interested tear out this page and place with letters to be answered.

ished rolled steel, since after the strike the full pre-strike rate of production, which was about 2,500,000 tons a month, would not immediately be restored. A fair estimate to-day is a loss of 3,000,000 tons, this including allowances for deficiency in production in January and February, and no one can be certain that production will be going along smoothly even next March.

In these circumstances it is not surprising that steel consumers are seeking eagerly to cover their requirements for the fore part of next year, and that the manufacturers who do not as a matter of policy adhere to March 21 prices are asking advances for such material as they have to offer. The Steel Corporation pursues rigidly its price maintenance policy, but cannot in all cases supply even its regular customers fully. The independent tin plate mills are practically a unit in going along with the Steel Corporation in maintaining the regular $7.00 price, but less than half the independent sheet manufacturers are showing the same spirit as to sheet prices.

Pig Iron

The rise in pig iron continues. While some furnace interests a few weeks ago were professing themselves as anxious to see the market held on an even keel, they did not commit themselves by selling ahead at old prices and the forces in favor of advancing prices have had full sway. The Philadelphia market has advanced again, being now $37.60 delivered Philadelphia for No. 2X, while Buffalo and Cleveland have also advanced. In the Pittsburgh valley market a wide range of prices has obtained, according to tonnage and delivery. A small lot of malleable has sold at $35.25, valley and foundry has brought $35, valley for December. The top price on Bessemer has been $36 valley done on 100 tons for December, while a valley furnace sold Bessemer at $32 and then at $33, a detached Western Pennsylvania interest afterwards securing $34, delivery December to March inclusive, equal to $35.10, delivered Pittsburgh. Outside of fancy prices paid for small prompt lots the valley market is quotable at about $32 for basic, $33 to $34 for Bessemer, and $33 to $35 for foundry. The furnaces have been talking higher costs, and also claiming that they have made no money of late, even during the latter part of the war..

According to present appearances, Lake Superior iron ore will not be higher for the new season, but Connellsville coke will be much higher. The average cost in the past few months has been $4.25 per net ton at ovens, but the average is likely to be $6.00 and higher for the first half of next year. For a particularly good brand of coke some contracts have just been made at a ratio of 5 to 1 on basic pig iron, valley, which at the present $32 market would mean $6.40 for the coke.

CANADIAN FIRMS HAVE SEVERAL INQUIRIES IN THE MACHINERY MARKET

Special to CANADIAN MACHINERY.

NEW York, Dec. 4.—Canadian companies are inquiring for machine tools in New York. One such inquiry is from the Canadian Ingersoll-Rand Co., Ltd., Sherbrooke, Quebec, and asks for quotations on one 10 x 20 ft. planer, one 16 x 24 ft. vertical extension boring mill, one 7 ft. radial drill, and one floor-type boring mill with 6 in. spindle. The Fraser, Brace Shipyards. Ltd., 83 Craig Street West, Montreal, Quebec, is inquiring for the following equipment: One oil-heated angle iron furnace, one plate bending roll, two vertical punching machines, six plate punching tables, two single-headed shears. one horizontal punching machine, three radial countersinking machines. one angle iron cutting machine and an emery wheel.

The American Locomotive Co. will buy from its New York office a considerable quantity of new equipment for its Montreal works, where foreign orders for locomotives will be executed.

Business in machine tools is booming in the East. Not since the war has there been such a large volume of buying. The automotive industries are the principal purchasers. The New Departure Mfg. Co., Bristol, Conn., a subsidiary of the General Motors Corporation, has placed orders for 400 to 500 tools, totalling its value close to $1,000,000. The company's output of ball bearings will be greatly increased. The Willys Corporation, Elizabeth, N.J., which will put a new light six cylinder automobile on the market, has bought about $500,000 worth of tools, mostly special machines. The H. H. Franklin Mfg. Co., Syracuse, N.Y., is in the market for equipment for a plant addition.

Among other companies which are buying or inquiring for tools are the General Electric Co., Western Electric Co., Worthington Pump & Machinery Corporation, C. H. Johannson, Inc., Poughkeepsie, N.Y.; American Car & Foundry Co., Liberty Starters Co., Poughkeepsie, N.Y.; and the Eastern shipyards are inquiring and buying a few new tools.

The Standard Oil Co. of New Jersey has bought about $150,000 worth of tools and plate-working machines for shipment to Roumania. This is the largest export order placed in some time.

Deliveries on machine tools are getting further off. One Eastern company is sold up until the end of 1920 on a line of automatic machines. An Eastern lathe builder received orders last week for upwards of 100 lathes. Many tool builders have orders on their books for three to six months. Prices are recording no important changes, and sellers predict that there will be no further advances unless costs of labor and material should go considerably higher.

U.S. SCRAP METAL

While there are many instances of advances in scrap material, in some districts the coal strike has knocked the bottom out of the market. Following are reports from United States districts:

CHICAGO.—While there is decreased buying by some interest due to the coal situation, others are keeping up their buying. This is particularly the case with rerolling mills, which although closed down, are still buying all the rails they can obtain. Cast scrap is active, and prices higher.

NEW YORK.—Most grades have shown an advance in price, those remaining stationary being heavy cast and machinery cast. Heavy melting is standing at $18 f.o.b. New York. Dealers seem to be holding back for further advances.

PHILADELPHIA.—There has been a general advance in scrap prices, and dealers are holding for still more advances. A lot of Eastern steel was sold at $24 delivered, Pittsburgh. Heavy melting is quoted at $21 to $22 delivered, but probably would be hard to get at this price.

PITTSBURGH.—Advances in this district are pretty sharp, with a good demand. A large lot of heavy melting steel is reported to have changed hands at $25.75 delivered at Massillon, O. Heavy machinery scrap has brought $29 delivered.

CLEVELAND.—A sale of heavy melting steel of 10,000 to 15,000 tons at $23 delivered is reported. There is a good demand for most grades, and the market is firmer. Dealers look forward to better prices for 1920. Malleable is around $26.

CINCINNATI.—Coal strike and car shortage are having a bad effect on the scrap market, but there have been advances in some grades. No 1 machine cast and cast boring have advanced approximately $1 per ton, and heavy melting is keeping its level.

ST. LOUIS.—The possibility of being closed down due to the threatened coal strike has caused many consumers to stop their buying, resulting in a bad jar to the market. A large offering of various grades at lower prices found no buyers. Railroad offerings amount to only 875 tons and little material is coming in from the country.

BUFFALO.—There is a demand for heavy melting in excess of the available supply, and the price is going up. $22.-50 to $23 delivered is about the lowest quotation. Other grades are also in demand, with an upward trend.

BOSTON.—The scarcity of pig iron has caused consumers to look for more scrap, and this in turn is short. $30 for No. 1 machinery, the highest price since the armistice, reflects the condition. Availability of cars here has brought business from districts where the car shortage is acute.

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NONE BETTER CAN BE MADE

It is not our ambition to make all the Hobs used in industry; only to make the best.

ILLINOIS TOOL WORKS, CHICAGO.

Detroit Store—*
Woodward and Warren Aves.
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New York Office
141-145 West 36th St.

***Complete Stock carried at Detroit—Buffalo—Pittsburg and San Francisco.**

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$31 00
Lake Superior, charcoal, Chicago	38 40
Standard low phos., Philadelphia	40 00-40 00
Bessemer, Pittsburgh	3' 50
Basic, Valley furnace	30 00
Toronto price:—	
Silicon..2.25% to 2.75%	$34.00 to $37.00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	7 50
Chequered floor plate, ¼ in.	7 00
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$24 25	$25 00
Electro copper	24 00	25 00
Castings, copper	23 50	25 00
Tin	57 50	58 00
Spelter	10 00	10 50
Lead	8 25	8 50
Antimony	10 50	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 5 00	$ 5 00
Plates, 3-16 in.	5 25	5 25

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$14 00	13 75
Copper, crucible	17 00	17 00
Copper, heavy	17 00	17 00
Copper wire	17 00	17 00
No. 1 machine composition	15 25	16 00
New brass cuttings	11 00	10 75
Red brass cuttings	14 00	14 75
Yellow brass turnings	8 00	9 00
Light brass	6 25	7 00
Medium brass	7 25	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	6 00
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton	Gross
Heavy melting steel	13 50	16 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	14 50	16 00
Malleable scrap	18 00	20 00
No. 1 machine cast iron	24 00	25 00
Pipe, wrought	9 00	9 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	7 00	11 00
Stove plate	22 00	21 00
Cast boring	10 00	11 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	35
Carriage bolts, ⅜" and up	15
Coach and lag screws	50
Stove bolts	65
Wrought washers	50
Elevator bolts	25
Machine bolts, 7-16 and over	40
Machine bolts, ⅜" and less	40
Blank bolts	25
Bolt ends	25
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $0 75
Nuts, square, tapped	add 1 00
Nuts, hex., blank	add 1 00
Nuts, hex., tapped	add 1 25
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	50
Sq. and Hex. Head Cap Screws	45
Rd. and Fil. Head Cap Screws	20
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	45
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	40
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	25
Studs	30
Taper pins	50
Coupling bolts	10
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$46 00
Open-hearth billets	46 00
O.H. sheet bars	46 00
Forging billets	56 00
Wire rods	52 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 70
Cut nails	4 75
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 37
British Manila rope	0 31
New Zealand hemp	0 31
Transmission rope, Manila	0 43
Cotton rope, ¼-lb. and up	0 74

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	net

WANTED

Young man who can write advertisements for mechanical lines.

We have an opening for a man who understands machinery and who can write intelligently and convincingly. One who has had advertising experience preferred.

Give, in the first instance, full particulars as to age, education, experience, etc. Applications will be treated in confidence.

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MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	50
Standard drills, all sizes	50
3-fluted drills, plus	10
Jobbers' and letter sizes	50
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	list plus 10
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	10 to 40
Canadian high speed cutters	net
American	plus 40

COLD ROLLED SHAFTING

At mill ..... list plus 5%
At warehouse ..... list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 75
Sheets, black, No. 10	6 00	6 00
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	8 20
Premier, 10¾ oz.	....	8 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	30 00	26 50
1¾ in.	32 00	26 50
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	.....
Royalite, per gal., bulk	22½
Palacine	25½
Machine oil, per gal.	36
Black oil, per gal.	16
Cylinder oil, Capital	62
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0
Brass tubing, seamless	0
Copper tubing, seamless	0

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$11 50
Sheets, 3½ lbs. sq. ft.	10 50	11 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

Making Accuracy A Marketable Commodity

THERE'S a toolmaking shop in Detroit that refused to be stumped by any of the many problems our motor car builders present—the Michigan Tool Company.

This concern is fully equipped for any job—which means Dumore Grinders are there to do their bit.

In building jigs, standard bushings are used, the outer diameters running in an ascending series of sizes and calling for an arbitrary "constant" for the press-fit.

For grinding of this kind the Dumore is the ideal tool—high speed, dynamically balanced, non-vibrating, easy to move out of the way to permit the various holes to be indicated.

Write for information.

WISCONSIN ELECTRIC CO.

2916 Sixteenth Street Racine, Wisconsin

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.

Labor Paper Says Steel Strike Has Failed

But There Has Been a Tremendous Loss in the Struggle—The Failure of the Radicals Has Cost $280,000,000—More Labor-Saving Machinery Brought Out

PITTSBURGH. — Authentic reports from the Pittsburgh district on conditions resulting from the steel strike called Sept. 22, ten weeks ago, show that the strike has been a distinct failure and that the steel companies for the most part now are contending simply with the imperfect shop organization inevitably accompanying operation with a large percentage of men not yet familiar with their jobs. This difficulty obviously is becoming less serious each day. Of the 228,430 mill workers employed in this the steel centre of Americea, 162,474 either failed to report for work or were sent home the first day of the strike. Out of this latter number 109,455 are back at work.

During the ten weeks of the strike, seven lives were lost, one man was paralyzed as a result of being struck on the head with a brick, and 173 were injured in riots, street fights or clashes between pickets and workmen and guards.

A conservative estimate places the total payroll loss in the entire district at $29,634,064.67, and property loss at $153,150. The only figures obtainable as to the tonnage loss by the steel company are those given by the strike committee, which places it at $250,000,000.

Not 1 Per Cent. of Strikers Idle

It is estimated less than 1 per cent. of the men who struck are idle to-day. Most of them have returned to their old jobs. Others have gone elsewhere to work. Many foreign workers have returned to their native land.

As a result of the strike, the labor situation is more serious in this district than it was during the war. Workmen going back to Europe, or leaving this region to find employment elsewhere, have created a shortage of almost 30,000 common laborers. The longshoremen's strike in New York has served to prevent many mill workers from returning to Europe, and as soon as that difficulty is settled a rush to Europe is expected.

Steel officials say the problem of insufficient laborers is being met in various ways. Many negroes, Greeks and Mexicans have been brought into the district since the strike. Significant are reports showing that the strike has stimulated inventiveness in the management of steel plants, with the result that new methods were devised whereby fewer men than formerly are required to perform certain work. These labor-saving methods will continue to be used.

Labor scarcity does not exist in all steel towns, for some mills have more applications than they have jobs.

Many independent steel plants throughout the district were compelled to shut down because of the crane operators and electrical workers being called out on strike, thus making it impossible for other parts of the plant to continue operations. In the course of a week the places of most of the strikers were fillled. Some of the crane operators now are receiving as high as $225 monthly.

Difficulties Are Surmounted

At the Clairton Steel Works, where clashes of strikers and State police caused much excitement, 500 laborers walked out September 22, in response to the strike order. These men were an important cog in a vast machine, and their absence necessitated a shutdown of the works, employing 4,300 men. A new organization had to be effected. For weeks the plant ran far below capacity, but new departments were added from time to time until now the plant is running 100 per cent., not only in the steel works, but in the by-product plant. The experience of the Clairton Works is typical.

In the Clairton by-products plant, an average of one car of coke is made every six minutes throughout the twenty-four hours of the day. This plant supplies coke for the Clairton, Homestead, Braddock and Duquesne works, and also provides much of the gas used in these plants. The gas is a byproduct in the transformation of coal into coke,

From the beginning of the strike, it was evident to steel officials and others that a large percentage of the strikers were not idle from choice. Prior to the actual calling of the strike, there was no question but that the sentiment in favor of striking was overwhelming. Many of the workmen were agitators of the I.W.W. type. Hundreds of others, vaguely feeling themselves victims of an unfair economic system, were easy prey for these agitators. Still other hundreds were of the kind that always may be depended upon to "go with the crowd."

Many joined enthusiastically in the strike, not because they felt that they had a grievance, but because they expected it to be successful and to result in their being better off than before. All believed that the strike would be short.

Radicalism Killed Strike

Among the reasons for the collapse of the strike in this district, the radical character of its leadership and the failure to pay promptly promised strike benefits stand out prominently. The pamphlet on Syndicalism written by William Z. Foster, secretary-treasurer of the national strike committee, entered the limelight soon after the beginning of the strike, and it became a subject of general discussion, revealing the fact, for the first time, to thousands of strikers and their sympathizers the kind of man who was managing the gigantic walkout. With this realization there grew rapidiy among the striking workmen a conviction that they had allowed themselves to be used as "tools."

During October the American Sheet and Tin Plate Company of Vandergrift, which was closed by the strike, had the largest production in the history of the company.

The Wheeling district is the only one idle to-day. However, steel company officials say the backbone of the strike has been broken, as the hot mill men of the Laughlin plant of the American Sheet and Tin Plate Company in Martins Ferry and the La Belle plant of the same company in Wheeling, as well as the Aetna Standard in Bridgeport, have voted to return to work. All three of these plants own and operate their own coal mines, and until the coal situation is adjusted, there can be no resumption of operations in any of the big mills. The men of the Riverside plant of the National Tube Company in Benwood have voted to return to work, but no definite steps for a resumption have been taken by the company.

In Wheeling, the union commissary will supply more than 600 needy families of union strikers with foodstuffs during the week. Three weeks ago, the steel workmen's organization began disposing of food. At that time there were only 125 families. In two weeks the number jumped almost to 500, and it is expected that the number will double weekly until the strikers return to work.

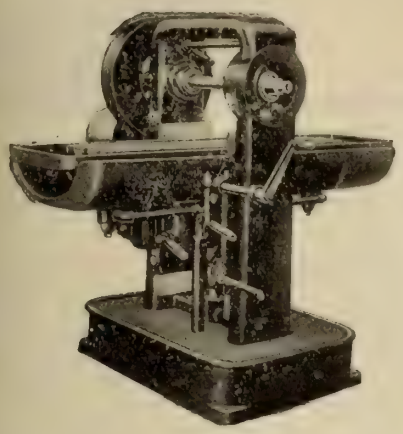
The commissary was installed in Youngstown instead of the promised financial benefits. Whenever this commissary is open, there are many women and children standing in line awaiting their turn to be served.

In its current issue, the West Virginia Labor News admits that the steel strike has collapsed, and admits the full resumption of operations at various plants, following agreement by the strikers to abandon their officials and return to work on the open shop basis. The News has been backing the steel workers in their strike.

The death is announced at his home in Haileybury of Mr. J. W. Moffet. The deceased was well known in the mining district, having erected mills at the Penn-Canadian, Silver Cliff, and Beaver Mines in Cobalt, and the Kirkland Lake mines. Death was due to tuberculosis. Mr. Moffet was born in Missouri 74 years ago, and came to Cobalt in 1905. He is survived by a widow and one daughter.

BRIGGS MILLERS

"We Call It the Big Little Milling Machine"



And so it is. A man who is unfamiliar with the "Briggs" and the work of which it is capable is always surprised at the power available and the extreme rigidity on any milling operation which is within the range of this tool. It is a small machine; but the solid over-arm construction and the convenience of operation make it a manufacturing machine of unsurpassed production possibilities on all work which it can handle.

The low first cost of the Briggs Miller is another of its surprising features. The floor space required is small. Upkeep is slight. operating cost is low because skilled labor is not required to obtain the best output of which the machine is capable. And there are other advantages, too, which we'll be glad to explain in more detail.

We have several of these machines in Toronto warehouse

Garlock-Walker Machinery Company, Limited

32 Front Street West, Toronto, Canada

MONTREAL **TORONTO** **WINNIPEG**

The Week's Events in Montreal Industry

The Mason Regulator and Engineering Co., of Montreal, has secured the agency for the Republic Flow Meter.

Roderic J. McLean, engineer, of Montreal, has obtained the agency for the T. J. Wing Manufacturing Co., 352 West 13th Street, New York, manufacturers of engine and boiler room equipment.

An order recently received from the Norwegian Government by the Canadian Vickers Co., for a large steel cargo vessel, is the second this company has had from this source in the past few months. This vessel is to be delivered by the close of May, 1920.

At a recent meeting of the Montreal branch of the C.A.S.E., the subject was the reading and discussion of a paper on D.C. current and equipment, illustrated by a large number of slides. The evening was one of interest and instruction.

M. P. Fennell, secretary of the Montreal Harbor Commission, has been elected to the office of secretariat of the American Association of Port Authorities, and this office will now be transferred to this city. It is interesting to note that this is the first occasion that a Canadian has held this office.

A commercial club has recently been organized in the city of St. John, N.B., with an initial membership of nearly two hundred. S. E. Elkin, M.P., has been elected president, and with the assistance of an able executive the club proposes to arouse public sentiment and hasten action for the development of the city along modern lines.

The proposed plan to connect the Great Lakes with the sea by way of the St. Lawrence is again in the limelight. In addition to developing schemes for removing existing obstacles for deep water navigation on the river, the utilization of available hydro power is part of the present plan. The scheme would involve the overcoming of a fall of 220 feet in a distanec of one hundred miles above Montreal.

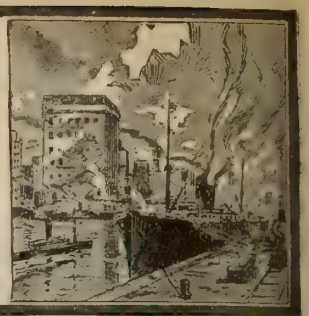
Edward F. Sise has resigned from the position of chief executive of the Northern Electric Company after a long period of successful administration. He organized the Wire and Cable Co. in 1899, and was managing-director of that company when it was amalgamated with the Northern Electric Co. The presidency of the company has been filled by Paul F. Sise, who will now assume the duties of this office.

At the invitation of J. J. York, A.E.I.C., the Montreal branch of the Engineering Institute of Canada visited the St. Lawrence Sugar Refinery on Friday evening and Saturday afternoon (Nov. 28 and 29). The parties were shown over the plant by Mr. York in person, the whole trip requiring fully three hours. Raw sugar is received at wharf, coming by boat from West Indies. The shed can hold a month's supply, the daily capacity being over a million pounds of sugar. The parties followed the refining process from the receiving shed to the final boiling to granulated white sugar, and automatic packing as granulated sugar or manufacture into cube sugar.

Two 25,000-kilowatt steam-driven turbine units of the American Westinghouse make, which, when installed, will complete the largest steam-driven electrical installation in the Far East, are now being erected at Osaka, Japan, for the Osaka Electric Light Company. With its power station situated in an extensive industrial district, this company furnishes light and power to street railways, steel works, shipbuilders, copper refining plants, paper mills, electrochemical installations, and other industries. It may be mentiored that in 1908 the Osaka Company installed three steam turbine units of 3,000 kilowatts each. In 1910 two more units of like capacity were added, and in 1911 two 5,000-kilowatt units. The 25,000-kilowatt units now being installed will bring the capacity of the plant up to 100,000 horsepower.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS
PERSONAL AND TRADE NOTES



TRADE GOSSIP

Emergency Coal for Canada.—The handling of coal released to Canada by the United States administration has been arranged by the fuel section of the Canadian Trade Commission. Coal is expected to come across the border in the next few days. Hospitals and such public institutions will have the first attention, after which will come industries engaged in the manufacture of foodstuffs. There have been many applications to the board from industries wishing to be placed in the essential class, but the board referred these to the Provincial administration.

Coal Situation in Toronto.—If the strike continues in the United States for another ten days, 10 per cent. of the small industries in Toronto will be forced to close down. This is according to statement made by William McGill & Co., of this city. A further statement from the same source was to the effect that very little coal was coming into the city, and the coal obtained by the fuel controller was being devoted to the use of hospitals and public utilities. The large industries were in a better position, having, in most cases, enough coal to carry them through the winter.

Coal Commissioner for B.C.—W. G. Gaunce, of Victoria, has been appointed Controller of Export Licenses for British Columbia. Shipowners requiring bunkers for their vessels, if not registered in Canada, must get a license from the controller before they can obtain their requirements. Coal for export must also be licensed. There are only two kinds of licenses issued, the first for coal cargoes destined for U.S. and Alaska points, and the second for bunker coal for ships flying any flag and sailing for any destination, but only for sufficient quantity to take them to the foreign port.

Canadian Bridges Too Light.—Mr. Frank Barber, speaking before the Electrical Club recently in Toronto, expressed the opinion that most of the Canadian bridges were built too lightly. There were bridges in Europe that were older than the banks of the streams they were on. The life of a steel bridge was seldom more than fifty years, and the failure of this type of bridge was due to poor concrete abutments. The use of concrete would eventually supersede steel for bridges. The new bridge being built in Peterboro' would be erected with one hundred and fifty tons of steel and fifteen thousand yards of concrete.

THE F. F. BARBER MACHINERY CO. OPENS UP FOR BUSINESS IN TORONTO

ANNOUNCEMENT is made of the formation of the F. F. Barber Machinery Co., with offices on the fourth floor of the Foy Building, Front St. W., Toronto. Mr. Frank Barber, recently in charge of the machine tool department of the A. R. Williams Co., is at the head of the new company. "Our prime object," said Mr. Barber to CANADIAN MACHINERY, "is specialization. We propose to handle sufficent lines to cover

F. F. BARBER,
Pres. of F. F. Barber Machinery Co.

production equipment, as well as standard machine tool equipment. We propose to carry the leading lines of tools in each type. By doing this we feel that we can give both customers and makers a better class of service than has hitherto been possible." Mr. Barber is at present in the machine tool markets of United States, where he is completing arrangements for representing a number of machine tool lines in Canada.

Mr. Barber has been in the machinery business in various capacities for a number of years—the fact is he has never been away from the business in some form or another. His first experience came when he was "articled" to F. W. Hudlass at Southport, England, who founded and directed the Phoenix Motor Car Works, and was later appointed chief engineer for the Royal Automobile Club of Great Britain and Ireland. Being "articled" at that time meant among other things, putting up £50 to guarantee that the "article" would remain on the premises until his apprenticeship term had been fully served. Such things would not go in this land now, but they are relics of a stern school of technical training.

Coming to Canada late in 1903 Mr. Barber was for a short period with the Russell Motor Co., going shortly to the McLaughlin Engine Co. as a mechanic. The next move brought him to the tool room of Roden Bros., silversmiths, going from that firm to J. P. Cleal, where he had splendid scope to work on models and engage in the development of patents. Mr. Barber was finally in charge of the experimental work in this shop, many intricate devices and improvements resulting from the adaption of his drawings.

It was in the year 1911 that Mr. Barber left the practical side of the business, going to the Fairbanks-Morse Co., sales department. He took kindly to the change and the change took kindly to him. In the early part of 1915, when the equipping of war shops was becoming an acute and urgent problem in Canada, as well as in every country under the sun, Mr. Barber joined the A. R. Williams Machinery Co. in the machine tool department. In common with dealers who went through the avalanche of business that threatened to bury and swamp the trade, Mr. Barber was able to render splendid service to the munitions shops, as well as gain a tremendous amount of valuable knowledge on shop equipment, special machines for special operations, etc.

Sault Ste. Marie.—Five bodies of the crew of the ill-fated Myron have been picked up above Salt Point in Whitefish Bay. This is after nearly a week's patrol of the north and south shores of Lake Superior and Whitefish Bay. No word of their identity has been received as yet. The body of Albert Neilson, deckhand of the steamer Townsend, was found near the centre pier. He fell in the canal some weeks ago while assisting to moor the vessel.

Secord Gets Contract.—P. H. Secord & Co. have secured the contract for the four-storey building for the William Paterson Sons & Co. in Brantford.

Victoria, B.C.—The Marine Department are considering the building of two 75-foot motor boats to supplement its present British Columbia fleet. The work of drawing up the plans has been entrusted to the Cholberg Shipyards.

Port Arthur.—Mr. J. H. Smith will be the new manager of the Port Arthur Shipbuilding Company, replacing Mr. J. F. Paige. Mr. Smith has not yet arrived in Port Arthur, he being detained in Cleveland owing to the illness of a brother.

First Oil Locomotive.—The first French locomotive to generate steam by the use of oil fuel has been tried out successfully, a heavy train being hauled without difficulty. It is understood that following this trial two hundred locomotives will be equipped to burn oil instead of coal.

Board of Commerce to Act. — The Board of Commerce has given public notice that any complaints re high prices charged for bituminous coal, will be at once investigated. If the charge is proved, the Board will take steps to secure a conviction.

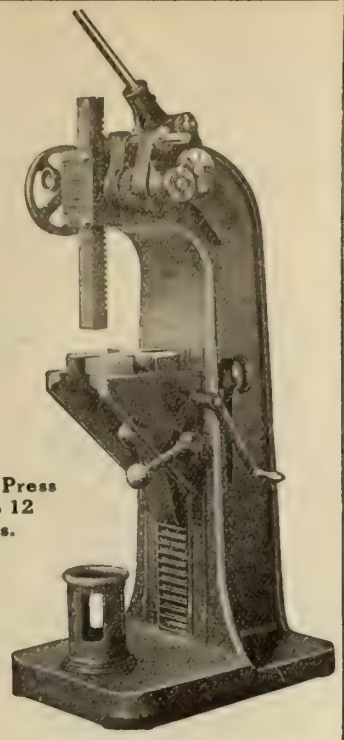
Coal Allowance Arrives.—The allowance of 150 carloads of bituminous coal daily, which was arranged for by the U. S. Fuel Administrator, started Dec. 1. The greater part of the first few days will be allotted to public utilities in various parts of Ontario.

To Build Bridge Approach.—The lines leading to the projected C.P.R. bridge over the Niagara River will be built by the Toronto, Hamilton & Buffalo Railway Co. The line will be from Welland to a point on the river six miles below Bridgeburg, where the bridge will be built.

British Trade for Canada.—Canadian manufacturers wishing to tender on business for British Government Department, will be sure of receiving the greatest consideration. The Admiralty, War Office, Ministry of Munitions, India Office and Crown Agents for all the colonies have signified their intention of considering Canadian offers for supplies purchased by them.

Baldwin's to Start Building.—It is understood that Baldwin's, Ltd., who have taken over the plant of the British Forgings at Ashbridge Bay, Toronto, will start the erection of two buildings immediately. Thes buildings are to be of considerable dimensions, one 800 feet long and the other 400. Other large buildings are being delayed owing to the shortage of structural steel.

To Take 50 Per Cent. of Space.—The British Ministry of Shipping, according to a report current in shipping circles, will requisition 50 per cent. of the cargo space of steamers sailing during the month of December. This is an increase of 15 per cent. over the requirements for November. The increase is probably due to the necessity of getting the grain moved over to England and Europe.



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ATLAS PRESS CO.
330 N. Park St.
Kalamazoo, Mich., U.S.A.

British Columbia Lumber.—The exports of British Columbia lumber, excluding paper and wood pulp, during October amounted to 30,000,000 feet. Paper and wood pulp amounted to 20,500,000 pounds. 8,000,000 feet of lumber were shipped to Europe and the Orient and the remainder by rail to the United States. There is still a shortage of ships. South Africa is also in the market for B.C. lumber.

Terminals for Sydney, C.B.—In response to a visit of a deputation some time ago to Ottawa, an engineer has arrived here to look over the site for a terminal. A tentative selection has been made at Anderson's Point, and Parliament has voted $100,000 for the building of the wharf and terminal. Mr. Coutlee, the Government engineer, has also been visiting Glace Bay to look over some projected harbor improvements.

Ottawa.—The Canadian Government Merchant Marine will number twenty-three vessels before the end of the year, according to a statement by Mr. Alec Johnson, the Deputy Ministr of Marine. The "Canadian Spinner," "Canadian Planter," "Canadian Settler," "Canadian Rancher." "Canadian Railer" and "Canadian Traveller" will be all delivered before December 31st. The "Canadian Navigator" has been handed over.

Control of Big Fleet.—An agreement has been made with the British Admiralty which definitely places control of the International Mercantile Marine Co. in the hands of the English directors. This agreement states that the company shall make it compulsory that Englishmen manage the ships, and that the directors shall be subjects and residents of the British Empire. The names of new directors must be submitted to the British Government for approval.

Employment Managers Organize.—The employment managers of Toronto met recently in the Social Service Building of Toronto University, and formed the Employment Managers' Association of Toronto. A proposed draft of the by-laws and constitution of the Association was put before the members, and was adopted with few amendments. The next general meeting will be held on Dec. 8th, and the election of officers will be held.

Increase for Expressmen.—The Canadian Express Company's employees demand for a new wage schedule has been met by a compromise offer. This includes an agreement on the two weeks' vacation question, and a general increase in wages. By this arrangement men receiving less than $100 per month would receive a 15 per cent. increase; those getting from $100 to $110 a 12 per cent. increase, and all getting over $110 an increase of 10 per cent. This will be accepted by the men.

Arrange Emergency Coal Supply.—

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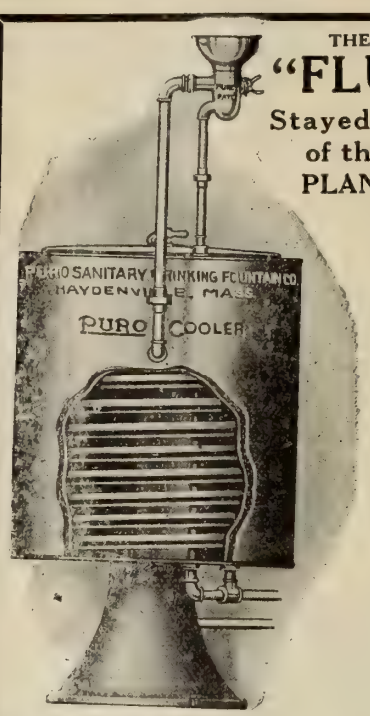
SAYS THE MASTER MECHANIC: The Greb Automatic Grip Puller is a One-Man Puller—Quick-acting, strong and simple in the extreme. May be locked in any desired position. A combination of two or three arms. Heavy Duty Size capacity 1" to 18"—Junior size capacity 1" to 7". Two sets of jaws furnished with each size.

TEN DAYS' TRIAL.—If your dealer or jobber does not have them we will send you one. Try it ten days. If not satisfactory, return to us and we will refund your money. We also make the GREB RIM TOOL.

THE GREB CO., 318 State St., BOSTON

An arrangement has been made by Mr. McGrath, Canadian Fuel Commissioner, by which an allotment of bituminous coal will be available to Canada. The procedure necessary in obtaining a supply is as follows: Preferred industries in Canada must have their applications substantiated by C. A. Magrath, Ottawa, after which the applications will be forwarded to the Canadian War Mission at Washington and by the Mission to the Central Fuel Committee.

THE "FLU" Stayed out of this PLANT



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BETTS
Builders of Heavy Duty Machines for over 50 years
PLANERS, BORING AND TURNING MILLS, HORIZONTAL BORING & MILLING MACHINES, LATHES, SLOTTERS.
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Pig Iron Production.—The growth of pig iron production in the United States has been remarkable in the last few years. According to the National Bank of Commerce the United States now produces half of the pig iron output of the world. The output has grown from 14,000,000 tons in 1913 to 39,000,000 tons in 1918. The annual production of pig iron has a greater value than any other single manufactured product in the country, or of all the rest of the metals produced.

Fort William.—The "E. D. Kingsley," built by the Canadian Car & Foundry Co. here, made a successful trial trip recently. The vessel, which is an oil burning freighter, developed a speed of 13½ miles per hour on her trial trip. The Kingsley took on a cargo of 30,000 bushels of grain for Montreal after the completion of the trial, and after discharging this cargo in Montreal, will go in the West India trade for two or three months. She will then proceed to Vancouver by the Panama Canal.

Leaside Munition Plant.—An effort is being made to preserve the buildings at Leaside belonging to the American Munitions Board, and Colonel Stuart of the U. S. War Department has been conferring with Mayor Church on the matter. Colonel Stuart stated that the U. S. War Board would rather sell the buildings than tear them down, but so far had been unable to find a purchaser. As the ground lease runs for only a short period the buildings will have to be removed before the lease expires unless they can be sold.

To Open St. Lawrence Navigation.—The experts for the Dominion and United States Governments who are examining the Rivers St. Lawrence and Ottawa, for purpose of submitting report to the International Joint Commission, have got their report ready. It is now in the hands of the Joint Committee for consideration, and meetings will be held soon of all the interested parties on both sides of the St. Lawrence, with a view to action being taken to make the upper reaches of the river and the Great Lakes accessible to ocean-going ships.

Exhibition of Canadian Industries.—The Canadian Manufacturers' Association has circulated its membership on the subject of being represented at the Canadian Industries Exhibition, to be held in the Royal Agricultural Hall, London, England, from June 3rd to June 17th next. Mr. Lloyd Harris, who is now in Canada, supports the movement strongly, as one holding great possibilities for Canadian foreign trade. Mr. H. Greville Montgomery, who has offices in Toronto, will allot space and transportation and attend to the details for Canadian exhibitors.

Moulders Are Out.—In accordance with the terms of their ultimatum to the management two days ago, the moulders and coremakers employed by the Dominion Iron and Steel Company, at Sydney, together with the apprentices in the company's foundry, quit work. Forty-one men are concerned. The men's demand is for a wage increase which the company has claimed cannot be made at this time of unsettled conditions in the steel trade. International headquarters of the moulders' union instructed the men to negotiate further, and this was followed by the men's notice to the company that unless the demands were met in forty-eight hours they would go out.

Changes in C.F.M. Staff.—W. J. Legge has been appointed manager of the machine tool department of the Canadian Fairbanks-Morse Co. at Montreal. He was formerly in the machine tool department at Toronto. The small tool and supply department of the Toronto branch of the Fairbanks-Morse has been organized apart from the machine tool department, and is in charge of P. E. Thring, who has recently returned from service overseas. E. E. Turner, of the machine tool department of the C.F.M., Montreal, has left for various plants in United States, where he will remain studying special production problems for the next three months. It is the intention to have Mr. Turner doing development and investigation work in Canadian shops where production on a quantity basis is possible.

MARINE

Fort William.—The grain rate for December loading will be five and possibly six cents, instead of three and a half cents prevailing in November. Regular marine insurance ceases at 1 o'clock November 30.

Cleveland.—Latest news of the Tioga, ashore near Calumet, is that she is pounding to pieces. She has been abandoned by her owners to the underwriters as a total loss. The crew left her the day after she stranded. Her wheat, valued at $250,000.

Port Huron. — The liner Hamonic, which was in the river here on Saturday, cast off and went out into the lake during the heavy gale. Her captain preferred to be clear of the narrow waters, where he had no room to manoeuvre, and feared being blown aground and damaged.

Calumet, Mich.—The steamer Tioga of Superior is hard aground three miles east of Eagle River, and leaking badly. She was driven ashore in a heavy snow storm, and with the heavy northwest wind that was blowing at the time, she was in danger of breaking up. Last reports give eight feet of water in her hold.

Fort William.—Tugs are busy keeping the harbor open until the close of navigation. The steel tugs Strathmore and Strathbell have been working for some days breaking the ice as it forms, and the tug E. C. Whalen is being brought along to assist them now the weather is colder. If necessary, the Grant will also be employed.

WORST STORM SINCE 1913 BLOW

The Westmount Battles Through and Runs Into an 80-Mile Gale

Fort William.—Capt. Davis, of the Canadian steamer "Westmount," which left Sault Ste. Marie for Fort William Saturday, passed through what he described as the worst storm since the great blow of November, 1913. The Westmount arrived in Fort William early in the morning.

According to Capt. Davis, the barometer dropped to 7.8, and just off Caribou Island he ran into an 80-mile N.E. gale, with blinding snow. Frost from water made vision impossible for more than a ship's length. The thermometer registered 20 degrees below zero, and the spray froze as it touched the decks and rigging. The Westmount was sheathed in ice in a few minutes. Tons of ice were shipped from the decks on arrival here.

Capt. Davis reported Slat Island Light extinguished.

CANADIAN PIG IS SELLING IN U.S.

Looks as Though There Might be a Runaway as Far as Prices are Concerned

New York Dec. 4.—Some symptoms of a runaway market in pig iron have appeared, but as the main pressure is for early delivery and the supply of such iron is not large, the scramble has been limited. In next year's iron there is not yet the general buying nor the general willingness to sell that combine to produce a broad movement.

In basic iron a sale of 15,000 tons to a plate manufacturer is reported at Philadelphia at $31.25, delivered, and sales of 10,000 tons in the Pittsburgh district were at $30 at furnace. No. 2 foundry has sold in the Central West in considerable lots at $32 at furnace for the first half. One Alabama seller opened its books for 1920, but after selling 23,000 tons at $31 at furnace, an advance of $2, withdrew from the market. Heavy inquiries have come up in central territory particularly from the Detroit district.

The sales of Canadian pig iron to melters in the United States have been considerable. Shipments from the Soo furnaces in Ontario, together with recent sales, make a total of 45,000 tons to the Chicago district, besides 15,000 tons for the Pacific coast. The Port Colborne, Ont., furnace has also made sizeable shipments to this side.

Estimates that the railroads will buy 1,000,000 tons of rails when they are turned back are considered conservative in view of tentative inquiries by the Pennsylvania and New York Central Lines. In the Chicago district pending inquiries amount to 250,000 tons. The Algoma mill has an order for 80,000 tons for the Canadian Pacific. In view of the car and motive power scarcity that is already menacing winter distribution of fuel and steel, figures for next year's needs exceeding 200,000 for cars and 5,000 for locomotives are not considered excessive.

DISPUTE OVER PLANT VENTILATION

Echo of Some of the Processes Used In the Making of Munitions

Ottawa.—The first case heard in the Supreme Court was Scotland vs. Canadian Cartridge Company. The appellant was employed in respondent's munition factory at making brass shells for cartridges, part of his duty being to dip the shells in baths of sulphuric acid and cyanide of potassium. After four months of employment he was taken ill and the doctors decided that inhalation of noxious gases was the cause. He brought an action for damages, basing it on the ground that defendants had not complied with the provisions of the Factory Act in the ventilation of the room in which he worked.

The jury found the defendants negligent as to ventilation, and a verdict was entered against them for $3,500.

The Appellate Division set it aside and dismissed the action, holding that plaintiff had failed to prove negligence.

Judgment was reserved.

DESIGNING THE RAILWAY TRACK

Great Attention Must Be Given This Work to Secure Best Running Results

In a paper on "Railway Track Design and Manufacture," read at the meeting of the Montreal branch of the Engineering Institute of Canada, Mr. W. E. L. Dyer referred to track construction as a branch of engineering as important as that of location, especially in view of the very large amount of capital invested in roadbeds. He then traced the development of the different forms of rails, and of spikes, chairs, fish-plates, and angle-bars. Efforts, he said, had been made to eliminate joints, but without success. The lap joint initiated by the C.P.R. was being adopted by some of the American companies.

Crossing failures were sometimes due to faulty foundations, and he advocated the use of concrete foundations for crossings. It was not generally known how accurately intersections had to be calculated and designed; many of the larger intersections required a week for calculation, and after that they had to be designed. The hard steel frog was introduced into Canada by Mr. Blackwell, one of the presidents of the institute.

Mr. Dyer discussed in detail the use of solid manganese steel, which was more expensive as to first cost, but which had many points to recommend it as to use.

ORGANIZATION OF TOOL DEALERS SHOULD BE NATIONAL IN SCOPE

COMMENCING on an interview with one of the Toronto machine tool dealers in last week's "Canadian Machinery" to the effect that there should be an association of dealers in Toronto, another dealer stated this week: "I noticed what was said in the last issue of CANADIAN MACHINERY in regard to a local organization of machine tool dealers to deal with various selling problems. If such a thing were undertaken the best results would follow from an organization that would take in the whole Dominion. In such a body there could be divisions, with a centre at Toronto, another at Montreal, one at Winnipeg and another at the coast. In this way I believe something might be accomplished on a larger scale than just arranging differences in selling campaigns. I do not see any good reason why the makers of machinery and machine tools in this country could not have a membership in such an organization. It might help the makers and dealers to get together occasionally and have a better understanding of each other's problems."

Still another dealer, speaking of the matter, stated that some sort of an organization could be of advantage in keeping makers of machinery from playing one house against another. "Not so very long ago the representative of a certain firm came to my office," he stated, "and told us that they were not going to stand for the representation that a certain other house had been giving them. This gentleman intimated that he wanted to open up his line with us in this country. Now, I happened to know more of the facts of the case than the man did who was representing that firm. His representative had made a great number of calls for this line, and he had made them intelligently and persistently. I used to run across him time and again, no matter how often he had been turned down. That firm did not back up the house that was handling their line. To my knowledge they never assisted with the advertising, and never turned in and gave a hand to put their line in the Canadian market. The firm that had been making all these attempts was to be turned down flat and the line handed over to us. I refused. I told that representative that he had been well represented in this field, and that if the business were not forthcoming it was no fault of their representative."

Now, it seems to me that an association of machine tool dealers would be able to bring out all the facts with a case like that, and help all concerned. I do not mean for one minute that any central organization could dictate the policy of any firm. I know we would not stand for that, neither would any other firm that I know of. But apart from that, there are many matters that could be discussed to the mutual advantage of all concerned."

PLAN BRIDGE TO CROSS AT WINDSOR

Scheme Would Involve an Expenditure of $12,000,000—Plans Under Way

Detroit.—Under the leadership of Gustav L. Lindenthal, the eminent Swedish engineer, of New York, a movement is on foot to organize a corporation under the charter of the American and Canadian Governments for the purpose of constructing a $28,000,000 suspension bridge across the Detroit River, connecting Detroit and Windsor. The plans have been so far advanced that the proposition seems assured.

It is proposed to build a bridge supported from towers on either side of the river with double deck suspension, the span to be capable of handling railroad, street car, automobile and pedestrian traffic. There would be one span 110 feet from the water level, which would allow any of the Great Lakes carriers to pass through.

MUST GET RID OF COAL AT SYDNEY

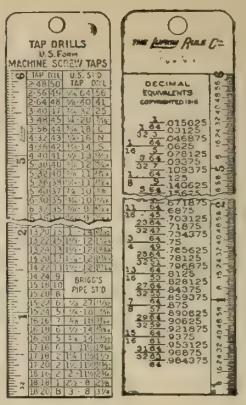
Embargo Against Shipping Brings Up a Big Problem of Employment

Sydney, N.S.—What to do with the surplus coal of Cape Breton is a problem. The embargo on at present forbids coal going to foreign countries. With the closing of the St. Lawrence the large bunker trade which the Dominion Coal Company has enjoyed during the summer will be very greatly reduced. By the curtailment of this business the company will have a still larger surplus from its mines than it has at present.

If the mines of Cape Breton are to be given steady work throughout the winter there are only two ways in which this can be obtained, according to a prominent coal official, one is to remove the present embargo or have the companies obtain a market in Great Britain. At present Britain faces a very grave situation as regards coal supplies, and the heating problem is a very serious one.

There seems to be no reasonable grounds for curtailing the output of the Cape Breton mines, but unless local mines can find an outlet in Britain for the surplus output from their collieries, the companies will have to resort to banking in order to keep the mines working.

Shipping coal from Cape Breton to Great Britain would involve few, if any more, difficulties than shipping to Rotterdam. In spite of this, coal could be landed at a fair marketable price in Britain, freight rates would not be any higher than to Rotterdam and possibly a little lower. In such cases the difference would make up for the little extra time in discharging.



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MACHINE TOOLS for Shipbuilders & Iron & Steel Works
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BLACK DIAMOND OVENS
OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
Brantford Oven & Rack Co., Ltd.
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WRIGHT HOIST

The last word in mechanical efficiency for the mills, shops, factories warehouses, refineries—in fact all places where strength, speed and safety in hoisting are demanded.

Canadian Distribution:
The A. R. Williams Machinery Co.
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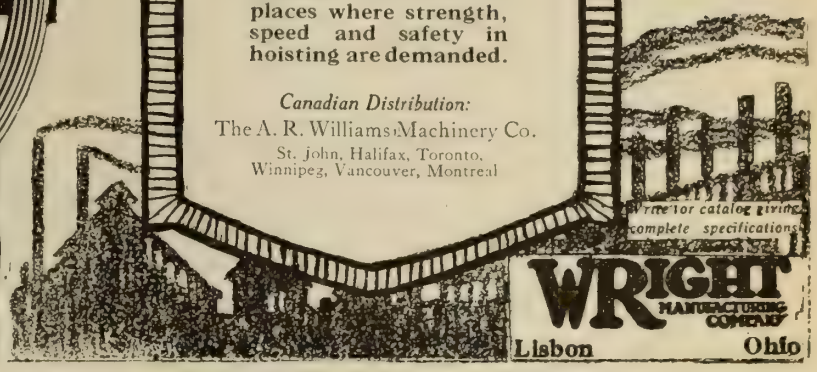

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Sell it to the firm who can use it, and both of you will make money.

ADVERTISE IT IN THE CLASSIFIED SECTION OF
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We invite your inquiry.

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BY WELL-KNOWN BRITISH MANUFACturer, young unmarried man to act as sales representative. Must be keen, aggressive, steady business getter, resourcesful and absolutely reliable. To such a man a good future will open up. The line is high grade textile belting, paper makers' felts and linen fire hose, and a stock will be carried. Box 638, Canadian Machinery. (c24m)

WANTED — MACHINE SHOP FOREMAN — Must be able to handle men and a good organizer. To a man who can handle proposition we can offer permanent growing position, in a city of 25,000, sixty miles west of Toronto. Please state experience, and salary expected. Apply Box 640, Canadian Machinery. (c23m)

POSITIONS WANTED

POSITION WANTED BY A FIRST-CLASS mechanic with a large experience in making gauges, dies, jigs and fixtures for small work, and small tools; can take charge of department. Know how to handle screws; have been working in some of the best shops in the U.S. Is an inventor, also improver and designer. Aged 50 years; good health; steady worker. In answering please mention the class of work and mention the highest wages, with all particulars. A position wanted for his son, also a first-class mechanic. Apply during the week of November 15th. L.E.J., 38 Glenelg Street W., Lindsay, Ont. (c26m)

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WANTED—ONE ONLY HIGH-SPEED RIVETer, Shuster preferred, capable of riveting ¼ inch. Toronto Lock Mfg. Co., Toronto, Ont.

FOR SALE

FOR SALE—BRAND NEW INGERSOLL-RAND After-cooler, never used, for compressor up to 14 x 14". London Mfg. & Machine Co., Ltd., London, Ont. (ctfm)

FOR SALE—WATSON-STILLMAN HYDRAUlic Press, complete with four-plunger automatic variable belt pump. A. G. Crawford, 14 Mail Bldg., Toronto, Ont.

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MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (cfm)

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Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.
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1 Tube Mill Fraser & Chalmers 5 x 22.
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Business men nowadays turn to the "want ad." as a matter of course for a hundred small services.

The "want ad." gets work for workers and workers for work.

It gets clerks for employers and finds employers for clerks. It brings together buyer and seller, and enables them to do business though they may be thousands of miles apart.

The "want ad." is the great force in the small affairs and incidents of daily life.

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Names that were household words yesterday are gone to-day.

Because people knew your Name and your Line a year ago it is no sign they do to-day. They forget easily.

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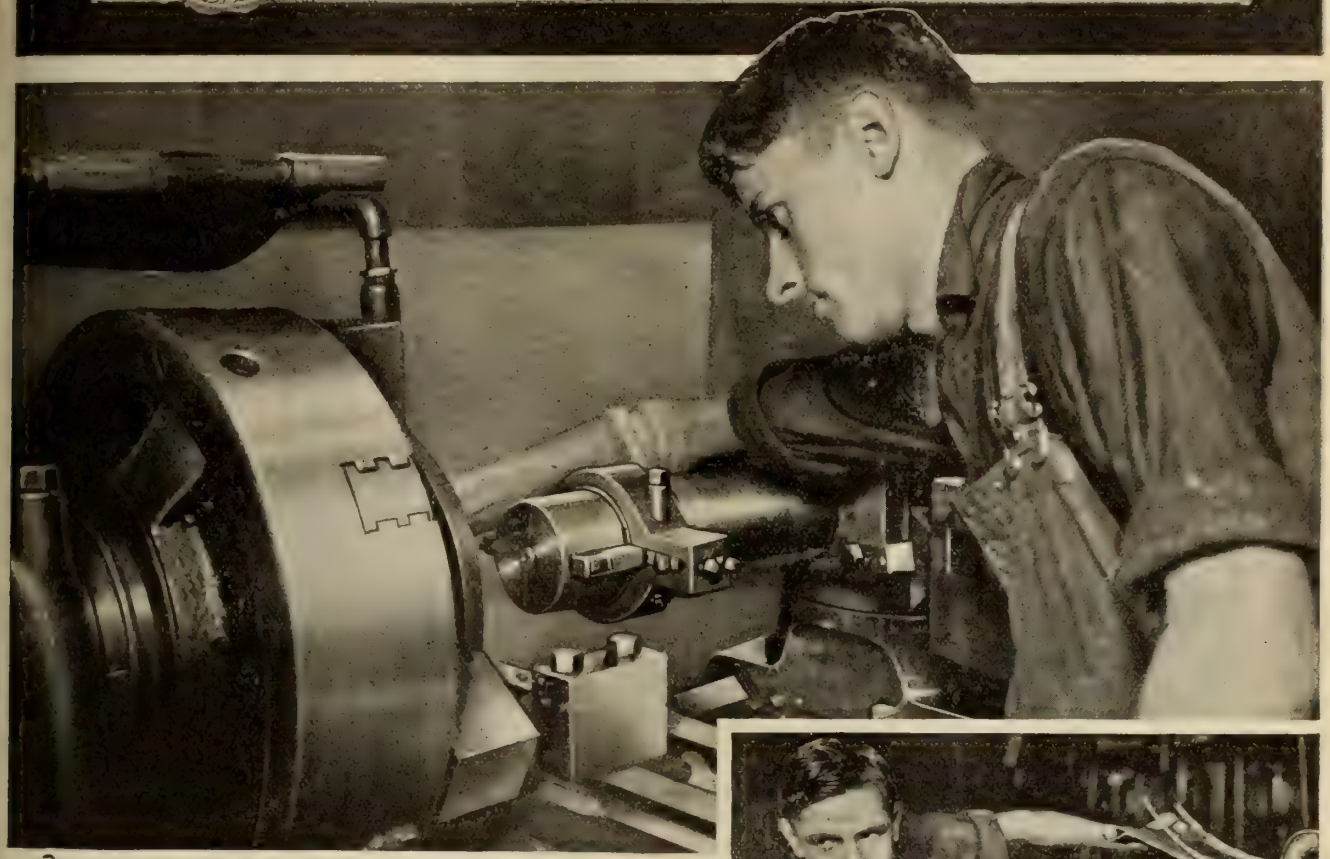

KELLY REAMERS

Reduce Spoilage 99 Per Cent

A large New York State gear manufacturer had been using Kelly Reamers for only three weeks when he permitted us to take these photos. In that time they had reduced spoilage on large gear bores just 99 per cent.

Production was interesting also. One large Kelly Roughing Reamer was removing 7/16″ on the diameters of steel gears. It stood up over a period of five days and four nights, machining in all 4,950 gears without need of resharpening. The Kelly Finishing Reamer for the same job removed 0.020″ with a tolerance of plus or minus 0.001″, and stood up for a similar length of time.

This company is now using Kelly Reamers on practically all turning machines. And the Kelly Service Man is regularly on the job to see that these tools are giving all they were built for. **Write for Catalog J-3.**

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Must School Teachers Starve?

By Sir Robert Falconer, President of the University of Toronto

CANADA is threatened with another epidemic—cheap teachers! A grave warning, showing the seriousness of the situation, has been made public, through the medium of MACLEAN'S MAGAZINE.

The financial attractions in commerce and trade are proving such a lure to the clever Normal School and University graduates that public schools, high schools and universities throughout the Dominion are being driven to engage inferior teachers—if they can get any at all! One teacher in Ontario is paid the princely sum of $300 per annum.

The article gives the opinions on this vital topic of such men as: Sir Robert Falconer; Principal R. Bruce Taylor, of Queen's; Dean of Arts W. Sherwood Fox, of Western University; A. P. S. Glassco, Secretary of McGill; President MacLean, of the University of Manitoba; President Klinck, of Canada's youngest university—British Columbia; President A. Stanley Mackenzie, of Dalhousie; and many others.

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By Basil King

This famous Canadian novelist has written a remarkable story that deals with a man who loses his identity while fighting in France. This strong novel, "The Thread of Flame," starts in the December issue of MACLEAN'S. This is the first occasion that a novel by Mr. King has appeared in any Canadian periodical prior to book publication.

Other Features of the December Number

"Merrie Gentlemen"—By Arthur Beverley Baxter.
You will think this the best Christmas story since Dickens' "A Christmas Carol."

"Capital and Labor"—By Ralph Connor.
One of a series of articles on "The New Canada and Its Needs."

"Ottawa is Ready for the Worst"—By J. K. Munro.
A humorous and pithy review of events at the Federal seat.

"Better Late Than Never"—By C. W. Stephens.
A bright Christmas story.

"Some Canadian Snobs"—By Montgomery Dix.
A humorous article on some phases of Canadian society.

"A Blighty Christmas"—By Gertrude Arnold.
An article on the way Yuletide was celebrated in a Red Cross Hospital.
And a dozen other articles and stories all of equal interest.

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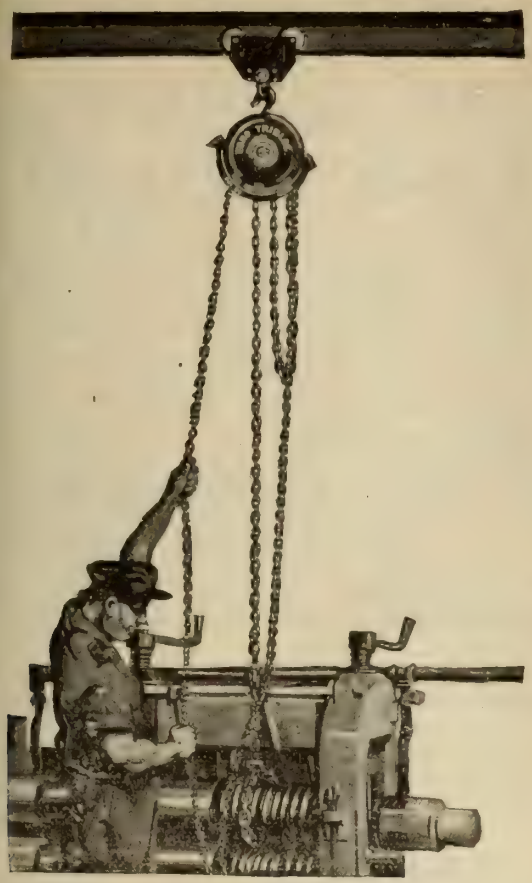

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It operates at high speed—the patented **Loop Hand Chain Guide** prevents "gagging" or over-riding of the flange. The planetary gears are steel. These and other features make a TRIBLOC dependable for consistent operation.

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Either carbon or high-speed steel.
Material the best obtainable.
Unsurpassed in efficiency and durability.
Centred at both ends.
Unsurpassed in accuracy and finish.
Large quantities carried in stock.

The Whitney Mfg. Co., Hartford Conn.

Chains, Keys and Cutters, Hand Milling Machines

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THE

TRADE K–T IE A MARK

FOUNDRY

GALT, ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25%; a different method of molding them might double your production at no increase in molding cost. *We can advise you* and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

If you need some new Patterns send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us.

ASK US

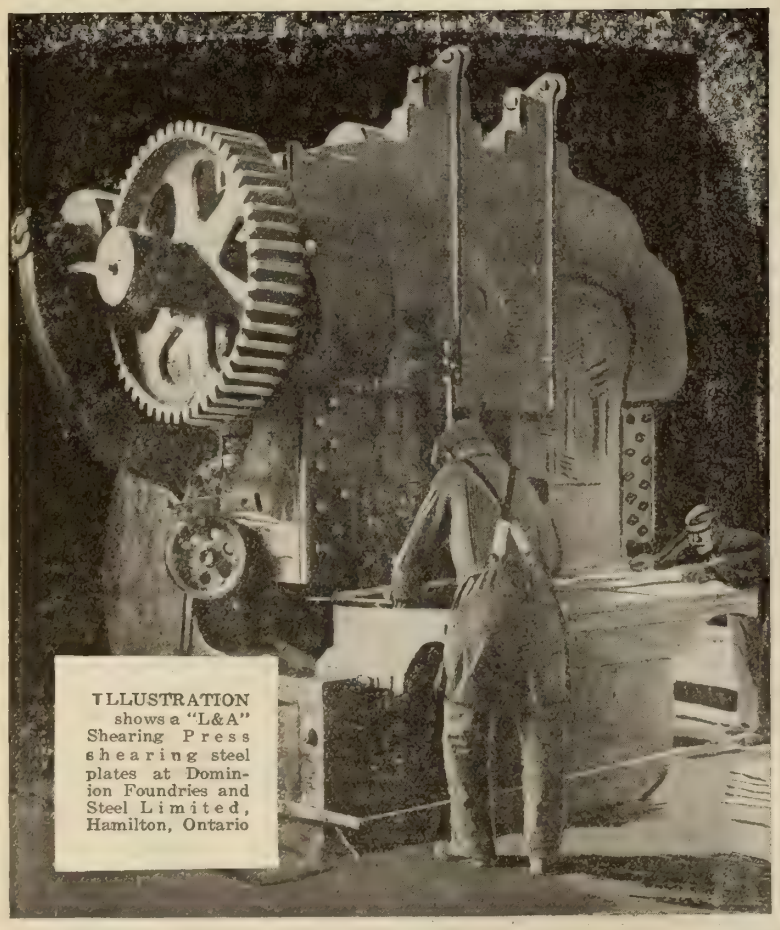

ILLUSTRATION shows a "L&A" Shearing Press shearing steel plates at Dominion Foundries and Steel Limited, Hamilton, Ontario

"The Quality Line"

PUNCHING and SHEARING MACHINERY

We manufacture "The Quality Line" machinery equipment for Rolling Mills, Bridge and Structural Works, Steel Car Plants and Shipyards. All machines are built of the same high grade workmanship and material that have given the "L & A" product a recognized standard of quality of over 50 years.

Send for our big catalogue.

The Long & Allstatter Co.
American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

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RUDEL-BELNAP MACHINERY CO., LIMITED
Toronto, Montreal.

TRANCO TRUCKS

SAVE TIME

The Universal Elevating Truck

Made in Canada

Solves the Problem of High Cost of Labor

Labor is the big factor in costs. It was never so big a factor as it is to-day. This is true of trucking operations as in every other line of work.

In few other lines of work, however, can the situation be so effectively met as in trucking. This is made possible by the introduction of the elevating truck.

The TRANCO Universal Truck, for instance, can do the same amount of work that formerly took five men under the old stystem of trucking. High cost of labor thus is made almost negligible.

HOW THE TRANCO OPERATES: The load is piled on inexpensive platforms. Then the platforms are taken to their destination by means of TRANCO Trucks. Here the platforms are deposited and left until the material is disposed of. **The operation is simple and quick.** No time is wasted, and breakage, spoilage and other injury to material are reduced to practically nothing.

Ease of locomotion and operation is a big feature of the TRANCO. It operates with steering head and handle at any angle when lifting and lowering the load.

A double row of the famous Chapman Double Ball Bearings is used in the wheels. The swivel head is also equipped with these ball bearings. This makes the TRANCO Truck steer and roll much easier than a truck with other types of bearing.

We would like to explain more fully how the adaptability, simplicity and labor saving features of the TRANCO Truck can make a worth-while reduction in your costs of handling material. **Have us send you our attractively illustrated booklet.**

The Chapman Double Ball Bearing Co.
OF CANADA, LIMITED
339 Sorauren Ave. - Toronto, Ont.
TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N.Y.

COMPLETE RANGE OF STEEL BALLS ALWAYS CARRIED IN STOCK

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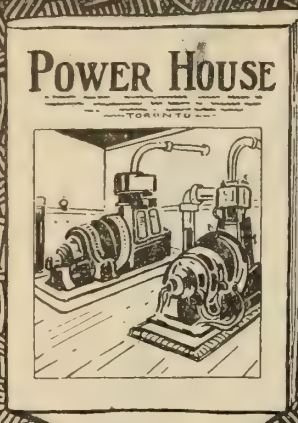

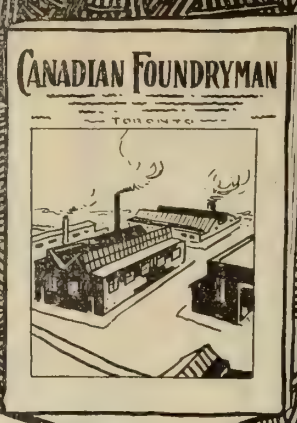

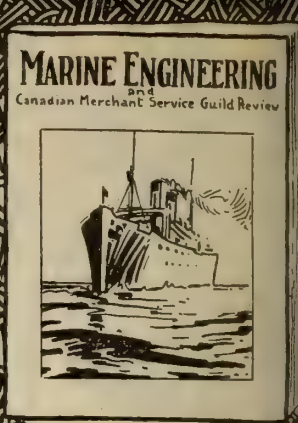

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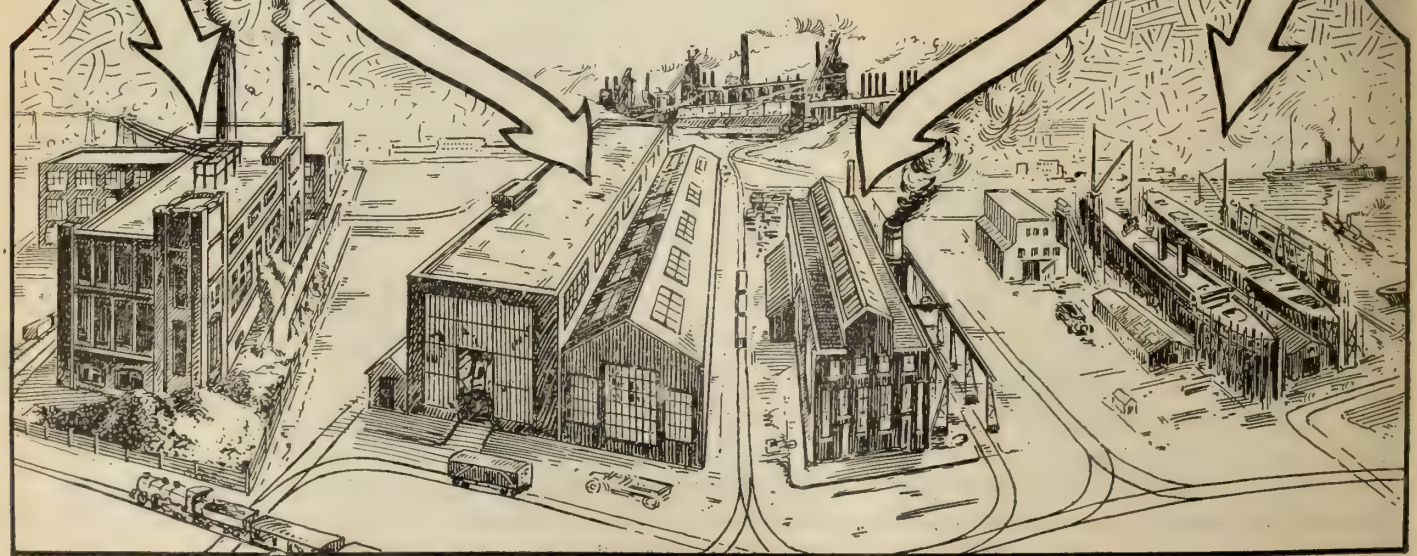

SURPLUS EQUIPMENT FOR SALE

PRESSES

	Stroke Inches	Width Bed	Approx. Cap. Tons
2—No. 666 Toledo Embossing Presses	2	32	1,200
2—No. 27 Bliss Embossing Presses	2	32	1,000
2—No. 87 Bliss Crank Presses, double back geared	16	27	250
2—No. 60½ Bliss Rack and Pinion Drawing Presses	60	21	100
10—No. 60½ Bliss Rack and Pinion Drawing Presses	42	21	100
1—No. 857 Toledo Rack and Pinion Drawing Press	48	25	100
1—Robertson Hydraulic Press with pump and extra set of columns	24	27	800

LATHES

7—11″ Blount Speed Lathes, 5′ bed.
1—18″ Hamilton Lathe, 6′ bed.
1—19″ Greaves & Clushman Lathe, 8′ bed.
2—18″ Davis Lathe, 6′ bed.
1—15″ Carroll Jamieson Lathe, 6′ bed.
1—16″ Davis Lathe, 6′ bed with Turret.
1—16″ Hamilton Lathe, 6′ bed.
5—16″ Blount Speed Lathes, 6′ bed.
4—No. 2 Warner & Swasey Speed Lathes.
2—20″ Stoll Wood Turning Lathes.
35—Bullard Cartridge Case Lathes.

GRINDERS

2—Wells Cutter Grinders.
1—12″ x 72″ No. 4 Cincinnati Universal Grinder.
1—No. 70 Heald Internal Grinder.
1—No. 75 Heald Internal Grinder.
1—10″ x 24″ Landis Grinder.
1—No. 1 American Surface Grinder.
1—No. 74 La Salle Surface Grinder.
1—Ford-Smith Double Head Grinder, 3″ x 24″ wheel.

FURNACES

1—Gas Muffle Furnace, 3¼ x 1½″ x 7″ long.
1—Gas Tempering Furnace with oil reservoir.
1—Gas Tempering Furnace with Tray in Reservoir.
1—H.S. Tool Hardening Furnace, 9″ x 8″ x 9″ long.
1—Double Door Gas Furnace, Doors 20½″ x 12″ high. Fire Space 50″ wide, 12″ high, 54″ long.
1—Gas Furnace for Annealing Scrap Brass.
5—26 ft. Rockwell Single Chamber Annealing Furnaces, equipped with Electric Pyrometers and Recording Instruments, Oil and Gas Burners, Air Rams and Pullers.
1—16 ft. Rockwell Single Chamber Annealing Furnace equipped with Electric Pyrometers and Recording Instruments, Oil and Gas Burners, Air Rams and Pullers.
3—Conveyor Type Annealing Furnaces. Could be used for annealing automobile pistons or other similar work.

BLOWERS AND FANS

	Size of Outlet	Displacement per rev.
1—Root Positive Blower	8″ Vertical	3.3 cu. ft.
2—Connersville Positive Blower	8″ “	3.3 “ “
2— “ “ “	6″ “	1.5 “ “
1— “ “ “	6″ Horizontal	1.5 “ “
1— “ “ “	8″ “	1.5 “ “
1—No. 4 Sheldon Blower	9″ “	
2—No. 4 “ “	9″ Vertical	
1—No. 4 Sturtevant “	10″ Horizontal	
1—Boland Positive Blower	4″ “	

3—Desk Fans.

MOTORS

10 to 75 H.P., 25 and 60 cycle, 220 Volt., 3-phase.

MISCELLANEOUS

DRILLS

1—3 Spindle Variable Speed Drill. C. G. Allan Co., Barrie, Mass.

SHEARS

1—No. 1 Gray's Sheet Metal Cutter.
1—No. 1 Quickwork Rotary Shear.

HACKSAWS

1—No. 3 Atkins Power Hacksaw.

MILLING MACHINES

1—No. 1 Standard Hand Miller.
11—No. 3 Brown-Boggs Trimming Machines.
1—No. 066 Deming Gear Oil Pump, Belt Drive.
2—Franklin Portable Cranes.
12—Cowan Elevating Trucks.
2—20-lb. Cap. Scales Drams Graduation on Beam.
1—Two-Ton Platform Scale.
1—Five-Ton “ “
2—½-Ton “ “
2—1,200-lb. “ “
1—Tinius Olsen Testing Machine, 10,000 lbs. capacity, hand-operated.
1—No. 1 Brinell Hydraulic Testing Machine.
1—Sauveur-Boylston Photo-Micrographic Instrument.
23—4″ Curtis Air Hoists.
2—5″ “ “ “
1—6″ “ “ “
26—I-Beams for Curtis Air Hoists.
1—Boland Special Sand Blast Machine.
1—No. 2X Garvin Vertical Tapping Machine.
1—Whitton Centering Machine.
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Cast Iron Split Pulleys.
Shafting, and Hangers.
1—Model “M” Richardson Force Feed Oil Pump.
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4—2½″ x 18″ Screw Jacks.
1—2¼″ x 16″ “ “
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1—No. 873 Toledo Trimming Machine.
Bristol & Brown Indicating Pyromters.
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3—Shore Scleroscopes.
1—C. E. Wright Metal Cutting Handsaw, 30″ Wheels.
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5—Heads Suitable for Polishing Brushes, 1¾″ Hole in chuck, 1″ spindle.
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1—Thor 1—1/16″ x 4″ serial D.R.H. Air Hammer.
1—Ingersoll Rand, size 1 S, symbol 1 SM Air Hammer.
1—Ford Car Starter.
2—Automatic Receivers for Boiler House Feed Pumps.
1—Tank, 30″ dia. x 48″ long, suitable for Compressed Air.
1—Tank, 24″ dia. x 60″ “ “ “ “ “
1—Tank, 36″ dia. x 72″ “ “ “ “ “
1—Open Galv. Iron Tank, 5 ft. high x 3 ft. dia. with 1″ faucet.
4—¼″ Thick Iron Open Tanks, 4 ft. long, 2 ft. wide x 1 ft. 8 in. deep with 2 in. drain.
1—Motor-driven addressograph machine with stencil cutting machine and full equipment of special attachments.
2—Adding Machines (Listing)

CANADIAN CARTRIDGE COMPANY, LIMITED

HAMILTON, CANADA

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WILTON

Master Gage Blocks

Each block is guaranteed to be accurate to within ten millionths of an inch for each inch in length and when used with the accessories constitute a complete gauging system.

SET C

consists of 35 blocks which wring together, giving all dimensions from 3/10″ to over 12″ in steps of 1/10,000″.

Price in Walnut Case.....$175.00

The accessories include three Holders, Vee Blocks, Measuring Plugs, Scribers, etc.

Price in Walnut Case.....$75.00

SET E

consists of five Round blocks, giving all dimensions by sixteenths from 1/16″ to 1 5/16″ (accurate to within fifteen millionths of an inch).

Price in Black Nickel Case.....$8.50

All prices f.o.b. Boston, Mass.

IMMEDIATE DELIVERIES. **WRITE FOR CATALOGUE.**

WILTON TOOL & MFG. CO.

84 LINDEN PARK ST. BOSTON, MASS.

Agents Wanted

SET C, Price $175.00

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DOMINION CHUCKS

Especially Adapted for Severe and Heavy Duty Work

BODY—The body is of heavy cross section and so designed to give broad and deep bearings for the jaws.

JAWS—The jaws are drop forgings, heat treated. The jaw is so designed that the threaded portion makes 180° contact with the screw.

SCREWS—The screws are large in diameter, broached at both ends and are reversible.

Dominion Chucks can be furnished in crucible or cast iron bodies.

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Rubber Manufacturing Machinery.
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Cut Gears—Worm, Spur, Helical and Bevel.
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A sturdy, efficient and economical Electric Furnace

OUR CLIENTS INCLUDE:

Five (5) U.S. Navy Yards
British Govt. (2 furnaces)
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SOLE CANADIAN AGENTS FOR
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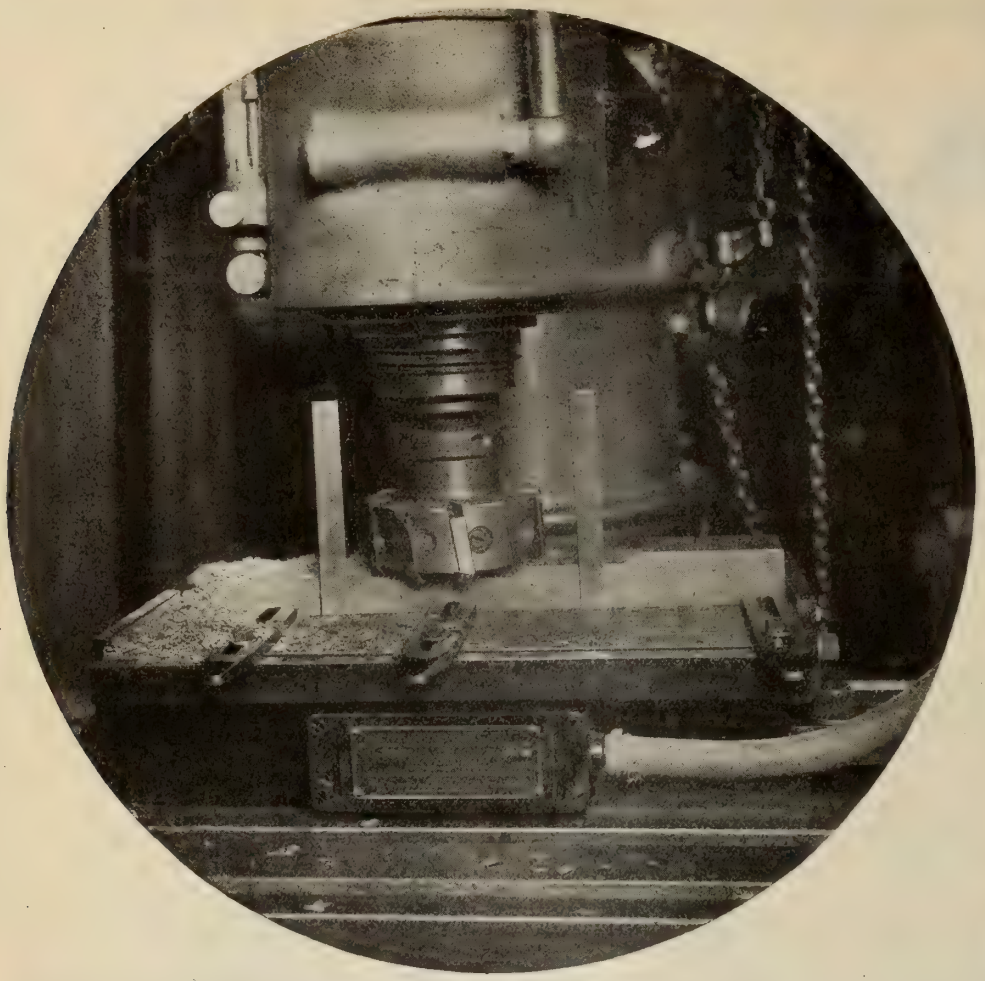
ALL SIZES
IN STOCK



Holding a 5/16 x 2 in. Cut in Cast Iron on a Simmons Magnetic Chuck

Here is an example of the "grip" of a Simmons Chuck used on a No. 5 Brown & Sharpe Vertical Milling Machine.

On a piece of cast iron 16 in. x 2 in. x 1½ in. held by an 8 in. x 18 in. chuck, a cut 5-16 in. deep was made across the entire piece. The feed was 12½ in. per minute from the beginning of cut; the cutter was a 5 in. diameter inserted tooth face mill, running at a speed of 100 R.P.M. for the entire cut. Current used by the Chuck 0.4 amp. at 110 volt. *The strongest "grip," with the least current* —and no leakage of magnetism into frame of chuck or machine. It is powerful and yet it conserves electricity.

Bulletin 107E describes Simmons Magnetic Chucks

TAFT-PEIRCE

Woonsocket, R.I., U.S.A.

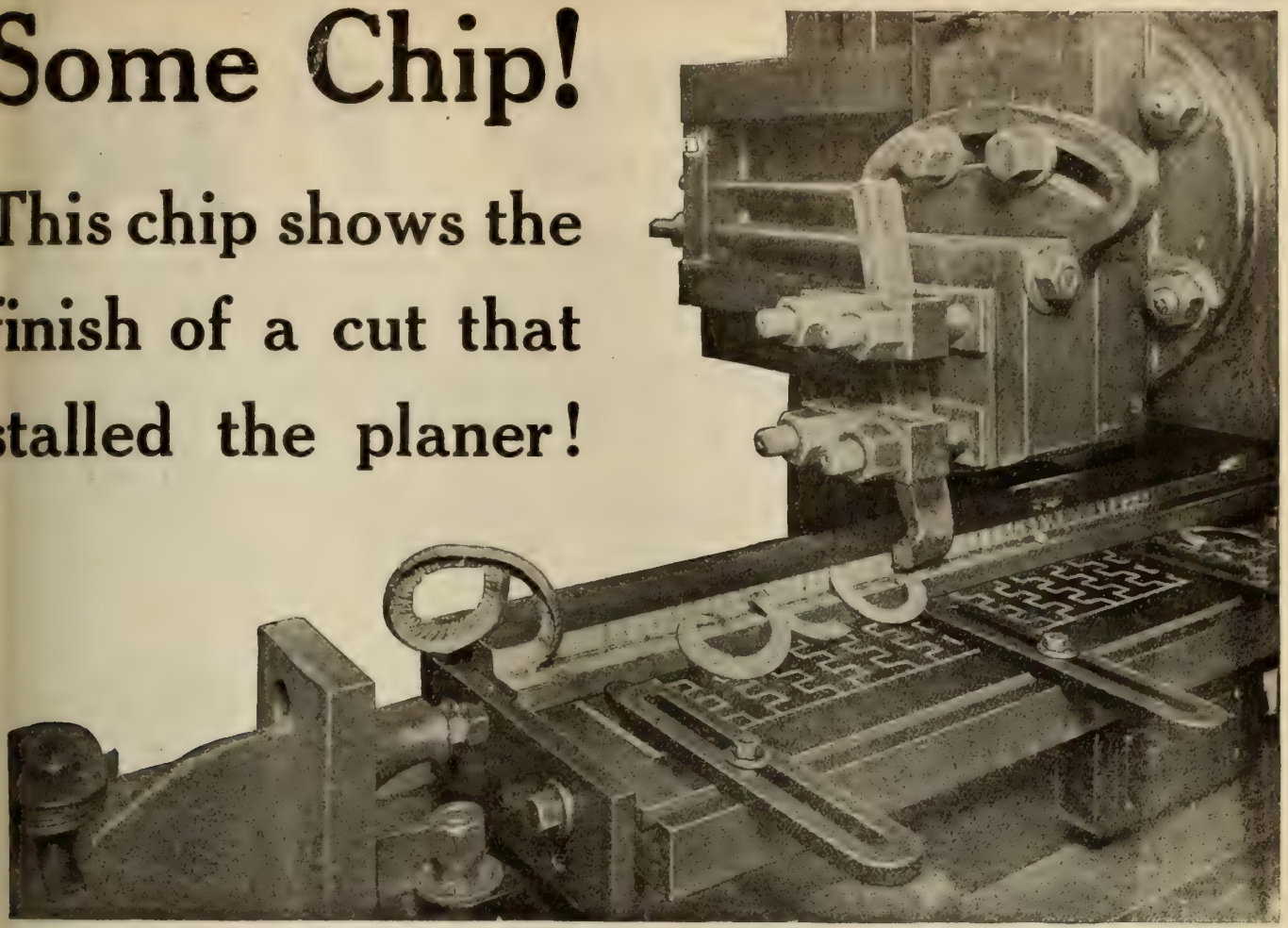
New York: Woolworth Building Detroit: Majestic Buildin

Williams & Wilson, Ltd., Montreal and Quebec

20

Some Chip!

This chip shows the finish of a cut that stalled the planer!



The cut was started at the far end of the piece and the work never budged. Some of the factors that contribute to the holding power and reliability of the SIMMONS UNIT-POLE MAGNETIC CHUCK are:

1—Effective utilization of the space on the face of the chuck;
2—Use of unit magnetic pole pieces of forged iron placed adjacent to each other with no neutral poles or neutral spaces between them;
3—Gaps between poles uniform throughout because adjacent edges are machined to definite dimensions;
4—Complete magnetic circuit insulated from the body of the chuck—a patented construction;
5—Machine wound coils assure uniform quality and equal ampere-turns in all;
6—Interlocking pole pieces offer transverse as well as longitudinal resistance to the work;
7—Watertight construction.

The Simmons Unit-pole magnetic chuck works where others fail, because it is designed in accordance with the principles of correct magnetic practice and gets the maximum pulling power that can be obtained in a given space. Ask for bulletin 107-E.

Details of Tests

The test here shown was made on a 30-inch Gray planer equipped with a 31 x 10¼-inch T-slot Simmons Unit-Pole Magnetic Chuck. The cut was taken on a cold rolled steel bar 31 inches long, 4 inches wide and ¾-inch thick. The chip was ⅝-inch deep and 3-16-inch thick. It stalled the machine.

TAFT-PEIRCE
Woonsocket, R.I., U.S.A.

New York Office: Woolworth Building Detroit Office: Majestic Building

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2078

Planing Mill Fan

No. 2 Vacuum Cleaner

Sturtevant (TRADE MARK)

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Autoforce Ventilator

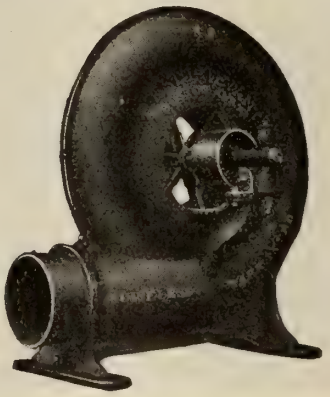
Steam Turbine

Electric Propeller Fan

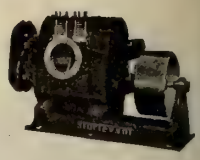
Sturtevant (TRADE MARK)

STEEL PRESSURE BLOWERS

Medium Pressure Blower



Low Pressure Blower



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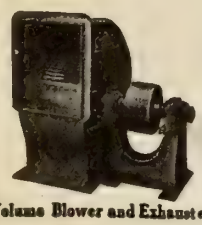
For All Purposes

THO designed originally for supplying air to cupolas and forges Sturtevant steel pressure blowers are now used for all purposes where pressures up to 16 ounces to the square inch are to be maintained; and where air is to be forced for long distances. Regularly built with horizontal discharge but can be readily made for down blast or up blast. Built in all sizes and may be belt, motor, engine, or turbine driven. Operating and upkeep cost is remarkably low as proven by actual performance in many long term (30 years and more) installations. Design and construction are typically Sturtevant—supreme! Blast wheel is made of refined steel and galvanized to prevent rust. Wheels are accurately balanced and run smoothly when driven at high speed. Bearings are each cast in one piece and are lined with highly durable non-heating white metal. Write for catalogue.

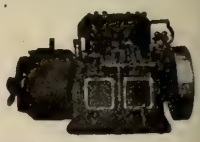
B. F. STURTEVANT COMPANY of Canada, Ltd.

Factory and Main Office
Galt, Ontario

Sales Office: Toronto,
Montreal, Winnipeg



Volume Blower and Exhauster



Gasolene Generating Set

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Direct Current Motor

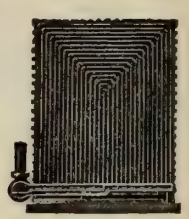
Type H Air Washer

Fuel Economizer

Sturtevant (TRADE MARK)

PRODUCTS

VS-7 Steam Engine



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SAVE LABOR — INCREASE PROFITS

Morris Cranes have a record for standing up under the hardest kind of usage, Because of the part they are playing wherever there is heavy work to be done, it is more than likely they will render you a maximum service.

The Herbert Morris Crane & Hoist Company, Limited

Head Office and Works :

Niagara Falls, Ont.

Electric and Hand Operated Cranes and Hoists, Chain Blocks, Jib Cranes, Elevating Trucks, Storage Battery Trucks

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CLINTON CEMENT

Did You Ever See Two Postage Stamps Stuck Back to Back?

Well, that's the way two bricks stick together when our cement is used.

The greatest loss in your furnace efficiency occurs as the result of leakage, cold air pouring in and interfering with proper combustion.

We Have Got This Licked!

Fireclay dries up and sifts out from between the bricks like powder.

But our cement sets and makes a surface like glass yet allowing for expansion and contraction. It sets hot or cold and stands a heat up to 3,000 degrees Fahrenheit.

This cement makes a joint that is stronger than the bricks themselves, and that is itself the strongest part of the whole furnace.

A five-pound tin of **Clinton Super-Heat Cement** will be sent to you free and all charges prepaid, if you write the

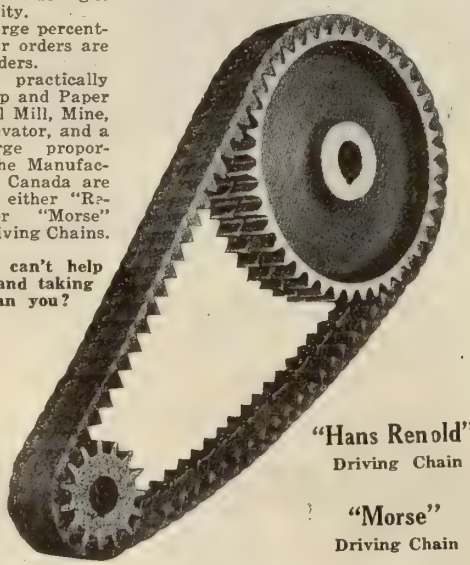
Standard Machinery & Supplies Limited

261 Notre Dame St. West **Montreal**

It's Interesting

WHEN a large Hydro-Electric Plant installs a 5000 H.P. Silent Chain Drive.
WHEN one of the largest Canadian Manufacturing Plants install over 27 Silent Chain Drives totalling over 4000 H.P.
WHEN a large Candian city installs a 500 H.P. Silent Chain for driving Generators to provide light for the city.
WHEN a large percentage of our orders are repeat orders.
WHEN practically every Pulp and Paper Mill, Steel Mill, Mine, Grain Elevator, and a very large proportion of the Manufacturers in Canada are Users of either "Renold" or "Morse" Silent Driving Chains.

Well, you can't help sitting up and taking notice. Can you?



"Hans Renold" Driving Chain

"Morse" Driving Chain

Sole Canadian Agents:

JONES & GLASSCO (Reg'd.)
Engineers.

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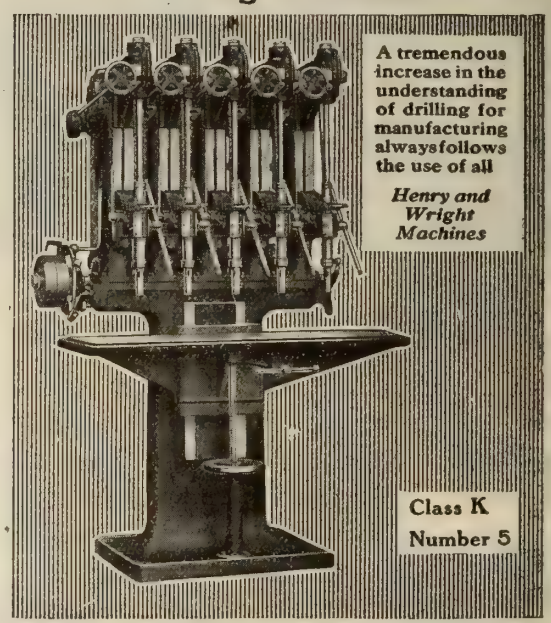
HENRY & WRIGHT

Drilling Machines



A tremendous increase in the understanding of drilling for manufacturing always follows the use of all ***Henry and Wright Machines***

Class K
Number 5

The Henry & Wright Mfg. Co.

Hartford, Conn.

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co., Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

The foreman says.

"I suppose it's because I used them myself when I was at the bench, but it does seem as though the best men in the shop have a preference for Starrett Tools.

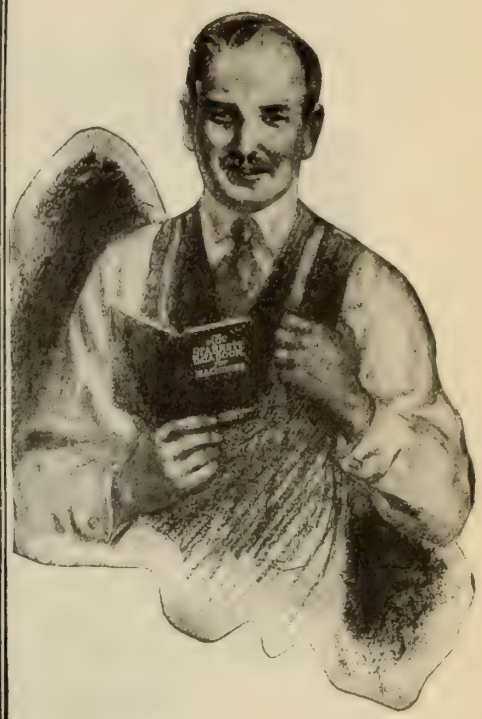
"Of course, most of them sort of got into the habit of relying on Starrett for fine work when they were apprentices and journeymen.

"Speaking of apprentices — that little red book there, 'The Starrett Book for Machinists' Apprentices,' has saved me more time and helped more young fellows to learn how to do things right than anything else in the shop.

"When a young lad asks me how to do this or that, I usually tell him or show him, and then ask him if he has one of those books. I've noticed that as soon as he gets one of them he doesn't have half so many questions to ask.

"Starrett gets out another book, 'The Machinists' Data Book,' that's just about as big a help to the experienced machinist. It's got all the tables and formulas and so on that he ever needs, and it isn't cluttered up with a lot of engineers' stuff that he doesn't use.

"Yes, I bought one of each of the books down at the hardware store, as soon as they came out. They cost me seventy-five cents each, but they're worth it."



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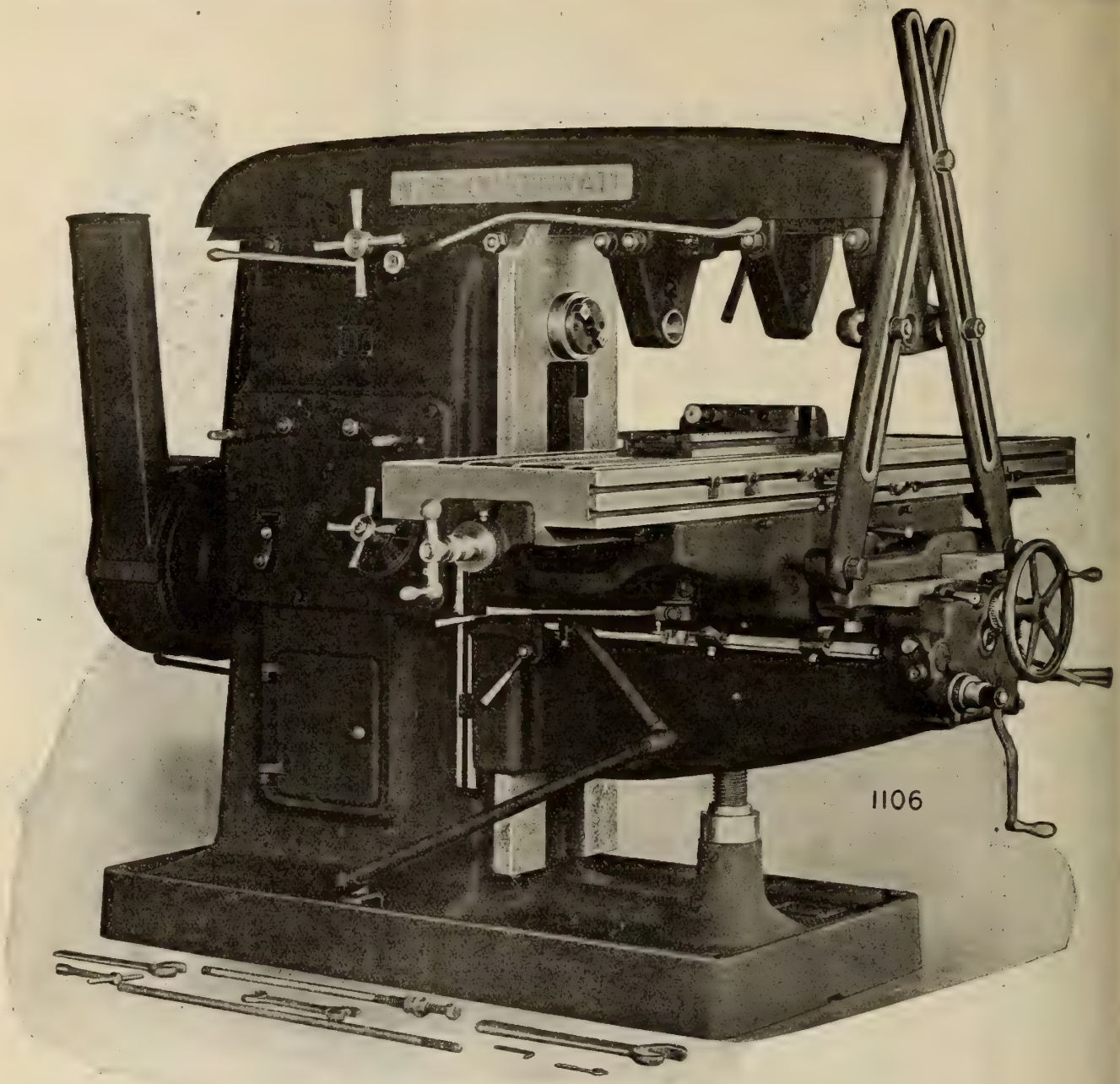

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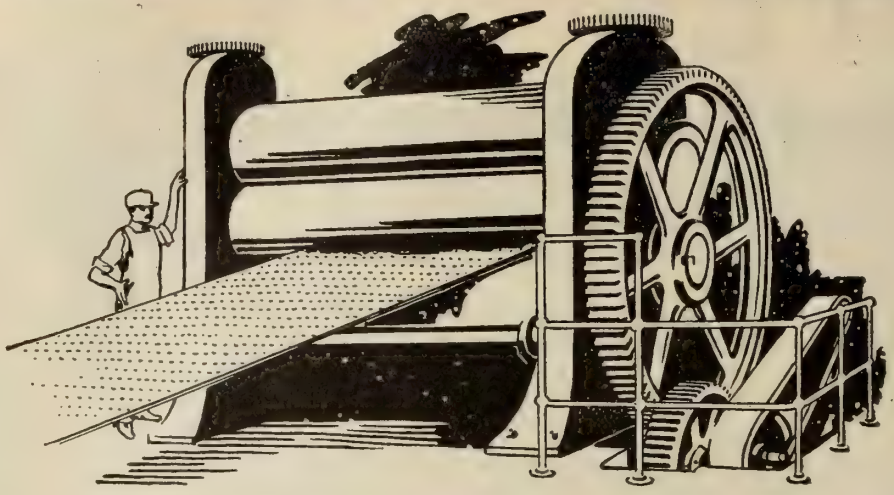

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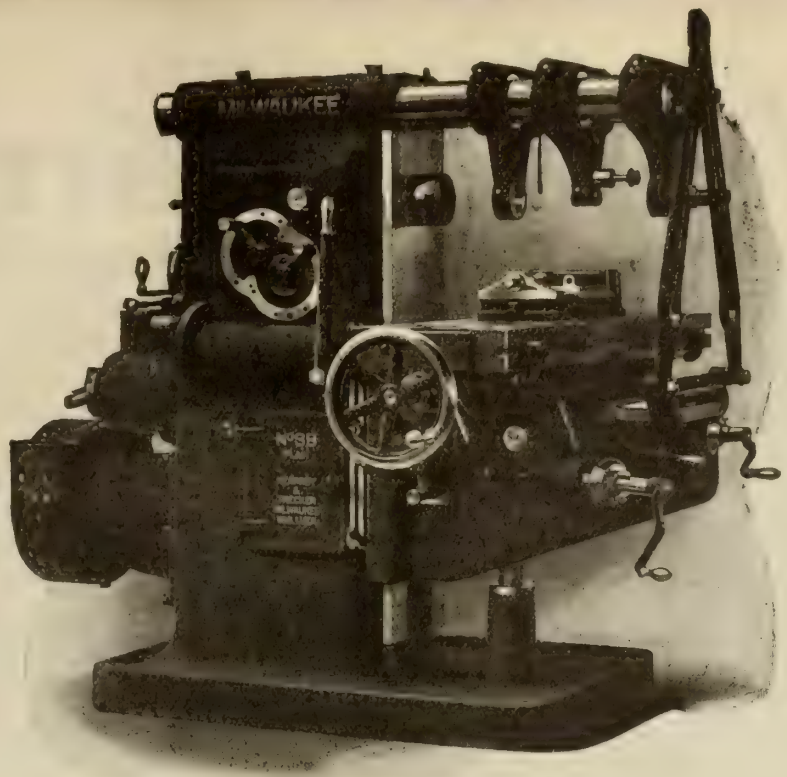

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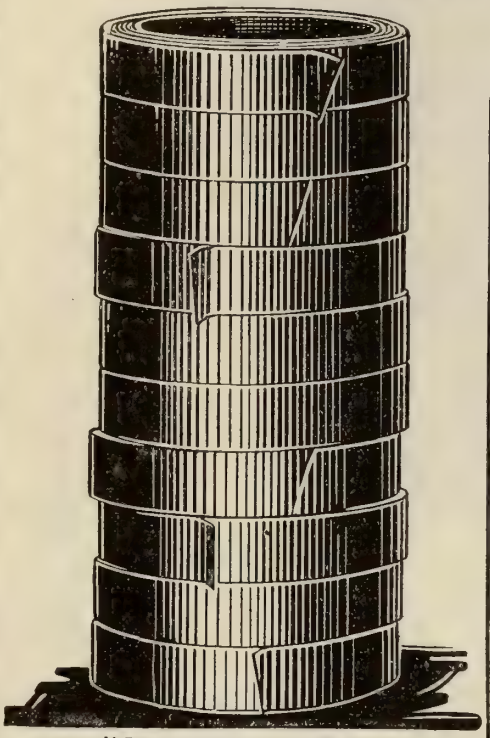

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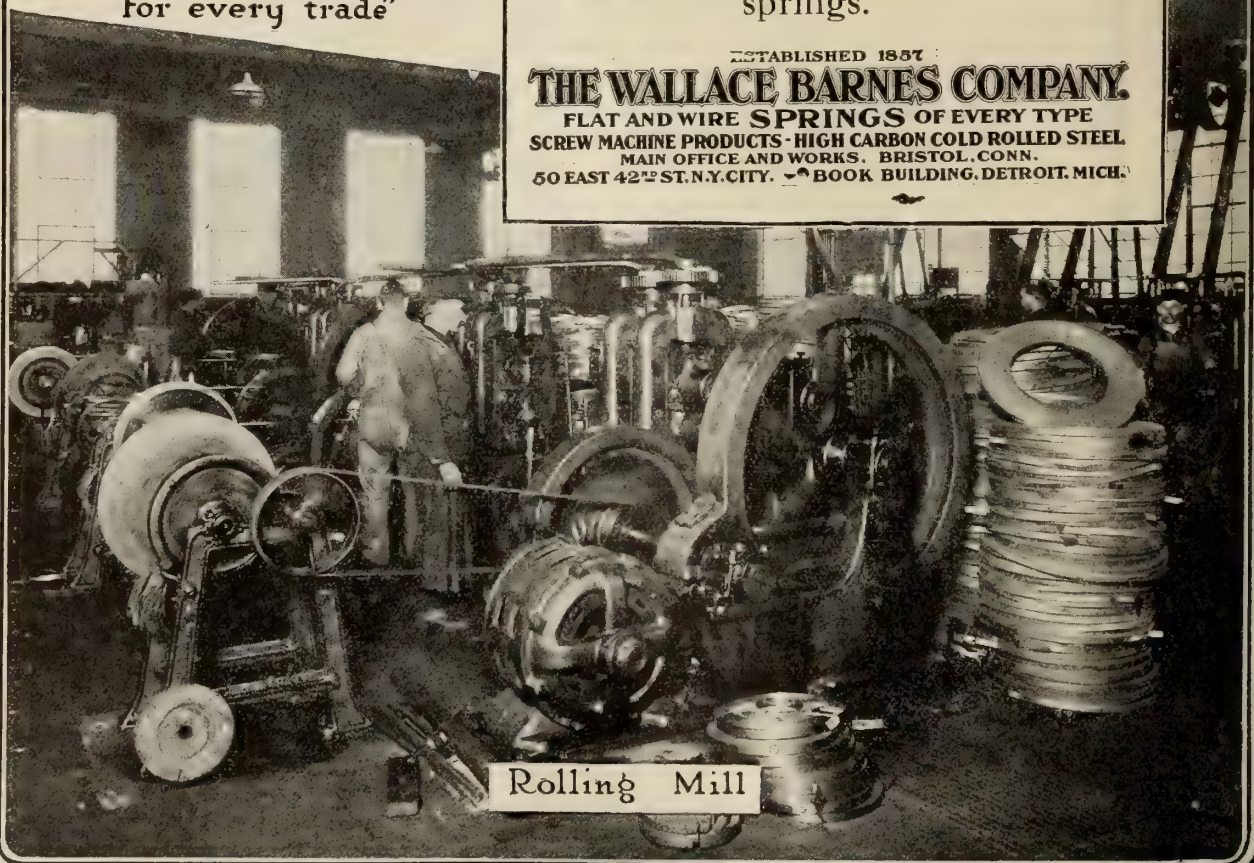

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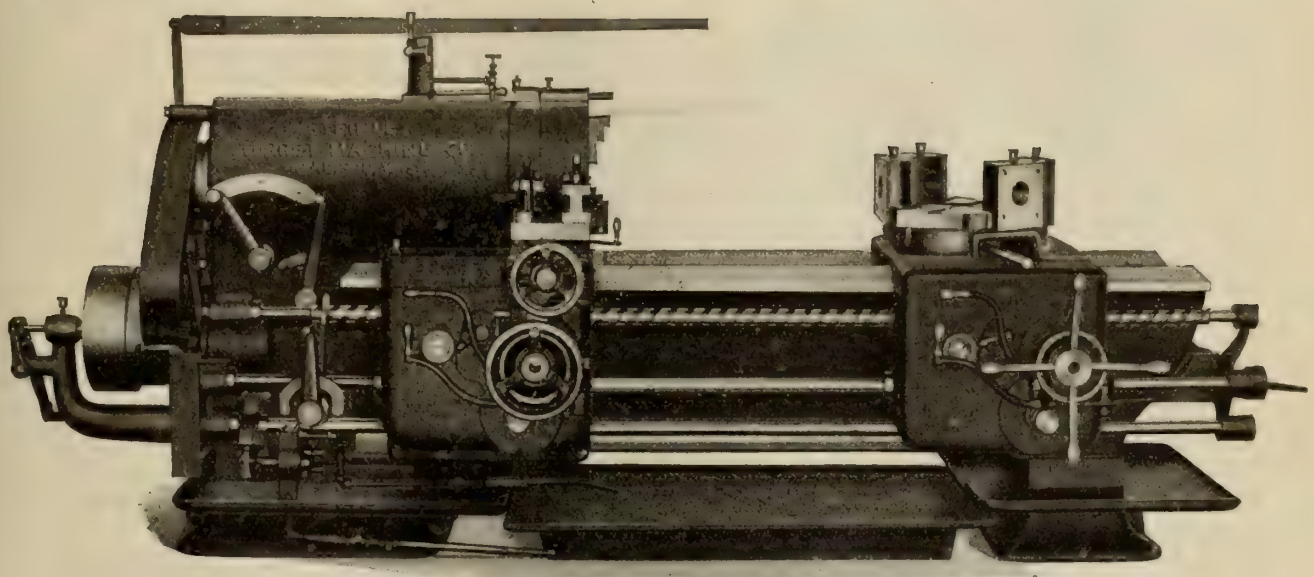

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In designing this turret the following points were taken into careful consideration:

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The combination turret has power traverse and quick change reversible longitudinal feed controlled from the apron.

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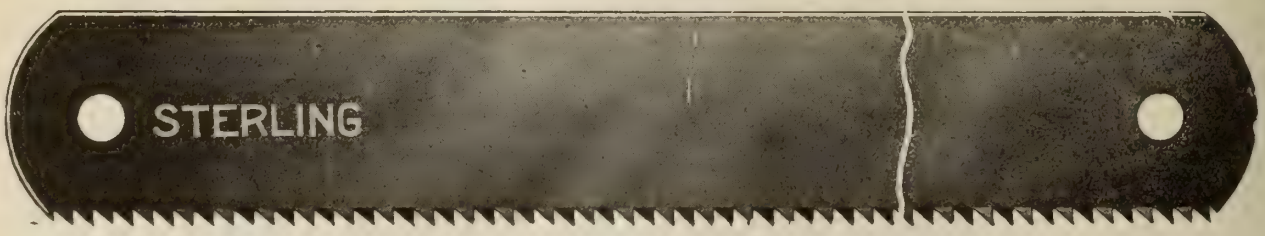

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Speediest of All Metal Cutters

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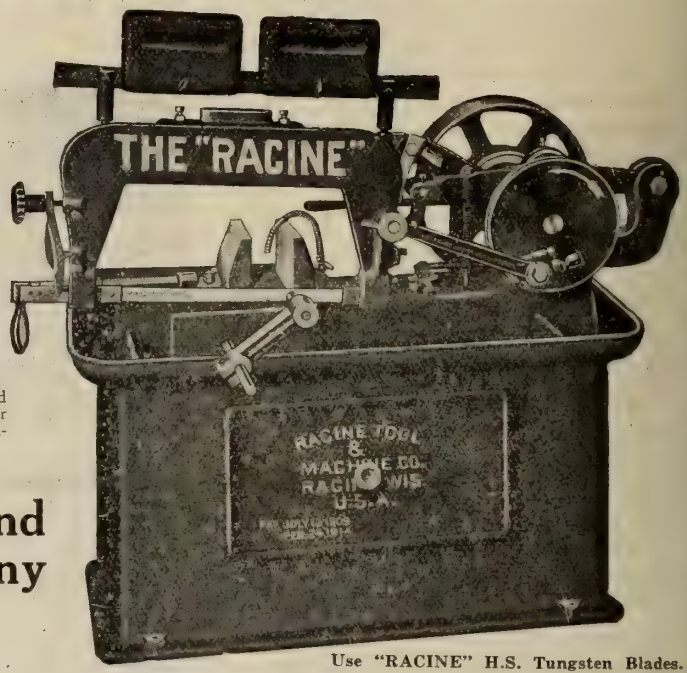

THE "RACINE" machine and "RACINE" H.S. Tungsten Power Blades make an efficient and economical combination—use both.

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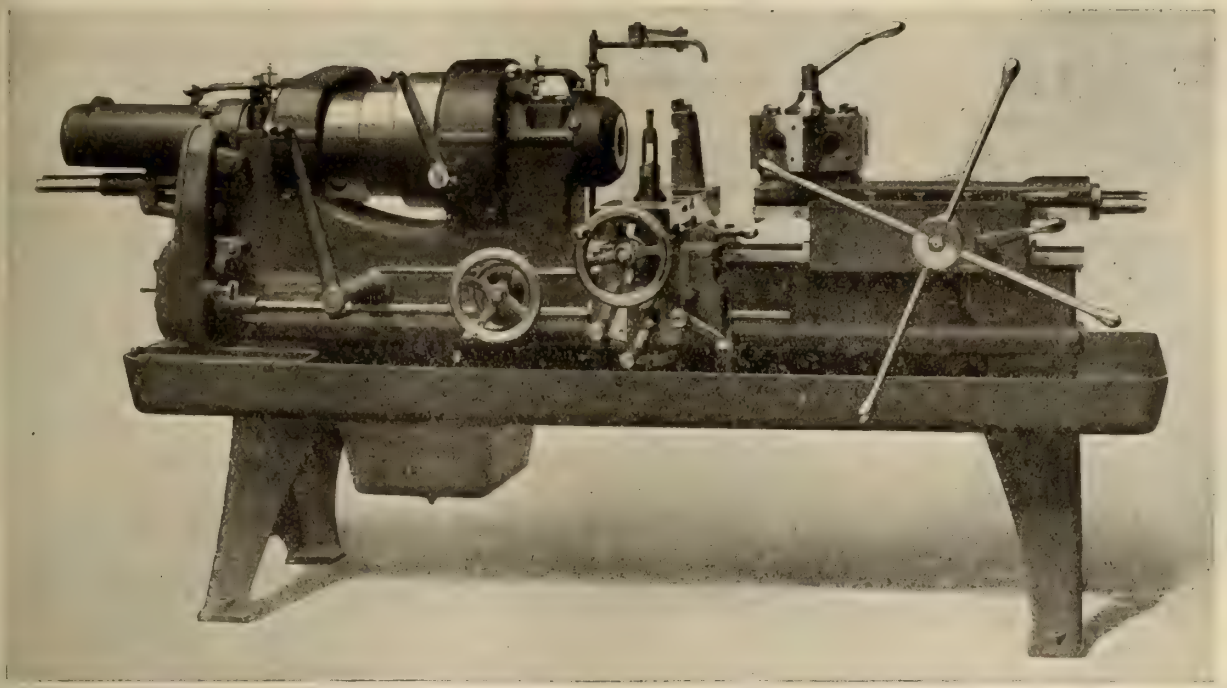

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9¼" swing over carriage
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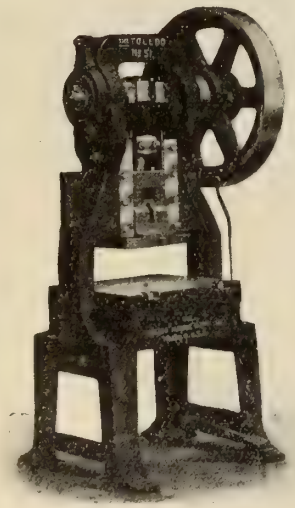

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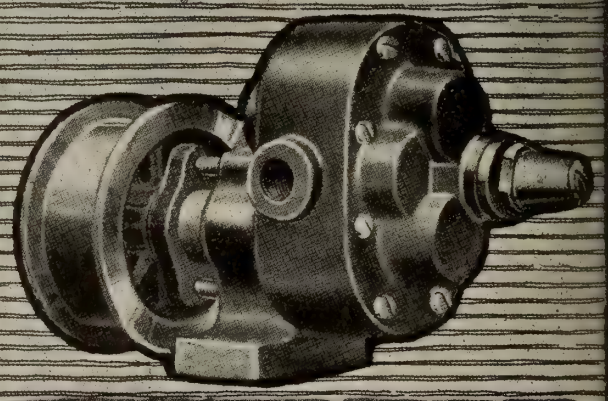

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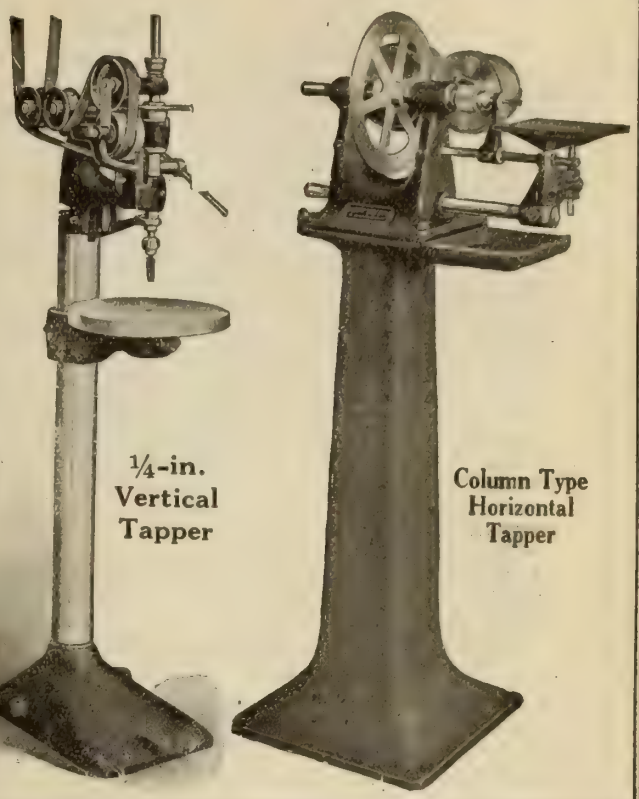

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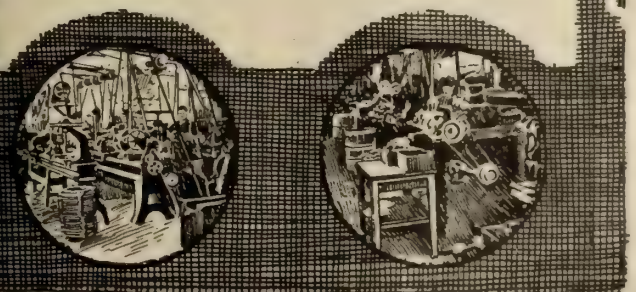

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Grip the broken tap and back it out before you've had time to count three times sixty.

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removes broken taps buried below the surface of the work without trouble or loss of time. It removes any broken tap without injuring the thread. It saves the casting or forging. Pays for itself over and over—often on the very first job.

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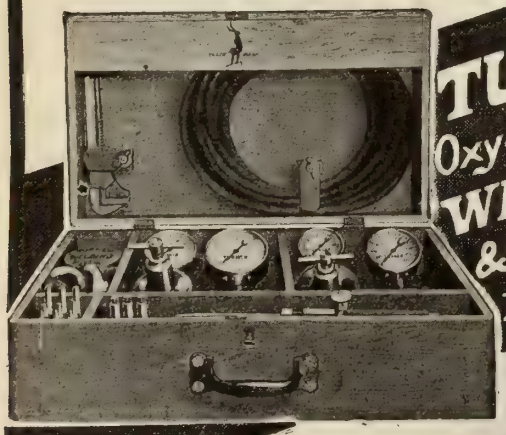

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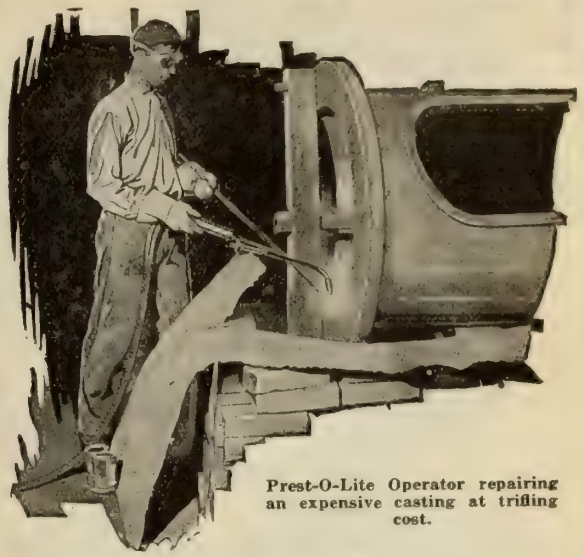

Prest-O-Lite Operator repairing an expensive casting at trifling cost.

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World's Largest Makers of Dissolved Acetylene

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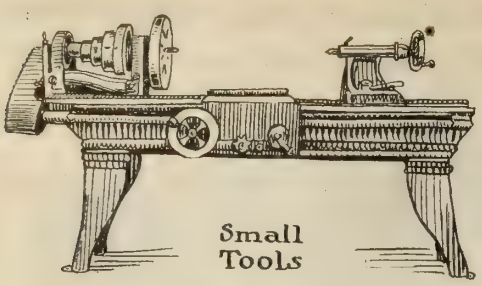
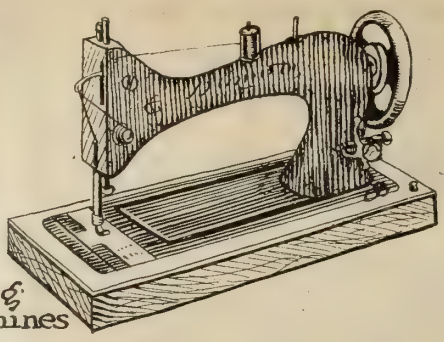
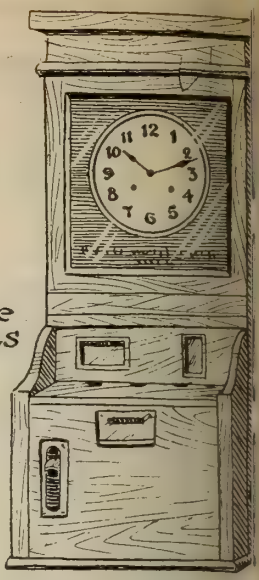

Small Tools


Sewing Machines


Time Clocks

It's Made for YOUR Work

Leading manufacturers of scores of different kinds of light machines are of the opinion that the Bilton Gear Miller was designed for their individual needs.

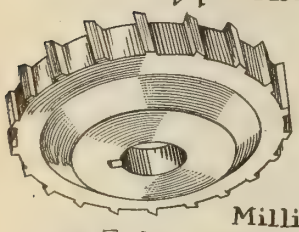
It so speedily and accurately produces spur and bevel gears and worms, and the countless small irregular parts that enter in the makeup of your product, that you cannot be blamed for thinking it was built for your special use.

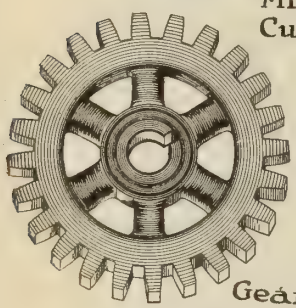
It is a valuable addition to your tool room for producing small milling cutters, reamers, etc.

If production increase interests you, our circulars will make pleasant reading; better put in that request to-day.

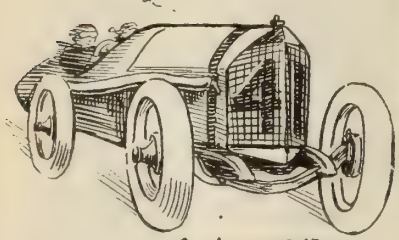
Ask for copy of Catalog No. 30

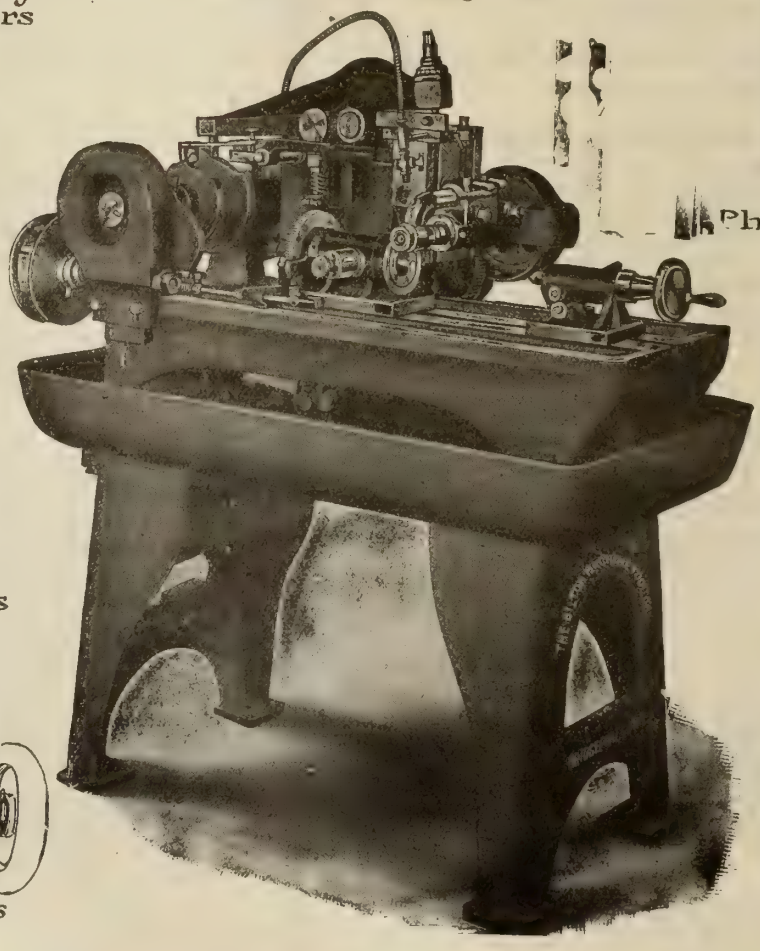
Typewriters

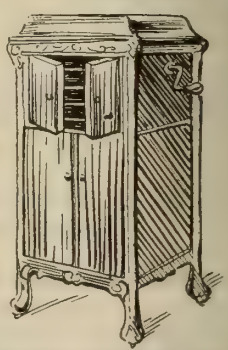

Milling Cutters

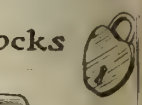

Gears

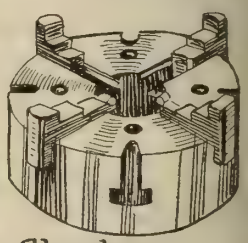
Speedometers

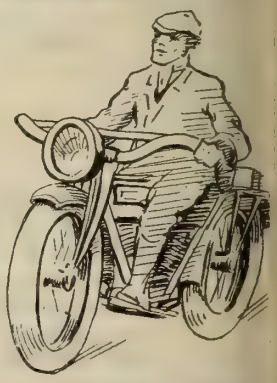

Automobiles




Phonographs


Locks


Chucks


Motorcycles

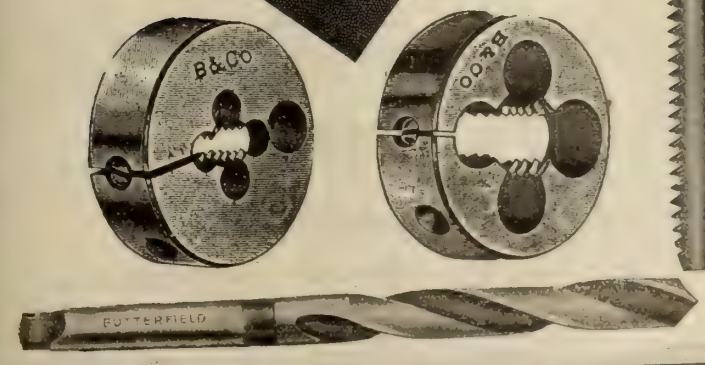
BILTON MACHINE TOOL COMPANY

Housatonic Avenue, BRIDGEPORT, CONN.

Drills, Taps, Reamers, Dies and Milling Cutters

Butterfield

"Look for this name—it means your gain"

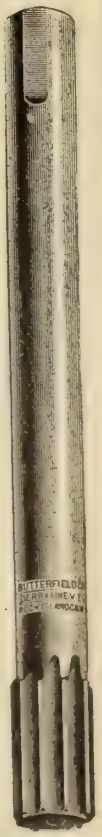


The Name "Butterfield" is a guarantee of Quality

Get acquainted with the Butterfield line by measuring its service by the test of long, hard service.

You'll find Butterfield durability the key to tool economy.

May we send a trial order?



Butterfield & Co., Inc.

Rock Island, P.Q.

Toronto Office: 220 King St. W.

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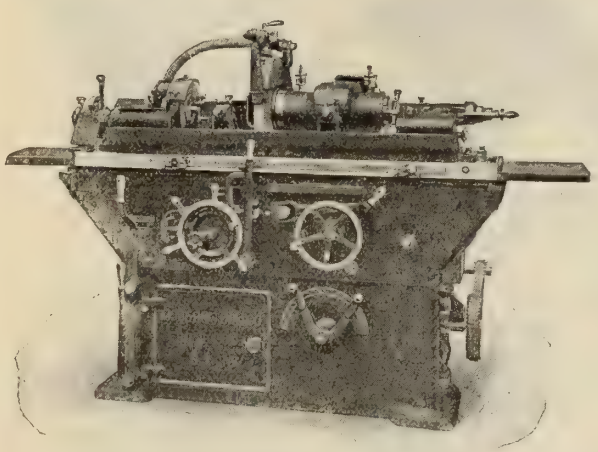
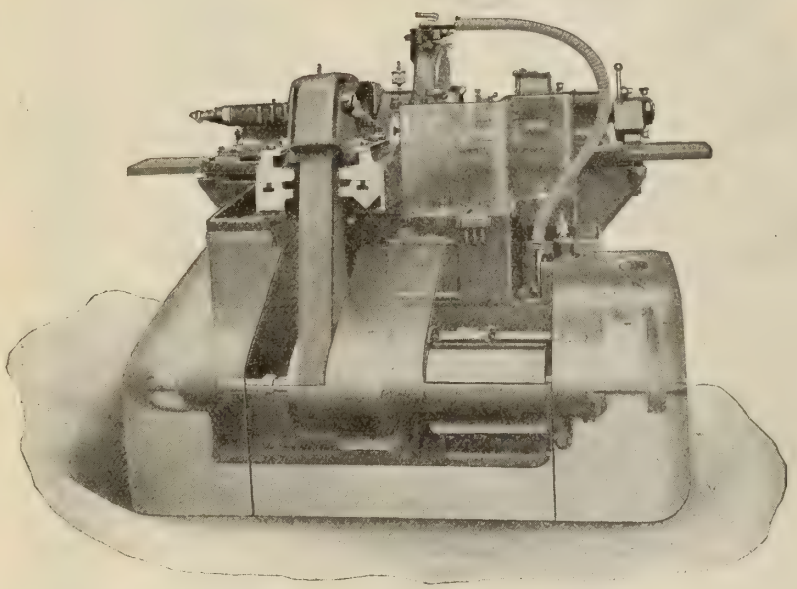
MODERN PLAIN GRINDERS



The Success of Modern Plain Grinders results chiefly from all around superiority.



—They're accurate—and stay so.

—They're durable—stay on the job.

—They're dependable—rugged and rigid. Do not easily get out of order.

—They're convenient—all controls on front of machine in easy reach of operator.

—They're fast — Moderns are noted for big output.

—Moderns are made in 10 sizes, 8″ x 18″ to 16″ x 60″.

Send us blueprints and specifications and we'll prove Modern's ability on your job.

Send for complete technical bulletin.

MODERN TOOL CO., ERIE, PA.

Main Office and Works: State and Peach Sts.

Canadian Agents, Rudel-Belnap Machinery Co., Ltd., Toronto and Montreal

CANADIAN MADE CANADIAN MADE

Electric and Hand Traveling Cranes

Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons

Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.

Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Northern Crane Works, Limited

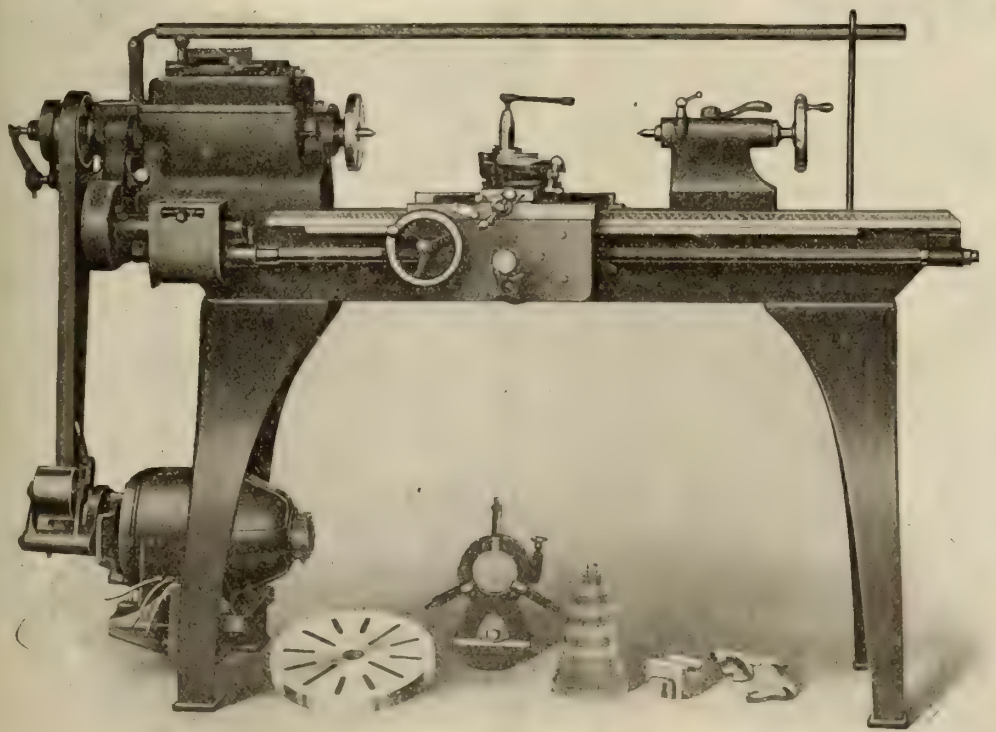
Walkerville, Ontario, Canada

Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

WORCESTER LATHES



12″ and 14″ Swing, Cone or Geared Head, Single Pulley or Motor Drive

WORCESTER LATHES are high grade throughout, only the best of workmanship and materials being used in their manufacture.

Their alignments are particularly good, and their wearing surfaces are sufficiently generous and substantial to maintain exceptional accuracy for a long time.

Write for complete information.

WORCESTER LATHE CO., WORCESTER, MASS.

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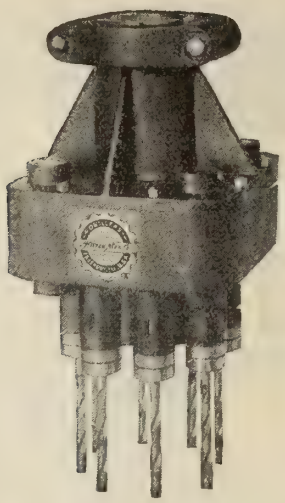
2 Minutes or 20?



This Is The Vital Question

Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.

THE HŒFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 217 Stanwix St., Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio; John M. Howett, 18 W. Second St., Dayton, Ohio; 881 Ellicott Sq., Phone Seneca 2033, Buffalo, N.Y.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House For Mechanical Goods"

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

Manhattan

Universal Tool Grinder

Capable of handling cylindrical or internal grinding with speed and accuracy.

An invaluable tool to the machine shop where there is a large variety of grinding to be done. Complete equipment.

Manhattan Machine & Tool Co.

Grand Rapids, Mich., U.S.A.

Foreign Representatives: "Aux Forges de Vulcain," Paris, France. Farmer & Co., Clerkenwell London, E.C.

PERRIN FOR RELIABILITY

Hydraulic Screw and Filter Presses

Made in Canada

Hydraulic Truck Tire Press

WILLIAM PERRIN LIMITED

TORONTO

The Connecting Link between Power and Production

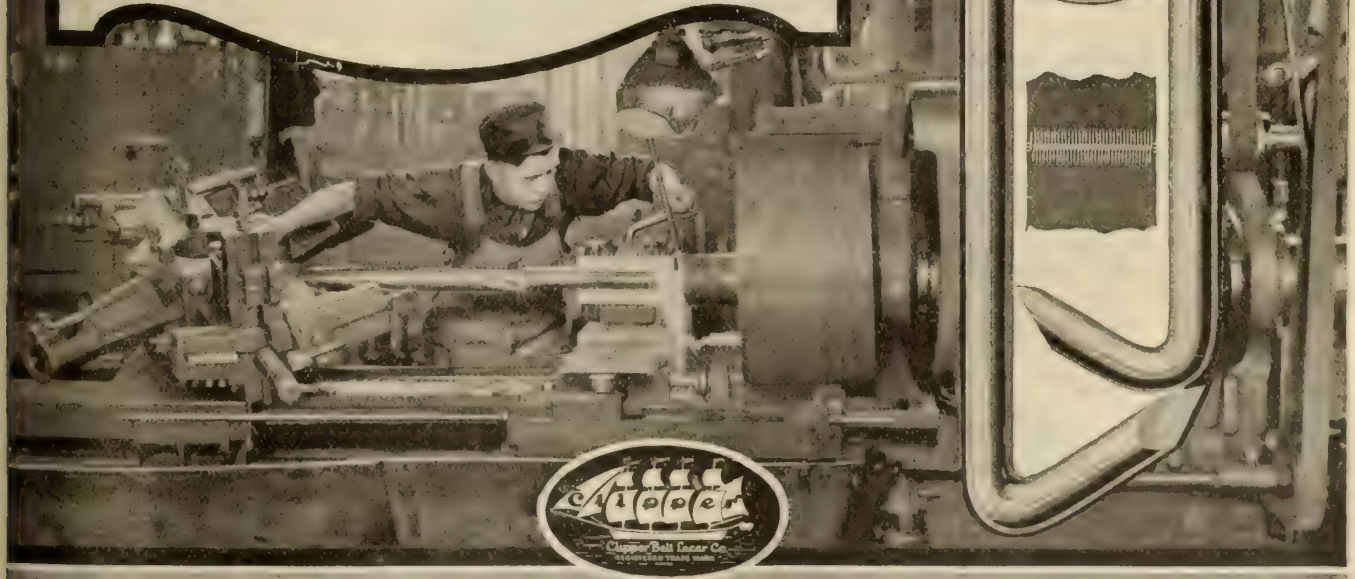
MAXIMUM production can only be attained through uninterrupted transmission of power from line-shafts to machines. Belts *will* break. Because no method to-day equals the "Clipper" for speedy repairs, "Clipper" belt hooks are the connecting links between power and production. "Clipper" hooks make possible practically continuous operation of machines during working hours in the workshops of the world.

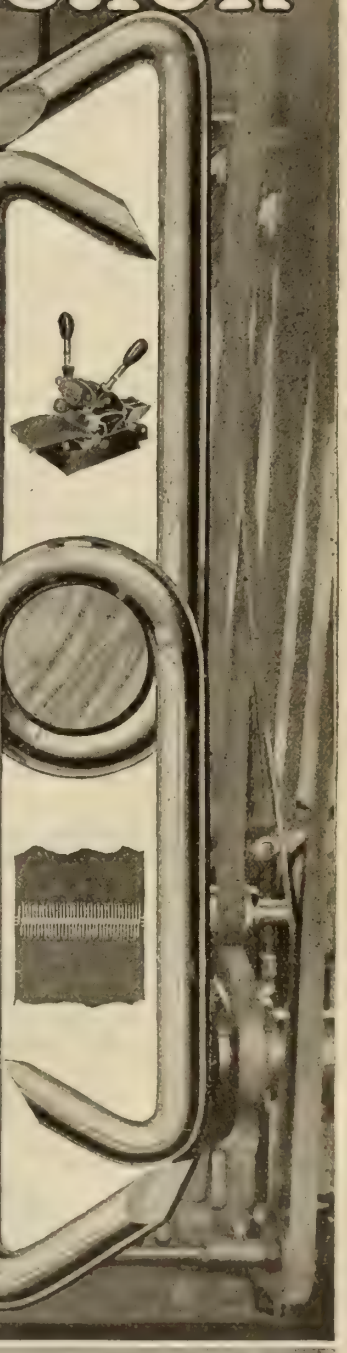
The Clipper Belt Lacer
Laces a Belt in Three Minutes

Out-of-date methods take from ten minutes to half an hour. The "Clipper" makes a durable joint—one that is smooth on both sides, is as flexible as the belt itself, is safe and pulls right.

The "Clipper" goes to manufacturers on free trial and is perpetually guaranteed.

Clipper distribution is world-wide through mill-supply houses. Where we are yet open for representation our dealer proposition is one of mutual profit.





Clipper Belt Lacer Company
GRAND RAPIDS, MICHIGAN, U. S. A.
LONDON, ENGLAND—NO. 10 NORFOLK STREET

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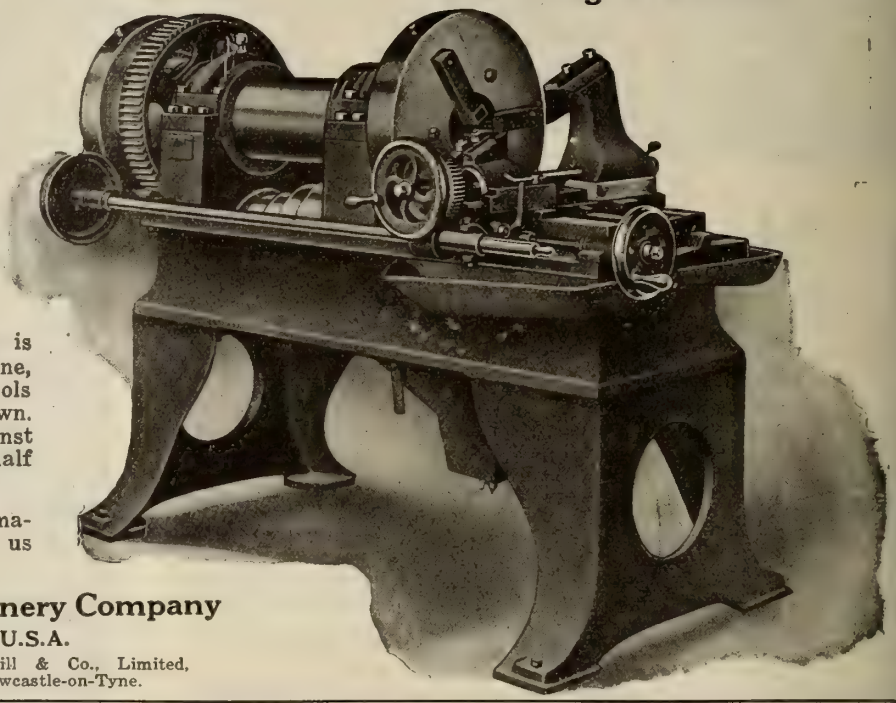
Cut Your Cutting-off Costs in HALF

HURLBUT'S

Patent Cutting-off and Centering Machines



TO say that the Hurlbut, Rogers Cutting-Off and Centering Machine will **double your production** and **cut your costs in half** may seem like a broad claim. But this is just what this machine will do compared with any ordinary machine of its kind.

Hurlbut, Rogers speed and efficiency is easily explained. Instead of only one, it is equipped with two cutting-off tools —one cutting up and the other down. In this way they hold the work against each other and finish a job in just half the time and do twice the work.

You can't afford to be without this machine. It saves real money. Let us tell you more about it. Write!

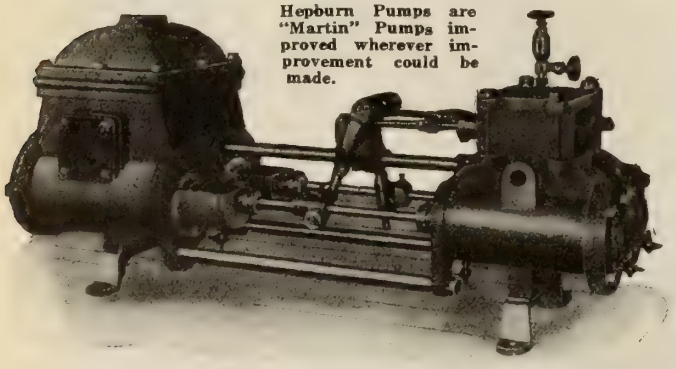
The Hurlbut, Rogers Machinery Company

South Sudbury, Mass., U.S.A.

Foreign Agents—England: Chas. Churchill & Co., Limited, London, Manchester, Glasgow and Newcastle-on-Tyne.

Hepburn Pumping Machinery

Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.

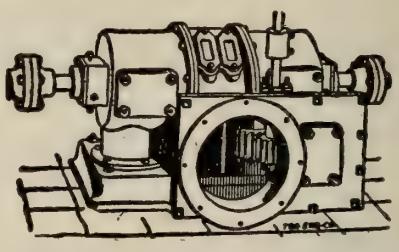


Hepburn Pumps are "Martin" Pumps improved wherever improvement could be made.

JOHN T. HEPBURN, LIMITED

18-60 Van Horne Street **Toronto, Ontario**

WATER POWER DEVELOPMENT



Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

THE J. C. WILSON MFG. CO.

LIMITED

BELLEVILLE, ONTARIO

Gear Cutting with the "IF'S" Left Out

The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

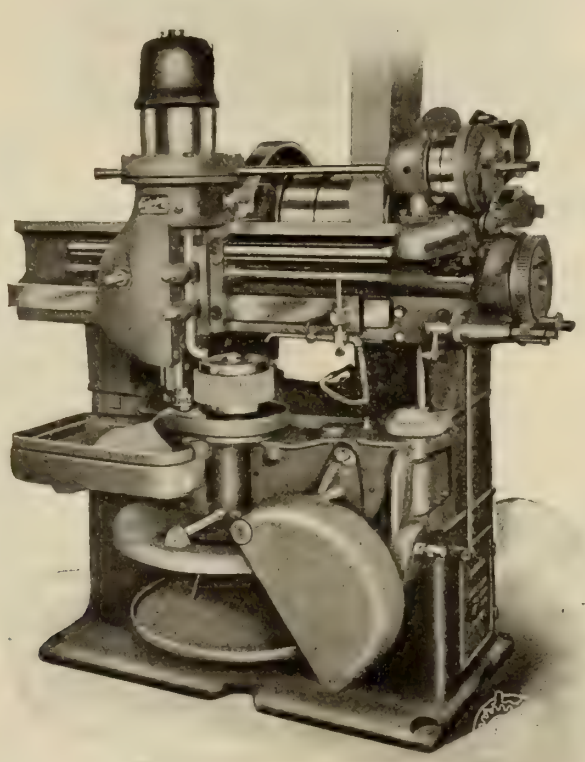
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

Send for your copy to-day



The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting.

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Société Anonyme Alfred Herbert, Paris, France, Societa Anonima Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert, Barcelona, Spain; Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert, Limited, Calcutta, India; A. B. Galco, Limited, Stockholm, Sweden.

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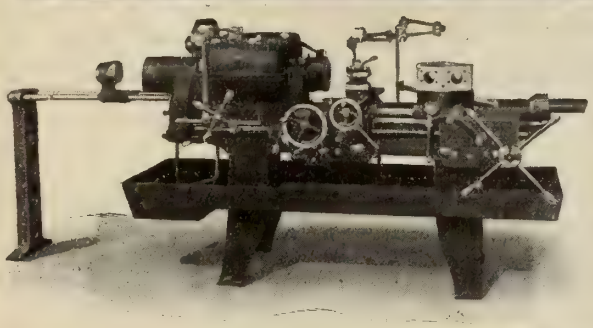
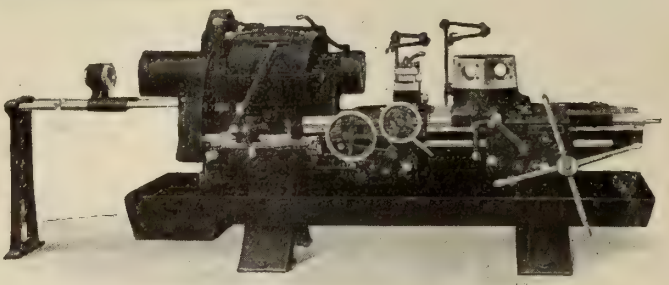


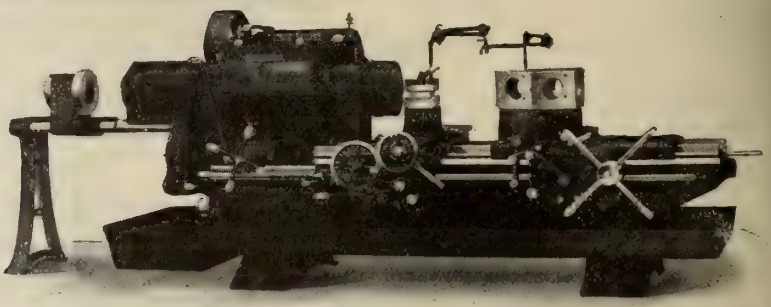
BAR CAPACITY FOSTER UNIVERSAL TURRET LATHE

1-B
2" x 20"



2-B
3¼" x 30"

3-B
4½" x 40"



HOW ARE YOU EQUIPPED FOR BAR WORK?

Have you checked up the machining cost of your shafts and other bar work lately? Are you keeping the cost down to the old level and at the same time increasing the wages of your men and thus making them able to meet the steadily mounting cost of the necessities of life?

Some people have not analyzed their cost figures yet.

Others have.

The Foster Universal Turret Lathes are capable of increasing your production per man. We are not particularly interested in what equipment you are using now; we **know that** we can increase your production.

The machines have the power. It is now a question of how heavy a cut the tool will stand up under, not of whether the machines will pull.

The general design of the machine, the reducing the overhang to minimum, the weight and massiveness of the bed lend rigidity in a high degree.

The centralized control saves the operator's time and energy, and increases your, and his earnings.

It will pay you to investigate the merits of the Foster Universal Turret Lathes. Your competitors probably have one or several of these machines in their factory already. If they do it has given them the drop on you.

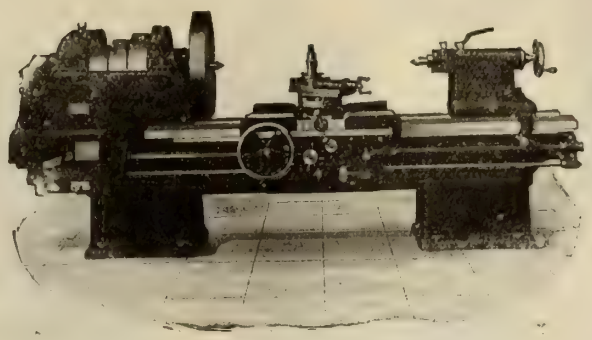
OUR CATALOGUE SHOULD BE IN YOUR FILE—WRITE TO-DAY.

FOSTER MACHINE CO., ELKHART, IND.

SIDNEY

Sidney for Service

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double brake gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 ft.

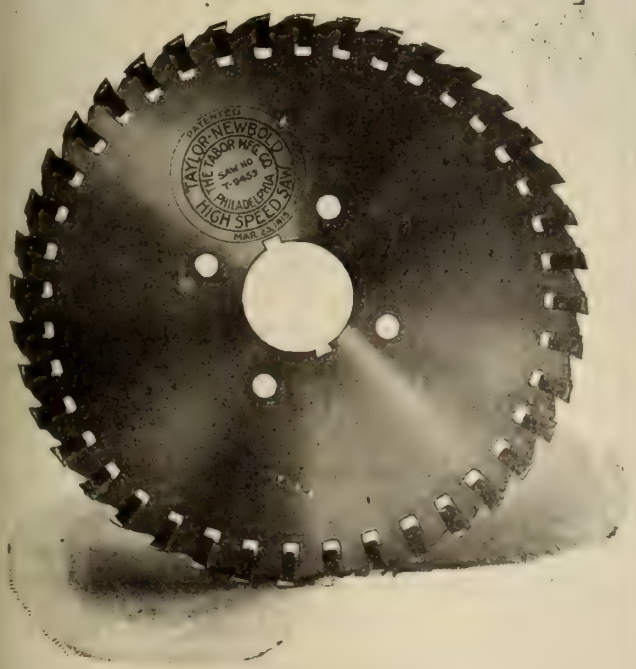
The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

Heavy Duty Engine Lathes

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: Yeates Machinery & Supply Co., Montreal, Que.
H. W. Petrie, Limited, Toronto, Ontario

THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, Pa., U.S.A

WONDER
"Bending Machines"

BEND PIPE COLD
ELIMINATE FRICTION
2 New Models

"Wonder" Pipe and Tube Bending Machines (pat.) electrically operated to bend from 1" to 8".

We also manufacture 10 other sizes
Hand operated to bend from ⅛" to 6".

American Pipe Bending Machine Company
52 Pearl Street
BOSTON, MASS. U. S. A.
The Canadian Fairbanks-Morse Co., Ltd., Montreal, Que., Agents for Canada

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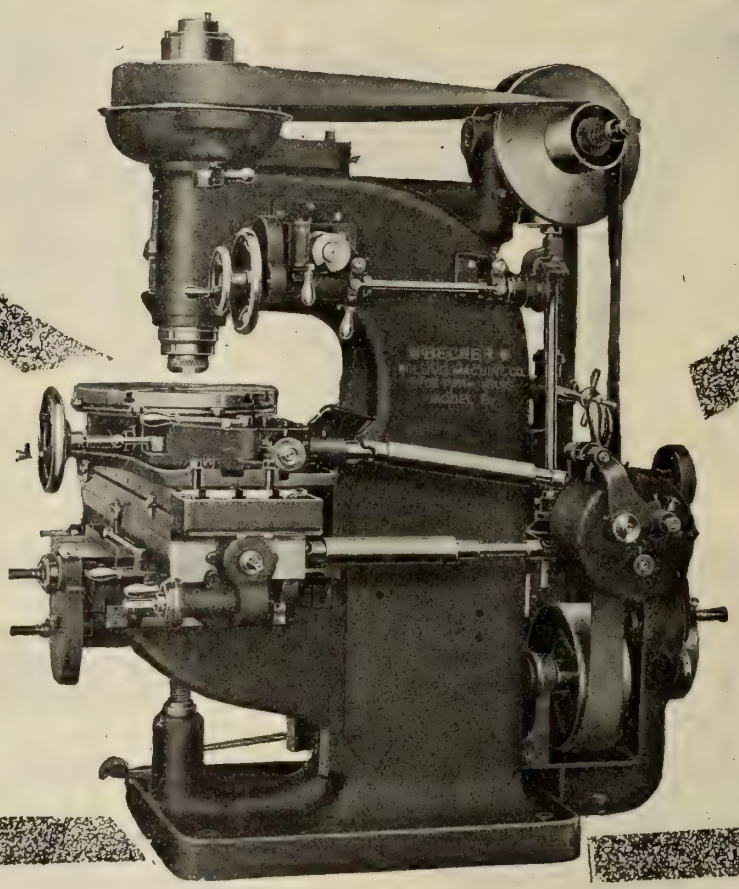
Becker



"Becker Belt Driven Millers"

The Machine that gives the Smooth Finish

Model B

The machine shown above is a Becker Model B Belt Driven Miller—Like the other machines of this line it is a Production Tool of the first class, embodying all the features that have made Becker Millers the standard.

The strenuous period of war work has introduced Becker Belt Driven Millers into Canadian factories. They were essential then because they greatly increased production without adding to manufacturing costs—and now, they are essential also because they will enable you to reduce your manufacturing costs in order to cope with the keen after-war competition.

You need a Becker Belt Driven Miller.

Write for Circular O-501—NOW.

BECKER MILLING MACHINE COMPANY

Hyde Park, Boston, Mass

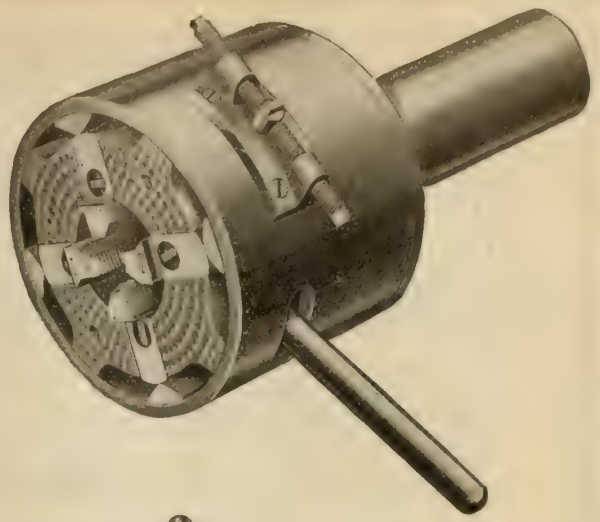
Canadian Agents:

Rudel-Belnap Machinery Company, Ltd., 137 McGill St., Montreal.

A. R. Williams Machinery Company, Ltd., 64 Front St. West, Toronto.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

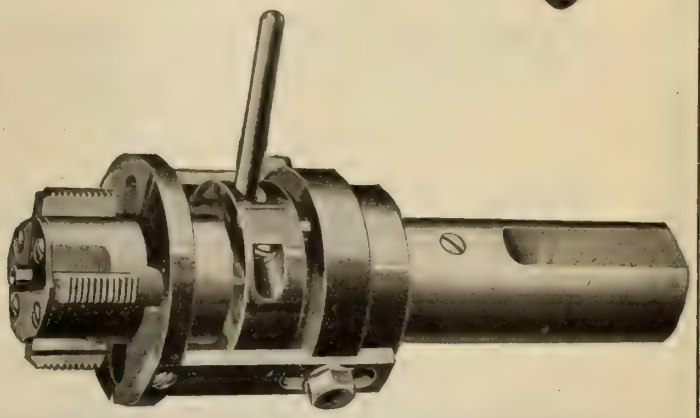
NAMCO DIES TAPS



It doesn't make a bit of difference whether it's threading screws or tapping axle housings, there's a NAMCO Threading Tool for every thread cutting requirement.

NAMCO Dies and Taps are simple in design, rigid in construction to cut threads true to specification on all classes of work.

Ask for catalog--no obligation



The National Acme Company

CLEVELAND, OHIO

New England Plant - Windsor, Vt.
Canadian Screw Plant - Montreal, P.Q.

Branch Offices:
New York Boston Chicago Detroit Buffalo
Atlanta San Francisco

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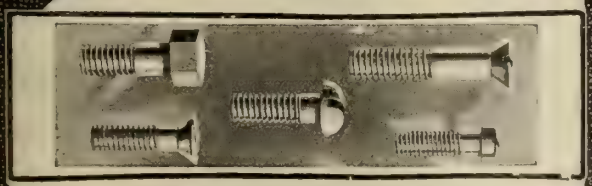

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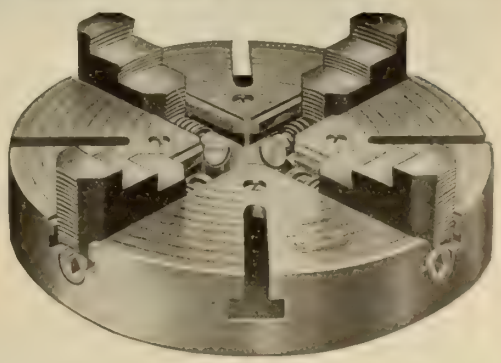

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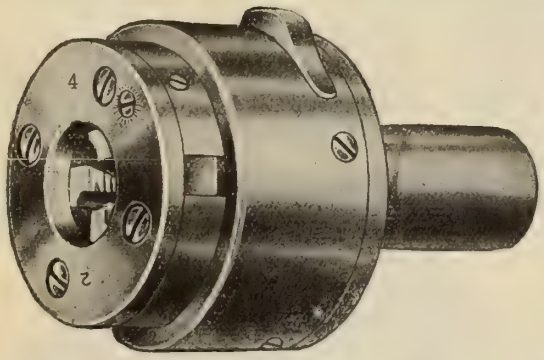

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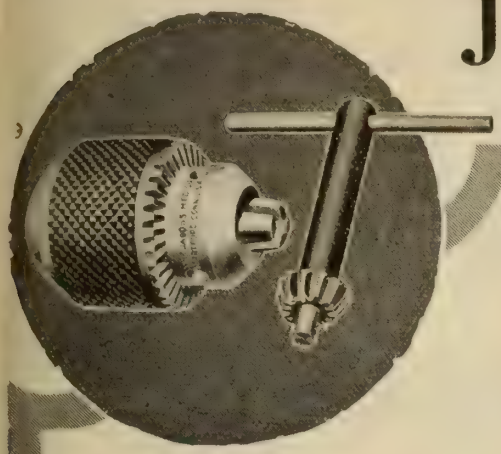

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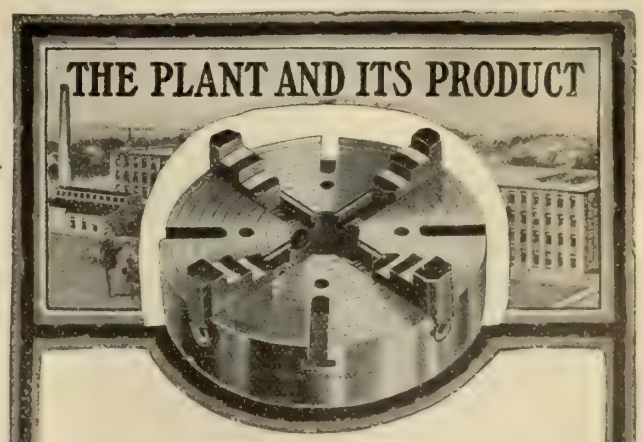

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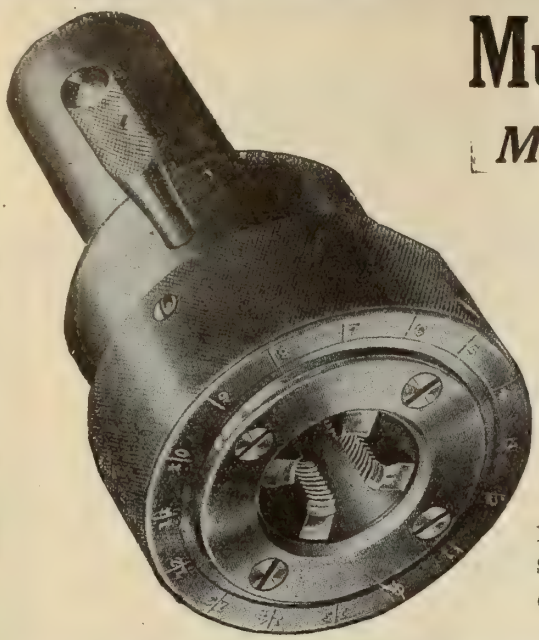

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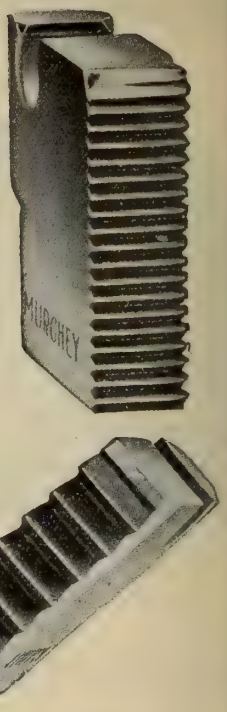

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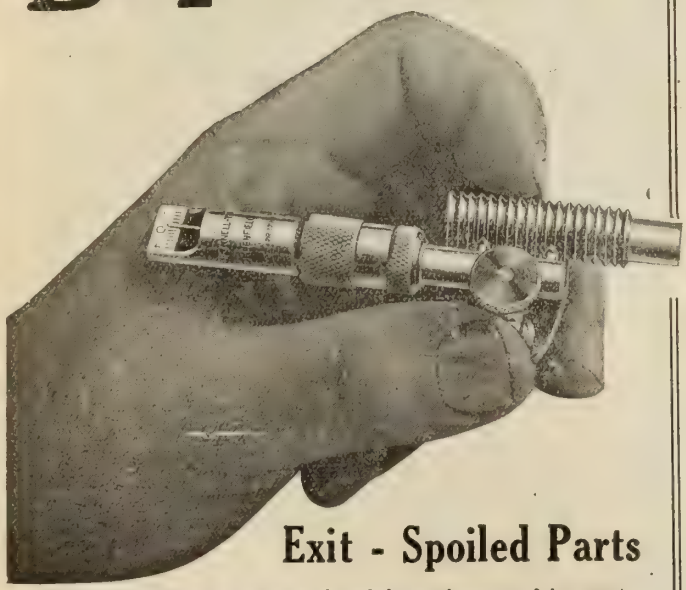

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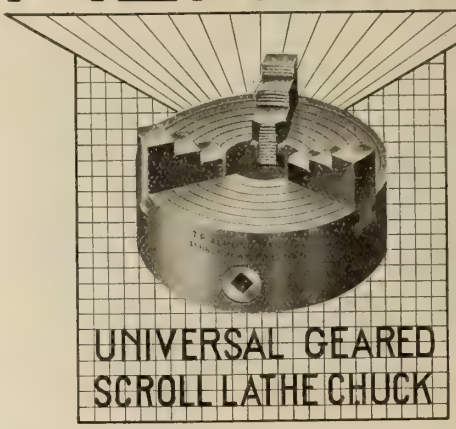

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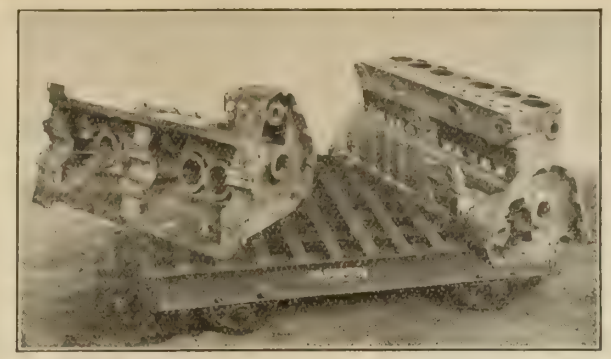

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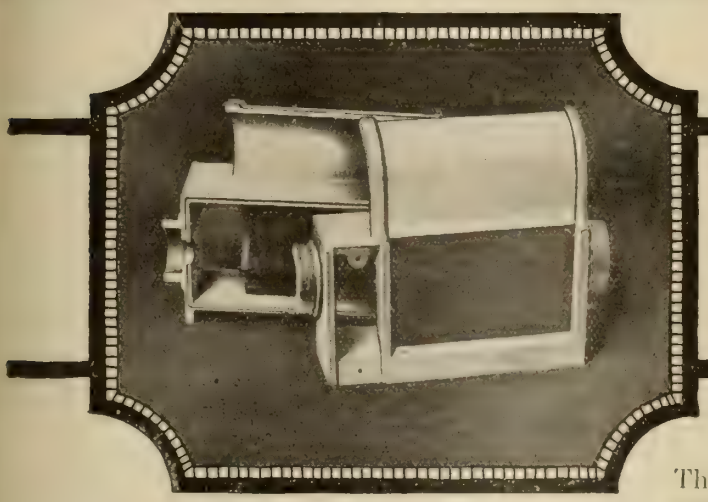

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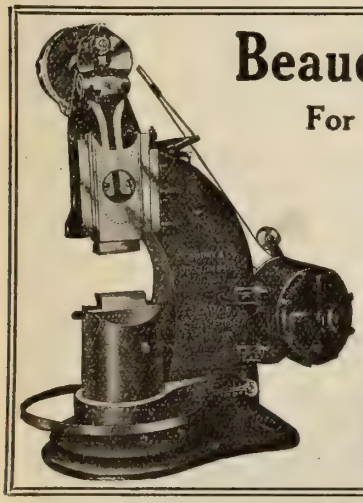
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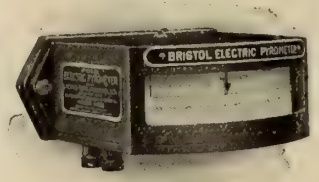

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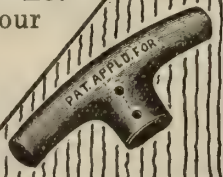

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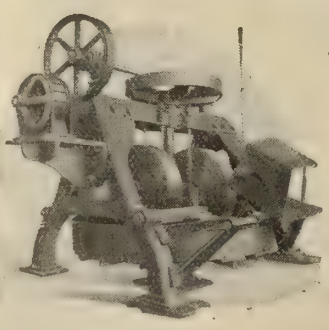
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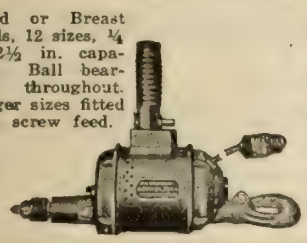

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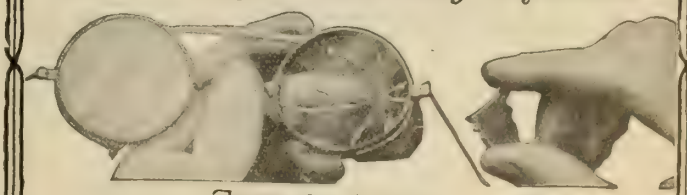

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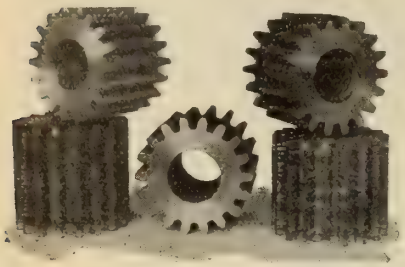

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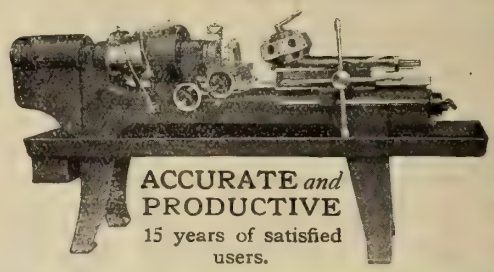

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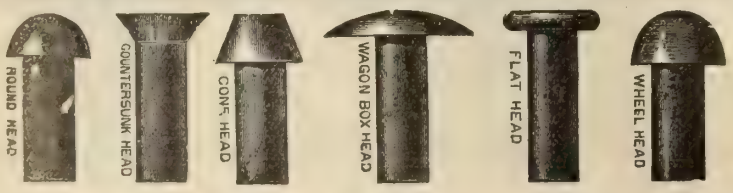

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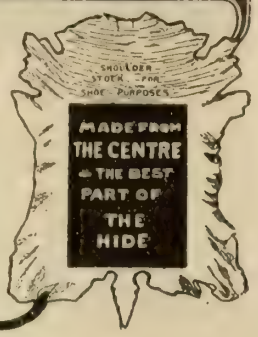

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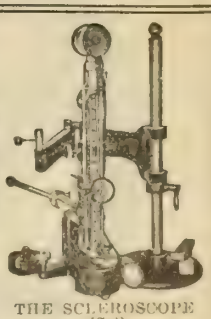

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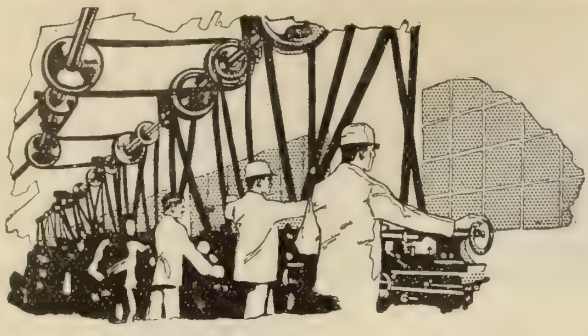

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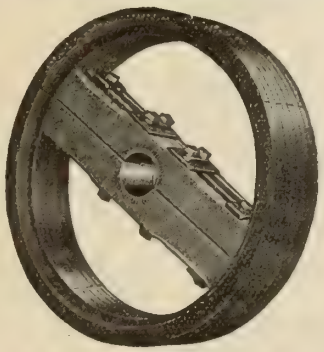

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Victoria Foundry Co., Ottawa, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
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Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa

CHUCKS, MACHINE MILLING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Co., J. H., Brooklyn, N.Y.

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Hoggson & Pettis Mfg. Co., New Haven, Conn.

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Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Auburn, Ont.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

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Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

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Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson Ltd., Montreal, Que.

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Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

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Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

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Canada Found's & Forgings, Ltd., Welland, Ont.

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Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
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Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
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Volta Mfg. Co., Welland, Ont.

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CONVEYORS, OVERHEAD
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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
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Brown's Copper & Brass Rolling Mills, New Toronto, Ont

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Whitman & Barnes Co., St. Catharines.

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Blanche Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson Ltd., Montreal, Que

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

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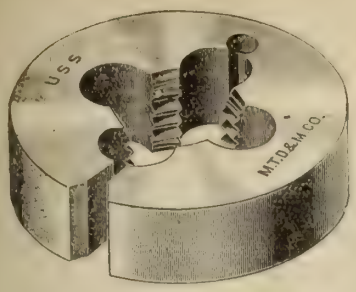
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.



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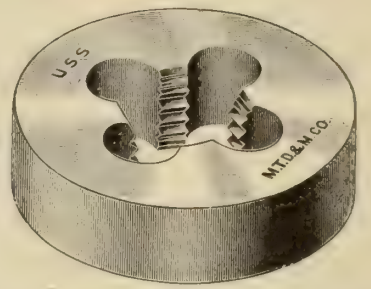

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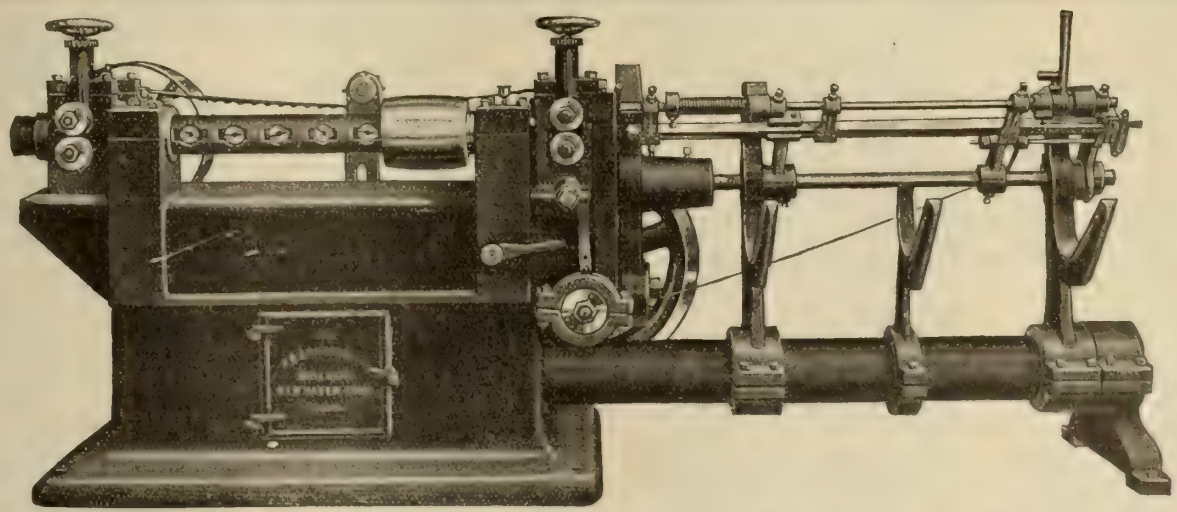

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Wilson & Co., J. C., Belleville, Ont.

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Volta Manufacturing Co., Welland, Ont.

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Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

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Northern Crane Works, Walkerville.

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Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

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Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Canada Found'a & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

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Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

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Williams & Wilson, Ltd., Montreal, Que.

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See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
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Davidson Tool Mfg. Co., New York, N.Y.
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Illinois Tool Works, Chicago, Ill.
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Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
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Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
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Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
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Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
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Williams & Wilson, Ltd., Montreal, Que.

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Swedish Crucible Steel Co., Windsor.

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Smalley General Co., Inc., Bay City, Mich

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Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING
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Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Ford-Smith Machine Co., Hamilton, Ont.
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Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

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Joyce, Koebel & Co., Inc., New York.
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Foss Mchy. & S'ply Co., G. F., Montreal.
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Modern Tool Co., Erie, Pa.
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National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
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Wells Bros. of Canada, Galt, Ont.

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Norton, Ralph B., Agent, Montreal.

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National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
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Pratt & Whitney Co., Dundas, Ont.

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DRAWING OFFICE SUPPLIES
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Williams & Wilson, Limited, Montreal

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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
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Niles-Bement-Pond Co., New York.
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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

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Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

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Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
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Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Morrow Screw & Nut Co., John, Ingersoll, Ont.
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Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
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Peerless Machine Co., Racine, Wis.
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Canada Machinery Corp., Galt, Ont.
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Graton & Knight Mfg. Co., Montreal.

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Brown & Sharpe Mfg. Co., Providence, R.I

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Cut your Metal faster—

more accurately—more economically—with this

SPECIFICATIONS:

Capacity, 10″ x 10″.
Floor space, 4′ x 6′.
Height, floor to table, 26¾″.
Length of Band Saw, 12′ 3″.
Size of Band Saw, 1″ x .035″.
Belt or Motor Driven.
Power required, 1 H.P.
Driving Pulley, 12″ x 3″.

FEATURES:

Continuous cutting—hence FAST.
Gravity feed—EASY on saw.
Roller guides—ensuring SQUARE, ACCURATE cuts.
Blade .035″ thick—SAVING metal.

Napier Metal-Cutting Machine

The ONLY Horizontal Band Saw Made

SAVES METAL—because the cutting band is only .035″ thick, and less metal is removed than with any other machine. Compare it with a cold saw's gash!

SAVES TIME—because its thin, continuous, one-way cut is at least twice as fast as the half-the-time cut of the power hack-saw.

SAVES POWER—because it removes a minimum amount of metal, in the easiest possible way.

CUTS SQUARE AND TRUE—because the roller guides, close to both sides of the work, hold the inch-wide blade rigid and unswerving. Gravity instead of force feed eliminates the tendency to run off.

BAND SAWS WEAR LONG—because every tooth is used. Because the length of the saw, and the contact with the wheels, keeps it cool. Because the spring-counterbalanced gravity feed allows the saw to "give" when it strikes a hard spot.

MACHINES STAND HARD SERVICE—Napier Metal-cutting Machines are simple, rugged, free from weak points. They stand hard, steady service in unskilled hands and **turn out the work.**

Speed up your hand and power hack saws by using NAPIER blades!

Made by

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Garlock-Walker Machy. Co., Toronto, Ont.
Gooley & Edlund, Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati.
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Cleveland Milling Machine Co., Cleveland.
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Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
Gooley & Edlund, Inc., Cortland, N.Y.
Hardinge Bros., Inc., Chicago, Ill.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
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Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Morrow Screw & Nut Co., J., Ingersoll, Ont.

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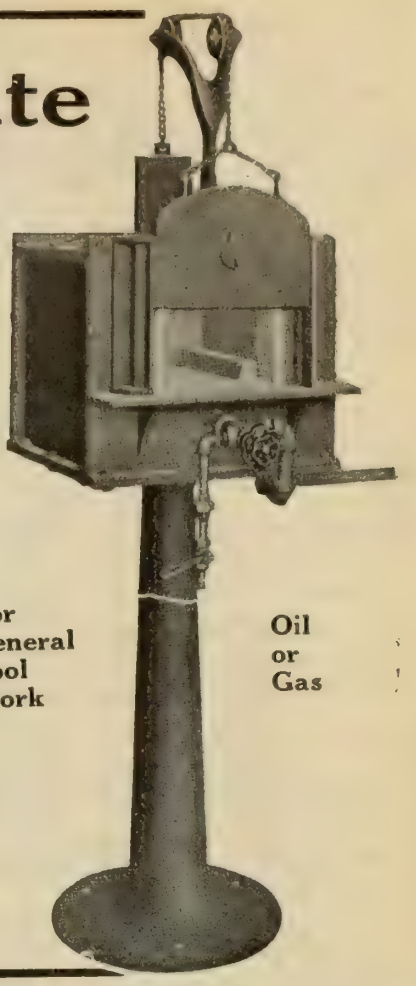

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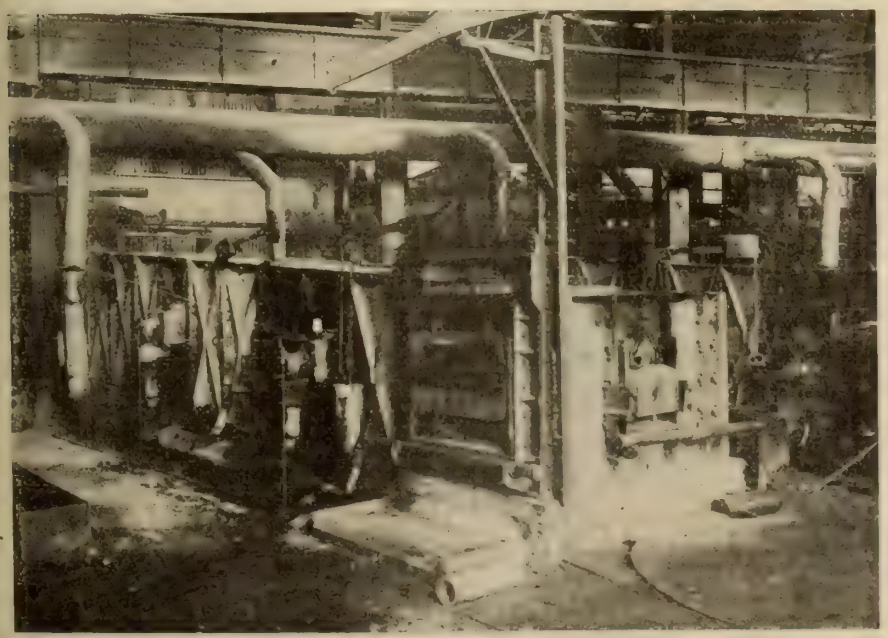

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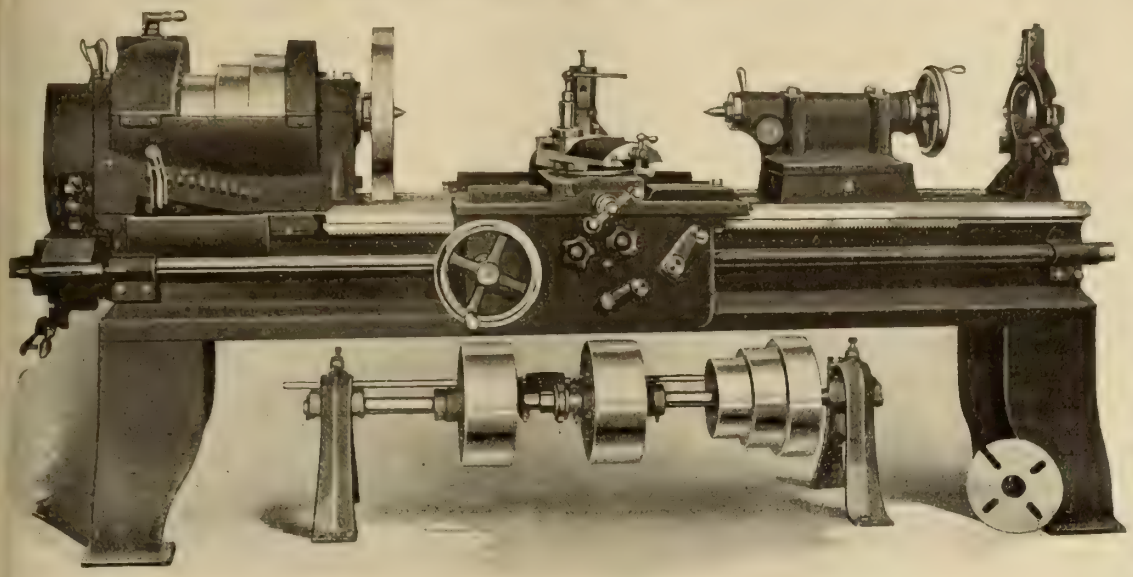

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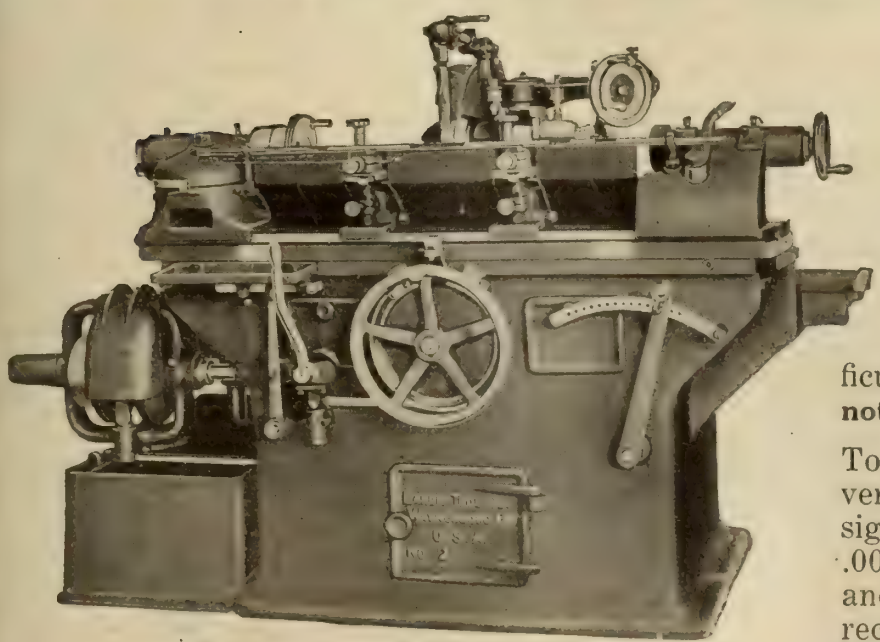

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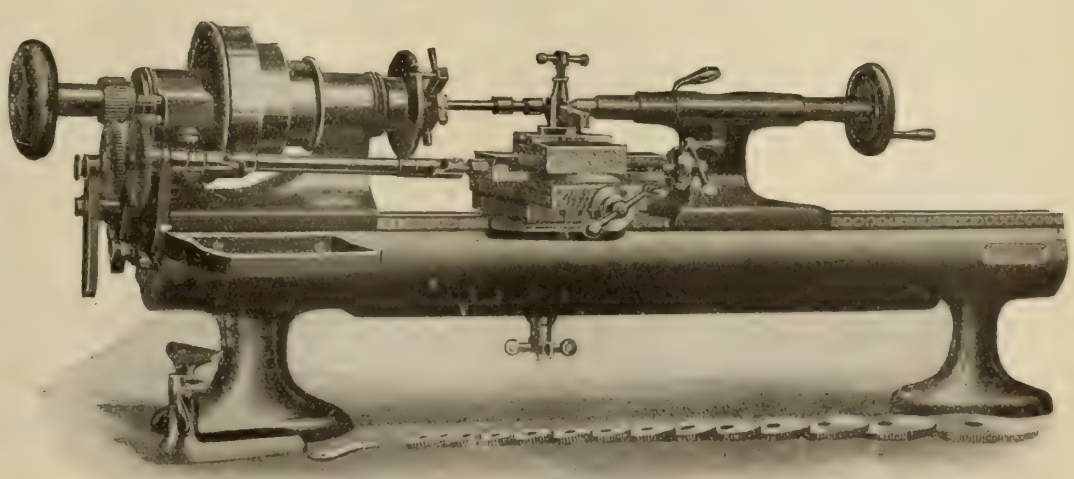

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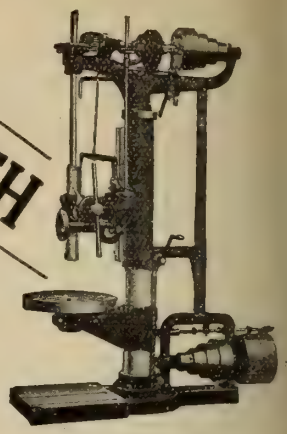

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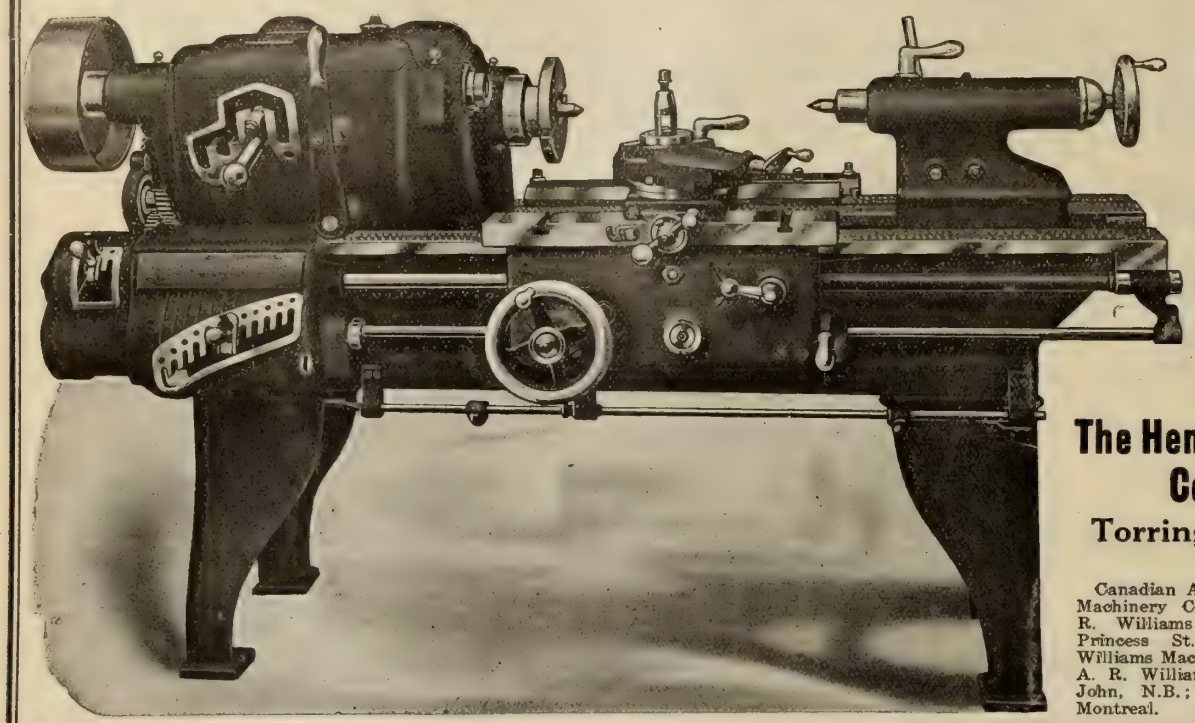

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(Patented May 28, 1918)

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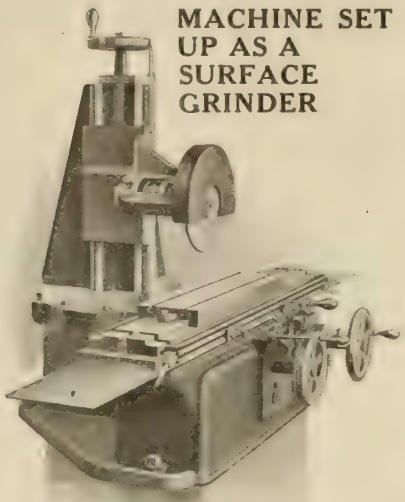

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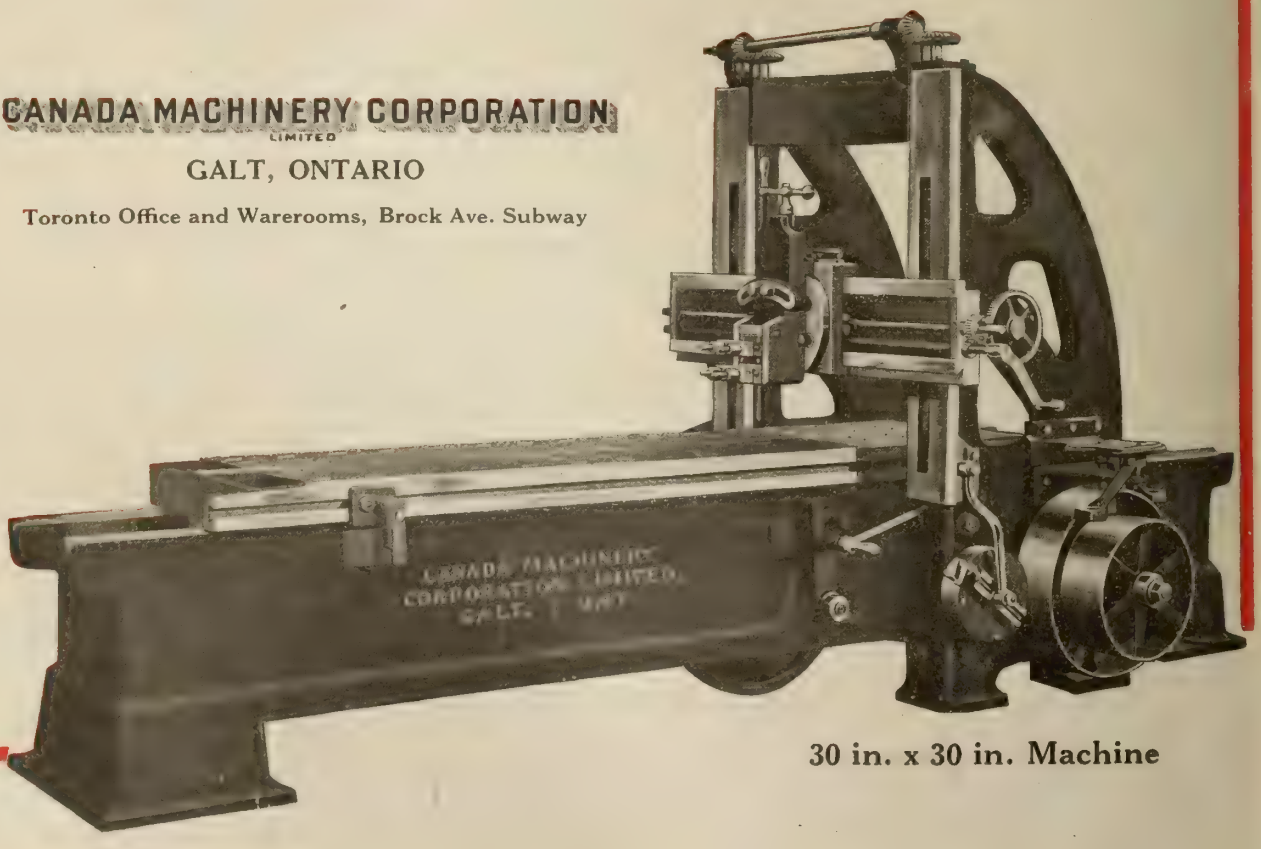

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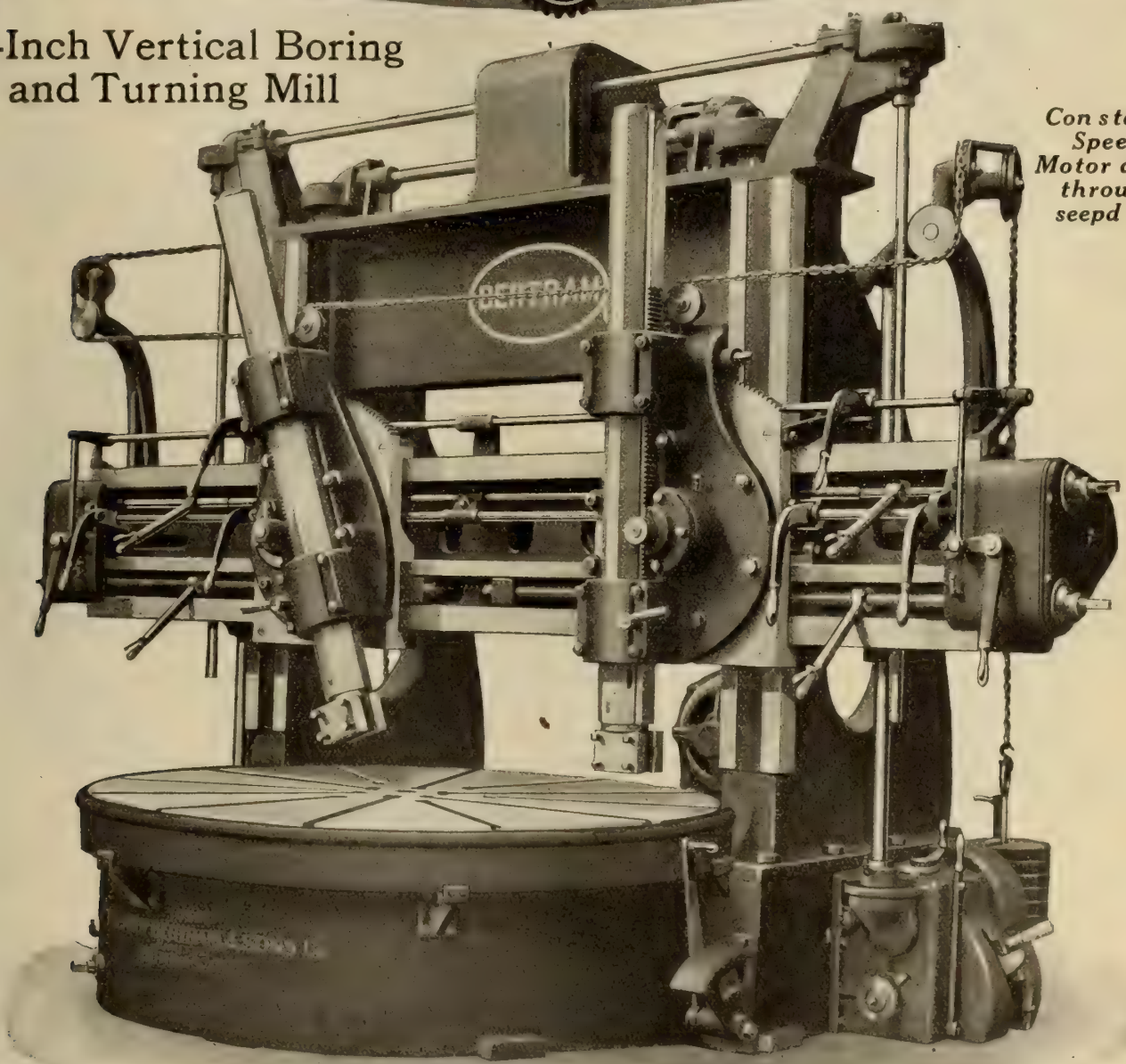

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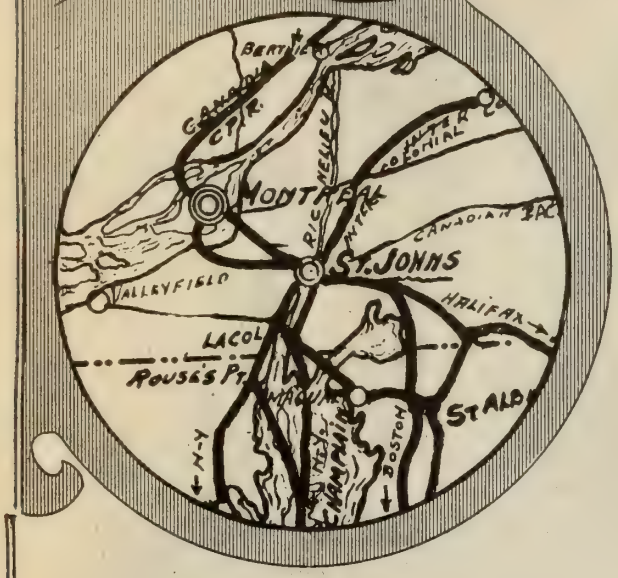
The City of ST. JOHNS, QUEBEC



ITS LOCATION

It is located in the Province of Quebec which, as regards industries, is to Canada what New England is to the United States. (It is 27 miles, or 45 minutes, from Montreal).

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5 x 3½"—5 x 3"—4½ x 3"
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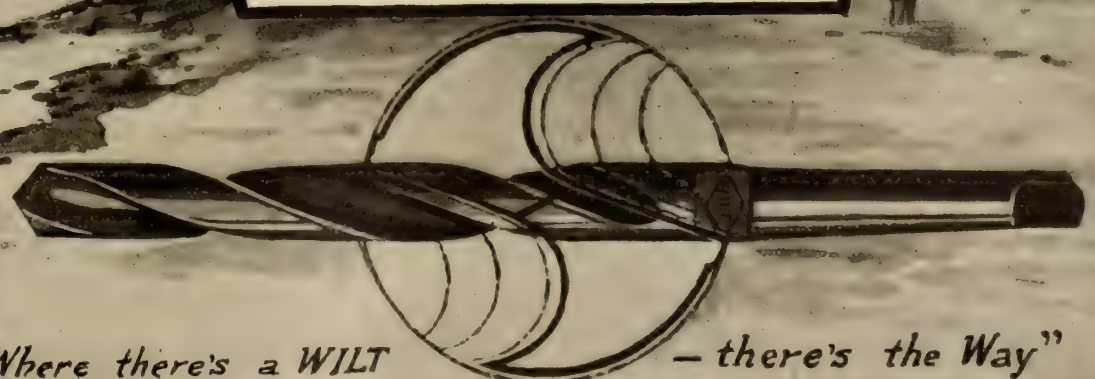

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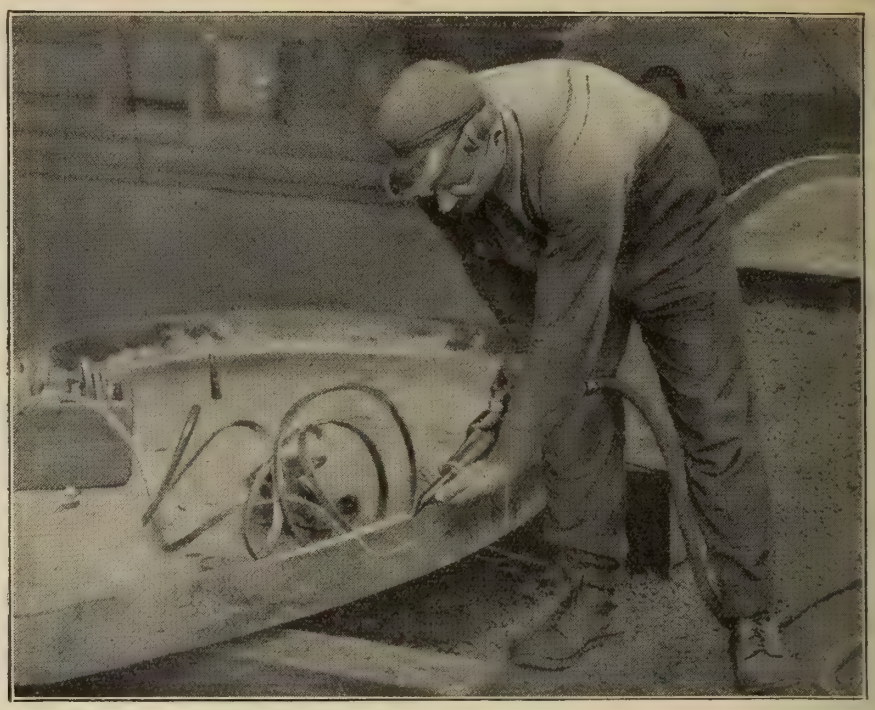

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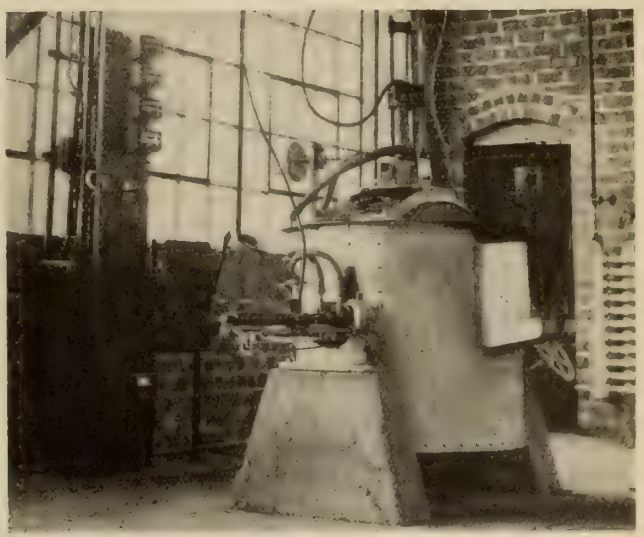

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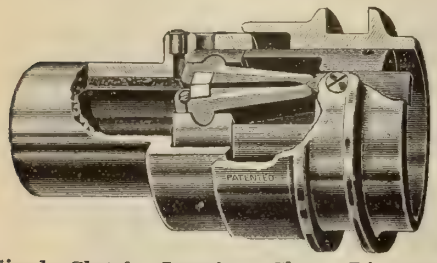

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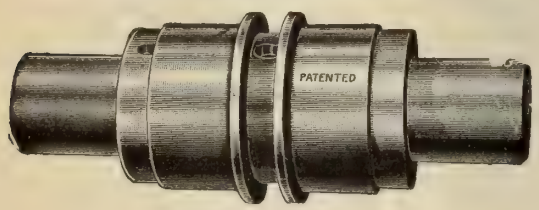

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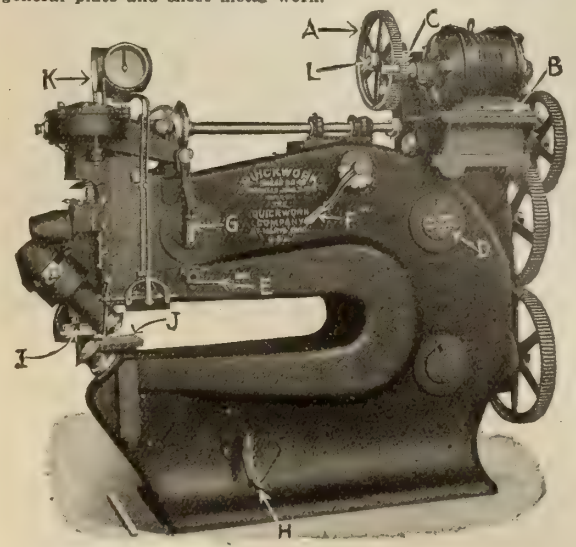

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Eliminates Oxyacetylene Cutting and Plate Planing.

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Tool Steel for Every Purpose

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Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc., Music Wire for Springs, Steel Balls. Cold Rolled Tool Steel in Strips and Sheets Circular Saws, Machine Knives.

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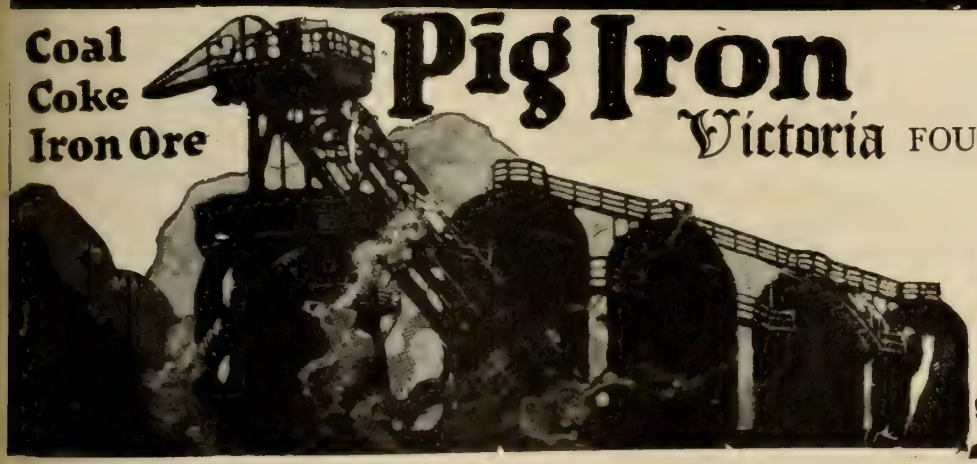

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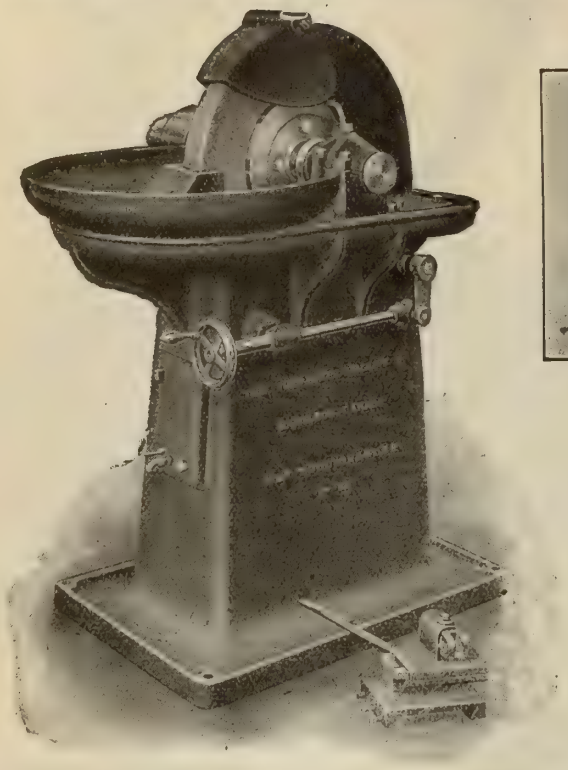

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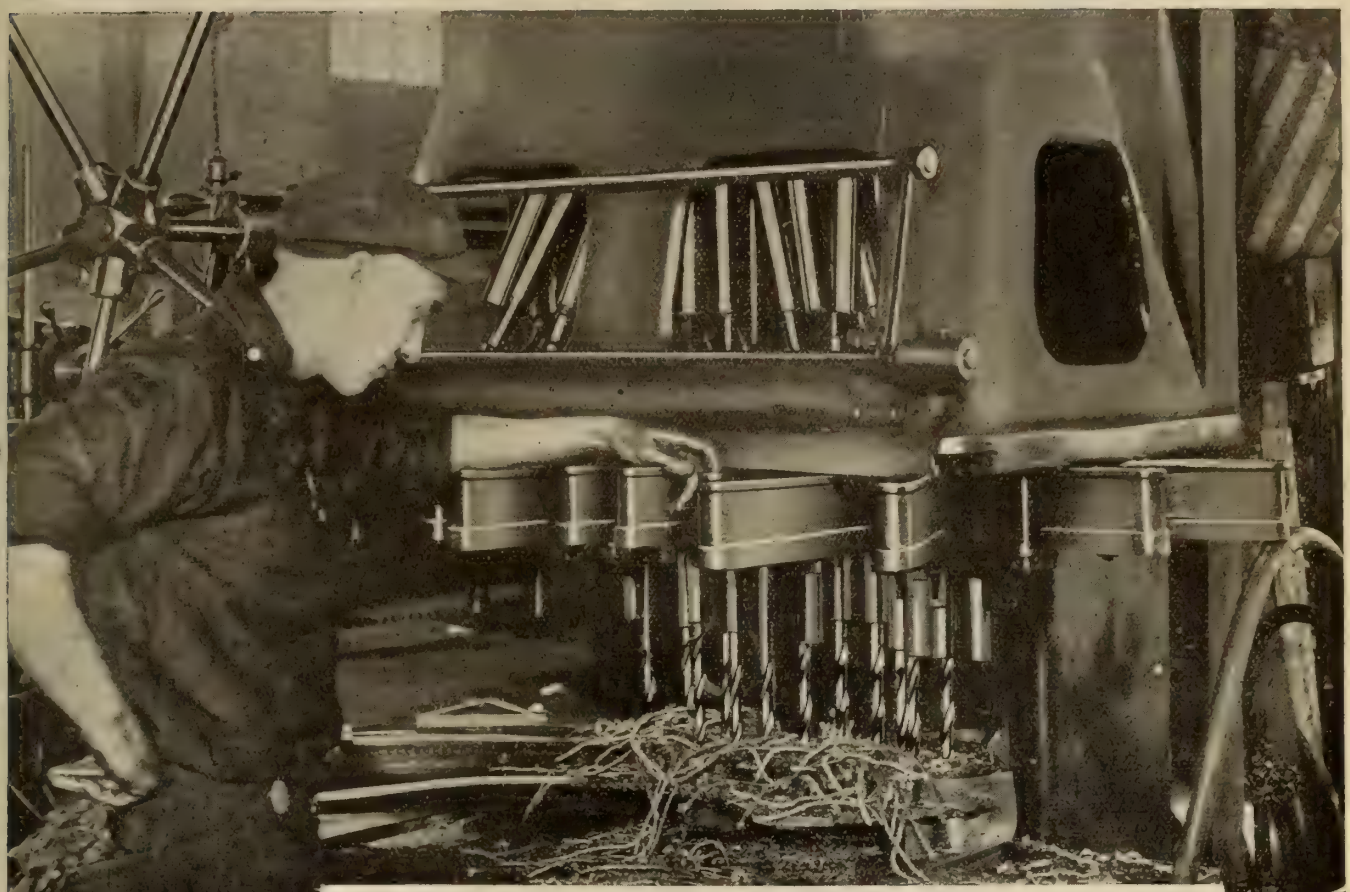

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"Most accurate and reliable—surely gets the work out." That's the verdict of the R. D. Nuttall Co., Pittsburgh, who has just become acquainted with NATCO possibilities.

The NATCO drills 12 holes 25-32 inch in diameter to a depth of 2¼ inches. Four of these holes are then countersunk. The piece is a Segment for gun carriage made of nickel steel, and the NATCO does the work at the rate of 18 pieces per day.

Reaming, recessing, tapping, spot-facing, are all within the NATCO range—and the NATCO multi-method has been one of the most prolific production factors where many holes of different dimensions are drilled, tapped, etc., into the same piece. The NATCO patented feature provides approximately the correct speed for each spindle.

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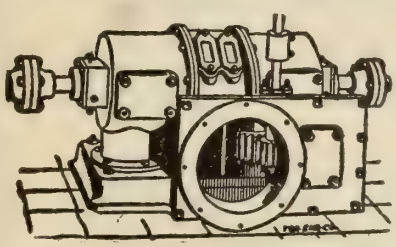

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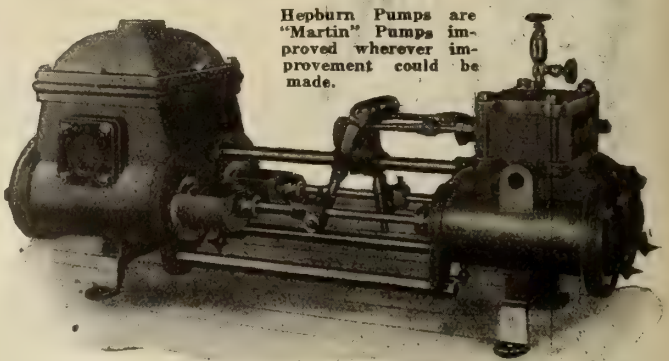

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"ARGO" BRAND *HIGH-SPEED* STEEL

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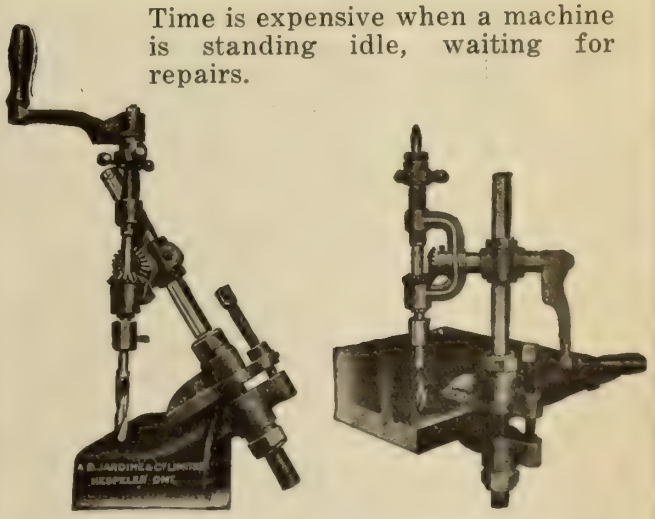
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

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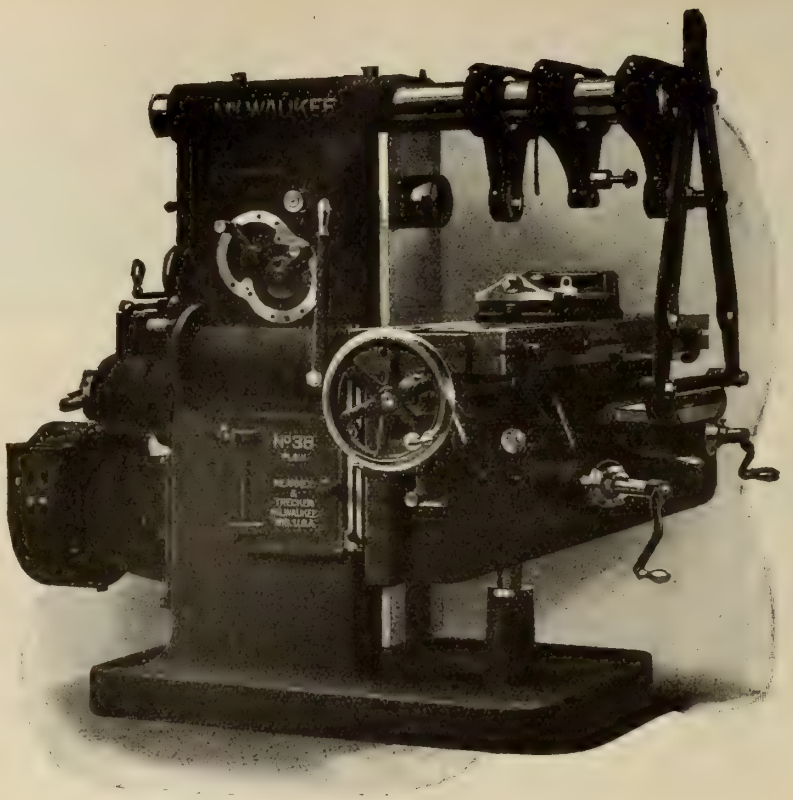


MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

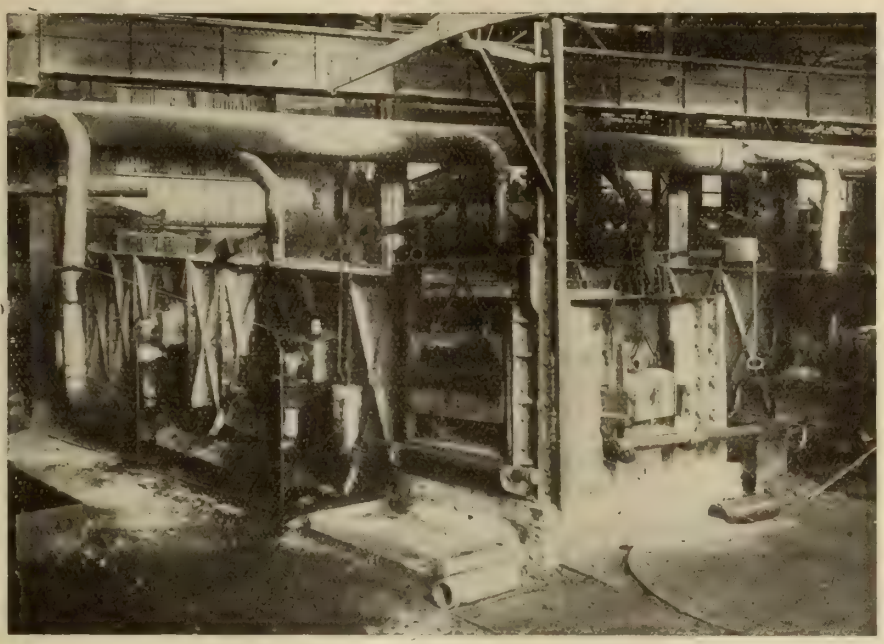
Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

KEARNEY & TRECKER CO.
MILWAUKEE, WIS. U.S.A.

Another MECOL Furnace

demonstrated its superior features poin by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges.



We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.

Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

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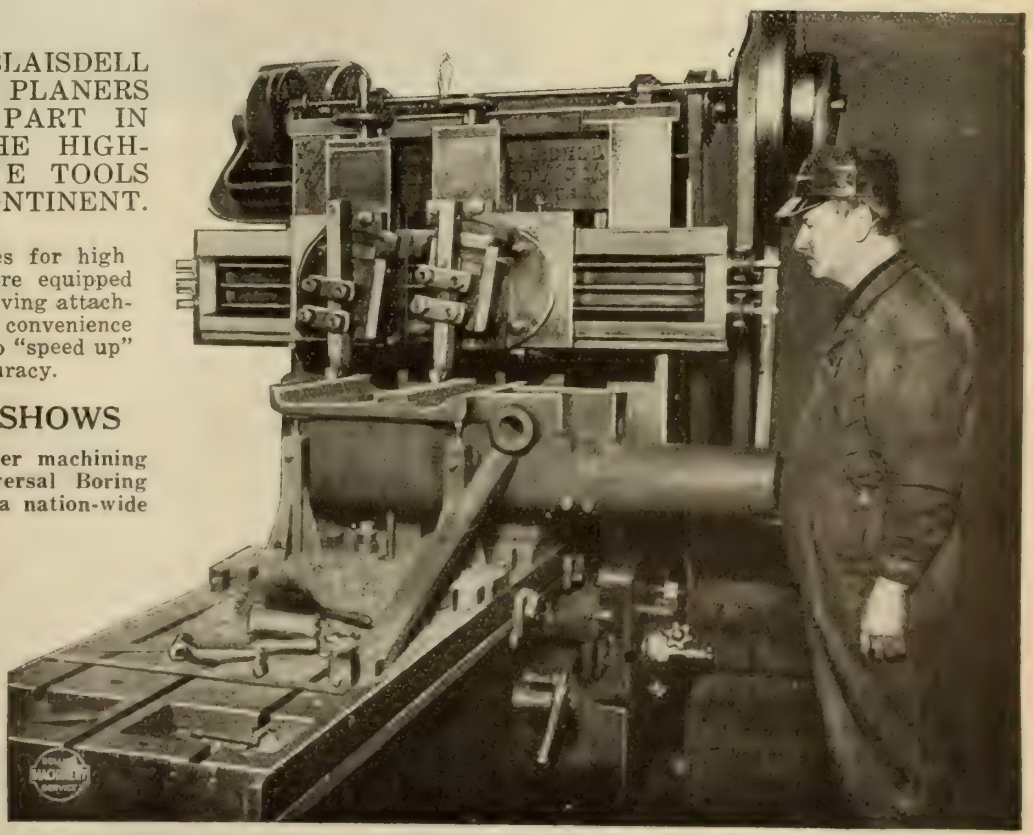
WHITCOMB-BLAISDELL LATHES AND PLANERS PLAY SOME PART IN THE MOST OF THE HIGH-GRADE MACHINE TOOLS MADE ON THE CONTINENT.

ALL-ROUND machines for high grade work, they are equipped with special labor-saving attachments that add to their convenience and enable the operator to "speed up" without endangering accuracy.

ILLUSTRATION SHOWS

a Whitcomb-Blaisdell Planer machining the head post of a Universal Boring Machine—a machine with a nation-wide reputation for accuracy.

May we send you our catalogue giving full particulars?



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guarantee perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
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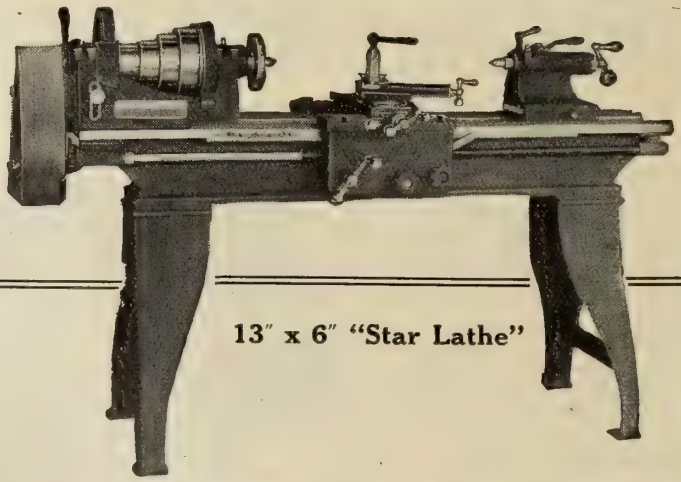

13" x 6" "Star Lathe"

"STAR" Lathes

STAR TRADE MARK REGISTERED

The Tool that makes Garage Work and General Repair Work more Profitable

This is a remarkably sturdy lathe for its size, and its ease of operation, handiness, and accuracy all make it an invaluable tool. It does the work of larger and costly machines at a much lower cost.

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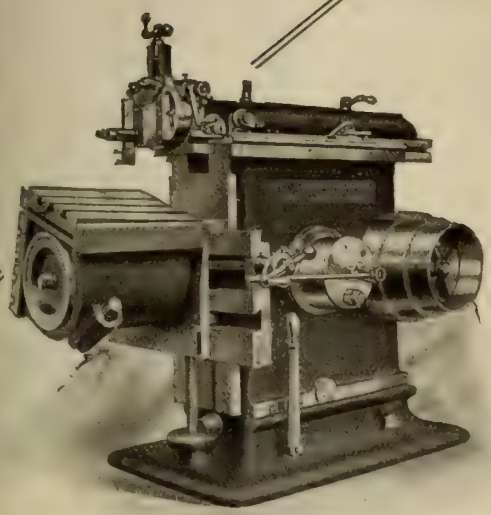

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15-INCH STROKE
24-INCH STROKE

The UNIVERSAL feature of these machines eliminates the necessity of special vises, fixtures, etc., and makes them especially adapted for—

Die Work—Tool Making — General Manufacturing Purposes.

Machines regularly furnished with:

Swivelling Graduated Table.
Auxiliary Tilting Side for Compound Angles.
Power Down Feed on any Angle with any variation of feed.
Automatic Feed Stop.
Graduated Collars on Tool Head Feed Screw and Table Feed Screw.
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Bulletin No. 38

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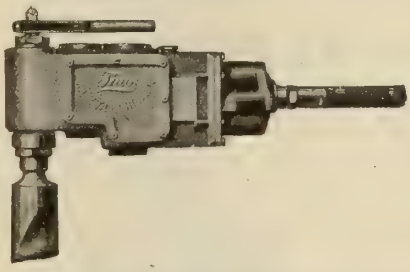
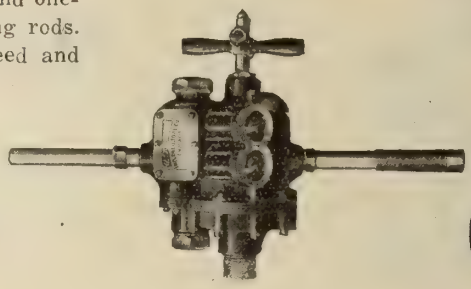
Pneumatic DRILLS and Hammers

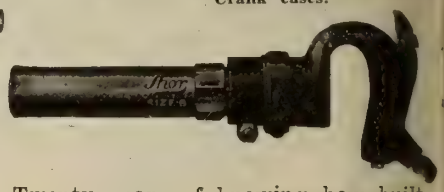
There is a Thor Tool made especially for your work. Try it—and watch it save you time and labor and increase your production.

Thor are the only air drills made in America having Corliss valves, roller bearings, and one-piece pressed Vanadium steel connecting rods. Also equipped with telescopic screw-feed and removable crank chamber plate.

No. 32-L Reversible Compound Piston Air Drill driving ⅜-inch studs in Motor Crank cases.







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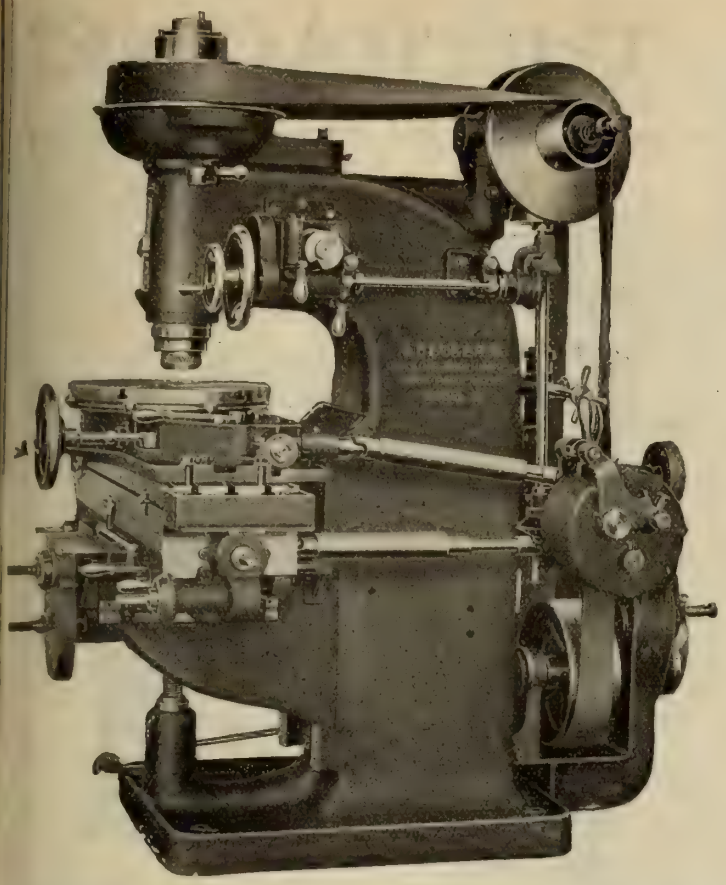

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"THE MACHINE THAT GIVES THE SMOOTH FINISH"

All gear driven spindles lack flexibility and induce vibration through the unavoidable progressive development of back lash between gears resulting in vibration and hammer action which has a crumbling effect upon the cutter teeth and leaves chatter marks on the finished work.

With the Becker Elastic Belt Drive this gearing is eliminated.

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It doesn't make a bit of difference whether it's threading screws or tapping axle housings, there's a NAMCO Threading Tool for every thread cutting requirement.

NAMCO Dies and Taps are simple in design, rigid in construction to cut threads true to specification on all classes of work.

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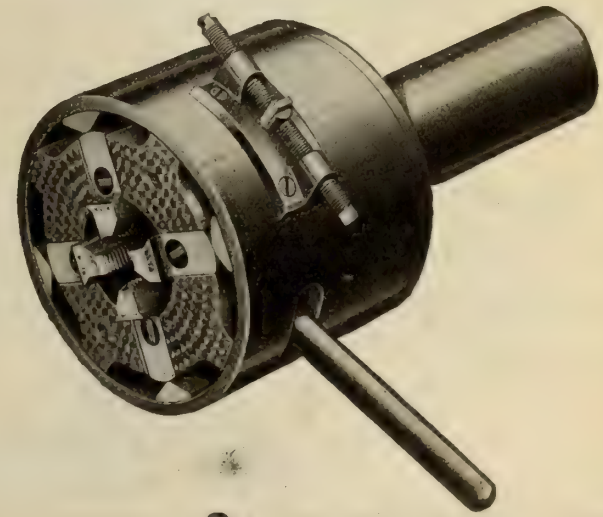

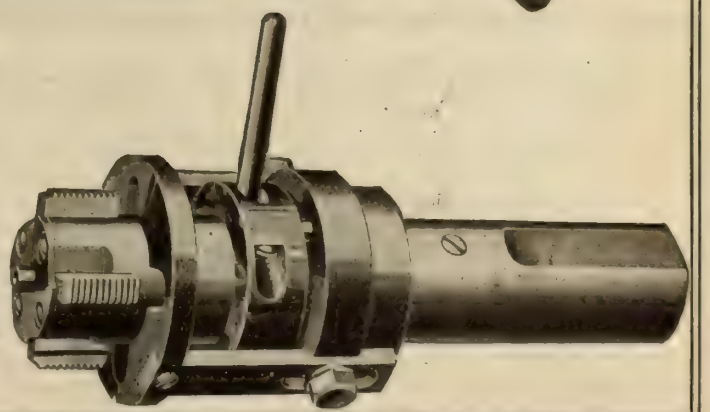

The National Acme Company
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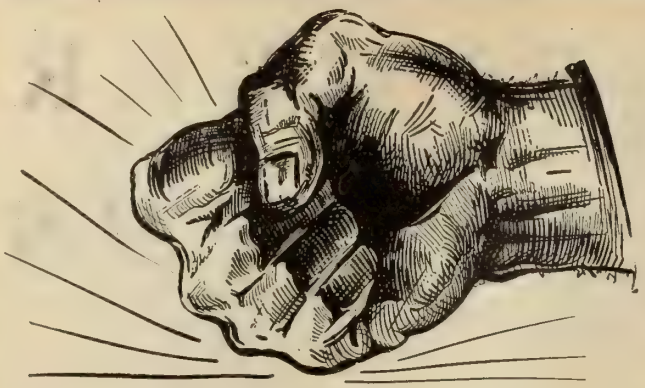
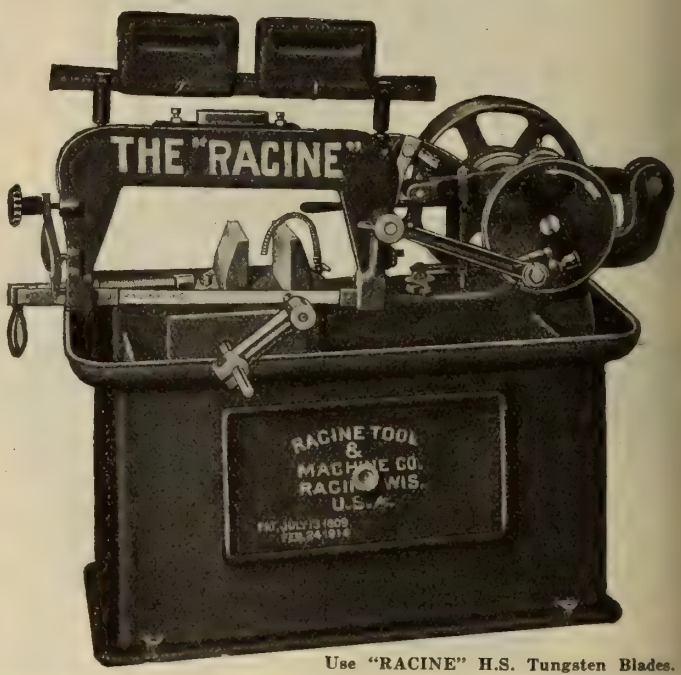


THE "RACINE"

puts PUNCH into Metal Cutting Operations



HAVE you a metal cutting proposition that needs more driving force? The "RACINE" High Speed Metal Cutting Machine is the machine you need! No other machine can approach it for putting **punch** into production. Patented automatic lifting device raises the blade on the return stroke, preventing dragging and strain on the non-cutting stroke. This means greater cutting speed as well as a saving in blades and a saving in power. **Can you afford to operate any other machine?**

With the "RACINE" use H.S. Tungsten Power Blades.

Standard the World Over

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Use "RACINE" H.S. Tungsten Blades.

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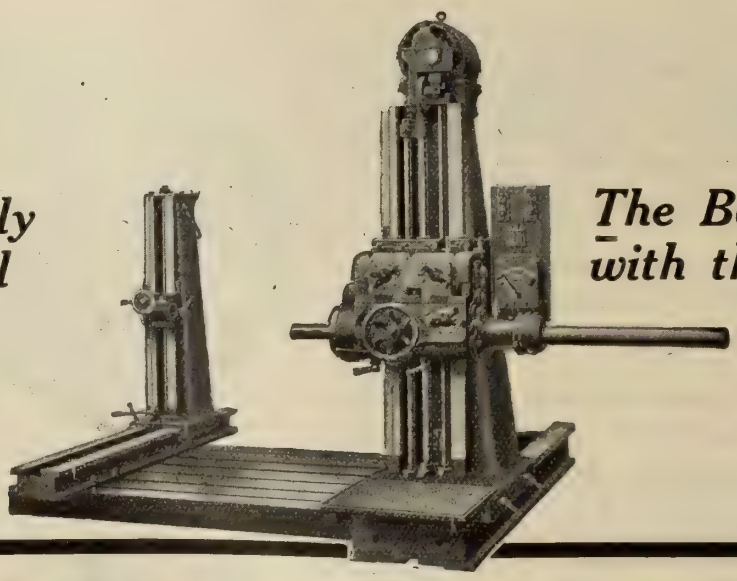
A Tremendously Successful Tool Durable and Accurate



The Boring Machine with the Powerful Spindle

DURABILITY (Defined) — Columns Sidebraced

in two directions and well proportioned for rigidity. Floor plate and runways of solid web construction and very stiffly ribbed. Bearings of high grade bronze, Gears and Shafts of chrome nickel steel and specially heat-treated—these are the features which contribute to the unequalled DURABILITY of this machine.

A machine possessing such DURABILITY and capable of as many as seven different operations on large work with only one chucking is the machine for intensive production.

Our Boring Machine Catalog gives complete data.

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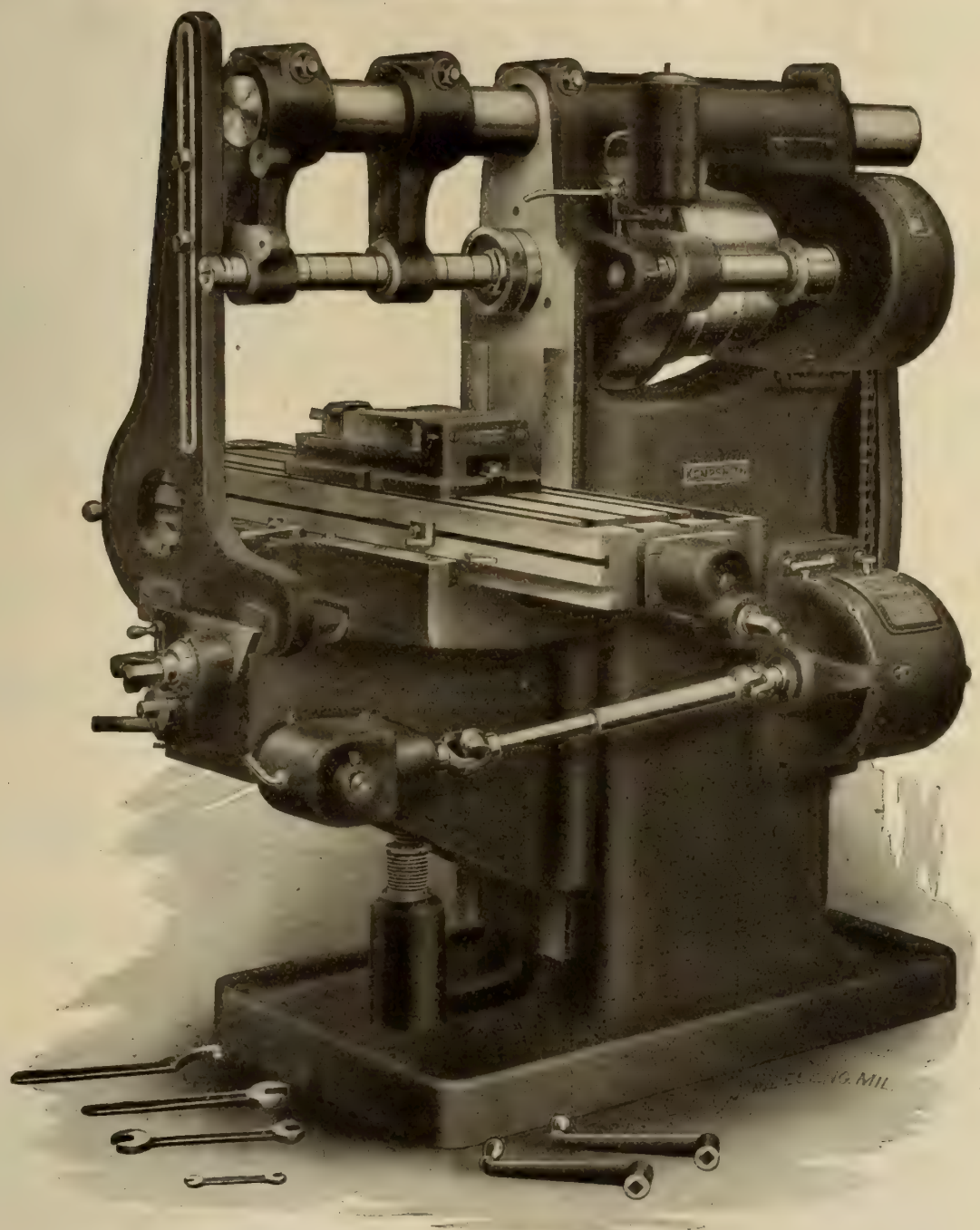

KEMPSMITH No. 3 Plain Milling Machine

Double Back Geared.

A heavy, powerful tool with double back gears and wide driving belt running on a three-step cone of large diameter. Our catalogue "B" describes and illustrates many notable features of the Kempsmith Miller. Write for a copy to-day.

THE KEMPSMITH MANUFACTURING CO.

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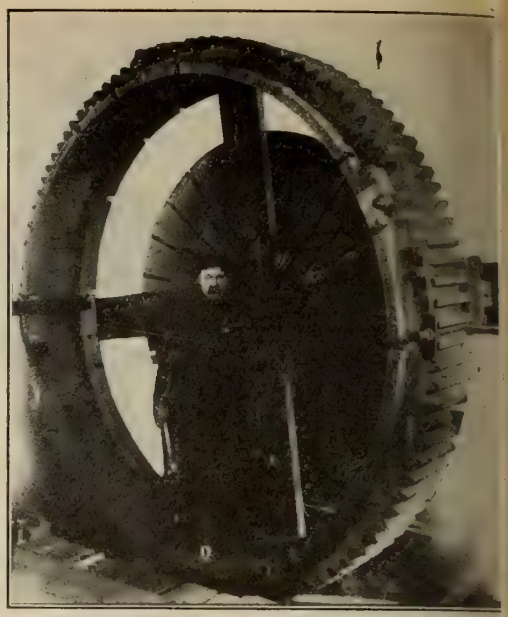

"HISCO" Moulded Gears

WHY pay for expensive patterns when you install new machinery that necessitates special gears? "HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber and labor is something to be considered.

THE "HISCO" plant is equipped to produce machine-moulded gears up to 18 feet in diameter without patterns—and remember, very often the pattern costs more than the gears. *Write for our Estimates.*

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HULL - - CANADA

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Drilling Machines

The Henry & Wright Mfg. Co.
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HAVE WORLD WIDE REPUTATION
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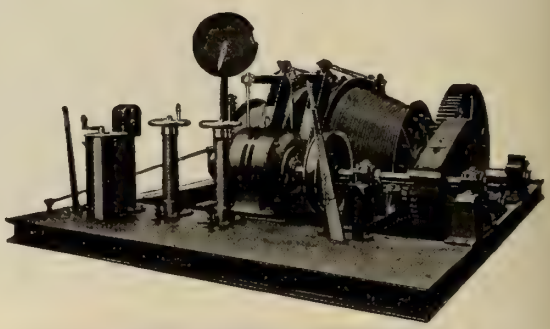
"RELIABILITY"



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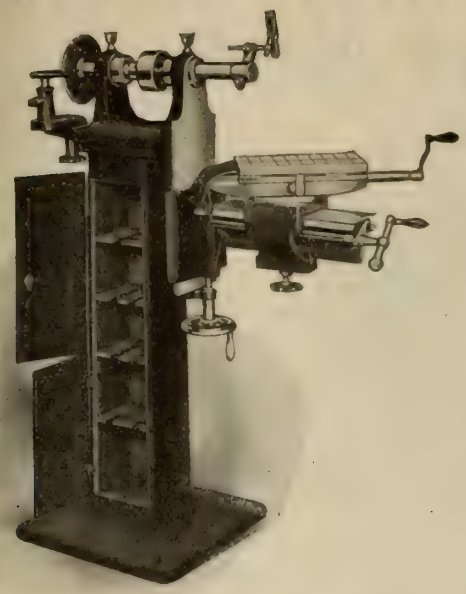

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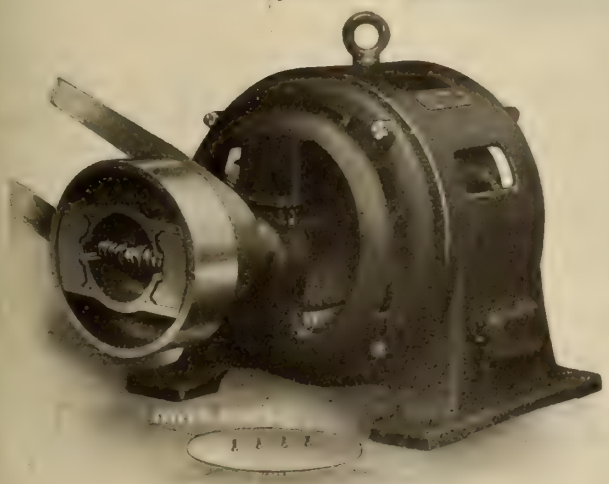

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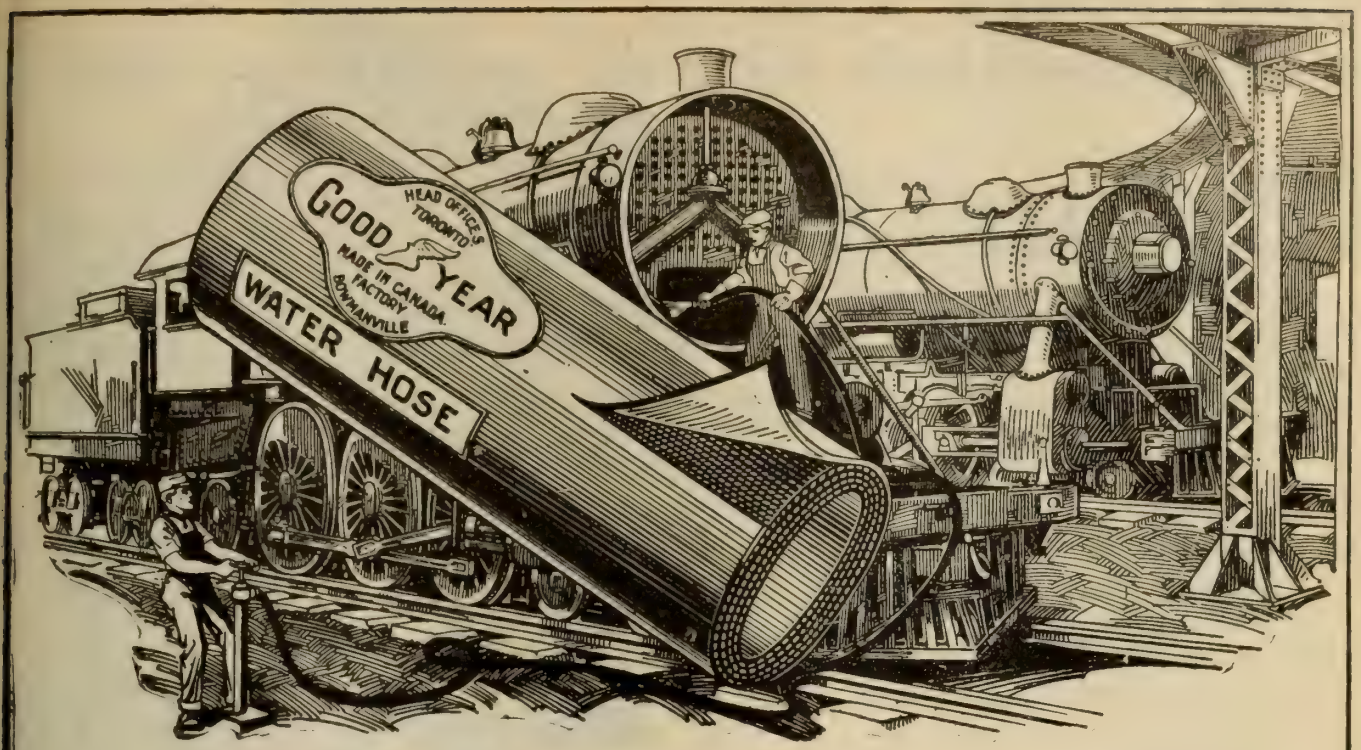

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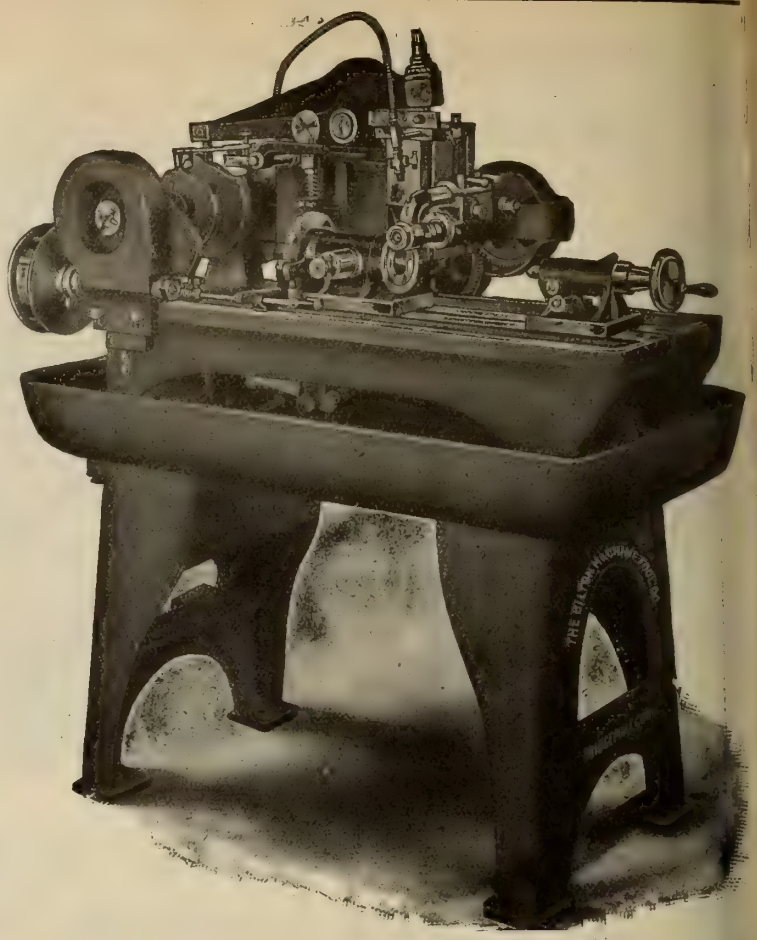

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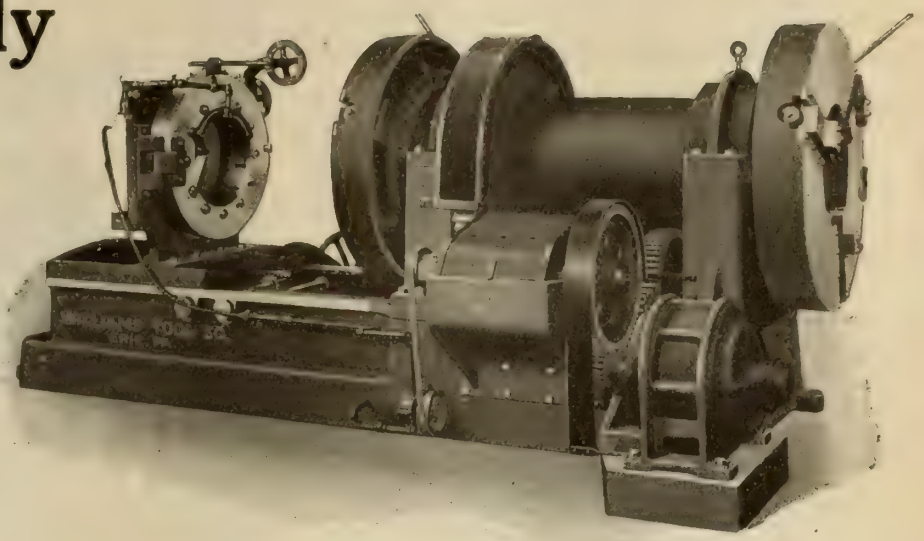

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No. 53A

OPERATING SPEEDS FOR SNAGGING CASTINGS

GENERALLY SPEAKING, the correct speed for grinding wheels in snagging castings is between 5,000 and 6,000 surface feet per minute. This is fairly well established and quite generally accepted by the manufacturers of grinding wheels. This range was determined partly by years of experience and partly by physical laws and the desire for an adequate factor of safety. All snagging wheels made by reliable manufacturers are subjected to a speed test just before they are packed for shipment that generates a centrifugal stress many times in excess of the stress prevailing under the recommended operating speed. In the case of the Norton Company, this tested factor of safety runs from 2¼ to 3¼. This, then, is the first limiting factor to wheel speed.

Furthermore, it has been shown that there is no appreciable gain from faster speeds; at least, not enough to offset certain drawbacks. It should be further remembered that the grinding wheel is made to operate at approximately the recommended speeds and any appreciable deviation calls for adjustments that are not always easy to make nor are they conducive to efficiency.

It is necessary to keep the speed of the grinding wheel approximately within the recommended range, if its productive capabilities are to be maintained. It has been demonstrated that if a wheel's speed is allowed to fall to a very low level, or if it is speeded up beyond a certain point, reduced cutting ability for the same amount of effort expended is the result. In the case of a sub-normal wheel speed, not only does the productive capacity fall off, but there is excessive wheel wear.

To illustrate this point, let us consider the case of an 18-in. wheel, grain 10, grade U Alundum, for snagging steel castings. At 1,175 revolutions per minute its peripheral speed is 5,500 surface feet per minute, and it cuts and wears satisfactorily. If the revolutions remain the same, at 11 inches diameter, the surface speed is 3,500 feet. What is the result? Every cutting grain on the face of a revolving grinding wheel has a definite amount of energy stored up in it. It is the expenditure of this energy that enables the grain to do useful work and remove metal. Now the energy available varies as the square of the surface speed. Therefore, at 11 inches diameter, the cutting grains deliver only 40 per cent. of the energy that they did at 18 inches diameter and they cannot be expected, therefore, to grind as rapidly. Also, because of the decreased energy it is less capable of withstanding the resistance offered by the steel and hence is more readily torn from its setting. This, then, explains the difficulty that will be encountered in attempting to grind at very low surface speeds.

In order to keep this same wheel operating at highest efficiency, the wheel speed should be increased at about 13 inches to 1,700 revolutions per minute. By doing this the surface speed as the wheel wears from 18 to 13 inches varies from 5,500 to 4,000 surface feet per minute, and in wearing from 18 to 9 inches the variation is from 5,700 to 4,000.

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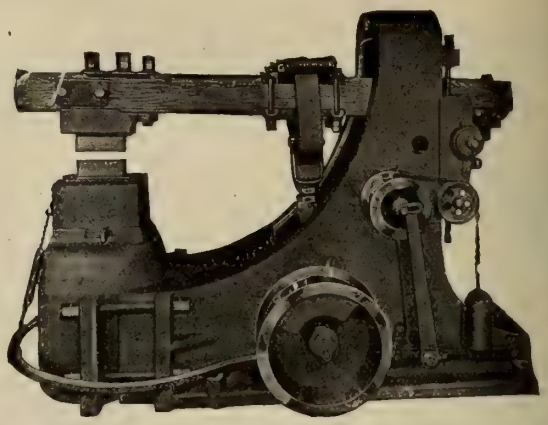

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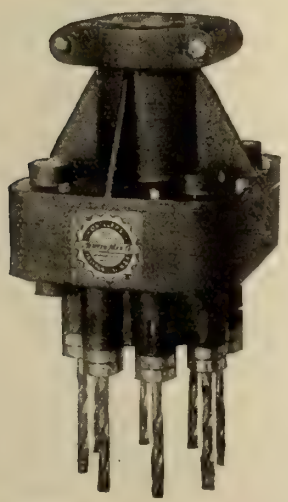

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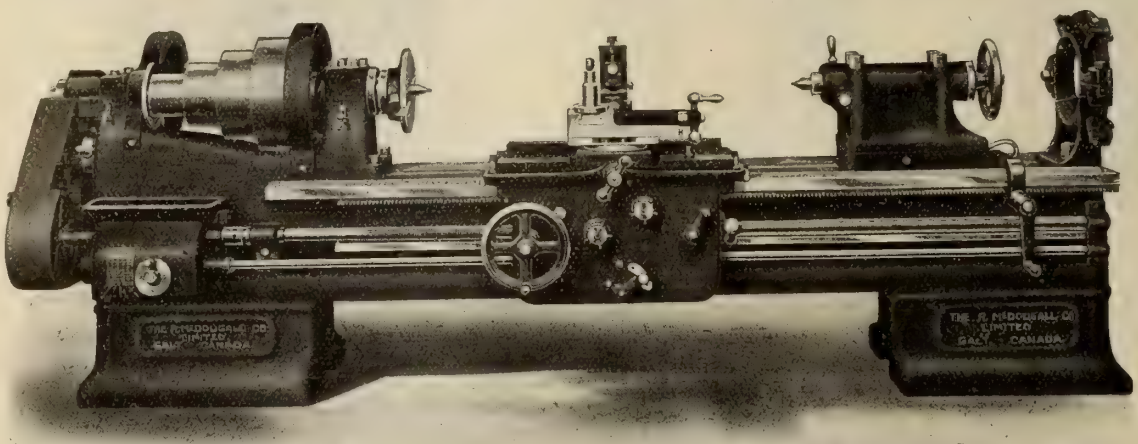

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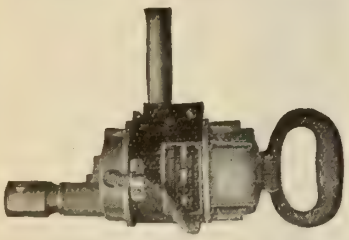

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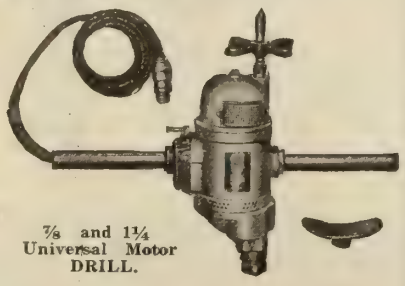

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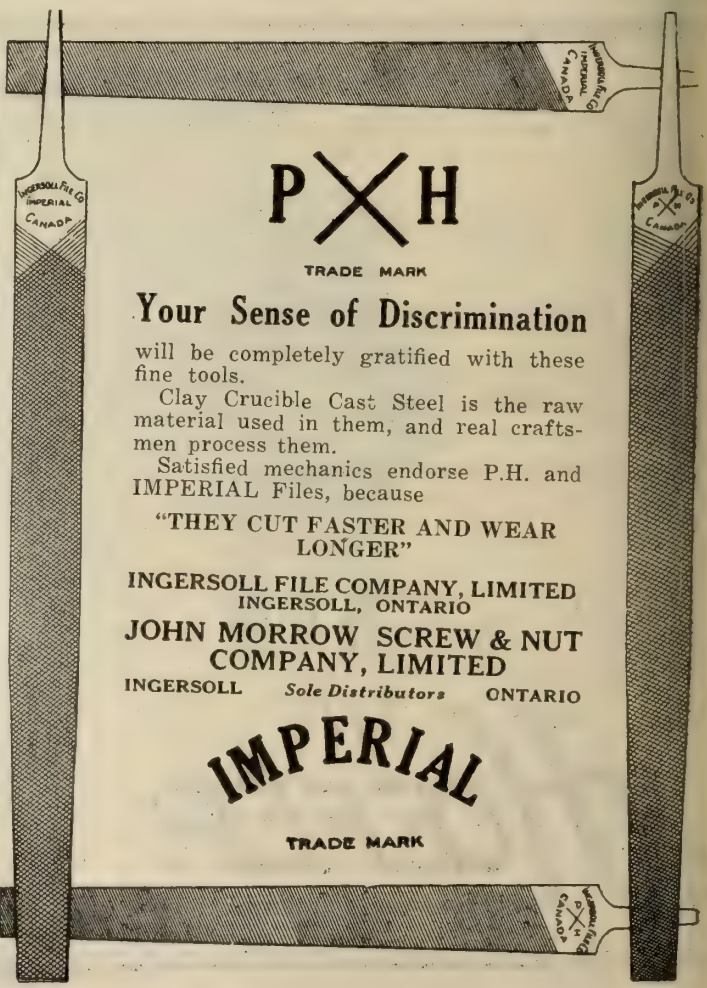

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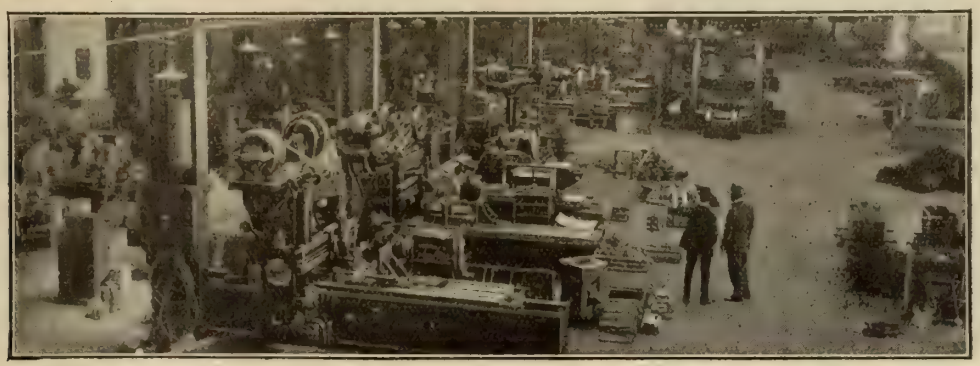

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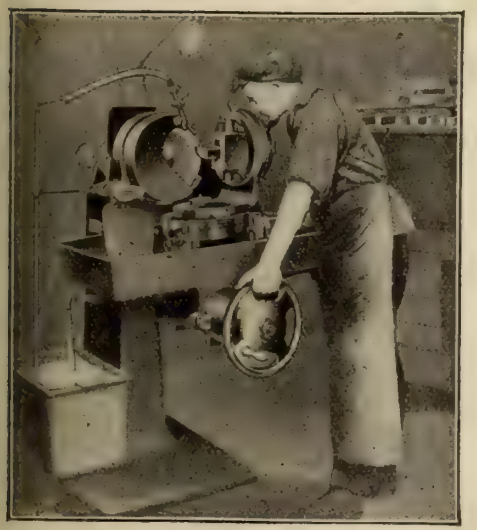

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXII. No. 24 December 11, 1919

Broaching as an Aid to Greater Production

The Second of a Series on This Subject. The Combinations Used in the Production of Broaching Work, Together With Views of Various Types of Broaching Machines, Are Described Herein

By FRANK H. MAYO

HAVING described in the previous section of this article some of the details and variations of design incident to broaching, a few illustrations showing combinations used in the production of broached work are here shown, also various types of broaching machines are shown, of which Fig. 14 illustrates a draw broaching machine of the type commonly employed for pulling a broach through the work. This machine is made in a number of sizes, and operates horizontally in the following manner:

A nut A is caused to revolve forward and reverse by means of gears and clutch, and this nut draws the screw B transversely forward and back; at C, a tool slide is attached to the screw, and to this slide the broaches are attached. The work is held against the face plate D, or in a suitable fixture, and the broaches, operating through this plate, broach the work inside or on the outside, as the case may be. On some types of broaching machines, in place of a nut and screw, a rack and pinion are used to draw the broach; the principle involved in such a construction is illustrated by Fig. 15, where the pinion A, travelling forward and reverse, operates the rack B, which has attached to it at C a tool slide. By the use of either

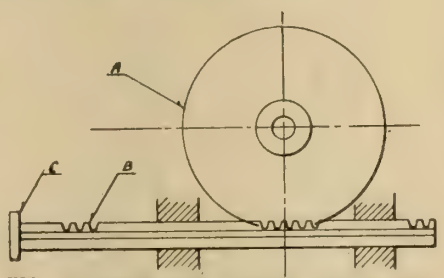


FIG. 15—RACK AND PINION DRIVE FOR BROACH

of these machines, the broaches are drawn slowly through the work at the proper cutting speed, and a quick return for the same is provided by the gearing and reversing mechanism. It is claimed for the screw-and-nut arrangement, that it is smoother acting than when a rack and pinion are used, and the screw and nut is the construction most universally employed.

In Fig. 16, a type of machine used for cutting keyways is illustrated. This is a vertical-stroke machine, and works more on the principle of a slotter. The work is held on the upper plate A, while the cutter bar B is operated from below by suitable reciprocating mechanism.

A very cheap machine often resorted to for an occasional job of broaching on small work is the arbor press, and Fig. 17 shows a small bench press where the work is held on A, either in a fixture or not, while the broaches, which are usually short, are pushed through by the ram B, which is in turn operated by the lever C attached to a pinion that meshes in a rack on the ram. This illustrates the principle of push broaching, whether it be carried out on a punch press, hydraulic press, or any common type of press.

A small horizontal push broaching machine, having a screw and nut as the operating medium, is shown by Fig. 18. This takes the form of a bench lathe, the work A being gripped in a chuck B, which is held to a stationary spindle; this spindle has a hole in it, through which the broaches pass. The broaches

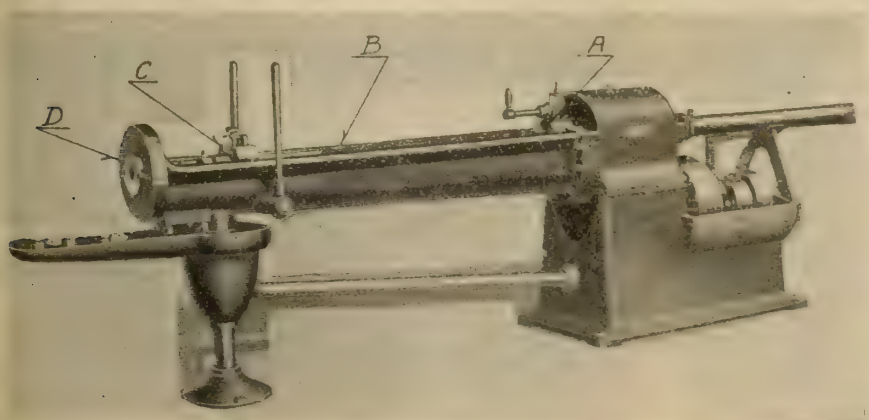


FIG. 14—BROACHING MACHINE USED FOR DRAW BROACHING.

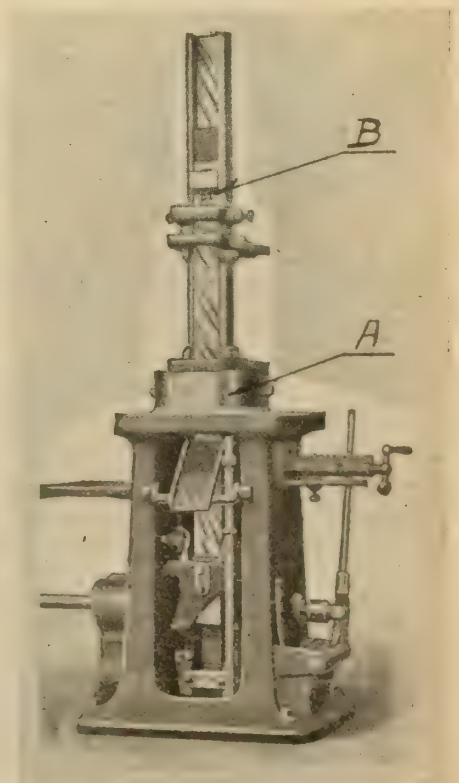


FIG. 16—VERTICAL TYPE OF MACHINE USED FOR BROACHING.

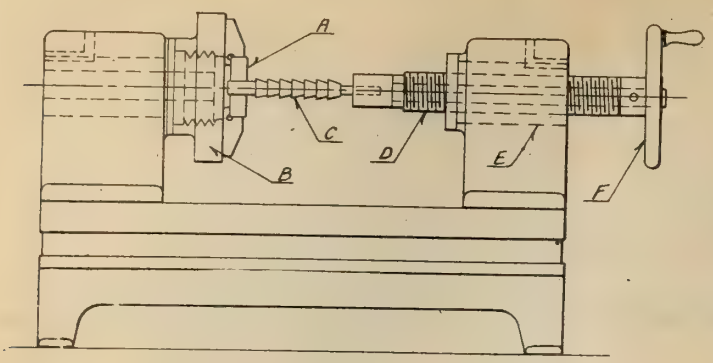


FIG. 18—SMALL PUSH BROACHING MACHINE.

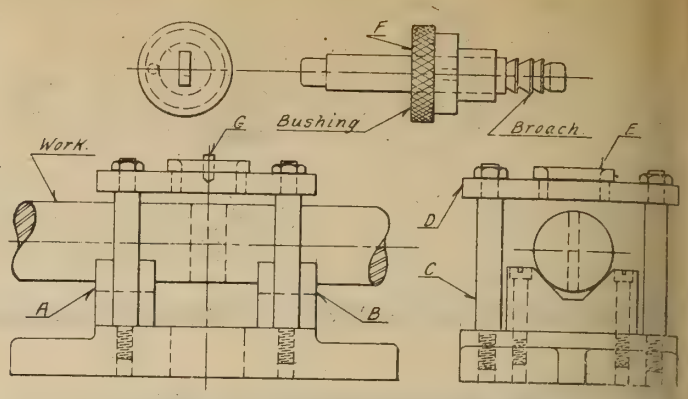


FIG. 19—FIXTURE FOR PUSH BROACHING RECTANGULAR HOLE.

C are pushed through the work by the screw D operating in the fixed nut E, a handwheel F being used to revolve the screw.

Fig. 19 shows a fixture that was used on a press for push broaching, an elongated hole which passes through a round bar, and also illustrates the type of broaches and guide bushings used in this connection. Referring to the illustration, the work is held between two vee blocks A and B, no clamps or other means being used to hold it in place. Four studs C carry a plate D, which contains a fixed bushing E. Slip bushings F, containing different sizes of broaches, are successively put in place in the fixed bushing E, and these broaches have short pilots on them which enter the work and locate it in line with the bushing. This hole is first drilled out and the broaches trim the sides and square the corners of the hole. To locate the slip bushings in the proper radial location, a pin G is provided, which enters a hole in the slip bushings. These broaches have three cutting edges, and the upper portion is a slip fit in the bushing.

For cutting vee slots in the outside

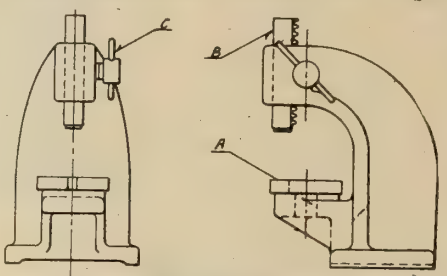
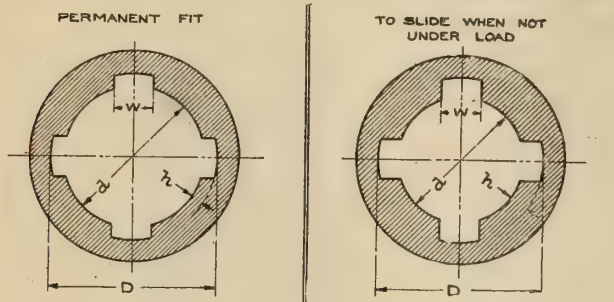


FIG. 17—ARBOR PRESS SOMETIMES USED FOR BROACHING.

of a round piece, a built-up broach, such as that shown in Fig. 20, may sometimes be used to good advantage; this broach is used on a press in connection with four others. The two vee-shaped slots in the work run by the neck, the broaches A are held in a suitable holder B, and the work is pushed through the broaches by the ram of the press. The views at the right of Fig. 20 show how a number of discs (five in this case) are fastened together by screws and dowels, each disc being backed off to form a tooth, thereby making a progressive broach. In the view showing the work in place, the broach illustrated is of the plain type, and would have but one cutting edge, and by comparing this with the built-up type, the advantage of the five cutting edges over the one is readily apparent.

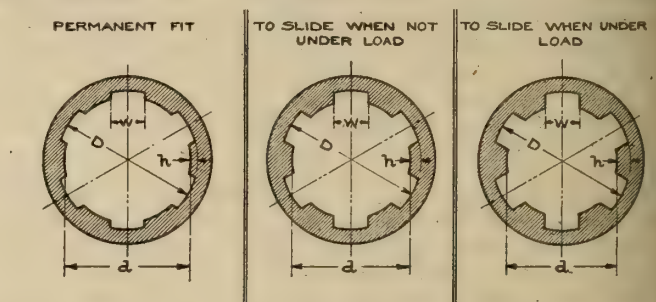
Another feature sometimes incorporated in this style of external broach, is a recess at the upper end, to act as a pilot when starting the work through the broach. In connection with broaching practice, the tables of splines, Figs. 21, 22 and 23 are of interest, also the table



NOMINAL DIA.	PERMANENT FIT D	d	w	h	T	TO SLIDE WHEN NOT UNDER LOAD D	d	w	h	T
	w = .241 D, h = .075 D, d = .850 D					w = .241 D, h = .125 D, d = .750 D				
3/4	.750	.637	.181	.056	78	.750	.562	.181	.094	123
	.749	.636	.180	.055		.749	.561	.180	.093	
7/8	.875	.744	.211	.066	107	.875	.656	.211	.109	167
	.874	.743	.210	.065		.874	.655	.210	.108	
1	1.000	.850	.241	.075	139	1.000	.750	.241	.125	219
	.999	.849	.240	.074		.999	.749	.240	.124	
1 1/8	1.125	.956	.271	.084	175	1.125	.844	.271	.141	277
	1.124	.955	.270	.083		1.124	.843	.270	.140	
1 1/4	1.250	1.062	.301	.094	217	1.250	.937	.301	.156	341
	1.249	1.061	.300	.093		1.249	.936	.300	.155	
1 3/8	1.375	1.169	.331	.103	262	1.375	1.031	.331	.172	414
	1.374	1.168	.330	.102		1.374	1.030	.330	.171	
1 1/2	1.500	1.275	.361	.112	311	1.500	1.125	.361	.187	491
	1.499	1.274	.360	.111		1.499	1.124	.360	.186	
1 5/8	1.625	1.381	.391	.122	367	1.625	1.219	.391	.203	577
	1.624	1.380	.390	.121		1.624	1.218	.390	.202	
1 3/4	1.750	1.487	.422	.131	424	1.750	1.312	.422	.219	670
	1.749	1.486	.421	.130		1.749	1.311	.421	.218	
2	2.000	1.700	.482	.150	555	2.000	1.500	.482	.250	875
	1.998	1.698	.480	.148		1.998	1.498	.480	.248	
2 1/4	2.250	1.912	.542	.169	703	2.250	1.687	.542	.281	1106
	2.248	1.910	.540	.167		2.248	1.685	.540	.279	
2 1/2	2.500	2.125	.602	.187	865	2.500	1.875	.602	.312	1365
	2.498	2.123	.600	.185		2.498	1.873	.600	.310	
3	3.000	2.550	.723	.225	1249	3.000	2.250	.723	.375	1969
	2.998	2.548	.721	.223		2.998	2.248	.721	.373	

T = 1000 X 4 X Mean R X h X l = INCH-POUNDS TORQUE CAPACITY PER INCH BEARING LENGTH AT 1000 LBS. PRESSURE PER SQUARE INCH ON SIDES OF SPL. NO ALLOWANCE IS MADE FOR RADII ON CORNERS NOR FOR CLEARANCES.

FIG. 21—TABLE OF S.A.E. FOUR SPLINE FITTING.



NOMINAL DIA.	PERMANENT FIT D	d	w	T	TO SLIDE WHEN NOT UNDER LOAD D	d	w	T	TO SLIDE WHEN UNDER LOAD D	d	w	T
	w = .25 D, h = .05 D, d = .90 D				w = .25 D, h = .075 D, d = .85 D				w = .25 D, h = .10 D, d = .80 D			
3/4	.750	.675	.188	80	.750	.638	.188	117	.750	.600	.188	152
	.749	.674	.187		.749	.637	.187		.749	.599	.187	
7/8	.875	.788	.219	109	.875	.744	.219	159	.875	.700	.219	207
	.874	.787	.218		.874	.743	.218		.874	.699	.218	
1	1.000	.900	.250	143	1.000	.850	.250	208	1.000	.800	.250	270
	.999	.899	.249		.999	.849	.249		.999	.799	.249	
1 1/8	1.125	1.013	.281	180	1.125	.956	.281	263	1.125	.900	.281	342
	1.124	1.012	.280		1.124	.955	.280		1.124	.899	.280	
1 1/4	1.250	1.125	.313	223	1.250	1.063	.313	325	1.250	1.000	.313	421
	1.249	1.124	.312		1.249	1.062	.312		1.249	.999	.312	
1 3/8	1.375	1.238	.344	269	1.375	1.169	.344	393	1.375	1.100	.344	510
	1.374	1.237	.343		1.374	1.168	.343		1.374	1.099	.343	
1 1/2	1.500	1.350	.375	321	1.500	1.275	.375	468	1.500	1.200	.375	608
	1.499	1.349	.374		1.499	1.274	.374		1.499	1.199	.374	
1 5/8	1.625	1.463	.406	376	1.625	1.381	.406	550	1.625	1.300	.406	713
	1.624	1.462	.405		1.624	1.380	.405		1.624	1.299	.405	
1 3/4	1.750	1.575	.438	436	1.750	1.488	.438	637	1.750	1.400	.438	827
	1.749	1.574	.437		1.749	1.487	.437		1.749	1.399	.437	
2	2.000	1.800	.500	570	2.000	1.700	.500	833	2.000	1.600	.500	1080
	1.998	1.798	.498		1.998	1.698	.498		1.998	1.598	.498	
2 1/4	2.250	2.025	.563	721	2.250	1.913	.563	1052	2.250	1.800	.563	1367
	2.248	2.023	.561		2.248	1.912	.561		2.248	1.798	.561	
2 1/2	2.500	2.250	.625	891	2.500	2.125	.625	1300	2.500	2.000	.625	1688
	2.498	2.248	.623		2.498	2.123	.623		2.498	1.998	.623	
3	3.000	2.700	.750	1283	3.000	2.550	.750	1873	3.000	2.400	.750	2430
	2.998	2.698	.748		2.998	2.548	.748		2.998	2.398	.748	

T = 1000 X 6 X Mean R X h X l = INCH-POUNDS TORQUE CAPACITY PER INCH BEARING LENGTH AT 1000 LBS. PRESSURE PER SQUARE INCH ON SIDES OF SPLINES. NO ALLOWANCE IS MADE FOR RADII ON CORNERS NOR FOR CLEARANCES.

FIG. 22—TABLE OF S.A.E. SIX SPLINE FITTINGS.

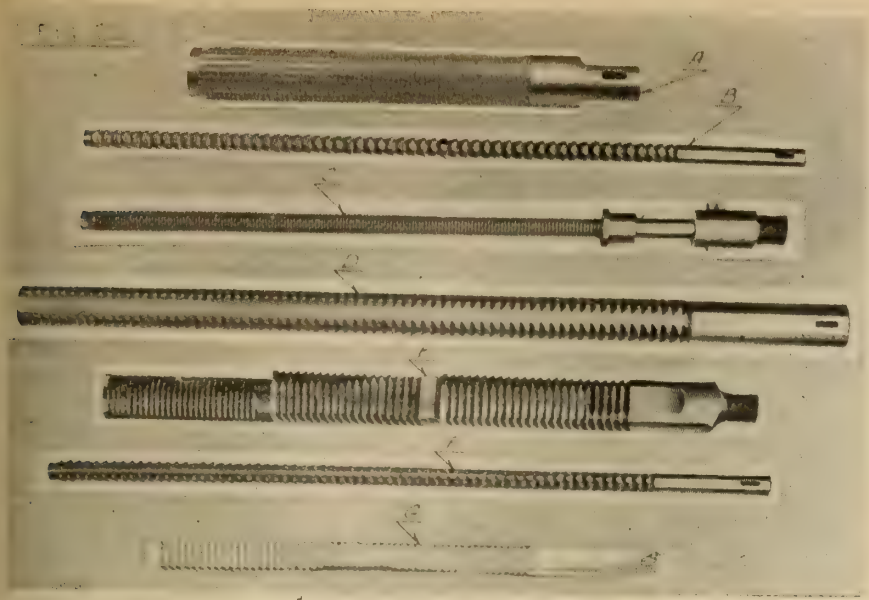


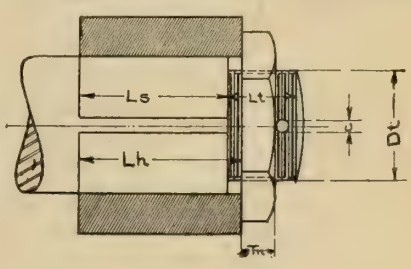
FIG. 26—ILLUSTRATIONS SHOWING VARIOUS TYPES OF BROACHES.

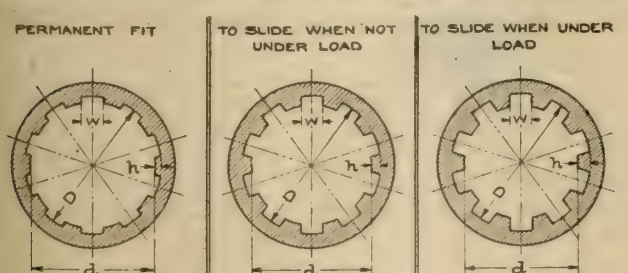
of squares, Fig. 24. These are the Society of Automobile Engineers standard practice, and broaches for cutting the same are carried in stock by some broach makers. In Fig. 21, it will be noticed that the table gives dimensions for four splines to "permanently fit" on shaft and "to slide when not under load," while the tables, Figs. 22 and 23, give three styles of fit. The table of squares, Fig. 24, gives sizes for "permanent fits," and also for "slip fits."

On draw broaching machines, the tool slide is a very important unit, as it must be very substantially made, and a view of a tool slide is shown by Fig. 25. This illustrates the method of gripping the broach-holding units, which were shown in the first part of this article; this is taken care of by threading them into the sliding block A, which is adjustable, to bring the broach in the proper relation to the work by means of the screw B; a square-headed screw C locks the broach holder, and this illustration shows a split broach holder D in position. Two slots E, one shown and one at the opposite side, fit over slides on the machine and prevent the screw of the machine and slide from turning, while at the same time supporting the slide and broach contained therein. The lug F, which carries the plug G, is so located that it engages with trips which control the travel of the screw on the machine.

A typical group of broaches of varied design are illustrated by Fig. 26, the upper one of which is of the type commonly employed to broach internal gears, it being indicated as A and shaped like a spur gear with teeth increasing from nothing to the full depth of the gear tooth spaces; at B a broach for a hexagonal hole is shown; C illustrates a broach for a round hole to replace a reamer; D is a large square broach; E is a special broach for forming an arc; F is a grooving broach of the type used for cutting splines; while the lower broach G is for finishing a rectangular slot. Broaches of the latter type are frequently made with the teeth on opposite sides, sloping diagonally opposite, as this makes a stronger tool, with the advantage of a shear cut, more teeth are thus working at the same time, and the angles should be so made that they neutralize the side thrust on the broach when cutting.

Among the common accomplishments

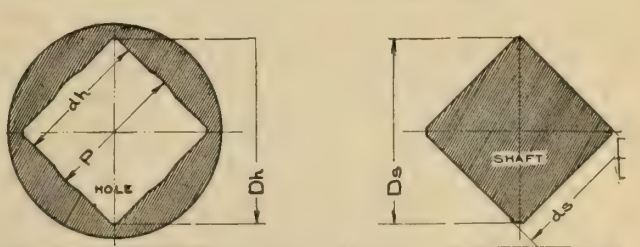




	PERMANENT FIT					TO SLIDE WHEN NOT UNDER LOAD					TO SLIDE WHEN UNDER LOAD				
NOMINAL DIA.	D	d	w	T		D	d	w	T		D	d	w	T	
			w = .156 D h = .045 D d = .91 D					w = .156 D h = .07 D d = .86 D					w = .156 D h = .095 D d = .81 D		
3/4	.750	.683	.117	120		.750	.645	.117	183		.750	.608	.117	241	
	.744	.682	.116			.749	.644	.116			.749	.607	.116		
7/8	.875	.796	.137	165		.875	.753	.137	248		.875	.709	.137	329	
	.874	.795	.136			.874	.752	.136			.874	.708	.136		
1	1.000	.910	.156	215		1.000	.860	.156	326		1.000	.810	.156	430	
	.999	.909	.155			.999	.859	.155			.999	.809	.155		
1 1/8	1.125	1.024	.176	271		1.125	.968	.176	412		1.125	.911	.176	545	
	1.124	1.023	.175			1.124	.967	.175			1.124	.910	.175		
1 1/4	1.250	1.138	.195	336		1.250	1.075	.195	508		1.250	1.013	.195	672	
	1.249	1.137	.194			1.249	1.074	.194			1.249	1.012	.194		
1 3/8	1.375	1.251	.215	406		1.375	1.183	.215	614		1.375	1.114	.215	813	
	1.374	1.250	.214			1.374	1.182	.214			1.374	1.113	.214		
1 1/2	1.500	1.365	.234	483		1.500	1.290	.234	732		1.500	1.215	.234	967	
	1.499	1.364	.233			1.499	1.289	.233			1.499	1.214	.233		
1 5/8	1.625	1.479	.254	566		1.625	1.398	.254	860		1.625	1.316	.254	1135	
	1.624	1.478	.253			1.624	1.397	.253			1.624	1.315	.253		
1 3/4	1.750	1.593	.273	658		1.750	1.505	.273	997		1.750	1.418	.273	1316	
	1.749	1.592	.272			1.749	1.504	.272			1.749	1.417	.272		
2	2.000	1.820	.312	860		2.000	1.720	.312	1302		2.000	1.620	.312	1720	
	1.998	1.818	.310			1.998	1.718	.310			1.998	1.618	.310		
2 1/4	2.250	2.046	.351	1088		2.250	1.935	.351	1647		2.250	1.823	.351	2176	
	2.248	2.046	.349			2.248	1.933	.349			2.248	1.821	.349		
2 1/2	2.500	2.275	.390	1343		2.500	2.150	.390	2034		2.500	2.025	.390	2688	
	2.498	2.273	.388			2.498	2.148	.388			2.498	2.023	.388		
3	3.000	2.730	.468	1934		3.000	2.580	.468	2929		3.000	2.430	.468	3869	
	2.998	2.728	.466			2.998	2.578	.466			2.998	2.428	.466		

T = 1000 X 10 X MEAN R X h X 1 = INCH-POUNDS TORQUE CAPACITY PER INCH BEARING LENGTH AT 1000 LBS. PRESSURE PER SQUARE INCH ON SIDES OF SPLINES. NO ALLOWANCE IS MADE FOR RADII ON CORNERS NOR FOR CLEARANCES.

FIG. 23—TABLE OF S.A.E. TEN SPLINE FITTINGS.



Nominal D	PERMANENT FIT ds/Ds = .80													SLIP FIT ds/Ds = .73					
	P	ds	dh	Ds	Dh	Le	Lh	Lt	Dt	N	Tm	H	c	Cp	P	ds	dh	Ds	Dh	Cs
1/4	.193	.1895 .1885	.1876 .1865	.250 .245	.260 .252	5/16	3/8	5/16	3/16	32	5/32	4/32	1/16		.257	.248 .247	.250 .249	.3437 .3397	.3537 .3457	26
5/16	.290	.2832 .2822	.2812 .2802	.375 .370	.385 .377	7/16	1/2	7/16	1/4	28	7/32	3/8	5/64		.386	.373 .372	.375 .374	.5156 .5106	.5256 .5176	59
1/2	.386	.3770 .3760	.3750 .3740	.500 .495	.510 .502	11/16	3/4	7/16	5/16	24	5/32	1/2	5/64	49	33/64	.498 .497	.500 .499	.6875 .6825	.6975 .6855	10.
5/8	33/64	.3020 .3010	.3000 .2990	.625 .620	.635 .627	11/16	3/4	1/2	1/2	20	1/4	3/4	3/32	67	41/64	.623 .622	.625 .624	.8437 .8387	.8537 .8457	16.
3/4	37/64	.5045 .5035	.5025 .5015	.750 .745	.760 .752	15/16	1	1/2	1/2	20	1/4	3/4	3/32	105	49/64	.748 .747	.750 .749	1.031 1.026	1.051 1.036	23.
7/8	45/64	.6895 .6885	.6875 .6865	.875 .870	.885 .877	1 1/16	1 1/4	5/8	5/8	20	5/16	1	1/8	130	57/64	.873 .872	.875 .874	1.187 1.182	1.207 1.192	32
1	27/32	.8155 .8145	.8125 .8115	1.000 .995	1.010 1.003	1 3/16	1 1/2	5/8	3/4	20	5/16	1	1/8	175	1 1/32	.998 .997	1.000 .999	1.375 1.370	1.395 1.380	42
1 1/8	29/32	.9780 .9770	.9750 .9740	1.125 1.120	1.145 1.130	1 3/16	1 1/2	5/8	3/4	20	5/16	1	1/8	250	1 5/32	1.123 1.122	1.125 1.124	1.562 1.557	1.582 1.567	53
1 1/4	1 1/32	1.003 1.002	1.000 .999	1.250 1.245	1.270 1.255	1 3/16	1 1/2	5/8	1	20	5/16	1 1/2	1/8	260	1 9/32	1.248 1.247	1.250 1.249	1.687 1.682	1.707 1.692	66
1 3/8	1 5/32	1.128 1.127	1.125 1.124	1.375 1.370	1.395 1.380	1 7/8	2	5/8	1	20	5/16	1 1/2	1/8	300	1 27/64	1.373 1.372	1.375 1.374	1.875 1.870	1.895 1.880	79.
1 1/2	1 5/32	1.128 1.127	1.125 1.124	1.500 1.495	1.520 1.508	1 7/8	2	5/8	1	20	5/16	1 1/2	1/8	450	1 35/64	1.498 1.497	1.500 1.499	2.062 2.057	2.082 2.067	94.
1 3/4	1 27/64	1.378 1.377	1.375 1.374	1.750 1.745	1.770 1.755	2 1/16	2 1/4	3/4	1 1/4	18	7/16	2 1/8	1/8	540	1 43/64	1.748 1.747	1.750 1.749	2.375 2.370	2.395 2.380	128.
2	1 33/64	1.504 1.503	1.5000 1.4985	2.000 1.995	2.020 2.003	2 3/8	3	3/4	1 1/4	18	7/16	2 1/8	1/8	800	2 1/16	1.9975 1.9965	2.0000 1.9985	2.750 2.743	2.770 2.755	168.
2 1/4	1 13/16	1.754 1.753	1.7500 1.7485	2.250 2.245	2.270 2.255	2 3/8	3	3/4	1 1/4	18	7/16	2 1/8	1/8	940	2 5/32	2.2475 2.2465	2.2500 2.2485	3.062 3.057	3.082 3.067	210
2 1/2	2 1/16	2.004 2.003	2.0000 1.9985	2.500 2.495	2.520 2.505	2 3/8	3 1/2	1 1/8	2	16	5/8	3 1/8	3/16	1050	2 11/32	2.4975 2.4965	2.5000 2.4985	3.437 3.438	3.457 3.442	263
2 3/4	2 5/16	2.254 2.253	2.2500 2.2485	2.750 2.745	2.770 2.755	2 3/8	3 1/2	1 1/8	2	16	5/8	3 1/8	3/16	1250	2 23/32	2.7475 2.7465	2.7500 2.7485	3.750 3.745	3.770 3.755	315.
3	2 27/64	2.504 2.503	2.5000 2.4985	3.000 2.995	3.020 3.005	2 7/8	4	1 1/8	2	16	5/8	3 1/8	3/16	1500	3 3/32	2.997 2.996	3.000 2.998	4.125 4.120	4.145 4.130	379.
3 1/2	2 59/64	2.754 2.753	2.7500 2.7485	3.500 3.495	3.520 3.505	4 3/8	4 1/2	1 1/4	2 1/2	14	3/4	3 7/8	1/4	2200	3 11/32	3.497 3.496	3.500 3.498	4.750 4.749	4.770 4.755	514.
4	3 23/64	3.254 3.253	3.2500 3.2485	4.000 3.995	4.020 4.005	5 3/8	5 1/2	1 1/4	2 1/2	14	3/4	3 7/8	1/4	2800	4 1/8	3.997 3.996	4.000 3.998	5.500 5.495	5.520 5.505	672

N = THDS. PER INCH ds = SHORT DIA. OF HUB Dh = LONG DIA. OF HUB Cp = CAPACITY IN FT. LBS. PER INCH LENGTH AT 10000 LBS. PRESS. PER SQ. IN. Cs = CAPACITY IN FT. LBS. PER INCH LENGTH AT 1000 LBS. PRESS. PER SQ. IN.

FIG. 24—TABLE OF A.S.E. SQUARE FITTINGS.

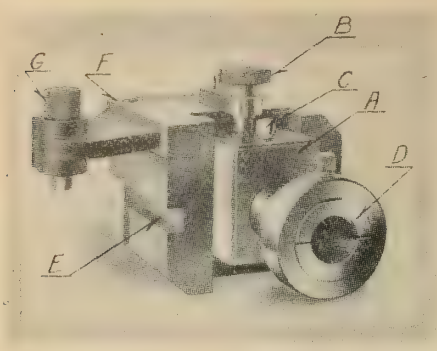


FIG. 25—METHOD OF ADJUSTING BROACH. PORTABLE DRILL PRESS.

across flats required at both ends; this forms a bearing for the work on the plug, as it is successively indexed about the same.

An example of broaching out a sliding gear is shown by Fig. 28. In this instance, it is necessary to remove considerable metal at both sides of the key portion, as indicated at A. To accomplish this, the work is held against the face plate of a draw broaching machine in the usual manner while a long broach is pulled through it, and a section through this broach at three points are shown in the upper row; the first section shows the round shank of the broach through the groove of the first tooth; the next section shows how the teeth are nicked at B to break the chips; while the last section shows one of the finishing teeth, where it will be noticed flats have been cut across the broach grooves to provide additional chip room, as the finishing teeth not only cut out between the key portion of the work but also trim the sides of the same.

By referring to Fig. 29, an idea may be had of the construction of a broach holder for cutting six keyways at the same time. This is held to the tool slide of the machine in the usual manner, and the holder portion A has slots cut in it to receive the broaches B, while a ring C forced over the holder contains six screws D, which securely hold the broaches in place, the broaches being made with a hook shape at X so the pull of the cut will come against solid metal.

In the final section of this article, examples of spiral and group broaching will be shown, which, together with what has already been said, forms quite an extensive description of the broaching practice, which for quickness of results is rivalled only by the punch press the chief disadvantage of broaching being the first cost of the tools and the uncertainty incidental to the length of time they will stand up on the job.

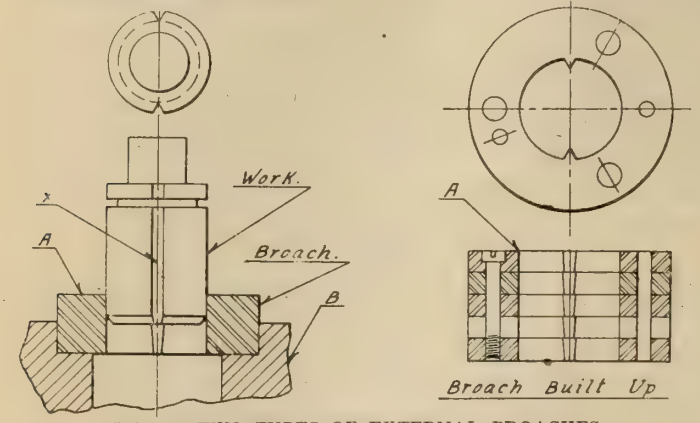


FIG. 20—TWO TYPES OF EXTERNAL BROACHES.

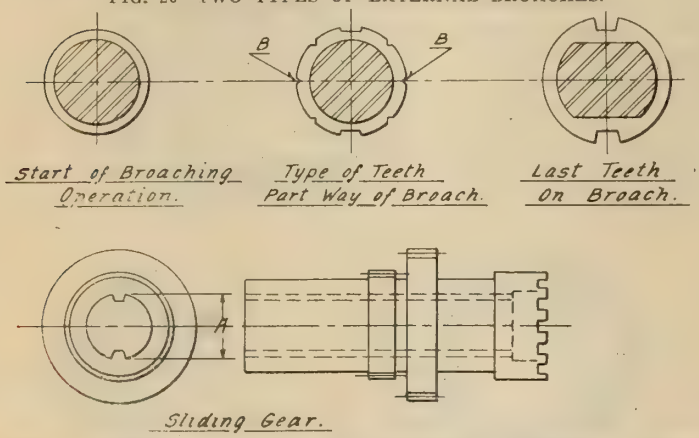


FIG. 28—EXAMPLE OF WORK AND SECTIONS OF BROACH TEETH.

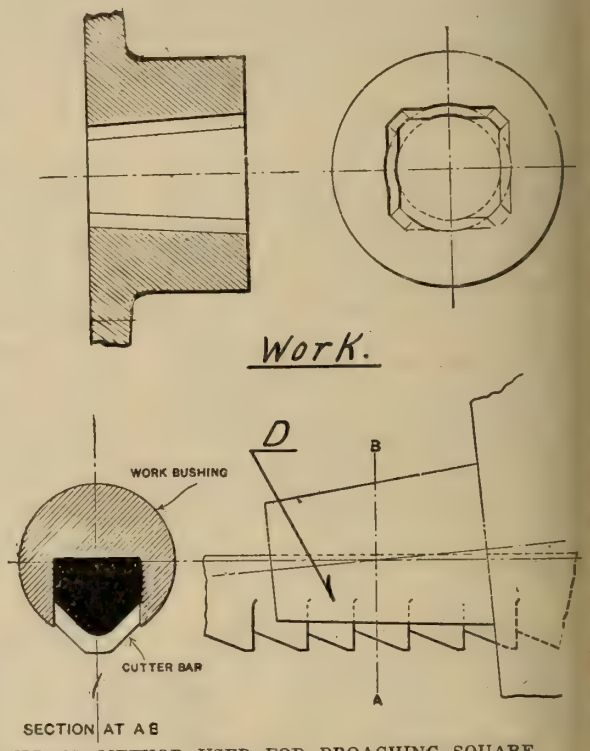


FIG. 27—METHOD USED FOR BROACHING SQUARE TAPERED HOLE.

of broaching practice are listed broaching keyways in a tapered hole and broaching tapered square holes. Referring to Fig. 27, this shows an example of work broached with a tapered square in it, while below, the method of holding the work for this operation is shown. It will be noted in this connection that the work is held on an angle, so as to bring the line D parallel with the screw of the machine. To machine, by broaching, this tapered hole, it is necessary to provide an indexing fixture arrangement so the work may be indexed four quarter revolutions, thus alternately bringing the four corners of the work in the correct location, so that when the broach, which is made to trim out the corners and part way across two sides, is drawn through four times, the holes will be completed. The general practice in this connection is to have the work supported by the round-tapered plug in a hole reamed slightly larger than the distance

The Chemical Products Corporation Ltd., Toronto, are considering the erection of a plant in Belleville at an estimated cost of $1,000,000.

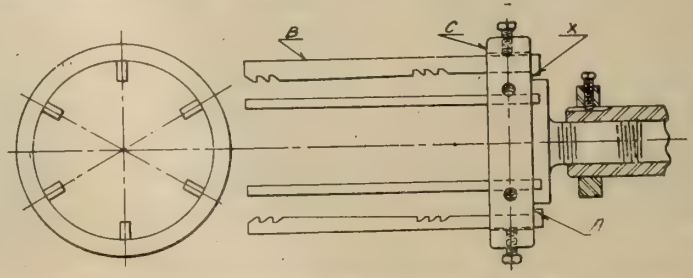


FIG. 29—HOLDER AND BROACHES FOR CUTTING SIX SLOTS.

What is the Mechanical Engineer's Position?

Some Excerpts From an Address Read Before the Institution of Mechanical Engineers on Administration and Organization, With the Danger of Further Encroachments Upon Their Established Position in the Engineering World

By EDWARD HOPKINSON, D. Sc., President *

[F we are to maintain, or perhaps I should say if we are to prevent, further encroachments upon our stablished position in the engineering orld, mechanical engineers must give ore attention to the administration and rganization of workshops. We have mitted to realize that to make an efficient machine is one thing, but to make t efficiently another thing. . . . The xigencies of war have taught us much, nd have, I think, brought to the fore a onsiderable number of young engineers f natural administrative and organizng capacity. But administration and rganization cannot be left entirely to atural aptitude, even when combined ith long experience. There can be ittle doubt that in the future our shops nust be managed by younger men, of nore limited personal experience than as been customary hitherto, who will herefore need to rely to a greater exent upon the experience of others, acquired through reading and lectures. These questions of management and organization are vital matters which ought not to be left to chance, and should form part of the specific training of a mechanical engineer. . . . The war has changed the outlook of the works manager. He has begun to realize that the man who has the advantage of wide reading and of thorough technical training, provided he has a natural practical bent, may make a far better under-manager than the man who has not these advantages, but has spent a much longer time in the workshop.

One reason which has militated against the more rapid absorption of the product of the technical schools as an integral part of workshop organization is to be found in the fact that too little time is given in the schools to teaching the art of production. The right use of tools and the accommodation of design to the methods of manufacture and to the tools available receive too little attention. Many lectures are devoted to the design and working of a dynamo or steam engine, but few to that of a lathe or milling machine. How often are parts of scientifically correct design incapable of being moulded economically in the foundry or tooled economically in the shop?

Our institution has an important part to play in this respect. Much can be done by encouraging the reading of papers which deal with workshop organization and with production from tools. There has been already a noticeable increase in papers of this character, and I hope it will continue. I do not agree that the discussion of these problems will tend towards advertisement, lower the general scientific status of the papers, or emphasize unduly the purely commercial aspect of works production. A description of the means adopted by a works manager to obtain maximum production of the required degree of accuracy at minimum cost is as important to the progress of mechanical engineering as the description of a new invention.

There is another side of engineering at which it is too often the custom of engineering institutions to look askance, namely, that concerned with the distribution and selling of the product. In most industrial engineering undertakings the commercial section of the staff is larger than the designing, testing, and foreman section, and it is just as essential to the highest success that it should be composed of trained engineers. A very large proportion of the men who enter engineering works with the intention of fulfilling their calling in constructive work find that they are drafted, through the force of circumstances, to the commercial side, and develop their careers in that direction. No salesman of high-class engineering products can be altogether successful unless he has the engineering instinct and has had a sound engineering training. The successful engineer-salesman must be able to understand and enter into the wants of the purchaser and suggest means for satisfying them. He must also understand thoroughly the properties and capabilities of what he has to sell. It is a common, though erroneous, idea that a man ceases to be an engineer when he becomes involved in the commercial side of engineering. On the contrary, it often happens that in discharging his commercial duties he is using to the best advantage his engineering knowledge and aptitude. . . .

Whatever may be the steps taken to widen the curricula for engineering students, it is essential that those occupied in administrative duties should recognize that successful administration is based on principles which are capable of definition and of scientific treatment and analysis, that the accumulated experience of others can be put into a form in which it can be taught and learned, and that those mental and moral characteristics which are essential in the good administrator can at least be developed, if not implanted by training.

We must not, however, be content with teaching only those who are to administer our works and factories. We shall never get the best out of any system of organization or administration in any field of work unless the workers themselves understand the principles upon which the system is based. A wise manager in an engineering shop will make no changes without first explaining their object to the workers, probably through the medium of the Works Committee. A still wiser manager will so develop the interest of the workers in efficient administration that proposals for improvement originate with them, and they thus assume the position of having to prove their case. With this in view, it is most important that there should be evening classes in administrative subjects in our technical schools.

Largely due to the experience gained during the war, the need for systematic instruction in industrial administration has been so prominently forced on the attention of those responsible for the conduct of some Lancashire engineering and other industries, that a year ago six firms combined to make an offer to the Manchester Municipal College of Technology to provide an annual sum for the establishment of a special department for this purpose. The department has been constituted and is worked in close co-operation with an Advisory Committee of those who are themselves engaged in works administration. A director has been appointed with three assistants. . . .

The material side is only one part of works administration; not less important is the purely human factor All that pertains to the physical health and mental contentment of the workers is reflected in the efficiency of their work. The most important problems in the human side of administration are those connected with industrial fatigue. The efficiency of a man as measured by his capacity for output is dependent upon his hours of work, both in length and distribution, and the integration of the curves connecting rate of output with time of work will show the maximum amount of work which can be obtained from the individual. The investigation of these questions on a scientific basis is of a peculiarly difficult nature on account of the large number of independent variables which affect the result. But notwithstanding the difficulties which surround investigation, I

*Owing to the illness of the President, the address was read by Mr. Michael Longridge, immediate past-president. October 24th, 1919.

am convinced that discussion of the deductions drawn from systematic observation by the physiologist and the psychologist, combined with the inductive conclusions of the works manager, will yield most valuable results. . . .

The right and economical use of the human labor working a tool has given rise to another line of investigation in workshop administration known as "time and motion" study. A "best" way can be found of performing any operation dependent upon muscular effort by methodical and scientific study of the various motions involved.

Though the actual application of such principles can only be carried out in the workshop and gauged by practice there, the importance of their study and the methods of studying them may well be taught at school or college. Our public schools take infinite pains to teach boys how to get the most out of a cricket bat or an oar with a given amount of muscular effort; coaching in rowing or cricket is acknowledged to be essential, why should not our young engineers have similar coaching in the multifarious manual operations of an engineering shop? The analogy of our organized school games also suggests that the interest of the worker may be enhanced and sustained if he is treated as a member of a team playing for a definite goal. "Team work"—that is, the combination of individual effort to achieve a definite result—ought to be developed to a much greater extent than hitherto in our workshops, and must increase efficiency and improve discipline.

Attention has recently been drawn to another psychological aspect of the labor question in engineering workshops where modern conditions are unfavorable to efficient work compared with those that obtained in earlier days. In the old days a millwright employed, for instance, in the setting out of a main gear for driving a mill, himself drew it out on the drawing floor, received the wheels from the foundry and set them out for tooling, and finally was usually selected to erect and set to work. From beginning to end of his job he had a clear idea of the ultimate use to which his work would be put, and was largely responsible for it until put into operation. Such incentives have necessarily disappeared under modern workshop conditions, but probably much may be done, even under the stifling conditions of modern repetition work, to impart to the workman a fuller knowledge of the ultimate object of his labor and so to engender a keener interest therein.

Production

Though the more far-sighted leaders of public opinion, both among employers and employed, now realize that only by increased production can we recover from the losses and damage of war, recent events too clearly prove that this truth has not yet permeated all classes of the nation. It has been thrust into the background by the demand for the establishment of a higher plane of living for the working classes without consideration of the means whereby it can be obtained. Every step in increasing consumption can only be achieved by increasing production in a much larger ratio. It is too often popularly assumed that the higher remuneration of labor will by itself secure an industrial Utopia, and that labor, if it has more to spend, will be able to satisfy its desires. Experience has shown that the very contrary is the fact. Mere increase in wages, mere changes in the distribution of wealth, have the effect in themselves, divorced from other influences, of providing less rather than more of the good things of the earth. It has been proved again and again from actual figures of most of our staple industries that a redistribution of the profits of industry, however desirable on other grounds, cannot in itself materially add to the welfare of labor unless it directly conduces to increased production.

If, as a nation, we are to realize what we all desire, a fuller and happier life for all classes of labor, every proposal for increase or change in the methods of remuneration of labor, every proposal for sharing or redistribution of profits, every proposal for change in control or in the management of industry ought to be subjected before adoption to crucial examination as to whether it will increase production per worker or can be accompanied by other changes in the conduct of the industry which will, in their combined effect, achieve the same object. Unless they satisfy this test we shall fail in attaining our end. Instead of promoting the welfare of the industry and of those engaged in it, we shall doom it to decay and ultimate extinction.

India

I have spoken hitherto solely of the home point of view with regard to reconstruction rather than of those wider considerations which apply to the Empire as a whole. In conclusion, I ask your attention for a few moments in connection with some matters which vitally concern us as engineers in one constituent part of that Empire—India, where the problems to be solved are not, as at home, those of reconstruction, but rather of construction.

Until a few years ago India looked almost entirely to Great Britain for the bulk of her engineering requirements, but we may expect that in the near future India will be in a position to rely less upon home engineering products, and will supply at least the simpler forms of these products from her own resources. I am not concerned now to inquire in detail whether this tendency will have a good or bad effect upon British engineering, but I may remark in passing that all industrial history shows that, although there may be hardships in certain industries in the process, the industrial development of one country, closely knit in its commercial relations with another, is to the ultimate benefit of both. . . . To promote the development of engineering industries in India is not generally in opposition to the best permanent interests of such industries at home, though it may entail temporary dislocation.

India has already laid the basis of an engineering industry in the establishment of two important and successful iron and steel works. The Bengal Iron and Steel Works under their present management have been established for some twenty-five years at Kulti, and have had a chequered career, during which, in 1903, an attempt was made to manufacture steel which proved unsuccessful, and was abandoned. The works are now most successful, both financially and in quality of product, turning out 10,000 tons of pig iron per month, about one-third of which is used in their own foundry for the manufacture of pipes, columns and pot sleepers and chairs. More recently the Tata Iron and Steel Works have been erected at Sakchi on the Bengal Nagpur Railway, about 155 miles from Calcutta, and in reasonably close proximity to their supply of coal and iron ore. The works were started in 1912, and have two large blast-furnaces in operation, each capable of producing about 350 tons of pig per day, a third nearing completion, and three more much larger in process of construction. Most of the pig is converted into steel. The rolling mills produce about 120,000 tons of rails and smaller sections yearly. About 13,000 men are employed in the works, adjacent to which a town having 50,000 inhabitants has sprung up, carefully planned in every detail with suitable houses, mostly provided with gardens, for all classes of employees, and schools, institutes, and hospital. These two works, even when extended, will not provide more than a fraction of the iron and steel India needs, of which the imports in 1913-14 amounted to over 1,250,000 tons.

At the present time India cannot roll a steel plate nor draw a steel tube; there are no rolling mills for tin-plate or for copper or brass sheets. Lead piping, galvanized sheets, steel wire, copper, and brass rods are not made in India, and no steel castings are produced except on a limited scale at some of the ordnance factories and in a few of the railway works. Even railway axles, carriage springs, wire ropes, and chains are imported. No steam engines of any size are constructed; probably the largest are those of some 400 h.p. for river craft. Portable engines, traction engines, and road rollers also are not made, nor steam boilers, except a few of very small capacity. Agricultural machinery, the greatest need of all in India, is not manufactured except to a limited extent in its simpler forms. Substantially no cotton or jute machinery, either for spinning or weaving, is made in the country. Locomotives cannot be built without obtaining many essentials from abroad, and shipbuilding is in its most elementary stage. Electrical machinery

f every kind is imported. Apart from ie railway workshops, the principal entre of general engineering workshops i India is Calcutta, but in 1915 there ere only twenty-seven of these with n aggregate of 12,000 employees.

Owing to the pressure of war condi- ons, the situation in respect of engin- ering industries is rapidly changing. he Tata Iron and Steel Company will hortly have a large plate mill at work or rolling plates up to 1¼ in. thick nd it is proposed to construct a wire ill and a belt and nut shop of large apacity. Works are to be erected for ie manufacture of tea machinery, which itherto has been entirely imported. chemes are in hand for the manufac- ure of agricultural implements in India rom Indian steel. Vacuum brake ma- erial, as required by the Indian rail- ays, is now being made in India. Gal- anizing is being carried on on a fairly irge scale by several companies. A irge workshop has been erected for the anufacture of jute mill machinery of ll classes, now entirely imported into ndia. Such are only a few of many in- tances of advance. . . .

There is as yet no base on which to uild elementary mechanical training for he Indian artisan. With a people lmost wholly illiterate, schools for the eaching of elementary mechanical sub- ects are useless for the ordinary boy, nd in those that have been started it s soon found that the first years must e spent in imparting sufficient elemen- ary education to enable the scholar to erive any advantage at all from voca- ional teaching. We must look to the orkshop itself, not only for training in he particular crafts, but also for such eneral elementary education and rudi- ientary technical education as are ecessary for the acquisition of crafts- anship. Although a man may become xquisitely skilled in the art of, say, arving ivory, or engraving brass, and emain entirely illiterate, depending pon hereditary genius in his craft, he annot become a patternmaker or fitter nless he can read and understand a rawing. Wherever schools in direct onnection with workshops have been et up, the results have been most sat- sfactory. If a class of artisan me- hanics is to be built up in India, every ngineering works, either alone, if of ufficient size, or otherwise grouped vith neighboring works, should provide school for teaching the boys employed oth general subjects and also such ele- ientary technology as is suited to the rade they are learning, and the teach- rs as far as possible should be drawn rom the foremen and others engaged n the works.

These engineering developments in ndia must have a marked effect on the rofessional status of engineers em- loyed in India which it is incumbent n us as members of the institution to vatch closely, and, where possible, to nfluence for the benefit of our own nembers in India and for the mainten- nce of high professional standards.

At the present time there are in India about 600 members of the Institution of Civil Engineers, 400 members of the Institution of Mechanical Engineers, and about the same number of members of the Institution of Electrical Engineers, besides members of various other bodies, such as the Institution of Naval Architects, the Iron and Steel Institute, and various mining societies. There are also undoubtedly many qualified engineers in India holding positions of responsibility who are not members of a home society. But India is a vast country, and these engineers are split up into little groups working in places separated by great distances and only aggregated to any extent in such industrial centres as Calcutta and Bombay.

The Indian Industrial Commission gave much attention to the various suggestions made to them by engineers in various parts of the country on this subject, and in its report advocated the foundation of a representative Society of Indian Engineers. It is obvious that conditions in India preclude the formation of individual institutions to represent the various branches of engineering, and that the objects of such a society could only be attained by combining all branches of engineering, whether civil, mechanical, electrical, mining, or R.E. The recommendations of the Commission have been actively taken up by engineers of all classes, and I am glad to say especially by our own members in India. The institution of such a society was decided on at a representative meeting held in Calcutta in December last under the presidency of Sir Thomas Holland. A committee was appointed to draft proposals for the constitution of the society and rules for its conduct and to consult all the various interests involved. I am informed that all the existing organizations have decided to cooperate in the formation of the new society, so that it will embrace and be representative of all professional engineering interests in India. It was at one time thought possible for the new society to be formed under the auspices of our leading home institutions, but for various reasons such a plan was not feasible, and I think it is generally conceded both here and in India that it is better that the Indian Society, knowing the wants of its own members and the local conditions, should devise its own constitution independently. At the same time, it is, I think, incumbent upon our institution to use its influence in maintaining a high qualification for membership in the Indian Society and to collaborate with it with a view to obtaining the benefits for our own members in India which such a society can provide.

SYNTHETIC CAST IRON

C. A. Keller, the French metallurgist and electric furnace expert, discusses and describes at considerable length the process which he elaborated before and during the war for the manufacture of synthetic cast-iron from steel turnings, etc.

Briefly, the process consists in melting the turnings in a specially arranged electric furnace, which he describes. There are two possible methods of producing the cast-iron: the carburizing medium can either be added to the steel in the molten state, or, as in the writer's process, the carbon is incorporated in the charge in the form of fine coke or charcoal, so that the process of carburization is continuous and gradual. The basic slag as added to the burden ensures desulphurization of the charge, if this is required, and at the same time diminishes the conductivity of the mass by the interposition of non-conducting materials with the conducting materials (turnings and carbon), thus enabling the process to be carried out at the tensions usually adopted in electro-thermal operations. Thus the cast-iron obtained in the presence of a sufficiently basic slag retaining the small quantity of silica introduced, contains practically all the material composing the burden, excepting the sulphur, without increase of silicon, and the carbon of the charge is used only for carburization, and has no appreciable effect on the silica.

As an example of what may be achieved by the method, from steel turnings containing:

Si	0.44 per cent.
Mn	0.55 per cent.
S	0.07 per cent.

a white cast-iron giving the following analysis has been obtained:

C	3.55 per cent.
Si	0.52 per cent.
Mn	0.48 per cent.
S	Trace.

The mechanical properties of cast-iron obtained by the writer's process have been very satisfactory.

As regards the economy of the process, the writer states that the consumption of electrodes may be reduced to 6 kg. per ton, provided they are of good quality. The consumption of non-oxidized steel turnings is 1,050 kg. per ton of cast-iron, this figure increasing to 1,100 kg. with fairly oxidized turnings. The quantity of coke containing 80 per cent. of fixed carbon required for obtaining a ton of extra-high strength cast-iron containing 3 per cent. carbon and 1.75 per cent. silicon, using ordinary steel and shell-turnings, is about 80 kg.

Several new plants were laid down by the writer's firm during the war and they attained a very high degree of organization, supplying cast-iron to outside firms also. The detailed arrangements of this lay-out and of the patented furnaces used are given in the original article.

The future of the synthetic method of manufacturing cast-iron will depend of course mainly on the quantity of raw material available, as well as on the possible extensive application of hydro-electric energy for the purpose.—Bulletin de la Societe de l'Industrie Minerale.

The Use of Abrasive Wheels for Metal Cutting

Abrasive Wheels Are Now Recognized as an Ideal Medium for Removing Metal in Quick Order. Some Practical Hints Are Given Herein on Selection and Proper Mounting of Wheels, Etc.

By EDWIN L. MONK

THE use of abrasive wheels for the purpose of cutting and shaping metal and other hard substances has of late years gained favor to a remarkable extent, both with large and small engineering shops. The reason for this development is not difficult to discover when we consider that rapid production and economy in labor are two factors which are of the utmost importance to the success of any business undertaking.

The following table shows the relative percentage weights of cast iron, wrought iron, steel, and brass removed by ordinary hand processes as compared with that removed by a grinding wheel in the same period of time:

	Emery wheel.	Hammer and chisel	File	Wastage of-emery wheel.
Cast iron	100	30	4.6	9
Wrought iron	100	26.2	6.9	34
Steel	100	2.7	1.8	53
Brass	100	7.5	3	24

A good grinding wheel should cut freely and not glaze or fill up with particles of the material it is cutting. The work when grinding operations are complete should be smooth.

The Proper Wheel

The actual selection of a wheel for any particular class of work can generally be left to the manufacturer. When sending an inquiry a piece of the material it is desired to grind, and also, if possible, a sample piece which has been actually ground will be of great assistance in enabling the suppliers to select the most suitable grade of wheel for the work required. The inquiry should also state the diameter and width of the wheel. If the shape is irregular, but is a standard manufacture and can be found in the manufacturer's catalogue, then the list number will be sufficient; if not a standard, then a rough dimensioned sketch should be supplied. The exact diameter of the arbor on which it is proposed to mount the wheel must also be given, and the hole in the wheel should allow a comfortable sliding fit. The correct clearance allowance can be left to the manufacturer.

If it is found impossible to send samples as suggested, then a description of the kind of material to be ground, stating whether rough or finished work is required, should be included in the inquiry, and in any case whether samples are sent or not it should be stated whether the work is to be applied by hand or automatically, and whether it is proposed to use the side or the periphery of the wheel, also some idea as to the kind of surface, whether flat, irregular, or cornered, should be given.

Users who wish to make their own choice of grade may be guided by the following considerations: The coarser the grit and the softer the grade, the more rapid will be the cutting effect. On the other hand, by using a fine grit and a hard grade the total amount of work performed by a wheel is increased, whereas for high finish a fine grit and soft grade is necessary. Heavy work calls for a harder wheel than light work. A harder wheel must be used for corners and edges than for surface work. The wheel must be softer as the contact surface increases.

Three materials are chiefly used in the manufacture of grinding wheels, emery, corundum, and carborundum, Emery is a mixture of corundum and hematite, and contains impurities to the extent of about 40 per cent., which are, of course, useless as cutting agents and cause undue heat.

Corundum is far superior to emery as its impurities only amount to about 4 per cent. of its composition, giving a cutting efficiency of anything from 30 to 100 per cent.

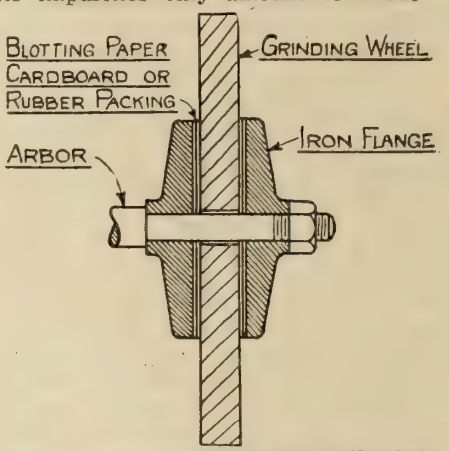


FIG. 1—ILLUSTRATING THE MOUNTING OF WHEEL.

Carborundum is composed of 30 parts by weight of carbon to 70 parts of silicon, and will easily cut either corundum or emery. Carborundum is an artificial abrasive, and is produced by means of an electric furnace. It is very brittle and practically infusible.

Grinding wheels are manufactured in various degrees of hardness to suit the particular class of work for which they may be required. The varying degrees from soft to hard are usually denoted by letters of the alphabet, and are known as grades. The grade of wheels is obtained by varying the amount of bond. If an increased amount of bond is used the particles of the wheel are not so easily broken, and it is consequently graded as hard; if, on the other hand, less bond is used, the grade will then be soft. The actual size of the abrasive grains are sorted out and are numbered after they have been passed through sieves, each having a varying number of meshes per square inch. For the ordinary purposes of manufacture the grade range from about 8 to 100; for special purposes, however, finer grades can be procured.

Proper Mounting of Wheels

We now come to the question of mounting the wheels on the machine and this is a matter over which great care should be exercised. Flanges should be used to support the wheel on each side, and in the case of large wheels the size of the flange should be from one-half to two-thirds the diameter of the wheel. As the wheel gradually wears down the flanges should be replaced by a pair of smaller diameter. Rubber, cardboard, or blotting paper washers must be used between the flange and the wheel and care should be taken to ensure that the wheel is not a tight fit on the arbor there should always be a slight clearance to allow for expansion of the arbor which may become heated when running and so cause the wheel to burst. The flanges must not be tightened up too much, not more than is necessary to prevent the wheel from slipping on the arbor. Fig. 1 shows the correct method of mounting a grinding wheel.

Sometimes a new wheel may get cracked in transit and the defect may be quite invisible, so that it is always advisable to ascertain that it contains no flaw. If a perfect wheel is gently tapped with a small hammer, it will produce a clear ring, whereas if it contains a flaw, then the sound it emits will be dull and dead. Wheels which are found to be defective should not under any circumstances be mounted.

For wheels of average thickness the following size arbors will be found to be amply strong enough: ½ in. diameter arbor for wheels 6 in. diameter or less; ⅝ in. for 8 in. diameter; ¾ in. for 10 in. diameter; 1 in. for 12 in. diameter; 1¼ in. for 14 in. diameter; 1½ in. for 16 in. diameter; 1¾ in. for 18 in. to 20 in. diameter; 2 in. for 22 in. to 24 in. diameter; 2¼ in. for 24 in. to 26 in. diameter; 2½ in. to 3 in. for wheels 26 in. diameter and over.

If the wheels are extra thick, then the sizes of the arbors should be increased in proportion.

The correct peripheral speed of grinding wheels in order to obtain the best results for ordinary purposes may be taken as from 5,000 to 5,500 ft. per min. Sometimes on large wheels 6,000 ft. per minute may be reached. A good practical method of obtaining the correct speed is to first run the wheel at a high speed and then gradually reduce it until the

*From "Practical Engineer."

wheel just begins to crumble; the most efficient speed will be slightly above "crumble speed." When the correct peripheral speed has been ascertained for any particular wheel, it should be maintained at that speed in order to obtain equal efficiency. This, of course, means that as the wheel wears down the revolutions per minute at which the machine is running must be increased. This may most conveniently be done by means of some variable-speed device, of which there are several on the market, or by means of cone pulleys. A less satisfactory way is to change the driving pulleys. The objection to this, of course, is that the speed variations can only be obtained in steps, intermediate speeds being impossible.

Operators often complain that wheels appear to be softer towards the centre, the real cause of the trouble being that the speed has not been varied in proportion to the wear of the wheel.

On no account should a wheel be run at a greater speed than that recommended by the manufacturer. The great danger and risk in doing so lies in the fact that the stress due to centrifugal force does not vary in direct proportion to the speed of the wheel, but as the square of its velocity; which means that if the speed is doubled, the stress due to centrifugal force will be increased four times. For instance, a wheel travelling a peripheral speed of 5,000 ft. per minute sets up a stress of about 75 pounds per square inch. At the factory wheels are usually subjected to a test of 9,000 ft. per minute peripheral speed, the test being carried out under special conditions, proper protection being afforded against breakages; at this speed the strain due to centrifugal force is about 250 pounds per square inch.

In order to ascertain the necessary revolutions per minute of any particular-sized wheel to produce any desired peripheral speed the following formula will be found useful:

$$\text{R.P.M.} = \frac{\text{Peripheral speed in feet per min.} \times 12}{\text{Diameter of wheel in inches}}$$

In order to make this quite clear, we will take a specific example and assume the wheel to be 26 in. in diameter, and that we wish to obtain a peripheral speed of, say, 5,500 ft. per minute. Applying our formula, we get

$$\text{R.P.M.} = \frac{5500 \times 12}{26 \times 3.1416} = 806$$

The table following will be found useful.

Wheels of cup shape should not be run faster than 3,000 to 4,000 peripheral feet per minute unless they are specially supported, but ring wheels carried in chucks can be run at ordinary speeds. The use of water on grinding wheels limits their speeds to about 3,500 peripheral feet per minute, as above this speed it will be found impossible to keep the water on the revolving surface. Wet grinding is used to-day to a far greater extent than might have been expected, judging by the prejudice that existed some few years ago. Up-to-date machines and improved water arrangements have to a great extent been responsible for the development which has taken place in this class of work.

It is most important that grinding wheels should be kept perfectly true, not only on account of better working efficiency, but also to ensure safety in working. Trueing up wheels is done by means of a wheel dresser or a diamond. A wheel dresser consists of a series of toothed wheels the teeth of which are sharpened to a knife edge. These wheels which are made out of hardened steel, are mounted side by side on an arbor, which is carried on a fork provided with a handle. This tool is held firmly at such a distance from the edge of the revolving wheel, so that any prominent parts may first be removed; when this is accomplished, the dresser can be brought gradually closer until the wheel is turned perfectly true.

Diamond dressers consist of a steel bar, which is sometimes provided with a handle, the cutting diamond being mounted at the other end of the steel. The diamond tool is used in exactly the same way as the wheel dresser. When dressing a wheel it is not absolutely necessary to alter the speed, but when using a wheel dresser it is certainly advisable to reduce the speed to about half normal working speed, and the use of water will prevent heating of the cutters and dust.

Certain grade wheels are specially made for individual classes of work, and if a wheel should fail to give satisfaction it will often be found that the cause is not the wheel, but that the purpose for which it is being used is not that for which it was supplied; or, again, the speed may be wrong. The best results cannot, of course, be obtained under such conditions, which more often cause glazing of the wheels and heating of the work. Grease and oil should be carefully kept away from wheels. Heavy machines mounted on a solid foundation are very desirable in order to eliminate vibration as much as possible. The rests should be properly adjusted so as to prevent any chance of the work getting wedged between the rest and the wheel.

In modern works, where several machines are kept more or less continuously employed, it is very desirable that proper provision should be made for the removal of the dust, which in most cases is very detrimental to the health of the operators of the machines and to those employed in the shop. There are several firms of ventilating and heating engineers who specialize in this particular branch of work and who are usually

Dia. of wheel in	R.P.M. for surface speed of			
inches	4000 ft.	5000 ft.	5500 ft.	6000 ft.
1	15,279	19,099	21,009	22,918
1.5	10,186	12,732	14,005	15,278
2	7,639	9,549	10,504	11,459
2.5	6,112	7,640	8,404	9,168
3	5,093	6,366	7,003	7,639
3.5	4,366	5,456	6,002	6,548
4	3,820	4,775	5,253	5,730
4.5	3,396	4,244	4,668	5,092
5	3,056	3,820	4,202	4,584
6	2,546	3,183	3,502	3,820
7	2,183	2,728	3,001	3,274
8	1,910	2,387	2,626	2,865
9	1,698	2,122	2,334	2,546
10	1,528	1,910	2,101	2,292
12	1,273	1,592	1,751	1,910
14	1,091	1,364	1,500	1,637
16	955	1,194	1,313	1,432
18	849	1,061	1,167	1,273
20	764	955	1,051	1,146
22	694	868	955	1,042
24	637	796	876	955
26	586	733	806	879
28	546	683	751	819
30	509	637	701	764
32	477	596	651	716
34	449	561	618	674
36	424	531	584	637
38	402	503	553	603
40	382	478	526	573
42	364	455	500	546
44	347	434	478	521
46	332	415	457	498
48	318	397	437	477
50	306	383	421	459
52	294	369	405	441
54	283	354	390	425
56	273	341	376	410
58	264	330	363	396
60	255	319	351	383

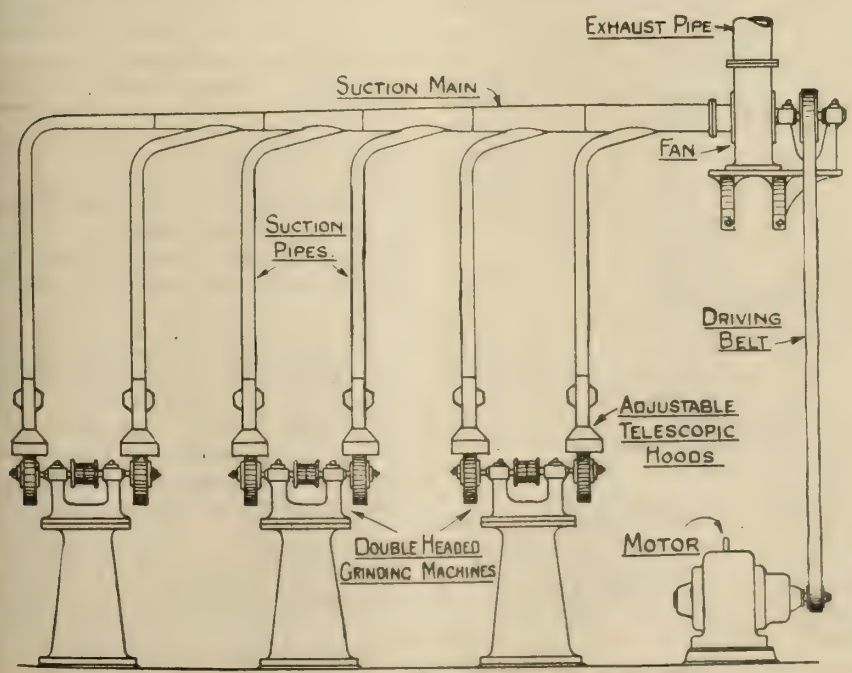


FIG. 2—APPARATUS FOR REMOVAL OF DUST, ETC.

glad to submit plans and quote for schemes to suit individual conditions. Fig. 2 shows a typical plant arranged for extracting the dust from three double-headed grinding machines. Dust-extracting plants of this description usually consist of a paddle-type fan with the bearings properly protected from dust. A main suction pipe is connected to the fan, and smaller branch pipes connect the machines to the main suction. Hoods are placed over the grinding wheels and are fixed to the ends of the branch suction pipes by means of telescopic tubes; this arrangement enables the operator to adjust the hoods close to the wheels when small articles are being dealt with, or to slide them up to admit larger articles. The pipes are usually made of sheet steel riveted and galvanized.

Accidents can in many cases be prevented by proper care. Some of the causes we have already mentioned, such as forcing wheels on to arbors which expand on account of heat and burst the wheel; other causes are allowing work to become jammed between the rest and the wheel; running wheels on unstable machines; either omitting to use flanges or using those of wrong or too light design; loose bearings; applying too much pressure to the emery dresser.

The following precautions should be observed by those responsible for the working of grinding wheels: The rests should be of substantial design, and should be used in such a position relatively to the wheel that it is impossible to get any work jammed between them. It is better policy to run each machine at one fixed speed, and this speed should be painted either on a board fixed near the machine or on the machine itself; as the wheel wears down it should be transferred to another machine making more revolutions per minute, so that the peripheral speed may be maintained. Where practicable this plan is preferable to the use of cone pulleys from the standpoint of safety, as it eliminates the danger of too high a speed being used by the uninitiated operator without the knowledge of the foreman in charge; although, on the other hand, considered from the practical working standpoint, it must be admitted that the cone pulley is certainly more convenient where only a few machines are used. Wheels should be kept true and in balance, and the dressing tools should be in charge of some responsible person. Machines should be enclosed as far as possible by sheet steel guards.

The Vertical or Horizontal Compressor?

By A. W. SWAN

IT is a curious fact that the trend of air compressor as distinct from low pressure blowing engine's design, has followed entirely different lines in North America and in Great Britain. With the exception of small air compressors for garage work, etc., and one special horizontal and vertical machine, American manufacturers have held to the horizontal design, while the trend in Great Britain is entirely in the opposite direction, and the horizontal compressor is unusual.

The reason behind this difference in design is largely a matter of tradition. England and Scotland have been for years the greatest shipbuilders in the world, and the marine engine has been developed largely by British engineers. The marine triple-expansion engine is invariably vertical. It was natural to keep to this construction for stationary steam engines for power houses, etc., and when the first air compressor cam to be built, steam driven, the line of least resistance was followed, and the air compressor was also built with the vertical construction, having the steam and air cylinders in tandem. On this continent the air compressor was developed independently from the steam engine, and while the advantage of the vertical construction were admitted, the horizontal compressor was seen to have its own advantages, and this style was held to. In a large part of Canada and the United States coal is both dear and difficult to procure, and the consequence has been the rapid development of Hydro-Electric power, and the decrease of direct use of steam power except in certain favored regions. One consequence of this has been the rapid development of the electric drive for air compressors, and a still greater separation from the old steam engine traditions. In Great Britain, on the other hand, while coal has risen greatly in price, it is always available—except during strikes—and while electric power supplied from central stations is making great strides, direct steam power is still used very largely. As a result of this, the steam-driven air compressor is still important and as a matter of fact, in the catalogues of some of the British compressor manufacturers the claims of the steam drive are urged quite strongly.

The principal advantage of the vertical type of construction is compactness; no horizontal compressor however arranged, can hope to compete with the vertical machine for minimum space. This feature is important chiefly where space is at a premium, as where a compressor has to be tucked away into a corner of an existing engine room. Another advantage urged for the vertical type of compressor, or at least, one that is put forward by the British manufacturers, is that with the horizontal construction the weight of the piston causes it and the rod to wear oval, with consequent loss of efficiency.

However, extreme compactness is not always the controlling factor in a compressor installation, particularly if the compactness carries with it some disadvantages, and if the vertical construction has such manifold advantages it is surprising that the Ingersoll-Rand, Chicago Pneumatic, Sullivan (except in their twin-angle machine) have held so tenaciously to the horizontal type of construction. The fact is, that horizontal construction of air compressors carries with it the great advantage of accessibility, which is often at least as important as extreme compactness. A well-built compressor will run steadily for months without even inspection, but even the best of machines is none the worse for an occasional run over, and if a compressor is built so that inspection is easy it is much more likely to have attention than one which is difficult of access. Even with the best systems of splash or forced lubrication, including strainers, etc., the oil should be cleaned out every now and again and sent to the filter; in fact, accessibility is a highly important and necessary feature in an air compressor. And the horizontal machine is certainly easy of access for inspection. The crank chamber can be inspected by lifting off a cover in some makes, cross-head and guides are similarly get-at-able. The cylinder is also easily accessible without having to climb a ladder to get at the cylinder head, and this applies particularly to the steam-driven compressor. Then as to the piston wearing oval, there seems to be another case where the theory sounds better than the actual facts; at least there are hundreds of large and heavy air compressors all over Canada and the United States, all of horizontal construction, and it certainly is not a common complaint to hear of pistons and rods wearing oval, and giving trouble in this way.

When all other considerations have been weighed, there remains one important advantage of the direct-connected horizontal air compressor—fewer bearings. The rotor of the motor for the direct-driven horizontal type of compressor is wound on the main driving shaft, and there are only two bearings. In the vertical machine the motor is at one end of the compressor, with the fly-wheel between compressor and motor. The motor has its own two bearings, there is another bearing between fly-wheel and compressor, and two more bearings in the compressor itself. The

whole unit is mounted on one base, and as the four bearings are bored at one setting, there will be no difficulty about securing correct alignment for the initial set-up. But maintaining correct alignment when the bearings begin to wear is another story. So that while the vertical direct-connected machine is satisfactory if properly erected, and if the foundation is absolutely stable, the direct-connected horizontal machine is easier to erect, and keep in alignment.

Summing up, it is seen that the vertical type of air compressor has certain advantages, such as compactness and evenness of wear of piston and piston-rod—these advantages being more apparent in the steam-driven machines, while the horizontal compressor scores for accessibility, and, in the direct-connected type, simplicity of erection.

EFFICIENT FOUR LEVER JIG

By HUGH SCOTT

It is not often that one jig can be made for four different levers, but the following one described accomplishes this fact very easily. The jig is by no means intricate in design, which is of course a point in its favor. Readers will do well to study this design as it is a sure money saver.

First let us refer to Figs. 1 to 4. Here we see the four levers, and, as can be noticed, the lengths from centre to centre are different, also the widths and diameters of the hubs. The holes and shapes are also entirely different for each one of these levers, so it was necessary that we design a jig that would incur no loss of time in changing over.

The operation to be performed of course was drilling. Every lever had to be drilled correctly without bothering to remove the jig from the drill press.

The large holes were drilled in the centres of these hubs, therefore this left only the question of designing a jig adjustable in such a way as to insure absolute correctness in the length from centre to centre, after the small holes were drilled. The result is shown at Fig. 5.

First look at the plan view. Note the line AB through which the section view shown below was taken.

The jig proper consists of the following members: A cast iron body rested on two legs as illustrated, and connected by two tie rods F. The top plate of the jig is finished and provided with the slot J. Another cast iron side G is fitted to this top plate in such a manner as to slide in the slot J already spoken of. This slide G can be fastened at any spot within the limits of the slot J by means of the stud and washer with the nut H. The upper shaft, or shank I, is turned to suit the hole of one of the levers.

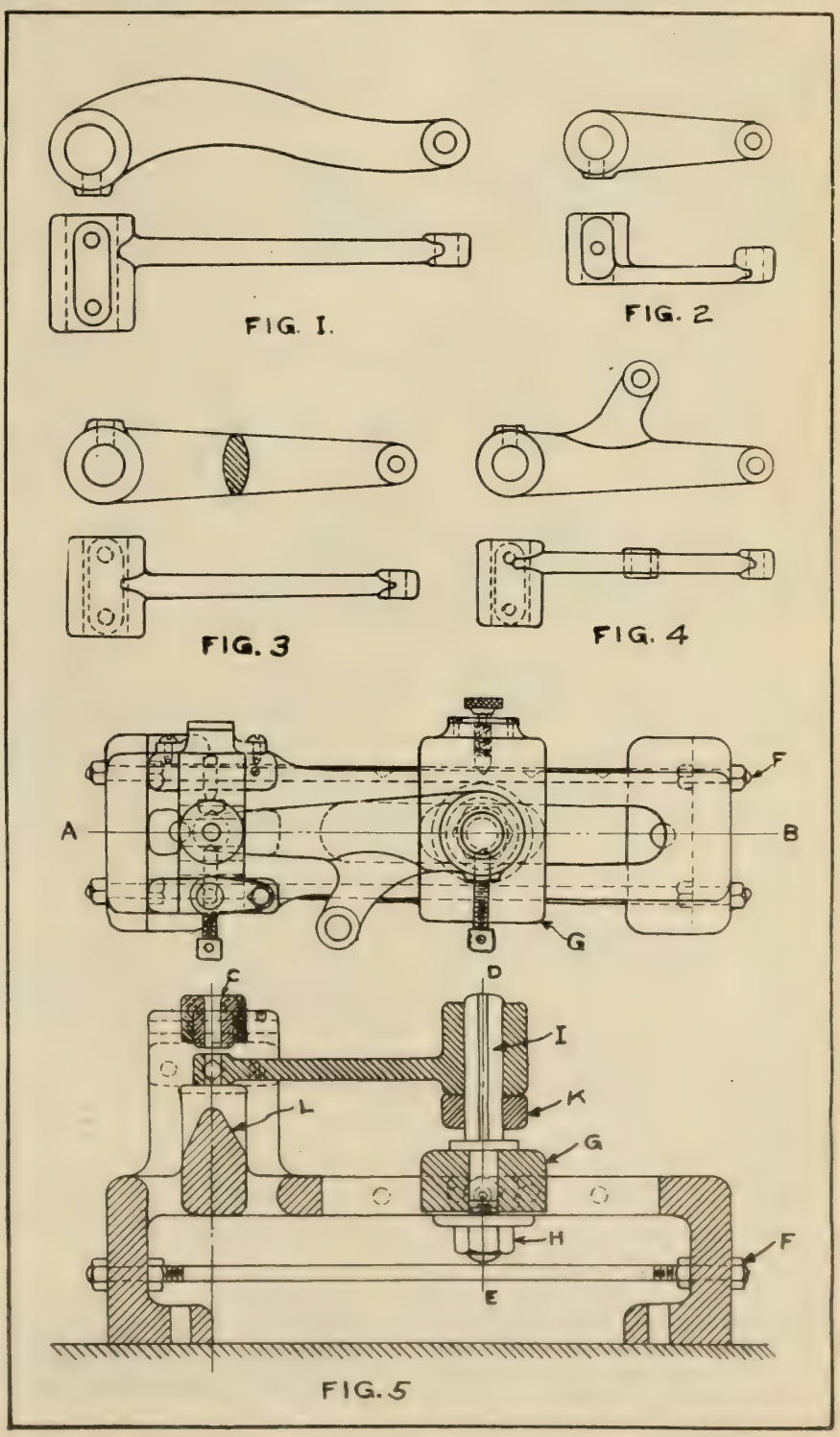
The collar K is adjusted by a screw to hold the hubs of the various levers at their correct height. This stud I already mentioned is provided with a groove which receives the hardened point of a screw which in turn prevents the collar from moving around. One side of the slide G is provided with a hub. This hub is drilled out to receive a pin. This pin is always pressed against the sides of the body by means of a spring. A knurled head serves to draw this pin back.

A projection is cast on the body and worked out to receive a steel hinge. This hinge is held by a small steel lever with a handle while the jig is in operation.

This jig is self-cleaning, since the chips all fall over a V-shaped rib L as shown.

This illustration shows one of the levers actually in the jig. If it is to be used for another size and shape of lever, the stud I is taken out and replaced by one which fits the lever to be drilled. The pin already spoken of is now drawn out and the slide G moved to its correct position and fastened to the nut H.

The jig is now ready for work, so we leave readers at this point to study it out for themselves.

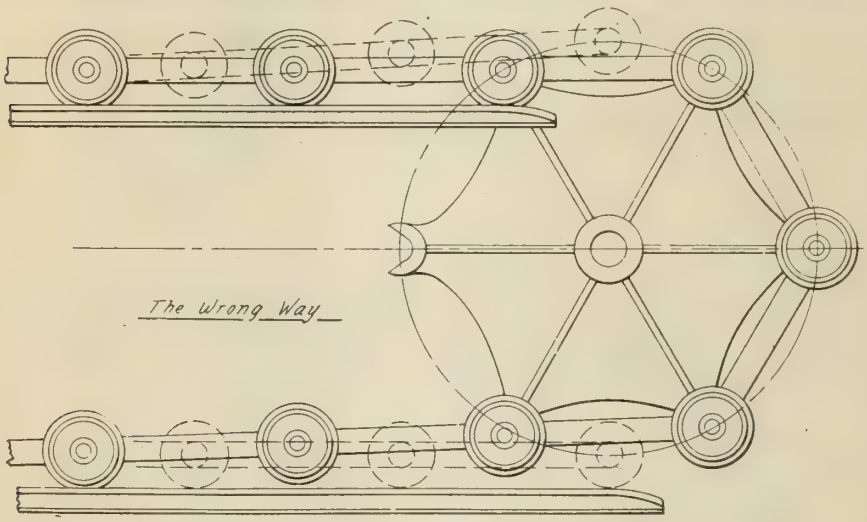


WHAT OUR READERS THINK AND DO

LOCATION OF RAILS IN BUCKET CONVEYORS

By John S. Watts

It is a peculiar fact, but all the bucket conveyors the writer has ever seen are built with the rails placed as shown in Fig. 1. That is, with the upper and lower rails in line with the tread of the wheel, when the wheel is at low point of the vertical movement, due to the revolution of the sprocket.



It must be admitted that to anyone without experience in operating these conveyors, the position of the rails shown in Fig. 1 would appear to be the correct one, but it is not, as will be shown in what follows:

In the sketch, Fig. 1, is indicated by dotted lines, the wheels in the position they will occupy when the sprocket has revolved 30° from where it is shown in full lines.

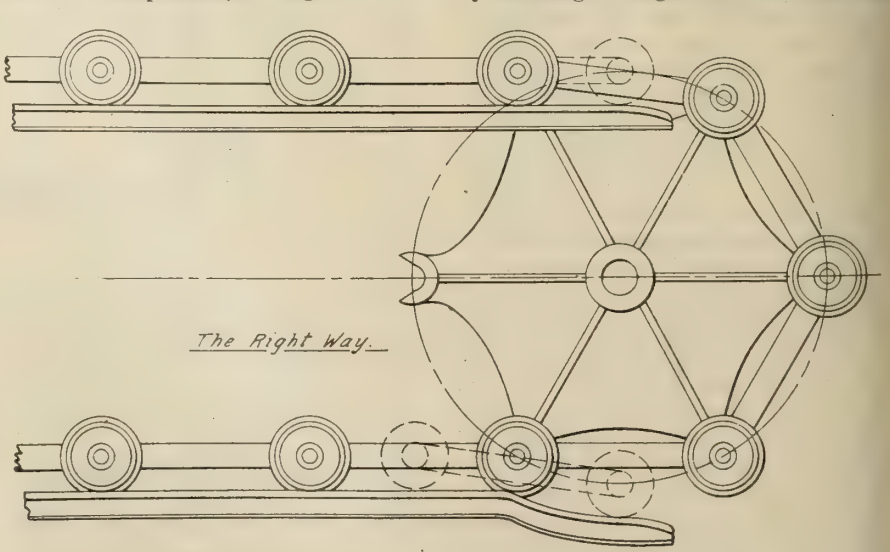
Taking the upper rail first, we find that the wheels and buckets have been raised from the rails, and of course will fall back on the rail when the sprocket revolves through another 30°.

On the bottom rail the same raising and falling of the wheels and buckets takes place, as is shown by the full and dotted lines.

With the large buckets now in use weighing as much as 3,500 pounds when loaded, the rising and falling causes a constant hammering of the wheels on the rails, accompanied by a deafening noise and destructive vibration in the whole structure. I have seen this effect so severe as to break the wheels.

The remedy for this hammering is to raise the rails up to the position shown in Fig. 2; this, as a perusal of drawing will show, prevents the wheels from ever rising from the rails and there cannot, therefore, be any hammering.

This change in the location of the rails can be made in conveyors already built by blocking up the rails to the required amount at the sprockets. The track may not be raised throughout the whole length of the conveyor as it will answer our purpose just as well if we start at that point at which the wheels commence to leave the rail. At this point the rail should commence to rise on a gradient such as to bring it up to the height shown at the sprocket, in Fig. 2.



PORTABLE LIGHTING FOR MACHINES

No matter how well-lighted a machine shop may be from a general effect point of view, the portable form of local illumination is always a necessity. The overhead fixed lamp, whether gas or electricity be the medium employed, may be quite adequate for setting up a job in a machine, or for subsequent plain, straightforward operations, but when it comes to precision work of a fine character, intricate operations, and a close attention to scribed lines, pop marks, or in measurement checking in thousandths, then the shadows created by interposing solid objects, and the lack of concentrated light, local rather than general, makes accuracy and working comfort a difficult proposition. It is a debatable point whether gas or electricity makes the best form of portable light; personally I am inclined to the former.

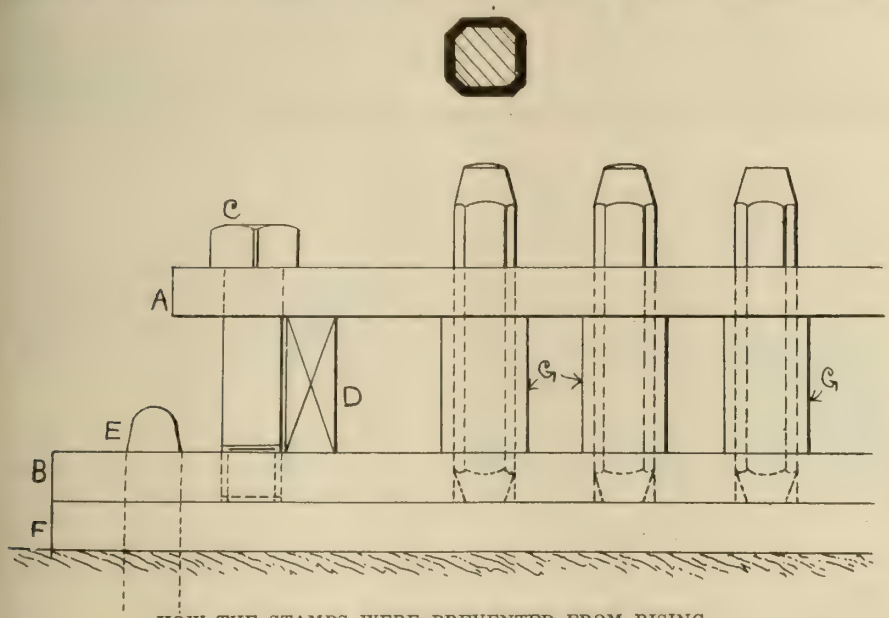
A convenient type for general machine operations is that which consists of just a short vertical length of, say, ¼ in. iron tube, furnished with an ordinary burner and a tap; the base being a fairly heavy block of lead, having a broad, flat bottom so that it shall not easily topple over. And it is always the better plan to use flexible metallic tubing rather than plain rubber. Often, too, it is desired to show a light some way down a deep hole that is being bored out or recessed, either in lathe or vertical boring mill. It will be found that an excellent portable lamp can be made by utilizing a length of ¼ in. iron tub-

ing welded up at the end and having drilled up the centre a 1-32 in. diameter hole.

PREVENTING STAMPS FROM RISING

By F. Horner

During the period of hostilities an urgent job of figure stamping came in, consisting of markings for depth in fathoms, on a ⅜-in. steel plate about a foot long. To locate the correct position of the stamps, a frame was built up as seen in the illustration (showing one end), comprising guide-plates, A and B, fastened together with a pair of set-screws, C, packing, D, being laid in as distance-pieces. The frame was located by dowell pegs, E, passing through the plate, F, to be marked, the pegs being driven into a baulk of timber acting as a cushion. The plate was therefore dropped over the pegs, the frame lowered over, and the stamps struck in rapid succession. The trouble was to keep these in position without bouncing up after the blow, and a simple solution of the difficulty was found in the shape of bits of rubber tubing, G, cut to length, and through which the stamps were forced.



HOW THE STAMPS WERE PREVENTED FROM RISING.

THE WELDER IN LOCOMOTIVE REPAIRS

The importance of having competent welders, particularly in the repair of locomotive boilers, was again emphasized at the recent convention of the Master Boiler Makers' Association. The boiler being, so to speak, the heart of the locomotive, any laxity in its construction or inspection is usually followed by disastrous results. One vital feature of boiler making and repairing is the practice now becoming quite extensive, of welding patches to the sheets when repairing cracked or otherwise defective parts of the boiler. There is no other form of repair work that may be so easily slighted through incompetent or careless workmanship and still pass the required inspection, only to fail at some critical moment in the operation of the locomotive. Many excellent papers are published from time to time in the technical journals devoted to railroad questions, and it is the duty of the men who have taken up welding to keep themselves fully informed concerning the methods and progress of the art of welding. Both the electric and the acetylene gas welding apparatus have been developed to a point where they require only careful and intelligent operation to secure satisfactory results. Anyone taking up this line of work may be assured of every assistance from the manufacturers of the welding outfits, as well as from their shop foremen, and should not fail to take advantage of every channel of information available. The importance of careful welding in every repair made to a locomotive boiler cannot be too strongly impressed on those who are engaged in this work.—"Railway Mechanical Engineer."

A machine piece is said to be tapered when no two places of its diameter are equal. Tapers are usually specified as the difference in their end diameters in inches, of a piece one foot in length, as, taper per foot.

$$\text{Taper per inch} = \frac{\text{Large Dia} - \text{Small Dia.}}{\text{Length}} \qquad \text{Taper per foot} = \frac{\text{Large Dia} - \text{Small Dia.}}{\text{Length}} \times 12.$$

$$\text{Large Dia} = \text{Small Dia} + (\text{Taper per inch} \times \text{length}) \qquad \text{Small Dia.} = \text{Large Dia.} - (\text{Taper per inch} \times \text{length})$$

$$\text{Length} = \frac{\text{Large Dia} - \text{Small Dia}}{\text{Taper per inch}}$$

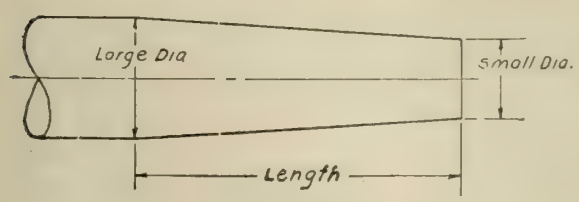
When the taper is excessive, its value is given in degrees.

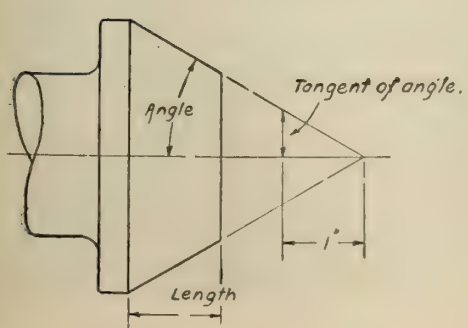
$$2 \times \text{Tangent of angle} = \text{Taper per inch.}$$

$$\text{Taper per foot} = \text{Tangent of angle} \times 24.$$

$$\text{Difference between both Dia's} = \text{Tangent of angle} \times \text{length} \times 2.$$

$$\text{Length} = \frac{\text{Large Dia.} - \text{Small Dia.}}{2 \times \text{Tangent of angle}}$$





L. Dia	S. Dia	Length	T.P.F	Tangent	Angle	Diff.
1.12		7.412	.4776			
2.46	650	6.250				
	3.210	2.240			20°	
	1.80			.8988		7.379
3.120		5.75	1.250			
3.40			6.270			2.650

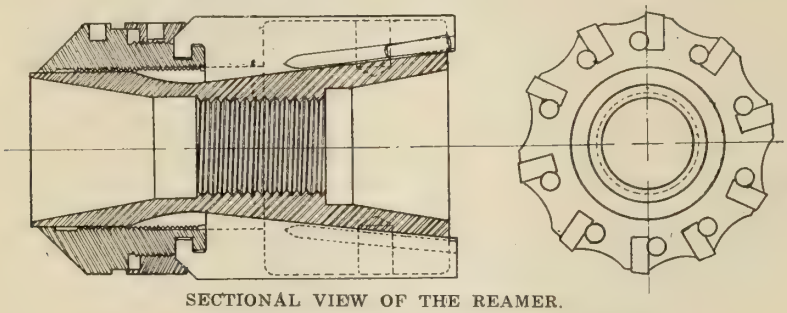
Tangent of angle = Taper per foot ÷ 24.

TAPERS.

DEVELOPMENTS IN SHOP EQUIPMENT

THE DAVIS EXPANSION REAMER

For a long time the old style of solid shell reamers were used, but with the constant improvement of other machine shop equipment, the necessity of a reamer whose blades could be expanded in a practical manner to compensate for wear, was keenly felt. Numerous types of adjustable reamers were placed on the market from time to time, the majority of which were controlled and locked with individual blade screws or pins. But none of these fully met all the requirements of the trade. The great percentage of these went into the discard, but there are still several types of adjustable reamers which have survived.



SECTIONAL VIEW OF THE REAMER.

Some time in the year 1909, Mr. E. E. Davis, general manager of the Davis Boring Tool Company of St. Louis, Missouri, also realized the necessity for a thoroughly practical expansion reamer. With the aid of his thorough knowledge of boring equipment and metal boring requirements, as well as an exceptional mechanical experience, he set to work solving the problem. The result was the Davis expansion reamer, one of the greatest improvements on record in the history of machine tools.

The entire principle and design of this tool were originated by Mr. Davis, and in December, 1912, a patent was taken out as a protection against infringement.

The distinguishing features of the Davis expansion reamer are simplicity and practical construction, with fewer parts than any other tool of similar type. All wearing parts are hardened. All threaded parts are protected from dust, chips or possible injury which might result from careless usage or accident.

The blades are positively controlled by an accurate micrometer adjusting dial, graduated in quarter thousandths, which acts for both expanding and receding of blades. The blades are slotted and fit over the ring on an adjustable dial which prevents their movement either way without turning the dial. When the reamer is set to size required the blades are individually and doubly locked to reamer body by a locking principle which positively locks the blades without the use of screws, virtually making a solid reamer in its entire principle.

Blade Efficiency

Davis expansion reamers require but three groups of blades to cover range of sizes from 1⅝ inches to 6 inches, inclusive. The large range of sizes covered, together with the greatest possible range of expansion, will show a decided increase in the number of holes reamed per set of blades.

When the blades for the 6-inch reamer are worn under size, they can be used in a number of smaller sizes down to and including 4-1/16 inches. Blades for the 4 inch reamer can be used in smaller sizes down to 2½ inches. Blades in the 2-7/16 inch reamer can be used in smaller sizes down to 1⅝ inches.

This is reamer blade efficiency at lowest blade expense, and means 100 per cent. to 300 per cent. more holes reamed per set of blades than with any other similar type of reamer.

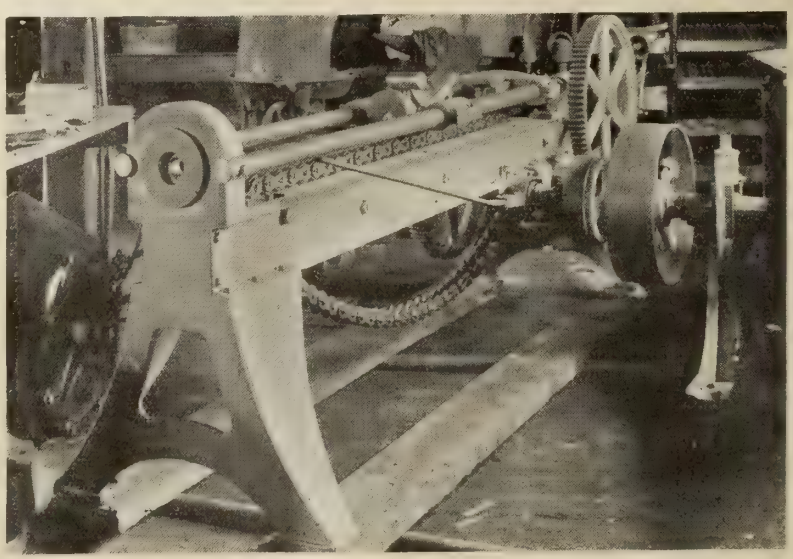
The Davis Boring Tool Company, Incorporated, are the originators of the forward movement of blades for the purpose of expansion in a tool of this type. This feature always keeps the blades cutting in advance of the tool body, consequently the blades never lose their bottoming feature.

DRAW BENCH

The Winterhoff Tool and Machine Co. of Elkhart, Ind., have placed on the market a new draw bench, as illustrated.

This machine is designed to draw tubes to a very thin wall, straight, and accurate gauge.

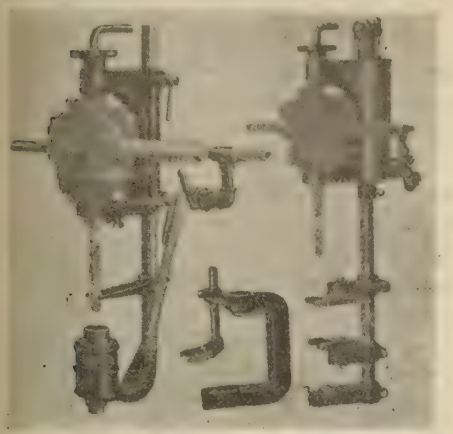
It is different from the usual type in that it is provided with guide rods that are in perfect alignment with pitch line of sprocket, and die hole in drawing head. It is also provided with safety stop that disengages hook from chain at any point desired. Chain is of standard roll link type and has a capacity of fifteen tons. Machine is back-geared to approximately 150 to 1.



GENERAL VIEW OF THE DRAW BENCH.

LABOR-SAVING SHOP TOOLS

The Liberty Tool Company, Baltimore, Md., is showing a number of new devices designed to effect time and labor saving in shop work.

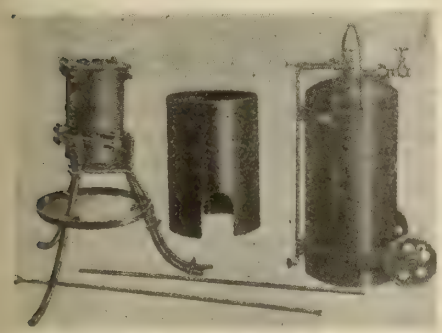


PORTABLE DRILL PRESS

Portable Drill Presses

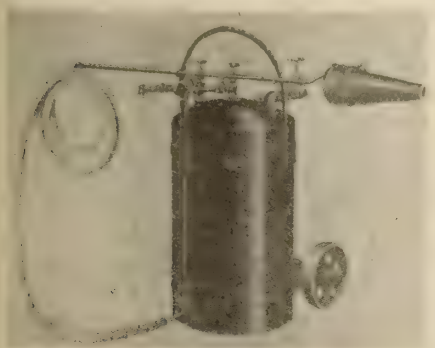
A portable drill press, designed to fit any make or shape of air drill having a vertical motor, is especially adapted for drilling and countersinking flange and plate work, such as firedoors, flue sheets and door sheets. This device has a 2¾-in. pneumatic feed end and is equipped with a sliding head taking any work from ½ in. to 14 in. thick. It will drill holes from ½ to 1 5-16 in. and countersink up to 2 in. in diameter.

A double cylinder portable drill press



RIVET HEATING FURNACE.

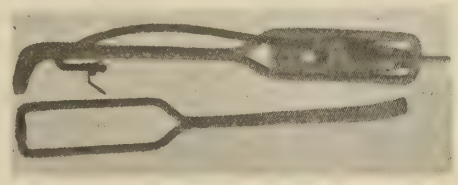
with a crowfoot attachment is designed for any class of work and fits any of the pneumatic drills commonly used. It is equipped with a sliding head and a sliding table, has an 8 in. pneumatic feed and will drill holes up to 1 5-16 in. and countersink to 2 in. in diameter. It can be used as a radial drillpress up to 18 in. in diameter of hole circle and the sliding head can be adjusted to take work up to 14 in. in thickness.



PORTABLE HEATING TORCH.

Rivet Heating Furnace

A portable rivet heating furnace using oil as fuel is designed so that the point of the rivet may be heated to any desired temperature, while the head is heated only to a cherry red or sufficient to readily conform to the work in the riveting operation. The top of this furnace is pierced with holes, through which the rivets are inserted, so that the point of the rivet is in the flame, while the rivet head rests on the outside or top of the furnace. The intensity and uniformity of heat may be regulated by means of a control valve.



HOLDING ON BAR

Portable Heating Torch

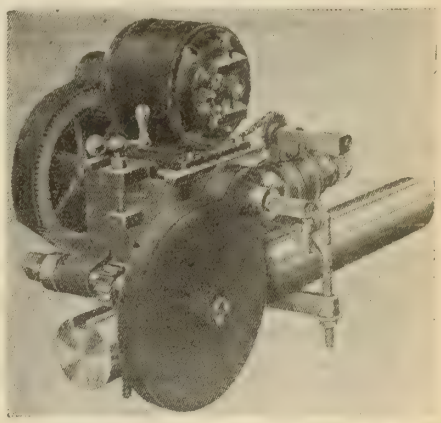
This apparatus consists of a fuel tank, a hose and a burner. The torch has one line of hose leading from the tank to the burner, which makes it convenient to handle in close places. This torch will heat to any desired temperature and may be used in the open air with excellent results.

Holding-On Bar

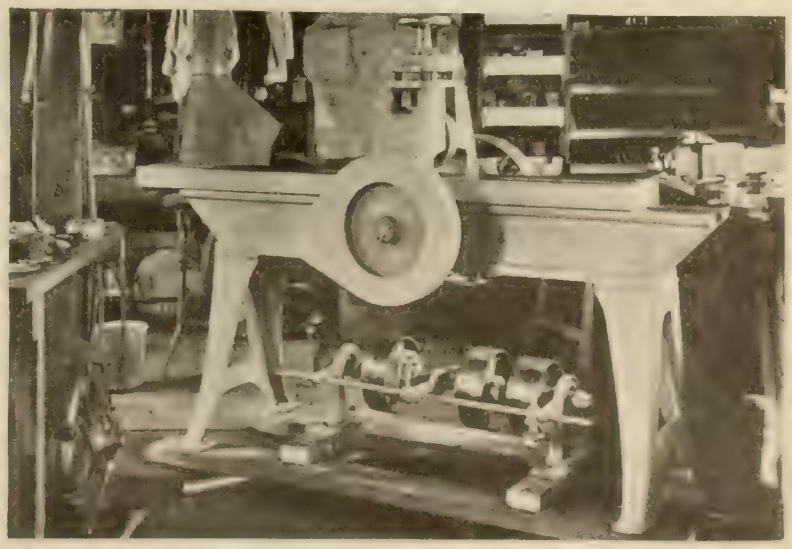
This holding-on or dolly bar has a pneumatic clamping device secured in a rectangular frame which is part of the bar itself. The bar can be placed in position quickly and the recessed end tightly clamped over the rivet. It may be readily applied in close quarters and is especially designed for use in locomotive flue sheet riveting and repair work. This company is showing a heading attachment for a riveting hammer, designed to rivet stay bolts and stay rods or countersink rivets and also a portable drill press for a close corner motor.

BUCHER-SMITH KEYSEATING MACHINE

The Bucher-Smith Co., East Liverpool, Ohio, is now manufacturing a portable motor-driven keyseating machine, in addition to its Style A hand-power machine. The machine shown is known as style A-2, and has a spur-gear drive. The sliding head is cast solid to the spindle; the feed screw, being inside the spindle, keeps the pulling strain close to the shaft. A power feed is furnished by a sprocket-chain connection from the main shaft to worm gearing on the screw. The depth of cut is regulated by the vertical screw shown above the cutter. The main shaft is squared on the end for a wrench, thus permitting hand-power operation if current is not available. The motor furnished is either alternating-current or direct-current and the power connection is usually the nearest lamp socket. The machine will cut keyways from ¼ to 1¼ in. wide by 12 in. long, and is suitable for shafts from 1¼ to 5 in. in diameter.



PORTABLE KEYSEATING MACHINE.



VIEW OF THE SEAM ROLLING MACHINE.

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Ask the Men Who Have Gone Up

PREMIER DRURY has been speaking considerably on education, and in some respects at least he seems to be on the right track.

If he wants to get assistance in this matter he can do so by calling in some of the foremen and superintendents of shops who have come up through the ranks.

These men know what they were equipped with when they had to leave school. They know what was useful to them and they also know what they had in the way of surplus and useless knowledge.

They will all go back to the fact that they were not well enough equipped in the fundamentals of education. They wanted to know more about arithmetic and methods of doing it quickly. They wanted more reading and writing. They wanted these things and lots of them.

It would not be a hard matter to name a half-dozen men in the metal working lines who could give valuable advice along these lines. We mean men who did not have the advantage of a college education — men who started to learn a trade, and when at it a year or so found that they were up against a stone wall all because they did not know enough.

There is no doubt at all but that other lines of enterprise could furnish foremen and superintendents who have had the same experience.

Men who have gone through the mill, and who know what helped them through are in a better position than the finest book scholar in existence to advise those who want to make the public school curriculum suitable to provide that necessary "something" for the boys coming on now.

CANADIAN MACHINERY has no doubt that men who have worked and studied and burned the midnight oil to fit themselves for positions of responsibility and good salaries would be willing to sit down in conference with the provincial authorities and give them the benefit of dearly-bought experience.

Time To Quit Tinkering

HOW much longer can the state of industry on this continent continue to be tinkered with before it goes to smash?

A person hardly needs to be a pessimist to ask such a question. Certainly the most confirmed optimist can hardly close his eyes to the trend that events have been taking in recent months.

Just now we are coming to realize what the coal strike means. Not in Canada? Yes, but Canada is United States as far as the coal strike is concerned.

Go into the market to-day and try and buy steel and coal. Can you get them? You can not. Without any academic discussion on the merits or the demerits of the case, how are you going to get along without them? They are both basic purchases of the first water.

When officials of some of the miners' unions heard that the recommendation of the arbitrators awarded them fourteen per cent. increase, the expression alleged to have been used was "To hell with it!"

It is well that these words were used, because it brings into concrete form a spirit that has been rampant in an indefinable way for months.

"To hell with it!" is not nice language, neither is it good form to reprint it, but no other phase will state fully the frame of mind of many people on this continent who have the making or the breaking of our industrial prosperity in their hands.

The war has not taught the world very much. We made the sacrifice. It was enormous. It was ghastly and it was heart-breaking. We believed that the after-war period would see a kindling of the fires of love and tolerance and sacrifice in our national, industrial and individual lives. We had dared to think that somehow or other, from the furnace of suffering and death would come a conception of something higher and more worthy than money grabbing.

And to-day can you blame the man who looks around and asks where the improvement has come in? He sees strikes, discontent, probing into large profits, investigations into plots and uprisings against rulers and against governments. He does not see men in honor preferring one another, showing a spirit of kindliness and toleration.

Things are approaching the stage where the man who stands up now and tosses another monkey wrench into the wheel should be regarded as nothing less than the common enemy of all, and he should be dealt with accordingly.

THE International Association of Ash Sifters have officially opened the 1919-20 season. The slogan: "Dust thou art to dust returnest."

* * *

IMAGINE the good old days when a machine tool dealer could give you delivery in two weeks—and then was willing to stand back a spell and wait for his money.

* * *

MANY a salesman is successful on account of the things he does not say rather than for the things he does say.

* * *

SHORTER hours and less production will never remedy the condition this country faces. It is bound to mean lower wages and unreliable employment. The high mark for wages in Canada was in the munition shops, and those wages were possible on account of the high production secured.

Joins General Combustion Co.

NORMAN M. CAMPBELL

NORMAN M. CAMPBELL has resigned his position as general sales manager of Canadian Ingersoll-Rand Co., Limited, and as a director of that Company, having been appointed managing director of General Combustion Co., of Canada, Limited, with headquarters in New Birks Building, Montreal. He will assume his new duties on the first day of January next.

Mr. Campbell was born in Montreal in 1878, the son of Rev. Dr. Robert Campbell of that city. He was educated at Montreal High School, Abingdon School and McGill University, from which he graduated in 1899 with degree of Bachelor of Science.

On graduation he was appointed Assistant Engineer in the Waterworks Department of the Dominion Iron and Steel Co. at Sydney, during the construction of that Company's plant.

He joined the staff of the Canadian Ingersoll-Rand Co., Ltd., in 1900, as manager of their Toronto branch and was moved to Montreal to take a similar position there three years later.

In 1910, he was appointed general sales manager of the company, and during his tenure of that position he has had the satisfaction of seeing the Company grow from a very modest concern to its present status as one of the largest manufacturing plants in the iron and steel industry of Canada.

In the General Combustion Co. of Canada, Ltd., Mr. Campbell will have associated with him Dr. Milton L, Hersey and Mr. Henry H. Vaughan, both very well-known figures in engineering circles in Canada.

The Company was recently formed to exploit in Canada and Great Britain, industrial furnaces for annealing, forging, heat treating, etc., under the well-known Sklovsky patents, with the trade name of "OILGAS" furnaces, and from its inception it has been notably successful.

A Real Imagination

WE are indebted to "The Locomotive" for bringing this gem of pure imaginative effort to light. It is supposed that it was written by a member of the air service at Scott Field to his father and was found near the Southern Railroad Station.

"I have been appointed Mess Sergeant of the Flying Detachment, Scott Field, and to show of what my work consists, I will give some few examples of our tasks and efficiency.

"The kitchen range is 500 feet wide and 3,000 feet long, takes 27 experienced firemen to keep the heat at the necessary temperature, 400 cooks on duty at all times, 1,000 mechanical stokers for kitchen police and 1,000 assistant kitchen police who look after the stokers.

"Two hundred washing machines are used for washing the potatoes, 27 pile drivers mash them, 14 steam shovels shovel eggshells away from the kitchen door. Twenty-two Liberty motors are used in the coffee mills. Dirty dishes are hauled out to 11 blast furnaces, as the dishes are all paper and are burned after each meal. Hot cakes are mixed with 19 concrete mixers and 46 men with bacon rinds attached to their feet continually skate over the large griddle to keep it greased.

"Soup is made in an artificial lake, which keeps 34 dump trucks busy hauling the necessary ingredients. Cooks use steel boats and are dressed in asbestos clothing. Every few minutes they row to the centre of the soup lake and drop depth bombs to properly stir the mixture. Sixty-seven fire engines are used to pump soup to the 954 tables. Bread is cut by 11 high-powered band saws. A perforated endless conveyor properly salts and peppers the victuals. Twenty large street sprinklers are used to place syrup on cakes. Coffee is made in a 600-gallon tank and pumped to the tables through pipes by 17 centrifugal pumps. Ten five-ton rollers are used to roll the batter. To save labor and cost six-inch mains have been installed from 20 of the country's largest dairies for the supplying of milk.

"Radio telephones are used by the Mess Sergeant, who also uses a motor cycle in travelling around the dining hall and kitchen. All cooks wear gas masks. Ford trucks haul the silverware. Now, dear father, you can see just what I have to do and why I do not desire to quit the army."

The Old-fashioned Home

THERE is one place I like to go, of that there place I'll write—it's got your fancy dangled homes knocked higher'n a kite. To enter there's a tonic sure for every aching bone, that place is sure a wholesome one—a real old-fashioned home.

You seem to feel the home-like stuff before you're quite inside, there's not a touch of snobbery, of jealousy or pride.

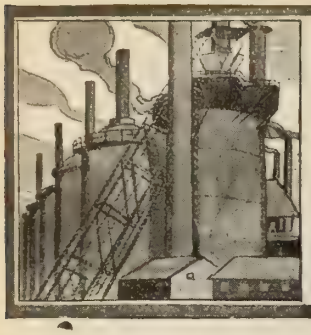
They haven't got those spindley chairs you fear to sit upon, nor the paper tinted to a shade betwixt the night and dawn. And cushions ain't piled up in hills, just to be squinted at; what's more, there is no Turkish rug nor Oriental mat.

But everything seems just to say, it talks as plain as mud, "Just come and rest your carcass here, you great big weary dub. It doesn't make no odds to me how hard or fast you sit, or whether you wear silk-lined gloves or just a home-made knit."

Perhaps the carpet's just as plain, 'twas rag made hit and miss, but it beams and shines and seems to say, this is a place of bliss. Folks like to joke about the words in mottoes on the wall, and 'bout the peacock feathers stuck resplendent in the hall. And if a spot appears upon the carpet by a chance, the folks don't throw a fit right off, or pass into a trance. It aint a very serious crime, it really aint, by heck—to spot a place upon the wall where flies have left a speck.

But sweet content is campin' there—it comes in like a flood, and you couldn't chase it out again with a broomstick nor a club. Let's toast the good old-fashioned home, with its dear old-fashioned airs, unspoiled by touch of higher art, nor cursed with three-legg'd chairs.—ARK.

IF PRICES and wages fall together, there is very little hardship on the individual, but on the other hand there is also very little benefit, and by far the best thing is for prices to fall and for labor costs also to fall by means of increased production. Increased production per man, with the help of improved appliances, may save the situation and enable us to retain and extend our industries at the time when severe foreign competition begins to operate and may even enable high wages to be paid, but without increased production the only conclusion possible appears to be that wages must fall or our industries will be killed. —*Machine Tool Review.*



MARKET DEVELOPMENTS

U. S. Rollers Do Not Want To Book Business

Canadian Buyers Find Trouble in Booking Tonnages at Large Mills—Looking for Higher Prices in 1920—Increases Are Noted in Wood and Metal-Working Machinery

SOME Canadian buyers have been in the steel district of the United States during the week in an effort to place business for future delivery. They found that rollers there were not anxious to discuss the proposition at all. In fact, it was intimated that some of the mills during the war had booked tremendous tonnages at current rates, and when the higher prices came they were not in shape to handle that business, being busy with the lower price contracts. They are not going to repeat that error, and to use the words of the buyer, they are not going to fill up on soup so high that they won't have room for turkey."

Indications point to higher prices for steel. The Corporation adheres to the schedule of March 21, but the Corporation can give no definite shipping promises. It seems likely that premiums will be frequent and of fairly large dimensions in the near future.

Increases are noted in machinery lines. One New York maker gives notice this week of a seven and a half Dealers complain that prices on high speed cutters are per cent. increase. Woodworking machinery goes faster than that, and increases in the last three weeks in some lines, when brought to a Canadian basis, would amount to almost thirty per cent., coupled with a delivery schedule that was inclined to be vague.

Old Country high speed goods are coming on the market again. The Canadian trade used to be good for these lines, but since the war it has been a great place for U.S. goods that got a start in here during the war rush. Stock lists and quotations show an ability to meet competition. being brought in some cases to a point where there is nothing in it for them. Apparently the makers consider that they can sell their output from the factory.

Shortage of supplies in the way of many lines that usually come from the U.S. steel mills, coupled with the shortage of coal, and the drastic methods that are being taken to meet the situation, do not help matters in the industrial world. They tend to create a hand-to-mouth policy, which precludes orders on a large enough scale to keep things moving in a good volume.

TOO LATE TO BRING SCOTIA COAL BY BOAT TO MONTREAL MARKET

Special to CANADIAN MACHINERY.

MONTREAL, Que., Dec. 11.—There is one ray of sunshine in the gloom of the present situation in the announcement that a satisfactory arrangement is expected this week in connection with the coal strike in the States; not that such action will offer any immediate relief to the existing conditions, but it will enable business to become more stabilized and permit of a more definite policy for trade developments and general industrial operations. Local plants have not been seriously affected by the inability to obtain coal, as many firms were well stocked with fuel when the strike came into force. The near approach to the close of navigation and the consequent increased difficulty of securing supplies were factors that were arousing considerable concern, but the prospects of a near settlement of coal troubles in the States has removed much of the tension of the past few weeks, but dealers and manufacturers realize that all is not smooth running yet, and that every precaution will have to be taken to conserve available supplies, as it will be many weeks, or even months, before the lost production can be made up and shipments normal. There has been some talk of bringing supplies from the Maritimes, but with the St. Lawrence closed, this would entail long haulage over the railroads—almost a prohibitive practice. Recent export trading has been somewhat adversely affected by the low British exchange rate, a factor that prevents expansion of Canadian export trade.

Steel Supplies Falling Off

Apart from the possibility that the coal strike in the States may be terminated this week, there is little new in the present industrial situation. Conditions here have not been acute, but the disturbances in the American coal fields, and the uncertainty of fuel shipments to Canada, have gradually increased the tension in regard to the continuance of industrial operations. Curtailment of productive activities, which have become so general in the States, has not been found necessary here, as yet, although the attitude of the U. S. authorities in withholding coal shipments has caused some unfavorable comment in Canadian business circles. The present demand for steel and the inability to supply the same would be ample excuse for a higher price on finished materials, but large producers are apparently not departing from the policy of keeping the quotations from soaring to runaway figures, which would be the case if a lead was once given. Whatever is being done in the way of premiums there is little appearing on the surface to indicate that transactions are carried on on other than the quoted basis. Dealers here report difficulties in getting materials shipped in from the States, and long delays are frequently recorded, even after the stuff has left the mills or the warehouses. Local stocks are not all that could be desired and in such lines as sheets, plates and tubes, it is only in the less-called-for sizes that stocks are reported, and even here the supply is gradually falling. The

general market is strong and quotations given should only be considered as nominal.

Dealers Await Developments

Nothing of importance has developed in the old material situation and the dealers are still waiting for something to turn up that will revive the demand. The disturbed state of industry across the line has not been conducive to the buying of scrap and local trading is not in sufficient volume to cause other than normal comment. Shipment of scrap out of the country has fallen off considerably, and in consequence the present market has a weak tendency. Dealers are looking forward to better buying in a week or so, as reports point to an early resumption of coal mining operations. It will be some time, however, before normal steel operations can be resumed, as it will require some little time to restock depleted coal piles. Dealers are holding to quoted prices, but state that they are of a nominal character, and governed by individual transactions.

TENDENCY NOW IS MUCH HIGHER

And U. S. Mills Are Not Anxious to Take on Much Business for 1920 Delivery

TORONTO.—Prices have crowded into the centre of the stage as far as the machine tool and iron and steel market is concerned. There may be some price lists that still exist as absolute, but they are becoming more infrequent, and the tendency seems to be to withdraw all quotations, and give prices on request for actual delivery. This is not a very satisfactory way of doing business for either the consumers or the dealers, but it is about the best that can be done now.

The Machine Tool Market

The market for wood working machinery is just as uncertain as in the metal working lines. There are cases where makers of machinery have made advances as high as twenty per cent., which, in this country, would be worth thirty per cent. on account of duty and exchange. Metal working machines are more firm in regard to advances, and few have been made during recent weeks. It amounts to practically the same thing, however, as many builders refuse to quote any price at all for future deliveries. As far as can be seen they are willing to accept business for future shipment, but only on the understanding that price shall be that which is prevailing at the time of delivery.

This is being reflected in the used machinery trade. One dealer informed CANADIAN MACHINERY this week that instructions had been sent out to hold up all prices quoted on used equipment, as there would likely be a revision in the near future.

Cutting Prices Now?

Some of the salesmen handling certain lines of high-speed goods complain that prices are being cut below where they can make any money in the business. It is hard to explain why, but it is a fact that U.S. concerns are now paying net list for high-speed cutters, while in Canada the price is ten off. This has been the prevailing price for some time, but just recently quite a lot of buying has been done at ten and ten off. The jobber complains that he can do nothing at this price. Of course, it is all right for the concerns using the cutters, as they are getting a close price, and they know it. English firms are getting in shipments of high-speed once more. Prior to the war the high-speed steel market in this country was largely in the hands of the British makers, but during the time of the war, owing to the need for material at home, and the inability to get shipments through, the business passed largely into the hands of American firms. It is evident that British makers are out now to get a slice of that market back again, as they are putting in their high-speed goods in some cases at a price which is ten per cent. better than the local quotations.

The Market For Steel

As far as the jobbers are concerned, price lists appear to have ceased to exist. They may still be in existence for the guidance of buyers, but for actual transactions in sheets, plate, tube, etc., they have passed out for the time being. Figures that are quoted elsewhere in CANADIAN MACHINERY in these lines are simply nominal. When a house has nothing to offer in the way of sheets or plate it might as well quote ten dollars as one dollar.

Bar mills in this country have gone up $7 per ton in the last three weeks. United States mills, according to Canadians who have been over the ground recently, are not in good shape, or at least they are not taking on business. It looks very much as though some of the mills were looking for better prices in the spring, and are not inclined to book up at present quotations. It may be that they even expect prices to mount rapidly when the spring rush comes, as it surely must come.

Here is the way one Canadian buyer sized the situation up for CANADIAN MACHINERY: "It looks to me as though the mills in United States had profited by the lessons they learned during the war. At that time they booked away ahead, and piled up enormous tonnages. The result was that they were kept busy grinding away on this stuff at a set price, while other mills with not such great bookings were at liberty to go out and take on business that was pressing for delivery and therefore willing to pay a higher price. As one of the U. S. men stated the case a few days ago: 'We do not propose to be caught as we were during the war. Then we were so filled up on soup there was no room for turkey when they passed it to the mills. This time we are going easy on the soup and we are going to sit up when the turkey comes.' Which is another way of saying that they intend to roll easily for the present and when the higher prices become common they will roll seriously."

The independents are acting pretty much together at present taking their lead from the Corporation. The Corporation is becoming pretty well booked ahead and will not promise anything in the way of deliveries, although adhering to the prices of March 21. It is figured out now that the independents realize that urgent buyers will be in the market and prices are liable to soar in proportion to the urgency of each separate case.

POINTS IN WEEK'S MARKETING NOTES

One maker of lathes has notified the New York market that he is making a seven and one-half per cent. increase in his selling prices, effective at once.

—

Advances are recorded in several lines of wood-working machinery, some of them, by the time they reach this country, amounting to as much as 25 and 30 per cent.

—

English high-speed goods are coming on the market here once more. For some time American goods have held this market on account of the inability of British makers to ship here.

—

Dealers claim that prices are being shaved again on high-speed cutters. U. S. buyers get these at net list, while Canadian prices are ten off, and some fairly large orders have been taken at ten and ten off.

—

Canadian buyers going into the United States to place plate and sheet business find the mills there not anxious to talk future orders at all. Apparently higher prices are in store in the spring, and many of the mills want to be in shape to roll at the new quotations.

—

Scrap metals are dull this week. Coppers are apparently now at their low mark, and improvement is anticipated. Iron and steel are holding at the advances that were marked up for them last week. No. 1 machinery scrap is very much in demand.

—

Tin plate rollers are closing down first in United States, as steel for that purpose has to be heated six times. Curtailment on other lines is necessary on account of coal and coke shortage.

—

Iron and steel jobbers have for the most part taken their quotations in for the present, prices being given on application for certain definite lots.

The mills at the Soo of the Algoma Steel Corporation are busy now, having a lot of business on their books, especially in the merchant bar mill. The demand is very strong for small bars, reinforcing bars structurals the Soo mill now rolling up to 15 in. in the latter.

The Non-Ferrous Markets

Coppers are showing a little more strength, but the market is crowded with material, owing to the manner in which United States exchange is working against business being done in that country. It might also be mentioned that speculators who had bought some time ago in the hope of a rise in the copper market are having a merry time trying to hang on in hopes of a better chance for them turning up in the near future.

Scrap Not Active

Coppers in the scrap market are weak, with little demand either way from dealers to users or from pickers to dealers. The steel and iron section is stronger and holding well at the advanced prices that were marked up last week.

Mr. J. H. Laroche, of Ste. Croix, Quebec, has written to CANADIAN MACHINERY asking where he can secure No. 1 machinery scrap, and what he will have to pay for a car load.

MACHINE TOOL TRADE NOT HURT MUCH BY THE COAL STRIKE YET

Special to CANADIAN MACHINERY.

NEW YORK, December 11.—It is a matter of some surprise to the machine-tool trade that business has held up so well in spite of the somewhat uncertain industrial outlook brought about by the coal situation. The explanation may be that far-seeing manufacturers do not anticipate any long-drawn-out coal strike and are preparing to take advantage of the backed-up demands for all products that may exist when the coal shortage has been overcome. Deliveries on nearly all standard tools are now from two to four months or longer overdue, and if coal shortage affects output of machines, as it is very likely to do, these deliveries will be extended even further, without any increase in business. Therefore, those who have faith that the industrial situation will right itself within several weeks, at the most, are not loath to place their orders to insure reasonable delivery.

The General Electric Co. is one of the most active buyers, so far as quantity is concerned, but there is general buying of small lots of tools which extends to manufacturing plants in nearly all metal working lines. The General Electric Co. will buy equipment for its two new plants at Rochester, N.Y., and Decatur, Ind. The latter plant will make small motors. It is reported that the company has received a contract for one million vacuum cleaner motors. The New Departure Mfg. Co., Bristol, Conn., has not quite completed its buying as more tools will be purchased soon for its coaster brake department. One large machine-tool concern received an order from this company for $600,000 worth of tools. The Willys Corporation, Elizabeth, N.J., is buying tools almost every day for the additions at its plant. It will be about June 1920, before the company gets on a real production basis on its new six-cylinder light automobile. Equipment will also be bought soon for another unit of the Willys Corporation, the plant of the Electric Auto-Lite Co., Poughkeepsie. The Dupont Motors Corporation, which is building a new automobile plant at Wilmington, Del., will be in the market for equipment soon, so also will two other Eastern automobile companies, the Rolls-Royce Co., Springfield, Mass., and the Stevens-Duryea Co., Chicopee, Mass.

The Nathan Mfg. Co., New York; the Mergenthaler Linotype Co., New York; the Newport News Shipbuilding & Dry Dock Co, Newport News, Va.; the Traylor Engineering & Mfg. Co., Allentown, Pa.; the International Motor Co., Allentown, Pa., and the De Laval Cream Separator Co., Poughkeepsie, N.Y., are among the companies which have come into the market for small lots of tools.

An officer of the Greek navy is in this country to confer with machine-tool builders relative to a list of equipment for a naval air station to be built in Greece. The equipment has been figured on in England, but a part of it may be bought in the United States owing to the high prices prevailing in England.

A leading manufacturer of turret lathes has advanced prices 7½ per cent.

SHUTTING OFF SOME MILLS NOW BECAUSE COAL AND COKE ARE SHORT

Special to CANADIAN MACHINERY.

PITTSBURGH, Dec. 11.—Last week, when the coal strike had already lasted four weeks, occurred the first noticeable curtailment in steel mill operations, while predictions were that if the coal strike continued a fortnight longer a large part of the industry, perhaps half, would have to close. Nevertheless coal production has been increasing, by the non-union mines doing better, and by a union mine here and there resuming production. The explanation of the currents thus crossing is of course that the steel mills had been operating chiefly on their stocks of coal, and these stocks were nearing exhaustion.

Inasmuch as the steel is heated six times in the process of making tin plate, it is not surprisng that the first cases of mill closing reported were tin mills, including the American Works, Elwood, Ind., and the Gary tin plate department, both of the American Sheet & Tin Plate Company, and of some at least of the tin mills of the Trumbull Steel Company, Warren, O.

With only a gradual increase in coal production this closing of mills will spread, there being many requirements more essential. Only a practically complete resumption of the union mines can put the steel industry in an easy position, but if there is such resumptions the industry will be relieved almost at once, since there are stocks of coal held by the railroads for distribution to the most important uses, and these would be released as soon as it became known that fresh supplies were coming. Closings, if they occur, will probably affect the rolling and finishing of steel somewhat more than the making of steel. Even now some mills are husbanding their coal by putting steel through the finishing processes that require the smallest quantity of coal per ton of product.

By the order determined upon by the Fuel Administration, Dec. 2, the production of beehive coke is being restricted about 25 per cent., the regulation being effected through the medium of car supply for coke loading. In Connellsville region the regular procedure is likely to be for the railroads to furnish no coke cars Wednesdays and Thursdays, coal cars being furnished on those days. There has been a rush on the part of blast furnaces to pick up any lots of furnace coke available, and in the space of one week the market price of Connellsville furnace coke for spot shipment advanced from $6.25 to $10, on transactions involving very limited tonnages. Some conservative coke operators deplored the advance, but had no coke to offer at the prices they considered reasonable. Some of the buyers were furnace interests whose supplies from other coke fields, or from their by-product operations, had been decreased, while others were regular customers of the Connellsville region who desired to gather up a surplus against contingencies.

The Iron and Steel Strike

All interest in the iron and steel strike is now lost, the coal situation being of vastly more consequence than what little remains of the iron and steel industry's own strike. The Wheeling district remains largely closed with rumors, denied at strike headquarters, that the strike in general has been called off. At various other points there remain some strikers, but the mills where they remain strikers are more interested in lining up the men in employment and organizing them into efficient working units again, than in getting more men into employment. Even in the Mahoning valley, which next to the Wheeling district has held out the longest, some mills are turning away an occasional applicant for a job, as they either do not need the man at all or are not ready for him.

Pig Iron Movement May Be Over

There are distinct suggestions that possibly the pig iron buying movement is about over, in which case the remarkable rise in prices will stop. Inquiry is certainly much less widespread, but whether that is because consumers are now well covered in most cases, or because the consumers remaining uncovered feel that the advance has gone too far to make it worth while for them to cover now, is uncertain. It is learned that there was a considerable volume of speculative buying, particularly of Buffalo and Eastern Pennsylvania iron, in the advance, and the speculative holdings may disturb the market at some later time.

An effect of the advance in pig iron has been to encourage the Connellsville coke operators to demand more money for coke for 1920 delivery and most of the furnaces that have closed for coke have had to pay large advances. Another effect may be to encourage an advance in Lake Superior iron ores for the 1920 season, whereas a month ago it seemed certain that the ore interests would be quite content to go along for another season at the established prices. The furnaces will be consuming 1920 ore into May or June of 1921 and if the pig iron advance they have brought about does not hold they may find themselves not much ahead in the final reckoning.

Foundry and basic grades are no higher than a week ago, being at $33, valley, equal to $34.40, delivered Pittsburgh, but Bessemer has scored an advance of $1 a ton, to $35, valley, two sales having been made at this price, one of 500 tons for December and one of 3,000 tons for equal deliveries over the first half of 1920.

Steel Prices

The finished steel market has not gained perceptibly in strength in the past week, except perhaps in the case of small lots from stock. The chances of the mills that are out for the highest prices obtainable are not as favorable and the policy of these producers, including the Steel Corporation, of adhering strictly to the March 21 price schedule stands better chances of dictating the general market level. For a time it was maintained in some quarters that the mills adhering to the old prices would become so hopelessly over-sold that the market would be thrown into the hands of the mills that intended to get the highest prices obtainable. This the March 21 price mills are endeavoring to avoid by limiting their sales to regular customers and in many cases, furthermore, by cutting down the tonnages inquired for. Undoubtedly there will be demand for many months to come for all the steel that can be made, the only issue being as to prices exacted. Export offerings are extremely limited and are likely to continue so, more or less, but as there will probably be little disposition to limit prices in the case of export business there may be considerable incentive to sell for export. The uncertainties of the foreign exchange situation help to discourage mills from forming any definite export policy.

The Week's Events in Montreal Industry

Preparations are being made by the management of the Canadian National Railways to haul from the Eastern seaboard all the available supplies of coal as a reserve, should the tie-up across the line continue. It is expected that when the details have been completed, not a single empty car will be brought back from the Maritime Provinces to either Ontario or Quebec, but that these empties, which are constantly moving from the seaboard to the interior, will be utilized to haul in a big reserve supply for the interior provinces. This will then be available should it be needed for emergency.

After a period of unrest of several weeks a strike of the miners of the Minto Coal Company at Minto, N.B., has become effective and the mines are now practically idle. It is estimated that about two hundred men are involved, and the normal production of coal that will be affected wil be approximately 350 tons per day.

Capt. E. J. Edwards has been appointed Trade Commissioner for Montreal, succeeding G. T. Milne, who will join the British Legation in Cuba as commercial secretary. Mr. Edwards is now in England but will leave there shortly to assume the duties of his new office. He has been associated with the British Naval Service and latterly as sales manager of a large manufacturing firm.

Considerable interest has been aroused over the proposal to erect a sixteen-storey hotel on one of the main streets of Montreal. One of the obstacles to the scheme is that of the existing by-law restricting the height of buildings to ten storeys. It is possible that this objection will be overcome by issuing a special permit, provided no great expense is incurred by the city in the matter of suitable water supply and fire protection.

The Elder-Dempster cargo steamer "Bassa," which grounded in the mud of the harbor on November 28 when clearing for South Africa, has been successfully floated after a week's effort to free her from the fixed position. It was necessary, however, to remove a large portion of her cargo before sufficient buoyancy could be obtained for the final release. She is now in drydock at Vickers undergoing light repairs.

The settlement of the strike of freight handlers at St. John, N.B., has been negotiated and the men are all back at work and the port is again resuming normal activities. For some time ocean traffic has been diverted to other terminals and St. John has suffered considerably but shipping men are more encouraged as to the future prospects. It is estimated that nearly half a million dollars was lost to the port as a direct result of recent disturbances and loss of business.

The Marconi Wireless Telegraph Company of Canada has purchased the four-storey stone structure at 11 St. Sacrament St., Montreal, and will utilize the greater portion of it for the main offices of the company. This building was originally erected for the Montreal Stock Exchange. The offices will be entirely remodelled and the building known as the Marconi Building. The company will still retain the factory on William Street. It is also proposed to open a school for the training of wireless operators.

S. P. Brown, the engineer who was in charge of the construction work on the Mount Royal tunnel, was drowned last week in Sebec Lake in Maine. He was dragging his nine-year-old son on a sled at the time when the ice gave way beneath him. Before assistance could be obtained he sank. Mr. Brown was an American citizen but superintended the planning and the subsequent building of the tunnel, one of the most important works of its kind ever undertaken, it being a record achievement both as to the time in putting through the hole and the successful working out of the details of construction.

At a recent meeting of the Montreal branch of the Engineering Institute of Canada, the subject of returning the railroads back to private ownership was presented to the members by W. F. Tye, the well-known railroad authority. The speaker went very thoroughly into the subject and commented on the general success attained by roads under private control. It is the opinion of Mr. Tye that the only solution to the transportation problem was for the Government to give decided increases in freight rates, and after putting the roads in first-class shape, organize new companies to take over the roads and operate same as private concerns.

T. B. Macaulay, president of the Sun Life Assurance Company of Canada, who has recently returned from a visit to the West Indies, addressed a recent meeting of the Montreal Board of Trade on the subject of "Relations With the West Indies." Mr. Macaulay is quite enthusiastic over the trade possibilities with these colonies, and believes the time is opportune for Canada to share extensively in the development of the West Indies, not in the sense of union with this country, but in close co-operation with local authorities and business houses, believing that close co-ordination between the colonies is essential to Empire progress.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$33 00
Lake Superior, charcoal, Chicago	38 40
Standard low phos., Philadelphia	40 00-40 00
Bessemer, Pittsburgh	35 00
Basic, Valley furnace	30 00
Toronto price:—	
Silicon..2.25% to 2.75%	$37.00 to $40.00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	7 50
Chequered floor plate, ¼ in.	7 00
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

Pittsburgh to Following Points	Per 100 Pounds. C.L.	L.C.L.
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$24 25	$24 00
Electro copper	24 00	24 00
Castings, copper	23 50	24 00
Tin	57 50	60 00
Spelter	10 00	10 75
Lead	8 25	8 75
Antimony	10 50	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 5 00	$ 5 00
Plates, 3-16 in.	5 25	5 25

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$14 00	13 75
Copper, crucible	17 00	17 00
Copper, heavy	17 00	17 00
Copper wire	17 00	17 00
No. 1 machine composition	15 25	16 00
New brass cuttings	11 00	10 75
Red brass cuttings	14 00	14 75
Yellow brass turnings	8 00	9 00
Light brass	6 25	7 00
Medium brass	7 25	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	6 00
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton	Gross
Heavy melting steel	13 50	16 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	14 50	16 00
Malleable scrap	18 00	20 00
No. 1 machine cast iron	24 00	25 00
Pipe, wrought	9 00	9 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	7 00	11 00
Stove plate	22 00	21 00
Cast boring	10 00	11 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	15
Carriage bolts, 7-16 and up	Net
Coach and lag screws	30
Stove bolts	50
Wrought washers	50
Elevator bolts	5
Machine bolts, 7-16 and over	10
Machine bolts, ⅜" and less	20
Blank bolts	25
Bolt ends	10
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $1.50
Nuts, square, tapped	add 1 75
Nuts, hex., blank	add 1 75
Nuts, hex., tapped	add 2 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	40
Sq. and Hex. Head Cap Screws	35
Rd. and Fil. Head Cap Screws	5
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	35
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	25
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	10
Studs	15
Taper pins	40
Coupling bolts	Net
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$43 00
Open-hearth billets	43 00
O.H. sheet bars	46 00
Forging billets	56 00
Wire rods	55 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 95
Cut nails	5 00
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 32
British Manila rope	0 26
New Zealand hemp	0 26
Transmission rope, Manila	0 43
Cotton rope, ¼-in. and up	0 80

POLISHED DRILL ROD

Discount off list, Montreal and Toronto ..... net

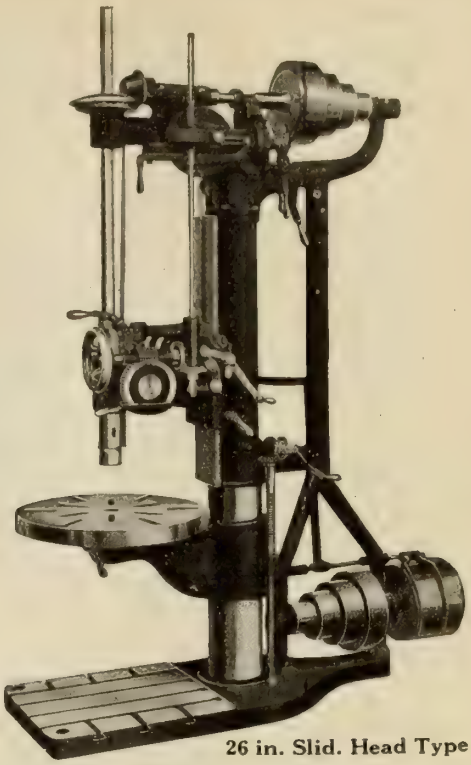
A Complete Line 8 in. to 50 in. Swing
with or without tapping attachment

BARNES

Upright Drills
Horizontal Drills
Gang Drills

Accuracy—Strength
Convenience of Operation

Carried in Stock by



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MONTREAL ST. JOHN, N.B. WINNIPEG VANCOUVER HALIFAX BUFFALO, N.Y.

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

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DRILLS FILES

MORROW NUTS MORROW

Set and Cap Screws

Made from material specially prepared for this purpose and each *"Morrow"* Screw has a finishing die rim over it—*Result: Tenacity, Accuracy.*

Twist Drills

Made from the most expensive and highest grade Sheffield steel, **Jessops,** and our expert tempering process—*Result: Morrow Drills do more work with less re-grinding.*

Reliable jobbers carry them.

Works at

Ingersoll Canada

Machinists prefer Ingersoll Files because "they cut faster and wear longer"

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40-10-5
Standard drills, all sizes	40-10-5
3-fluted drills, plus	10
Jobbers' and letter sizes	40-10-5
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	5% off
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 40
Canadian high speed cutters, net	to 10 off
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 75
Sheets, black, No. 10	6 00	6 00
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	8 20
Premier, 10¾ oz.	....	8 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	30 00	26 50
1¾ in.	32 00	26 50
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	24½
Palacine	24½
Machine oil, per gal.	36
Black oil, per gal.	15
Cylinder oil, Capital	58
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$11 50
Sheets, 3½ lbs. sq. ft.	10 50	11 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

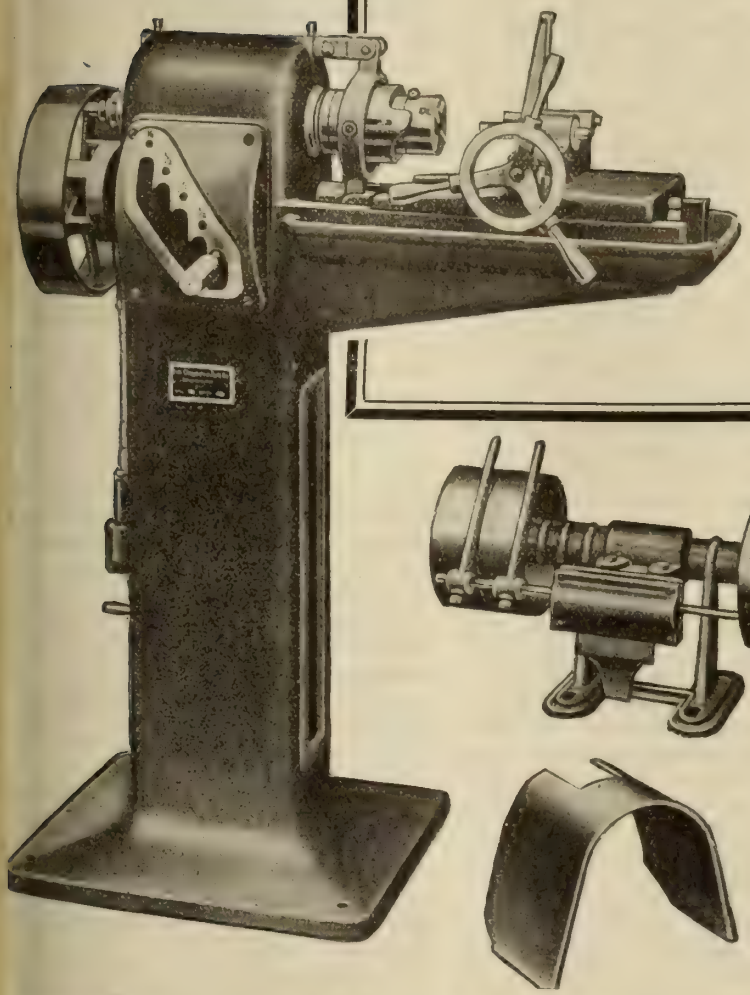
THE GEOMETRIC WAY

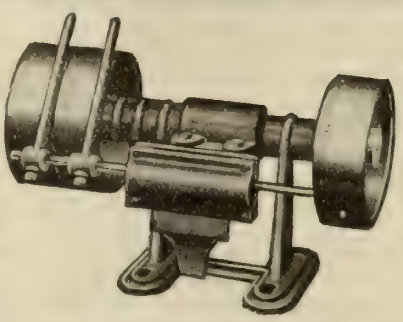
Where quantity and exactness have to be considered, the Geometric Threading Machine is just the way that suits. These machines have been tested and proved over and over again on speed, accuracy and endurance.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut 1/8 to 1/2 inch, 1/4 to 3/4 inch, and 3/4 to 1 1/2 inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.





A line from you brings full details regarding this machine. Tell us your threading requirements — let us recommend the proper Geometric Collapsing Tap or Self-opening die.

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If interested tear out this page and place with letters to be answered.

Henry Ford's View on a Very Vital Question

In the issue of the Dearborn INDEPENDENT, *on "Mr. Ford's Page," which appears this week, is the following article. It discusses the amount of profit in a day's wage. How much does it cost a man to produce a day's work?*

How much profit does a workman reap from his day's labor? How much ought he to reap? Does a "good living" come under the head of profit, or is it properly a part of the cost ofproducing a day's labor? How far can human energies be measured and human values standardized in order that the cost of a day's labor may be standardized?

Questions like these occur in one period or another of every man's thought about a system of economics which shall be more solidly based than any which serves us now.

But a more than academic interest attaches to these questions, for they are the real, even if unspoken, basis for much of the irritation and confusion which exists in the industrial world today.

The workingman is beginning to understand that he is in business. His raw material is human energy. His product is a day's work. All other business men seek a profit above cost of production, why should not he?

The difficulty thus far has been in making out the cost sheet. How much does it cost to produce a day's work? —that is the question for which there seems to be no satisfactory basic answer.

It is perhaps possible accurately to determine—albeit with considerable interference with the day's work itself—how much energy the day's work takes out of a man. But it is not at all possible to accurately determine how much it will require to put back that energy into him against the next day's demands. Nor is it possible to determine how much of that expended energy you will never be able to put back at all—because a "sinking fund" for the replacement of the body and vital strength of a worker has never been invented.

It is possible, however, to consider these later problems in a lump and provide for them under a form of old-age pensions; but even so, we have not thus attended to the question of profit which each day's labor ought to yield in order to take care of all of life's overhead, all physical losses, and the inevitable deterioration which falls upon all earthly things.

Moreover, there are questions having to do with the pre-productive period, which would have to be solved. Here is the man, let us say, ready to begin his service to society by turning out days' work throughout his life. How much did it cost to rear and educate him to his present age and usefulness? And how can that be figured as part of the cost of the energy he puts forth as he works to-day? Now, if it were the case of a machine, you would know what to charge. The machine cost a certain sum; it wears out at a given rate; it would cost such-and-such an amount to replace. It is a simple matter to figure the actual cost of the machine and its productive work, and add the profit.

Can we do that with men? Rather, can men do that for themselves, so that

> THIS article discusses the amount of profit in a day's wage. How much does it cost a man, in strength, money and ability, to produce a day's labor? How much profit ought he to receive on that outlay? How can basic figures be obtained on these matters?

selling a day's work they will have as intelligent an idea of the cost of that day's work and the profit it ought to bring, as any manufacturer ought to have of his product?

The problem becomes more complicated when you consider the man in all his aspects. For he is more than a workman who spends a certain number of hours at his work in the shop every day.

If he were only himself, the cost of his maintenance and the profit he ought to have would be a simple matter. But he is more than himself. He is a citizen, contributing by his cultivation and interest to the welfare of the city. He is probably a householder, living under conditions which represent more than mere maintenance, in that they represent the graces of social life. More than that, he is probably a father with more or less numerous progeny, all of whom must subsist and be reared to usefulness on what he is able to earn.

Now, it is obvious that to regard the man alone, refusing to reckon with the home and the family in the background, is to arrive at a series of facts which are misleading and which alone can never suffice even for a temporary solution of the questions that concern us.

How are you going to figure the contribution of the home to the day's work of the man? You are paying the man for his work, but how much does that work owe to his home? How much to his position as a citizen? How much to his position as the provider of a family? The man does the work in the shop, but his wife does the work of the home, and the shop must pay them both: on what system of figuring is the home going to find its place on the cost sheets of the day's work? It finds its place there already in a sort of haphazard way. If a man cannot support himself, his wife, his children, his habitation, his position in society—why, he doesn't stay at the job, that's all. It isn't a matter of cost and profit to him; it is the matter of a "living."

Is a man's own livelihood the "cost"? And is his ability to have a home and a family the "profit"?

Is the profit on a day's work to be computed on a cash basis only measured by the amount a man has left over after his own and family's wants are all supplied?

Is the livelihood of five or six persons beside those of the actual worker to be charged up to "profit"?

Or, are all these relationships to be considered strictly under head of "cost," and the profit to be computed entirely outside of them? That is, after having supported himself and family, clothed them, housed them, educated them, given them the privileges incident to their standard of living, ought there to be provision made for still something more in the way of savings profit, and all properly chargeable to the day's work? These are questions which call for accurate observation and computation.

Perhaps there is no one item connected with our economic life that would surprise us more than a knowledge of just what excess burdens the day's work actually carries.

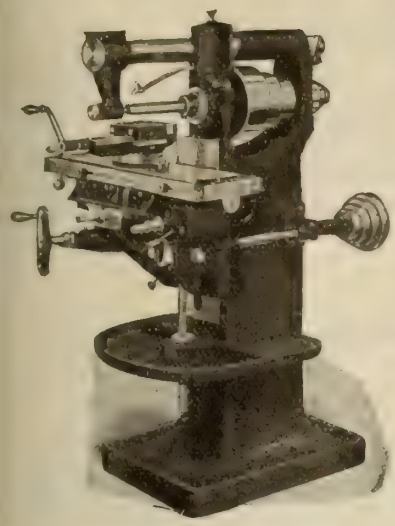
It carries all the worker's obligations outside the shop; it carries all that is necessary in the way of service and management inside the shop. The day's productive work is the most valuable mine of wealth that has ever been opened.

Certainly it cannot be made to carry less than all the worker's outside obligation. And certainly it ought to be made to take care of the worker's sunset days when labor is no longer possible to him, and should be no longer necessary. And if it is made to do these, industry will have to be adjusted to a schedule of production, distribution and reward which will stop the leaks toward the pockets of men who do not assist production in any way, and turn all streams for the benefit of those who do. In order to create a system which shall be as independent of the good-will of benevolent employers as of the ill-will of selfish ones, we shall have to find a basis in the actual facts of life itself.

It costs just as much physical strength to turn out a day's work whe

MACHINE TOOLS

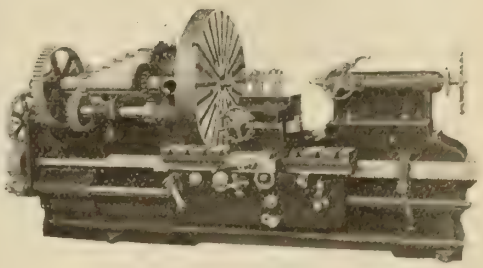
New or Used



We have an excellent list of new and used machine tools in our Toronto warehouses and on order for early shipment.

YOU are undoubtedly from time to time buying new equipment.

YOU will profit by giving us an opportunity of quoting you.



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32 Front St. West, Toronto

MONTREAL - - WINNIPEG

"Everything in Woodworking and Metalworking Machinery"

wheat is $1 a bushel, as when wheat is $50 a bushel. Eggs may be 12 cents a dozen or 90 cents a dozen—it makes no difference in the units of energy a man uses in a productive day's work.

One would think that the real basis of value would be the cost of transmuting human energy into articles of trade and commerce. But no; that most honest of all human activities is made subject to the speculative shrewdness of men who can produce false shortages of food and other commodities, and thus excite anxiety of demand in society.

It is not in industry that the trouble lies, but in those regions beyond, where men lie in wait to seize the fruits of industry and create false scarcities for the sake of arousing an anxious demand for things which normally are, and ought to be, accessible to all who engage in orderly productive pursuits.

We must begin with the land; we must continue with the day's labor; and we must keep so close, so jealously close to both these fundamentals that we shall be suspicious and fearful of all that robs the land of men, and robs labor of its primal importance in material life. We shall think out, and try out, and establish more enduring economic systems as we go on about our work, than we shall ever be able to do sitting idle with our heads in our hands trying to "think" a new world system out of our brains.

The day's work is the hub around which the whole wheel of earth-life swings. It must be kept central, both in our thinking and our action. Any system that shunts the day's work off to one side as unimportant, is riding to a fall.

U.S. SCRAP METAL

The coal strike effects are apparent in some districts, while others are untouched. Prices are higher in some cases. Following are reports from various centres:

CHICAGO.—Although a number of plants have had to close down, due to a shortage of coal, the scrap market remains strong. Foundry grades retain their strength and No. 1 wrought is a good feature. Railroad offerings amount to about 6,500 tons.

BOSTON.—There has been a general advance in the New England district, and the past month has been the best month for business of the year. Re-rolling rails have sold at $27 shipping point. Heavy melting steel will bring $17 if of good quality. Wrought pipe is at $18, and No. 1 machinery is $34.50 delivered.

NEW YORK.—There has not been much trading, but several grades have advanced. Heavy melting steel is at $18 to $18.50 f.o.b. New York. There is considerable buying by brokers, but not much selling.

PHILADELPHIA.—Heavy melting steel is strong in this district. Some heavy tonnages have been sold at $24.50 delivered, and one lot of 5,000 tons was sold at $22.50 delivered.

PITTSBURGH. — The coal shortage is affecting the market here. Several melters here have asked suspension of shipment against orders. This has had the effect of checking what was a strong upward market. Heavy melting steel is being quoted at $26 to $27 delivered.

BUFFALO.—Heavy melting steel is unobtainable in this market, although $23.50 has been offered. Dealers are holding on to their stocks and expect a further rise in this grade.

CLEVELAND.—The market here is weak, and not much change is expected till the New Year. Consumers are out of the market, and while prices are unchanged they are merely nominal.

CINCINNATI.—The coal shortage has resulted in the closing down of a number of steel mills. Dealers' stocks are increasing and the market is in consequence shewing signs of weakness.

ST. LOUIS.—Business is very light, the coal situation having had its effect, several consumers having asked suspension of orders. Prices are firm with advances in some cases. Heavy melting has advanced $1 to $22. Re-rolling rails have advanced $1 to $32. Cast scrap and malleable are in demand.

CIRCUIT BREAKERS DISCUSSED

The circuit breaker is a most important piece of apparatus in power plant design, and upon its successful functioning depends in large measure the size attainable in generating stations and their safe operation.

The rupturing capacity of an oil switch is one of the most important features of design with the rapid growth of power systems. Circuit breakers installed some years ago have been found to be totally inadequate in this important particular. The limitations of space as imposed upon the manufacture by the engineers in charge of station design often work to the detriment of successful breaker design, and it becomes necessary for the designer to make the breaker fit the job instead of being free to do what his best judgment dictates. A new type circuit breaker was described by G. A. Burnham, chief engineer of the Condit Electrical Mfg. Co., Boston, in a paper read before the Toronto Section of the A. T. E. E. at the Engineers' Club, on Friday evening, December 5. This breaker has been developed to take the place of other circuit breakers of a lower rupturing capacity and in design possesses some novel and interesting features. The structural design of the tank supporting parts has been very much strengthened and they are made of cast steel or malleable iron. They have been designed for a pressure of 40 pounds per sq. in. The tank is double and consists of an inner shell, which slides up inside a deep projecting lip on the top. The outer shell passes up around the outside of the lip, although only for a short distance, since it is some inches shorter than the inner one. On the occurrence of a severe short circuit or other disturbance, causing the breaker to trip open, the contacts separate in the usual manner and the pressure exerted by the ignition of oil vapors and by the arc itself is relieved by means of the spring suspension. The movement downwards of the tank, which is 1 1-16 in. for 40 pound pressure, also absorbs much of the shock on account of the inertia effect of the moving parts.

On the conclusion of the paper an animated discussion took place relative to the merits of the new device and related to circuit breaker troubles in general.

France Adopts Oil Fuel.—Trials have been made on an old locomotive on the leading French railway, with a view to ascertaining the possibility of burning oil instead of coal under the boilers. The trials have proved so successful that two hundred locomotives are being fitted with the burners for the new fuel immediately.

Electric Club Lunch.—The Electric Club held a most successful luncheon in the Mossop Hotel, Toronto. There were representatives of nearly every electrical company in the city present and the dining hall was not big enough to hold them. A very interesting address was given by T. W. Gordon, of the General Electric Company of Schenectady, on "Thrust Bearings."

War Plant for Sale.—The munition plant of the Ker & Goodwin Company, of Brantford, which was just about completed at the time of the armistice, is being placed on the market. Negotiations for its purchase have been opened by the Brantford Cordage Co., according to a report from that city.

The death is announced from Sarnia of Malcolm McPherson, at the age of 72 years. Mr. McPherson was well known on the Great Lakes, where he sailed for many years. He was buried at the Union Cemetery, Mooretown.

Ottawa.—The "Canadian Recruit" was the last vessel to leave Montreal for the season of 1919 with a cargo. The "Canadian Planter" is still at Vickers' yard, but will be completed and sent down to Quebec to be loaded. The Elder-Dempster liner "Bassa" is still ashore, and the work of lightening her is proceeding. Fear is entertained that she may be compelled to remain in the river all winter if not speedily floated.

Sarnia.—Released from a bar where she had gone ashore a day or two previously, the tug Annie Moiles turned over and sank. Six men were aboard of her when she turned over, but all made their escape in safety. The tug went ashore while towing the scow Ontario.

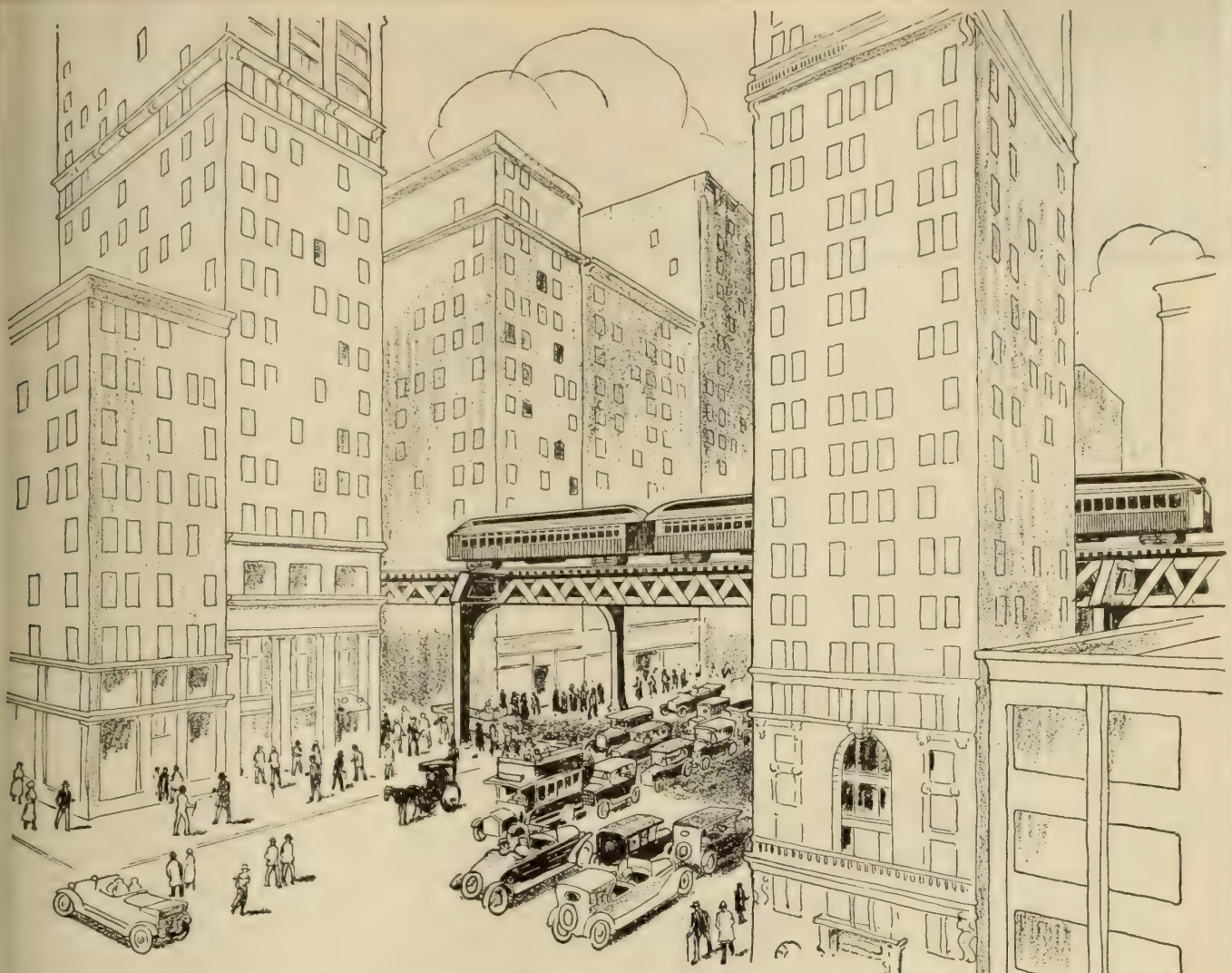
HE'LL TELL THE WORLD

Williams in Indianapolis "News."

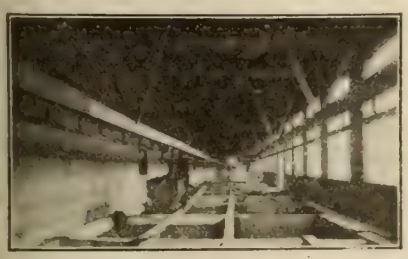
Vancouver.—The first of the fou steamers being built in the Coughla yard for the Canadian Merchant Marin was launched successfully. She is vessel of 8,100 tons, and was christene the "Canadian Importer." The sponso was Mrs. Cooper, the wife of the Fe eral member for South Vancouver. Sh will be the first vessel of the Canadia Merchant Marine to take the regul sailings for Australia.

Wrecking at Leaside.—The work demolishing the tool house at the Le side ammunition plant, the property the United States Government, is bein rapidly proceeded with. The buildin which has a frontage of 40 feet by 1 feet in depth, is being sold piecemeal fast as it is pulled down. The Leasi town council are in communication wi the Federal Government with a view saving the main building, which co $3,000,000 to build.

The Richardson-Phenix Compan Milwaukee, have again opened the Philadelphia office and placed it in th charge of Mr. Geo. F. Fenno. M Fenno has been associated with the Ric ardson-Phenix Co. for ten years and h recently been released from the Gover ment service, where he was in char of the conservation of lubricants for t department of military aeronautics.



Have An Elevated Railway In Your Plant



When New York could not find room for all her traffic on street level **she carried it overhead.**

Land is too valuable in these days for floor space to be wasted. The passages in your factory have all the traffic they can accommodate.

Why not use the space on the ceiling?

By using an overhead conveyor you will save congestion on the floor. The men can handle bigger loads at a time, without risk of blocking the passages.

Every factory or warehouse is a miniature New York! There is more traffic to be accommodated than floor space will comfortably handle! An overhead conveyor will relieve the congestion and utilize space that is going to waste.

BT TIME SAVER

BT Overhead Conveyors

BT TIME SAVER

All kinds of buildings throughout the Dominion have been fitted with BT Conveyors, from small garages and machine shops to big steel plants and factories. We have track, hangers, switches and the necessary fittings for any building. From big bars of steel to loads of leather scrap, we have designed carriers to convey products of all kinds. Complete information is yours for the asking. It will be a pleasure to go into the matter with you and help you to decide how to arange a conveyor outfit for your plant. A card will bring full details, without obligation to you, of course.

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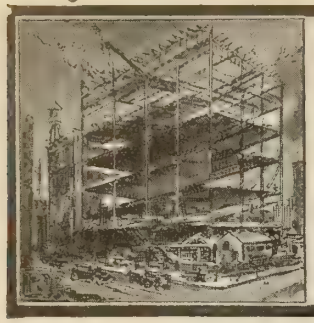

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

TRADE GOSSIP

Lignite Plant in Manitoba.—A plant for the manufacture of lignite fuel will be erected in the spring near Bienfait, Man., on the C.P.R. This was announced by J. M. Leamay, Provincial Commissioner. The buildings will all be of steel.

C.N.R. Confiscates Coal.—St. John, N.B., coal dealers are having their stocks cut down by confiscation by the Canadian National Railways. The railway has power under an order-in-council to take what coal they require and pay the dealer the mine price.

Privy Council Awards Share.—The proceeds of the sale of the steamer "Storstad," which sunk the Empress of Ireland, will be shared by the C.P.R. The Canadian Supreme Court gave the preference to the passengers, but the Privy Council reversed the decision.

Start New Bridge.—Work on the construction of the new bridge over the Niagara River will commence this month. Representatives of the Canadian Niagara Bridge Company have arrived at Black Creek, six miles from Bridgeburg, and will start work preparing for the abutments as soon as the necessary machinery arrives.

Mechanics Go To States.—The officials of the Metal Trades and Building Trades Unions are seriously worried by the growing shortage of men, due to so many of them going across the border. A good many men who went there during the strike here have failed to return. More are going now, being attracted by the high rate of wages.

Canada Iron Foundries' Report.—The Canada Iron Foundries' report shows the effect of making the readjustment from war-time to peace conditions. The earnings for the year ending September 30 show a decrease from those of last year. They were $489,943, compared to $580,824 in 1918. An additional sum of $99,098 was secured from interest discount and exchange which brought the total to $595,908.

Clergyman on Conciliation Board.—The appointment of the Rev. Clarence McKinnon to the Board of Conciliation dealing with the dispute between the Dominion Coal Company and its employees at Glace Bay, is the first instance of a clergyman acting on a board under the Lemieux Act. Mr. McKinnon will act as chairman of the board, J. C. Watters will represent the employees, and Col. W. E. Thompson the coal owners.

Toronto Engineering Institute.—An interesting lecture on sound ranging of heavy artillery in France was given by Captain Roy Cockburn at a recent meeting of the Institute at the Engineers' Club. The election of officers was also held, the result being as follows: Chairman R. O. Wynne Roberts; Committee men: Geo. T. Clarke T. Taylor, Prof. C. R. Young and J. C. Krum.

Will Stop Export.—An official of the Canadian Railway Board speaking recently said that even if the coal strike was settled there was little chance of any coal reaching Canada during December. Railways are already using wood fuel for their stationary boilers, and have reduced their passenger service, and there is no doubt that a serious curtailment of freight trains will ensue.

Big Convention for Toronto.—The next convention of the International Machinists' Association will be held in Toronto, in all probability. The date fixed is September, and about 3,000 delegates will attend. The convention will last about three weeks, and business to the amount of $400,000 will accrue to the city if Toronto's invitation is accepted. Acceptance depends on the ability of the city to accommodate the delegates.

Secure Contract. — The MacKinnon Steel Co., Ltd., of Sherbrooke, Que., has been awarded the contract for the steel superstructure of the highway bridge which the Government of the Province of Quebec has arranged to erect over the Batiscan River at Batiscan, Que., on the Montreal-Quebec highway. This bridge, which is over twelve hundred feet long, will be one of the largest highway bridges in the Province of Quebec.

$1,000,000 Arena For Montreal.—An arena with seating capacity for 6,000, and standing room for 6,000 more, will be built and ready for hockey on January 15th next. The location will be near Windsor and Dorchester street. The building will include a garage. The capital will be $2,000,000, the shares being of $10 each, so that opportunity will be given to all sport lovers to subscribe.

Hamilton as an Ocean Port.—An association known as the Canadian Deep Waterways and Power Association, has been formed. The object of the association is the promoting of the shipping interest of the ports, and important developments are expected from their activities. The Board of Control of Hamilton are considering a request for a contribution to the funds of the association. Plans for the development of the Hamilton waterfront are nearly ready for presentation to the Board of Control.

Antimony Mine Plant.—The North American Antimony & Smelting Company, a new company with a capitalization of $2,000,000, organized for the developing of the antimony mines of Lake George, York County, N.B., has ordered its machinery. The machinery ordered at present consists of boilers and engine and preparations are being made for the installation of the concentrating plant.

To Boom Municipalities.—An industrial conference will be held next summer, the object of which will be to bring the power facilities of the Niagara district prominently before the world. This was decided on at a meeting of the municipal representatives from all parts of the Niagara district held at Welland recently. The towns concerned are St. Catharines, Welland, Thorold, Niagara Falls, Bridgeburg, Port Colborne, Fort Erie, Stamford, Merritton and Crowland Townships.

MARINE

St. John, N.B.—The new dry dock which is being built at Courtenay Bay, St. John harbor, will be, when completed, the largest dry-dock in the world. It will take two and a half years to complete.

New York.—The "Imperator," the huge ex-German liner, will make her first voyage under the British flag this week. She will carry 600 first, 400 second, and 1,500 third cabin passengers. She will receive sufficient bunker coal for the voyage to England.

Ottawa.—Recommendations for improvements to Vancouver harbor, presented to Mr. Ballantyne, include a modern 1,300-foot wharf on Burrard Inlet, a car ferry service between Vancouver and North Vancouver, and a terminal railway system. The improvements would run into several million dollars.

Port Arthur.—A wireless was received from the steamer "Collingwood" that she had been forced to go for shelter behind Kewwanaw Point. A severe storm was raging on Lake Superior and several other boats were also seeking shelter at the same time. The weather at the time was quite fine at Port Arthur.

Sault Ste. Marie.—There were several big freighters caught in the ice in Mud Lake recently, a most unusual occurrence for the time of the year. Mud Lake is just below Sault Ste. Marie. The vessels were the "Martian," "W. Grant Morden," "Odanah" and "Midland King." A tug was necessary before they could be released.

Ottawa.—The Government have now received and commissioned eighteen of their fleet, and they will have before the

SURPLUS EQUIPMENT FOR SALE

PRESSES

	Stroke Inches	Width Bed	Approx. Cap. Tons
2—No. 666 Toledo Embossing Presses	2	32	1,200
2—No. 27 Bliss Embossing Presses	2	32	1,000
2—No. 87 Bliss Crank Presses, double back geared	16	27	250
2—No. 60½ Bliss Rack and Pinion Drawing Presses	60	21	100
10—No. 60½ Bliss Rack and Pinion Drawing Presses	42	21	100
1—No. 857 Toledo Rack and Pinion Drawing Press	48	25	100
1—Robertson Hydraulic Press with pump and extra set of columns	24	27	800

LATHES

7—11″ Blount Speed Lathes, 5′ bed.
1—18″ Hamilton Lathe, 6′ bed.
1—19″ Greaves & Clushman Lathe, 8′ bed.
2—18″ Davis Lathe, 6′ bed.
1—15″ Carroll Jamieson Lathe, 6′ bed.
1—16″ Davis Lathe, 6′ bed with Turret.
1—16″ Hamilton Lathe, 6′ bed.
5—16″ Blount Speed Lathes, 6′ bed.
4—No. 2 Warner & Swasey Speed Lathes.
2—20″ Stoll Wood Turning Lathes.
35—Bullard Cartridge Case Lathes.

GRINDERS

2—Wells Cutter Grinders.
1—12″ x 72″ No. 4 Cincinnati Universal Grinder.
1—No. 70 Heald Internal Grinder.
1—No. 75 Heald Internal Grinder.
1—10″ x 24″ Landis Grinder.
1—No. 1 American Surface Grinder.
1—No. 74 La Salle Surface Grinder.
1—Ford-Smith Double Head Grinder, 3″ x 24″ wheel.

FURNACES

1—Gas Muffle Furnace, 3¼ x 1½″ x 7″ long.
1—Gas Tempering Furnace with oil reservoir.
1—Gas Tempering Furnace with Tray in Reservoir.
1—H.S. Tool Hardening Furnace, 9″ x 8″ x 9″ long.
1—Double Door Gas Furnace, Doors 20½″ x 12″ high. Fire Space 50″ wide, 12″ high, 54″ long.
1—Gas Furnace for Annealing Scrap Brass.
5—26 ft. Rockwell Single Chamber Annealing Furnaces, equipped with Electric Pyrometers and Recording Instruments, Oil and Gas Burners, Air Rams and Pullers.
1—16 ft. Rockwell Single Chamber Annealing Furnace equipped with Electric Pyrometers and Recording Instruments, Oil and Gas Burners, Air Rams and Pullers.
3—Conveyor Type Annealing Furnaces. Could be used for annealing automobile pistons or other similar work.

BLOWERS AND FANS

	Size of Outlet	Displacement per rev.
1—Root Positive Blower	8″ Vertical	3.3 cu. ft.
2—Connersville Positive Blower	8″ “	3.3 “ “
2— “ “ “	6″ “	1.5 “ “
1— “ “ “	6″ Horizontal	1.5 “ “
1— “ “ “	8″ “	1.5 “ “
1—No. 4 Sheldon Blower	9″ “	
2—No. 4 “ “	9″ Vertical	
1—No. 4 Sturtevant “	10″ Horizontal	
1—Boland Positive Blower	4″ “	

3—Desk Fans.

MOTORS

10 to 75 H.P., 25 and 60 cycle, 220 Volt., 3-phase.

MISCELLANEOUS

DRILLS

1—3 Spindle Variable Speed Drill. C. G. Allan Co., Barrie, Mass.

SHEARS

1—No. 1 Gray's Sheet Metal Cutter.
1—No. 1 Quickwork Rotary Shear.

HACKSAWS

1—No. 3 Atkins Power Hacksaw.

MILLING MACHINES

1—No. 1 Standard Hand Miller.
11—No. 3 Brown-Boggs Trimming Machines.
1—No. 066 Deming Gear Oil Pump, Belt Drive.
2—Franklin Portable Cranes.
12—Cowan Elevating Trucks.
2—20-lb. Cap. Scales Drams Graduation on Beam.
1—Two-Ton Platform Scale.
1—Five-Ton “ “
2—½-Ton “ “
2—1,200-lb. “ “
1—Tinius Olsen Testing Machine, 10,000 lbs. capacity, hand-operated.
1—No. 1 Brinell Hydraulic Testing Machine.
1—Sauveur-Boylston Photo-Micrographic Instrument.
23—4″ Curtis Air Hoists.
2—5″ “ “ “
1—6″ “ “ “
26—I-Beams for Curtis Air Hoists.
1—Boland Special Sand Blast Machine.
1—No. 2X Garvin Vertical Tapping Machine.
1—Whitton Centering Machine.
Dodge Wood Split Pulleys.
Cast Iron Split Pulleys.
Shafting, and Hangers.
1—Model “M” Richardson Force Feed Oil Pump.
3—No. 310 Simplex Lifting Jacks.
4—2½″ x 18″ Screw Jacks.
1—2¼″ x 16″ “ “
3—1¼″ x 4″ “ “
1—No. 873 Toledo Trimming Machine.
Bristol & Brown Indicating Pyromters.
“ “ Recording “
3—Shore Scleroscopes.
1—C. E. Wright Metal Cutting Handsaw, 30″ Wheels.
1—No. 35 Demagnetizer Style, 115 D.C., Amps. 1.5, Volts 115. Made by D. & W. Fuse Co., Providence, R.I.
5—Heads Suitable for Polishing Brushes, 1¾″ Hole in chuck, 1″ spindle.
1—Bench Tapping Machine, takes up to ⅜″ tap. Burke Machine Company, Conneaut, Ohio.
1—Carboy of Cement Hardening, 5 Gals.
1—Thor 1—1/16″ x 4″ serial D.R.H. Air Hammer.
1—Ingersoll Rand, size 1 S, symbol 1 SM Air Hammer.
1—Ford Car Starter.
2—Automatic Receivers for Boiler House Feed Pumps.
1—Tank, 30″ dia. x 48″ long, suitable for Compressed Air.
1—Tank, 24″ dia. x 60″ “ “ “ “ “
1—Tank, 36″ dia. x 72″ “ “ “ “ “
1—Open Galv. Iron Tank, 5 ft. high x 3 ft. dia. with 1″ faucet.
4—¼″ Thick Iron Open Tanks, 4 ft. long, 2 ft. wide x 1 ft. 8 in. deep with 2 in. drain.
1—Motor-driven addressograph machine with stencil cutting machine and full equipment of special attachments.
2—Adding Machines (Listing)

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Don't be contented with half-way goodness or makeshift drinking arrangements.

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

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SANITARY DRINKING FOUNTAIN

Allows just the proper amount of cool, clean fresh water to come through the bubbler. No spurting, overflowing, no loss. "Puro" regulates itself.

"Puro" saves 35% on water bills, too. You can attach it in a few minutes.

Tell us how many men, how many departments and we'll tell you how much the cost will be.

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TEN DAYS' TRIAL.—If your dealer or jobber does not have them we will send you one. Try it ten days. If not satisfactory, return to us and we will refund your money. We also make the GREB RIM TOOL.
HET GREB CO., 318 State St., BOSTON

WHEN WRITING ADVERTISERS KINDLY MENTION THIS PAPER

end of the year twenty-two in active service. The "Canadian Aviator," built in Vancouver, will shortly leave for Australia with a cargo of paper, and the "Canadian Volunteer" and "Canadian Trooper" have sailed for Great Britain by way of the Panama Canal.

Ottawa.—The two ships recently ordered from the Wallace Shipbuilding Co. in Vancouver, bring the Dominion Government fleet up to fifty-seven ships. There are about 20,000 men employed in the various yards of the country and there are about the same number employed in the contributory trades. Canada has an investment of $47,000,000 in her shipyards. The two latest vessels are of 8,350 tons.

New York.—The people of the Eastern states are not feeling very kindly towards the move to deepen the St. Lawrence canals and open up the lake ports to ocean navigation. They are of the opinion that such a move would be to the detriment of the Atlantic ports of the U.S. and a benefit to Canada only. This is not in accordance with their wishes, and they will oppose strenuously any participation by the United States Government.

Masters, Mates and Pilots.—The National Association of Masters, Mates and Pilots have joined the Trades and Labor Council. The National Association, which was organized in the States last March, has now eighty-nine harbors, or as they would be called ashore, locals. Montreal, Kingston, Quebec and Toronto have harbors, and many more will be formed shortly. Capt. W. Stitt is president of Toronto Harbor No. 68. Capt. John Strain, of Buffalo, is business manager of the organization.

PERSONAL

Mr. W. Wheatley, lately elected president of the Armstrong-Whitworth Company of Canada, sailed from Liverpool, Eng., recently on the steamer "Lapland" for Montreal. He will start his new duties in the course of a few weeks, after paying a visit to his native town of Lima, Ohio.

Mr. William Worthington, head of the Sewers Branch of the Toronto Works Department, has tendered his resignation to take effect on December 15. Mr. Worthington will go into private practice as a consulting engineer, after eighteen years spent in the service of the city. This is the fourth of Toronto's department heads to resign recently.

INCORPORATIONS

Incorporation of a $10,000,000 company for Montreal, and of a number of other companies of large capitalization have been gazetted. The principals are: The Oakcoal Company of Canada, Limited, Toronto, capital $1,250,000; Gear Produce of Canada, Limited, St. Catharines, Ont., capitay, $250,000; Librairie Garneau, Limited, Quebec, capital $250,000; Tremblay & Dufour, Limited, Chicoutimi, capital $50,000; Ottawa Farm Journal, Limited, Ottawa, capital $200,000; Trans-Canada Theatre, Limited,

ontreal, capital $3,750,000; Western heel & Foundries, Limited, St. Boniface, Manitoba, capital $2,000,000; Simons, Limited, Montreal, capital $10,000,000; Canadian Nathan, Limited, ontreal, capital $100,000; Canadian acArthur Concrete Pile Company Limited, Montreal, capital $24,000; Charles . Goad Engineering Company, Limited, oronto, capital $300,000; MacPherson Wire Company, Limited, Hamilton, capital $400,000; Canadian Inspection & esting Co., Limited, Toronto, capital 40,000; Edgar Allan & Co., of Canada, imited, Montreal, capital $50,000; Elley Dress Manufacturing Company, imited, Toronto, capital $150,000.

CATALOGUES

The Jeffrey Manufacturing Company, Montreal, P.Q., have issued Bulletin No. 273 which supplements Catalogue No. 244. A line of 10 in. bucket elevators has been added, also chains having reversible steel bushings. A page is given to each Standard Elevator, which is illustrated both in perspective and in line drawing, giving dimensions. Also on each page there is an illustration showing the chain and bucket used on that type of elevator. Below the illustrations are the specifications from which you can easily select the elevator for your needs.

OBITUARY

The death is announced from Brockville of Mr. Sidney Arthur Logan. Mr. Logan had been a resident of the town for 41 years and was a well-known contractor. He was born in Elma, Dundas County, in 1846, his parents being pioneers of that community. He went to Brockville in 1878, and engaged in sewer and waterworks construction.

PIG IRON TRADE

The price of pig iron of all grades is going steadily upwards. In an already strong market, the prospect of curtailment by lack of coal acted as a further strengthener. Following are reports from various U. S. centres:

PITTSBURGH.—The foundry iron market has been quiet lately, but this is due to the furnaces being pretty well booked up for next year, first half. There has been great activity in basic, 40,000 tons of this grade having been sold. The basic prices are $33 valley and Bessemer at $34.

NEW YORK.—The demand for pig iron is strong, and furnaces have sold up at least half their capacity for the first half. This condition is reflected in the rising prices. Eastern Pennsylvania foundry, 2.25 to 2.75 silicon, first half delivery, has sold at $37 and $38 furnace, and 2.75 to 3.25 silicon at $39 to $41 furnace.

BUFFALO.—The three grades of foundry as well as malleable and basic have advanced in price. No. 2 foundry is now $38. Basic is quoted at $36 and malleable at $39.25. Consumers from outside the district have come into this market for iron.

CLEVELAND.—Heavy demand, far exceeding the available supply, characterized the market, resulting in further advances. High silicon iron was sold for $36 for the base grade. Basic has sold for $33 valley furnace. Coal supply is getting very low, and may interfere with production shortly.

CHICAGO.—Producers are practically out of the market, thus applying to both Northern and Southern furnaces. Melters would be glad to place contracts almost regardless of cost. A small tonnage from a Virginia furnace is being offered in the Chicago district at $36 furnace, with a $5 freight rate, and full manganese differentials.

CINCINNATI.—There is not much iron available in Southern Ohio, and the quotation for 1.75 to 2.25 silicon for first quarter delivery is $35 Birmingham. Malleable is in good demand with only a limited quantity to be had.

BIRMINGHAM.—Enquiry is good, and production is not up to normal. Foundry iron No. 2 grade is selling at $35 in one case but generally at $33 to $34. The probability of advanced wages to coal miners is making producers cautious, as this would increase their costs.

PHILADELPHIA.—There is general anxiety on the part of consumers to buy iron, the effects of the coal strike being in evidence already. There are several enquiries for lots of 15,000 for first half. Makers are mostly out of the market, having booked up 50 to 70 per cent. of their first half capacity. Malleable has sold at $37 Eastern Pennsylvania furnace for first half delivery, and basic at $35 Eastern Pennsylvania furnace.

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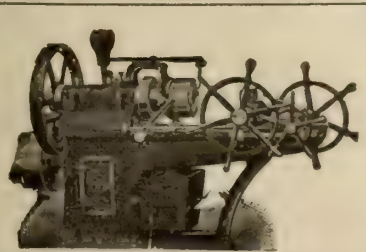

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"National" Bolt Cutters, "Wedge Grip" Bolt and Rivet Headers, Forging Machines, Nut Machines, Roll Threaders and Wire Nail Machines are used by leading Railroads and Industrials.
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AGENTS WANTED THROUGHOUT DOMINion for Cowan Transveyors. Address R. B. Smiley, 120 Glenholme Ave., Toronto, Ont.

BY WELL-KNOWN BRITISH MANUFACturer, young unmarried man to act as sales representative. Must be keen, aggressive, steady business getter, resourceful and absolutely reliable. To such a man a good future will open up. The line is high grade textile belting, paper makers' felts and linen fire hose, and a stock will be carried. Box 638, Canadian Machinery. (c24m)

MONTREAL SUPPLY HOUSE HAVING SALES organization and good connections with mills and industrial plants in Quebec and Maritime Provinces (branch St. John, N.B.), is open to handle one or two more specialties of merit, chemical or mechanical. Address Box 642, Canadian Machinery. (c25m)

POSITIONS WANTED

POSITION WANTED BY A FIRST-CLASS mechanic with a large experience in making gauges, dies, jigs and fixtures for small work, and small tools; can take charge of department. Know how to handle screws; have been working in some of the best shops in the U.S. Is an inventor, also improver and designer. Aged 50 years; good health; steady worker. In answering please mention the class of work and mention the highest wages, with all particulars. A position wanted for his son, also a first-class mechanic. Apply during the week of November 15th. L.E.J., 38 Glenelg Street W., Lindsay, Ont. (c26m)

MACHINERY WANTED

WANTED—ONE ONLY HIGH-SPEED RIVETer, Shuster preferred, capable of riveting ¼ inch. Toronto Lock Mfg. Co., Toronto, Ont.

FOR SALE

FOR SALE—BRAND NEW INGERSOLL-RAND After-cooler, never used, for compressor up to 14 x 14". London Mfg. & Machine Co., Ltd., London, Ont. (ctfm)

FOR SALE — WATSON-STILLMAN HYDRAUlic Press, complete with four-plunger automatic variable belt pump. A. G. Crawford, 14 Mail Bldg., Toronto, Ont.

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Alley & McLellan Air Compressor 600 ft. at 100 lbs. pressure, 125 H.P. Motor, heavy duty 600 R.P.M. 3 phase 60 cycle 550 volts.
Ingersoll-Rand 800 ft. Air Compressor.
1 Tube Mill Fraser & Chalmers 5 x 22.
1 Power & Mining 5 x 22.
Also large assortment of Pumps, Tanks, Classifiers, Boilers and Mining Equipment for sale.

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Canadian Machinery
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2—60" Bullard Vertical Boring Mills
1—60" Niles Vertical Boring Mill
No. 4—B. & S. Plain Miller
1—36" x 36" x 8' Gray Planer, two heads
No. 3—Cincinnati Universal Miller
5—No. 0 Steptoe Hand Millers
13" x 5' 6" New Carroll-Jamieson Quick-Change Lathe
14" x 6' New Carroll-Jamieson Quick-Change Lathe
15" x 6' New Sidney D.B.G. Quick-Change Lathe, swing 17"
15" x 8' New Sidney D.B.G. Quick-Change Lathe, swing 17"
17" x 8' New National Quick-Change Lathe
3—17" x 8' New Sidney D.B.G. Quick-Change Lathe, swing 19"
17" x 10' New Sidney D.B.G. Quick-Change Lathe, swing 19"
18" x 24" New Rahn Larmon Lathe, D.B.G. Quick-Change
19" x 10' New Sidney D.B.G. Quick-Change Lathe, swing 21"
9—19" x 8' New Sidney D.B.G. Quick-Change Lathe, swing 21"
25" x 14' New Sidney D.B.C. Quick-Change Lathe, swing 27"
38" x 14' Putnam, arranged for Motor Drive
6' Western Radial Drill
5' Bickford Single Pulley Drive Radial
100-lb. New Little Giant Hammer
50-lb. New Little Giant Belt Hammer
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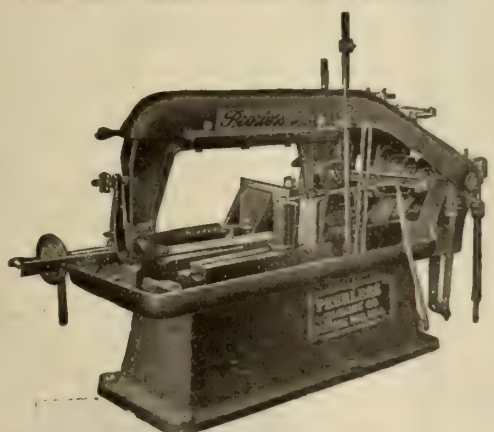
Thedard Metal Saw of TO-DAY



While labor is demanding more and more, manufacturers are demanding machines of greater output. The "Peerless" meets that demand. It is the standard metal saw of TO-DAY.

With its rapid cut and various time-saving features, it easily increases production from 50 to 100 per cent. With its automatic feed, straight line pull, positive blade clamp and general rigidity, it gets the maximum results of which a blade is capable and reduces breakage to a minimum.

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(not shown in cut) further increases output and saves blades wherever soft steel or metals of varying degrees of hardness have to be cut. The "Peerless" is furnished either with or without this feature, also with or without motor.

A trial order at our risk and expense is convincing

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1607 RACINE STREET RACINE, WISCONSIN

MACGOVERN & COMPANY LIMITED POWER MACHINERY

HORIZONTAL RETURN TUBULAR BOILERS

Quan.	Size	H.P.	Make	Pressure
1	60" x 14'	70		80 lbs.
1	62" x 14'	70	JOHN INGLIS	85 lbs.
1	60" x 16'	85	GOLDIE & McCULLOCH	120 lbs.
2	66" x 16'	100	GOLDIE & McCULLOCH	100 lbs.
1	60" x 16'	100		75 lbs.
1	66" x 14'	100		85/110 lbs.
2	66" x 15'	100		
2	66" x 16'	100	MURRAY IRON WORKS	125 lbs.
3	72" x 18'	125	STEWART	140 lbs.
1	73" x 14'	125	GOLDIE & McCULLOCH	165 lbs.
3	72" x 21'	125	DILLON	125 lbs.
4	72" x 16'	135		80/100 lbs.
3	72" x 18'	150		135 lbs.
2	72" x 18'	150	BROWNELL	150 lbs.
2	72" x 18'	150		150 lbs.
2	72" x 18'	150	STEWART	140 lbs.
4	72" x 20'	170	KEELER	125 lbs.
2	72" x 18'	198	ROBB MUMFORD	125 lbs.
1	72" x 18'	216	UNIFLOW	125 lbs.
2		250	KEELER	105 lbs.

WATER TUBE BOILERS

Quantity	H.P.	Make	Headers	Pressure
1	100	BABCOCK & WILCOX		40 lbs.
1	125	HEINE		125 lbs.
3	150	ROBB ENGINEERING	straight	125 lbs.
2	204	BABCOCK & WILCOX	vertical C.I.	160 lbs.
1	212	BABCOCK & WILCOX	inclined C.I.	160 lbs.
4	215	HEINE	inclined	150 lbs.
1	250	CAN. FOUNDRY		160 lbs.
8	250	STERLING		160 lbs.
4	250	STERLING		150 lbs.
6	264	BABCOCK & WILCOX	steel	175 lbs.
2	300	CANADA FOUNDRY		130 lbs.
5	308	HEINE		140 lbs.
3	328	BABCOCK & WILCOX	C.I.	250 lbs.
4	350	BABCOCK & WILCOX		200 lbs.
1	350	HEINE		180 lbs.
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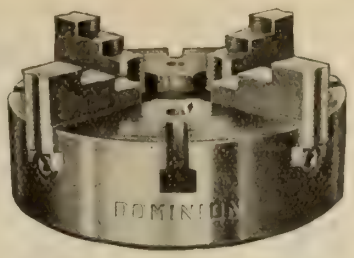

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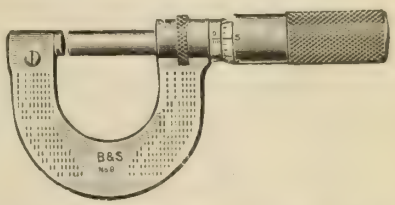

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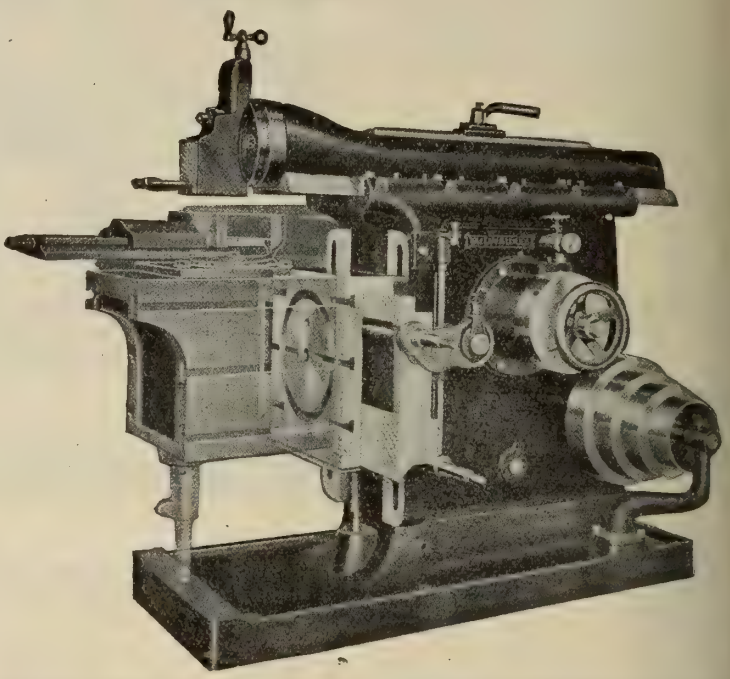

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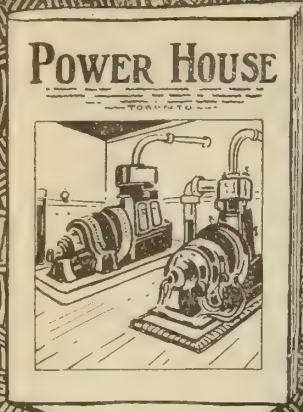

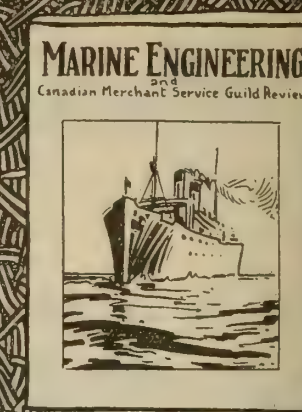

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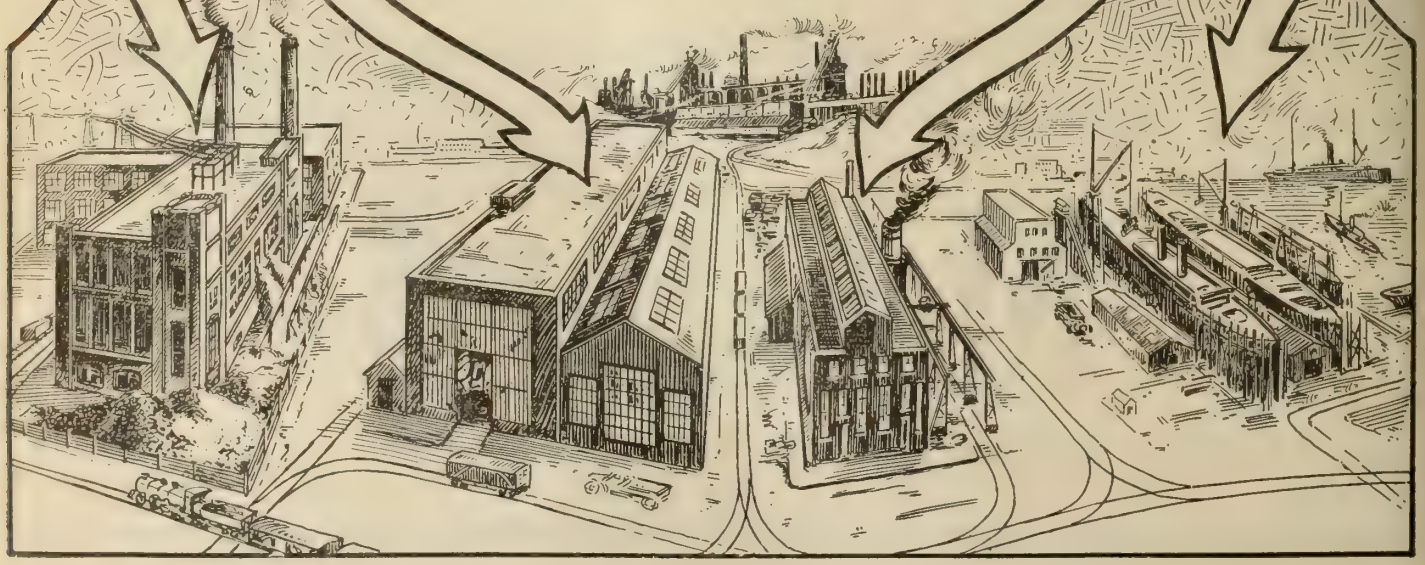

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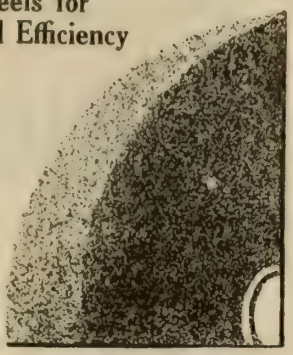

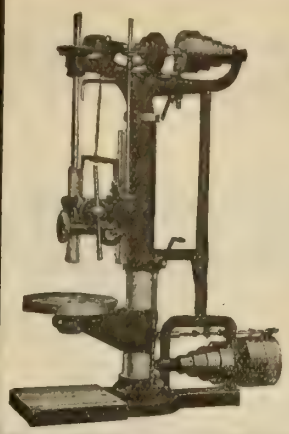

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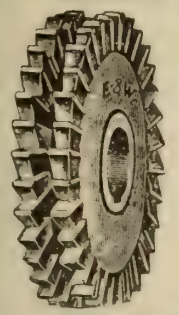

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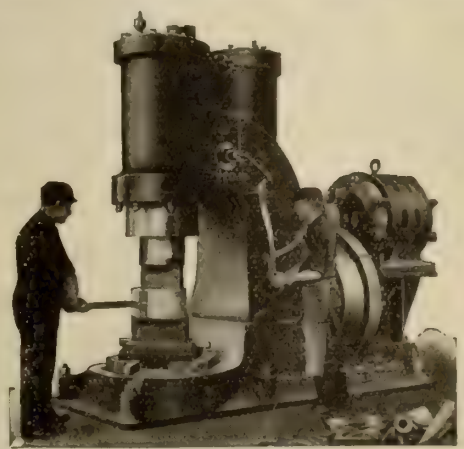

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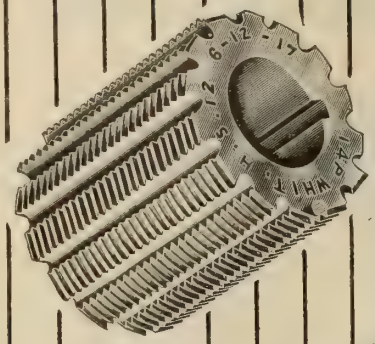

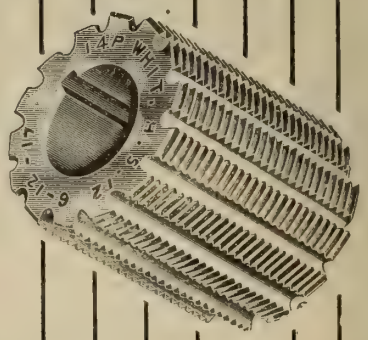

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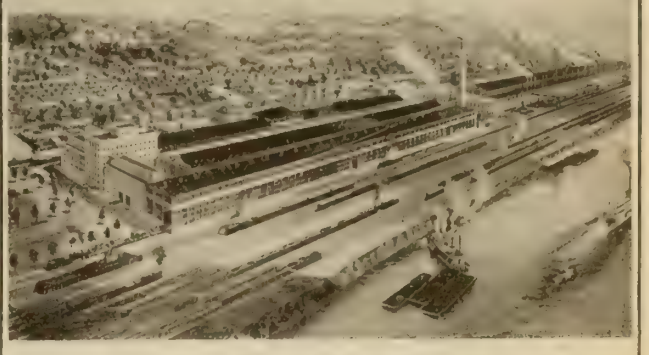

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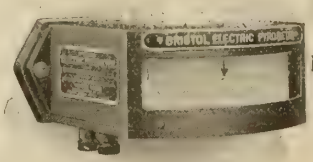

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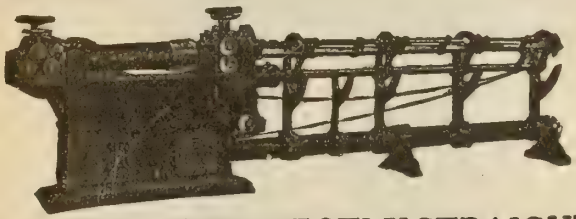

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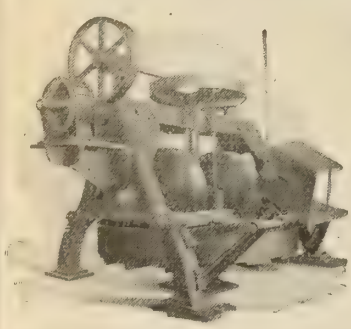

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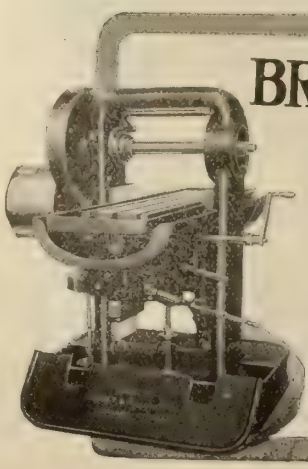

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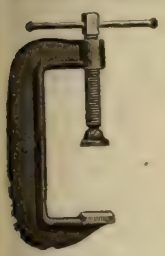

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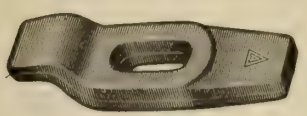

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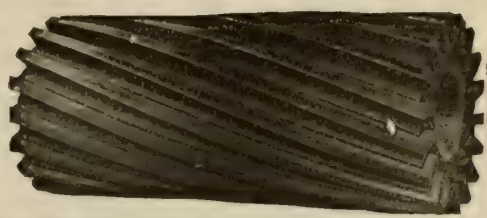

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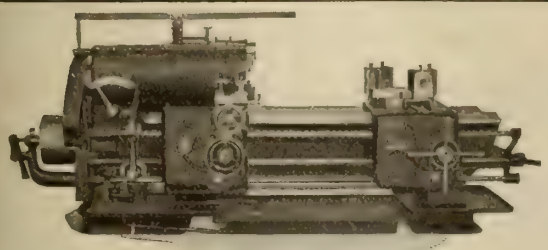

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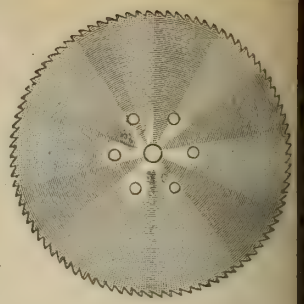

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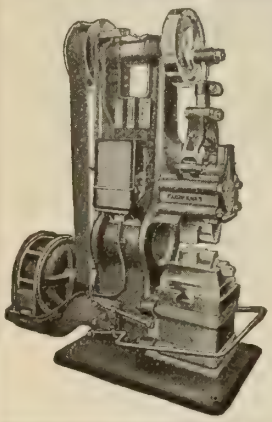

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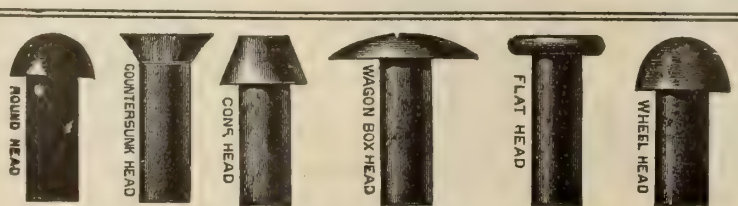

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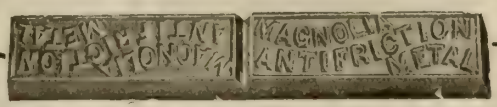

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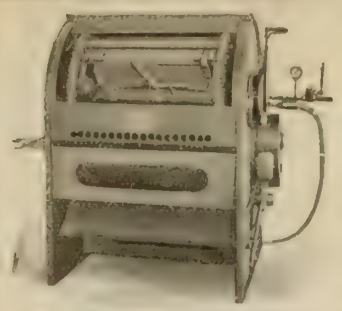

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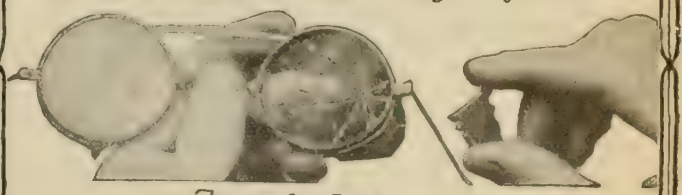

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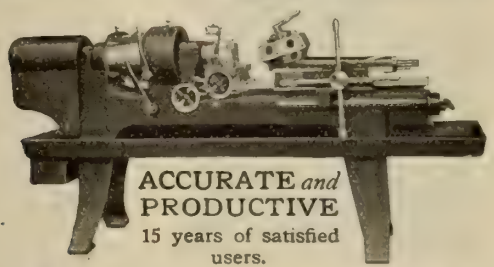

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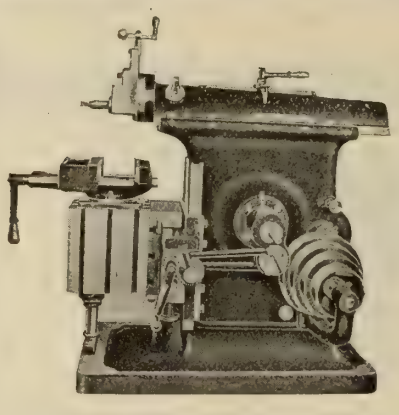

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Gisholt Machine Co., Madison, Wis.
Niles-Bement-Pond Co., New York.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

BARS, MERCHANT
Algoma Steel Corp., Sault Ste. Marie.

BARS, CONCRETE REINFORCING
Algoma Steel Corp., Sault Ste. Marie

BEADING MACHINES
Quickwork Co., St. Marys, Ohio.

BELT CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Limited, Montreal

BEARINGS, BRONZE
Wilson & Co., J. C., Belleville, Ont.

BEARINGS, DIE CAST
Franklin Mfg. Co., Syracuse, N.Y.

BELT-LACING MACHINES, HOOKS AND PINS
Clipper Belt Lacer Co., Grand Rapids

BELT LACING LEATHER
Aikenhead Hardware Co., Toronto, Ont.
G. F. Foss Mchy. & Sply. Co., Montreal.
Graton & Knight Mfg., Worcester, Mass.
Rice Lewis & Son, Toronto, Ont.

BELTING, BALATA
Federal Engineering Co., Toronto, Ont.

BELT HOOKS, WIRE
Clipper Belt Lacer Co., Grand Rapids

BELTING, RUBBER
Can. Consolidated Rubber Co., Montreal.

BELTING, CHAIN
Can. Fairbanks-Morse Co., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, CONVEYOR
Can. Consolidated Rubber Co., Montreal.
Baxter & Co., Ltd., J. R., Montreal.
Canadian Fairbanks-Morse Co., Montreal
Federal Engineering Co., Ltd., Toronto.
Graton & Knight Mfg., Worcester, Mass.
Jones & Glassco, Montreal, Que.
McLaren Belting Co., J. C., Montreal.
Morse Chain Co., Ithaca, N.Y.
Plewes, Ltd., Winnipeg, Man.
Rice, Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

BELTING, FRICTION AND SURFACE
Can. Con. Rubber Co., Ltd., Montreal.

BELTING, LEATHER
Can. Graton & Knight Mfg. Co., Montreal
John Tullis & Son, Glasgow, Scotland.

BELTING, WOVEN
Federal Engineering Co., Ltd., Toronto

BENDING ROLLS, PLUTE & AUGH
Wickes Bros., Saginaw, Mich.

BENDING MACHINERY
Bertrams, Ltd., Edinburgh, Scotland.
Bertram & Sons Co., John, Dundas
Brown-Boggs Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Kitchener.
Garlock-Walker Mach. Co., Toronto.
Dom. Steel Products Co., Ltd., Brantford.
Williams & Wilson, Ltd., Montreal.

BLAST GATES
W. S. Rockwell Co., New York, N.Y.

BLASTING MACHINES, SAND
Garlock-Walker Machinery Co., Toronto.
Jardine, A. B., & Co., Hespeler, Ont.
National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
William Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.
Wickes Bros., Saginaw, Mich.

BLUE PRINT PAPER
Hughes, Owens Co., Ltd., Montreal, Que.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield Mass

BOILER BREECHINGS
William Hamilton Co., Peterboro, Ont.

BOILER FEEDING TRAPS
Geo. W. Cole, Ltd., Toronto.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co. Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

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Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

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Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Harbison-Walker Refractories, Montreal.

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MacKinnon Steel Co., Sherbrooke, Que.

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Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

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Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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MacKinnon Steel Co., Sherbrooke, Que.

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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

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Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

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Brown, Boggs & Co., Hamilton, Can.

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Union Carbide Co., Toronto, Ont.

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Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

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Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

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Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

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Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
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CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
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Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
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International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
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Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

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International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

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Gardner, Robt., & Son, Montreal.

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Victoria Foundry Co., Ottawa, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
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CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, New York.

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Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, N.Y.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

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National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

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Toronto Testing Lab'tory, Ltd., Toronto

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Whitman & Barnes Co., St. Catharines.

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Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

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Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
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Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

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Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

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Victor Tool Co., Waynesboro, Pa.

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Hoggson & Pettis Mfg. Co., New Haven, Conn.

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Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
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CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Co., J. H., Brooklyn, N.Y.

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Hoggson & Pettis Mfg. Co., New Haven, Conn.

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Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

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Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
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Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

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J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

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Brown's Copper & Brass Rolling Mills, New Toronto.
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Oakley Chemical Co., New York, N.Y.

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Smalley-General Co., Inc., Bay City, Mich.

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Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

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Volta Mfg. Co., Welland, Ont.

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MacGovern & Co., Montreal, Que.

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Jones & Glassco, Montreal.

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Beatty Bros., Fergus, Ont.

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Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

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Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
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Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson Ltd., Montreal, Que

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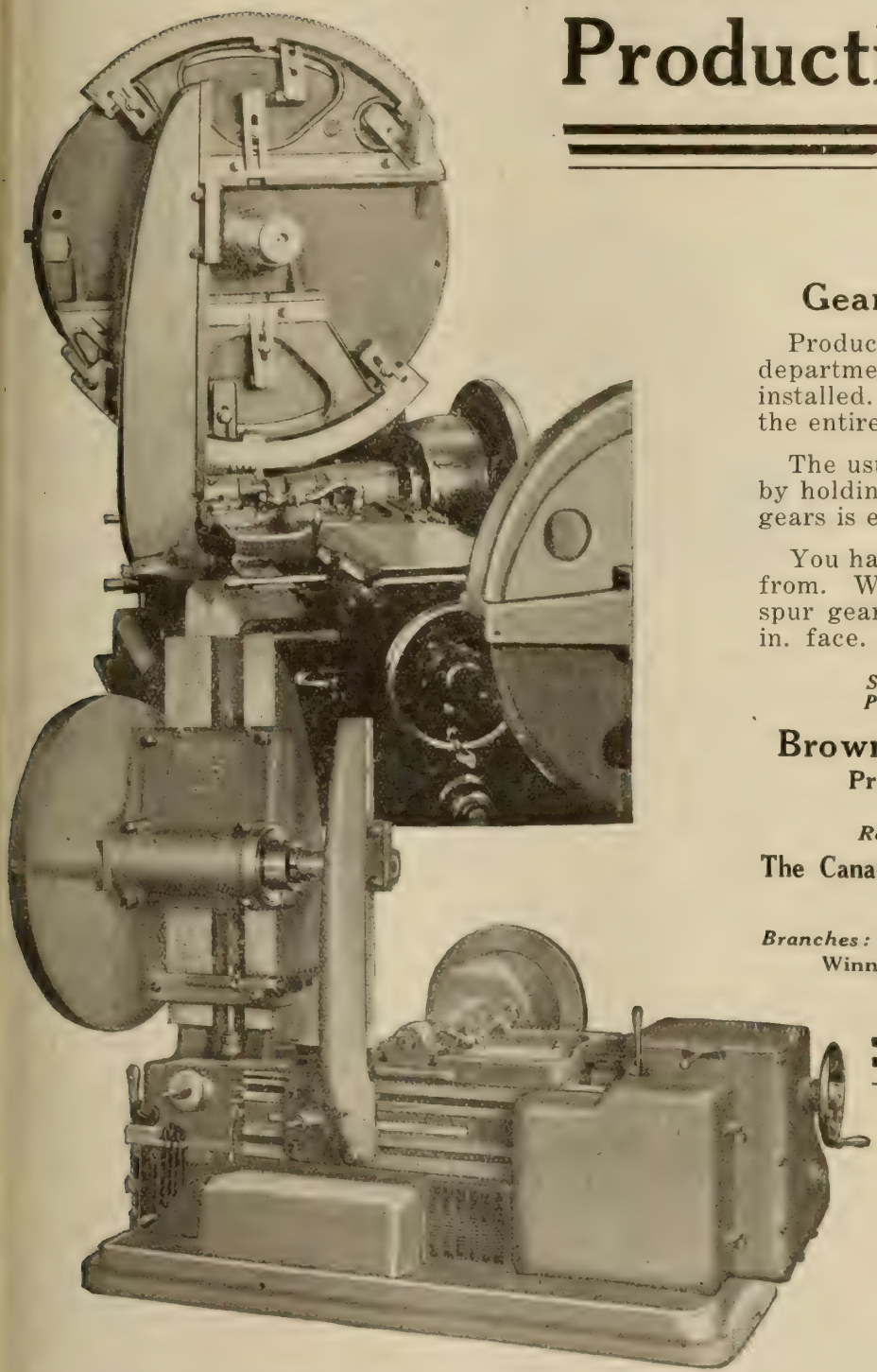

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Independent Pneumatic Tool Co., Chicago
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Northern Crane Works, Walkerville.

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found's & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING
B. F. Sturtevant Co, Galt, Ont.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND (BORTZ)
Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIES, CUTTING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, METAL STAMPING
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

DIE SINKERS
Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

DIE STEEL, HOT AND COLD WORK
Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

DIES FOR SCREW PLATES
Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

DIES, SCREW AND THREAD
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

DIRECT CONNECTED UNITS
MacGovern & Co., Montreal, Que.

DRAFT, MECHANICAL
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

DRAWING INSTRUMENTS
Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES
Hughes, Owens Co., Ltd., Montreal, Que.

DRESSERS, GRINDING AND EMERY WHEEL
Can. Desmond-Stephan Mfg. Co., Hamilton
Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

DRILL PRESSES
Aurora Tool Works, Aurora, Ind.
W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILL RODS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

DRILLING MACHINES, GANG
Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, LOCOMOTIVE AND MULTIPLE SPINDLE
John Bertram & Sons Co., Dundas.
Bilton Mach. Tool Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg. Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
A. R. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

DRILLING MACHINES, RADIAL AND TURRET
John Bertram & Sons Co., Dundas.
Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, SENSITIVE
Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
Canadian Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal.

DRILLING MACHINES, UPRIGHT AND HORIZONTAL
Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

DRILLING MACHINES, SPECIAL
Hoefer Mfg. Co., Freeport, Ill.

DRILLING MACHINES, WALL RADIAL
Lynd-Farquhar Co., Boston, Mass.
Wickes Bros, Saginaw, Mich.

DRILLING POSTS
Aikenhead Hardware Co., Toronto, Ont.
Keystone Mfg. Co., Buffalo, N.Y.
Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

DRILLS, BENCH
Aikenhead Hardware Co., Toronto.
W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, CENTRE
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, BLACKSMITH AND BIT STOCK
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

DRILLS, CARBON
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

DRILLS, ELECTRIC, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DRILLS, EMERY
Garlock-Walker Mach. Co., Toronto, Ont.

DRILLS, HIGH SPEED TWIST
Aikenhead Hardware Co., Toronto, Ont.
Armstrong-Whitworth of Can., Montreal
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

DRILLS, OIL TUBE
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

DRILLS, PNEUMATIC
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

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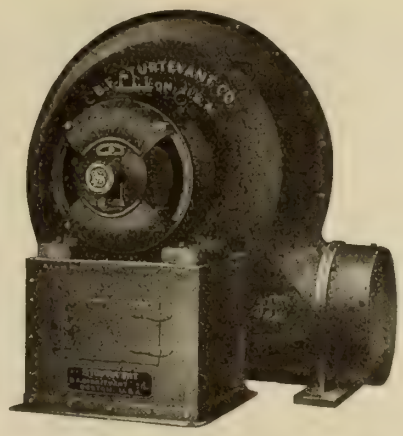

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Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

DRILLS, RATCHET AND HAND
Aikenhead Hardware Co., Toronto, Ont.
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cincinnati Electrical Tool Co., Cincinnati.
Cleveland Twist Drill Co., Cleveland.
Garlock-Walker Mchy. Co., Toronto, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

DRILLS, ROCK
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland Pneumatic Tool Co., Toronto.
The Foss Mchy. & Supply Co., Montreal.
A. R. Williams Machy. Co., Toronto.

DRILLS, TRACK
Butterfield & Co., Irc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
The Foss Mchy. & Supply Co., Montreal.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

DRINKING FOUNTAINS, SANITARY
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

DRIVES, CHAIN
See Belting, Chain.

DRIVING TOOLS
The Thos. Pink Co., Ltd., Pembroke, Ont.

DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

DRYERS, SAND
Pangborn Corporation, Hagerstown, Md.

DRYING APPLIANCES
Baird Machine Co., Bridgeport, Conn.
W. S. Rockwell Co., New York, N.Y.

DRUM CONTROLS
Volta Manufacturing Co., Welland, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
MacKinnon Steel Co., Sherbrooke, Que.

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Pangborn Corporation, Hagerstown, Md.

DUST HANDLING EQUIPMENT
Pangborn Corporation, Hagerstown, Md.

DUST SEPARATORS
Can. Blower & Forge Co., Kitchener, Ont.

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Canadian Fairbanks-Morse Co., Montreal.
Lancashire Dynamo & Motor Co., Ltd., Toronto.
MacGovern & Co., Montreal, Que.
A. R. Williams Machy. Co., Toronto.

ELECTRICAL SUPPLIES
Can. General Electric Co., Toronto, Ont.

ELECTRIC FURNACES
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Volta Manufacturing Co., Welland, Ont.

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Volta Manufacturing Co., Welland, Ont.

ELECTRICAL RESISTANCE MATERIALS, NICHROME, KROMORE, CHROMAX, CLIMAX, NICKEL, SILVER, ADVANCE.
Can. Driver-Harris Co., Walkerville, Ont.

ELECTRIC HOISTS, STATIONARY AND MONO RAIL
Volta Manufacturing Co., Welland, Ont.

ELECTRIC MOTORS
Volta Manufacturing Co., Welland, Ont.

ELEVATOR, ENCLOSURES
Volta Mfg. Co., Welland, Ont.
Canada Wire & Iron Goods Co., Hamilton

ELEVATOR WEIGHTS
Katie Foundry, Galt, Ont.

ELEVATORS AND BUCKETS
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

ELEVATING AND CONVEYING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Williams & Wilson, Ltd., Montreal, Que.

EMBOSSING PRESSES
Dom. Steel Products Co., Ltd., Brantford.
Oliver Machinery Co., Grand Rapids, Mich

EMERY GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.

EMERY AND EMERY WHEELS
Brantford Emery Wheel Co., Brantford, Canada.
The Foss Mchy. & Supply Co., Montreal.
Garvin Machine Co., New York.
Canadian Fairbanks-Morse Co., Montreal.
Canada Emery Wheels Co., Hamilton.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

EMERY WHEEL DRESSINGS
Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Trueing Tool Co., Windsor, Ont.

END MILLS
John Morrow Screw & Nut Co., Ingersoll

ENGINEERS—INDUSTRIAL CLEANING (Free Consultation)
Oakley Chemical Co., New York, N.Y.

ENGINES, STEAM, GAS, GASOLINE
Furniss, Clarke & Co., Montreal, Que.
Canadian Fairbanks-Morse Co., Montreal.
Johnson Mach. Co., Carlyle, Manchester, Conn.
MacGovern & Co., Montreal, Que.

ENGINES, HORIZONTAL AND VERTICAL
Johnson Mach. Co., Carlyle, Manchester, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

ENGINES, HEAVY OIL, DIESEL TYPE
Furniss, Clarke & Co., Montreal, Que.

ENGINES, MARINE
Can. Ingersoll-Rand Co., Sherbrooke, Que.

ENGRAVERS
Pritchard-Andrews Co., Ottawa.

ESCUTCHEON PINS
Parmenter & Bulloch, Gananoque, Ont.

EXHAUST HEADS AND HOODS
Can. Blower & Forge Co., Kitchener, Ont.
Canadian Fairbanks-Morse Co., Montreal.

EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
Pangborn Corporation, Hagerstown, Md.
Williams & Wilson, Ltd., Montreal, Que.

EXTRACTORS, TAP
Walton Co., The, Hartford, Conn.

EYE BOLTS AND NUTS
Can. Foundries & Forgings, Ltd., Welland, Ont.

EYE PROTECTORS
Standard Optical Co., Geneva, N.Y.
Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

FACTORY GATES
Page Steel & Wire Co., Adrian, Mich.

FACTORY LOCATIONS
City of St. Johns, Quebec.

FACTORY SITES
City of St. Johns, Quebec.

FANS
Baird Machine Co., Bridgeport, Conn.
Can. Blower & Forge Co., Kitchener, Ont.

FENCING, WIRE
Page Steel & Wire Co., New York, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

FENCE, IRON AND FACTORY
Can. Wire & Iron Goods, Hamilton, Ont.
Page Steel & Wire Co., Adrian, Mich.

FERRO-TUNGSTEN
Vanadium-Alloys Steel Co., Pittsburgh, Pa

FILES
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Wm., Sheffield, Eng.
Ingersoll File Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

FILTERING AND CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Can. Wire & Iron Goods, Hamilton, Ont.

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Brown & Sharpe Mfg. Co., Providence, R.I.

FIRST AID CABINETS
Strong, Kennard & Nutt Co., Cleveland.

FIRE EXTINGUISHERS
Strong, Kennard & Nutt Co., Cleveland, O.

FIXTURES
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Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ontario.
Toronto Tool Co., Toronto, Ont.

FLAT SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

FLANGING CLAMPS
Wickes Bros., Saginaw, Mich.

FLOTATION MACHINERY
Elec. Steel & Metals, Welland, Ont.

FLUMES
William Hamilton Co., Peterboro, Ont.

FORGES, HAND PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.

FORGINGS, STEEL AND IRON
Blancke Co., L. C., New York City.

FORGINGS
Mesta Machine Co., Pittsburgh, Pa.
Can. Found. & Forgings, Ltd., Welland.
Nova Scotia Steel & Coal Co., New Glasgow, N.S.

FORGINGS, DROP, AUTOMOBILE AND LOCOMOTIVE FORGING AND WELDING
Blancke Co., L. C., New York City.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamp'g Co., Walkerville.
Steel Co. of Canada, Ltd., St. Catharines.
Victoria Foundry Co., Ottawa.
Williams & Co., J. H., Brooklyn, N.Y.

FORGING MACHINERY
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

FORGINGS, SPECIAL
Armstrong-Whitworth of Can., Montreal.
Blancke Co., L. C., New York City.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

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Brown & Sharpe Mfg. Co., Providence, R.I.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
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Brown & Sharpe Mfg. Co., Providence, R.I.
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Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
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Standard Fuel Engr. Co., Detroit, Mich.
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Armstrong Bros. Tool Co., Chicago.

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GASKETS, LEATHER, ETC.
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Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

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Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGE BLOCKS
Wilton & Mfg. Co., Boston, Mass.

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Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

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Wells Bros. of Can., Galt, Ont.

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Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
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Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
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Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

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Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL
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Dom. Found. & Steel, Hamilton, O
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Katie Foundry, Galt, Ont.

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Fellows Gear & Shaper Co., Springfield.

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Fellows Gear & Shaper Co., Springfield.
Garlock-Walker Mchy. Co., Toronto, O
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto
Williams & Wilson, Ltd., Montreal, Q

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Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochest

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Can. Link-Belt Co., Toronto, Ont.
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Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, O
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Hamilton Gear & Machine Co., Toron
Hull Iron & Steel Found., Ltd., Hull,
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GEARS, SPRING
Morse Chain Co., Ithaca, New York.

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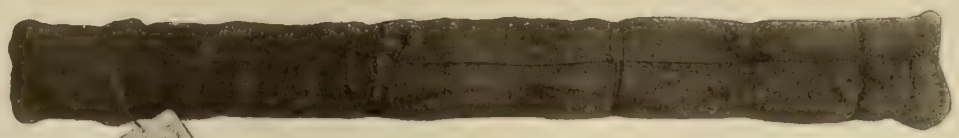

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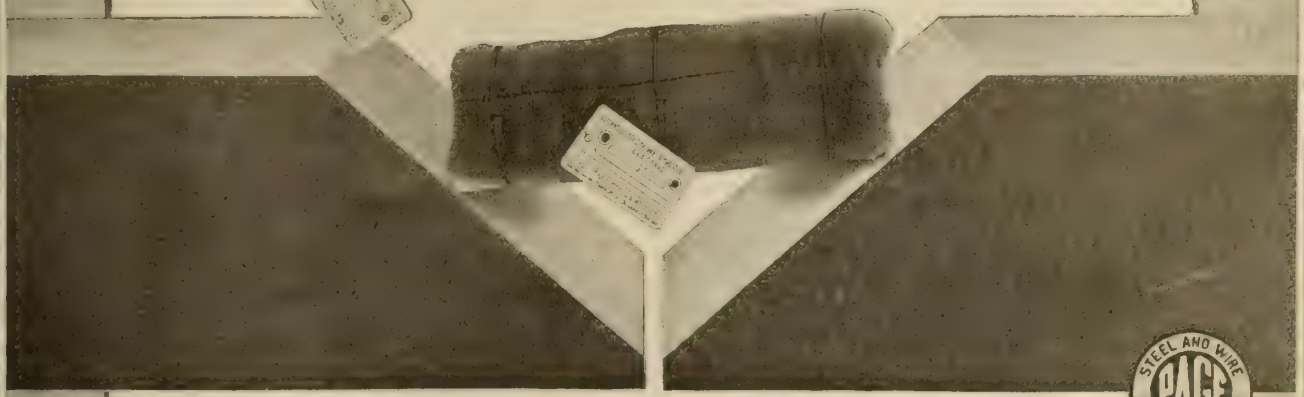

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Dennis Wire & Iron Works, London, Ont.
Page Steel & Wire Co., Adrian, Mich.
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Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
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United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

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Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal.

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Dominion Bridge Co., Montreal, Que.
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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

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Clipper Belt Lacer Co., Grand Rapids.

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Toronto Iron Works, Ltd., Toronto, Ont.

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Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Wells Bros. Co. of Canada, Galt, Ont.

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Dom. Steel Products Co., Ltd., Brantford.
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Taylor Instrument Co., Rochester, N.Y.

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Starrett Co., L. S., Athol, Mass.

INDEX CENTRES

Brown & Sharpe Mfg. Co., Providence, R.I.
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Garvin Machine Co., New York.
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INGOTS, FORGING AND ROLLING

Electric Steel & Metals Co., Welland.

INSULATING COMPOUNDS

Robertson Co., Ltd., H. H., Sarnia, Ont.

INSTRUMENTS, ENGINEERING

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Gisholt Machine Co., Madison, Wis.
Homer & Wilson, Hamilton, Ont.
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Marten Machine Co., Hamilton, Ont.
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JOURNAL WEDGES

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Garvin Machine Co., New York.
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Williams Machy. Co., A. R., Toronto.
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LATHE DOGS AND ATTACHMENTS

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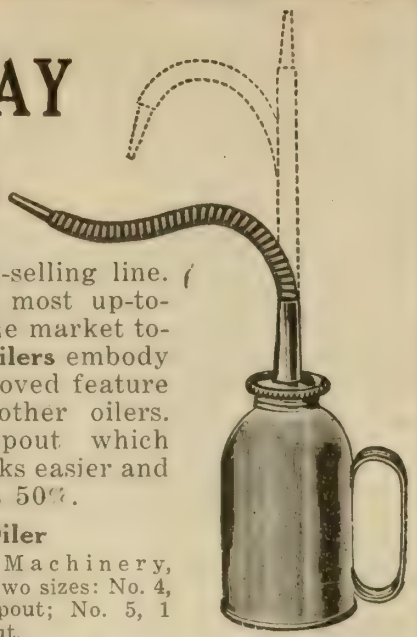

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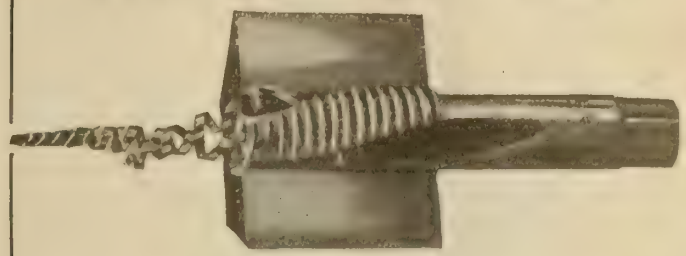

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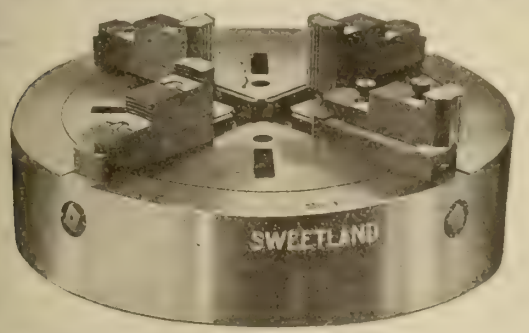

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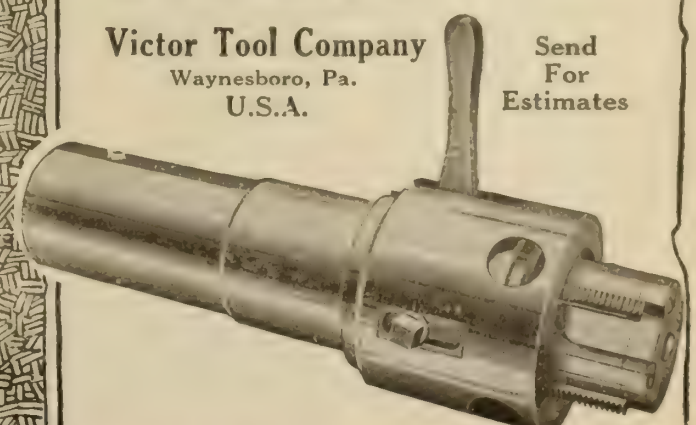

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Niles-Bement-Pond Co., New York.
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Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machy. Co., Toronto, Ont.
Garvin Machine Co., New York.
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Volta Mfg. Co., Welland, Ont.
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Can. Driver-Harris Co., Ltd., Walkerville.

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Pilot Steel & Tool Co., Montreal, Que.

NICKEL SILVER

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NICKEL STEEL

See Steel.

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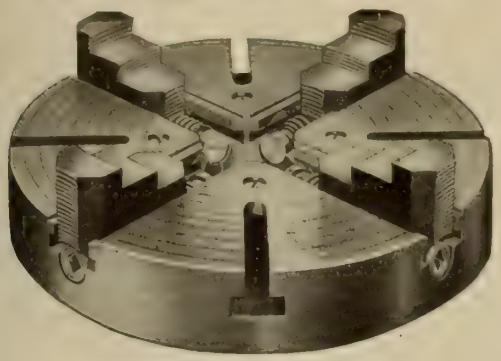
are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



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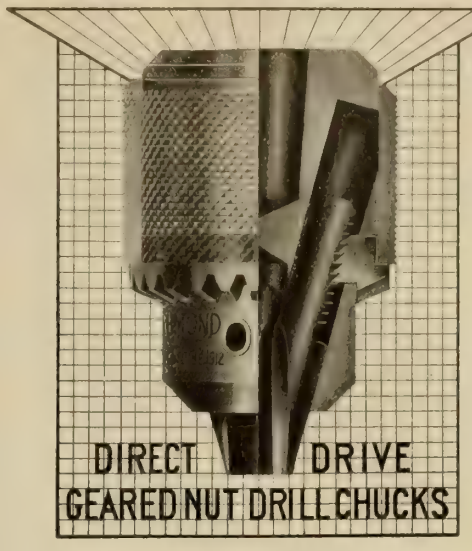

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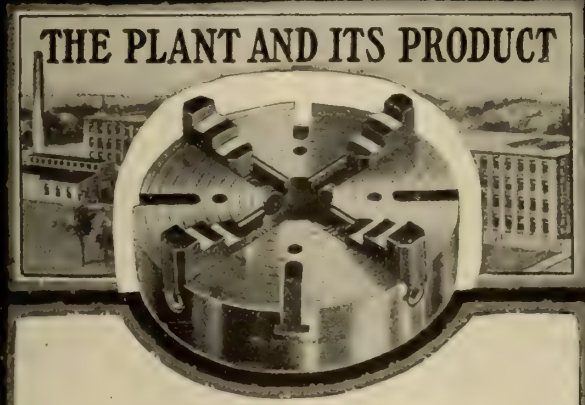

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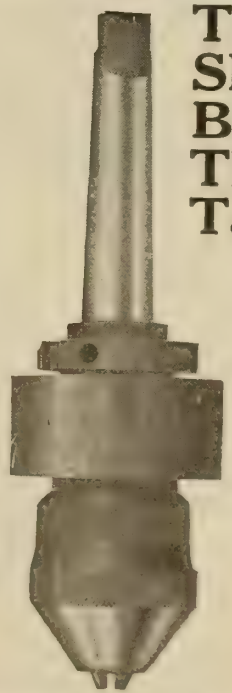

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Hoggson & Pettis Mfg. Co., New Haven, Conn.

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Dom. Steel Products Co., Ltd., Brantford.
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Dom. Steel Products Co., Ltd., Brantford.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW DRIVERS
Whitman & Barnes Co., St. Catharines.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co, Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Milwaukee Shaper Co., Milwaukee, Wis.
Rae Mach. Tool Co., Ramilton.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
Marshalltown Mfg. Co., Marshalltown, Ia.
The Quickwork Co., St Mary's, Ohio.

SHEARS, PNEUMATIC
Toledo Machine & Tool Co., Toledo, Ohio.

SHEET METAL ROLLING MACHINES
Peck, Stow & Wilcox Co., Southington.

SHEETS, NICKEL, RESIST. ALLOY
Can. Driver-Harris Co., Ltd., Walkerville.

SHEARS, PLATE CUTTING, SLITTING
Marshalltown Mfg. Co., Marshalltown, Ia.
Quickwork Co., St. Mary's, Ohio.

SHEARS, SPLITTING
Dom. Steel Products Co., Ltd., Brantford.
Marshalltown Mfg. Co., Marshalltown, Ia.
Peck, Stow & Wilcox Co., Southington.

SHEARS, IRREGULAR AND CIRCLE CUTTING
The Quickwork Co., St. Mary's, Ohio.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL MACHINERY
Peck, Stow & Wilcox Co., Southington, C.

SHEARS, SERPENTINE
The Quickwork Co., St. Mary's, Ohio.

SHEARS, SQUARING
Brown, Boggs & Co., Hamilton, Ont.
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHEET METAL WORKING TOOLS
Baird Machine Co., Bridgeport, Conn.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co. Hamilton.
Peck, Stow & Wilcox Co., Southington, C.
D. H. Stoll Co., Inc., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal.

SHEETS, CRUCIBLE, CAST
Kayser-Ellison & Co., Ltd., Montreal.
Ralph B. Norton, Agent, Montreal.

SHEET METAL WORKING MACHINERY
D. H. Stoll Co., Inc., Buffalo, N.Y.

SHELVING, STEEL
Dennis Wire & Iron Works, London.

SHIPYARD MACHINERY, SHOP FURNITURE
Dennis Wire & Iron Works, London.

SIDE TOOLS
Armstrong Bros. Tool Co., Chicago.
J. H. Williams & Co., Brooklyn, N.Y.

SILENT CHAINS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLEDGES
Aikenhead Hardware Co., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.
Wilkinson & Kompass, Hamilton, Ont.

SLEDGES, CAST IRON
Katie Foundry, Galt, Ont.

SLINGS, CHAINS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

SLOTTERS
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
National-Acme Co., Cleveland, Ohio.
Niles-Bement-Pond Co., New York.

SMOKESTACKS
William Hamilton Co., Peterboro, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

SNIPS, TINNERS AND SHEET METAL WORKERS
Kearney & Trecker Co., Milwaukee, Wis.
J. Morrow Screw & Nut Co., Ingersoll, Ont.

SOCKETS
Brown & Sharpe Mfg. Co., Providence.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Keystone Mfg. Co., Buffalo, N.Y.
Modern Tool Co., Erie, Pa.
J. Morrow Screw & Nut Co., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

SOIL PIPE FITTINGS, CAST IRON
Katie Foundry, Galt, Ont.

SOLDERING IRONS
Aikenhead Hardware Co., Toronto, Ont.
Brown, Boggs & Co., Hamilton, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.

SOLDER
Aikenhead Hardware Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Toronto, Ont.
Tallman Brass & Metal Co., Hamilton.

SPEED REDUCING GEARS
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

SLICING CLAMPS
Peck, Stow & Wilcox Co., Southington, Conn.

SPRINGS, MACHINERY
Barnes, Wallace Co., Bristol, Conn.
Can. Steel Foundries, Ltd., Montreal.
Cleveland Wire Spring Co., Cleveland.
Dumbar Bros. Co., Bristol, Conn.
Garlock-Walker Machinery Co., Toronto.
Jas. Steele, Ltd., Guelph, Ont.

SPECIAL MACHINERY
Baird Machine Co., Bridgeport, Conn.
Bertram, John, & Sons Co., Dundas.
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada.
Brown Engineering Corp., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Garvin Machine Co., New York.
Gooley & Edlund, Inc., Courtland, N.Y.
John H. Hall & Sons, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
Katie Foundry, Galt, Ont.
National-Acme Co., Cleveland, Ohio.
Mesta Machine Co., Pittsburgh, Pa.
Marten Machine Co., Hamilton, Ont.
Mach. Tool Co., Ramilton.
Stoll Co., D. H., Buffalo, N.Y.
Victoria Foundry Co., Ottawa, Ont.
Wilson & Co., J. C. Belleville, Ont.
William R. Perrin, Ltd., Toronto.
Warmington & Co., J. N., Montreal, P.Q.

SPECIAL TOOLS, MACHINERY
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Wilton & Mfg. Co., Boston, Mass.

SPRING COILING AND WINDING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Garvin Machine Co., New York.

SPRING MAKING MACHINERY (AUTOMATIC)
Baird Machine Co., Bridgeport, Conn.

SPRINGS, SPIRAL, TOOL
The Dunbar Bros. Co., Bristol, Conn.

SPROCKETS, COMPENSATING
Morse Chain Co., Ithaca, New York.

SPROCKETS, SPRING
Morse Chain Co., Ithaca, New York.

SPROCKETS, CHAIN
Can Link-Belt Co., Toronto, Ont.
Grant Gear Works, Boston, Mass.
Jones & Glassco, Montreal.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia.
Wilson & Co., J. C., Belleville, Ont.

SPRINGS FOR TOYS AND ELECTRIC DEVICES
The Dunbar Bros. Co., Bristol, Conn.

SPROCKET WHEELS, CAST
Can. Link Belt Co., Toronto, Ont.

(Photograph and data by courtesy of our customer)

Roasters 18 x 12 x 4½ deep from 24 gauge pickeled and annealed steel at 350 per hour.

Sold in 1898

A "Bliss" No. 14 Toggle Drawing Press. It is here being run at 7 strokes per minute, the operator catching 85 per cent. of the strokes.

The owners bought their first "Bliss" Press in 1871, and to-day our records show the purchase of 66 "Bliss" presses of various kinds. It is neither our longest nor greatest record for a single customer, but it has been maintained with characteristically mutual respect and satisfaction.

BLISS 1857

E. W. BLISS COMPANY

BLISS 1919

Main Office and Works: BROOKLYN, N.Y., U.S.A.

CHICAGO OFFICE People's Gas Bldg.
DETROIT OFFICE Dime Bank Bldg.
CLEVELAND OFFICE Union Bank Bldg.
LONDON, ENGLAND, Pocock Street, Blackfriars Road, S.E.
PARIS, FRANCE, 100 Boulevard Victor-Hugo St. Ouen

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If interested tear out this page and place with letters to be answered.

Perrin, Wm. R., Toronto.
Wilson & Co., J. C., Belleville, Ont.

SPROCKET WHEELS, CHILLED THREAD
Katie Foundry, Galt, Ont.

SQUARES
Peck, Stow & Wilcox Co., Southington, Conn.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

SANDERS
Oliver Mach. Co., Grand Rapids, Mich.

SAW BENCHES
Oliver Mach. Co., Grand Rapids, Mich.

SAW GUARDS
Oliver Mach. Co., Grand Rapids, Mich.

SAWS SWING
Oliver Mach. Co., Grand Rapids, Mich.

STAYBOLT TOPS
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

STAIRS, IRON
Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS, SHEET BRASS, COPPER, ALUMINUM AND STEEL
Dom. Forge & Stamping Co., Walkerville
Homer & Wilson, Hamilton, Ont.

STAMPING MACHINERY
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs, & Co., Hamilton, Can.
Canada Machinery Corp., Galt, Ont.

STAMPS AND DIES, STEEL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

STAMPS, STEEL ALPHABET, FIGURES
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Matthews, Jas. H & Co., Hartford, Conn.
Pritchard-Andrews Co., Ottawa, Can.

SAFETY CYLINDERS
Oliver Mach. Co., Grand Rapids, Mich.

STEAM APPLIANCES
Darling Bros., Ltd., Montreal, Quebec.

STEAM SEPARATORS AND TRAPS
Can. Fairbanks-Morse Co., Montreal.
Geo. W. Cole, Ltd., Toronto.

STEEL BALLS
See Balls Steel.

STEEL, CRUCIBLE TOOL
Atkins & Co., Ltd., Wm. Sheffield, Eng.
Illingworth Steel Co., John, New York.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

STEEL, CARBON, FERRO-TUNGSTEN
Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent Montreal.
Latrobe Electric Steel Co., Latrobe, Pa
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL CHROME VANADIUM
Blancke Co., L. C., New York City.
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm. Sheffield, Eng
Marshall, Son & Bunney, Toronto.

STEEL CHROME NICKEL
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.

STEEL CASTINGS
Joilette Steel Co., Montreal, Que.
Kennedy & Sons, Wm., Owen Sound.
Electric Steel & Metals Co., Welland.
Nova Scotia Steel & Coal Co., Windsor.
Swedish Crucible Steel Co., Windsor.

STEEL, COLD ROLLED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Can. Drawn Steel Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co. Ltd., Montreal.
Union Drawn Steel Co., Hamilton, Ont.
Warmington & Co., J. N., Montreal, P.Q.

STEEL, NICKEL
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Blancke Co., L. C., New York City.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

STEEL, HIGH SPEED
Armstrong-Whitworth of Can., Montreal.
Blancke Co., L. C., New York City.
Wm. Atkins & Co., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal
H. A. Drury Co., Ltd., Montreal.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Illingworth Steel Co., J., New York.
Kayser Ellison & Co., Sheffield, Eng.
Latrobe Electric Steel Co., Latrobe, Pa.
Marshall, Son & Bunney, Toronto, Ont.
Ralph B. Norton, Montreal, Que.
Plewes, Ltd, Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Swedish Steel & Importing Co., Ltd., Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, CHROME, MANGANESE
Joilette Steel Co., Montreal, Que.

STEEL, OPEN HEARTH
Illingworth Steel Co., John, New York.

STEEL, CRUSHED
Pittsburgh Crushed Steel Co., Pittsburgh.

STEEL PRODUCTS AND MACHINERY
Dom. Steel Products Co., Ltd., Brantford.

STEEL, ROCK DRILL
Armstrong, Whitworth of Canada, Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal
Norton, Ralph B., Agent, Montreal.

STEEL, STRUCTURAL
Algoma Steel Corp., Sault Ste. Marie.
MacKinnon Steel Co., Sherbrooke, Que.

STEEL, TOOL
Armstrong, Whitworth of Can., Montreal.
Atkins & Co., Wm., Sheffield, Eng.
Blancke Co., L. C., New York City.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Drury Co., H. A., Montreal, Que.
Firth & Sons, Thos., Montreal, Que.
Hawkridge Bros. Co., Boston, Mass.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto, Ont.
Norton, Ralph B., Agent, Montreal.
Latrobe Electric Steel Co., Latrobe, Pa.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son Toronto, Ont.
Vanadium-Alloys Steel Co., Pittsburgh.

STEEL, VANADIUM
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Armstrong, Whitworth of Can., Montreal.
Drury, H. A., Co., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Vanadium-Alloys Steel Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

STENCILS
Hoggson & Pettis Mfg. Co., New Haven, Conn.

STOCK RACKS FOR BARS, PIPING, ETC.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

STOCKS AND DIES
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros., of Can., Galt, Ont.

STOCKS, PIPE
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son, Toronto, Ont.
Wells Bros., Co., of Canada, Galt, Ont.

STRAIGHTENING MACHINERY
Baird Machinery Co., Bridgeport, Conn.
Bertrams, Ltd., Edinburgh, Scotland.

STRAND
Dom. Steel Products Co., Ltd., Brantford.
Page Steel & Wire Co., Adrian, Mich.

SURFACE PLATES
Brown & Sharpe Mfg. Co., Providence, R.I.

STRUCTURAL STEEL WORKS
William Hamilton Co., Peterboro, Ont.

SUPPLIES, RUBBER MFRS.
Hoggson & Pettis Mfg. Co., New Haven, Conn.

SWEDGES AND WEDGES
Whitman & Barnes Co., St. Catharines.

SWITCHBOARDS
Can. General Electric Co., Toronto, Ont.

SWITCHES, RAILWAY
Can. Steel Foundries, Ltd., Montreal.

TABLES, SAND-BLAST
Pangborn Corporation, Hagerstown, Md.

TAPPING MACHINES (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

TANKS, GASOLINE, KEROSENE AND OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Dom. Forge & Stamping Co., Walkerville.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Marshall, Son & Bunney, Toronto.

TANKS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

TANKS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

TANKS, STEEL, WATER PRESSURE
Bowser Co., Ltd., S. F., Toronto, Ont.
Dominion Bridge Co., Montreal, Quebec.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal, Que.
Toronto Iron Works, Ltd, Toronto.

TANK WAGONS
MacKinnon Steel Co., Sherbrooke, Que.
St. Lawrence Welding Co., Montreal.
Toronto Iron Works, Ltd., Toronto.

TANKS
Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Elec. Steel & Metals, Welland, Ont.
Geo. W. Cole, Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
William Hamilton Co., Peterboro, Ont.

TAPER PINS
Galt Machine Screw Co., Ltd., Galt, Ont.

TAPES, MEASURING
James Chesterman & Co., Ltd., Sheffield, Eng.
Rice Lewis & Son, Toronto, Ont.

TAPPING MACHINES AND ATTACHMENTS
Bertram, John & Sons Co., Dundas.
Bicknell-Thomas Co., Greenfield, Mass.
Rudel-Belnap Mach. Co., Ltd., Montreal.
Canada Machinery Corp., Galt, Ont.
Garvin Machine Co., New York.
The Geometric Tool Co., New Haven.
J. H. Hall & Sons, Brantford, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Niles-Rement-Pond Co., New York.
Rickert-Shafer Co., Erie, Pa.
National-Acme Co., Cleveland, Ohio.
L. S. Starrett Co., Athol, Mass.
Whitney Mfg. Co., Hartford, Conn.
Williams & Wilson, Limited, Montreal.

TAPES, MEASURING, STEEL AND WOVEN
Lufkin Rule Co. of Can., Windsor, Ont.

TAPES, POCKET
Lufkin Rule Co. of Can., Windsor, Ont.

TAPS, ADJUSTABLE
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Geometric Tool Co., New Haven.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Pilot Steel & Tool Co., Montreal, Que.
Victor Tool Co., Waynesboro, Po.

TAPS, GUN, HAND, BOILER
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE RELIEVED
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, MACHINE SCREW
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

TAPS, PIPE
Butterfield & Co., Inc., Rock Island, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
Wells Bros. of Can., Galt, Ont.

TAPS, SPECIAL
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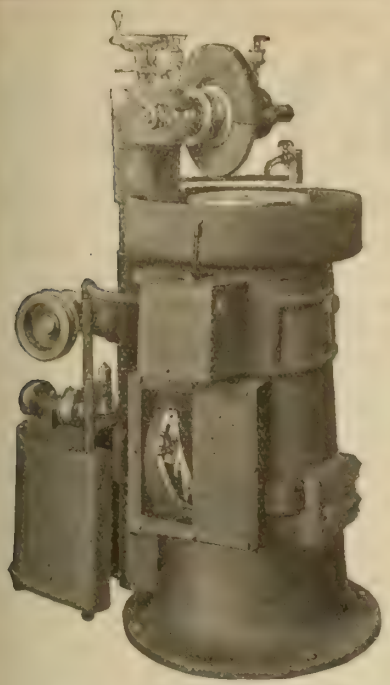

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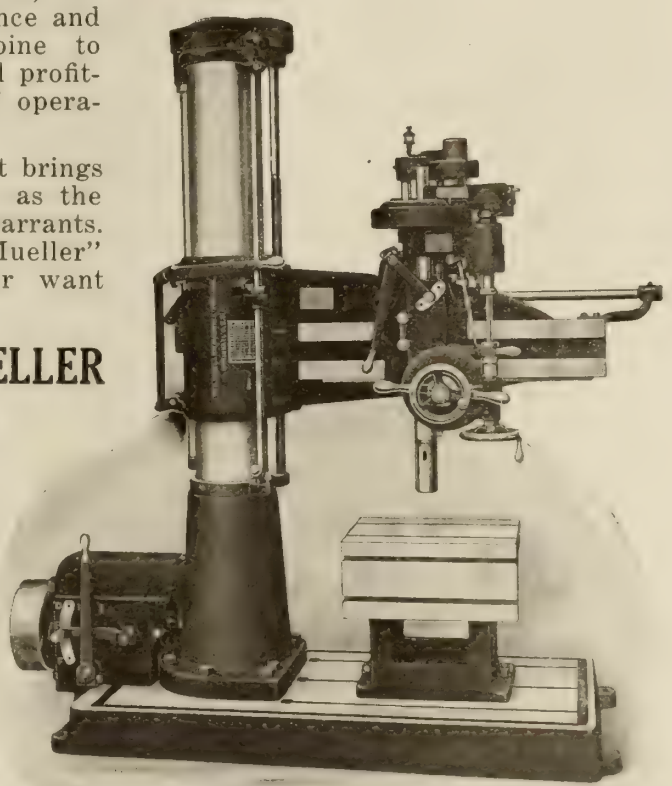

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FOR IMMEDIATE DELIVERY

We have in stock the following list of New and Second-Hand Wood Tools which we offer for immediate acceptance subject to prior sale

AT SPECIALLY REDUCED PRICES

Quantity	Make	Size		
PLANERS				
2	Sussex		Planer and Matcher, Eastern Monarch	New
1		30"	Cabinet Planer and countershaft	Second-hand
1	Ross	24"	Planer and Matcher	Second-hand
3	Sussex	16"	Buzz Planers	New
1	Goldie & McCulloch		Buzz Planer	Second-hand
1	McGregor-Gourlay	24" x 7'	Planer, single suface	New
1	Falls		Self-feeding Attachment	New
MOULDERS				
1	McGregor-Gourlay	12"	Moulder	Second-hand
1	Cowan	13"	Moulder	Second-hand
1	Gledhill		Moulder for Sash, double table	Second-hand
MORTISERS				
5	McGregor-Gourlay		Mortisers, Power	New
1	Goldie & McCulloch		Mortiser and Tenoner	Second-hand
1	Clark & Demille		Mortiser, Power	Second-hand
TENONERS				
1	Goldie & McCulloch		Tenoner, Blind Slat	Second-hand
1			Tenoner, Wood Frame	Second-hand
1	Cowan		Tenoner, Blind Slat	Second-hand
1	Fay & Egan		Tenoner, Blind Slat	Second-hand
SHAPERS				
1	McGregor-Gourlay		Shaper	New
1	Sussex		Shaper, heavy, with special C/S	New
SANDERS				
1	Peerless		Sander	Second-hand
1	Jackson-Cochrane	48"	Three-Drum Sander	Second-hand
1	Lucas		Sander	New
1	Lucas		Sander, with Extension Carriages	New
SAW TABLES				
1	McGregor-Gourlay		Saw, roller table cut-off, 7' table	Second-hand
1	Goldie & McCulloch		Saw Table	Second-hand
1	Ballantine		Saw Table	New
BAND SAWS				
1	Ballantine	30"	Bracket Band Saw	New
1	McGregor-Gourlay	42"	Self-Feed Band Rip Saw	Second-hand
1	Cowan	36"	Circular Re-Saw	Second-hand
RIP SAWS				
1	Cowan		Rip Saw	Second-hand
1	McGregor-Gourlay		Saw, with countershaft	Second-hand
BORING MACHINES				
1	Sussex		Belt-Driven Post Borer	New
1	Goldie & McCulloch		Post Borer	New
1	Goldie & McCulloch		Spindle Borer	Second-hand
1			Blind Style Borer	Second-hand
SUNDRY MACHINES				
3	Goldie & McCulloch	16"	Single End Wood Lathes	New
1	Jackson & Cochrane		Continuous Feed Glue Jointer	Second-hand
1	Ballantine		12-spindle Dovetailer	Second-hand
1	Sussex	12" x 44"	Veneer Press, 3 screws	New
1	Clark & Demille	12" x 44"	Veneer Press	New
1	Ballantine	12" x 50"	Veneer Press, 4 screws	New
1	Sussex		Double Emery Grinder	New
1	Sussex		Double Emery Grinder, two step cone	New

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LIMITED

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CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper covering in a practical manner the mechanical power, foundry and allied fields.
Published by the MacLean Publishing Company, Limited, Toronto, Canada

Vol. XXII., No. 25 Publication Office: Toronto, December 18, 1919 $3.00 per year. Subscription Price

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Motor drive—15 H.P. Motor.

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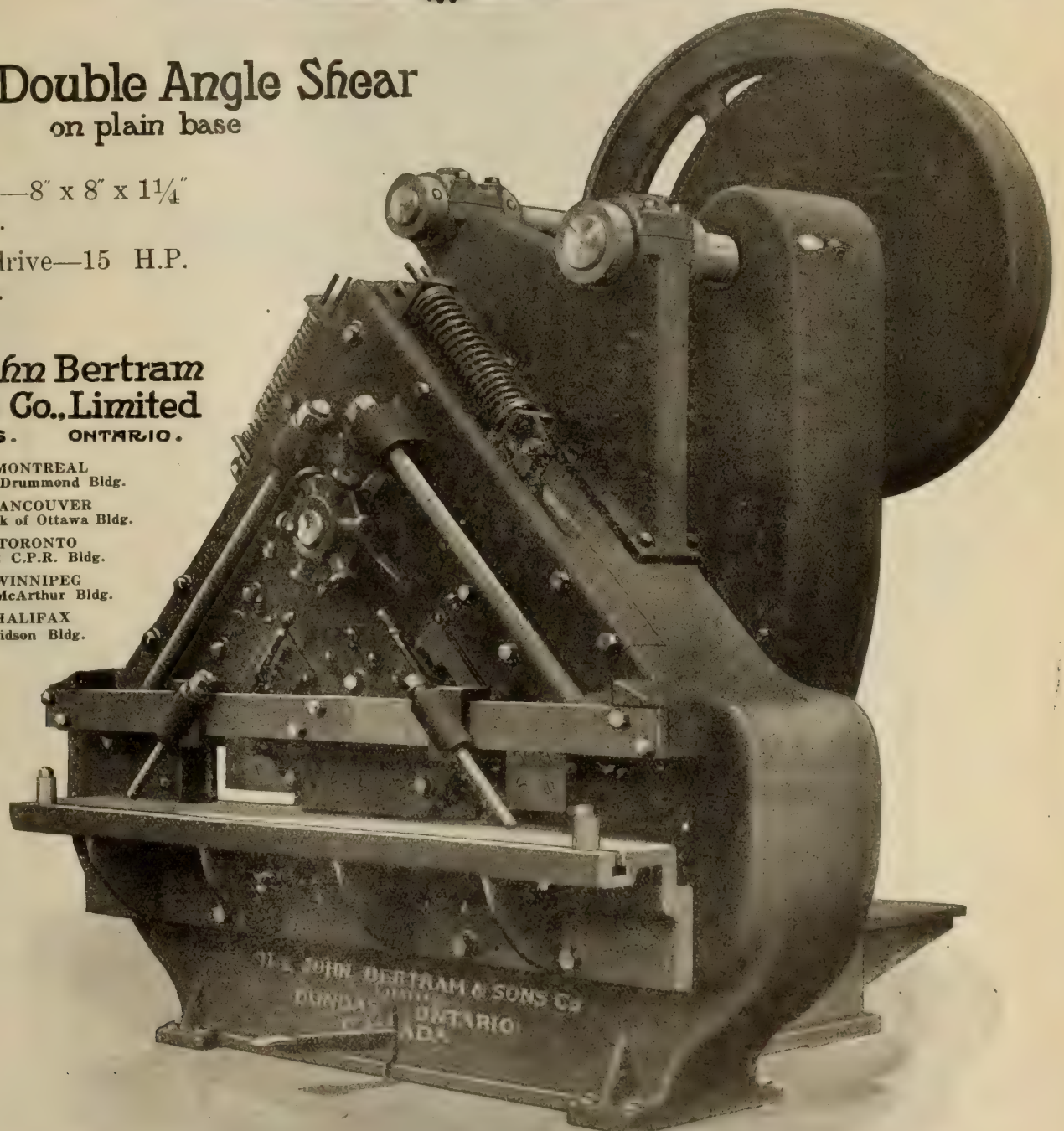

P13201

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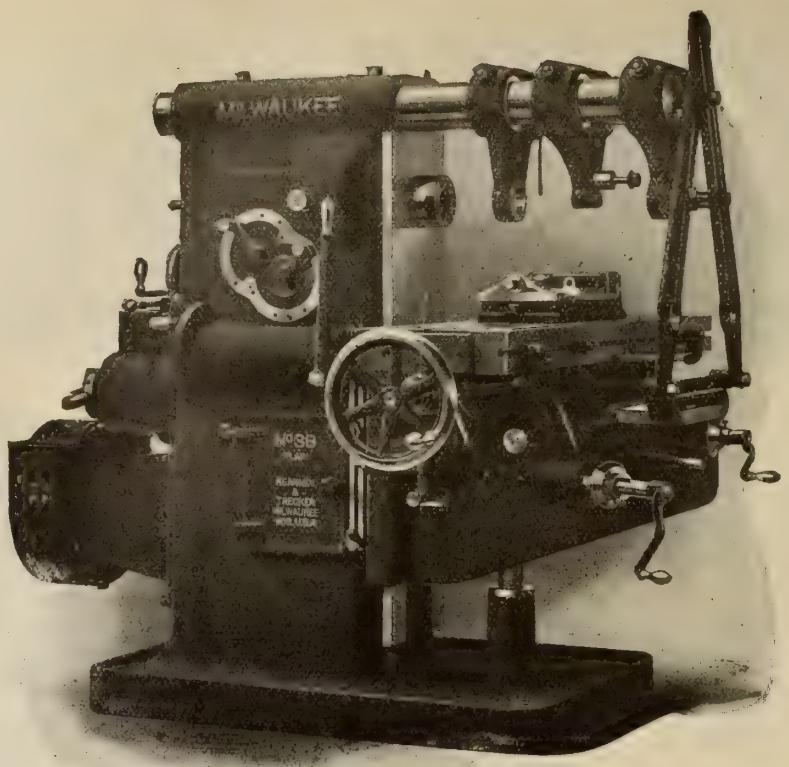

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Double Overarm maintains alignment.

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6 x 6"—5 x 5"—4 x 4"
3½ x 3½"—3 x 3"
2½ x 2½"—2¼ x 2¼"
2 x 2"—1¾ x 1¾"
1½ x 1½"—1¼ x 1¼"

ANGLES—Unequal Leg—
6 x 4"—6 x 3½"—5 x 4"
5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
15", 12", 10", 8", 6", 5", 4", 3".

CHANNELS—
15", 13", 12", 10", 8", 6", 5", 4", 3".

ZEES—
3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
3⅛ x 4 1/16 x 3⅛ x 5/16"
3 3/16 x 4⅛ x 3 3/16 x ⅜"
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All sizes from ½" up to and including 4".

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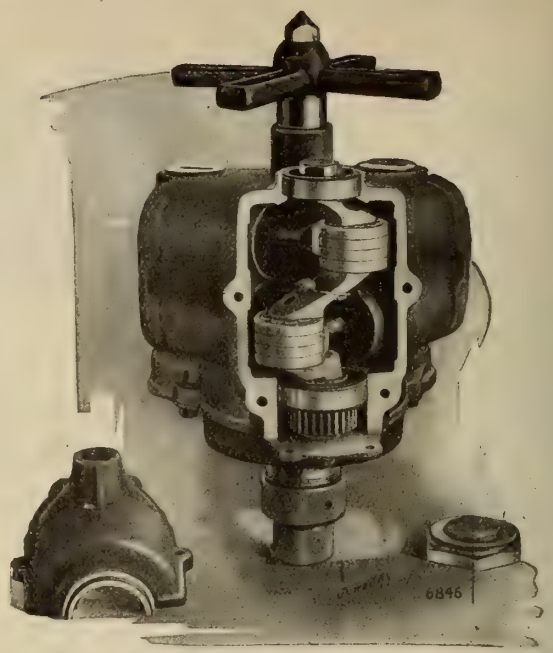

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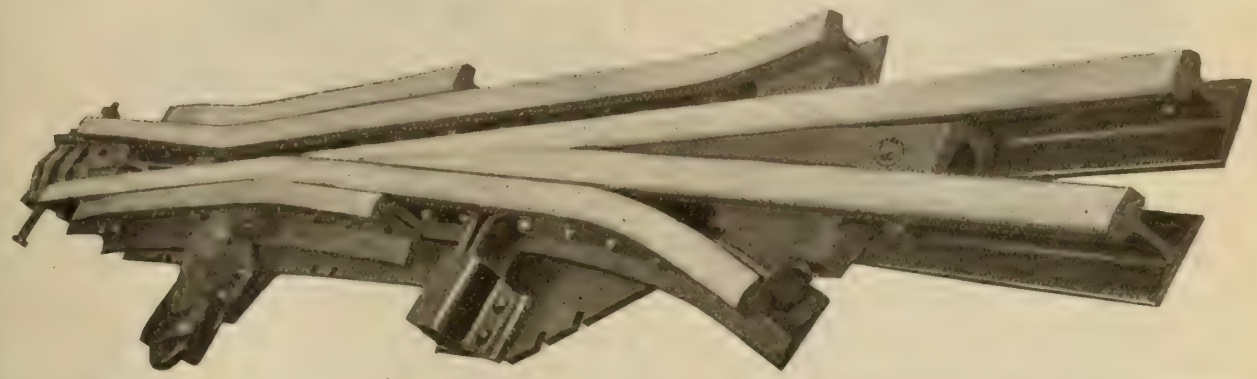

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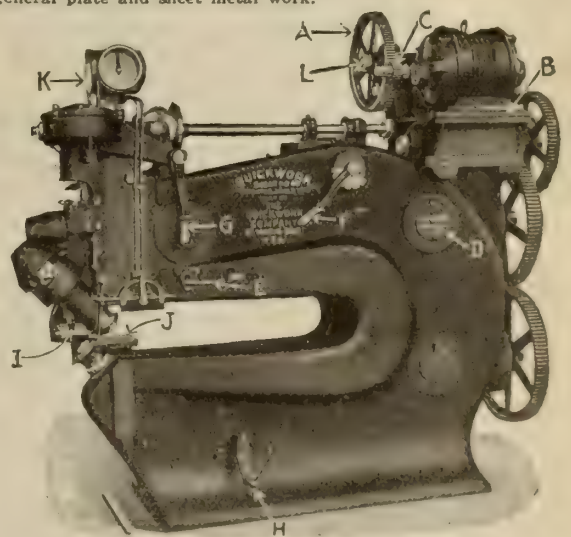

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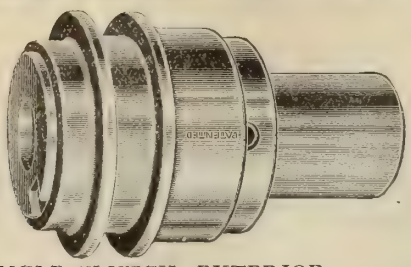
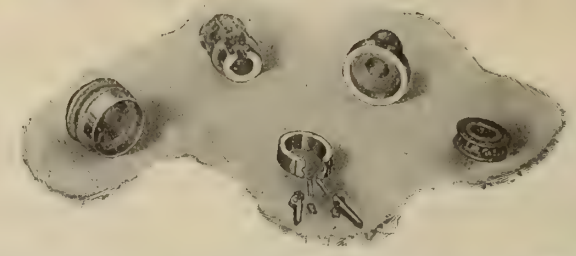


SINGLE CLUTCH—EXTERIOR



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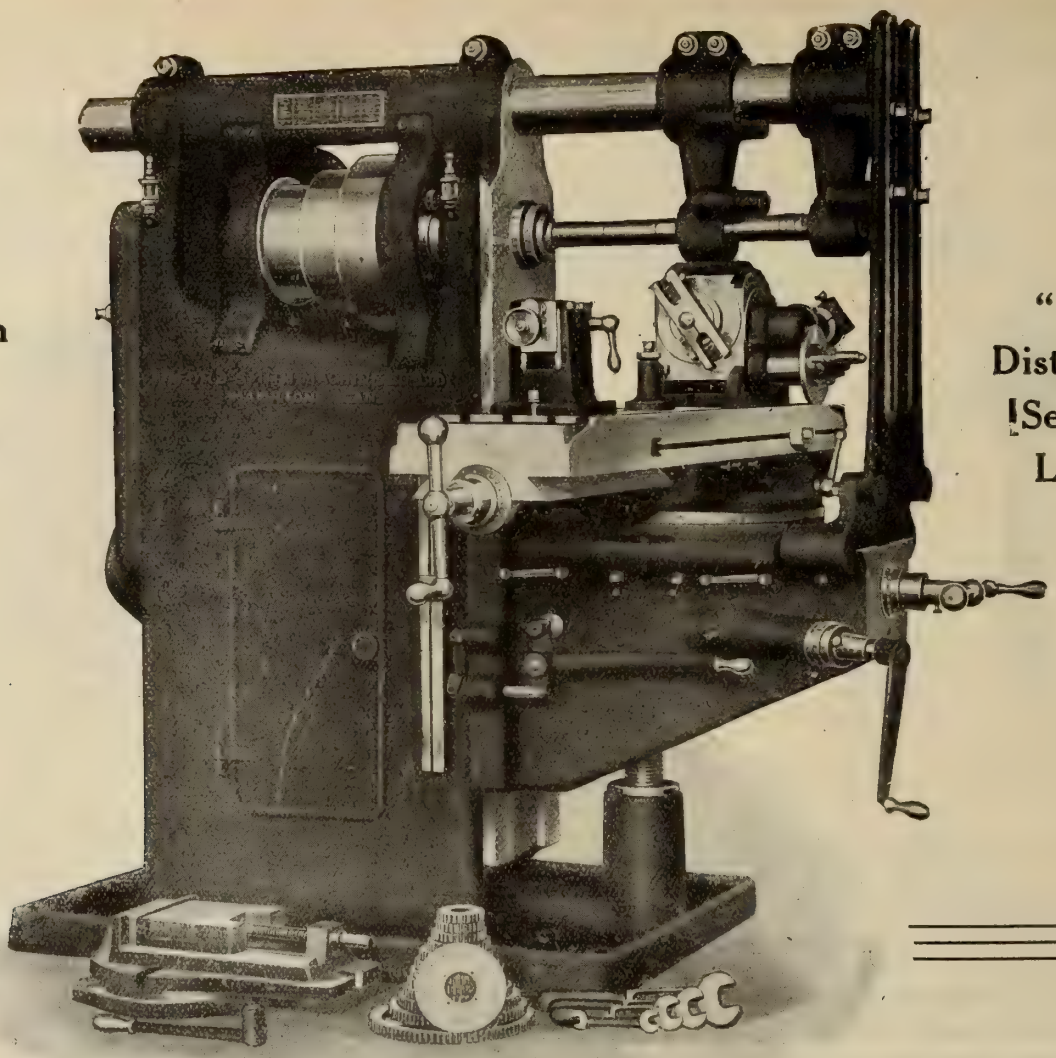

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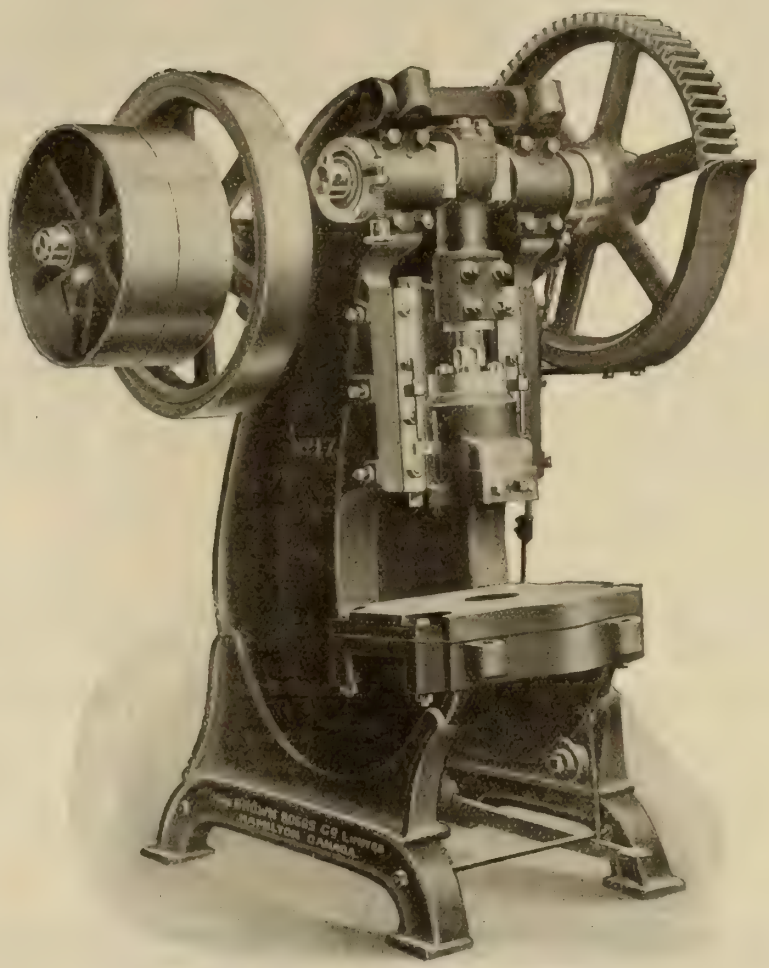

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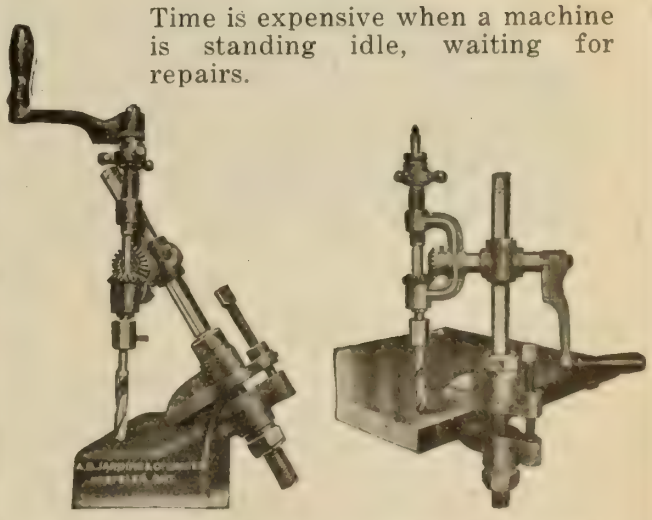
Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.
Sold by all Machinery and Supply Houses

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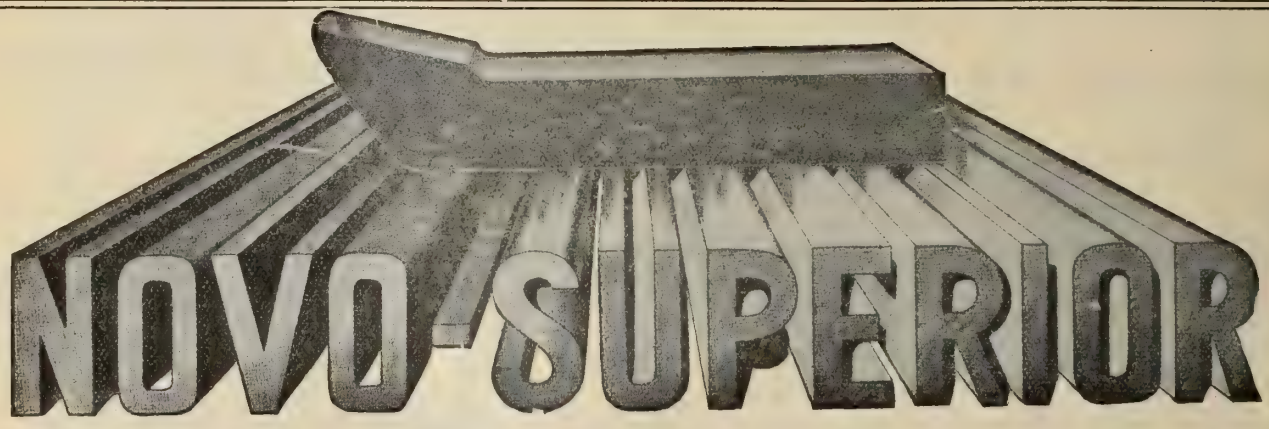

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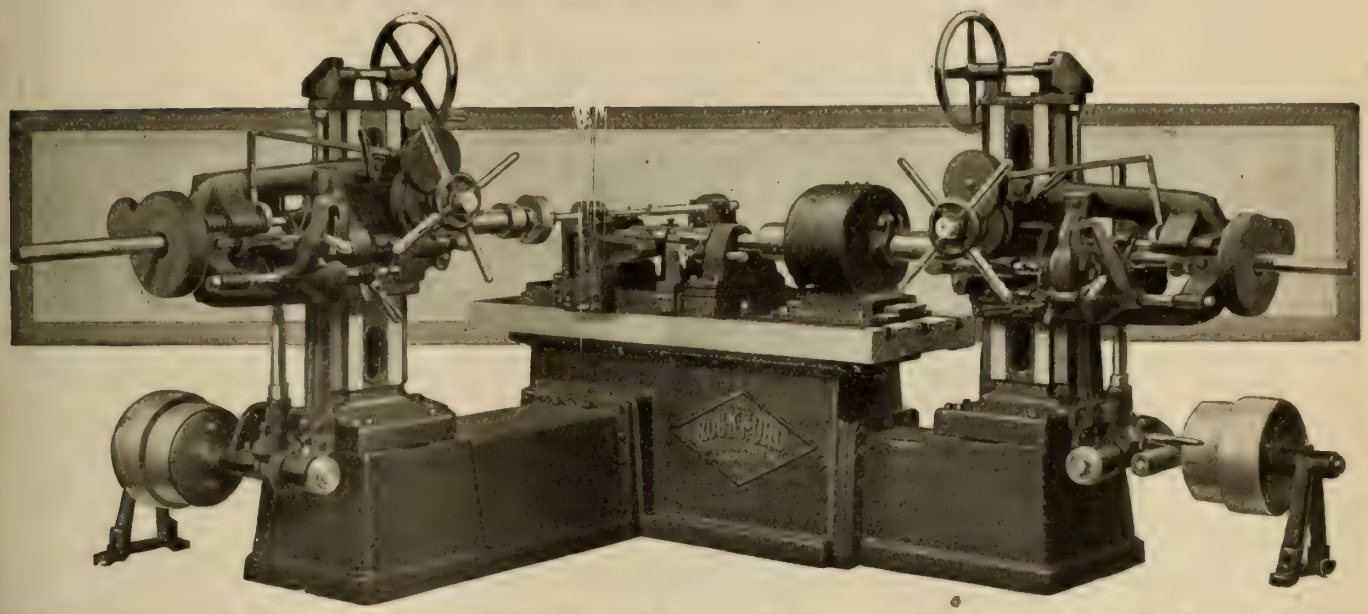
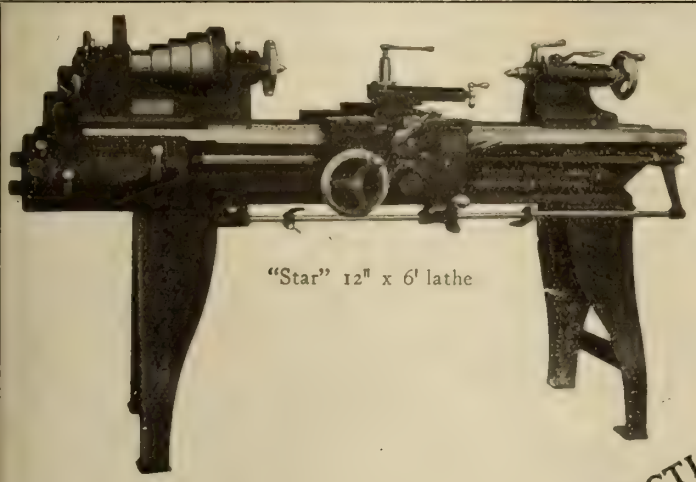
This tool is unusually rapid and accurate in the boring of crank cases, transmission cases and rear axles. Has two heads at right angles to each other. Spindles bore longitudinal and cross holes in work simultaneously.

Send us blue prints of your boring work and we will give you figures on the "Rockford's" ability on it.



The Rockford Drilling Machine Co., Rockford, Ill.



"Star" 12" x 6' lathe

Economical in first cost, operation, maintenance and floor space.

9"-11"-12"-13" swing with a full line of attachments.

36 YEARS OF PERFECTION IN SMALL LATHES

"STAR" LATHES

THE SENECA FALLS MFG. CO. INC., 366 W. Fall St., Seneca Falls, N.Y.

STAR TRADE MARK REGISTERED

The ideal equipment for Tool Room, Accurate Manufacturing Production, Training Schools and all classes of accurate, high-class work.

If interested tear out this page and place with letters to be answered.

ALOXITE DISCS AND FAFNIR BEARINGS

ONE thousand outer rings of Fafnir Radial Ball Bearings are faced on both sides with two Alxoite Discs in a ten hour day. The rings are 7.4804 inches outside diameter. The Aloxite Discs used are eighteen inches in diameter in 36 grit.

Fafnir methods of making the splendid Fafnir Bearings call not only for extreme care and accuracy, but for quick efficient methods of production.

So when it came to the proposition of facing the rings,

ALOXITE DISCS MEASURED UP TO THEIR STANDARDS

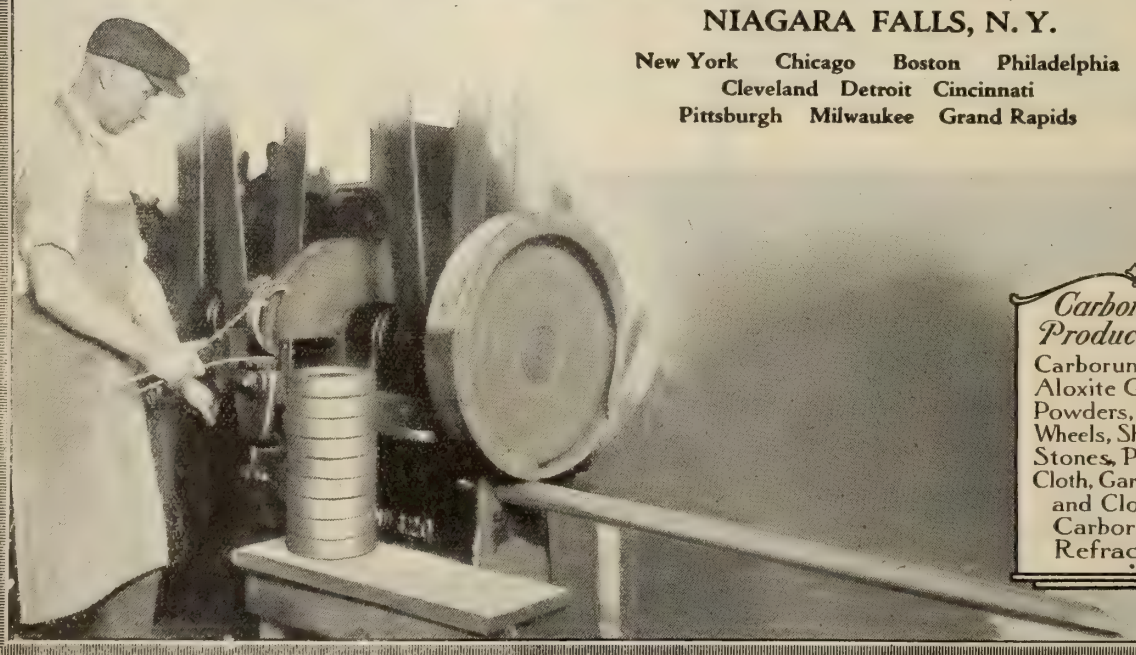
They are Discs that are cut clean and free.
They are Discs that are uniformly coated with hard, sharp, tough, Aloxite Grains and they are built for real grinding efficiency.

Aloxite and Carborundum Discs can be made to definitely meet YOUR Discing conditions

THE CARBORUNDUM COMPANY

NIAGARA FALLS, N. Y.

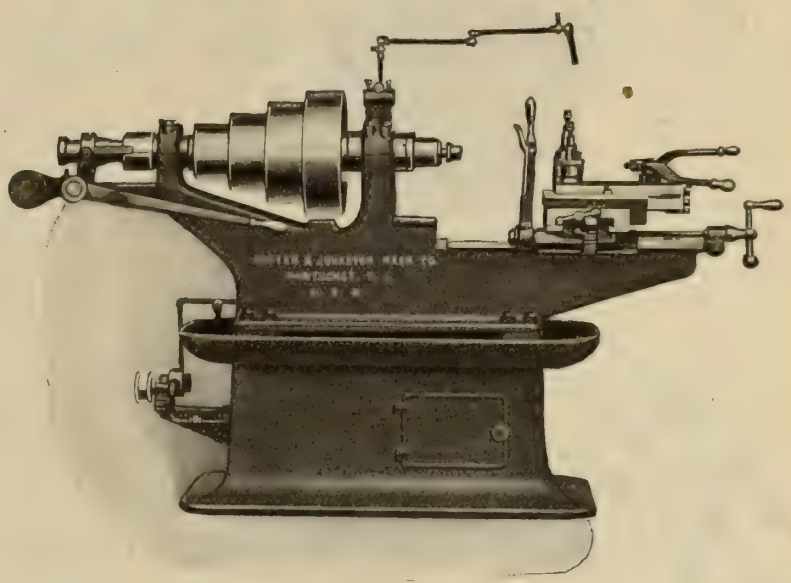
New York Chicago Boston Philadelphia
Cleveland Detroit Cincinnati
Pittsburgh Milwaukee Grand Rapids



Carborundum Products are:
Carborundum and Aloxite Grains and Powders, Grinding Wheels, Sharpening Stones, Paper and Cloth, Garnet Paper and Cloth and Carborundum Refractories

For Second Operation Work

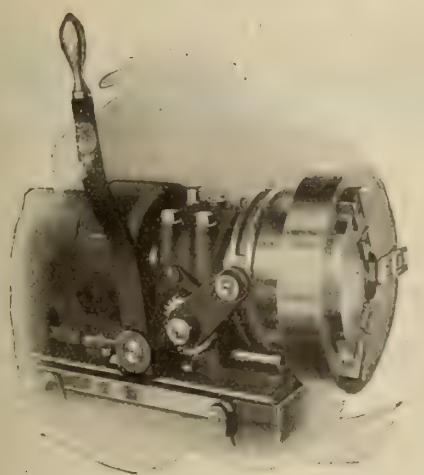
on pieces coming from Manufacturing Automatics or Screw Machines, for such work as squaring up the ends of hubs, rounding out rims of gear blanks and short turning operations, also reducing and rounding the ends of shafts, bolts and screw head, short stud work, etc.



Screw Shaving And Turning Machines

Built in Three Sizes

Number 3 — Number 4 — Number 5



The P & J Patented Automatic Lever Chuck may be applied to the spindle of the numbers 3 and 4 machines, and will be found useful for gripping castings or forgings of all diameters up to 12 or 14 inches, for performing short operations, such as facing, chamfering, recessing, etc.

The Lever Chuck is operated by a hand lever and on pieces which can be inserted into and removed from the chuck, using one hand, it is unnecessary to stop the spindle.

Bulletin 42.

Canadian Office: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

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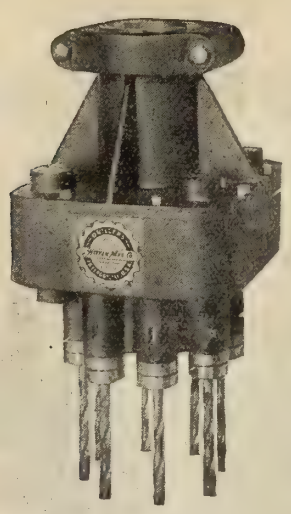
2 Minutes or 20?

This Is The Vital Question



Do you drill ten holes in the time it takes for one? The Hoefer Auxiliary Head equips any driller so as to accomplish this big saving in time. It speeds up production in drilling tremendously. Not only do you save the drilling time, but also the time now lost in shifting the jigs and raising and lowering the spindle for the extra holes.

Hoefer Auxiliary Heads are made in any multiple, arranged in any manner, from 2 up. They are made by expert tool makers and unqualifiedly guaranteed to handle accurately the work for which they are designed.

Investigate now—every day you use a single drill where the multiple may be used you are paying for an auxiliary head through increased costs, but not securing its benefits.

Write for catalog. Send a blueprint of some of your work for estimate of time and cost.

THE HOEFER Mfg. Co., Freeport, Ill.

621 Washington Blvd., Phone Haymarket 2408, Chicago, Illinois; 1113 Citizens' Bldg., Phone Main 795, Cleveland, Ohio; 217 Stanwix St., Phone Court 1911 or 1912, Pittsburgh, Pa.; 602 Kerr Building, Phone Cherry 2884, Detroit, Mich.; 30 Church Street, Phone Cortland 1615, New York City; Badger-Packard Mchy. Co., Milwaukee, Wisconsin; National Supply Co., Toledo, Ohio; John M. Howett, 18 W. Second St., Dayton, Ohio; 881 Ellicott Sq., Phone Seneca 2033, Buffalo, N.Y.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House For Mechanical Goods"

Halifax St. John Quebec Montreal Ottawa Toronto Hamilton Windsor Winnipeg Saskatoon Calgary Vancouver Victoria

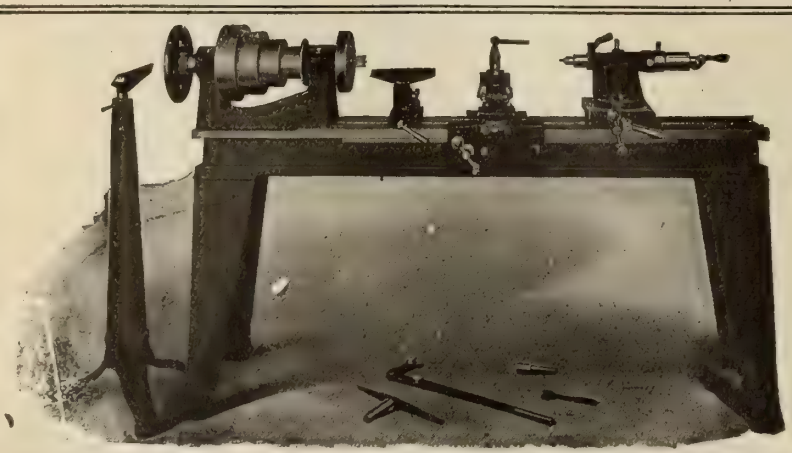
"STERLING" Hack Saw Blades

Guarantee satisfaction. A trial will convince you of their superiority.

Insist on securing the "STERLING" Brand.

Manufactured by

DIAMOND SAW & STAMPING WORKS, BUFFALO, N.Y., U.S.A.



A Favorite—

Blount Pattern-makers' Lathe

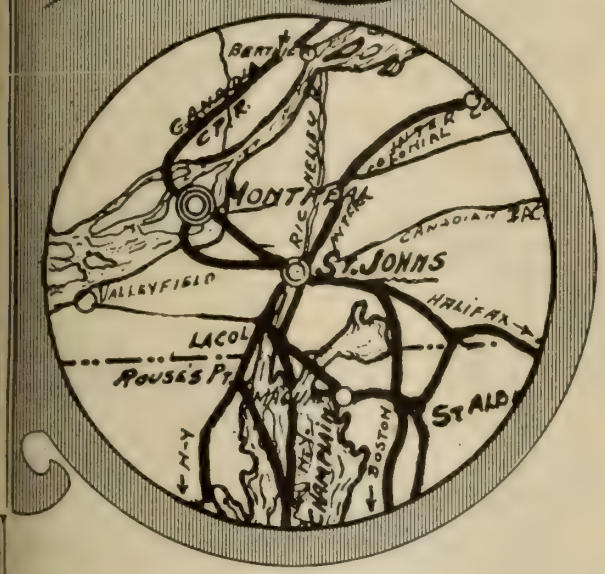
FAST AND ACCURATE—Equipped with set over swivel tailstock and carriage, and outside face plate and tripod. Built in 16" swing with beds 6 or 8 feet in length. Spindle is made of high carbon steel, is hollow and fitted with Morse Taper and runs on self-oiling bronze bearings.

Our catolog gives a full description of this strong and highly efficient machine, also our other quality speed lathes and grinders. Give us your address.

J. G. BLOUNT COMPANY

EVERETT, MASS., U.S.A.

The City of ST. JOHNS, QUEBEC



ITS LOCATION

It is located in the Province of Quebec which, as regards industries, is to Canada what New England is to the United States. (It is 27 miles, or 45 minutes, from Montreal).

ITS RAILWAYS

The two big railroad systems (double track) of Canada, the Canadian Pacific and the Grand Trunk Railways, pass through St. Johns, where merchandise can be shipped and exported anywhere upon the globe with dispatch. These railways are connected by a terminal switching system: charges at exceedingly low rate. All Eastern U.S. railroads are connected with St. Johns.

Direct Connections with Docks at Montreal

Goods can be exported direct by steamers to European, South African, South American and West Indian Ports.

St. Johns has long been recognized as the cheapest labor centre in Canada. Reasonable rents and living costs are keeping it so even in these times.

No other locality offers the following inducements to new industries---but we do

Exemption of taxes for fifteen years' period that is subject to extension. All public improvements which you may require, such as extension of streets, sidewalks, waterworks and sewerage; five per cent. bonus to you on your payroll for five years and if you wish we will advance this to you to be applied to the purchase or erection of any building suitable to your purpose.

For more specific information write to

The Secretary of the City Council

St. Johns, Quebec, Canada

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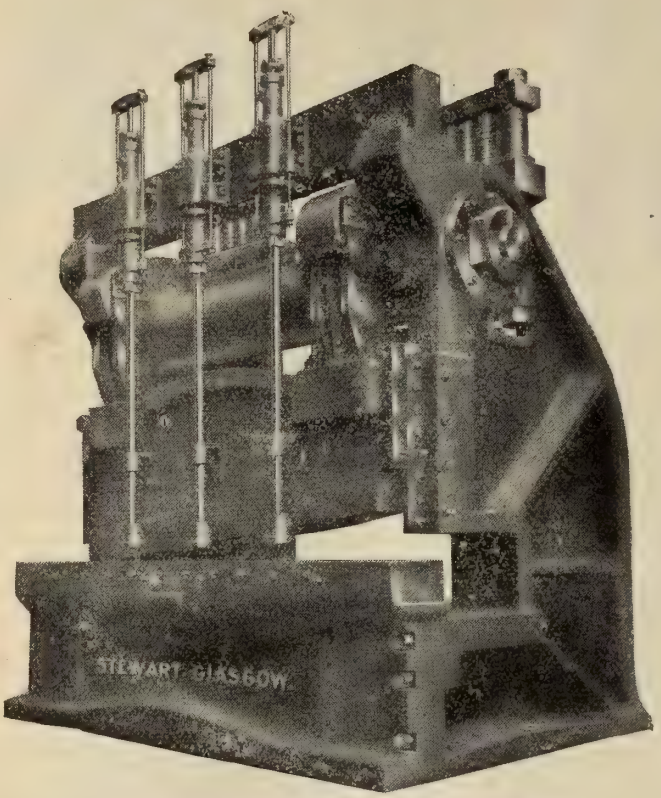


1¾ in. x 8 ft. Steam Hydraulic Plate Shears

Steelworks Plant and Hydraulic Machinery

ROLLING MILLS
BLOOM, SLAB, BILLET AND PLATE SHEARS
FORGING PRESSES
TUBE DRAW BENCHES
TROUGHING PRESSES
HYDRAULIC PUMPS

Duncan Stewart & Co., Ltd.

LONDON ROAD IRON WORKS
GLASGOW
ESTABLISHED 1864

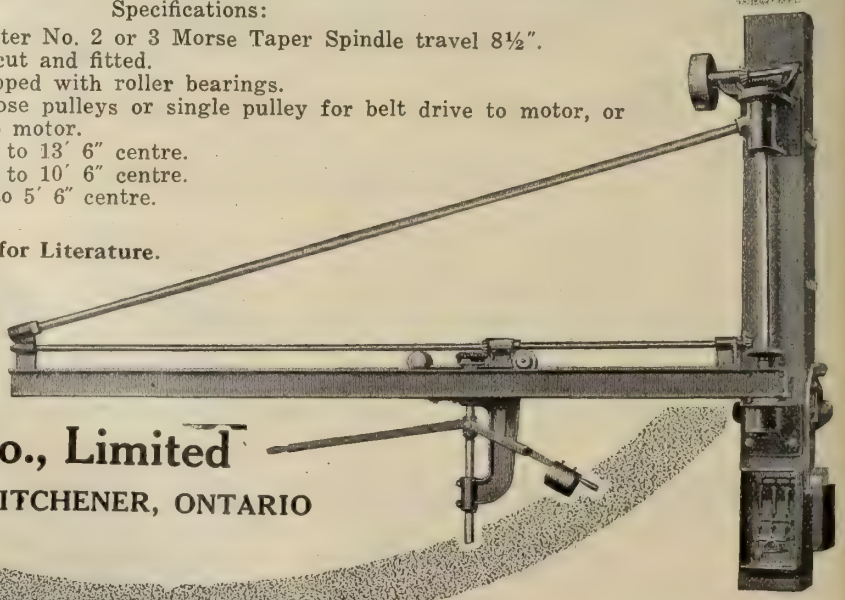
Built for Service

The Canadian Radial Drill is designed particularly for work in structural shops. For seaming and countersinking large surfaces such as structural shapes, boiler plates, long beams, etc.

Specifications:

Spindle 2 3/16″ diameter No. 2 or 3 Morse Taper Spindle travel 8½″.
All gears accurately cut and fitted.
Carriage wheels equipped with roller bearings.
14″ x 14″ tight and loose pulleys or single pulley for belt drive to motor, or direct connected to motor.
15 ft. Beam will drill to 13′ 6″ centre.
12 ft. Beam will drill to 10′ 6″ centre.
7 ft. Beam will drill to 5′ 6″ centre.

Write Dept. 16 for Literature.



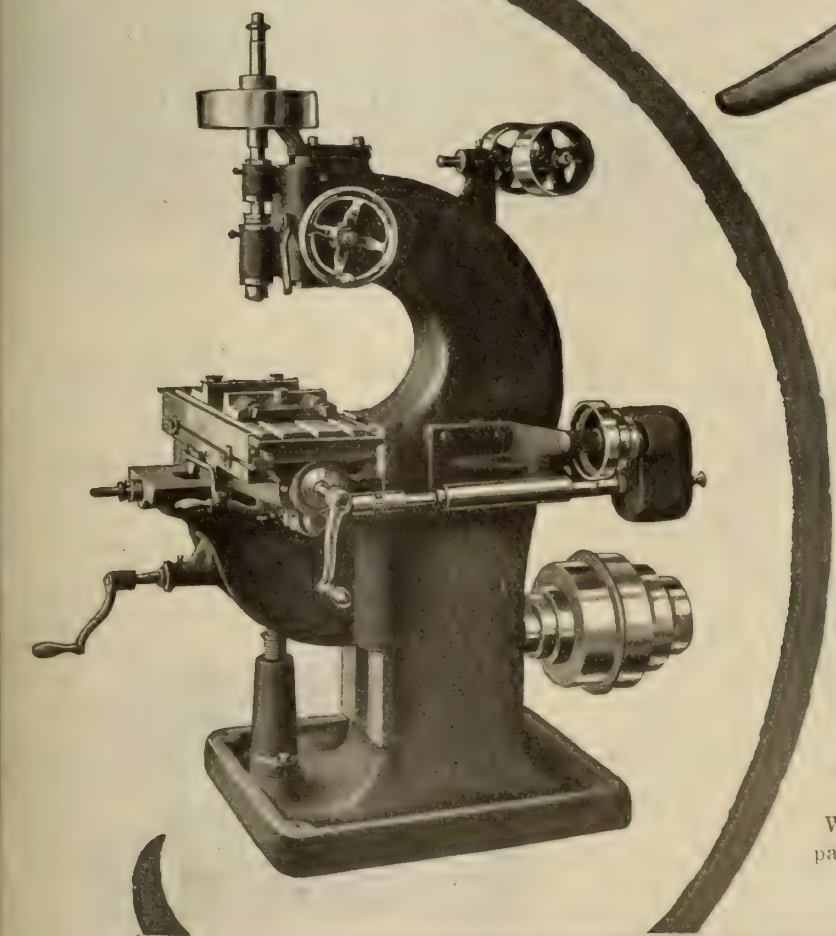
Canadian Blower & Forge Co., Limited

KITCHENER, ONTARIO

BRISTOOL

Bristol Vertical Milling Machine

A Tool of Large Capacity



Ball Bearings are used at the most important points making it a free running tool, which, combined with its being a belt-driven machine, makes it capable of turning out work on which an extra smooth finish is desired.

The longitudinal table feed is controlled by the gear change box which gives six different feeds for each change of spindle speed. A stop to gauge with micrometer adjustment is used on the head to regulate the depth of cuts.

Learn all about its production capacity.

Write for bulletin giving fullest particulars.

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

If interested tear out this page and place with letters to be answered.

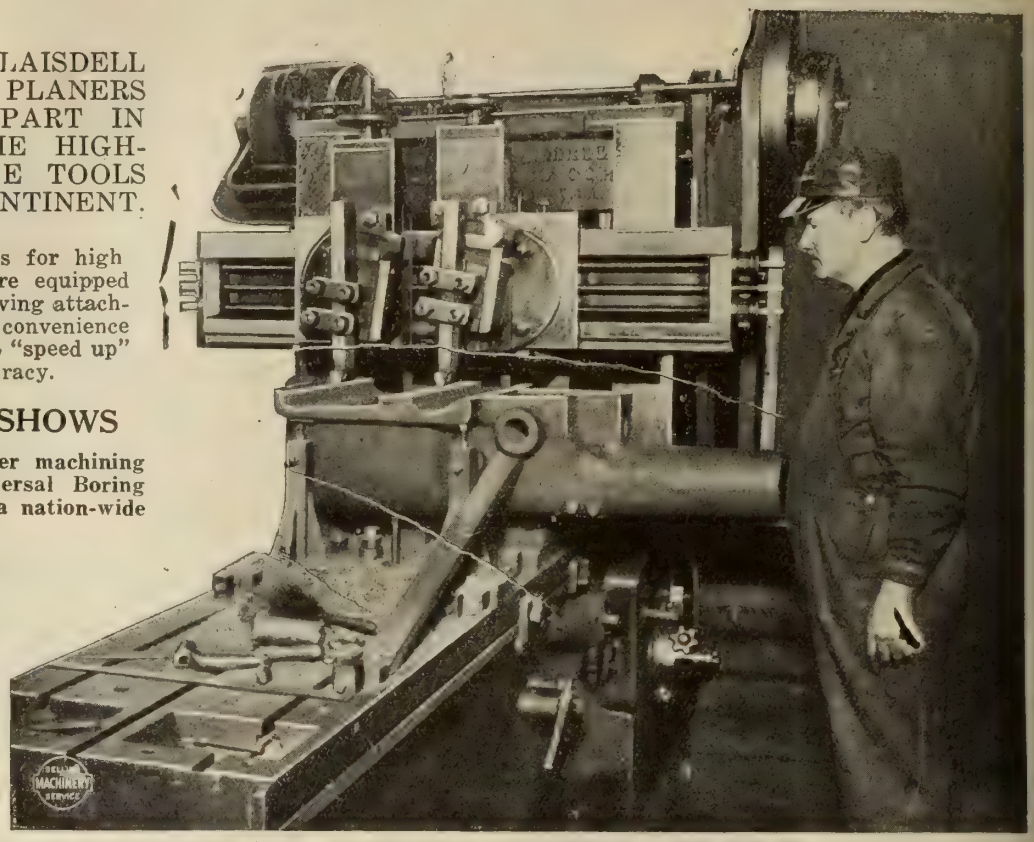
Whitcomb-Blaisdell Planers

WHITCOMB-BLAISDELL LATHES AND PLANERS PLAY SOME PART IN THE MOST OF THE HIGH-GRADE MACHINE TOOLS MADE ON THE CONTINENT.

ALL-ROUND machines for high grade work, they are equipped with special labor-saving attachments that add to their convenience and enable the operator to "speed up" without endangering accuracy.

ILLUSTRATION SHOWS

a Whitcomb-Blaisdell Planer machining the head post of a Universal Boring Machine—a machine with a nation-wide reputation for accuracy.



May we send you our catalogue giving full particulars?

Whitcomb-Blaisdell Machine Tool Co.

WORCESTER, MASS. U.S.A.

Dunbar

Springs *for* Every Use

We have been making springs of all kinds for 70 years. Let us advise you when in difficulty.

Tell us the purpose for which the spring is intended, and our experts will gladly co-operate to see that you get the design best suited to the purpose.

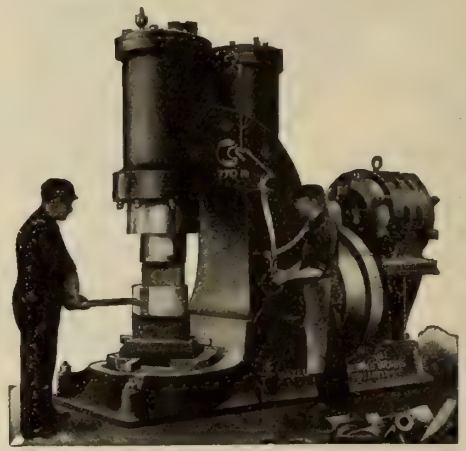
Dunbar Springs are thoroughly tested for **accuracy** and **quality.** Send us specifications, for estimates.

THE DUNBAR BROS. CO.
BRISTOL, CONN.

The Nazel Air Hammer

(A Self-Contained Unit)

Noted for Its Blow and Control



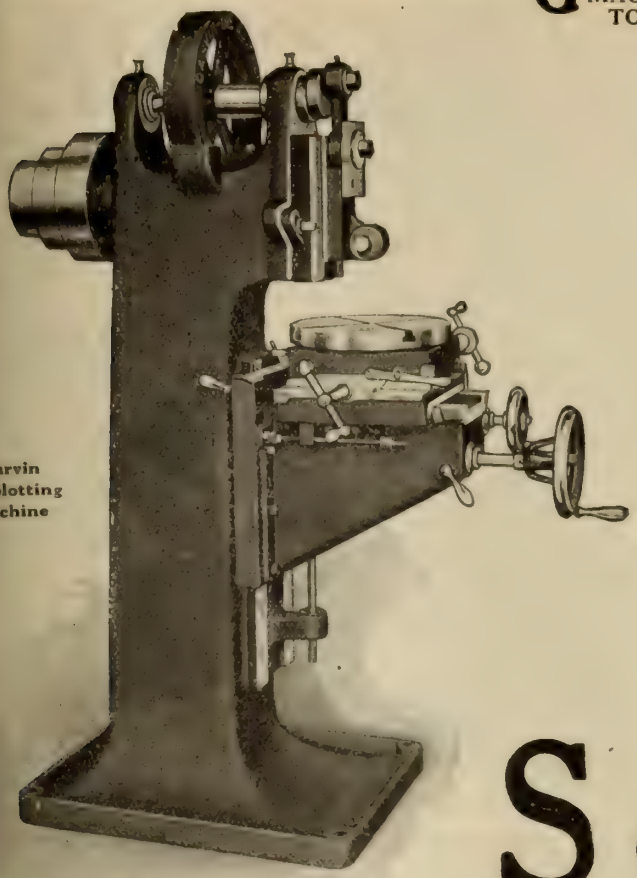
The Most Modern Reliable Power Driven Substitute for the Steam Hammer.

Built in 3 types, 6 sizes, arranged for belt or direct motor drive, with capacities up to 7" square for all manner of jobbing, manufacturing and certain classes of die forging. Write for catalogue.

Nazel Engineering & Machine Works
Dept. F., Philadelphia, Pa.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

GARVIN MACHINE TOOLS



Garvin Die Slotting Machine

Service

When you purchase a Garvin machine tool you provide yourself with a means of production in which you can place absolute confidence. It will serve you well and faithfully, with a minimum amount of attention and upkeep.

Garvin machine designs are fundamentally correct — proven so by the fully satisfactory service rendered in plants the country over — workmanship is precise and checked to an exacting standard. Operating economy is second to none. *You can safely trust your product's reputation for accurate machining to Garvin machine tools.*

GARVIN
MACHINE TOOLS

- Milling Machines
- Profilers
- Cam Cutters
- Die Slotters
- Screw Slotters
- Tapping Machines
- Duplex Horizontal Drills
- Gang Drill Presses
- 4 Head Right Angle Drills
- Screw Machines
- Cutter Grinders
- Wrenchless Chucks
- Surface Grinders
- Duplex Slot Millers
- Hand Lathes

Have you a copy of the 340 page Garvin Catalog?

The Garvin Machine Company
Spring and Varick Sts.
New York, N.Y., U.S.A.

GARVIN

BUILDER OF BETTER MACHINE TOOLS

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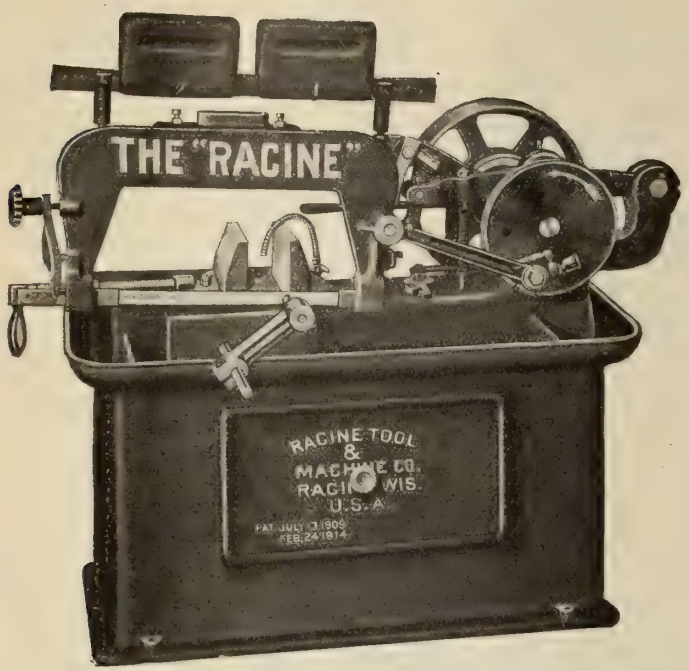
Standard the World Over

"THE RACINE"



HIGH SPEED METAL CUTTING MACHINE

Reduces Blade Expense

Aside from its ability to turn out more work than any other metal cutting machine, "THE RACINE" will save you considerable money on blades alone—enough to pay for itself in a reasonable time. The automatic lifting device is responsible for that. It automatically raises the blade on the return stroke, relieving it of all dragging or strain. This also means quicker cutting, less power used and greater production.

There are many ways "THE RACINE" will prove a big saving. Let us tell them to you.

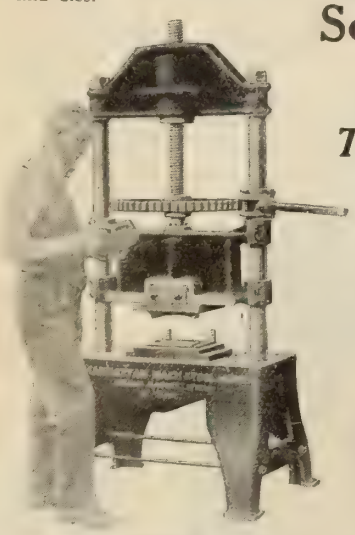
Use "Racine" H.S. Tungsten Power Blades

Racine Tool & Machine Co.
Melbourne Avenue, RACINE, WIS., U.S.A.

Mr. Toolmaker, you need it!

A one-man machine. You require no help in handling any dies.

Insures rapid production of accurately fitting punches and dies.



Type B
Guaranteed to 80,000 lb. pressure.

Manhattan Screw Press

Speeds up Tool Making

It is both sensitive and powerful in operation, having power enough to shear in any die within its capacity.

The convenient handling saves hours of time.

Write for full details.

Manhattan Machine & Tool Company
Grand Rapids, Mich., U.S.A.

Foreign Representatives: "Aux Forges de Vulcain," Paris, France. Farmer & Co., Clerkenwell, London, E.C.

Peerless HIGH SPEED

The Standard Metal Saw of TO-DAY

While labor is demanding more and more, manufacturers are demanding machines of greater output. The "Peerless" meets that demand. It is the standard metal saw of TO-DAY.

With its rapid cut and various time-saving features, it easily increases production from 50 to 100 per cent. With its automatic feed, straight line pull, positive blade clamp and general rigidity, it gets the maximum results of which a blade is capable and reduces breakage to a minimum.

OUR SIX-SPEED GEAR BOX

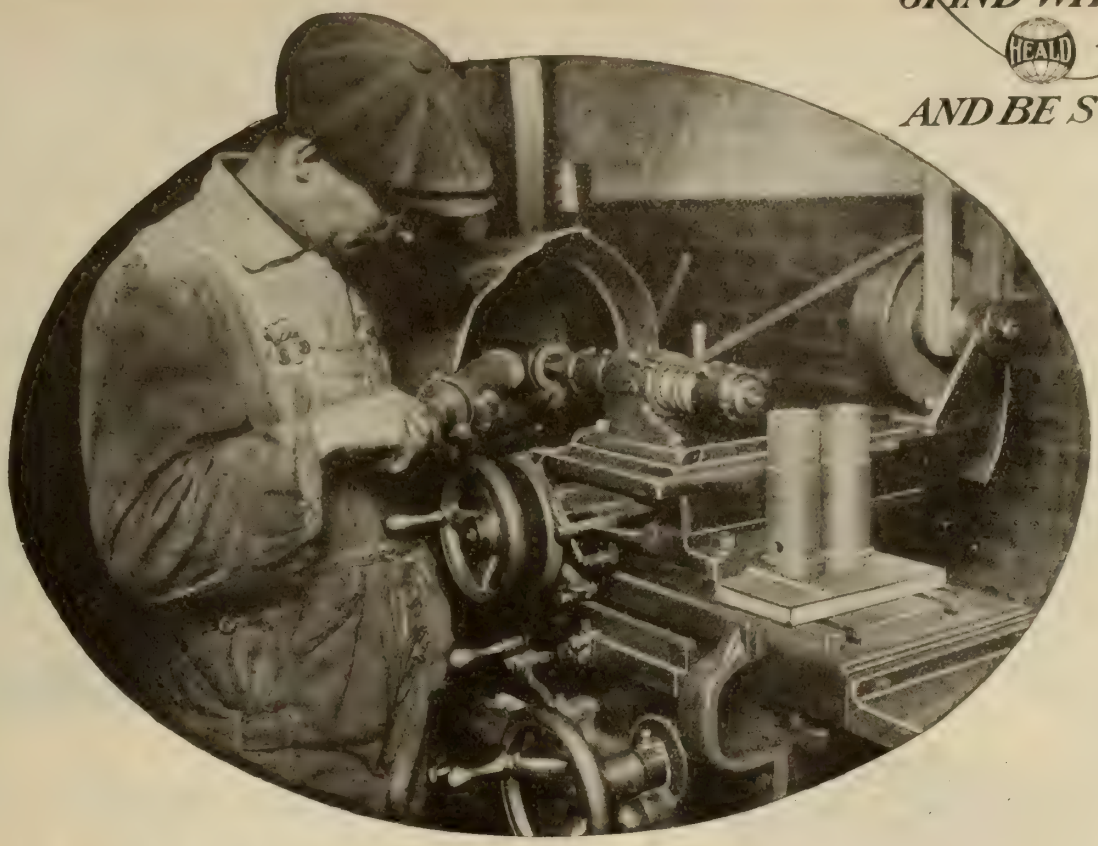
(not shown in cut) further increases output and saves blades wherever soft steel or metals of varying degrees of hardness have to be cut. The "Peerless" is furnished either with or without this feature, also with or without motor.

A trial order at our risk and expense is convincing

PEERLESS MACHINE COMPANY
1607 RACINE STREET RACINE, WISCONSIN

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

GRIND WITH A HEALD *AND BE SURE*



A Heald Internal Grinder

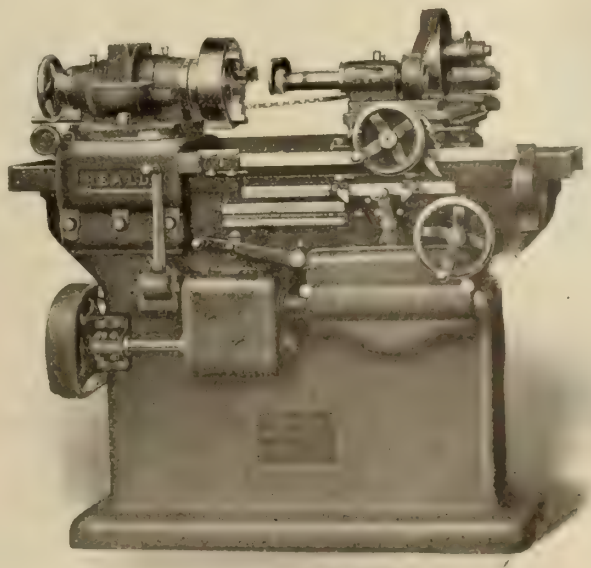
Ten Years Old and Still on the Job

This internal grinding machine was installed at the Blanchard Machine Company's plant at Cambridge, Mass., ten years ago, and has been running continuously ever since on production and precision work.

In the above photograph this machine is grinding a steel sleeve from which it removes .025 inches of stock from a hole 1¾" diameter x 3¾" long to limits of plus or minus .0005 in 15 minutes.

Notice the lower cut and see if it is not a machine that you would be proud to have in your shop.

Heald Internals are not limited to accuracy and production, but do angular and face grinding on all kinds of work. Different style heads, instantly interchangeable, make this machine practically a universal grinder.



The Heald Machine Co.

Worcester, Mass.

AGENTS: New York, 839 Singer Bldg. Philadelphia, 1408 Commonwealth Bldg. Chicago, 24 South Jefferson St. Detroit, 911 Majestic Bldg. Cincinnati, 311 Provident Bank Bldg. Cleveland, 721 Engineers Bldg.
WESTERN AGENTS: Eccles & Smith Co., San Francisco, Los Angeles and Portland. Salt Lake Hardware Co., Utah and Idaho.
FOREIGN AGENTS: Alfred Herbert, Ltd., England. Societe Anonyme, Alfred Herbert, France, Switzerland, Spain and Portugal. Societa Anonima Italiana, Alfred Herbert, Italy. F. W. Horne Co., Japan. Wilh. Sonesson & Co., Sweden, Denmark and Norway

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Cast Nichrome Annealing Box

Cast "Nichrome" Heat Treating Containers

Carbonizing and annealing boxes and other heat treating containers must be durable to withstand the action of heat during operation.

Cast iron, cast steel, structural steel and wrought iron receptacles **crack, grow, scale** or **warp,** their use is inefficient, involving costly maintenance due to additional expenses for labor, fuel, material and constant replacement.

Cast Nichrome boxes, pots, tube and retorts guarantee uniform high quality of product, increase the capacity of the plant, and reduce the cost of heat treatment.

Write for further particulars.

Manufactured under Henderson Patents.

CANADIAN DRIVER-HARRIS CO., Ltd.

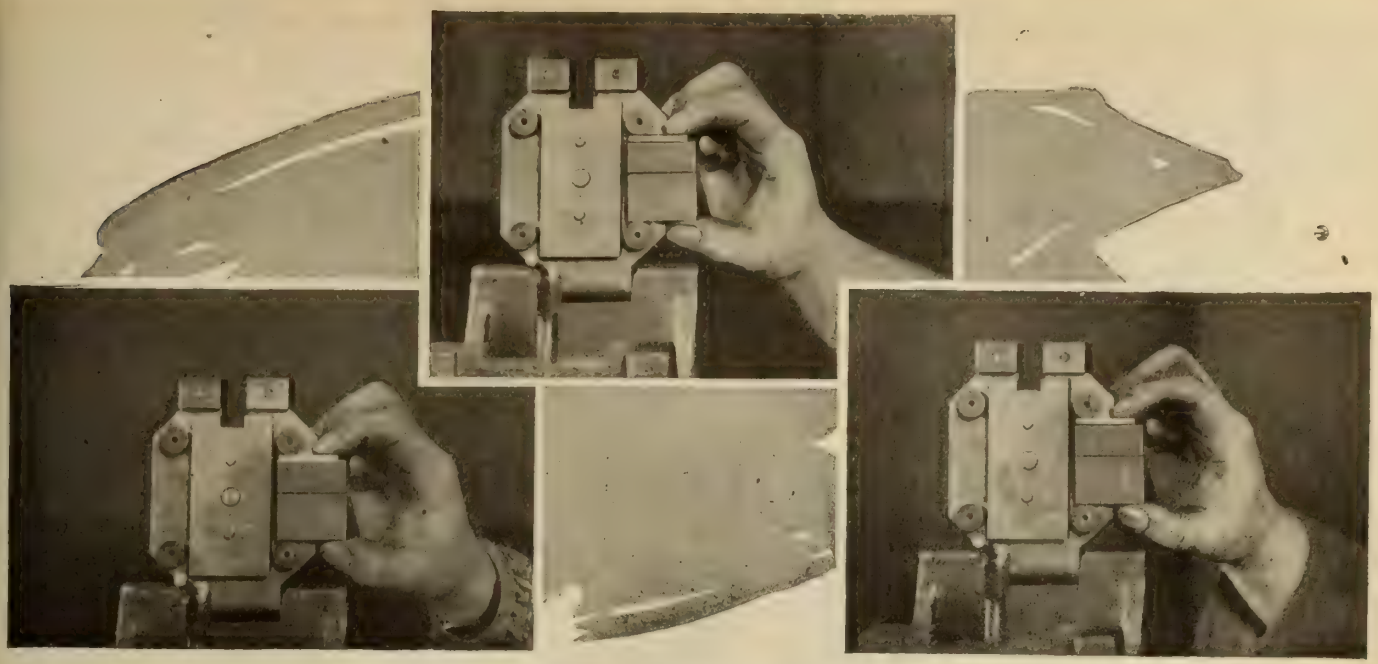
WESTERN OFFICE AND DEPOT CHICAGO 28 So JEFFERSON ST

WALKERVILLE, ONT. CANADA

AMERICAN OFFICE AND WORKS HARRISON, N J

BRITISH WORKS MANCHESTER ENGLAND

25



NO QUARRELS

—when Johansson blocks are used

Differences of opinion among tool-makers as to who has the correct measurement never occur in the shop where there is a set of Johansson Gages.

Accuracy isn't a matter of opinion—it is a matter of **FACT.**

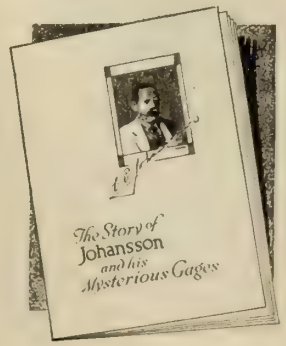
Jigs, fixtures and tools made and checked with Johansson Gages in one shop will pass inspection with Johansson Gages anywhere.

Due to their positive character, any number of mechanics can get the same result when checking a piece of work. For example, the distance between the pins of the jig shown above is the same to all three hands. The combination of Johansson Blocks just goes in.

Three men could check this distance with other types of measuring tools and each might get slightly different "reading." In such a case, who would be right?

No so with the "Johnny Blocks." Their positive, unchanging character gives results that the men are willing to accept.

For this reason Johansson Blocks eliminate scraps, arguments, wrangling, letters back and forth between shops. They get your work accepted and your bills paid.



Write for our booklet, "A Thousand and One Users" and then write to a few of these users. Our oldest customers are our biggest boosters.

"The Story of Johansson" mailed to all who send us their name and address.

C. E. JOHANSSON INC., 72 QUEEN ST. WEST, TORONTO

FACTORY AND GENERAL OFFICES, POUGHKEEPSIE, N.Y.

Johansson

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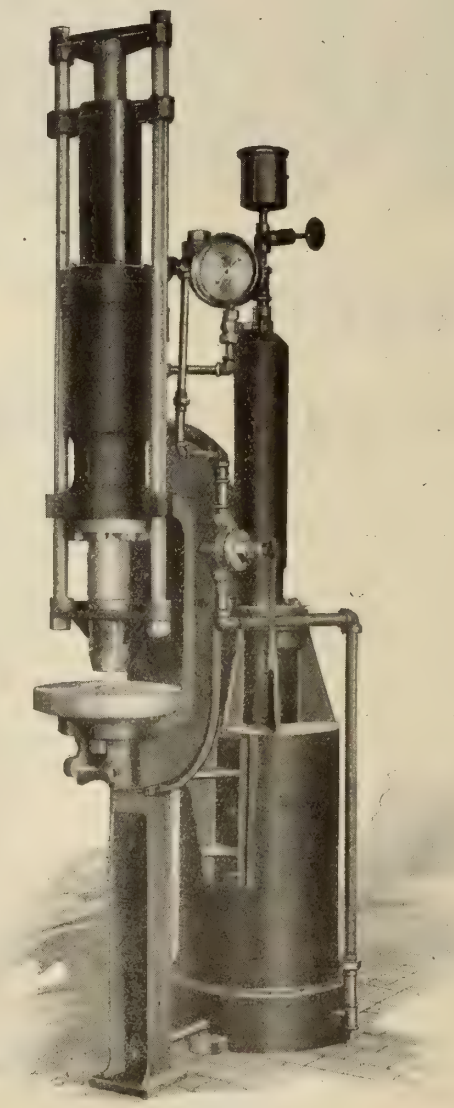
ORIGINALITY

is Characteristic Always of

"METALWOOD"

DESIGNS and DEVELOPMENTS



The "Metalwood" line of these Quick Operating Hydro-Pneumatic Presses comprises a variety of styles, types and sizes.

By performance through a period of years, these presses have established themselves in a wide range of industries as standard tools for light straightening, broaching, forcing and assembly operations.

The "R-149" style press of 20-ton capacity shown here is described in our bulletin B-47.

METALWOOD MANUFACTURING CO.

High Speed Hydraulic and Hydro-Pneumatic Machinery

DETROIT, MICHIGAN

EXCLUSIVE SALES REPRESENTATIVES:

Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Pa.

It's Their Time But It's Your Money

The moment one of your men continues working after a file has become dull you lose money, because the man will waste more time with the dull file than a new one would cost.

Teach them to turn in a file as soon as it becomes dull and get a new one. And specify the Standard *Famous Five* Files when ordering.

Notes On Grinding

NORTON COMPANY WORCESTER, MASS.

No. 77A

WHAT CONDITIONS AFFECT WHEEL SELECTION

A great many times the question is asked, "What wheel should I use for grinding this material to get the best possible results?" Many times it seems that an answer is expected which will be a definite recommendation.

Perhaps a little discussion of some of the many things, which can and do affect wheel action, will make clear just why a definite recommendation **cannot be given.**

Kind of Material.

In general, materials of high tensile strength, such as steel, wrought iron, and annealed malleable iron are successfully ground with Alundum wheels; and Crystolon wheels are best suited to grinding low tensile strength materials of which gray iron, brass and aluminum are typical. Slight changes in tensile strength may make the use of harder or softer wheels necessary.

The higher the tensile strength, the harder it is to tear a chip from the metal. Therefore, the wheel must be kept sharper than for a weaker metal. This is accomplished by furnishing a wheel which is soft enough to allow the abrasive grains to be torn out when they lose their cutting edges, which happens sooner in the case of tough metals. But we cannot say that because a metal has a tensile strength of 100,000 pounds per square inch, a grade K wheel should be used for cylindrical grinding, because there are other factors which must be considered.

Hardness.

Apart from tensile strength, this property has its effect on the choice of wheels (both the grain and grade). Naturally an abrasive grain must penetrate a given material before it removes a chip. The sharper the grain, the easier it penetrates under a given pressure. To cut properly, a wheel face should contain grains which are sharp enough to penetrate easily. The harder the material, the sharper the wheel face must be kept. This makes it necessary to use softer wheels.

But for a given Brinell or Scleroscope hardness, we cannot say a certain grain and grade will be best for the work.

Machine.

Vibration has considerable effect on a grinding wheel. Considerably softer wheels can be used with a heavy machine, set on a solid concrete foundation. This is because there is less pounding of the wheel on the work. Where a machine has light spindles and is attached with spindle bolts to a wooden floor, there may be a large amount of vibration. Because of this, the wheel constantly gets out of truth and besides pounding itself to pieces must be dressed very frequently.

One can easily understand that vibration cannot be measured numerically in given terms from which we can determine the proper wheel to use.

Finish.

By a good commercial finish one operator may mean a fairly rough surface, whereas another may have reference to a highly refined grinding job. You can well realize that it is impossible to say, "We want to get finish No. 3. Give us a wheel for this work." You may say, "We must have a very good surface. We recommend trying a 46 grade K with which some operators can get excellent results and good production." Because another operator tries to remove too much stock during one traverse or does not dress the wheel fine enough, we may have to furnish a 60 grade K or perhaps even an 80-J.

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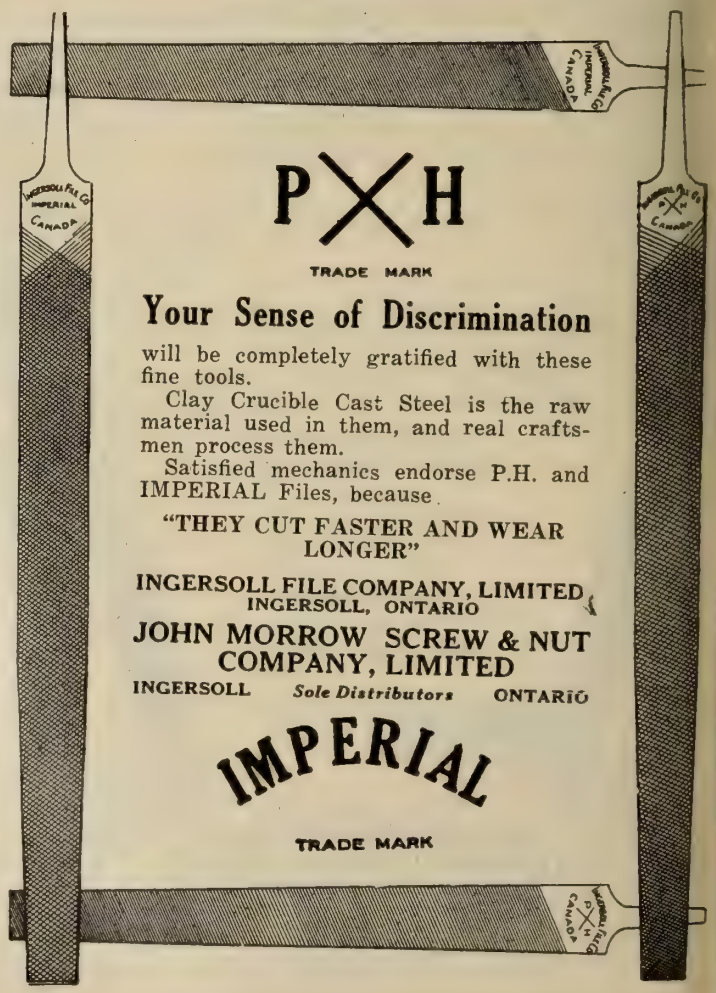

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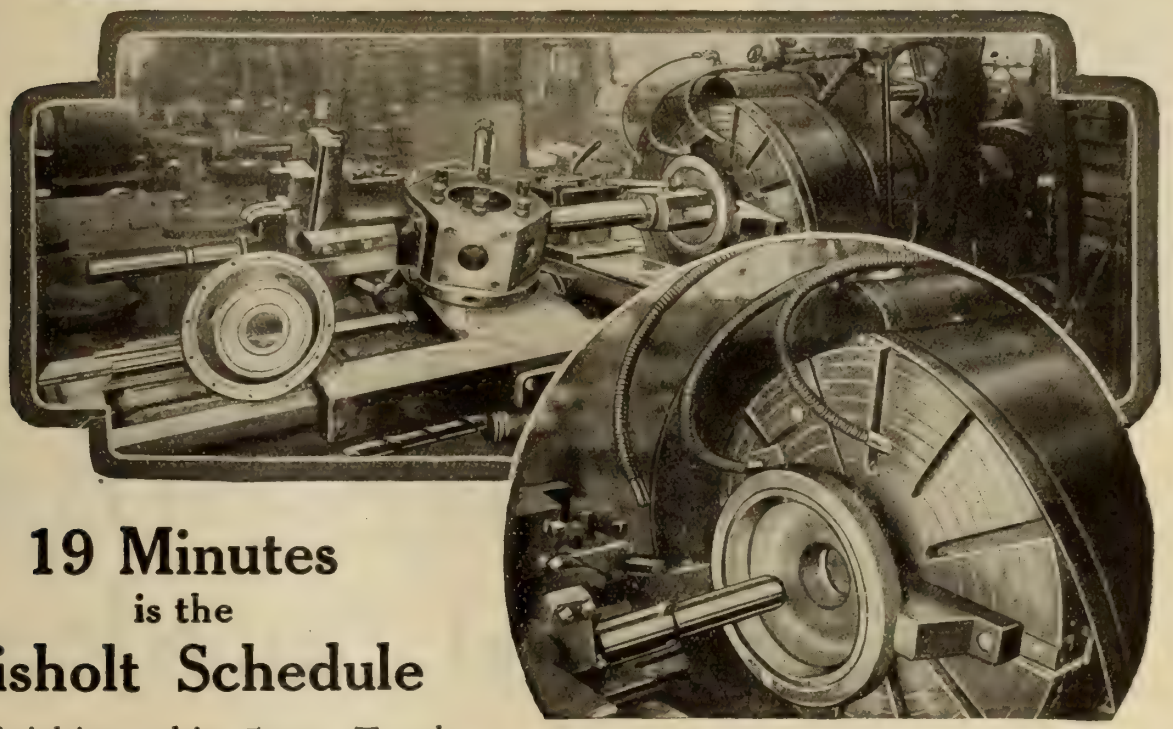

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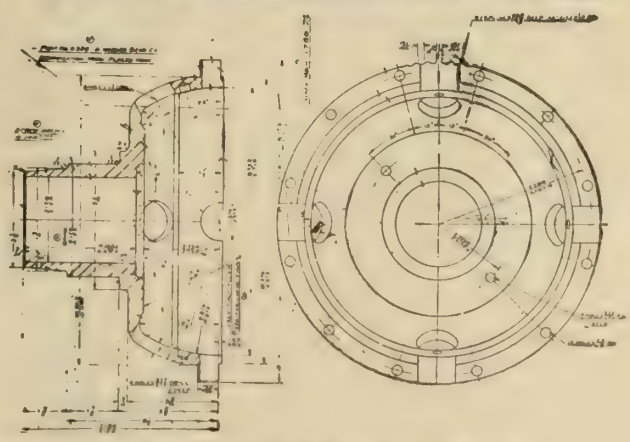

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXII. No. 25 December 18, 1919

Various Types of Cold Chisels and Their Uses*

Planing, Shaping, Milling and Other Machine Operations Have Decreased the Chisel's Field of Usefulness. There Remains, However, a Place for the Humble Chisel as This Article Will Show

NEXT to the file, the cold or chipping-chisel is the most useful tool employed for the cutting of metal where hand work is necessary. In the early days, when planning and shaping machines were scarcely developed, this tool held prime place as a roughing appliance, preparatory to finishing with the file. All this laborious work has been abolished by the introduction of planing, shaping, milling, grinding, and keyway cutting machines, and such regular operations are only performed by hand when it is impossible to use the machines, as on breakdown jobs, emergencies, situations where the work cannot be removed conveniently to take to the machines, and out-door jobs. But, apart from such cases, the chisel fills a large place still at the bench, and in power-plants, on railway and tramway jobs, gas, water and pipe undertakings generally, being adapted for cutting various shapes of surfaces, removing superfluous pieces of metal, cutting grooves, slots, holes, and parting off wire, rods, bars, pipes, sheets, corrugated iron, girders, etc. With the introduction of pneumatic hammers the chisel has had its capacities immensely increased, particularly for girder and bridge work and shipbuilding, in which tough steel has to be cut.

A glance at the principal types of chisels in common use may be first taken, as there are a good many differing varieties of work which require a particular shape of chisel to cope with them. For ordinary chipping of surfaces, cutting off lumps, serving lengths of material, and general cutting, the common chisel, A, Fig. 1, is employed, having an edge exceeding the width of the stem portion; the latter is sometimes made much longer for reaching into places where the ordinary length will not go, and to give leverage for forcing and prising purposes, as when necessary on some breaking up and repair work. In some cases where the width of edge of this ordinary chisel prevents it being used, the "cape" chisel has to be employed; this is narrow, and thickened up for strength in the vertical direction, B. There is a modification of it utilized for key-seating purposes, C. that is cutting key-grooves, etc., where the one-sided formation is more convenient for manipulation, and it is easier to see the edge. The diamond point and the round-nose chisels, D and E, are selected chiefly for making grooves, such as those for draining purposes, or for leading in oil, and for serving pipes and other shapes by nicking round. Oil-groove chisels, F, are round-nose, but bent to enable them to be used in the concavities of bearings, brasses and pulleys. For heavy duty round-nose cape chisels, G, afford a stronger shape. At H is illustrated a round-nose with larger curve, suited for cutting concavities less pronounced than oil-grooves, as well as for cutting out circles in sheet metal, a further development for this function being the cow-mouth type, J. Another modification, seen at K, is shaped for severing corrugated iron, the edge being ground to a quick curve, while a hollow-ground edge, L, is sometimes used for pipe-cutting, being much less likely to slip when working round the circle.

The section of steel chosen for a chisel of standard size is usually octagon, because this gives a firm grip with the minimum tendency to twist during the hammering, combined with

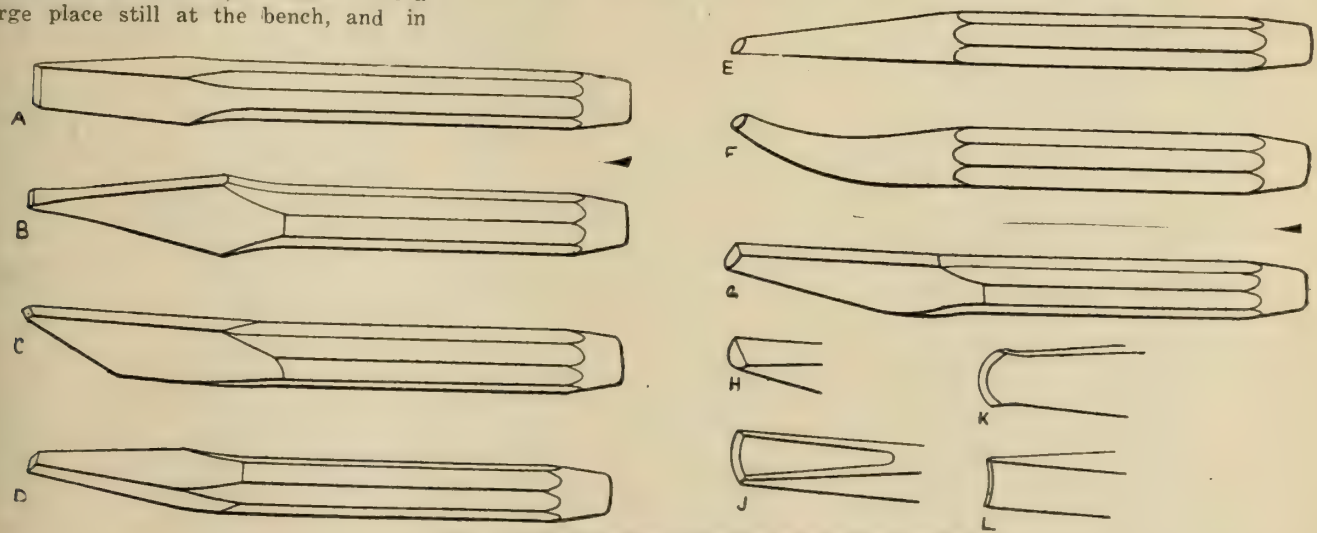


FIG. 1—ILLUSTRATING VARIOUS STYLES OF CHISELS.

*From the "Tardware Trade Journal."

the least fatigue to the hand. Another section largely utilized is round, with flats on opposite sides, giving a comfortable grip. But in the smaller chisels for fine work, where the hold is generally between thumb and fingers, a round section, plain or knurled, is suitable, and square section is also convenient, being a little less trouble than round to keep from twisting.

One of the troubles incidental to chipping is that of obtaining the correct temper of the chisel edge. If too soft for the purpose the edge soon goes, preventing neat work, and adding to the labor; if too hard the edge is likely to shiver to pieces, or break out piecemeal. The results, however, depend upon the material under treatment, the severity of the blows, and the skill of the craftsman. A very hard chisel may successfully endure on light duty, that is, penetrating soft materials, taking light cuts, and struck skilfully with fairly directed blows; while on hard stuff, or if sent too deeply in, or struck awry, the edge may go to pieces immediately. The advantage of using a hard chisel is that its edge lasts keen so long, and much better work may be therefore done, with less waste of time and of steel incurred through sharpening. The method of tempering a chisel is to heat the nose up for a length of two inches or so to a bright red, and quench in water for a few moments, leaving the stem still hot. The chisel is then withdrawn from the water, the end rubbed bright with a bit of broken grindstone or emery wheel to obtain a small patch on which to watch the color. This begins to creep along, due to the spread of the heat in the body, and the tool is completely quenched when the appropriate shade of straw color shows. The pale straw is suitable for average service, and a darker shade should be chosen for the severest duties, where the hardness or toughness of the material opposes great resistance to penetration.

The edge of a chipping chisel, like other cutting tools, is nothing more than a wedge, and the keener it is ground the more easy will penetration be. But the limitation of strength comes in, and too keen an edge will either dull, turn over, or shiver to pieces. The included cutting angle is therefore made from 45 deg. to 60 deg., and re-sharpening (as well as easy cutting) is facilitated by forging the end thin, Fig. 2, A, leaving short grinding facets, and freedom for the cuttings to slide up into the air. The angle at which the chisel is held, B, is approximately 45 deg., varying according to the cut, the ground angle of the cutting edge, and the quality of the material. On soft stuff, where penetration is easy, the chisel may lay lower down and be driven along with facility, while in hard metals, which break off in short bits, the chisel must be tipped more towards the vertical, particularly when starting a cut afresh. The edge should always be pushed up to the cut before rather than near the nose, the latter position being liable to let the head wobble about. There is no advantage in having a large area of head surface (with a mistaken idea of lessening the chances of misses) because such an expanse causes difficulty in getting on a fair direct blow. The top should be ground round to a neat chamber, and trimmed as often as rags are beaten out by the hammering. To leave these ragged overhanging edges on is rather dangerous, because a chance unlucky blow at one side might drive the fringe off and down into the worker's hand. The edge of a chisel when required for going over a flat surface, or for severing purposes, ought not to be ground straight across, but with a little convexity, Fig. 2, C; the idea of this is to render guidance easier, from the fact that the corners do not pull into the metal and tend to draw the chisel out of its path, and moreover, they are not so likely to be broken off by concussion. When one desires to chip a very flat, true surface, especially at a finishing cut, the degree of convexity ground on the edge should be very slight indeed, so as to prevent chipping a series of hollows.

The removal of a considerable quantity of metal from a face is not best accomplished by employing the ordinary wide chisel, as this takes a lot of heavy slogging, and the width of the chips (in fibrous materials especially) renders their bending up a laborious task at each blow. The use of the narrower cape chisels is better, running a series of grooves across, after which the chipping down of the ridges thereby produced is easy—see section D. This also shows chamfering of the edges before commencing to chip, the depth of chamfer corresponding to the depth of the material to be removed. The chamfer all round serves two purposes: (1) to act as a guide to the eye without scrutinizing a scribed line frequently; (2) to prevent the breaking out of the edges when the chisel works towards an edge. After a face has been fairly reduced, its flatness can be assisted by frequently changing the attitude of the chisel, setting it diagonally to the last series of cuts so as to top off the ridges and avoid the formation and perpetuation of hollows, this being done by changing one's foothold on the floor, shifting around the vice or the work.

Chipping interior surfaces is sometimes awkward on account of the difficulty of seeing the results, and the narrowness of apertures. Occasionally it becomes necessary to grind a chisel similarly to one for wood—i.e., with facet on one side only, E—in order to be able to lower the tool enough to pass through the hole or slot.

This often arises in producing square or rectangular or other apertures from solid metal, subsequently to drilling out

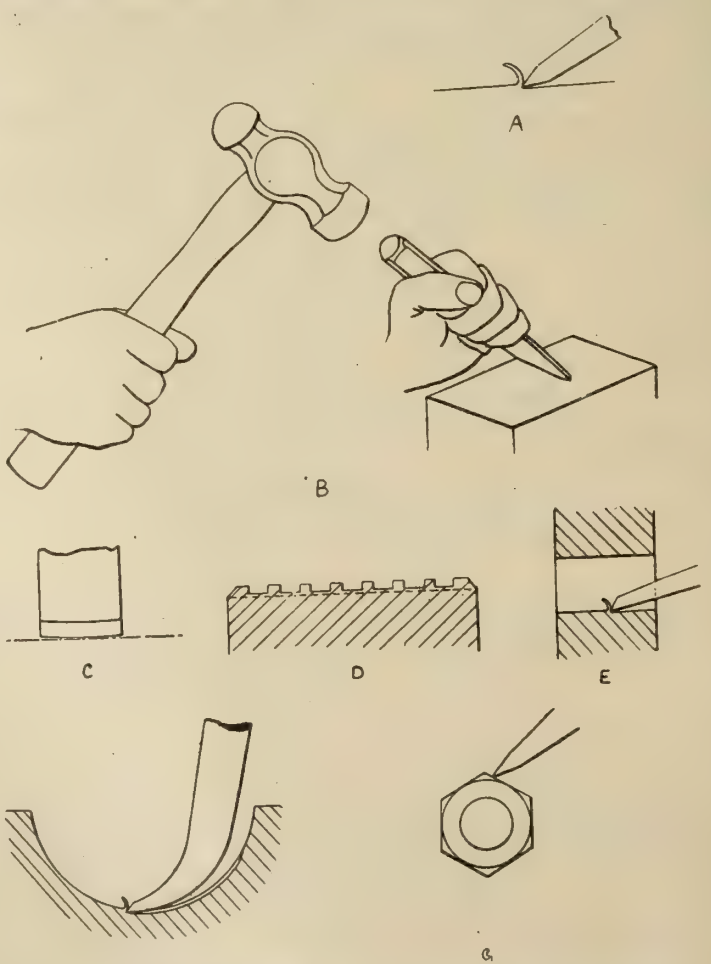


FIG. 2—ILLUSTRATING USES OF THE VARIOUS STYLE CHISELS.

the bulk of the stuff. The round-nose chisel, if used for chipping oil-grooves in bores, takes up a similar attitude, but in cutting around a curve, as when oil-grooves are disposed spirally, a straight-backed cannot be used without digging in too deeply, hence the back is curved for this operation, F. The groove is chipped by judging the direction with the eye, or a line is marked by laying a strip of thin card or zinc around the curve and scribing a line along, guiding the scriber by the edge of the strip. If the chipping is performed neatly, very little filing will be required to make a smooth finish. The end of a rat-tail file will have to be bent to enable this to be done, heating the file for a distance of about ¾ inch to a red, and knocking it round the edge of a block of wood, afterwards re-heating to bright red and quenching.

Apart from legitimate chipping, the cold chisel is handy for odd jobs, such as forcing open joints that have rusted up, knocking off scale and rust, cutting off rivet and bolt heads, and loosening rusted nuts. The last-named job is done by striking against a corner of the nut, G, the jarring effect being very useful in starting to loosen. The chisel edge should not be sharp for this purpose, or it will simply chip the corner off without producing the desired result. Sometimes a special chisel is kept for these emergencies, having its edge ground off blunt, and occasionally a hard brass or gunmetal one is used for loosening bright nuts that ought not to be spoiled.

Canadian Machinery Drafting Course—Part IX

A Further Discussion on the Art of Projection. Students Should Study This Portion Slowly, Making Sure They Grasp the Underlying Fundamental Principles

By J. H. MOORE, Associate Editor Canadian Machinery

SO far in this course we have taken up two plates in projection, but not any examples of what would happen in the event of a cone or cylinder being intersected by a plane.

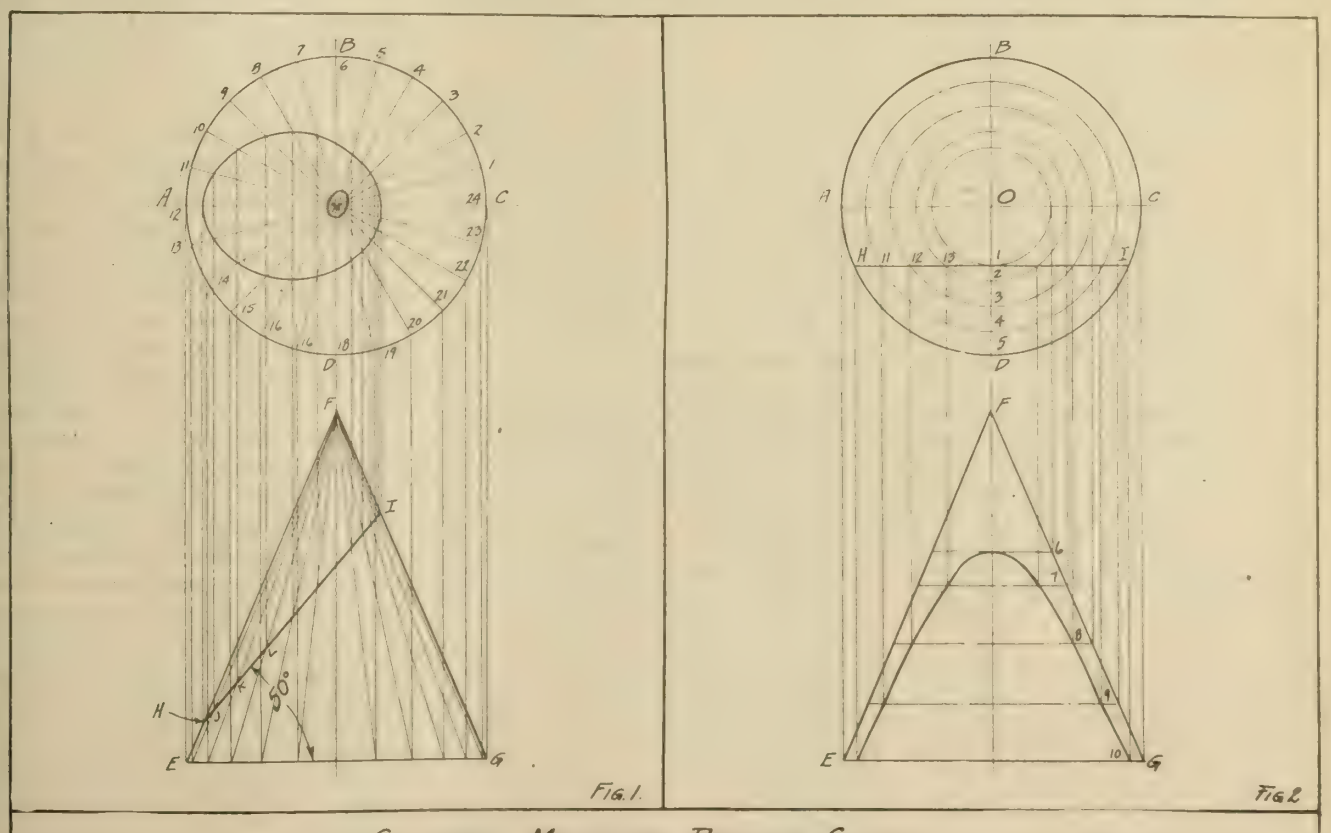
In this section we will discuss just the point spoken of above, and discover what occurs when a plane and cone meet.

Different curves are formed when such occurs, and two illustrations in the shape of Figs. 1 and 2, from plate No. 9.

If the plane of intersection is perpendicular to the axes of the cone, or cylinder, the curve of the intersection will be a circle, but if it is inclined to the axis it will be an ellipse in case of a cylinder, and an ellipse, hyperbola, or parabola, in the case of a cone, all depending on the angle of inclination.

Fig. 1 illustrates a cone cut by a plane, which, although cutting the cone, does not intersect the base of the cone. When the cutting plane does not intersect the base of the cone, the curve of intersection will be a true ellipse. Had the plane cut through the base the curve would have been a parabola.

To construct Fig. 1, proceed as follows: First, draw the plan view of cone base, by means of the circle, A, B, C, D; make this 3 in. diameter; divide this circle into 24 equal parts, as shown; from each point of intersection project down vertical lines until they meet at the base of the cone, E G, in the other view; this line can be placed to suit your own convenience. Make the distance vertically from this base to the point, or apex F 3½ in.; let the intersecting line, H I, start anywhere about where is shown on the plate, and let it form an



WATCH THIS PLATE. TAKE TIME TO DO IT NEATLY. ABOVE ALL SEND US IN YOUR WORK.

angle of 50 degrees with the horizontal.

From each of the intersecting points on the base of cone draw lines directly up to the apex F. Where these lines intersect with the plane line, H I, erect perpendicular projection lines up into the plan view. These lines are produced until they meet with the various radial lines on the plan view, such as 0, 11, 0, 10, and so on. The intersecting points in these lines form the contour of the ellipse to be drawn. Readers will, no doubt, have followed this description closely, and will now be able to proceed to draw this figure in place. Above all, study the work before drawing, for it is important that not only the principle be understood, but that care be taken. Without the proper care, the figure is useless, for it will not be a true projection.

In laying out these figures previous to inking in, be sure you do not use a softer pencil than 4H. If you use a 4H be sure the point is good and sharp, for blurry lines will be a great drawback to you in this work, and especially on this plate.

If students will only play safe, go easy, and keep their wits about them, this plate should not cause exceptional trouble.

Fig. 2. We now come to an entirely different proposition, namely, that the vertical plane, H I, is parallel to the axis of the cone. In this instance the curve, when found, will appear in its true shape and size, as the plane H I is parallel to the vertical. Students will note the method of solution.

The first step is to, of course, draw the cone, plan, and elevation views as before. The same sizes exist in this figure as the last.

Draw the line H I any place to suit, say, approximately, 5-8 in. away from the centre line, as shown. Now construct a circle tangent to this line, as illustrated at 1. Between the space 1 and D divide the distance up as you see fit. In this case the writer has shown 5 divisions, although he could equally as well have shown 12, or more, for the greater the number of divisions the more accurate the curve, but for the principle of the idea, the writer thought 5 sufficient.

From these circles on the centre line, A C, project down lines meeting with the elevation view of cone. Construct horizontal lines from these points as shown. It will be noted that a projection from the circle 0 1, lands the line down to the point 6, this point being in turn projected horizontally to locate the top of the curve, which in this case is a hyperbola.

From the points H, 11, 12, 13, etc., to I, vertical lines are projected down, these intersecting at points 7, 8, 9, 10, and, of course, in similar manner on the other side of the curve. By joining these various points found we construct our curve as shown.

For students' benefit and reference let us consider what we have found:

We have come to the knowledge that when a cone is cut by a plane which does not intersect the base, we construct as the curve of intersection, an ellipse. (Note, a true ellipse, and not an egg-shaped oval).

That in the event of the cutting plane passing through the base of the cone, we construct as the intersecting curve a parabola.

That when the cutting plane is parallel to the axis of the cone and perpendicular to the vertical plane, we secure as the curve of intersection a hyperbola.

There is one other point could be spoken of, namely, that in the case of a cylinder, which has a cutting plane running through its length at an angle, the resultant curve will be an ellipse.

Students cannot do better than memorize these points, as they come in handy when we get on further in the course.

So now to work on Plate No. 9. Stick to it, make sure you are accurate in your projections, dimensions, etc., and exercise great care when inking in. Above all, let us see your work for inspection. If you haven't so far landed a prize, there is no time like the present

Cut out and send with drawing

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A NEW RIVET FORGE

A rivet heating forge of a new type, the invention of an employee of the Pacific Coast Shipbuilding Company, is described in "Full Speed Ahead," the paper published at the plant of the company on Suisun Bay, thirty-five miles east of San Francisco. The account says:

An improved oil forge for heating rivets has been devised by J. T. Shepherd, plant plumber. Several of the forges are already at work. One of their most commendable features is the avoidance of backfire. Higher vaporization of the oil is secured through the use of the new invention.

The main features are a valve on the air line and a needle valve on the oil supply, with a mixing chamber. The latter is formed of a 1¼-inch T with a 1¼-inch nipple and a bell reducer reducing to ⅜. Above this is a second mixing chamber, formed of a 1-inch ell, the oil being carried then through a ½-inch T with a ⅜-inch nipple, forming an injector. Free oxygen is taken in with the vapor.

There is a ¼-inch vent on the tank, to make filling quicker, the vent forming a suction on the funnel. It is not necessary for the boy to go to the manifold to turn the air off. This is done right at the furnace. Another advantage is that the new forge needs no labor to connect the hose. A male hose connection is used, obviating two couplings.

The piping on the end where the valves are controlled is protected with a stay plate, reducing the danger of damage to the forge. The danger of backfire is eliminated by fire clay sealing.

The forges are also equipped with bleed valves, making it possible to clean out the tanks easily. Not only can water be bled from the oil, but the bottom of the tank can be blown clean.

Shepherd, who has been working on the forge design for some time, gave it to the company as a contribution to the yard's productivity.

COAXING WINDMILLS IN DENMARK

During the coal famine caused by the war many attempts were made, especially in Denmark, to improve the working of the windmills geared to dynamos to generate electricity. About 250 installations on farms and small estates have proved fairly satisfactory. Many experiments in this connection were carried out by the late Mr. P. la Cour, and a trial mill designed by him is still being used for observation purposes. During about one-third of the year there was either complete absence or excess of wind, and the force available was very variable. It was nevertheless found possible to save fuel for steam or gas-driven power producers. The cost per kilowatt from peat gas-fired plants is approximately the same as from a windmill-driven installation. Attempts were made to design special three-phase dynamos capable of maintaining constant voltage independent of the speed of the mill, special attention being also paid to automatic adjustment of the sails in order to reduce the cost of attendance.

What About Elevator Hazards and the Public?

The Elevator Has Dangerous Possibilities in Spite of Its Excellent Service. The Following Paper Read Before the Annual Congress of the National Safety Council Gives a Resume of Elevator Hazards

By DANA WEBSTER, Aetna Life Insurance Co., Indianapolis

BEFORE making any remarks on the safety of elevators, it might be interesting to cover, briefly, the gradual development in the manufacture of mechanical lifting devices.

Mechanical Lifting Devices

Lifting devices were undoubtedly used by Julius Caesar as far back as 256 B.C., as history mentions their lifting animals from the dens to the arena in the Coliseum of Rome. About the middle of the Nineteenth Century, platforms or cable-hoisted elevators were first installed in New York and Boston, but were not provided with any kind of safety devices, and, strange to say, you can find a few elevators without safety devices at the present time.

A few years later elevators were equipped with safety devices of such type that it was necessary for the hoist cable to break before the safety could actuate. There are a great many of this type of safety in use to-day, but with the introduction of high-speed elevators, which were required to meet the demands of the public, quite naturally it necessitated much better type of safety apparatus and a multiplicity of cables.

Accidents could, and did occur, from over-speeding elevators, caused by disarrangements of the controlling apparatus, and it became necessary to provide safety devices that would actuate should the elevator speed increase beyond a predetermined number of feet per minute.

The most essential elements of safety are the prevention of excessive speed from any cause, the over-running of the limits of travel at top and bottom, safe protection at the landing entrances to the elevator, and a regular examination of the cables and all parts of the elevator equipments.

Car Safety Device

The early type of the safety device was designed to stop the car instantaneously. They served the purpose satisfactorily for slow speed, but were not adequate for the higher speed of 400 to 700 feet per minute. It, therefore, became necessary to provide a safety device that would stop the car with an easy and gradual stop. This is accomplished by the friction clamp safety, which is actuated by a safety speed governor, usually set to trip at 40 per cent. above regular speed. This governor will act should the hoist cable break, allowing the car to drop, or should the car over-speed from some defect in the machinery after the governor trips and the car has dropped far enough to take up the clearance of the safety jaws. The jaws are forced hard against the guide rail (like a vice), and the car will continue to slide until the friction is enough to stop the car entirely. The distance the car will slide after the safety takes hold, depends upon the load; but the farther the car slides the tighter the safety grips the rail. Usually, a car will drop about six feet after the governor trips and clamps the governor cable.

Over-running of Limit Stop

The machine of all power-operated elevators should be equipped with automatic limit stops; that is, a device that will stop the elevator at the top and bottom limit of travel, regardless of the operator.

On Drum machines, the Automatic Limit Stop should be built with and made a part of the machine.

On Hydraulic elevators, the Automatic Limit Stop should consist of a Cut-off Valve, either in the to-and-from pipe, or in both the supply and discharge pipe.

On Traction type of elevators, the Automatic Limit Stops must be located in the hoistway, and the power cut off by the travel of the car. As there is more or less slippage of the hoist cables on the drive sheave, a machine automatic would not be dependable. In addition to automatic limit stops on electric elevators, there are hoistway limit switches located so that, should the car travel a certain distance by the automatic limit stop, the car would open a switch, thus cutting off the power and stopping the machine.

Safe Protection at Landings

The early types of passenger elevators —and, in fact, most elevators up to the present time—are provided with landing doors equipped with a catch located on the inside, so that the door can only be opened by the operator. The operator, however, in order to make speed—and the public is partly to blame for this—starts the elevator before the door is closed, and quite often the door would not fully close and latch, thus providing a very dangerous condition. Many persons have opened the door when finding it ajar, and, looking in the hoistway, have either fallen or have been knocked down the hoistway by the car and severely injured or killed. I might say, right here, that statistics show that 85 to 90 per cent. of all elevator accidents occur at the landing doors. Therefore, it became necessary to provide the landing doors with a locking device that would prevent the doors from being opened, unless the car was at the landing; also to prevent the car from being removed away from the landing until the landing doors were closed. This is termed the Interlocking Device, or Interlocks for Landing Doors. While I believe all landing doors of passenger elevators and gates for freight elevators should be equipped with interlocks, I am sorry to say that, at the present time, only a small percentage of elevators are equipped with this device, although they are becoming more and more in general use.

Cables

The Cables are the most essential parts of the elevator equipment, and their number and size should be equal to the load with a good factor of safety. The sheave should be of ample size, and placed in alignment, to prevent chaffing of the cables on the sides.

Great credit must be given to the manufacturers for the high state of perfection these devices have brought. This fact must be admitted when considering the few accidents on elevators, compared to the large number of passengers carried. Statistics show that 10,000,000 passengers are carried in the Borough of Manhattan daily, and it is said that this number exceeds the number of passengers that ride on all the surface, elevated, and subway cars; in other words—more people ride vertically than horizontally.

A great many elevator accidents are not due to faulty design in construction, machinery, or safety device, but to the carelessness of the injured party. It, therefore, becomes necessary for the City or State to enact Ordinances and Laws regulating the construction of elevators, and enforcing their equipment with effective safety devices, in the interest of accident prevention; that is to say—to prevent a person from being injured by his own carelessness, and also by the carelessness of the operator.

Elevator Inspection

Are the Safety Devices Kept in Proper Condition? is one important question. The only way this can be accomplished is by having the elevator regularly inspected by a competent elevator inspector, who should inspect all the different safety devices, machinery, cables, etc., in fact, everything pertaining to the elevator. The landing doors should be tried to determine whether they can be opened from the outside. The car safety device should be tested to be sure that it would actuate

and hold the car from falling, should the cable break. The automatic limit stops should be tested so as to be sure the car will not over-run and strike the overhead beams or bumpers. The slack cable device should be tested to be positive the power would be cut off should the cables slacken. The brake should be examined to be sure there is no slippage. The cables should be examined very carefully for defects, as there is no part of an elevator that requires the exercise of more good judgment than the examination of the cables. It is just as essential that the safety devices, and all parts of the elevator, be kept in good working order, as it is that they should be installed in the first place. After an inspection has been made, the owner should proceed immediately to install safeguards and remedy any defects reported.

The elevator should be oiled and greased regularly by the engineer, and looked over carefully for any defects, and not wait for an inspector to make a thorough inspection, and oftentimes the engineer will discover some little defect which, if fixed immediately, may avoid a serious accident.

There is another feature that I wish to mention before closing; that is, the elimination of mirrors, in fact all glass, from the passenger cars (except the electric light bulbs), not only because of the fact that they are liable to cause injury to passengers by getting broken, but also because of their attraction, which results in passengers failing to notify the operator promptly as to their destination. This necessitates a stop between floors, and a trip back to let them off. They also have a tendency to retard the loading and unloading of the cars.

What Plan Do You Adopt in Estimating Costs?

Do You Calculate the Total Weight of the Machine, or Apparatus, Then Guess at a Price Per Pound, or Do You Attack the Problem in a Systematic Manner?

By JOHN S. WATTS

THE usual method followed in making up an estimate for quoting on an inquiry is to calculate the total weight of the machine or apparatus in question, and then guess at a price per pound, taking as a basis the cost per pound of the most similar piece of work done previously.

While this method, if good judgment is used, will give fairly accurate results, if the job being estimated on is similar in every respect to the one taken as the base for the pound price, it is very seldom that this condition is fulfilled.

As a general thing in the small shop, the work to be quoted on consists of special machinery to the customer's drawings, and in taking the cost per pound of a certain type of machine made to one firm's design as a criterion on which to base the price per pound of a similar type of machine to another company's drawing, we are likely to be led astray, becuase one design will most likely have more weight of material for a given amount of machine work than the other, the two machines having been designed by different men, with different ideas, and to work under different conditions.

Another common method is to calculate from the drawings the cost of the raw material, i.e., plates, shapes, castings, etc., entering into its manufacture, and then submit the drawings to the foreman in each department for his estimate of the labor cost in his department

This is, outside of the estimated cost of the raw material, nothing but a guess. Very few, if any foremen have sufficient data on which to make an intelligent estimate. For instance, a foreman, especially in the small shop, has no time to spare for this work, nor should he be expected to attempt it, as by so doing he is compelled to neglect his proper function.

Estimating Costs in the Small Shop

The foreman will usually glance over the drawings and make some kind of a mental estimate (a euphemism for guess) as to about how many days' work will finish the job, and put in his estimate accordingly, with every intention of living up to the estimate, if not in actual fact, then at any rate by making the time sheets to agree with the estimate, soaking the balance on to some job that is not estimated on. This procedure makes some jobs so expensive that the customer kicks, and the costs of the job estimated on, as shown by the books, are below the actual cost, and are misleading and apt to lead the shop into losing money on future work through taking the cost of this job as a basis for quotations on similar work.

The system used by the writer for some years with gratifying results, is based on the fact that for similar operations on similar parts, the time consumed in doing the work will be proportional to the area to be machined.

To start with, whoever is going to do the estimating should split up the operations on each piece into boring, planing, turning, etc., and calculate the area in square inches for each operation of the surface to be machined.

Until data have been accumulated from actual work performed the area that can be machined by the various processes per hour will have to be estimated, but when the work estimated on has been done, the actual time can be used and the estimating changed from guess-work to a simple arithmetical problem, taking only a few minutes to solve.

In the case of boring, drilling, or turning, it is easier and just as accurate to take, instead of the area, the diameter of the piece or hole and multiply by the length of the machined surface, as both quantities are in direct proportion to each other.

To have these figures easily accessible, a card index should be used, the information being written directly on the cards about as follows:

Estimating Costs in the Small Shop

The heading of the card signifies that it is for data on boring straight holes in iron castings, that is parallel holes without keyseat, and the hub faces left rough. The first column gives a general idea of the part in question, and is neces-

Boring Straight Hole in C.I.

Part	Dwg. No.	Mach'n'd Surface	Area or DXL	Hours	Area or DXL per Hour
Rope Sheave—16" diam.	1125-B	2¼" Bore—3½" Long	7.875	$\frac{80\frac{1}{2}}{50} = 1.61$	4.9

ONE STYLE OF CARD USED.

sary to have, as it would take longer to bore the same size hole in an awkward shaped casting that had to be clamped to a face-plate. If conditions warranted it, another card could be appropriated for this latter class.

The second column gives the drawing number in case it might be necessary to refer to it for comparison with other work to be quoted on.

The third column gives the dimensions of the machined surface so that in estimating other jobs we can pick out for our basis the nearest size we have data on the card. It being understood that while only one job is shown on the sample card above, in practice other jobs of the same class would be entered on the card as data was gathered in time.

BORING STRAIGHT HOLE IN CAST IRON

PART	DWG. No.	MACH'D SURFACE	AREA OR D x L	HOURS	AREA OR D x L PER HOUR
Rope Sheave 16'0	1125-B	2½" Bore - 3½ Long	7.875	$\frac{80\frac{1}{2}}{50} = 1.61$	4.9

ILLUSTRATING THE FIRST CARD DESCRIBED.

The fourth column gives the area of the machined surface, or in the case of boring, etc., the diameter multiplied by the length, as explained above.

The fifth column, which is not filled in until completion of the work, gives the hours per part. In the example the figures $\frac{80\frac{1}{2}}{50}$ mean that 80½ hours were consumed in boring 50 sheaves, giving 1.61 hours as the time for one sheave. This 1.61, divided into the figure 7.875 in the fourth column, gives us the figure 4.9 in the last column.

It should be understood that the time taken includes all the time charged against the job, that is setting up machine, trueing up in lathe, etc., and the time of any helpers that may have been necessary.

Now, if we are called upon to estimate the labor cost of boring some 24 in. rope sheaves with a 3 in. hole, 4 in. long, the formula is:

$$\frac{D \times L}{4.9} = \text{hours}$$

$$\frac{3 \times 4}{4.9} = 2.45 \text{ hours}$$

From the card, we note that the 4.9 was taken on an order of 50 sheaves, so if the number of 24 in. sheaves to be bored is larger or smaller than 50, we would decrease or increase the 2.45 hours in accordance.

By putting this system into effect in the course of time we will accumulate a set of cards covering all the usual operations of our shop, and which will give some approximate idea even for the unusual operations.

The amount of clerical work involved is not great, and, in fact will soon, by eliminating guesswork and the running around to interview the foremen, save time.

Also, it will cut the losses incurred by underestimating, and also help to avoid losing work by overestimating.

It is not possible, nor would it serve any useful purpose, to try and get every job that went through the shop on these cards. The aim should be to get a line on all the various kinds of operations going through the shop. Some operations such as boring and keyseating can be lumped together on the one card as though they were only one operation.

WHY IS WELDING PROFITABLE?

Continued from page 603

in fact, for more things than there is time to mention herein. In connection with the cutting torch, the welding plant is useful for shearing and punching, chaping and straightening, cutting and splitting, in places inaccessible to any other method. The process may be utilized for removing carbon from tractor, auto and truck engine cylinders. In fact, it is hard to see where the objectors base their claim that the welding plant is liable to stand idle part of the time, unless they mean they would not get out and hunt up the business. There is plenty of work for the welder in the country right now; what will it be when things get going good?

And while we are on the subject of possibilities let us not forget the airplane. Here is something that is more than a possibility. The time is at hand when we will be using the air for means of transportation and pleasure to an extent little dreamed a year or so back. Already it is a common sight to see an air craft sailing over any section of the country. With Federal backing it will advance rapidly from now on. And this means opportunities for the torch operator. Many parts of the airplane absolutely demand wedded joints both as a factor of safety and to cheapen the machine. The principal cities over the country are planning landing grounds and otherwise preparing for the advent of the airplane. The welder should be on hand to make the repairs when needed.

As a closing argument let us review a list of people who need the welding machines. Who not only use them but must have them if they hope to cope with competition on all sides: First the repair man who can not get along without a plant. Then the foundryman, in steel, brass and iron; the junk dealer; the garage owner; the blacksmith; the miner; the contractor; the railroad; the electric power company; the shipbuilder and general manufacturer. Perhaps many more could be named but this list should remove any doubts as to the usefulness of the modern welding plant.

Yes, it is perfectly safe to purchase the welding plant you have been thinking of. Cut in now and get in on the beginning of things. It is a good idea to add to your present equipment if you already own a good plant. If it is an old-fashioned outfit you should investigate the advantages of a more modern machine. Don't get the idea that there will not be work enough to go around. And don't think the method is not a success. Also don't think you cannot learn to operate a welder as well as the other fellow. It is only a matter of sticking to it.

PRODUCTION OF ASBESTOS INCREASING

The asbestos industry of the United States is in better condition now than ever before, especially as to the quantity and the grade produced, and the outlook is encouraging. Most of the asbestos used in the large asbestos factories of the United States comes from Canada, but the growing appreciation of the high quality American fiber, especially that from Arizona, is a welcome feature of the industry.

The total quantity of domestic asbestos sold in 1917, according to J. S. Diller, of the United States Geological Survey, Department of the Interior, was 1,683 short tons, valued at $506,056, an increase of about 13 per cent. in both quantity and value over 1916. Most of the domestic asbestos comes from Arizona, where the proportion of crude spinning fiber to that of lower grades is much larger than in Canada, so that the average price of American fiber in 1917 was $301 a ton, whereas the average price of that in Canada was only about $50.

Some years ago the opinion was expressed that as the Arizon fiber contains less iron than that mined in Canada, it is therefore better adapted to use for electrical insulation than the Canadian fiber. This opinion has lately been confirmed by analyses made by R. E. Zimmerman, of Pittsburgh, whose investigations also indicate that the harshness of certain parts of the Arizona asbestos is due to thin films of calcite among the fibers.

A small amount of spinning fiber was mined in Fremont County, Wyoming, from a contact deposit of remarkable interest.

The increased demands for asbestos due to the war have been met largely by increased imports from Canada. The imports of asbestos from South Africa and Italy have been largely cut off. The demand for imported asbestos for use in filters is being supplied by amphibole asbestos obtained from residual deposits of the crystalline rocks of Maryland.

A New Type of Water-Cooled Induction Furnace

This Style Furnace Can be Used to Advantage in the Making of Carbon-Free Melts. This Furnace Was Developed at Trenton, N.J.

By FRANK C. PERKINS

THE accompanying drawing, Fig. 1, and illustration, Fig. 2, show the design and construction of a new water-cooled high frequency induction furnace, developed at Trenton, N.J. There has been constructed a source of high frequency current of 10,000 cycles per second, which is utilized in power units up to one hundred kilowatts. The oscillatory current system forms the major portion of the high frequency induction furnace.

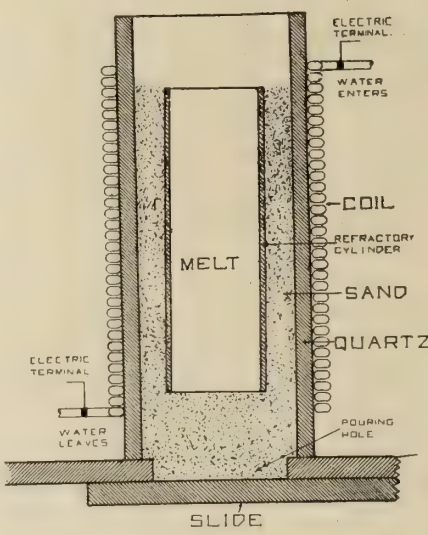
This special type of induction furnace is of advantage in the making of carbon free melts. The diagram, Fig. 1, is almost self-explanatory. The tremendous concentration of energy produced by inductive action in a comparatively small volume, makes it necessary to maintain the inductor coil cool by artificial means.

In order to accomplish this cooling in a simple and effective manner, the material used for winding the inductor coil is a thin-walled, flattened copper tubing. It is flattened and wound edgewise to obtain the maximum possible number of turns to the inch. A small flow of water through this tubular coil maintains it always at the temperature of the tap water used.

The melt, which is located within the inductor coil and which may be only ½ to 1 inch less in diameter than the inside diameter of the coil, may be raised to a temperature of 2500 deg. or 2800 deg. C., the coil remaining under 20 deg. C. The procedure in making a melt of any electrically conducting material such as electrolytic iron or nickel with which other metals are to be alloyed, is as follows:

There is a thin-walled crucible or open cylinder of fire-clay, magnesia, zirconia, or like material formed and this is located centrally in the inductor coil and the space outside and under this cylinder is filled in with fine alumina, silica, or zirconia sand. The metal or component parts of the alloy to be produced is gotten into the form of small pieces, preferably about the size of walnuts, and packed in the thin walled cylinder. When the high frequency current is passed through the inductor coil rapid heating begins at once. This heating is due solely to the enormously large eddy currents which flow in the small conducting masses of the product being heated.

It is of interest to note that the melting of pure iron in lots of 2 to 5 lbs. begins in from 10 to 20 minutes and high superheat is reached in 25 minutes. When the mass has become completely molten, more material may be dropped in. The melted mass does not leak, even though the thin-walled container cracks and breaks, for this is embedded in a mass of sand which makes a natural metal-tight pocket. As soon as the mass becomes molten a very useful and interesting phenomenon is noted.



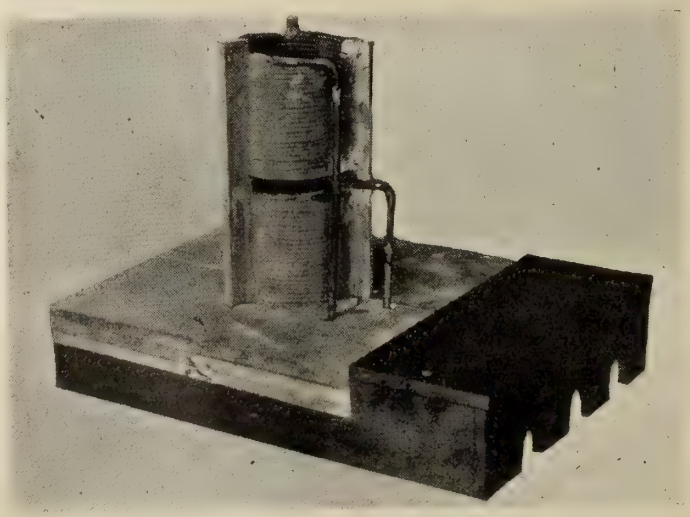
SECTION THROUGH FURNACE

The surface of the molten mass becomes much agitated and the central region of this surface is raised a considerable fraction of an inch above its circumferential region. The metal or alloy is, in fact, subjected to a vigorous stirring action. Metal flows vertically upward in the axial region and downward in the circumferential region, and thus an alloy becomes automatically most thoroughly mixed. This stirring action is not a thermal phenomenon, but is caused solely by the action of the electromagnetic forces. Its importance is easily recognized when a perfect mix of the constituents of the alloy is desired.

It is claimed that excellent results are readily obtained in this method of heating, as all conducting materials may be raised to 2500 deg., or 2800 deg. C., or to their vaporization temperature in an oxidizing atmosphere. Platinum is easily melted in this way. By placing the inductor coil on the outside of a quartz tube, which is closed at both top and bottom, melts may be made in any atmosphere or in vacuum.

It is also held that in the open type of furnace, the molten metal can be drawn off from the bottom into a mould and the quantity of metal, which can be handled at a single melt, is determined wholly by the size of the furnace employed and the power available. An inductor coil of 40 turns, 6 in. long by 3½ in. inside diameter, supplied with 10 to 20 k.w., will melt 4 lbs. of electrolytic nickel or iron at a charge in from 20 to 30 minutes. Larger furnaces supplied with larger power will handle larger quantities.

It is noted that Moissan's researches were chiefly concerned with the chemistry of the elements at the temperature of the arc. He studied the chemical reactions at elevated temperatures of the most refractory substances and compounds, producing oxides, phosphides, arsenides, carbides, and silicides of all the more refractory metals. He showed that the silicides of carbon possessed a hardness which approaches that of the diamond. His crystals of carbon silicide (carborundum) readily scratched the ruby.



GENERAL VIEW OF THE FURNACE.

It was found that no metal was so refractory that it failed to melt in kilogram quantities in his carbon arc furnaces. But these melts were all made in a carbonaceous atmosphere and the resulting product, in the cases of the higher melting metals, was always a carbide of the metal and not the pure metal. Many years passed after the work done by Moissan, before the soft and ductile properties of pure molybdenum and pure tungsten became known; for small traces of carbon render these metals, as well as many others, extremely hard and non-ductile. Platinum and iridium, likewise, when melted in the carbon arc, become hard and brittle and their useful properties are largely lost.

In the past, workers in metals of the platinum group have had to resort to the oxy-hydrogen flame for producing and refining their products. The usual electric furnace, which produces the highest temperatures obtainable artificially, is useless for this work, as in many other cases, because in all types of electric furnaces heretofore used for obtaining extremely high temperature, the product treated becomes chemically combined with the carbon invariably present.

While the higher temperatures have been obtained with tubes of iridium or tungsten used as a resistor, the first is precluded for general use by its excessive price and volatile nature when carried to a high temperature, and the second, besides being very high in cost, can only be used in an inert atmosphere or in a vacuum. A great need has therefore been felt in finding an electric method of melting and producing alloys of such pure metals as nickel, chromium, electrolytic iron, platinum and even iridium.

There are many who hold that the alloys of such metals, if produced absolutely free from all chemical contamination of carbon, silicon and every other element likely to be found in vapor state at the highest temperatures, will exhibit special and useful properties. Furthermore, it is recognized as highly important in heat treating the higher melting pure metals to be able to preserve absolutely their chemical purity.

It will be seen that with this device a method is now available and commercially perfected whereby any metal or alloy in granular form, in small broken pieces, or in solid masses, can be melted absolutely free from carbon and all other chemical contamination, provided this metal fuses at a temperature under the fusion temperature of pure zirconia. The only apparatus needed is a source of high frequency current of 10,000 cycles per second, or over, and the special type of induction furnace indicated in the photograph.

INTERNAL COMBUSTION ENGINE IMPROVEMENTS

Important improvements continue to be made by British engineers in the Diesel oil engines which are being so largely adopted for marine purposes and for the generation of electricity on land. One recent innovation is intended to enable tar oil to be successfully used as the fuel. A pilot jet of paraffin is provided to form a flame for the following jet of tar oil, thus overcoming the difficulties of ignition. Another novelty which is of special interest to central station engineers is a device for automatically controlling the pressure of the air supply to suit the varying loads met with in the supply of electricity. On one end the same gauge is a pointer registering the air blast pressure and another controlled by the current passing through the generator. The second pointer is arranged to indicate the correct air pressure according to the load on the generator, and everything is in order when the two pointers are together, in which position they close an electrical circuit controlling the compressor throttle. When the pointers are apart, the throttle opens and increases the air supply until the pointers come together. Greatly improved combustion is secured by this ingenious device. Another British firm has introduced an emergency governor which stops the engine completely in case of an excessive rise in speed—an emergency which is beyond the ordinary governor. This apparatus works by by-passing the fuel into the atmosphere. Another emergency device stops the engine whenever the water circulation fails, the apparatus being operated by a diaphragm, which flattens when the water pressure upon it is withdrawn. All the British makers concerned in this field are standardizing their designs in order to provide the advantages of mass production.

WELDING REPAIRS TO WATER WHEEL

An electric welding repair job that is of considerable interest to the power plant operator and the mechanical engineering field in general, is shown in the accompanying illustration. In the initial construction of these water-wheels, difficulty has frequently been experienced in obtaining a firm and rigid connection where the vanes join the supporting rings. Generally speaking, the vanes are steel castings that are placed in position in the sand mold so that the molten iron will flow about the edges and form an integral casting. However, the result has often been unsatisfactory, as the subsequent expansion and contraction of the vanes and the rings causes a looseness in one or more of the connections. The peculiar construction of the vanes makes it difficult to use the oxy-acetylene process in uniting the vanes to the retaining rings, and relatively poor success has, so far, been obtained by the use of the electric process, when working together steel and cast iron. However, the St. Lawrence Welding Co., of Montreal, who accomplished the repair on the wheel here shown, have effectively formulated a special influx that overcomes former difficulties, and the vanes can be rigidly secured to the cast-iron rings, by means of the electric arc method, so that the force of a sledge upon any of the vanes will not produce the slightest defect in the welded joints. The cut shows the work immediately after welding; the rough appearance of the added metal was subsequently removed by grinding, leaving a smooth fillet weld in from the outer edges. Water-wheels treated in this way have shown greater efficiency after welding by this method.

BUILDING UP A WATERWHEEL RUNNER BY WELDING.

WHAT OUR READERS THINK AND DO

Wanted: Views on the Subject of This Letter

Editor, CANADIAN MACHINERY:

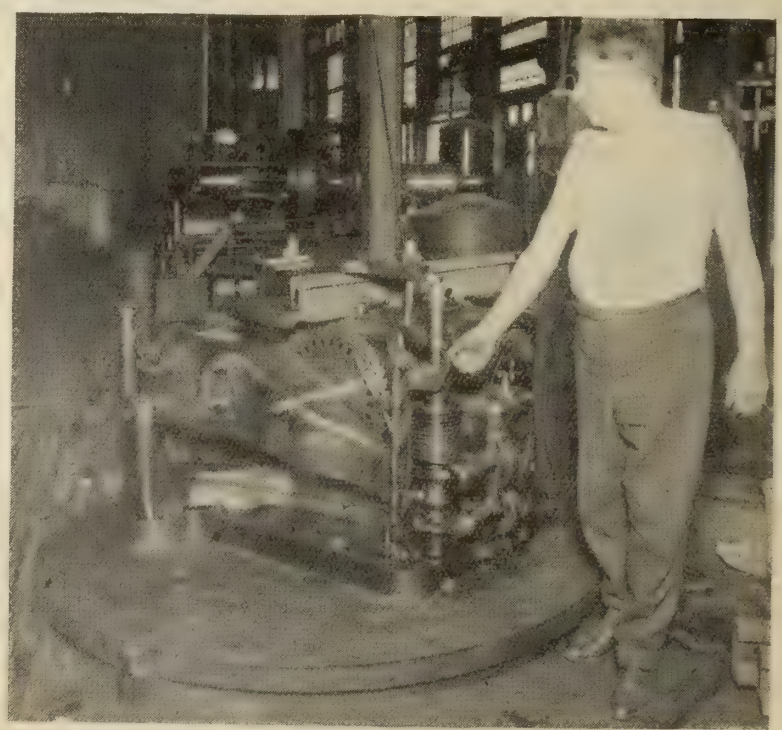
Dear Sir,—I take great interest in your mechanical drafting course, and note your reference to Mr. A. M. Lount, master mechanic for Massey-Harris. It is time some of the superintendents in this town sit up and take notice of the workman who is trying to get ahead of the game. Please let it be understood that the writer does not want, in any way, to discourage apprentices or workmen, but to give my honest opinion of conditions as I believe they are in most of the shops in Toronto to-day, I will quote a case in point. In one shop that I know of there is a young man, who, through home study, has got various ideas, and has submitted them to several firms where he has been employed. I might say at the start that he is one who is taking a course with the Scranton Schools, and his foreman is for ever running down these schools. Instead of giving the fellow encouragement it is entirely the opposite in this case. The young man conceived the idea that would have done away with one machine entirely in one operation, but would they try it out? Decidedly not. We hear much of this home study business. Is it worth while? Of course it helps one to hold down his job. The whole fault of the matter is this, that as soon as a man lets it be known that he can figure out ways and means of doing work in a more up-to-date manner than his foreman, then his foreman says: "I shall have to keep an eye on this fellow or by jingo he will be in my shoes before long." From this point on the poor fellow can look to his laurels. He is found fault with, and finally it is made so uncomfortable that he has to find fresh pastures, only to meet with the same rigmarole again. This is a true fact and can be proved up to the hilt. I appreciate such a man as Mr. Lount, as it shows that he does take an interest in his men, and if there were more of his kind there would not be so much antagonism between foreman and workman. I would say to the apprentice, stick to it; I am one who studies myself, and before long hope to be able to give something to the mechanical world that will be worth while. No doubt some of your readers will find for themselves that there are a lot of superintendents and foremen who are holding down jobs through the ideas of their workmen, who do not have the same opportunity of getting in touch with the heads of the concerns as their foremen have, and thus getting the credit every time for the ideas of their men. This state of affairs could be remedied by the offer of cash prizes for any improvements in the speeding up of production. Take for instance the following personal case: I was employed in one shop where they made a certain style of staple that could have been manufactured in two operations, or with even one operation, that at the present time goes through four. Why in the name of common sense is this allowed? Can someone explain? Yet this is only one of many cases I could point out. Hoping I have not taken up too much of your valuable space,

I remain,

Yours truly,

H. H. J.

Editor's note.—In our next issue we intend stating our views on this subject. In the meantime we will be pleased to hear from other readers, workmen, foremen, and superintendents alike on this subject.



HOW THE SAW OPERATES.

HANDLING LONG CUT-OFF JOBS IN CRAMPED PLACES

By J. J. McIntyre

The Cyrus Currier Co. of Newark, N.J., have to accomplish numerous cutting-off operations on railroad rails.

When the Earle-Rea Simplex saw, shown in the picture, was installed they secured it to a turntable, which can be clamped in a stationary position at any point in a circle. By this arrangement long lengths of rails can be cut at angles or loaded into machine from any point.

TAPER TURNING PROBLEM DISCUSSION

By George Barrett.

Reading Mr. Rodgers' article on Problems of Taper Turning in Nov. 13th edition of CANADIAN MACHINERY, brings to my memory a hot argument I had a few years back with a first-class lathe hand, who was cutting a taper thread with the tail stock set over method, just because it was too much trouble to connect up the taper attachment.

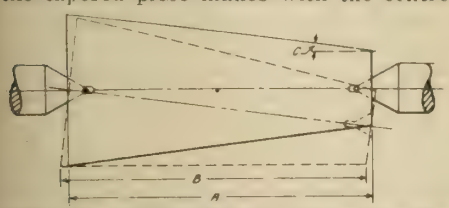
In setting over tail stock to cut a taper thread two errors will occur, and will be increased as the taper of the work increases.

The first error is in the pitch of the thread, which becomes finer than the standard as shown on my drawing.

The length of the work is A, if measured along the axis; if measured along the tapered surface the length is B, and to get this length you would have to use a trigonometrical formula and B would equal

$$\frac{a}{\text{cosine C}}$$

where C is the angle which the side of the tapered piece makes with the centre



THE IDEA EXPLAINED IN GRAPHIC FORM.

line. If the piece is threaded with a certain number of threads per inch, D, the number of threads in the whole length of the work, when threading by taper attachment would be A $\times$ D, but if threaded by the setting over of tail stock as shown by dotted lines in drawing the number of threads would be

$$\frac{A}{\cos C} \times D$$

or a greater number of threads, and consequently a finer pitch than with a taper attachment.

Example: Suppose the length A, measured parallel to the axis is 6 inches; assume that 16 threads per inch are to be cut and the angle C is 15 deg., the number of threads in the whole length of the work when cut by the taper attachment would be $A \times D = 16 \times 6 = 96$. Take the length B, shown by the dotted lines measured parallel to the outside, then the number of inches equals

$$\frac{6}{\cos 15^\circ}$$

The cosine of 15 degrees from any engineer's bankbook is .9659; and

$$\frac{6}{.9659} = 6.211$$

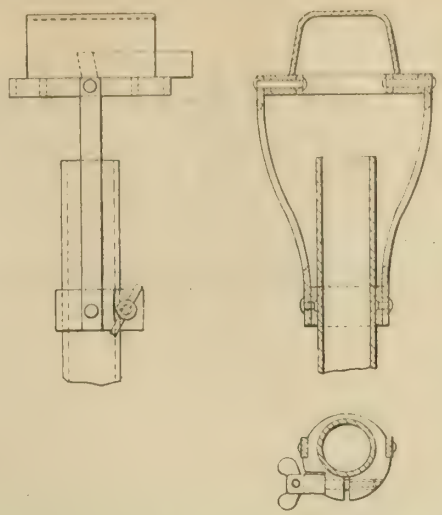
or nearly 6 7-32 inches.

therefore, $6.211'' \times 16 = 99.376$, or 99⅜ threads in the whole length of the work.

The second error would be that of a drunken thread. It is not a true continuous helic, and is due to the fact in taper trimming with the tail stock set over the work, does not turn with uniform angular velocity, while the tool is advancing along the work longitudinally with the uniform linear velocity.

The change of the pitch and the irregularity of the thread is so small it is not noticed with the naked eye, if the taper is slight.

But as the taper increases, the errors become more pronounced, therefore, the setting over of tail stock should be discouraged as much as possible.



TOOL-HEATING SUPPORT FOR BUNSEN BURNER

By F. HORNER

For heating fine tools for bending, hardening and tempering, the Bunsen burner is handy. To save the time and trouble of holding a tool in the tongs, the attachment shown herewith is valuable. It consists of a couple of rings riveted together with distance pieces between, the rivets also holding bent arms that go down to a clamping ring pinched on the tube with a thumb-screw. To conserve the heat and reduce the length of time of heating up, a hood can be laid on top. A mark may be scratched upon the tube when the best height according to the flame has been ascertained, so that the split collar may afterwards set to this line.

There are a few wells in the United States between 7,000 and 8,000 feet deep. At 7,000 feet the temperature was found to be 152 deg. Fahr., and the rate of increase at this depth is about 1 deg. in every 51 feet. At this rate the temperature would be pretty close to the boiling point, 312 deg., at 10,000 feet. This has been the theory of scientists for years, and it is strange that more effort has not been made to find natural heat and put it to use. Boiling springs and burning volcanoes are proof that fire exists in the bowels of the earth and heat will undoubtedly be drawn from wells at some future date.

TABLE OF WEIGHTS AND MEASURES

Long Measure

12 Lines	1 Inch
12 Inches	1 Foot
4 Inches	1 Hand
3 Feet	1 Yard
6 Feet	1 Fathom
5½ Yards	1 Rod or Pole
40 Rods	1 Furlong
8 Furlongs	1 Mile
3 Miles	1 League
69½ Miles	1 Degree
1760 yds. or 5280 ft.	1 Mile
6075.81 ft.	1 Nautical Mile

Square or Land Measure

144 Sq. Inches	1 Sq. Foot
9 Sq. Feet	1 Sq. Yard
30¼ Yards	1 Sq. Rod
40 Poles or Rods	1 Rood
4 Roods	1 Acre
640 Acres	1 Sq. Mile

Cubic or Solid Measure

1728 Inches	1 Solid Foot
27 Feet	1 Solid Yard
42 Feet	1 Ton Shipping
128 Feet	1 Cord Wood

Land Survey Measure

7.92 Inches	1 Link
100 Links	1 Chain
1 Chain	66 Feet
10 Sq. Chains	1 Acre

English Money Table

4 Farthings	1 Penny
12 Pence	1 Shilling
20 Shillings	1 Pound

Avoirdupois Weight

16 Drams	1 Ounce
16 Ounces	1 Pound
14 Pounds	1 Stone
25 Pounds	1 Quarter, C
28 Pounds	1 Quarter, E
4 Quarters	1 Hundredw't
20 Hundredw't	1 Ton
2000 lbs., Can.	1 Ton
2240 lbs., Eng.	1 Ton

Paper

24 Sheets	1 Quire
20 Quires	1 Ream

Apothecaries' Weight

20 Grains	1 Scruple
3 Scruples	1 Dram
8 Drams	1 Ounce
12 Ounces	1 Pound

Troy Weight

24 Grains	1 Pennyweight
20 Pennyw'ts	1 Ounce
12 Ounces	1 Pound

Cloth Measure

2¼ Inches	1 Nail
4 Nails	1 Quarter
3 Quarters	1 Flemish Ell
4 Quarters	1 Yard
5 Quarters	1 English Ell
6 Quarters	1 French Ell
37 Inches	1 Scotch Ell

Measure of Capacity

4 Gills	1 Pint
2 Pints	1 Quart
4 Quarts	1 Gallon
9 Gallons	1 Firkin
36 Gallons	1 Barrel
63 Gallons	1 Hogshead

Dry Measure

2 Pints	1 Quart
4 Quarts	1 Gallon
2 Gallons	1 Peck
4 Pecks	1 Bushel
36 Bushels	1 Chaldron

Time Measure

60 Seconds	1 Minute
60 Minutes	1 Hour
24 Hours	1 Day
7 Days	1 Week
4 Weeks	1 Month
12 Months, or 365¼ Days	1 Year
100 Years	1 Century

Days in the Month

30 days hath September,
April, June and November;
February has 28 alone,
And all the rest have 31;
But Leap Year coming once in four,
February then has one day more.

WELDING AND CUTTING

Why is Welding Profitable?

By DAVID BAXTER*

IF you are in doubt as to the advisability of installing an oxy-acetylene welding plant; if you think there are already too many engaged in the welding business; if you thing it is not a success as far as the process has been developed for all-round repair work; if you think there is liable to be a state of depression, of slack work in business in the future; if you think the welding business is not a paying one; in fact, if for any reason you are hesitating on the verge of purchasing a welding plant, you should read the encouraging prophecies, estimates and facts incorporated in this article.

If you already own a welder and are wondering whether or not to purchase additional equipment; if you think maybe you can rub along with your present outfit; if you think you can handle your share of the work in the future without the new improved accessories, supplies, etc.; if you have been dreaming around and have not kept posted with the facts concerning the tremendous era of development upon which this country has embarked; if you are out of date in equipment and information concerning the wonderful possibilities opening before the oxy-acetylene welder you should be interested in the following discussion.

If for any reason you think it takes a sort of super-mechanic to learn to operate the welding torch; if you believe it takes too much time and patience for the rewards to be earned; if you believe you would only have the plant sitting around idle half the time; in a word, if you do not know just exactly where you stand in relation to the welding business, the following article should prove interesting.

* * *

It is estimated in a recent issue of a leading automobile paper that the farms of America will absorb two million auto trucks in the next ten years. Can we realize what this means to the repair man, and especially the welder? Can we grasp the idea of the enormous amount of welding this great number of trucks will make? If we knew absolutely that there would soon be in use two million trucks, would it be possible to realize what this would mean to the owner or operator of a first-class welder? No doubt the figures would be staggering in their significance if we were able to put it in round numbers. It would seem almost impossible to get welders enough to keep the trucks in running order. And all of this would be on top of the thousands of passenger cars already in use together with the enormous number yet to come.

This estimate may be a trifle overdrawn, but those of us who have kept in touch with the highways movement of to-day can readily understand what it means to the truck business. Already some of the railroads admit that they are out of the running in so far as the short haul is concerned. The short distance hauling of freight in the near future will no doubt be done with motor trucks. Of course a great deal of this depends upon the rapidity with which the country adopts and installs good hard road systems. With the coming of hard roads comes the repair work for the welder. It is the truth in more ways than one that prosperity travels on hard roads.

Good roads are no detriment to the welder's business because the better the roads the harder they will drive and the quicker wear or break the trucks. It is scarcely necessary to make the reminder that all running machinery wears in time, so that even with the best of roads there will be plenty of work for the repair man. With the aid of the Federal Government there will be many roads built within the next year, and miles upon miles to be built in the following years. Now, if you believe in hard roads you must believe in the oxy-acetylene welder, for they will travel hand in hand.

So prepare for the business coming and install your plant, or get additional and better equipment if you now own a plant. Almost every part of a motor truck or automobile can be welded. In fact, this is the only method by which most of the parts can be repaired. Due to their shape and to the metal of which they are made, many of the different parts of motor cars would have to be thrown away if it were not for the modern method of welding. Such parts as crank cases, housing, crank shafts, etc., had to be discarded before the oxy-acetylene torch was devised.

For those who think there are too many welders in the business; consider the two million trucks for the farms, then to this add the trucks that will be used in the cities to accommodate this increase in volume of business. Then to that add the number of pleasure cars which will be bought with the profits of the double earning power of the trucks as compared with the slower team and wagon. You may say, "That is for the future, only a prospect. What about right now?" Well, just look around you and see how many torch operators who really understand their business are not busy. Ten chances to one you will find they are not complaining. You may find some idle plants, but you will also find they do not understand the work or else they do not let people know what they can do. No, there are not too many welders in the game. In fact, there is a scarcity right now, and what will it be when two million trucks are added to the list?

Those who are doubtful about the success of the oxy-acetylene process should turn to Government statistics. They will find therein where thousands of welders were used on all kinds of shipbuilding and war work. This is speaking of both the repair work and the manufacturing end of the business. One instance should convince the most skeptical concerning the success of the modern welding machine in repair work. Several of the largest ships that were taken from the Germans were found to be badly damaged. In fact, so badly damaged that it seemed impossible to ever repair them. The Germans had taken heavy hammers, bars, etc., and broken into many pieces some of the most essential engine and machine castings about the ships. Great complex castings that would require months to replace were found to be broken into several pieces while yet in place on the machine. Steel frames and bars were bent double in an effort to put the ship out of commission for a long time, and as the Germans hoped, permanently. If it hadn't been for the oxy-acetylene welder they would have succeeded, too! But the torch operator was put on the job and got the ships back in running condition in anywhere from one-tenth to one-half the time required to replace the castings. Now, if those large

*From "Acetylene Journal."

ship castings can be welded any kind can, so why should anyone doubt the ability of the welding process?

But you don't need to be told of the Government work to be assured of the success of the welder; just spend a day in any good welding shop. You will find any and all kinds of work successfully handled. You will find that they weld castings weighing a ton or more just as effectively as they weld a smaller job. In fact, an instance comes to mind of one torch operator who welded the time regulator of a common watch, a part so small it will not weigh except on very delicate scales.

Now, as to whether the welding business is a paying one or not; ask any owner of a large expensive automobile which he would rather do: pay thirty dollars to have his cylinder block welded or pay several hundred for a new one. You can weld an ordinary break in a cylinder block in a few hours at a cost of four or five dollars. Some that are badly broken will bring sixty or seventy-five dollars. Of course, this is not the common line of work that comes to the welding shop, but a good operator can make good money eight hours a day welding pump handles and stove legs. He can weld a hundred pump handles at fifty cents a piece in a day and not work hard, either. By pump handles is meant the common run of small tinker jobs. The operator must know his business; the machine won't do the head work. And, by the way, that is one mistake the maker of welding machines often makes; he leads the purchaser, unintentionally perhaps, to believe all he needs is the machine. He should impress upon his customer that it is comparatively hard to do good welding but it is very easy to learn to do good work. The operator must learn the nature of different metals and how to handle them. Anyone with average intelligence and mechanical ability can learn to operate the welding torch. Although very few can take right hold of it and do good welding without practice.

Let us revert again to the owner of an apparatus who is in doubt about adding to his equipment: He should add to his equipment now, or soon. Why? Because there is another large field for repair work ahead. This is the tractor business. If there will be two million trucks, does it require a very great stretch of reasoning power to realize that the tractor business will be nearly as large? And the tractors will probably furnish more repair work than the trucks by reason of the kind of work they do. Could any form of work be harder on machinery than plowing? Here is something that will wear and break all kinds of castings and forgings faster than most of us realize. Nor will the farmer spare the tractor when it comes to putting in the immense acreage required to feed the war-stricken world. He will plow and till at breakneck speed day and night. The tractors will naturally wear and break under the strain. Then the farmer will want it repaired as quickly as possible. He will be in poor shape if you are not equipped to do the work immediately. Remember there is no part of a tractor you cannot repair with a welder, even scored cylinders.

Aside from this big rush of business there are other reasons why you should be fully equipped. It is foolish to weld a job with a torch too large; it wastes gas and probably makes a poor weld. And it is just as bad to weld with a torch too small for the job; it wastes time and gas, too. It is foolish, too, to have a torch clog up in the middle of a job and have to stop and clean it. Much better have several torches in the shop whereby a quick change can be made, or the correct size selected for the work to be done. In event of a torch getting damaged or broken the welder would probably lose enough money to pay for several torches by being forced to wait several weeks for a new torch to arrive from the factory. These things argue for at least two torches to each operator.

Some of you who may be rubbing along with old style welding equipment do not know that this is in many instances a loss of time and money. There are now being manufactured new designed and constructed devices and attachments that will save enough time and material to pay for themselves in a very short time considering the inadequacy of the older apparatus. It is a mistaken idea to think a torch operator can compete with up-to-date apparatus by sticking to his old-style equipment. He should know that manufacturers are continually straining to design and build better machines, more economical and less fool-proof. If he is really following up the business he should keep in touch with progress or some day he may awake to find the other fellow is taking all the cream, because he is continually trying to improve.

There is a cheap and easy way to keep up to date on what is doing in the welding world. Subscribe for a trade paper, then read it and study the things you read; look at them from the angle that applies to your particular situation. And don't neglect the advertisements; read all of them and examine the pictures contained in them. Didn't you ever pick up any useful information from reading the ads.? Hasn't it ever occurred to you that an ad. furnished just the idea you were looking for to apply to some vexing problem? Has an ad. ever furnished to you the starting hint that helped you work out a hard problem? Hasn't the cut in an advertisement ever shown to you something you wanted to know? If not, then it must be that you do not read the ads. rightly. They should be read as one would read the news items of his trade paper, for they are in reality the newsiest kind of news items. All the new discoveries, the new inventions, the new supplies, even a great many trade secrets are inserted in the advertisements. Often the mere wording and picture suggests some way of improving your own method. You will find that the fellow who gets ahead is reading the advertisements as much as any part of his paper.

Yes, the welder who succeeds must keep his mind up to date as well as his equipment. Some of them are going to find this out to their sorrow in the near future if they try unprepared to meet the coming expansion and prosperity in these United States. Now if anyone doubts that we are entering upon an era of prosperity let them investigate the municipal improvements that are being installed in all parts of the country. Visit some of the little villages out on the prairie in Kansas and see how they are paving and installing sewers, etc. When the towns of five to ten thousand population commence to pave their streets it is good sign that the country at large is prospering.

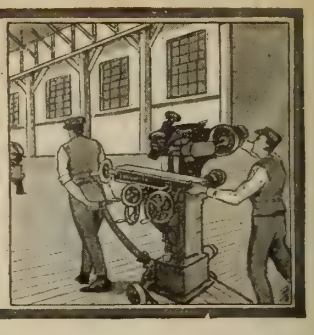
These things all point to a happy time for the repair man; in our case especially the welding machine operator. Did it ever strike you how nature balances things? The great wear and tear of machinery is balanced by the oxy-acetylene welding machine. It looks as though nature prepared in advance for the coming era of production by permitting the welding apparatus to be invented and perfected in advance.

Many farmers and residents of small towns are rapidly adopting power for the doing of many things. They grind their feed, churn their butter, pump their water, wash their clothes, and do many other things by machinery. This is another line that is enlarging by leaps and bounds. It is one worthy of careful thought. The repair welder is bound to reap a benefit from this enlarging tendency to let power do the work. Where power does the work it takes its toll in repair bills. Once more the welder is the best fitted to cope with the situation; he is the only one who can successfully repair these machines that are made of metal. And there is no danger of the individual installing his own welding apparatus on account of the time and concentration it takes to learn the business of successfully welding all kinds of metal. A tiny outfit will probably never be manufactured for home use since it would be impracticable for all kinds of general repairing. Therefore, there will always be a central welding shop.

Let us next try to refute the arguments that the welding plant is apt to stand idle a lot of the time: In the first place, there are so many different things that the plant may be used for there is no necessity for it to stand idle. These things are all aside from the usual work of repairing broken parts. The welding torch may also be used to case-harden tools and wearing parts; it may be used for melting babbitt; for burning grease off of tanks and cars; for melting caulking out of sewer pipe; for brazing and lead burning; for reclaiming defective castings in foundries; for heating castings to be shrunk on or removed from shafting; for removing boiler scale; for brazing, soldering, etc.; for manufacturing or wrecking; for opening steel safes;

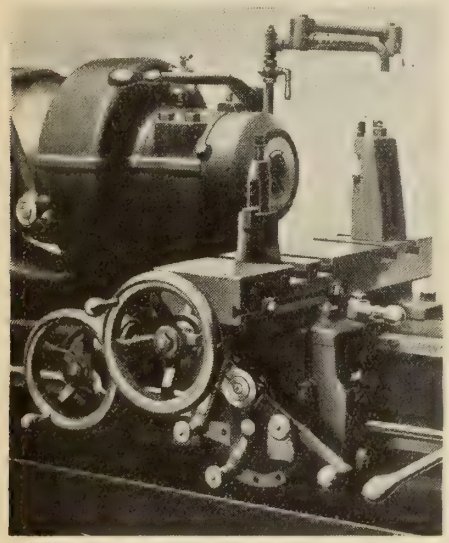
Continued on page 597

DEVELOPMENTS IN SHOP EQUIPMENT



NEW TURRET LATHE

The Warner & Swasey Company of Cleveland, Ohio, have placed on the market what is known as their No. 6 Turret Lathe equipped with double friction back gears, and with or without automatic chuck, bar feed, and



CLOSE UP VIEW OF SADDLE.

power feed to turret. Either the standard or heavy duty carriage is furnished with the machine.

Double friction back gears increase the productive ability over the single back geared machine by almost doubling the power and giving a greater speed range. With this construction nine spindle speeds are available, three for each step of the driving cone.

The power obtainable with the double friction back gears permits taking heavy forming and facing cuts on both bar and chucking jobs which are beyond the capacity of the single back geared type. When used for these heavier cuts the heavy duty carriage is preferable.

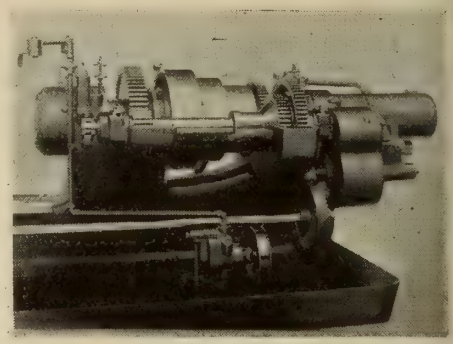
The heavy duty carriage has power cross and hand longitudinal feeds. The cross feed can also be operated by hand. Six power cross feeds and reverse are obtainable in the apron; the three finer feeds are ideal for forming, and the three coarser are suited to facing. The gears in the apron of this carriage are made of special steel and run in oil.

The cross slide is fitted with a dial graduated to .002 in. Adjustable stops are provided for either direction. The front tool post is round, has an adjustable wedge, and is arranged to be swiveled at any angle. A cutting off tool holder is regularly furnished for the rear. Either of these tool holders may be removd and forming tool holders substituted, or necking tool blocks, or any number of other tool holders, some of which are shown in the catalogue "Turret Lathe Tools."

With this heavy duty carriage on the No. 6 Turret Lathe, gear blanks, forgings, and tough alloy steels requiring heavy forming and facing cuts are handled to great advantage. Then, too, it is as easy to operate on the ordinary jobs as a machine without its reserve strength.

The standard carriage is the type that has been furnished on Warner and Swasey Turret Lathes for several years. Hand longitudinal and cross feeds are regular features of this type. Work requiring power cross feeds are best handled with the heavy duty carriage and power cross feed. Adjustable stops are provided for the cross slide. The round tool post for the front and the cutting off tool holder for the rear of the cross slide are similar to those furnished with the heavy duty carriage.

Hexagon turret is arranged for holding tools with or without shanks. The

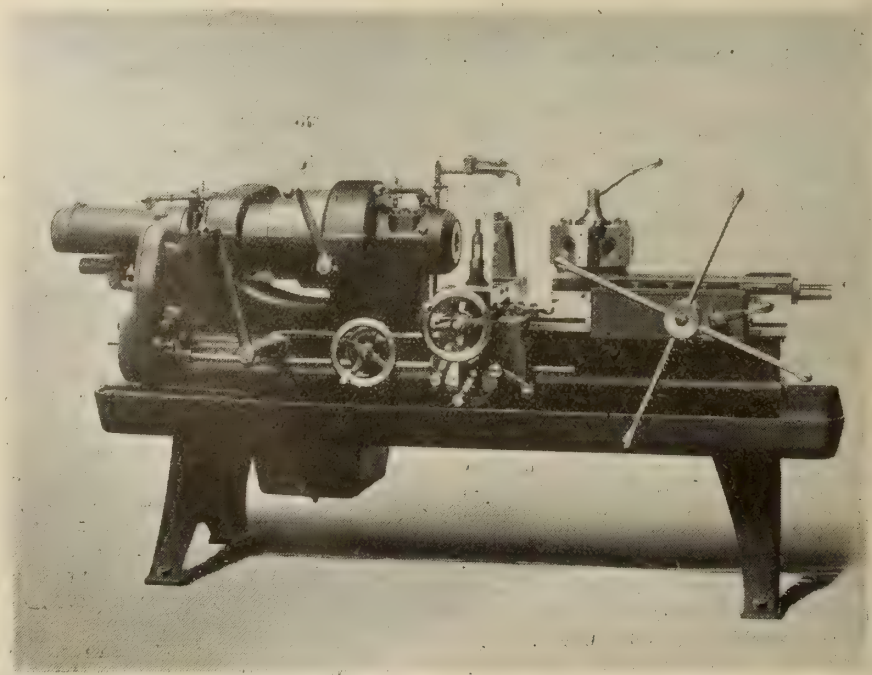


REAR VIEW SHOWING DOUBLE FRICTION BACK GEARS.

six-tool holes, counterbored for centering plate tools, are fitted with draw bolts and are bored 1¾ inches in diameter, unless ordered otherwise. Bolt holes are provided for securing plate tools to the faces.

The turret is revolved automatically by the backward movement of the slide. The locking bolt is at the front end of the slide, and works into steel taper bushings inserted in the bottom of the turret close to its outside edge, directly under the cutting tool.

Independent adjustable stops operate automatically for each position of the turret, and disengage the power feeds.



GENERAL VIEW OF THE LATHE.

They are readily adjustable for the length of each cut.

Turret saddle has a supplementary taper base to adjust the tool holes in turret to exact height of centre of spindle. Taper gibs, fitted the whole length of the saddle on each side, provide means for adjusting the slide sideways.

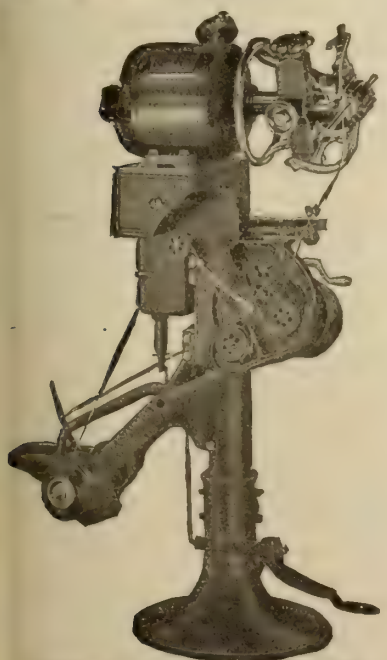
Power feed for turret slide is furnished when especially ordered. Any one of the four changes (38, 64, 107, 190) is instantly obtainable by moving lever. The automatic trip operates in connection with independent adjustable stops for each hole in turret.

An oil pump delivers a steady and abundant flow of cutting lubricant to the cutting tools. The pump operates when the machine is run in either direction.

NEW ARMATURE WINDER

The P. E. Chapman Electrical Works, of St. Louis, Mo., announces a much more complete model of the Chapman Adjustable Bipolar Drum Armature Winding Machine, in their style 3 as shown herewith. This model in addition to being adjustable in a few minutes for any style and size of random wound bipolar drum armatures and any size of wire from No. 20 to No. 36, has some special features enabling it to wind a very great amount of wire into armature slots without pounding the wire, and also has some unique lead forming and handling features reducing the labor on this part of armature winding.

Driving motor, controller, turn counter and other necessary parts are all integral parts of the machine, in fact, the machine is complete in itself.



GENERAL VIEW OF THE WINDER.

A new automatic dynamometer controlled real holder and tension device has been perfected, which it is claimed stops all spool troubles and enables quick starting, high speed, great tension and quick stops, so that only about five seconds are required to wind in a coil. This reel holder and tension device are simultaneously adjusted for any sizes of wire by a simple crank, and once adjusted needs no further attention until reel is empty. It is said the announcement of this device has been held back long enough to prove the machine a success in actual practice. In one case an output of nearly 600 per day was obtained where the estimate was 200 to 250. It is claimed that the output of the machines runs into hundreds of armatures per day on many sizes and kinds of armatures; that the saving over hand winding usually is anywhere from 10 to 30 to 1 or even better. It is claimed that the machine is easy to operate, well and strongly built; that it is useful both in the job shop and in the factory. The machine is also useful for winding field coils, smaller armature coils, etc.

W & A KEY SLOTTER

The Grob Hardware Corporation, of New York, sends us the following data regarding W & A key slotters.

In manufacturing machine or automobile parts in quantities, it very frequently happens that keyways or irregular-shaped holes are to be machined. Sometimes the proceedure is to do this work on a broaching machine or keyseater. A special broach must be made to the shape required, or if keyways are to be cut, a saw-shaped cutter-bar, the width of the keyslot. The cost of the tools alone is a serious item, which ranges anywhere from fifty to several hundreds of dollars. There is always a delay in getting these tools, sometimes several weeks, and there is also the possibility of breaking them, which means more delay and expense.

The W & A slotter will do a large volume of this work with practically no outlay for tools. Any shape can be machined, and, in many cases, in less time than a broaching machine could do it. The ordinary high-speed tool bit only is used, which is ground or formed to any shape or width. If broken, it can be replaced at a trifling expense, without delay. The slotter is instantly available for jobs within its rangs, and many thousands of parts can have the necessary machine operations performed on them and the job completed before a broach or special tool could be made.

The tilting table is a feature of great value. This allows the cutting of slots in tapered holes, the machining of all tapered work, and the rapid execution of a multitude of jobs which are within the range of neither broach nor keyseater, also entirely without the use of special tools.

In the tool-room, where a large variety of work is produced, this slotter will be found invaluable. Profiling, blanking dies, cutting clearances, filing and shaping of difficult pieces, are a few of the operations that can be accomplished with economy and ease, while another important feature is that the work is in plain view at all times.

The widest keyway that can be cut at once is ⅜ in. wide by 4¼ in. long in cast iron and 5-16 in. wide by 4¼ in. long in machine steel. A keyway of these dimensions can be cut in about one minute, either straight or tapered. The maximum stroke of the ram being 4½ in. Provision is made on all machines for attaching drive pulleys and countershaft. This will make a complete individual unit with three speeds, at small additional expense.

ELECTRIC WATER HEATER

The Bridgeport Machine & Tool Mfg. Co., Inc., of Bridgeport, Conn., have recently placed on the market an electric heater which can be used for the heating of water in factories, etc.

This device claims the following features: Clean, sanitary, and sterilized hot water, boiling hot if you desire, instantaneously, then natural cold water

BRIDGEPORT WATER HEATER

through the same faucet. A double valve faucet does not allow the cold water to pass over a red-hot resistance element. The same device will operate on either alternating or direct current.

To install, first remove the ordinary faucet and mount the Geyser. It is equipped to take standard ½-inch pipe. The name plate designates the voltage and amperage, which is all that is necessary to ascertain the proper size wire to be used for connecting direct from the meter to our device.

The two voltages supplied are their

110 Volt ..... 60 Amp.
220 Volt ..... 30 Amp.

but they can supply any voltage desired.

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Afraid to Let Go

WHAT is going to happen when the United States comes to the point when it must hand back the railroads of the republic to their owners?

That day is being postponed as far as possible. Every time it looms up as a sudden possibility some person comes along and shoves it a little farther into the future.

There is a peculiar proposition to be smoothed out in those same railroads. They are losing money, and it looks as though they were going to continue to lose money. The Government officials, when they had charge of the road, brought in the McAdoo award, which has put on a burden which only the very strongest and most fit can think of handling.

Supposing the private companies got those roads again to-morrow? What would they do with them? They would first of all have to start on the process of making them pay their way.

A Government road does not have to pay in order to exist. When a deficit occurs it has been shown that the easiest way out is to call on the Government for a grant and for an order increasing freight or passenger rates, or both.

Such practices may be all right for a short time under very unusual circumstances, but a continuation of them is the making of a catastrophe.

If the roads of United States were unconditionally handed back to the owners, and the owners were to start at once trying to make both ends meet, there would be trouble right straight off, and it might be serious enough trouble.

The trouble with too many Government departments, both in United States and Canada, is that they do not get a dollar's worth of value for a dollar spent. A private company has got to get its money's worth for money paid out, or something pretty close to it. If it does not, then there is bound to be trouble.

It begins to look as though the U. S. Government were afraid to let the owners of the roads come in and put the axe to the pile of multiplying expenditures that have been banked up against the earnings of the companies.

The Changing Mechanical Field

THE field of mechanical operations is changing in Canada. Perhaps the change can be noticed more quickly in United States, but it is coming here, and in a very marked form. The manufacture of automobiles may furnish the illustration for the case in point.

Take, for instance, the manner of treating cylinder blocks. Machines are in operation that bore out eight holes at once, where before it would have meant that a boring mill would have to have been employed to do the eight holes, one at a time.

Then there is another machine that at one operation will drill 47 holes at one time in the cylinder block. Previously this would have been done on an ordinary drill press, and the forty-seven holes would have been drilled one at a time.

Take the tapping of cylinder blocks. Here are two giant machines, twins you might call them, operating on 38 holes, 14 on one machine and 24 on the other. The machines are connected by a set of rails. A special jig slides on this rail from one machine to the other. This, in former days, would have been done by a tapping chuck, or farther back still, by hand, one at a time.

These operations are mentioned here simply to show that industry is changing rapidly to keep pace with the developments peculiar to the age.

Shop practice that was considered good enough a few years ago is now out of the question. It is a case of quantity production, and it opens one of the greatest fields possible for the mechanic who wishes to apply himself seriously to the problems that are confronting the shops that are working on such output as automobiles and parts thereof.

This refers not only to the design of machine tools, but to small tools to accompany them

It is a great study, and the chances are great in proportion.

But Times Have Changed

IN them there days what's went and gone and never to return; them days, my son, for which we sigh, for which we groan and yearn—we used to take a basket, then, around the Christmas time, and kick up quite a rumpus on two nickels and a dime.

We'd wander toward the market then, in homespun garb, my dear; with woollen socks upon our feet and wool tab on the ear.

We'd buy a turkey in them days—it did not strain our purse, nor yet did cause us to bust out in words that smelt of curse. We wandered through the grocery store, ah, yes, we did, by heck! Of currants and raisins and such truck, we bought 'em by the peck.

The gatherin' up of trinkets, too, it was a simple thing—we were not buyin' in them days as though for some fat king—in simple taste we sallied out and ere we went a block, we'd got for dad, in grey and red, a brand new Christmas sock.

But folks don't turn to them things now like what we used to do—the chance for gettin' past that way is mighty thin and few. For Christmas now we've got to go and dig down in our jeans, and peel from off our shrivelled wad the last few greasy beans.

We've got to give a motor bus, a gold watch or a farm—yes, scat you simple, woolly things what's weaved in braid and yarn.

Perhaps it's best that things should be just as they is to-day, as long as folks has got the cash to spill about that way—but I can't help just hankerin' back to them there days what's sped, when folks at Christmas time of year kept steady in the head. When we could saunter forth at ease around this buyin' time, and make a reg'lar rumpus on two nickels and a dime.—ARK.

The Tunnel Will Be Built

FOR years engineers have talked of the day when the tunnel would be completed between England and France. The world in general has not been much interested, probably because the world in general never thought such a thing practicable.

But work is going to start—start from both sides, the French and English Governments to find an equal share of the money and provide an equal share of the men.

Then it will be possible to take a train at London for Constantinople, for any European capital. Through the tunnel the line will be run by electric power. This will prevent trouble with engine fumes, which was one of the serious objections to the long tunnel through the Alps.

Forty-five minutes will be occupied in going through the Channel tunnel. Passengers, in fact, will pass through the tunnel almost without realizing they are passing under stormy Straits.

The tunnel will be about thirty miles long. It will not be exactly in a straight line. Beginning at a spot two or three miles on the island side of Dover, it will follow the gray chalk bed of the Channel, which is impervious to water and suitable for tunnel construction, and come out at a point between Calais and Boulogne, near the village of Marquise.

There will be, as on the London underground railways, two distinct tubes. Below them, about nine feet in diameter, will be a drainage tunnel. The whole work will take five years to complete and will employ 1,200 men on each side.

The French, who are proud of their share in the tunnel, will do half the work and find half the money. There is bound to be much friendly rivalry between the two sections of workers as to which will go ahead the faster.

According to exact calculations of the engineers, the French and British workers, who will begin construction of the tunnel thirty miles apart, will meet within an inch or two of the centre of the tunnel.

Doing Things Well

A GLANCE over the list of things for which merit and demerit marks are given on the C.P.R. system makes it clear that strict attention to business is insisted upon by this great company.

For instance, merit marks are given for these reasons:

Engineer—Detected broken rail, while in charge of passenger train and arranged to have same protected and replaced.

Engineer, fireman, brakeman—Discovered broken angle bars in track and took prompt action to have same repaired.

Section Foreman—Noticed brake beam down on coal car, on passing train, signalled train to stop and assisted in removing beam.

Trainman—Discovered two broken arch bars on freight train.

Trainman—For taking prompt action when he noticed sparks falling on oil house roof, and preventing roof catching fire, resulting in no damage being done.

Demerit marks come from failure to attend to business. Little things, perhaps. Caused no train wrecks. Lost no lives, but made it harder to give good service.

The C.P.R. is claimed to be 90 per cent. efficient in operation. It attends to details. It takes little or nothing for granted. It refuses to "take a chance."

What is good for the C.P.R. may be good for you, or for your concern. Make it your business to do things well.

POLITICIANS are keen to get a glimpse of the next Premier. But there's many a manufacturer who would much rather get a squint at the man who can deliver him a car of steel in sizes and shapes that he wants.

Let Up On Machine Shops

By DONALD HAMPSON

Just as every summer there appears a long list of drowning accidents, so does every summer and fall bring its quota of killed and maimed from farming machinery. Manufacturers who have been compelled by law to guard every possible and impossible point of danger in their plants, and have been heckled to the limit of endurance by officious inspectors and insurance men view with amazement the appalling disasters that are allowed to continue on the farm without interference. It is a fact that every issue of country newspapers during the season mentioned contains at least one account of fingers or hands cut off in ensilage choppers, legs cut off in mowing machines, men suffocated or burned to death in silos, fingers lost in unprotected "cogs" of gasoline-driven machinery, and so forth through a really frightful list of accidents made worse because the victims are usually alone and miles from skilled attendance.

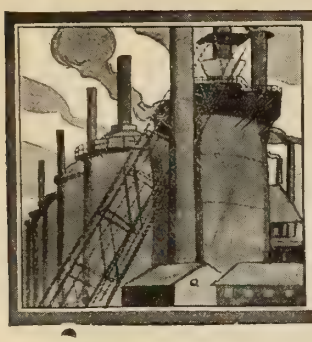
There was a time when machine shops were considered somewhat dangerous and the mighty hand of law was laid upon them never to be removed. However, this is all changed, and machine shop men and industrials generally feel that they are getting too much law while law is calmly "swallowing the camel" of the other fellow. Machine shop accidents to-day are of minor nature and almost never serious—the maimed workman is almost impossible to find. The writer knows of one shop of ninety men that has four among the number who are maimed to a greater or lesser degree (from lost fingers to lost feet) and every one of these four was injured on the farm. Any one of these accidents, and they are typical, would have made a great deal of trouble for the management had they occurred in the shop and would have cost from a hundred to ten thousand dollars through adjustments following, but the farm owner can proceed unmolested and his injured employee can learn to use a knife with his left hand, the only comfort (?) to be gained is that often the owner himself is the victim. Viewed from every standpoint, the shop men are justified in asking for no more regulations until the laws go after the really dangerous occupation of farming.

Aside from the features just detailed, mechanical men cannot help but wonder at the lack of guards on the products of manufacturers of farming machinery. Designers of every other class of machinery make guards and locks and safeties an integral part of the product, finding that it adds almost nothing to the cost while frequently it makes for increased efficiency and output. The farm machinery business forms too large a portion of the metal-working industry to continue in the useless sacrifice of life and limb.

AND now they are advocating an eight-hour day for farmers. When we was young we used to have the eight-hour day on the farm—one before dinner and another after.

* * *

TORONTO City Council failed to order compulsory vaccination. What else could be expected? With elections only a few weeks off who'd vote for a man who made him get scratched?



MARKET DEVELOPMENTS

Prices Going Up for New Machine Tools

Several Notices of Advances Have Been Received by Dealers This Week—Exchange Rate Also Helps to Make it Quite a Lift for the Canadian Buyer

PITTSBURGH despatches take some delight in stating that the steel strike has been broken, and the coal strike called off. That is good news, no doubt, but other Pittsburgh despatches, based on a knowledge of the steel industry, state plainly that it will probably be well on in March before a normal production can be expected from the steel mills. It all means that the Canadian industrial world will have to go easy—very easy in spots—in order to make the available steel spread over the scarce period. It also means that prices are going to be more than firm—they are going to be supplemented by a premium list which is already very much in evidence. It is hardly worth while publishing a list for jobbers just now because prices are only quoted against specific demand. Many jobbers have nothing to quote on in plate, sheets, tubes, etc., so a price list is unnecessary in their establishment.

When will the top come to the machine tool market? Just this week many Toronto dealers were notified of advances averaging around ten per cent. on standard lines. But they claim that it does not affect the sales, as the price is not nearly such an item as the ability to produce the machine. The exchange rate, duty and war tax now brings the price of a machine made in United States to an easy fifty per cent. advance over the price the American manufacturer has to pay. However, prices of machine tools are based largely on the figures prevailing at the time of delivery, and as deliveries are pretty well off into the future now the exchange rate may have righted itself before many more deliveries are made.

There is an acute shortage of cast iron scrap in the country at present, and no indications are in sight that any relief is forthcoming. This material generally comes from breaking down old plants or replacing old with new machinery. Otherwise the scrap market, especially brass and copper, is uninteresting and dull.

MONTREAL PORT HAS NOW BEEN CLOSED UP FOR WINTER SEASON

Special to CANADIAN MACHINERY.

MONTREAL, Que., December 18.—The closing of the port has virtually put the winter garment on Montreal, and especially in the vicinity of the harbor the decrease of activity is quite pronounced. Business generally has taken on a quieter tone, and this is particularly evident in many of the smaller metal working plants, where active operations are falling off. Dealers in steel lines intimate that business is still jogging along, with poor delivery still the factor of present trading. It is believed that some time will elapse before normal operations will be resumed. Coal supplies are uncertain and all parties are urged to exercise conservative policies. Machine tool movement is regulated by delivery from the States, and buyers are showing reluctance to purchase under existing conditions when adverse exchange is an important factor.

Scrap conditions are improving, but buying is not pronounced.

Slow Improvements in Steel

Despite the fact that the coal strike has ended and that recent restrictions on coal consumption has been partially removed, the situation as regards supply for industrial purposes is still sufficiently serious as to demand every precaution in the use of fuel, as the immediate supply is not ample to meet the full requirements of normal activity. The conservative burning of soft coal is almost as essential to-day as it was before the recent conference, and it will be some weeks yet before depleted piles can be replenished from the re-worked areas. The local situation is not causing undue concern, but all recognize the urgent necessity of reasonable conservation of supplies on hand. Many of the steel plants that were forced to close during the past week or two, in the States, are again active, and resumption of normal operations will, no doubt, be reflected here in the better delivery of ordered material, a condition that has been none too good for some time back. Dealers here are anticipating a quiet period until after the New Year, when some active buying is expected. The conviction that prices now ruling are likely to abide for a considerable period is firmly impressed upon the minds of most manufacturers and consumers, and early developments in the way of deferred industrial enterprise is not unlikely early in the New Year. In many lines of steel commodities the prices quoted are more as a guide than the actual figures at which sales are made, and when existing conditions are seriously considered it will be readily understood that present sales are invariably made on the merits of each individual transaction. Dealers here state that the prices quoted are a fair average of those generally figuring in current sales.

Strength Developing in Metals

There is a firmer tone ruling in the non-ferrous market, due to the more settled condition following the return to work of the coal miners. The demand has not shown any heavy increase, but the inquiry shows a more optimistic spirit on the part of consumers. The financial condition at present is the chief factor affecting business, particularly where purchases are made in the States. Dealers report a fair business in ingot metals but state that sheet movement is still restricted owing to the inability of obtaining sufficient to meet the trade requirements. Little galvanized material is carried in stock.

Quotations are unchanged, but a firm-

ness is evident that may result in stronger prices shortly.

Strength Appearing in Scrap

Following the resumption of normal steel operations as a consequence of the coal strike settlement, the market in old materials has shown slight improvement but no heavy buying improvements has developed, although the better inquiry would indicate that consumers are again looking for supplies. This has added to the strength of the situation and dealers report a steady firming in market conditions, a factor that will probably be reflected in an early upward revision of prices. Local dealers, however, are not looking for any great activity before the close of the year as the season's festivities generally have a bearing on business at this time of the year.

ADVANCES MADE IN THE SELLING PRICES

TORONTO.—There is practically no change in the machinery and steel market this week. Dealers in all lines are still figuring on what can be done to bring deliveries up to something that will keep pace with the requirements that are being placed upon the trade.

The exchange rate is not helping the sale of tools that are brought in here from across the line, but dealers are not certain that their business is suffering at all in consequence.

In some lines there is, generally, a little falling off during the season immediately around Christmas, but there is no reason to suppose that the same influence will not operate this year, although it is not much in evidence yet.

More Advances Made

In several instances this week, CANADIAN MACHINERY was informed that advices had been received of advances to the selling prices of several lines. One well-known firm making shapers, automatics, milling machines, etc., notified their agent of a five per cent. advance on December 8, while in another case the head of one Toronto machinery concern stated that the mail he was opening had brought in several notices of ten per cent. advances.

"Does that affect the volume of business you are booking?" asked CANADIAN MACHINERY.

"Not that we notice,' was the reply. 'The big thing just now is being able to get the machine wanted at all. The biggest bother is in getting in touch at once with all the outstanding quotations, notifying them that the figures that had been furnished to them have since been withdrawn. There is more annoyance from this than anything else, as we often have customers who imagine we should be able to get in and place their business at the price that has just been withdrawn. The exchange rate, while it is high, does not bother us much, as it makes a difference of only five per cent. above the price that has been paid all along. There is something else you must consider, viz., that selling prices of machine tools are based on the price at delivery, and not on present figures. Many of the best makers in the United States are sold out for four or five months to come, and by the time that has gone the exchange rate may have done much to right itself, so for the present there is no use of us worrying about it."

Should Plan Farther Ahead

Here's the opinion of one machine tool dealer, who has had a splendid chance to size up the situation as he finds it in the Canadian market: "Canadian manufacturers are fine fellows to do business with, but I am stating a plain and very apparent truth when I say that they do not plan far enough ahead. That is what is causing much of the congestion of orders at the present time. The average order that is placed in Canada looks like a piece of emergency business. You could almost imagine, at times, that the war was going to start all over again. It does not seem to be the practice to look ahead, make out their programme, and let the machinery dealers have a chance to get the business away to their principals in something like decent time."

The Small Tools

Some nice orders have been placed for supplies during the week. As stated last week, there is still some pretty close trimming being done in the matter of prices. One representative told CANADIAN MACHINERY this week that he had passed up a nice-sized order because he refused to meet a price that had been placed on the business. This same dealer was also of the opinion that the Canadian makers were holding their own in this market, despite other reports. Many of the dealers, outside of the special recognized representatives of the companies, are complaining of the lack of protection they receive from the makers. The makers of drills, etc., in Canada, sell at the same price to the trade as they will to the jobber. Dealers handling a number of lines feel that they must carry all these drills, etc., and in order to do so must make a profit on them. So, in some cases, they carry the lines, figure out their costs and selling price, and adhere to these figures regardless of what may or may not be done. They have to keep up their margin of profit, so they cannnot afford to cut prices in order to secure business, even on a large scale.

Like the machine tool business, the makers of drills, cutters, and similar lines are finding a demand for special equipment to do special work in the automobile field. So it is that firms have to make a special study of the shops with this view in mind.

Little in Scrap Market

Business is not making any new records in the scrap market just now. There seems to be a mysterious "something" in the scrap market these days that looks like some real happenings when it breaks, but there is also an air of mystery surrounding it that nothing has come out.

There is a very decided shortage of cast iron all over the country. It looks as though this shortage would become acute, as nothing is in sight at the moment to remedy the situation. The bulk of this kind of scrap usually comes from the breaking up of mills, factories, and the replacement of old machinery and equipment by new.

Conditions Are Worse

It looks from here as though the premium market would be in for a merry session in the spring, as far as the selling of steel is concerned. True, the United States Steel Corporation adhere to the schedule of March 21, but it must

POINTS IN WEEK'S MARKETING NOTES

Although the steel strike and the coal strike are both declared off, production at the steel mills in the United States will hardly be raised to anything like normal before the end of March.

—

U.S. authorities put a limit on the price of coke following a tendency to much higher prices due to the strike. The regulations may remain for some time yet.

—

It is estimated that the strike in the United States steel mills caused a loss in production of 2,600,000 tons.

—

U.S. railroads are counted on to come into the machine tool market for large supplies as soon as they are returned to their private owners by the U. S. Government officials.

—

Advances are reported in several lines of machine tools. Toronto dealers were notified of many ten per cent. advances. They contend that it does not hurt selling, although with exchange added it brings the price in Canada 50 per cent. above what the U.S. buyer pays.

—

Deliveries of steel are not improving. If there is any change in the situation it is for the worse rather than for the better.

—

Used machine tools are moving out very quickly owing to the fact that prompt delivery can be made, and there is also a big price difference.

—

There is an acute shortage of scrap iron just now, with no prospects of any relief. The coppers in the scrap line are dull and weak.

be remembered that the Corporation, large as it is, has a limit to its capacity, and also that none of the producers have much of a string on their material once it gets away from the mills.

Jobbers are trying to stock now for the spring rush, and they are finding that the work is hard and almost impossible. Any dealer that can get the ear of a mill just now, and secure a promise of a delivery at a date within reason at all, is lucky beyond words. Some of the rollers, according to reports, are not at all anxious to book up very far in advance, as they look for better business on ahead, and want to be in a position to get in on this when it comes.

Canadian mills are booked well in advance, so far, in fact, that there have been cases where orders for a very nice tonnage of sheets has gone begging for the reason that none of the mills cared to take it on. Booking is still going on at the Canadian mills, and they are making a very good performance in the matter of turning out the material.

NEW YORK MACHINE TOOL MARKET SHOWS A TENDENCY TO GO UPWARD

Special to CANADIAN MACHINERY.

NEW YORK, Dec. 18.—Not only has machine-tool business continued to hold up well, despite the restrictions put upon industry because of the coal situation, but the outlook for next year appears particularly encouraging. Many companies are known to be figuring on lists of tools to be bought early in 1920. The automotive industries bulk largely in present business and future prospects, but there are indications that next year the railroads will figure quite extensively in machine tool purchases. It is known that once the roads are returned to their owners, and a program of rehabilitation is inaugurated, large purchases of metal-working machinery will follow.

One of the interesting developments of the week is the issuance of a list of about 200 miscellaneous tools by the Wright Aeronautical Corporation, a new concern, which, in a measure, succeeds to the Wright-Martin Aircraft Corporation, though the assets of the latter were recently absorbed by the International Motor Co., of Plainfield, N. J. The Wright Aeronautical Corporation will build airplane engines, and possibly also Simplex automobiles. It will have a plant at New Brunswick, N.J., and possibly another one at Long Island City, N.Y.

Some Large Buyers

Other companies engaged in automotive lines are buying, or figuring on, extensive purchases. The Stevens-Duryea Co., Chicopee, Mass., has let a contract for a plant addition, and has already bought a few machine tools, with more purchases to come soon. Production of the Stevens-Duryea automobile will be resumed as soon as the plant can be tooled up. The Willys Corporation, Elizabeth, N.J., continues to place orders against its very large requirements, and the New Departure Mfg. Co., Bristol, Conn., a unit of the General Motors Corporation, has placed additional large orders in the past week. Several companies engaged in making lighting and starting systems, magnetos, spark plugs, etc., for automobiles, are figuring on buying tools early in 1920.

The American Locomotive Co., New York, is planning on the expenditure of several million dollars on plant expansion, and this will include some new work at the Montreal plant. New equipment, costing $500,000 or more, will also be purchased, some of the company's requirements now being before the trade for quotations.

The Farrel Foundry & Machine Co., Ansonia, Conn., which has purchased the Victory plant of the Fore River Shipbuilding Co. at Buffalo, has issued a list of about 70 tools, including large planers, boring mills, lathes, slotters, etc.

Prices on machine tools show an advancing tendency, some lines having been advanced from 5 to 10 per cent. within the past two weeks.

MAY BE MARCH BEFORE FULL PRODUCTION OF STEEL IS REACHED

Special to CANADIAN MACHINERY.

PITTSBURGH, Dec. 18.—An intense feeling of relief pervades the iron and steel industry. The coal strike is off, and probably carries with it what little was left of the iron and steel strike. What remains to be done is to complete the organization of working forces for efficient operations. Full output may not be reached until March, but steady progress is expected to be made. The steel trade feels as if it would be leaving behind it, with the old year, most of its troubles.

With one dissenting vote, the committee of the United Mine Workers, sitting at Indianapolis, on December 10, voted to accept President Wilson's proposal of 14 per cent. wage advance, any remaining grievances to be submitted to a commission of three to be appointed by the President and to report, if possible, within 60 days. Miners then began straggling back to work, and this week there is moderately-full operation of the union mines. Coal production by the non-union fields and a few union mines, had reached a rate about 50 per cent. of the rate in the four weeks ended Oct. 25, a period of very heavy production. Much coal was then being mined for stocking purposes, and thus there should be sufficient coal from now on, even though absolutely full operation at the union mines is not attained. Transportation will probably be the limiting factor. The railroads will make a special effort to expedite the production and movement of coal, but some of the commandeered coal had been moved far afield, and it will require some time to get all the empties back to their regular regions.

Most of the regulations as to the consumption of coal were removed by an order issued Dec. 12. They applied to the consumption of electric current in stores and office buildings. The regulation as to factories operating only three days a week was misunderstood in some quarters. It did not limit a factory that had coal, but prescribed that the distributing authorities would not furnish coal for more than a three-days' operation, and there was no guarantee that as much as that would be furnished.

Saturday, Dec. 13, the regulation as to consumption of coal in coke making was removed. As to beehive, the first restriction was 25 per cent., this being increased at the beginning of last week to 50 per cent.; but it required a little time to put the regulation into operation. Estimates are that last week's Connellsville coke production was 60 per cent. of that of the preceding week, which had shown a sharp increase over immediately preceding weeks, in the case of furnace ovens, but no increase in the case of merchant ovens. The by-product ovens were to be furnished no more than enough coal for a 50 per cent. operation, ovens being required to work on not less than 30 hours' coking time. This week the beehive ovens are operating as fully as labor conditions permit, while the by-product ovens will require some time to get into full operation again, as their coal must be shipped.

Pig Iron Production

Monday, Dec. 8, war-time price limits were placed on coke, these being $6 for furnace and $7 for foundry, in the case of Connellsville. Previously, there had been a scramble for spot lots, sending prices above $10. Some furnaces accumulated reserves, but a few had to bank; and this week a few more may have to bank, as it requires from one to two weeks for coke to reach destination. However, the restriction in pig iron production is not very serious. On the whole, the merchant furnaces have had to curtail more than the steel works furnaces.

The price limits will probably remain on coke until the end of the month

while coal price restrictions may last still longer. If the coke restriction were removed now there would be a wild market, through furnaces bidding against each other for spot lots, and furnaces claim that at such times some of the coke operators neglect their contract obligations to profit in the spot market, whereby some furnaces would simply be buying their own coke at a premium.

Steel Production

The coal strike can hardly have made steel scarcer, though there are no visible signs of it having made steel more plentiful. On the whole, the shortage of coal restricted the consumption of steel more than its production. A number of steel mills have been affected, but the finishing of steel has been restricted more than the production, through some works keeping their open-hearth furnaces, or Bessemer converters, going when they closed rolling departments to save coal, and the unfinished steel accumulated can be rolled later.

The Iron and Steel Strike

Before the coal strike began to restrict steel mill operations, the iron and steel strike was practically over, except in the Wheeling districts. Strikers in that district have been making investigations as to operations elsewhere, and find that the strike leaders grossly misled them by insisting that operations were poor in other districts. The Wheeling district strikers are, therefore, ready to go back to work, and plants in the district will be started as rapidly as fuel supplies permit.

While the strike is over, the steel producers explain that it will be some time before full production can be reached, as working forces are badly demoralized on account of so many men having shifted in employment, while the morale is low at some works through the men taking advantage of the knowledge that the employers preferred them to be on the payroll and doing indifferent work rather than to be on strike. The situation is probably not as bad as it is painted in some quarters, however, for it must be remembered that in August the production of steel, although greatly increased over the rate in May, was only about 80 per cent. of rated capacity, and in the first three weeks of September, just before the strike, it can hardly have been as much as 85 per cent. Thus the mills have no high mark to aim at in order to regain the rate of production before the strike.

It is now possible to make a fairly close estimate of the amount of steel production lost on account of the iron and steel strike. From its inception, September 22, until December 8, when the coal situation became altogether the dominant influence, there was a period of 11 weeks. The rate of finished rolled steel production just before the strike was about 600,000 gross tons a week; so that in the 11 weeks, normal production would be taken at 6,600,000 tons. Actual production may be estimated at about 4,000,000 tons, showing an apparent deficit of 2,600,000 tons. However, part of the production before the strike, perhaps 10 per cent. or more, was for the purpose of accumulating stocks, since the strike was expected, and in many quarters even a greater strike than occurred. Production for consumption was only between 500,000 and 550,000 tons, and stocks were drawn upon during the strike. The severest shortage was observed after the strike had been in progress eight or ten weeks, when production had greatly increased, because stocks were then largely exhausted. A 600,000-ton rate of production may not be reached before February or March, but if capacity operations are reached, the rate of production should be close to 725,000 tons a week. If labor shortage prevents full operation of steel mills, presumably the consumers of steel will likewise be affected by labor shortage.

Pig iron prices continue to show an advancing tendency, but only a slight one now, and possibly the buying movement is over.

SCOTIA CONTROLS ACADIA COMPANY

Purchase of Shares That Had Been Formerly Held by Belgian Interests

Halifax.—D. H. McDougall, president of the Nova Scotia Steel & Coal, is pleased with the results of the visit abroad of officials of that company. Prospects of export trade, especially in heavy forgings, axles and other finished products of the New Glasgow plants, were very encouraging, the Scotia company having formed most valuable connections in the British Isles and on the Continent.

In Belgium extensive and important business is now under negotiation, and the same may be said with regard to other European countries.

The high cost and scarcity of ships at the present time are delaying the closing sales of large quantities of ore that the Wabana mines are capable of producing, but the British and Continental steel manufacturers have a very high opinion of the quality of Scotia's iron ore and rapidly increasing and remunerative business in this direction will be finally closed when the shipping situation becomes clearer.

Gets Control of Acadia

On the other side the Scotia officials finalized the purchase of the Belgian interests of the Acadia Coal Company. This gives Scotia the control of very extensive and valuable coal areas in Pictou County which had been held in Belgium since 1910. The acquisition of these properties by the Scotia company means the rounding off of Scotia's holdings on the mainland, and in addition to greatly adding to the scale of the company's present operations it will eventually result in a much greater development of the properties of the two companies. Asked as to the rumors of the merger of the steel companies of Eastern Canada, Mr. McDougall said there was absolutely no change in this respect as far as Scotia was concerned. The company's connections on the other side, together with its already established business in Canada, places Scotia in a position to carry on very satisfactorily on its own account.

RAILROADS MAKE USE OF MOVIE BUSINESS

Teach Safety Ideas by Entertaining Methods—December Session of Railway Club

The advantages of motion pictures as an industrial educator were amply illustrated at the December meeting of the Canadian Railway Club, held in the Windsor Hotel, Montreal. One of the pictures shown was on "The House That Jack Built," the film used by the "Safety First" department of Canadian National Railways for the instruction of the employees in guarding against possible accidents incidental to the daily life of the railroad worker. Before the picture was thrown on the screen a preliminary talk was given by E. E. Stevens, of Moncton, N.B., safety engineer of the C.N.R.

The second picture depicted was what might be termed "Safety Second Movement" of industrial warfare. This film consisted of two reels taken by the St. John's Ambulance Association, for demonstrating in a pleasing and instructive manner the proper methods of treating a variety of injuries sustained by persons in the course of their daily domestic or industrial duties. The work of the St. John's Ambulance Association has been invaluable in the saving of life and limb, and a brief history of the origin and development of this universal first aid work was given in a very comprehensive talk by Col. R. J. Birdwhistle.

It was decided at the meeting that the annual dinner of the Canadian Railway Club would be held again this year, and a committee has been formed to arrange the necessary details for a banquet, which will take place about the end of January.

John Stewart, of Paris, Ont., died at Brantford recently. He was a resident of Paris for forty years and conducted a foundry in that city. He was born at Galt and has been living in Paris during the last four years following a stroke which incapacitated him. He is survived by three daughters.

Civil Service Appointments.—The following appointments are announced by the Civil Service Commission: Commander Bernard Leitch Johnson, D.S.O., Vancouver, to be superintendent of pilots for B.C., with headquarters at Victoria. John Milford Wyatt, juvenile employment specialist for the Department of Labor; Ralph Hoppimh, San Francisco, entomologist for the Department of Agriculture for B.C.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$33 00
Lake Superior, charcoal, Chicago	38 40
Standard low phos., Philadelphia	40 00-40 00
Bessemer, Pittsburgh	35 00
Basic, Valley furnace	30 00
Toronto price:—	
Silicon..2.25% to 2.75%	$37.00 to $40.00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	7 50
Chequered floor plate, ¼ in.	7 00
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

	Per 100 Pounds. C.L.	L.C.L.
Pittsburgh to Following Points		
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

		Gross.
Lake copper	$24 25	$24 00
Electro copper	24 00	24 00
Castings, copper	23 50	24 00
Tin	57 50	60 00
Spelter	10 00	10 75
Lead	8 25	8 75
Antimony	10 50	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 5 00	$ 5 00
Plates, 3-16 in.	5 25	5 25

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$14 00	13 75
Copper, crucible	17 00	17 00
Copper, heavy	17 00	17 00
Copper wire	17 00	17 00
No. 1 machine composition	15 25	16 00
New brass cuttings	11 00	10 75
Red brass cuttings	14 00	14 75
Yellow brass turnings	8 00	9 00
Light brass	6 25	7 00
Medium brass	7 25	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	6 00
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton	Gross
Heavy melting steel	13 50	16 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	14 50	16 00
Malleable scrap	18 00	20 00
No. 1 machine cast iron	24 00	25 00
Pipe, wrought	9 00	9 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	7 00	11 00
Stove plate	22 00	21 00
Cast boring	10 00	11 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	15
Carriage bolts, 7-16 and up	Net
Coach and lag screws	30
Stove bolts	50
Wrought washers	50
Elevator bolts	5
Machine bolts, 7-16 and over	10
Machine bolts, ⅜" and less	20
Blank bolts	25
Bolt ends	10
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $1.50
Nuts, square, tapped	add 1 75
Nuts, hex., blank	add 1 75
Nuts, hex., tapped	add 2 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	40
Sq. and Hex. Head Cap Screws	35
Rd. and Fil. Head Cap Screws	5
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	35
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	25
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	10
Studs	15
Taper pins	40
Coupling bolts	Net
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$43 00
Open-hearth billets	43 00
O.H. sheet bars	46 00
Forging billets	56 00
Wire rods	55 00

Government prices.

F.O.B. Pittsburgh.

NAILS AND SPIKES

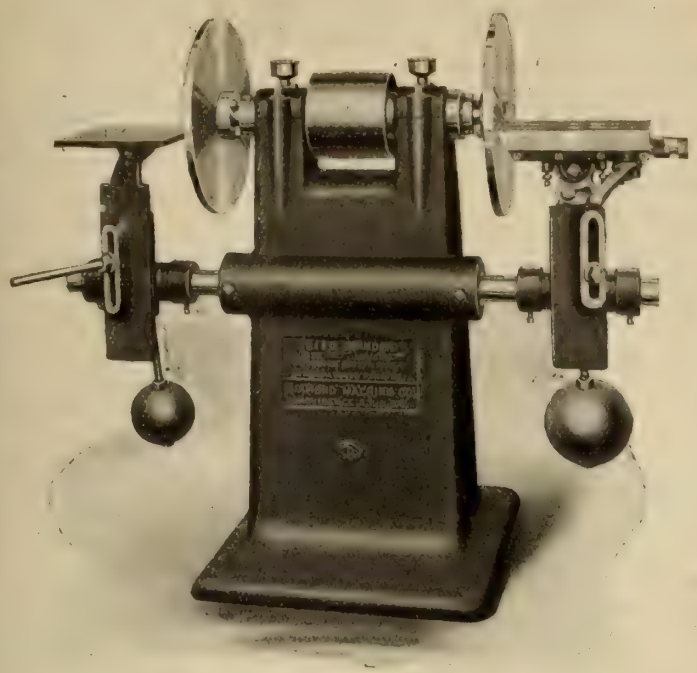
Wire nails	$4 95
Cut nails	5 00
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 32
British Manila rope	0 26
New Zealand hemp	0 26
Transmission rope, Manila	0 43
Cotton rope, ¼-in. and up	0 80

POLISHED DRILL ROD

Discount off list. Montreal and Toronto	net



DIAMOND
DISC GRINDERS

Good grinding in fast time has made the Diamond popular in a host of shops. The right design and build eliminate vibration and give the operator a perfect surface every time. There is a suitable size and equipment for every surface grinding job you have. Workmanship and material of "Diamond" quality throughout.

May we send you catalogue?

The A. R. Williams Machinery Company, Limited

ST. JOHN, N. B.
WINNIPEG, VANCOUVER

"If It's Machinery, Write Williams"

64 Front Street West
TORONTO

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited

Steel Foundry Division, Lachine Canal
Head Office: 187 Delisle St. MONTREAL
Phone Victoria 1402

MORROW SCREWS MORROW

THE MORROW PLANTS AT INGERSOLL

are an example of what can be attained by years upon years of skill, and honesty of purpose and liberal *treatment of customers.*

The company and the men are in perfect harmony—some of the men have worked continuously here for over 30 years—like one big family — from 300 to 700 people, all proud of their product and all striving with one object to give you the very best, *Twist Drills, Set and Cap Screws, Nuts,* etc., that are produced anywhere.

Every article, whether screws, nuts or drills, is guaranteed fully you must be satisfied or your money will be refunded.

Ask Your Jobber

John Morrow Screw & Nut Co., Ltd.

Ingersoll Files Are Good Files

MORROW DRILLS MORROW FILES MORROW NUTS MORROW

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40-10-5
Standard drills, all sizes	40-10-5
3-fluted drills, plus	10
Jobbers' and letter sizes	40-10-5
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	5% off
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus	20 to 40
Canadian high speed cutters, net to	10 off
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 75
Sheets, black, No. 10	6 00	6 00
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	8 20
Premier, 10¾ oz.	....	8 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅝ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	30 00	26 50
1¾ in.	32 00	26 50
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	24½
Palacine	24½
Machine oil, per gal.	36
Black oil, per gal.	15
Cylinder oil, Capital	58
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$11 50
Sheets, 3½ lbs. sq. ft.	10 50	11 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

GEOMETRIC

Adjustable Collapsing Taps

Have overcome all the expense and annoyance of tapping screw threads with a solid tap.

Anyone doing thread tapping knows what backing out a solid tap each time means. It usually means low production, poor threads, and worn out taps.

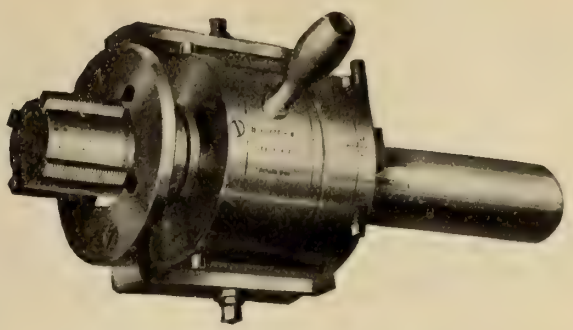
The mechanism of the Geometric Taps takes care of adjustment to correct diameter each time a thread is tapped, it collapses the chasers automatically, leaving a thread clean cut and perfect.

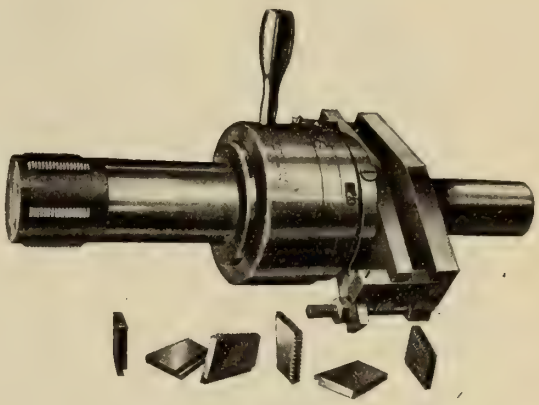
The chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

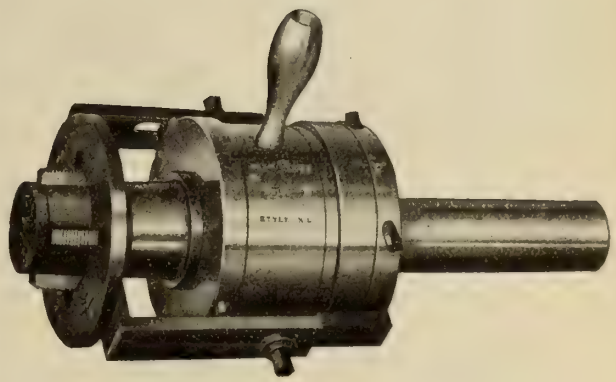
The manufacturers of the Geometric line of Collapsing Taps and Self-opening Die Heads are justly proud of the distinction which is theirs:—

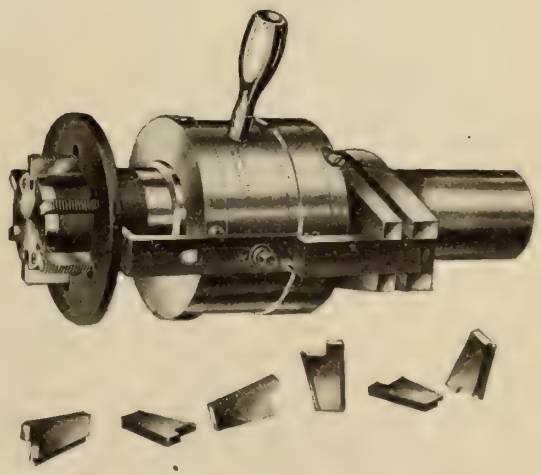
The Originators
and the
Largest and Best Known Manufacturers
of
Automatic Threading Tools

For cutting all classes of screw threads, internal and external, of any diameter and form.









The Geometric Tool Company

New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.; Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

MONTREAL NOTES

Lawrence Russell, vice-president and general manager of Armstrong, Whitworth of Canada, is on his way home from England, after a two months' business trip in the interests of the firm.

—

Following a recent address by T. B. Macaulay, before the Montreal Board of Trade, on the question of closer trade relationship between Canada and the West Indies, a special committee has been appointed to study the possibilities of this trade development.

—

The McClary Manufacturing Company will shortly erect a considerable addition to their Montreal plant, and have acquired an adjoining property for this purpose. It was stated by J. C. Newman, Montreal manager of the company, that the new building will be one of four storeys, and that construction operations will be commenced immediately.

—

Plans are progressing for the construction of a large modern equipped foundry at Lachine for the Dominion Bridge Co. This departure was found necessary, owing to the post-war developments of the company in regard to the manufacture of turbo machinery and paper mill equipment.

—

Owing to the pronounced scarcity of coal, the Canadian Trade Commission has taken steps to regulate the distribution of existing supplies, on a preferential basis. In connection with the bunkering of boats at Canadian ports, vessels under the Canadian flag will receive the first consideration. Generally speaking boats applying for coal will only be supplied with sufficient to reach their destination. It is recommended that, as far as possible, bunkering will be carried out at Sydney on account of proximity to the mines.

—

The closing of the port of Montreal for the winter season has transferred the shipping activities to St. John, N.B., and this latter terminal will take care of the bulk of the imports and exports of Canadian trade. In view of the growing importance of the city of St. John it has been proposed that better hotel accommodation should be furnished and to this end plans have already been prepared, and the committee in charge have recommended a structure of about 200 rooms at an estimated cost of approximately $900,000, of which $700,000 has already been raised.

Windsor.—During the operation of salving the Willis L. King, the chief officer, John T. Lillis, was killed, and James Dawson, foreman of the Great Lakes Engineering Works, Ecorse, was painfully injured. The accident was caused by the wire cable breaking away from the snatch block, while the tug was pulling on it in an effort to release the steamer from the bank.

U.S. SCRAP METAL

The pig iron market is still advancing, but is steadier than has been the case of late. In some districts, uncertainty over the coal situation has affected the market. Following are reports from various sources:—

PITTSBURGH—There has been a general advance of $1 per ton on the base grades of pig iron. Basic is selling at $34. The market is not so much on edge as it has been, but demand is good. Producers are not anxious to take much business at current prices. There is still a lot of 1920 business to close, and prices are expected to improve still more.

BOSTON.—Iron is scarce, both for prompt delivery and first half, and prices are mounting. A Massachusetts melter has bought from Eastern Pennsylvania furnace No. 2X at $37 furnace, prompt shipment. 400 tons of $3.25 to $3.75 silicon was bought for $41 Virginia furnace. Price is secondary consideration in the present state of the market.

NEW YORK.—A good deal of iron has been picked up quietly, and is being held for a rise. Basic has moved during the week at $35 Eastern Pennsylvania furnace. A Central Pennsylvania furnace is quoting $39 furnace on 1.75 to 2.25 silicon. There is not much iron available at furnaces.

Trade Notes

Restrictions on Gas Users.—The Government Gas Commissioner at Chatham has issued an order prohibiting any industry using natural gas for special manufacturing or commercial purposes without first obtaining a permit from the local gas company.

Sudbury Wants Aerodrome.—The Sudbury Board of Trade have decided to invite a representative of the Bishop-Barker Aeroplane Company to visit the city in connection with the establishment of an aerodrome for the trans-country service the company have in prospect.

Brantford Factory Has Large Output.—The Dominion Steel Products Company of Brantford turned out a total of 800,000 tons of propeller shafting during the war. This was twice as much as Canada's total tonnage for the year of 1918. One shaft was built for the United States destroyer Reid.

Coal Embargo Still On.—The restriction on coal which have been removed in the United States are still in force in Caanda. The embargo on coal coming across the border is still in force. This was announced following a meeting of the Dominion and Provincial fuel controllers, subsequent to the settling of the U.S. coal strike. There is still the danger of a serious car shortage developing, which would be as bad in its way as the non-production of coal at the mines.

PIG IRON TRADE

The market for old material is firm. In most districts demand is good, with rising prices in some cases. Following are reports from U.S. points:—

PHILADELPHIA. — There is a fair demand for most grades of scrap, and the tendency is for prices to advance. The fuel situation is acting as a check but should be discounted by now. Heavy melting is quoted at $25, delivered.

BOSTON.—All grades are in demand and selling higher. No. 1 machinery has sold at $36, and heavy melting at $18. 400 tons of No. 1 cast was sold at $34.50. Heavy cast brings $28 to $28.50.

NEW YORK.—The general trend of prices is upwards, in spite of one or two exceptions. Cast borings have dropped $1, now quoted $16.50 to $17 f.o.b. New York. Heavy melting is now $18.50 to $19 f.o.b. New York, an advance of 50 cents. Machinery cast has gone up $2, and is now $27 to $28 f.o.b. New York.

PITTSBURGH—The market is strong. Dealers are not inclined to make any sacrifices, on account of the threatened curtailment by the mills. Heavy melting is at $25, delivered. Other grades are strong, except bundled and baled sheets.

INCORPORATIONS

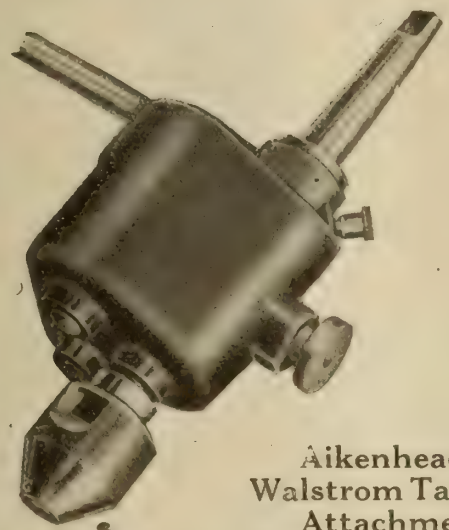
The Dominion Engineering & Machinery Company, Ltd., with a capital stock of $3,000,000, and with head offices at Montreal, heads the list of incorporations in this week's "Canada Gazette." Other companies are: United Amusements, Ltd., Montreal, $1,000,000; Peterborough Paper Box Company, Peterborough, $50,000; Super-Cement (America) Co., Ltd., Toronto, $500,000; Manatee Lands, Ltd., Montreal, $150,000; Scientific Experimenter, Ltd., Montreal, $100,000; Olswang Leather Specialty Co. of Canada, Ltd., Montreal, $20,000; Canada Drugs, Ltd., Yorkton, Sask., $50,000; Winans, Dickinson & Whitehead, Ltd., Montreal, $200,000.

Kingston.—The barge Cadorus, owned by the Sincennes-McNaughton line, sank in lock 21 of the Morrisburg Canal. The stern section of the Great Lakes liner Northland is blocked, owing to the accident. The Sincennes McNaughton Company will commence wrecking operations at once.

Montreal.—Plans for the harbor works at Vancouver have been authorized, and Mr. A. D. Swan, consulting engineer, has been instructed to proceed immediately with the work. The work will cost $5,000,000, and tenders will be called for within six or eight weeks. The Vancouver Harbor Commissioners have been studying harbor facilities at Montreal, Quebec and New York.

Aikenhead's Tools

Dependable in Quality and Service



Aikenhead's Walstrom Tapping Attachment

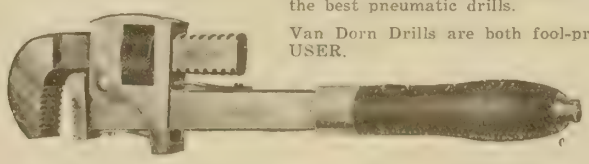
The oscillating movement mechanically imitates hand-tapping, though 10 times faster, and reduces tap breakage to the very minimum.

Attached to any drill press will quickly pay its cost.

Aikenhead's VanDorn Electric Portable Drills

Van Dorn Electric Drills make neat, clean holes 50% faster than the best pneumatic drills.

Van Dorn Drills are both fool-proof and trouble-proof. ASK THE USER.



Aikenhead's Stillson Wrench

The best of its kind always grips when wanted. A dependable friend for all types of pipe work.

Aikenhead's Walstrom Chuck

Grips the tool by the entire shank.

The cam action is such that the resistance on the tool governs the holding power of the jaws. **Slippage is impossible.**

Aikenhead's Bull-Dog Die Stocks

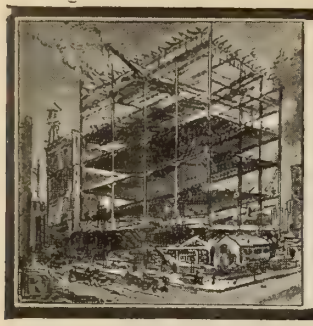
No keys—no collets—and tool changes made in two seconds without stopping spindle. No small parts to lose or get out of order nothing to break in use. No leader screw, making it possible to furnish with dies for a longer range of sizes.

Write for full particulars and prices re any line or lines in which you are interested.

Aikenhead Hardware, Limited

17 Temperance Street - Toronto, Ont.

If interested tear out this page and place with letters to be answered



INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

PECKOVER'S, LIMITED, TO ERECT BIG WAREHOUSE AT FOOT OF SPADINA AVE.

ANNOUNCEMENT is made of the formation of a new warehousing, jobbing and importing company in Toronto under the name of Peckover's, Limited. Work is being rushed on tem-

J. G. NEAR,
General Manager, Peckover's Ltd.

porary premises at the foot of Market street, the firm's address being for the present 67 Esplanade. They have been fortunate in mill deliveries, for already over a thousand tons are on the way in the line of bars, steel and iron, alloys, nickel steel, tool steel, sheets, plates, galvanized, tubes, etc.

The new premises, which will be ready as soon as possible in 1920, give Peckover's, Limited, a splendid site of three acres at the foot of Spadina Ave. at the corner of Fleet street. Besides a splendid dock, they are on three lines, the C.P.R., G.T.R., and C.N.R. In this way they can get water delivery from Algoma, Hamilton, or the mills in Nova Scotia, and are close to the rails for quick shipment.

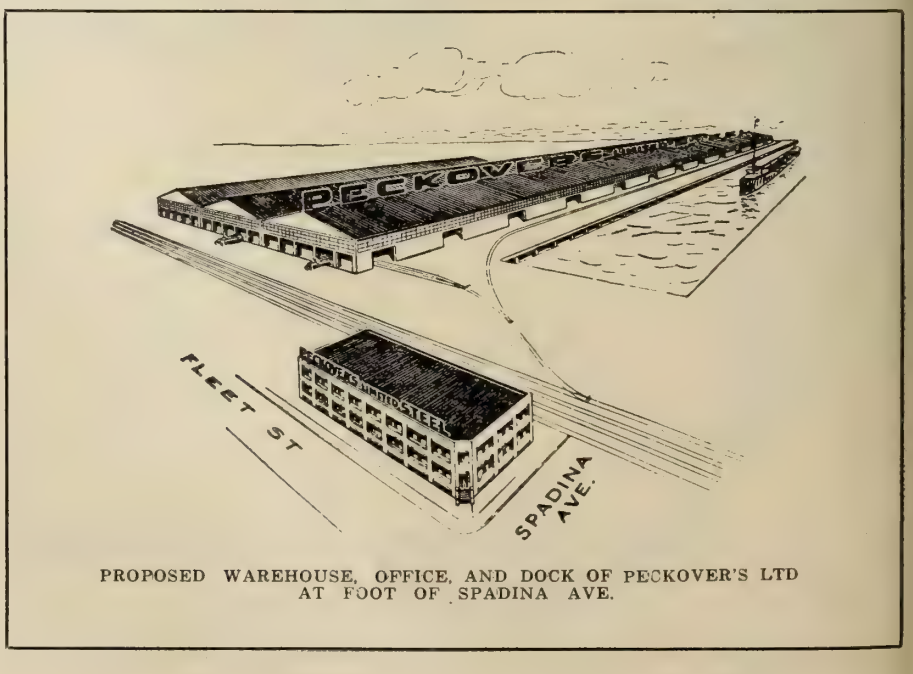
The principals in the new company are C. R. Peckover, of the firm Baines & Peckover, and J. G. Near, for the past 18 years with the Drummond-McCall Co., of Montreal and Toronto.

Mr. C. R. Peckover has been in the steel business in Canada for a long time. He first started at the study of steel in Scranton, coming to Canada about 23 years ago to the Rice Lewis Co., but remaining with them for only a year. It was then that he went into business with Mr. Baines as agents for the London Rolling Mills and for the London Bolt and Hinge Works. The firm of Baines & Peckover developed to large proportions, Mr. Peckover enjoying the confidence of a large clientele on account of his intimate knowledge of the steel business. Mr. Peckover has been a traveller as well as a successful steel merchant, but his travelling has very often had a touch of business. For instance, he has visited nearly all the large steel mills of America and Europe, and also most of the best conducted warehouses, looking for information and ideas.

J. G. Near is a Toronto boy, going from school to the Drummond-McCall business some 18 years ago. Mr. Near had much to do with the development of the Drummond-McCall warehouse department, having charge of that work for some years, and latterly in charge of all sales. He is well known to the industrial interests of Ontario particularly. A few years ago Mr. Near was better known as a runner, winning the Ward Marathon in Toronto (20 miles) in 1909. He also ran well up toward the front in the Boston Marathon, and was third man when the Hamilton Herald road-race was bringing out a string of contestants from all over the country each year. Mr. Near becomes the general manager and secretary of Peckover's, Limited.

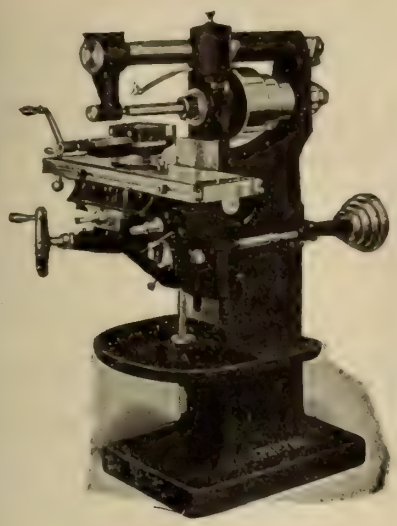
The new warehouse at the Spadina avenue property will be a model one in every particular, with overhead electric crane installations for moving material. The main building will be 200 feet wide by 600 feet long, while the offices of the company will be across the tracks, on Fleet street. Several changes will be made from the ordinary warehousing practices in Canada. Sheared plate is bought now in practically every case, but Peckover's, Limited, will cut to any size desired, in plate, shapes and structurals. Plate also will advance six inches at a time, instead of a foot, which is now the general practice.

As far as CANADIAN MACHINERY can learn, Peckover's, Limited, was brought into existence at this particular time on account of a fairly well-founded rumor that a large American concern was coming in here to conduct a waterfront warehouse on similar lines. The new firm is capitalized at half a million dollars, with $300,000 paid-up capital.



PROPOSED WAREHOUSE, OFFICE, AND DOCK OF PECKOVER'S LTD AT FOOT OF SPADINA AVE.

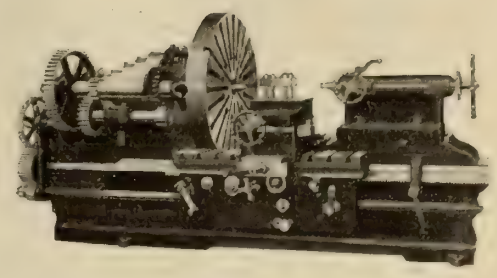
MACHINE TOOLS



New or Used

We have an excellent list of new and used machine tools in our Toronto warehouses and on order for early shipment.

YOU are undoubtedly from time to time buying new equipment.
YOU will profit by giving us an opportunity of quoting you.



Garlock-Walker Machinery Company, Limited

32 Front St. West, Toronto

MONTREAL - - WINNIPEG

"Everything in Woodworking and Metalworking Machinery"

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Grind your cutting tools in exactly the right way to get best results—and you save time. That's obvious. It is precisely that that this Tool Grinding Chart enables you to do.

It has been adopted as standard by many firms that found it a long way better than guess work.

CANADIAN MACHINERY would like to see this Chart in every shop in the Dominion. Mail the coupon below for your copy to-day.

Shows at a glance Correct Clearance and Rake Angles for Cutting Tools

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send me/us free, one of your tool grinding charts.

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City .....

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CANADIAN PAT. OFFICE NO. 44

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Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

Order "Hawk Vanadium" for your End Mills and cutters. Once known—always used.

Large Stock. Prompt Shipment.

Write for full particulars to

Hawkridge Brothers Company

Main Office and Warehouse:
303 Congress Street, Boston, Mass.
Storehouses Malden Mass.

STEEL
OF EVERY DESCRIPTION
SEND US YOUR ENQUIRIES.

Take notice that the Bennett & Wright Co., Limited, of the City of Toronto, Canada, duly manufactured the hot water heater covered by Canadian Patent No. 167120 prior to the period called for by the Patent Act, and on application to the undersigned any further orders for the above invention will be filled at a reasonable price. Ridout & Maybee, Kent Bldg., Toronto, solicitors for Anders B. Reck.

A Drinking Water Service that will last a LIFETIME

What you pay for a few ordinary drinking cups will meet the cost of the

PURO **SANITARY DRINKING FOUNTAIN**

(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean fresh water at a reduction of 15% to 35% in water bill. "PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.
Easily attached. Simply unscrew the ordinary faucet and put on the "Puro."
Write us to-day for full information regarding the cost of installation of the "PURO" Sanitary Drinking Fountain Service.

Puro Sanitary Drinking Fountain Co.

Canadian Agents
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18 St. Alexis St., Montreal, P.Q.

KNIGHT
Metal Products

If you do not see what you are looking for on this list ask us. We will most likely have it.

Used Machines

DRILLS

1—Perfect plain drill No. 19.
3—Perfect drills, No. 14.
1—Perfect drill, No. 15.
3—Le Land Gifford bench drills, high speed.
3—Le Land Gifford ped. drills, high speed.
12—Langalier H.S. bench drills, No. 2.
6—Langalier H.S. bench drills, No. 1.
And others.
1—No. 15 Garvin plain milling machine with vise and universal dividing head.
1—Perfect hack saw, No. 2.
1—Racine hack saw, No. 1.
3—No. 515 Acme Automatics, ⅝" capacity.
20—2¼" single spindle Gridley automatics.
6—No. 4 Foster screw machines.
1—14"x6' McKenzie engine lathe.

Also hangers, pulleys, belting and shafting, etc.

NEW

Knight Chucks

4"—3-jaw, 2 set jaws.
5"—3-jaw, 2 set jaws.
7½"—3-jaw, 2 set jaws.

Osborne & Sexton shapers
Paschall milling attachment for lathes

Knight Metal Products

Machine Tool Department
67 Adelaide St. W., Toronto

Your Ad in this Section

will get the attention of the busy men. They find grouped here a big list of equipment for immediate shipment, and they use it as a catalogue when they need any. Will they see your list?

TRADE GOSSIP

Brantford Cordage Will Rebuild.—The brick warehouse of the Brantford Cordage Company, which was blown down by the recent severe windstorm, will be rebuilt immediately. The new building will be steel and brick, and the P. H. Secord Construction Company have the contract. Work has already been commenced.

New Toronto Factories.—There are some big new buildings projected in connection with Toronto's industries. The Willard Chocolate Company are going to erect a large factory on the corner of Manning Avenue and Dupont Street, for manufacturing ice cream, the cost to be about $140,000. The Ward Baking Company, of New York, will erect a bakery on the north-west corner of the same streets, and on the north side of Dupont Street the Kinnear Wholesale Grocery Company will erect a $150,000 warehouse.

Hope for Settlement Soon. — The conciliation board enquiring into the Nova Scotia coal strike, held its first sitting recently, and following it, an official of the U.M.W. stated that there were good hopes of an early settlement. Mr. H. J. McCann, assistant to Mr. Mark Workman, signified his willingness to meet the men's representatives, and the latter said in reply that they had always been anxious to discuss their differences, and would be pleased to accept the offer of a further conference.

Fuel for Foundries. — According to Mr. Harrington the 150 cars of soft coal that have been held at the U.S. border have been ordered released by the Federal authorities. There is, therefore, no further fear that Canadian foundries will have to close down for lack of coal. Coke will, likewise, be allowed to come freely into Canada. Mr. Harrington also said that unless the utmost conservation was observed in office and large buildings, he would be forced to issue an order limiting the temperature, and enforce heatless days.

Going to Sarnia?—Lake Huron Steel Corporation plans are now centred in Sarnia, according to latest reports from that centre, and a deal is understood to be in process of completion for the acquiring of 1,184 acres along the St. Clair River front from the Sarnia Indians for $200,000. The property in question adjoins the tract purchased some time ago by the Wills Lee Automobile Corporation of Sarnia and Port Huron. It is the purpose of the Steel Company officials to proceed with the erection of a $15,000,000 plant in March. The persons whose names have been associated with the enterprise are S. A. Howland, Detroit banker, and J. J. Mahon of the Imperial Munitions Board. Several other men prominent in Canadian and American industry are stated to be connected with the company. The Chamber of Commerce and City Council of Sarnia are meeting the officials of the Steel Company to negotiate on the matter of concessions.

CHANGES MADE IN INGERSOLL FIRM

Ingersoll.—An important announcement pertaining to changes affecting several local industries has been made. It is of special interest to citizens in view of the fact that the annual payroll is one million dollars, which will necessarily be a big factor in continuing the substantial progress which this town has been making.

E. A. Wilson of the Ingersoll Machine Co., Ltd., has joined with the John Morrow Screw & Nut Co., Ltd., and will be vice-president and joint manager with J. A. Coulter, the head of the Morrow Co. for many years. It also has been announced that the Morrow Co. has purchased an interest in the Ingersoll Machine Co., Ltd., and the American Machine Products Co., Incorporated, of Detroit, and will, with Mr. Wilson and Mr. Munger, formerly of this town, operate them, together with the Ingersoll File Co., as subsidiary companies to the John Morrow Screw & Nut Co., Ltd.

At the plant of the Ingersoll Machine Co. some $50,000 worth of new machinery is being installed to make a line of tools not previously made here.

Col. F. H. Deacon, of Toronto, honorary president and director of the board, will devote as much time as possible to the development of the industries here.

MARINE

Kingston—The Canadian Beaver was launched from the yard of the Collingwood Shipbuilding Company at Kingston, being christened by Mrs. J. B. Foote, wife of Capt. J. B. Foote, of Toronto. The vessel is a full canal-sized freighter for the Canadian Government Merchant Marine. She is 251 feet long, and of 3,500 tons deadweight.

The Chairman of the Board of Control, Toronto, will receive tenders up till February 10th, 1920, for the supply and installation of one or more 16 to 20 million imperial gallon centrifugal pumps at the waterworks main pumping station. Specifications and forms of tender can be obtained at the Works Department, Room 12, City Hall.

Hamilton.—The steamer "Floretta," which was the first boat to steam through Hamilton harbor at the opening of navigation this season, has been refloated from the shoals of Kelly Harbor. She was stranded there through the receding of the water caused by the heavy wind of a few days ago. She has been in continuous service all season, and has steamed a total of 2,360 miles.

Halifax.—The "Royal George," fitted with an amplifier on her wireless apparatus of the same type that has been heretofore only supplied to warships, has broken a record for wireless telegraphy on merchant ships. She received a message from England when only a few miles off Halifax, this being the first time a merchant vessel has received a message clear across the Atlantic. The "Royal George" is the first merchant vessel to be fitted with an amplifier.

Montreal.—The Elder-Dempster liner "Bassa," which went ashore while clearing harbor on her voyage to South Africa, has been successfully refloated. She was taken into Vickers' floating dry dock for examination and repair, if found necessary. Before she could be floated it was necessary to lighten her of a large part of her cargo, and required the united efforts of a harbor tug and the Government steamer "Strathcona" to dislodge her.

Montreal.—Admiral Jellicoe does not believe that surface ships will be entirely supplanted by submarine and aerial types in the near future. Speaking before the Canadian Club in Montreal, he said he had every respect for the enthusiasm of aircraft and submarine officers, and no doubt it was very tempting to those who held the purse-strings to say "Let's spend no more on the navy." He thought the fact of the Admiralty being about to sell the "Indomitable" was because she was out-of-date.

London.—Owing to the frequency of losses due to floating mines the marine underwriters have been compelled to raise their rates. The rate is now about one-half of one per cent., against one-eighth of one per cent. a few weeks ago. The rates were dropped after a rather long period in which losses were low, but they have been gradually increasing. After the Russo-Japanese war, losses from mines were encountered as long as eighteen months from the conclusion of hostilities.

NEW CATALOGUE

The Clark Equipment Co., Buchanan, Mich., have issued a very attractive catalogue illustrating their well-known line of Celfor drills, reamers, lathe tools, etc. Their complete line is described in this useful book. A general information section is placed at the back, containing telegraph codes, feeds and speeds, morse taper shanks, decimal equivalents, and other useful data. This is known as their catalogue No. 17.

TOOL HOLDER CATALOGUE

A catalogue of unusual style has reached us from Jones & Shipman, Leicester, England. This booklet illustrates various style tool holders, both English and American design, but shows, in almost natural color, the finish on these holders. Lathe dogs, sockets, tool drifts, and centre drills, gauges and chucks, are also included in the catalogue.

LOOSE LEAF CATALOGUE

The Smith & Mills Co., of Cincinnati, Ohio, have recently issued an attractive loose leaf catalogue on their lines of pillar shapers, showing various size machines, also attachments for the same. Shaper vises are also included in this catalogue.

Increased Capitalization

The business of the Smalley General Company has grown so rapidly that a larger capitalization has become necessary to increase its plant and other facilities.

The Smalley General Company has increased its capital from $50,000 to $525,000, all of which is paid up. It has no bonded, mortgage or other funded indebtedness. It has no floating indebtedness save current accounts. It will discount its bills.

The management and officers of the Company remain the same. The new stockholders are: Messrs. John W. Eddy, of the Skinner-Eddy Corporation, Seattle, Washington; James G. Eddy, of the Ferry-Baker Lumber Company, Everett, Washington; R. B. Eddy, of the Eddy Investment Company, Bay City, Michigan; Howard F. Smith, of the Michigan Pipe Company, Bay City, Michigan, and Dominion Sugar Company, Chatham, Ontario, and J. R. Decker, Sales Manager of the Smalley General Company.

This increased capitalization will place the Company in an excellent position to promote the development of Thread Milling, to increase its production and to serve its customers.

SMALLEY GENERAL CO., INC.

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Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

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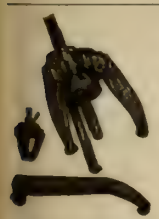
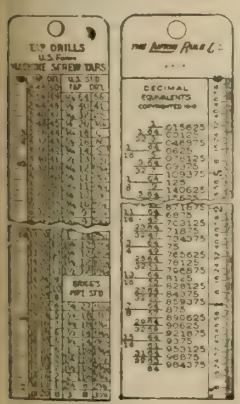
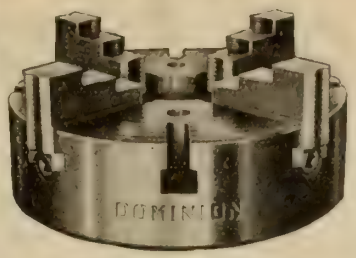

SAYS THE MASTER MECHANIC: The Greb Automatic Grip Puller is a One-Man Puller—Quick-acting, strong and simple in the extreme. May be locked in any desired position. A combination of two or three arms. Heavy Duty Size capacity 1" to 18"—Junior size capacity 1" to 7". Two sets of jaws furnished with each size.
TEN DAYS' TRIAL.—If your dealer or jobber does not have them we will send you one. Try it ten days. If not satisfactory, return to us and we will refund your money. We also make the GREB RIM TOOL.
HET GREB CO., 318 State St., BOSTON


A Handy Machinists RULE
Combining measurements 1/32nds—1/64ths together with tap drill sizes and decimal equivalents.
LUFKIN
TAPES AND RULES
Accurate and Durable
THE LUFKIN RULE CO. OF CANADA, LTD.
WINDSOR, ONT.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STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY

All Screws Are Reversible
SCREWS are made of the best grade steel. Both ends are broached and are heat treated after machining. They are reversible, so that either end may be used, are large enough in diameter to stand the torsional strains applied by operator when setting up his work. They are made to give the best service—and may be depended upon to stand up under the hardest usage.
DOMINION STEEL PRODUCTS CO. LIMITED
Engineers • Manufacturers
BRANTFORD, CANADA

BETTS
Builders of Heavy Duty Machines for over 50 years
PLANERS, BORING AND TURNING MILLS, HORIZONTAL BORING & MILLING MACHINES, LATHES, SLOTTERS.
Betts Machine Co., Inc. 408 Blossom Rd. ROCHESTER, N.Y.

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OVENS
Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.
Brantford Oven & Rack Co., Ltd.
Brantford, Canada.

MORTON MANUFACTURING CO
PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R.R. SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
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MACHINE TOOLS for Shipbuilders & Iron & Steel Works
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on all branches of Engineering and every conceivable subject. Second-hand at half prices. New at lowest prices. State wants and send for Catalogue No. 23, post free.
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WHEN ANSWERING ADVERTISEMENTS KINDLY MENTION NAME OF THIS PAPER

Long Lived

Because It's Made of Robertson Process Metal

Few parts of your buildings are subjected to the severe conditions that ventilators must face. With smoke, acid, alkali fumes and gases coming through them; and snow, sleet, and wind battering away at them on the outside it is no wonder that ordinary ventilators crumble away and cost so much for repairs.

This different kind of ventilator—the Robertson Ventilator, is *totally different* from other ventilators for two reasons.

First—It's made of Robertson Process Metal—a material that does not need painting and does not corrode. It is not affected by acids, fumes and gases.

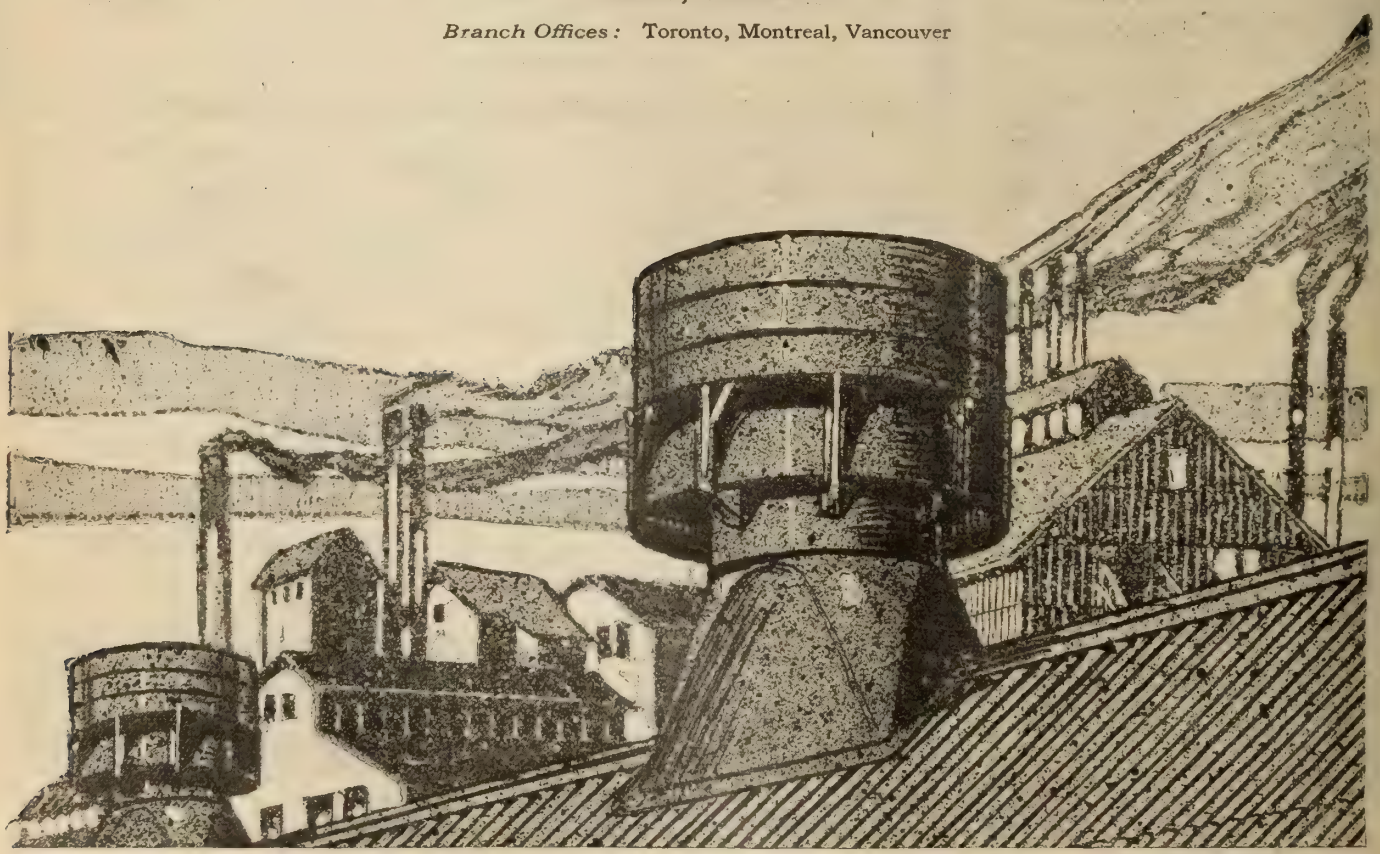
The underlying reason for this great durability is the three impervious coatings which serve as true protection. First, asphalt; second, asbestos; third, water-proofing. The metal is fully protected first and then built into Robertson Process Ventilators.

Second—It is a matter of design—a design which develops more "air-pulling" capacity than any other ventilator of equal diameter. The Robertson Ventilator is a stationary type. It therefore requires no oiling or cleaning and does not get out of order. By the use of projecting wings, two sets of tapering air channels and frustum cone hood with extra large outlets, this ventilator puts to work every air-current regardless of its direction. It does its work under the most adverse conditions—low or high wind velocity.

Robertson Ventilators are built in standard sizes with stack diameters from 8 inches to 72 inches. Robertson Engineers have made a special study of ventilation problems and their services are available without obligation. Send for special ventilator booklet or general booklet Robertson Process-Metal Gypsum, Asphalt.

H. H. ROBERTSON COMPANY, Limited
Sarnia, Ontario

Branch Offices: Toronto, Montreal, Vancouver



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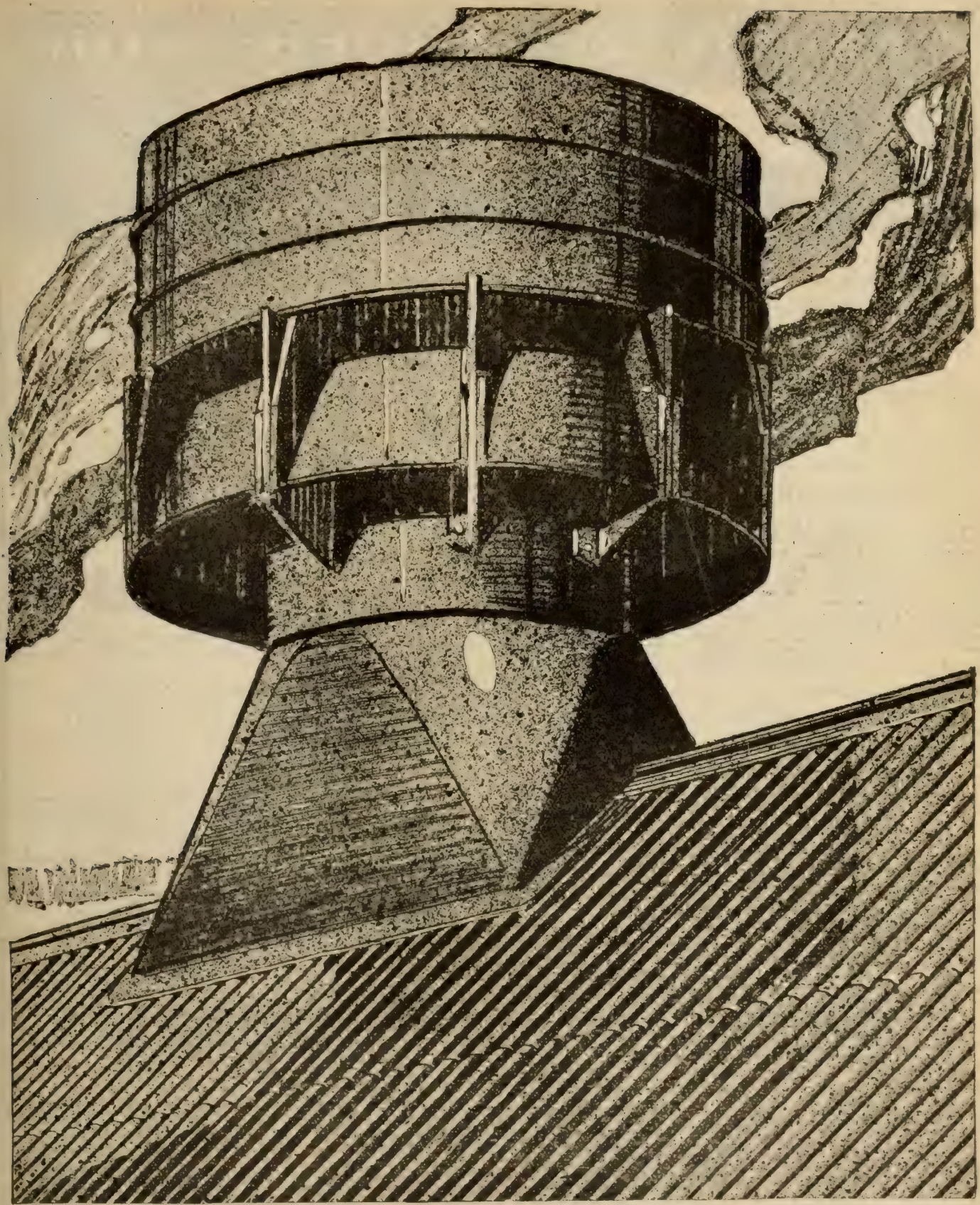

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HIGHWAY MATERIALS

Trade Mark Reg. U. S. Pat. Off.

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HELP WANTED

AGENTS WANTED THROUGHOUT DOMINion for Cowan Transveyors. Address R. B. Smiley, 120 Glenholme Ave., Toronto, Ont.

MONTREAL SUPPLY HOUSE HAVING SALES organization and good connections with mills and industrial plants in Quebec and Maritime Provinces (branch St. John, N.B.), is open to handle one or two more specialties of merit, chemical or mechanical. Address Box 642, Canadian Machinery. (c25m)

POSITIONS WANTED

POSITION WANTED BY A FIRST-CLASS mechanic with a large experience in making gauges, dies, jigs and fixtures for small work, and small tools; can take charge of department. Know how to handle screws; have been working in some of the best shops in the U.S. Is an inventor, also improver and designer. Aged 50 years; good health; steady worker. In answering please mention the class of work and mention the highest wages, with all particulars. A position wanted for his son, also a first-class mechanic. Apply during the week of November 15th. L.E.J., 38 Glenelg Street W., Lindsay, Ont. (c26m)

MACHINERY WANTED

WANTED—ONE ONLY HIGH-SPEED RIVETer, Shuster preferred, capable of riveting ¼ inch. Toronto Lock Mfg. Co., Toronto, Ont.

FOR SALE

FOR SALE—BRAND NEW INGERSOLL-RAND After-cooler, never used, for compressor up to 14 x 14". London Mfg. & Machine Co., Ltd., London, Ont. (ctfm)

FOR SALE — WATSON-STILLMAN HYDRAUlic Press, complete with four-plunger automatic variable belt pump. A. G. Crawford, 14 Mail Bldg., Toronto, Ont.

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CANADIAN AGENT WANTED TO HANDLE line of Black Diamonds, Diamond Tools, etc. Address Box 643, Canadian Machinery. (ctfm)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (ctfm)

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TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (cfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

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WANTED — First-class fitter (engine), preferably ex-R.A.F. warrant officer or N.C.O., who has been employed in an Engine Repair Park, or man with extensive shop experience. Excellent prospects for right man. Call or write

Major Jackson
MacLean Publishing Co.
153 University Ave.
Toronto

WHEN WRITING TO ADVERTISERS, KINDLY MENTION THIS PAPER

THE "WANT" AD.

The "want ad." has grown from a little used force in business life into one of the great necessities of the present day.

Business men nowadays turn to the "want ad." as a matter of course for a hundred small services.

The "want ad." gets work for workers and workers for work.

It gets clerks for employers and finds employers for clerks. It brings together buyer and seller, and enables them to do business though they may be thousands of miles apart.

The "want ad." is the great force in the small affairs and incidents of daily life.

SAY YOU SAW IT IN CANADIAN MACHINERY

Full line of
Honestly Rebuilt Machine Tools at bargain prices.
Special price on 20 inch x 8 ft. C.M.C. Lathe.
STANDARD EQUIPMENT & TOOL WORKS
179 St. James St. - MONTREAL

Manufacturers desirous of selling in Great Britain are asked to give particulars to
Furniss Clarke & Co.
Room 63
364 University St., Montreal

NOW!

You've been going to send in that ad for weeks, so why not mail it now for next week's issue.

Canadian Machinery
143-153 University Ave., Toronto

SURPLUS EQUIPMENT FOR SALE

PRESSES

	Stroke Inches	Width Bed	Approx. Cap. Tons
2—No. 666 Toledo Embossing Presses....	2	32	1,200
2—No. 27 Bliss Embossing Presses.....	2	32	1,000
2—No. 87 Bliss Crank Presses, double back geared	16	27	250
2—No. 60½ Bliss Rack and Pinion Drawing Presses	60	21	100
10—No. 60½ Bliss Rack and Pinion Drawing Presses	42	21	100
1—No. 857 Toledo Rack and Pinion Drawing Press	48	25	100
1—Robertson Hydraulic Press with pump and extra set of columns.....	24	27	800

LATHES

7—11″ Blount Speed Lathes, 5′ bed.
1—18″ Hamilton Lathe, 6′ bed.
1—19″ Greaves & Clushman Lathe, 8′ bed.
2—18″ Davis Lathe, 6′ bed.
1—15″ Carroll Jamieson Lathe, 6′ bed.
1—16″ Davis Lathe, 6′ bed with Turret.
1—16″ Hamilton Lathe, 6′ bed.
5—16″ Blount Speed Lathes, 6′ bed.
4—No. 2 Warner & Swasey Speed Lathes.
2—20″ Stoll Wood Turning Lathes.
35—Bullard Cartridge Case Lathes.

GRINDERS

2—Wells Cutter Grinders.
1—12″ x 72″ No. 4 Cincinnati Universal Grinder.
1—No. 70 Heald Internal Grinder.
1—No. 75 Heald Internal Grinder.
1—10″ x 24″ Landis Grinder.
1—No. 1 American Surface Grinder.
1—No. 74 La Salle Surface Grinder.
1—Ford-Smith Double Head Grinder, 3″ x 24″ wheel.

FURNACES

1—Gas Muffle Furnace, 3¼ x 1½″ x 7″ long.
1—Gas Tempering Furnace with oil reservoir.
1—Gas Tempering Furnace with Tray in Reservoir.
1—H.S. Tool Hardening Furnace, 9″ x 8″ x 9″ long.
1—Double Door Gas Furnace, Doors 20½″ x 12″ high. Fire Space 50″ wide, 12″ high, 54″ long.
1—Gas Furnace for Annealing Scrap Brass.
5—26 ft. Rockwell Single Chamber Annealing Furnaces, equipped with Electric Pyrometers and Recording Instruments, Oil and Gas Burners, Air Rams and Pullers.
1—16 ft. Rockwell Single Chamber Annealing Furnace equipped with Electric Pyrometers and Recording Instruments, Oil and Gas Burners, Air Rams and Pullers.
3—Conveyor Type Annealing Furnaces. Could be used for annealing automobile pistons or other similar work.

BLOWERS AND FANS

	Size of Outlet		Displacement per rev.
1—Root Positive Blower	8″	Vertical	3.3 cu. ft.
2—Connersville Positive Blower....	8″	“	3.3 “ “
2— “ “ “	6″	“	1.5 “ “
1— “ “ “	6″	Horizontal	1.5 “ “
1— “ “ “	8″	“	1.5 “ “
1—No. 4 Sheldon Blower.....	9″	“	
2—No. 4 “ “	9″	Vertical	
1—No. 4 Sturtevant “	10″	Horizontal	
1—Boland Positive Blower	4″	“	

3—Desk Fans.

MOTORS

10 to 75 H.P., 25 and 60 cycle, 220 Volt., 3-phase.

MISCELLANEOUS

DRILLS

1—3 Spindle Variable Speed Drill. C. G. Allan Co., Barrie, Mass.

SHEARS

1—No. 1 Gray's Sheet Metal Cutter.
1—No. 1 Quickwork Rotary Shear.

HACKSAWS

1—No. 3 Atkins Power Hacksaw.

MILLING MACHINES

1—No. 1 Standard Hand Miller.
11—No. 3 Brown-Boggs Trimming Machines.
1—No. 066 Deming Gear Oil Pump, Belt Drive.
2—Franklin Portable Cranes.
12—Cowan Elevating Trucks.
2—20-lb. Cap. Scales Drams Graduation on Beam.
1—Two-Ton Platform Scale.
1—Five-Ton “ “
2—½-Ton “ “
2—1,200-lb. “ “
1—Tinius Olsen Testing Machine, 10,000 lbs. capacity, hand-operated.
1—No. 1 Brinell Hydraulic Testing Machine.
1—Sauveur-Boylston Photo-Micrographic Instrument.
23—4″ Curtis Air Hoists.
2—5″ “ “ “
1—6″ “ “ “
26—I-Beams for Curtis Air Hoists.
1—Boland Special Sand Blast Machine.
1—No. 2X Garvin Vertical Tapping Machine.
1—Whitton Centering Machine.
Dodge Wood Split Pulleys.
Cast Iron Split Pulleys.
Shafting, and Hangers.
1—Model “M” Richardson Force Feed Oil Pump.
3—No. 310 Simplex Lifting Jacks.
4—2½″ x 18″ Screw Jacks.
1—2¼″ x 16″ “ “
3—1¼″ x 4″ “ “
1—No. 873 Toledo Trimming Machine.
Bristol & Brown Indicating Pyromters.
“ “ Recording “
3—Shore Scleroscopes.
1—C. E. Wright Metal Cutting Handsaw, 30″ Wheels.
1—No. 35 Demagnetizer Style, 115 D.C., Amps. 1.5, Volts 115. Made by D. & W. Fuse Co., Providence, R.I.
5—Heads Suitable for Polishing Brushes, 1¾″ Hole in chuck, 1″ spindle.
1—Bench Tapping Machine, takes up to ⅜″ tap. Burke Machine Company, Conneaut, Ohio.
1—Carboy of Cement Hardening, 5 Gals.
1—Thor 1—1/16″ x 4″ serial D.R.H. Air Hammer.
1—Ingersoll Rand, size 1 S, symbol 1 SM Air Hammer.
1—Ford Car Starter.
2—Automatic Receivers for Boiler House Feed Pumps.
1—Tank, 30″ dia. x 48″ long, suitable for Compressed Air.
1—Tank, 24″ dia. x 60″ “ “ “ “ “
1—Tank, 36″ dia. x 72″ “ “ “ “ “
1—Open Galv. Iron Tank, 5 ft. high x 3 ft. dia. with 1″ faucet.
4—¼″ Thick Iron Open Tanks, 4 ft. long, 2 ft. wide x 1 ft. 8 in. deep with 2 in. drain.
1—Motor-driven addressograph machine with stencil cutting machine and full equipment of special attachments.
2—Adding Machines (Listing)

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HAMILTON, CANADA

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C. G. E.
Fractional H.P. Motors

Every manufacturer who markets a motor-driven article should take into consideration that if the motor fails to give satisfaction, the whole machine will be condemned.

It is therefore obvious that the utmost care must be exercised in choosing the type of motor that will give maximum satisfaction with minimum attention, relative to the particular requirements of your product.

The C.G.E. Fractional H.P. Motor is a power unit that has stood the test of time. It is giving universal satisfaction in scores of different types of motor-driven appliances — from the Vacuum Cleaner and Washing Machine for the housewife, the Meat Cutter and Coffee Grinder for the butcher and grocer, to the Adding Machine and small Printing Press for the office.

Let us assist you in selecting or building the right motor under one h.p. to operate the machine you are now or contemplate making.

Write our nearest sales branch for full particulars.

Canadian General Electric Co. LIMITED

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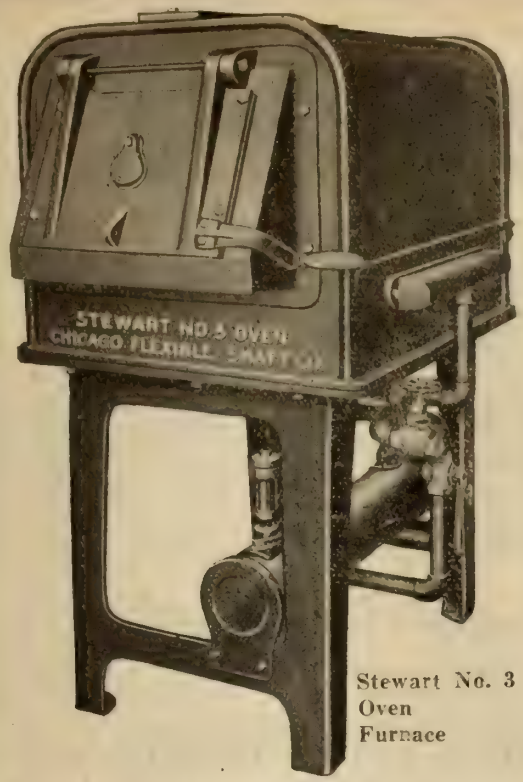
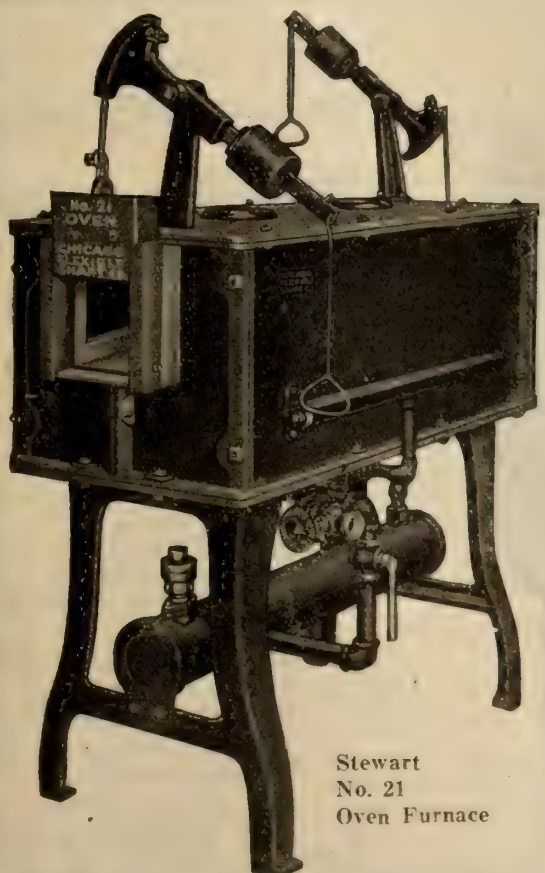


Stewart No. 3
Oven
Furnace

For Annealing, Tool Hardening and Carbonizing in small boxes.
Opening, 9″ x 15″. Depth, 24″.
Floor Space, 36″ x 48″.
Gas and air connections, 1½″.
Shipping weight, 1900 lbs.



Stewart
No. 21
Oven Furnace

Especial'y adapted for long work, as blades, rods, etc.
Opening, 6″ x 8″. Depth, 42″
Floor space, 28″ x 60″.
Gas and air connections, 1¼″.
Shipping weight, 2,325 lbs.
Front and rear openings.

Take No Chances

You Can't Afford to Spoil Material or Risk Tool Breakages.

MODERN industrial plants invest too much in costly material and high-priced labor to risk spoiled work or expensive breakages of machine parts or tools. Many tool breakages are directly due to improper hardening. It is often almost impossible to replace at once special tools or parts, making necessary the holding up of a machine and the entire progress of production.

Stewart Furnaces for proper industrial heat treatment are absolutely dependable in production results. No spoiled material—no imperfectly hardened tools or machine parts. You can trust your most exacting work to a Stewart and *know* that it will meet the requirements.

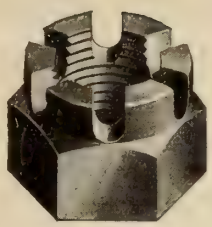
Stewart Furnaces are *built right*. Thorough knowledge of metallurgy and modern shop practice means practical, scientific design. High grade materials, skilled workmen, and efficient supervision make for sturdy, dependable construction that will stand up day after day. Convenient, economic fuel consumption, with just the right placement of heat, and temperature always under positive control, result in uniform, high quality production.

We will help you solve your heat treating problems. Our new catalog, No. 75, is yours for the asking.

Chicago Flexible Shaft Co.
1148 South Central Ave. CHICAGO, U.S.A.

Screw Machine PRODUCTS.

Standards in Stock



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SCREWS—Cap—S.A.E. and U.S. Standard. Set U.S. Standard.

Special Screw Parts to Customers' Specifications.

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De Courcelles and G.T.R. MONTREAL, P.Q.

Size No. A, Multiple Punch
(50 inches wide between the housings, motor-driven)

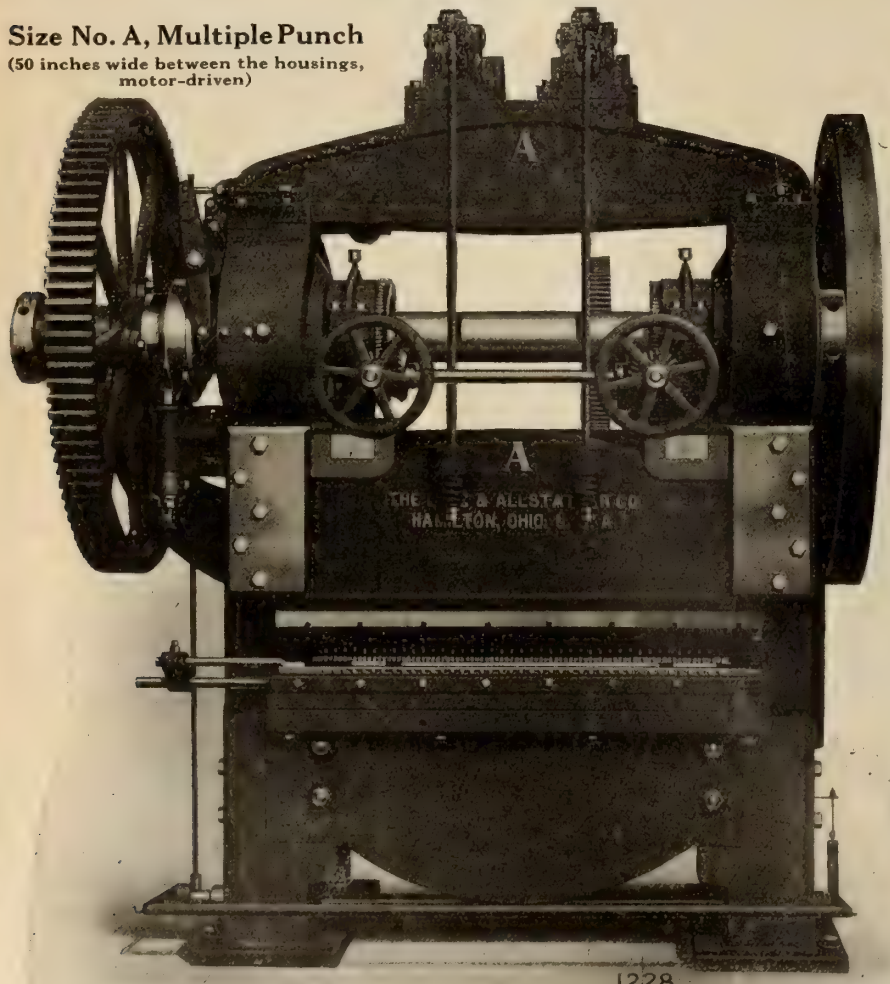

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Plate Splitting Shears
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Let us figure on your requirements.

The
Long & Allstatter Co.
American Punch & Shear Works
HAMILTON, OHIO, U.S.A.

Established 1856 Incorporated 1878

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Mild Steel, High Carbon Steel, Manganese Steel, Chrome Steel

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A Plant Equipped in Every Detail to Suit Your Every Need

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For Ships, Railways, Rolling Mills, Gears, Machinery and Ingots to 35 tons.

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Plates and Heavy Sheets to 30 inches wide, Soft and High Carbon, Automobile Plates and Sheets.

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Soft Centre and Solid Plow Steel, Harrow Discs, Shovel Steel, Cultivator Blades.

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HAMILTON, CANADA

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WHY waste time and energy with makeshift devices for boring operations when Williams' "Agrippa" Adjustable Boring-Tool Posts offer convenience and efficiency developed to the nth power?

Each post accommodates a wide range of Bars, the height of which is readily adjusted; a turn of the Knurled Ring raises or lowers the base on which they rest. The whole device is instantly and rigidly locked by tightening the Set Screw.

Four sizes for ½ to 2¼" diameter Bars—furnished with or without Bars.

Ask for Machinists' Tools Booklet.

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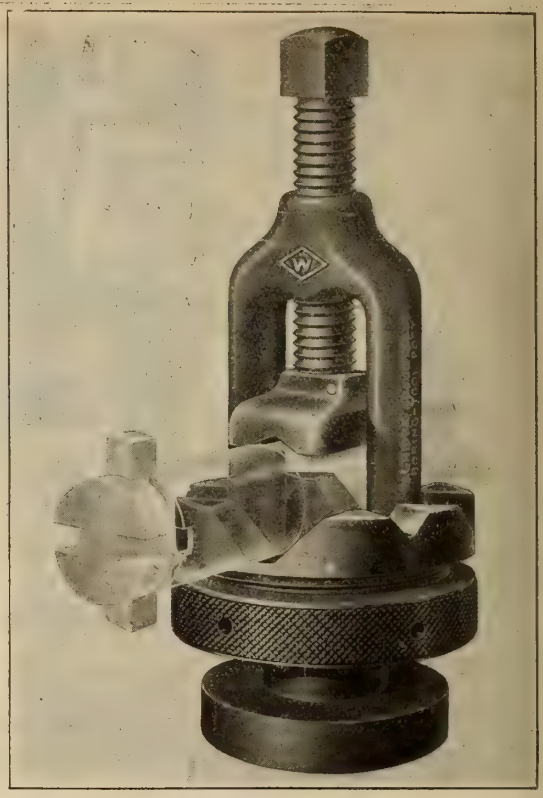
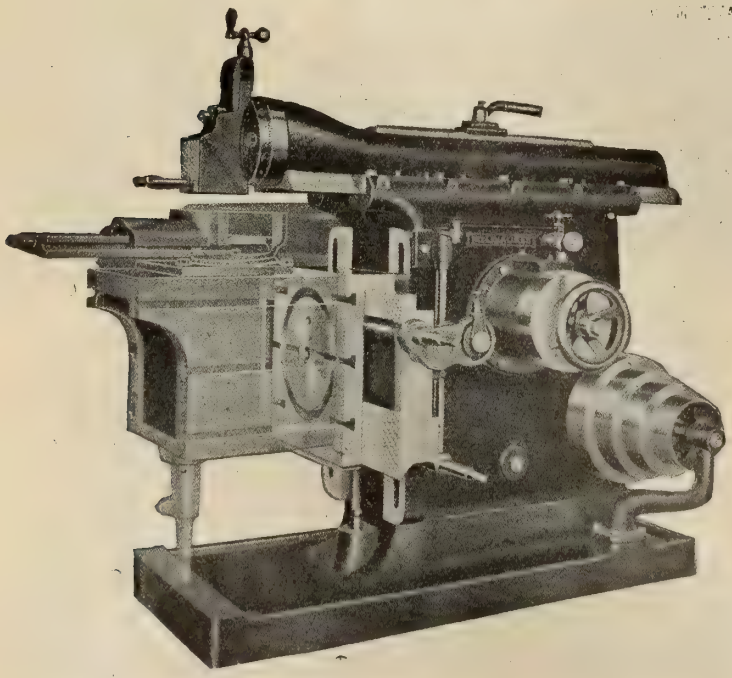
The A. G. Low Co., Ltd.,
45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Alberta, Saskatchewan and British Columbia.



Williams' "Agrippa" Adjustable Boring - Tool Posts

Milwaukee Shapers

Are Needed in Up-to-Date Canadian Shops



A line that is unexcelled in Rigidity, Accuracy, Power, Simplicity and **Production.**

Built in three sizes: 16 inch, 20 inch and 24 inch.

Write for descriptive Bulletins.

MILWAUKEE SHAPER CO.

1029 Coldspring Ave.
Milwaukee, Wisconsin

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Real Hack Saw Economy requires the use of common sense in the regulation of weight on the saw.

Every machinist knows, when he is using a hand hack saw, that as the blade becomes worn, more pressure must be put upon it if the cutting speed is to be maintained, but he's very apt to overlook that point in using power machines.

As the saw is used the teeth become worn, and what we call the "contact" area, the area of the blade that actually rests on the work, becomes greater. That means friction and a necessity for more pressure to make the blunted teeth cut into the work. On a heavy saw 64 pounds pressure is generally about the right figure to start with, but to keep the saw cutting as fast, after it has made twenty odd cuts as it did at first, more pressure-weight is needed.

The Starrett Hack Saw Chart "3" helps every user of Hack Saws to do more work at a lower cost. Copy sent you free upon request. Write for Catalog No. 21 "3"

THE L. S. STARRETT CO.

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled

ATHOL, MASSACHUSETTS

NEW YORK LONDON CHICAGO

Starrett Hack Saws

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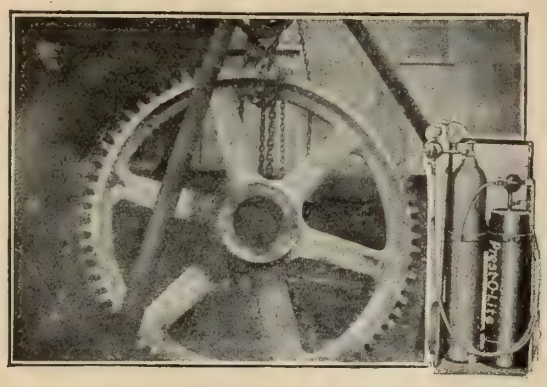
Oxy-Acetylene Welding and Cutting



This Expensive Gear Wheel Reclaimed at Trifling Cost

This Gear Wheel, in a large plant at St. Catharines, was broken recently. To replace it would have taken much valuable time and represented quite a serious expense.

A local Prest-O-Lite operator was called in and undertook to repair the casting in record time at trifling cost.

The work was done by the job welding department of the International Garage, St. Catharines, Ont., and has given complete satisfaction.

Prest-O-Lite Oxy-Acetylene Welding is proving a great economic factor in the Factories, Mills, Railroads, Mines and Machine Shops of Canada.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen) in portable cylinders. Prest-O-Lite Dissolved Acetylene is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones; provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by an addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

We will gladly send illustrated literature and interesting data showing actual instances of savings made by others. It may suggest valuable ideas to you. Write for it.

Address Department C-107.

Prest-O-Lite Company of Canada, Limited
PREST-O-LITE BUILDING
Corner Elm St. and Centre Ave.
TORONTO

Plants at: Toronto, Ont., Merriton, Ont. Shawinigan Falls, P.Q., St. Boniface, Man.

World's Largest Makers of Dissolved Acetylene

PURE OXYGEN

Save money by using

Electrolytic Oxygen 99.80 Pure

Write for particulars and prices, also samples gladly given for testing purposes.

We also handle Pure Acetylene.

Carter Welding Co. of Toronto LIMITED
7-11 Sheppard St.

ARMCO WELDING RODS IRON

AMERICAN ARMCO IRON

The standard material for oxy-acetylene and electric welding Guaranteed 99.84 per cent pure iron. Flows freely and makes a perfect weld.

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STEEL AND WIRE PAGE QUALITY PRODUCTS

SALES OFFICES: 30 Church St., New York; Chicago, 29 South LaSalle Street; Detroit, Book Building; San Francisco, American Rolling Mill Company of California. Canada: Taylor & Arnold, Ltd., Montreal, Toronto, Winnipeg. 56

WELDING APPARATUS AND . . . SUPPLIES

The REGO 100% Efficient Welding Torch

Saves Oxygen Eliminates Flash-Back Better Welding

Write to us for anything and everything you need.

WELDING & SUPPLIES COMPANY
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Limited

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Toronto, Canada

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Supplied in 100 or 200 Cubic Feet Cylinders.

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For Welding Cutting and Lighting

HIGHEST GAS YIELD
IMPERIAL CARBIDE
MADE IN CANADA

It insures **effectiveness** and **economy** by **invariably** producing acetylene gas of **unusual purity.**

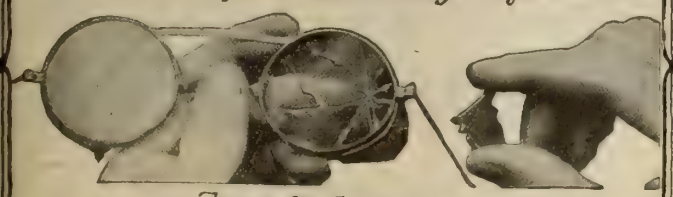
Manufactured by

Union Carbide Co. of Canada, Ltd.
WELLAND, ONTARIO

Large Stocks maintained at convenient distributing centres throughout Canada

SMELTERS & WELDERS GOGGLES

We have a style to meet every requirement



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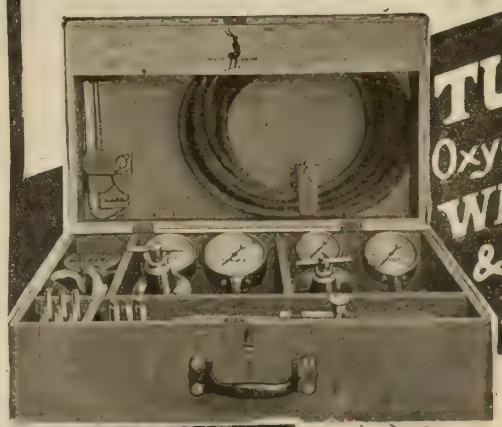
Consolidated Optical Company
Montreal Toronto Winnipeg Vancouver

For Repairing Broken Machinery or Tools of Medium Size



TURNER Oxy-Acetylene WELDING & CUTTING Equipment

These outfits will soon pay their cost in machine parts or tools reclaimed. The sectional extensions of the torch enable the operator to adjust it to any desired length or angle. The location of valves is such that the flame is controlled by one hand, leaving the other hand free for the work at all times.

For full particulars write

The Turner Brass Works
SYCAMORE, ILLINOIS, U.S.A.

Phones Main 5779 Nights: Westmount 3483

THE
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138-140 Inspector Street, Montreal, Que.

WE CAN WELD ANYTHING ANYWHERE

WELDING AND CUTTING
DAVIS
APPARATUS
DAVIS-BOURNONVILLE CO.
"MADE IN CANADA"

Davis-Bournonville Oxy-Acetylene Welding and Cutting Apparatus
"Made in Canada"
AT NIAGARA FALLS, ONT.
DAVIS-BOURNONVILLE COMPANY
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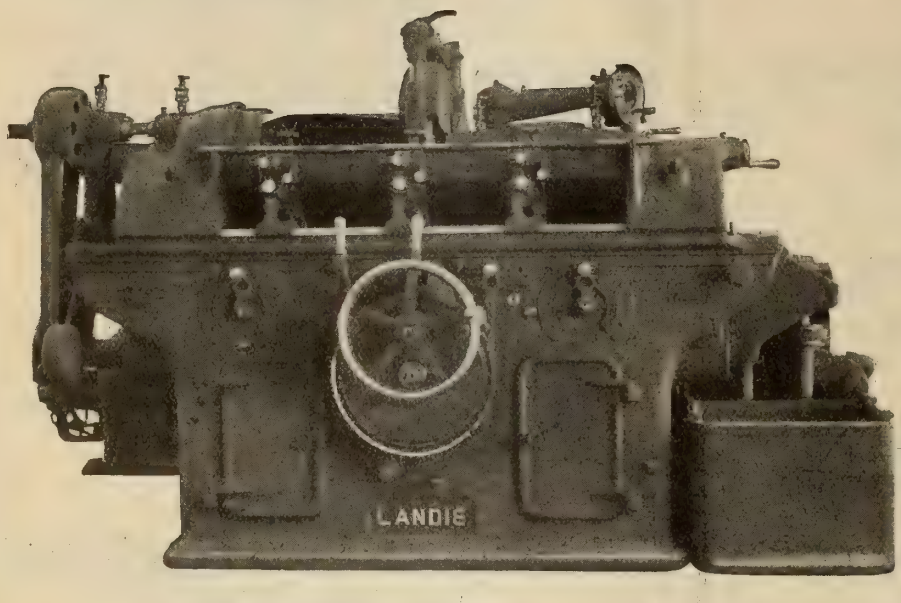
LANDIS

Accuracy---
A LANDIS Attribute



No matter how excessive the tool-load may be, there can be no variation of the degree of accuracy because the work is held stationary —and "the wheel travels."

In addition the Landis is compactly and rigidly built to avoid any chatter.

A study of the machine will convince you of its many advantages and its fool-proofness. The built - in, labor-saving features insure big production.

Let us send you our catalog.

LANDIS TOOL CO., Waynesboro, Penn.

50 Church Street, New York City

Your Christmas Will be Merrier

if you have that nice secure feeling which comes to those who, having confided their bearing troubles to us, are now using

MANUFACTURED BY

HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

SIMONDS

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UNEQUALED IN QUALITY ANY SIZE OR LENGTH

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the issuance of a new catalog of prime interest to all users of milling and gear cutters and small tools. Herein you will find listed styles and sizes of end mills (special and plain) T-slot cutters. Key cutters, thread mills, gear slots—in fact your needs in the small tool line of this class are sure to be covered. Get your copy and note its completeness.

If you special requirement doesn't appear, Bilton can produce it—and in true Bilton Quality.

Just sign your name and address on a card and post it to

The Bilton Machine Tool Company
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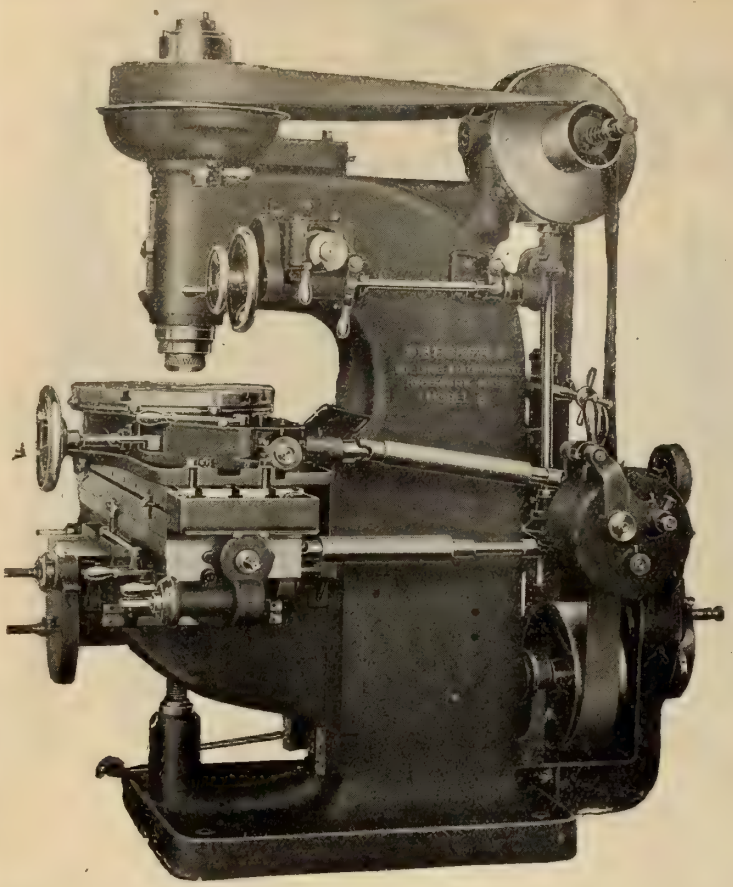

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All gear driven spindles lack flexibility and induce vibration through the unavoidable progressive development of back lash between gears, resulting in vibration and hammer action which has a crumbling effect upon the cutter teeth and leaves chatter marks on the finished work.

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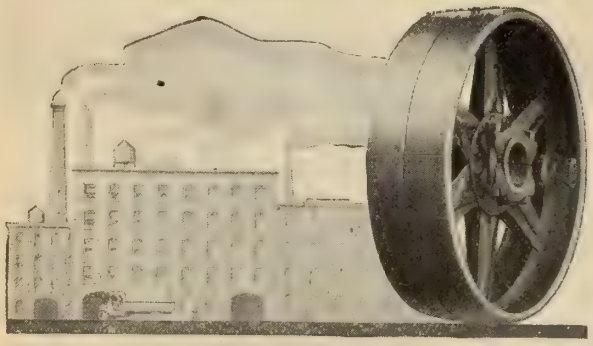

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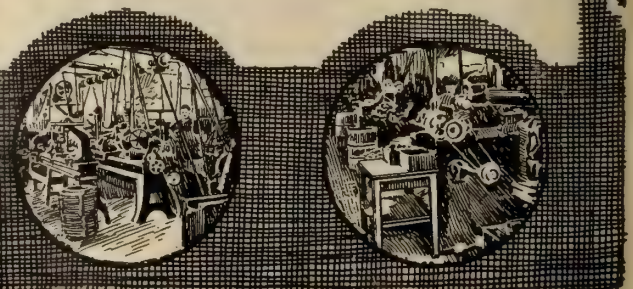

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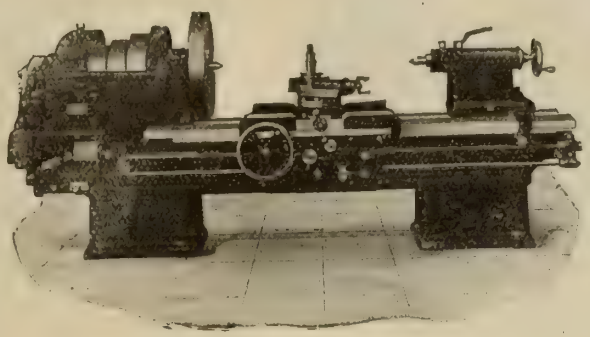
Heavy Duty Engine Lathes

Sidney-for-Service Lathes are noted for their power and rigidity. Take deep cuts through toughest metal without pause or chatter.



Specifications include 3-step cone, double brake gear, semi-quick change gear lathe, built on 10 ft. bed. This lathe also furnished with quick-change gears. Bed lengths available: 10, 12, 14, 16, 18 and 20 ft.

The Sidney Line comprises 15-inch, 17-inch, 19-inch, 25-inch, 27-inch, 30-inch and 36-inch lathes, which are adaptable to the finest tool room work or the heaviest duty shipyard or factory rapid production work.

The Sidney Tool Company, Sidney, Ohio

Canadian Agents: Yeates Machinery & Supply Co., Montreal, Que.
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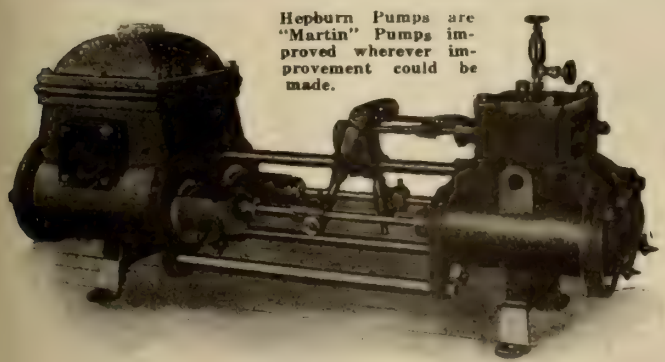
Our line embraces standard duplex pumps for boiler feeding and for fire and general service; tank or low service duplex pumps; duplex hydraulic pumps for service in connection with hydraulic lifts and presses, accumulators and oil presses; pressure or mine pumps; horizontal power pumps and air and circulating pumps, etc.



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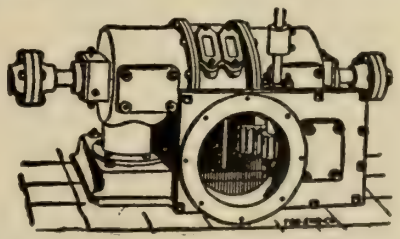

Over forty years' experience in designing and installing special turbines, both on vertical and horizontal shafts.

Can supply complete equipment, including flume, turbine and power transmission.

Stock of standard vertical shaft Little Giant Turbines on hand for prompt shipment.

We solicit your inquiries.

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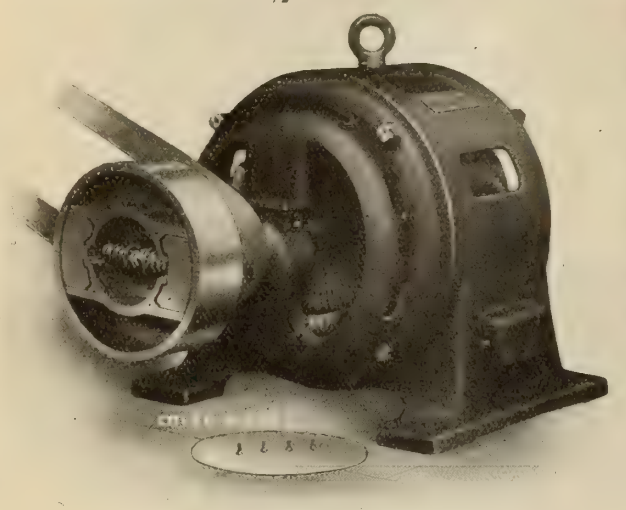
To Ensure the Easy Starting of A.C. & Squirrel Cage Motors

½ H.P. to 1500 H.P.



No Motor Should be Without This Simple and Unique Device.

Entirely Dispenses With all Starting Difficulties

The Clutch also Effects a Great Saving in Current Consumption and Reduces the Initial Cost of Motor and Switchgear.

Please Mention Speed and H.P. of Motor When Sending Enquiries and State the Current Supply.

Write for Catalogues and Full Particulars

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CISCO Lathes for Canada

Have You One in Your Shop?

A money-saver, a time-saver, a worry-saver. Accurate as it can be made (.0005 in 18 inches). Simple in operation (a boy can run them). Powerful and strong (will do the work of many larger lathes). Economical in service (repair bills will never bother you).

The Lathe With the Pull
The Lathe of Simplified Accuracy

Made in sizes 14", 16", 18", 20", 24" and 26". Engine or tool room, cone or geared head. Belt or motor driven.

THE CISCO MACHINE TOOL CO.

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CLINTON CEMENT

Did You Ever See Two Postage Stamps Stuck Back to Back?

Well, that's the way two bricks stick together when our cement is used.

The greatest loss in your furnace efficiency occurs as the result of leakage, cold air pouring in and interfering with proper combustion.

We Have Got This Licked!

Fireclay dries up and sifts out from between the bricks like powder.

But our cement sets and makes a surface like glass yet allowing for expansion and contraction. It sets hot or cold and stands a heat up to 3,000 degrees Fahrenheit.

This cement makes a joint that is stronger than the bricks themselves, and that is itself the strongest part of the whole furnace.

A five-pound tin of **Clinton Super-Heat Cement** will be sent to you free and all charges prepaid, if you write the

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One Cuts Up
Another Cuts Down
and
They Both Cut
At Once

Hurlbut,
Rogers
Cutting-off
and Centering
Machine

Here's Real Economy

This patented Hurlbut, Rogers Cutting-Off and Centering Machine embodies two cutting-off tools—one cutting up and the other cutting down, each holding the work against the other. What is the result?—**the production is doubled and the cost is cut in half.** Further, the centering operation goes on at the same time. Doesn't this appeal to you as real economy in production? When you are assured of such good-paying results why hesitate to adopt this machine? Soon pays for itself.

Let us hear from you and we will give you the full story of its ability.

The Hurlbut, Rogers Machine Company
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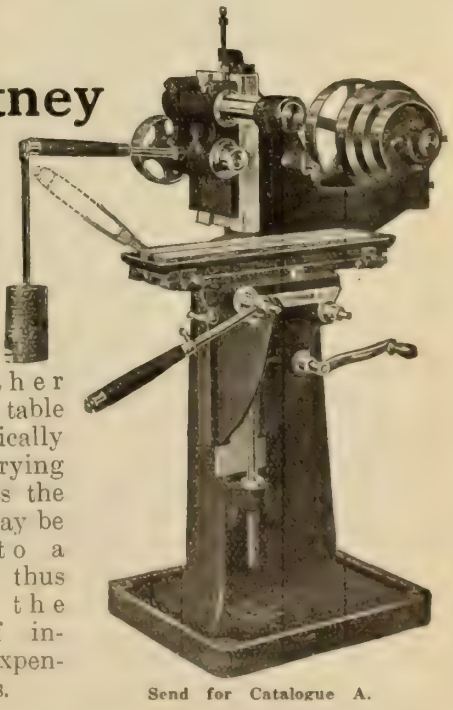
Thousands in Use

The Whitney

Hand Milling Machine

The Weight Attachment



feeds either head or table automatically and by varying the weights the pressure may be adjusted to a nicety, thus avoiding the danger of injury to expensive cutters.

Send for Catalogue A.

The Whitney Mfg. Co.
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Chains—Keys and Cutters—Hand Milling Machines.

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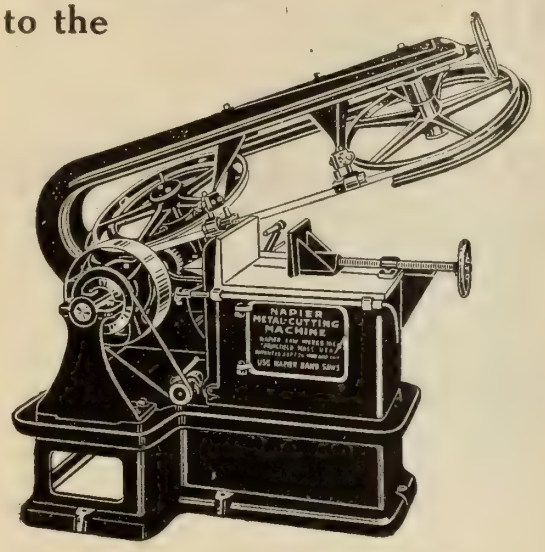
Continuous Cutting

gives more than a two-to-one advantage to the



NAPIER

Metal-Cutting Machine

Compare the swift, smooth, steady, **continuous** cut of the NAPIER with the hacking-back-and-forth, half-the-way cut of the best power hack-saw, and you'll see at once what the NAPIER can do for you.

Every tooth of the NAPIER band saw does its full share of cutting, and is not prematurely dulled by useless back strokes. There is no jerking or vibration to shorten its life.

Cutting without vibration, the thin NAPIER blade removes a kerf not over .049"—a decided saving of metal and power.

But the big advantage of the NAPIER Metal-cutting Machine in most shops lies in its **speed.** The NAPIER will do more and better cutting for you than any three power hack-saws that are or can be made! It cuts any size up to 10"x10", round or square —takes only 4'x6' of room—and weighs 1550 pounds. Belt or motor drive.

Shall we send you our illustrated NAPIER Booklet?

Napier Hack-Saws Blades get the best out of any hack-saw. Have you tried them?

made by

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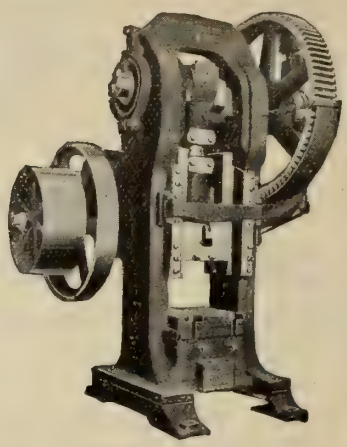
Straight Column Presses



The "Toledo" Straight Column Presses.

Designed for successfully withstanding the most severe working conditions.

Connections are massive and of improved design.

Slides are extra long moving in equally long and heavy gibs. Every detail is given the most expert thought and supervision so that these presses may prove pre-eminently dependable for working the heavier gauges of metal. Sixty-five sizes weighing from 3,000 to over 400,000 lbs.

The Toledo Machine & Tool Co.

Toledo, Ohio

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Sizes 180, 160, 140, 120, 110, 100, 90, 80, 70, 60, 54, 46, 40, 36, 30, 24, 20, 18, 16, 14, 12, 10, 9, 8, hole.

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Thor punch has helped put across many a job

Time is one of the most important items involved in every contract job.

The speed with Thor Hammers, Drills and other Tools work has pulled many a contract through on time.

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MESTA MACHINE CO.

Pittsburgh, Pa. U. S. A.

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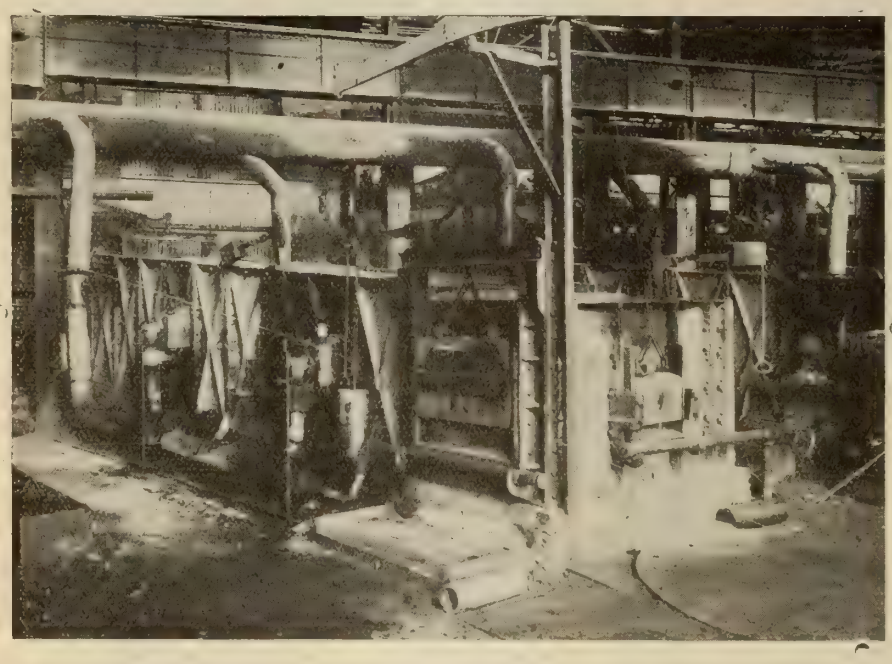
Another MECOL Furnace

demonstrated its superior features point by point to a group of men whose years of experience in the heat-treatment of metals made them appreciative judges.



We refer to the "Mecol" Furnace shown in this illustration, installed at the Pointe St. Charles Works of the Canadian Steel Foundries, Limited.

Our intimate knowledge of heat-treating methods, and our long experience in the building of efficient furnaces fit us to give helpful advice—and that we will do promptly if you

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ELECTRIC
Steel Castings

High Grade STEEL Castings
Of Every Description

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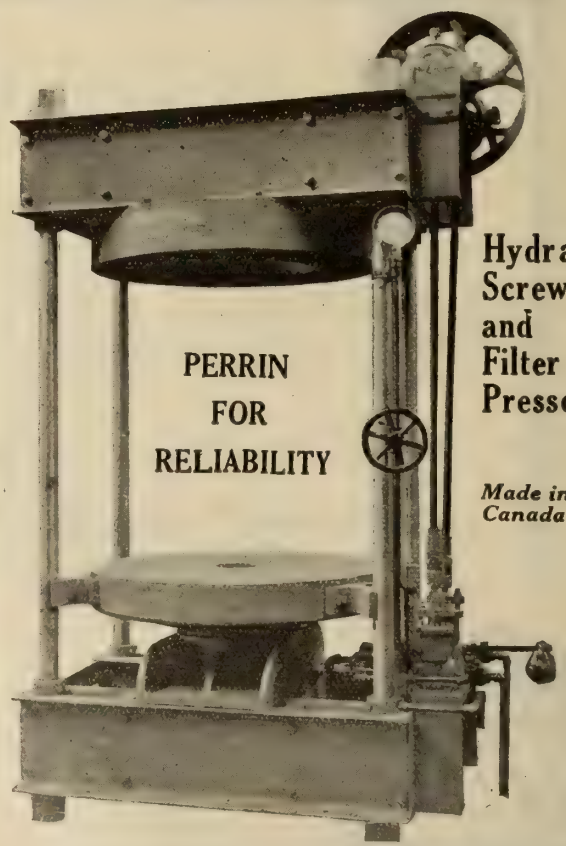

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Made in Canada

Hydraulic Truck Tire Press
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THE "RACINE"

Will Greatly Reduce Your Metal Cutting Costs

No matter what machine you may be using for your metal cutting operations, it will pay you to install the "RACINE" This is no exaggeration, but a fact. The "Racine" is superior to all others because:

It has a patented automatic blade lifting device.

This patented feature prevents all dragging and strain on the non-cutting stroke.

It permits faster cutting and greater production.

It gives a longer life to the blade.

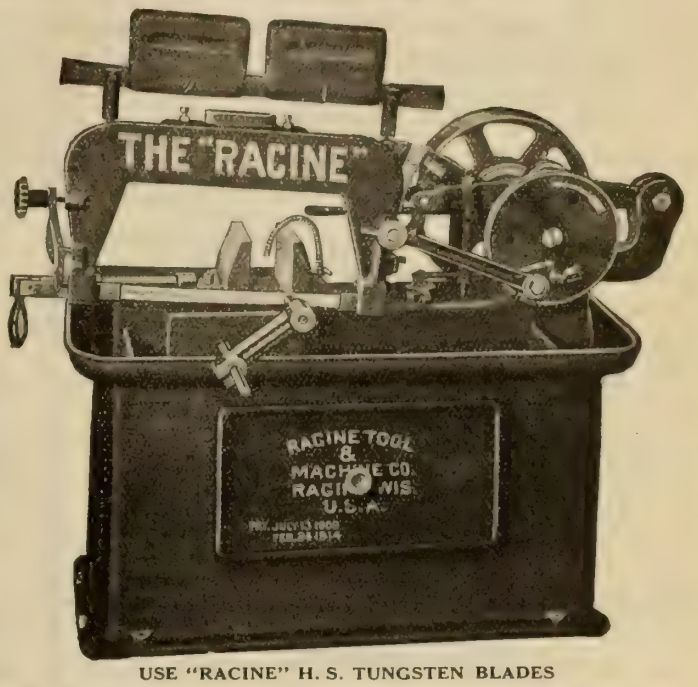
It uses up less power.

Don't you think you could use the "RACINE" to good advantage?

Standard the World Over

Racine Tool & Machine Co.

Melbourne Avenue RACINE, WIS., U.S.A.



USE "RACINE" H. S. TUNGSTEN BLADES

The Hammer With The Human Stroke

HEADS RIVETS COLD

Heads 'em tight or loose, flush, countersunk, or finishes heads any shape desired, and at the rate of:—

A rivet a second, sizes up to 3/16".
A rivet in two seconds, size ¼" to ⅜".
A rivet in three seconds, size 7/16" to ⅝".

And on special order we build machines to handle rivets up to 1½" with proportionate rapidity.

Built in eight sizes.

Besides riveting, the High Speed Riveting Hammer does all kinds of peining, swaging, upsetting, etc.

Send us sample assembly parts with rivets or sketch of your work,

and

Let us shoulder your riveting problems.
Send for the High Speed Hammer Book.

THE HIGH SPEED HAMMER COMPANY, INC.
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Engineers, Manufacturers and Erectors of Steel Structures

Industrial Bridges, Buildings, Towers, Smoke Flues and Stacks, Chutes, Coal Bins, Ore Bins, Tanks, Cranes, Engine Houses, Grain Elevators, Derricks.
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Builders of
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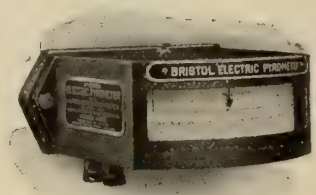

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BRISTOL'S
REG. U. S. PAT. OFFICE.
INDICATING AND RECORDING PYROMETERS
are compensated to eliminate errors due to cold and temperature changes of the thermo-couples.
There is no additional complication. You need these Pyrometers in your heat treatment room.
Laboratory Accuracy During Shop Use.
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and cut to accurate lengths when it comes from our AUTOMATIC WIRE STRAIGHTENING AND CUTTING MACHINE, whether it's ¾" diameter or only .020" wire, hard or soft wire, highly polished or rough stock.
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Also makers of Riveting Machines, Sprue Cutters, Cotter Pin Machines, etc.

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Trade Mark Reg. U. S. Pat. Office
A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.
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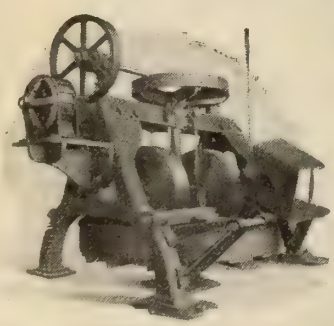
Greenfield Machine Co.
Greenfield, Mass., U.S.A.

Canadian Steel Foundries Need Frost Improved Sand Mills



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Unloading Device
Motor or Belt Drive
The Frost Mfg. Co.
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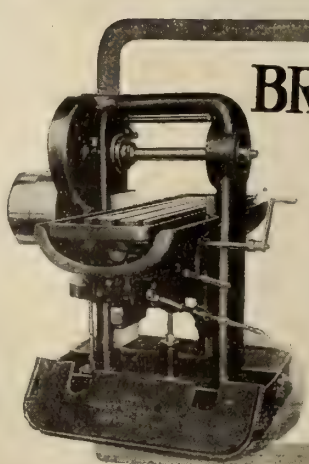

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This Miller is breaking production records wherever introduced. It handles work no other machine of its size can touch and it does perfectly accurate work. Rigid, powerful, accurate.
We should like to show how "Briggs" adaptability and convenience can better output and lower costs for you. Get in touch with us.
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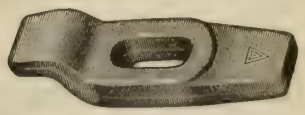

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"The Tool Holder People"
306 N. Francisco Ave., - CHICAGO

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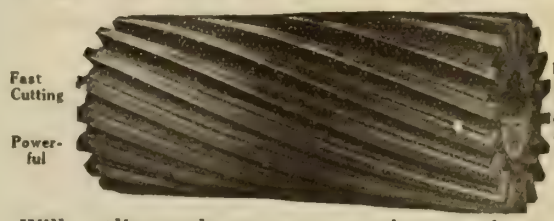

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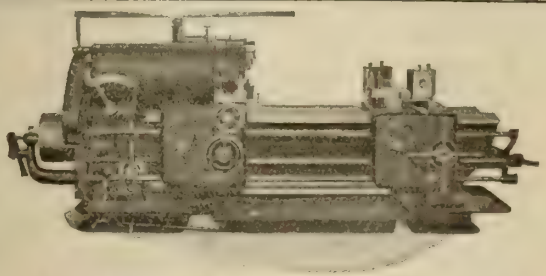

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Send Us Prints of Your Work
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"MADE IN CANADA"
Electric Travelling Cranes, Hand Cranes, Electric Hoists, Air Hoists, Foundry Equipment, Cupolas, Ladles, etc., etc.

"Type D"

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with Condensing Plant for quick delivery from stock at very favorable price.
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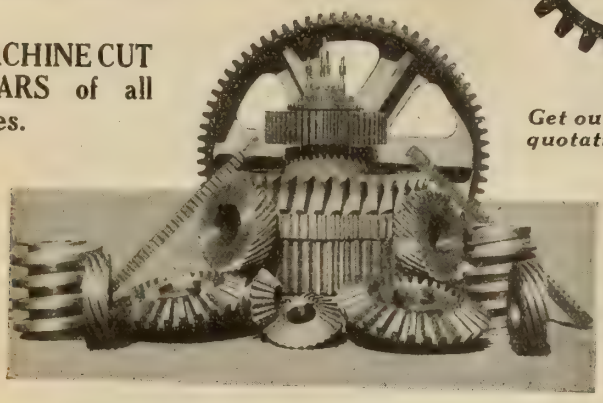

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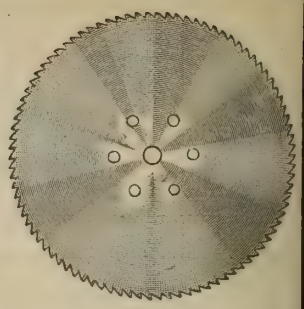

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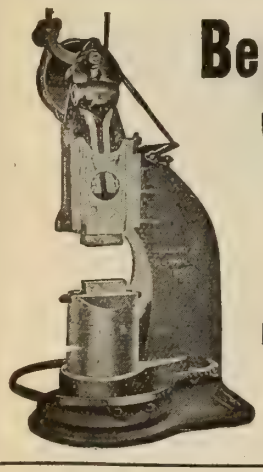

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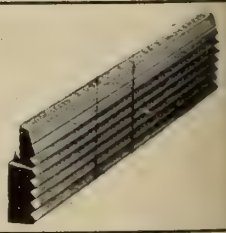

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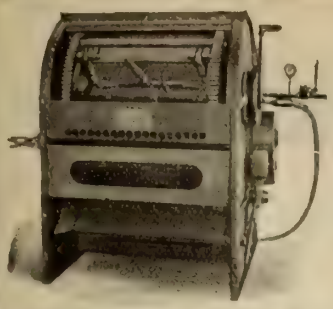

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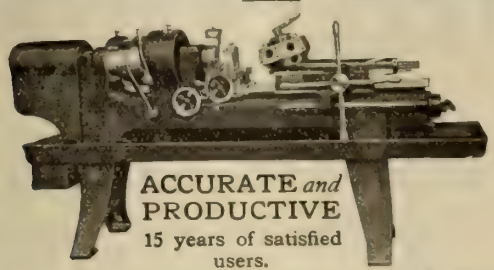

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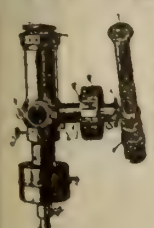

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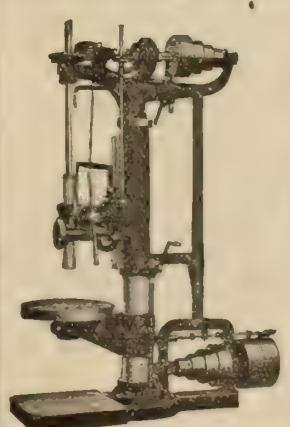

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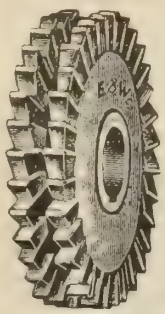

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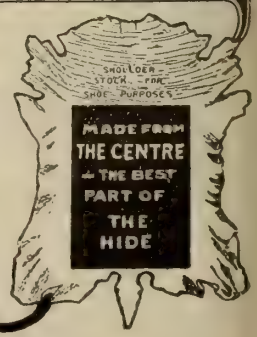

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Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Knight Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

BUFFING AND POLISHING MACHINERY
Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

BULLDOZERS
Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BURNERS, OIL AND NATURAL GAS
Northern Crane Works, Ltd., Walkerville.
W. S. Rockwell Co., New York, N.Y.

BURRS, IRON AND COPPER
Parmenter & Bulloch Co., Gananoque,.

BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

CANADA SILVER SHEETS, ROLLS
Brown's Copper & Brass Rolling Mills, New Toronto.

CANNERS' MACHINERY
Bliss, E. W. Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Can.

CANNERS' CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

CARBONIZING BOXES
Can. Driver-Harris Co., Ltd., Walkerville
Katie Foundry, Galt, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

CARRIERS, PNEUMATIC TUBE
Jones & Glassco, Montreal.

CARS, INDUSTRIAL
Can. Blower & Forge Co., Kitchener, Ont
Can. Fairbanks-Morse Co., Ltd, Montreal
Elec. Steel & Metals, Welland, Ont.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

CASTINGS, MACHINERY
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

CARRIERS COUPLING BOLTS
John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal..
Tallman Brass & Metal Co., Hamilton.

CASTINGS, BENCH LEG.
Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT, IRON
Warmington & Co., J. N., Montreal, P.Q.

CEMENT, ELASTIC JOINTING
Warmington & Co., J. N., Montreal, P.Q.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

CENTRE REAMERS
Bertram & Sons Co., John, Dundas.
Butterfield & Co., Inc., Rock Island, Que
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

CHAIN BLOCKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glassco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, N.Y.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson- Ltd., Montreal, Que

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MACHINE MILLING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAMPS, BELT
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glassco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
Can. Ingersoll-Rand Co., Sherbrooke.
Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal. Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found's & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

CONVEYORS, BELT AND CHAIN
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal.

CONVEYORS, OVERHEAD
Beatty Bros., Fergus, Ont.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blencke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

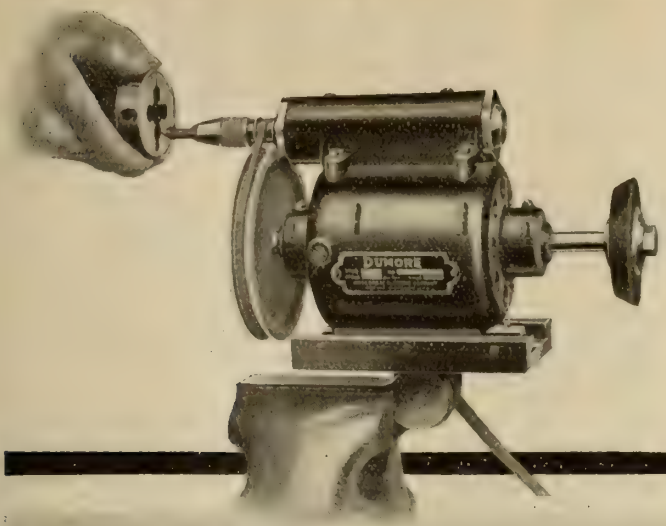
COUNTERSHAFTS
Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
Ford-Smith Machine Co., Hamilton, Ont.
Foster Machine Co., Elkhart, Ind.
Williams & Wilson Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.



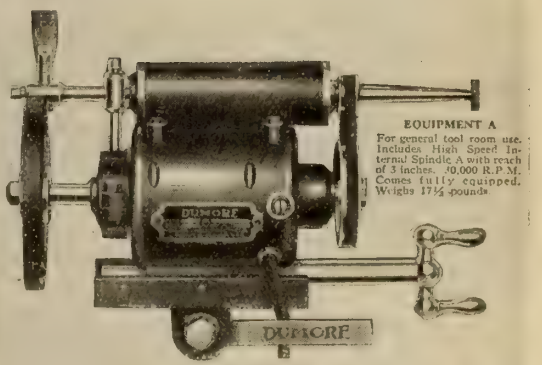
Regrinds Button-Dies in 3 Minutes

A GOOD example of one form of saving made possible through the use of the **DUMORE** grinder is found in the above illustration. Here is the attachment known as Equipment C that regrinds button-dies at the rate of twenty an hour. The special spring chuck holds an emery pencil that travels at the rate of 50,000 R. P. M. which has been found to be the correct cutting speed for work of this nature. Reclaiming these old and seemingly worthless dies, which formerly had to be discarded, means an enormous saving in the course of a few months.

The **DUMORE** grinder is portable and so constructed that the attachments are interchangeable. In other words, Equipment C may be detached and Equipments A or B put on. This gives the tool a very wide range of operation and makes it indispensable to the shop interested in securing the very best results. The **DUMORE** grinder is in perfect running balance and gives even small emery wheels the correct cutting speed. Chatter, taper or bell-mouthed grinding is thereby eliminated.

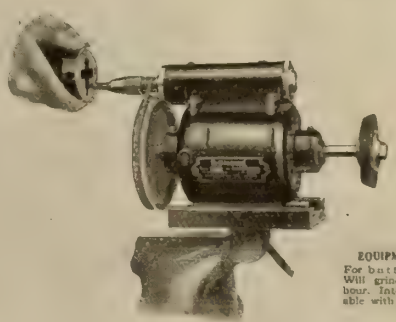
If your dealer does not carry the **DUMORE** in stock, write us for specifications and prices.

WISCONSIN ELECTRIC COMPANY
2918 16th Street — Racine, Wis.



EQUIPMENT A
For general tool room use. Includes High Speed Internal Spindle A with reach of 3 inches. 70,000 R.P.M. Comes fully equipped. Weighs 17½ pounds.

EQUIPMENT B
For deep internal work. Extension arm has 10-inch reach. 10,000 R.P.M. Arm interchangeable with internal spindle on Equipment A.



EQUIPMENT C
For button dies. Will grind 20 an hour. Interchangeable with A and B.

DUMORE HIGH SPEED GRINDERS

COUPLINGS, PLAIN, FLEXIBLE AND CUT OFF
Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

COVERS, OIL HOLE
Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

CRANES, GOLIATH, PNEUMATIC AND PORTABLE
Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

CRANES, TRAVELLING, ELECTRIC AND HAND POWER
Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

CRANK SHAFTS
Canada Found'g & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

CRANES, PORTABLE
Aikenhead Hardware Co., Toronto, Ont.
Can. Link-Belt Co., Toronto.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Springfield, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

CUTTERS, MILLING
Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Hinds Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
Foss Mchy & S'ply Co., Geo. F., Montreal
Garlock-Walker Machinery Co., Toronto.
Hurlburt, Rogers Machy. Co., South Sudbury, Mass.
Hall & Sons, John H., Brantford, Ont.
Kennedy & Sons, Wm., Owen Sound.
Niles-Bement-Pond Co., New York, N.Y.
Peerless Machine Co., Racine, Wis.
Prest-O-Lite Co., Inc., Toronto, Ont.
Racine Tool & Machine Co., Racine, Wis
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTING COMPOUND AND CUTTING OIL
Cataract Refining Co., Ltd., Toronto.

CUTTING OIL, RECLAIMING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

CUTTING AND WELDING PLANTS
Davis-Bournonville Co., Jersey City, N.J.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

CYANIDE AND LEAD BATH POTS
Swedish Crucible Steel Co., Windsor.

CYLINDERS, AIR
Ford-Smith Machine Co., Hamilton, Ont.
Smalley General Co., Inc., Bay City, Mich

CYLINDERS, AUTOMATIC REBORING JIGS AND REAMERS
Hinckley Machine Co., Hinckley, Ill.
Kelley Reamer Co., Cleveland, O.

DEHUMIDIFYING
B. F. Sturtevant Co, Galt, Ont.

DERRICKS
Aikenhead Hardware Co., Toronto, Ont.
Dominion Bridge Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

DIAMOND (BORTZ)
Furniss, Clarke & Co., Montreal, Que.

DIAMOND TOOLS
Ford-Smith Machine Co., Hamilton, Ont.
Furniss, Clarke & Co., Montreal, Que.
Joyce-Koebel Co., Inc., New York City.
Wheel Trueing Tool Co., Detroit.
Williams & Wilson, Limited, Montreal.

DIAMONDS, CARBON AND BORTZ
Wheel Trueing Tool Co., Detroit.

DIAMONDS, BLACK AND ROUGH
Joyce, Koebel & Co., Inc., New York.
Wheel Trueing Tool Co., Windsor, Ont.

DIE BLOCKS
General Steel Co., Milwaukee, Wis.

DIES, CUTTING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

DIE HEADS, AUTOMATIC
Greenfield Tap & Die Corp., Greenfield Mass.
Wells Bros. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

DIES, BRASS PRINTING, EMBOSSING AND LETTERING
Matthews, Jas. H., & Co., Pittsburgh, Pa

DIES FOR BIT BRACE USE
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Wells Brothers Co., of Canada, Galt.

DIES AND DIE STOCKS
Aikenhead Hardware Co., Toronto, Ont.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown, Boggs Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt. & Son, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Marshall, Son & Bunney, Toronto.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Rickert-Shafer Co., Erie, Pa.
Stoll Co., Inc., D. H., Buffalo, N.Y.
Wells Brothers of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que

DIES, METAL STAMPING
Elliott & Whitehall, Galt, Ont.

DIES, PIPE THREADING
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Williams & Wilson, Ltd., Montreal, Que.

DIES, THREADING
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Can., Galt, Ont.

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Becker Milling Machine Co., Boston
Garvin Machine Co., New York.
Pratt & Whitney Co., Dundas, Ont.

DIES FOR MACHINES
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Firth & Sons, Thos., Montreal, Que.
Landis Machine Co., Waynesboro, Pa.
Wells Brothers Co. of Canada, Galt.

DIE HEADS
Greenfield Tap & Die Corp., Greenfield, Mass.
Wells Bros. of Canada, Galt, Ont.

DIES, SELF-OPENING
Geometric Tool Co., New Haven.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
Wells Brothers Co. of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Mass.

DIE FILING MACHINES
Oliver Mach. Co., Grand Rapids, Mich.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
Firth & Sons, Thos., Montreal, Que.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

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Butterfield & Co., Inc., Rock Island, Que.
Wells Bros. Co. of Can., Galt, Ont.

DIES, SHEET METAL WORKING
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Canada
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Stoll Co., D. H., Buffalo, N.Y.

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Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Murchey Machine & Tool Co., Detroit.
National-Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Can., Galt, Ont.

DISCS, LEATHER, STEEL
Graton & Knight Mfg. Co., Worcester, Mass.
Swedish Steel & Importing Co., Montreal.

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W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
A. B. Jardine & Co., Hespeler, Ont.
Pratt & Whitney Co., Dundas, Ont.

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Hughes, Owens Co., Ltd., Montreal, Que.

DRAWING OFFICE SUPPLIES
Hughes, Owens Co., Ltd., Montreal, Que.

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Dominion Abrasive Co., Ltd., Mimico, Ont.
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Limited, Montreal

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W. F. & John Barnes Co., Rockford.
Can. Blower & Forge Co., Kitchener.
Canada Machinery Corp., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
U. S. Mach. Tool Co., Cincinnati, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Swedish Steel & Importing Co., Ltd., Montreal.

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Barnes, W. F. & John, Co., Rockford, Ill.
Bilton Mach. Tool Co., Bridgeport, Conn
Canada Machinery Corp., Galt, Ont.
Silver Mfg. Co., Salem, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Blower & Forge Co., Kitchener, Ont
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Mach. Co., Toronto.
Garvin Machine Co., New York.
Hoefer Mfg., Co., Freeport, Ill.
Henry & Wright Mfg. Co., Hartford, Conn
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Nat. Automatic Tool Co., Richmond, Ind.
Niles-Bement-Pond Co., New York.
Rockford Drilling Mach Co., Rockford, Ill

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Canadian Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Henry & Wright Mfg. Co., Hartford,
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.

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Bilton Mach. Tool Co., Bridgeport, Conn.
W. F. & John Barnes Co., Rockford, Ill.
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Canadian Machinery Corp., Galt, Ont.
Geo. F. Foss Mch. & S'ply Co., Montreal
Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
United States Mach. Tool Co., Cincinnati
Williams & Wilson, Limited, Montreal,

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Aurora Tool Works, Aurora, Ind.
John Bertram & Sons Co., Dundas.
Garlock-Walker Mach. Co., Toronto, Ont
Can. Blower & Forge Co., Kitchener.
Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Knight Metal Products, Toronto.
Landis Tool Co., Waynesboro, Pa.
R. McDougall Co., Galt.
Nat. Automatic Tool Co., Richmond, Ind.
Rockford Drilling Mach. Co., Rockford, Ill
Niles-Bement-Pond Co., New York.
Silver Mfg. Co., Salem, Ohio.
A. R. Williams Machinery Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

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Wickes Bros, Saginaw, Mich.

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Rice Lewis & Son, Toronto, Ont.
Silver Mfg. Co., Salem, Ohio.

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W. F. & John Barnes Co., Rockford, Ill
Can. Blower & Forge Co., Kitchener.
Can. Fairbanks-Morse Co., Montreal.
Geo. F. Foss Mch. & S'ply Co., Montreal
Fry's (London), Ltd., London, England
Garlock-Walker Machinery Co., Toronto.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O.
Williams & Wilson, Ltd., Montreal, Que.

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Cleveland Twist Drill Co., Cleveland.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Machine Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
Williams & Wilson, Ltd., Montreal, Que.

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Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Can. Blower & Forge Co., Kitchener.
Cleveland Twist Drill Co., Cleveland.
Geo. F. Foss Mch. & S'ply Co., Montreal
A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.
Wilt Twist Drill Co. of Can., Walkerville

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll

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Can. Blower & Forge Co., Kitchener.
Boker & Co., Inc., H., Montreal, Que.
Cincinnati Electrical Tool Co., Cincinnati
Geo. F. Foss Mch. & S'ply Co., Montreal
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
A. R. Williams Mach. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Garlock-Walker Mach. Co., Toronto, Ont.

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Armstrong-Whitworth of Can., Montreal.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland.
Canadian Fairbanks-Morse Co., Montreal
H. A. Drury Co., Montreal.
Geo. F. Foss Mch. & S'ply Co. Montreal
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
W. F. & John Barnes Co., Rockford, Ill
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Taylor J. A. M., Stair Bldg., Toronto.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que

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Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.

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Cleveland Pneumatic Tool Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Limited, Montreal.
Greenfield Tap & Die Corp., Greenfield.

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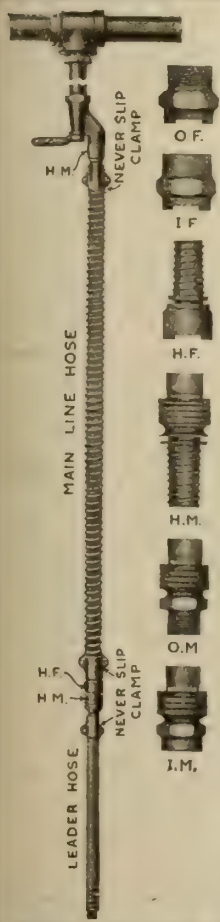
CLEVELAND HOSE SPECIALTIES



Bowes Automatic Air Hose Couplings

Standard Equipment Everywhere

STYLE O.F. is an Outside Thread Female Pipe End. Made in sizes ⅜-inch to 1½-inch.
STYLE I.F. is an inside Thread Female Pipe End. Made in sizes ¼-inch to 1½-inch.
STYLE H.F. is a Female Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE H.M. is a Male Hose End with spiral shank to insert into the hose and has groove for the Never Slip Hose Clamp. Made in sizes ¼-in. to 1½-in.
STYLE O.M. is an Inside Thread Male Pipe End Made in sizes ¼-in. to 1½-in.
STYLE I.M. is an Inside Thread Male Pipe End. Made in sizes ¾-in. to 1½-in.
The Male and Female Ends of Bowes Couplings interchange in sizes ¼-in. to ¾-in. Sizes 1-in. and 1¼-in. interchange. The 1½-in. ends interchange only with themselves.

BOWES COUPLINGS

Are instantly connected or disconnected.
They are absolutely air-tight under all pressures.
They quickly pay for themselves by stopping costly leaks.
They interchange in sizes most commonly used.
They have no loose parts to be mislaid or lost.
They are made of brass and will not rust.
The U-shaped Gasket interchanges in couplings ¼-inch to ¾-in.

The Cleco Never Slip Hose Clamp

Made in same sizes as Bowes Couplings

The adjoining cut of Cleco Never Slip Hose Clamp shows the "Flanges" which engage the groove provided in all hose ends of Bowes Couplings. The "Model Hose Line" illustrated shows correct styles of couplings and valve to use and proper way to attach the clamps.

CLECO GROOVED HOSE NIPPLE

Grooved Nipples when attached to hose with the wire clamp cannot "blow-out," as one-half of the Wire Clamp lies in Nipple Groove, and the other half on the hose, uniting nipple and hose permanently.

WIRE CLAMP TOOL

To apply Wire Clamps to Grooved Hose Nipples you need the Wire Clamp Tool illustrated, a small hand-operated tool at moderate cost which we carry in stock for immediate delivery. In Stock: Riveting and Chipping Hammers, Four-piston Air Drills, Corner Drills, Emery Grinders, Sand Rammers, Holder Ons, etc.

Use Annealed Wire No. 14

Write for Bulletin 38 illustrating Cleco Hose Fittings, Couplings, Valves, etc.

IMPORTANT:—The Small Leaks in your "AIR LINE" mean serious loss in DOLLARS. Have you any idea of the amount of "Air" wasted in small leaks at your connections? Air Leakage through 1-16 in. opening equals 5.32 cu. ft. per minute at 80 lbs. It will pay you to install Bowes Couplings and stop costly leaks.

Write for Bulletin 34A, 41 and 43.

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A. R. WILLIAMS MACHINERY CO., TORONTO, 337 Craig St., W., MONTREAL. WILLIAMS & WILSON, MONTREAL

If interested tear out this page and place with letters to be answered.

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Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.

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Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co. of Can., Walkerville.

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Morse Twist Drill & Mch. Co., New Bedford, Mass.
Wilt Twist Drill Co. of Can., Walkerville.

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DRIVES, CHAIN
See Belting, Chain.

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DRY CLEANING SYSTEM
Bowser Co., Ltd., S. F., Toronto, Ont.

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ELECTRIC MOTORS
Volta Manufacturing Co., Welland, Ont.

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Canada Wire & Iron Goods Co., Hamilton

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Katie Foundry, Galt, Ont.

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Curtis Pneumatic Machy. Co., St. Louis.
Williams & Wilson, Ltd., Montreal, Que.

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Williams & Wilson, Ltd., Montreal, Que.

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Oliver Machinery Co., Grand Rapids, Mich

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Ford-Smith Mach. Co., Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Standard Machy. & Supplies, Montreal.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

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FACTORY SITES
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Williams & Wilson, Ltd., Montreal, Que.

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Page Steel & Wire Co., Adrian, Mich.

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Vanadium-Alloys Steel Co., Pittsburgh, Pa

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Marshall, Son & Bunney, Toronto, Ont.
Nicholson File Co., Port Hope, Ont.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
Whitman & Barnes Mfg. Co., Akron, O.
Wilkinson & Kompass, Hamilton, Ont.

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Can. Wire & Iron Goods, Hamilton, Ont.

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Marten Machine Co., Hamilton, Ontario.
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FORGINGS
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Williams & Co., J. H., Brooklyn, N.Y.

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Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
National Machy. Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.

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Armstrong-Whitworth of Can., Montreal.
Blancke Co., L. C., New York City.
Can. Found. & Forgings, Ltd., Welland.
Williams & Co., J. H., Brooklyn, N.Y.

FORMING
Brown & Sharpe Mfg. Co., Providence, R.I.

FOUNTAINS, DRINKING
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

FRICTION LEATHERS
Graton & Knight Mfg. Co., Montreal.

FRICTION SURFACE BELTING
Can. Consolidated Rubber Co., Montreal.

FUEL OIL SYSTEMS
Bowser Co., Ltd., S. F., Toronto, Ont.
Gilbert & Barker Mfg. Co., Springfield.

FURNACES, ANNEALING, CASE HARDENING AND TEMPERING
Bellevue Furnace Co., Detroit, Mich.
Brown & Sharpe Mfg. Co., Providence, R.I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
Mechanical Eng'r'g Co., Three Rivers, Q.
W. S. Rockwell Co., New York, N.Y.
Standard Fuel Engr. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

FURNACES, BLAST
Bellevue Industrial Furnace Co., Detroit.
W. S. Rockwell Co., New York, N.Y.
Toronto Iron Works, Ltd., Toronto.

FURNACES, FORGING
Gilbert & Barker Mfg. Co., Springfield.
W. S. Rockwell Co., New York, N.Y.

FUSE BOXES, STEEL
Dom. Forge & Stamp. Co., Walkerville.

GANG PLANER TOOLS
Armstrong Bros. Tool Co., Chicago.

GAS AND STEAM ENGINES
Mesta Machine Co., Pittsburgh, Pa.

GASKETS, LEATHER, ETC.
Graton & Knight Mfg. Co., Montreal.

GASOLINE METERS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE TANKS
Bowser Co., Ltd., S. F., Toronto, Ont.

GASOLINE PUMPS, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.

GAUGES
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.

GAUGE BLOCKS
Wilton & Mfg. Co., Boston, Mass.

GAUGERS, CALIPERS
Williams & Co., J. H., Brooklyn, N.Y.

GAUGES, MERCURY COLUMN, DRAFT
Taylor Instrument Co., Rochester, N.Y.

GAUGES, HYDRAULIC
Taylor Instrument Co., Rochester, N.Y.

GAUGES, MANUFACTURERS, LIMIT, THREAD
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Can., Galt, Ont.

GAUGES, STANDARD
Brown Engineering Corp., Toronto, Ont.
Canadian Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
C. E. Johanson, Inc., Toronto, Ont.
Morse Twist Drill & Machine Co., New Bedford.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney Co., Hartford, Conn.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Toronto Tool Works, Toronto, Ont.
Wells Brothers Co. of Canada, Galt, Ont.
Worth Engineering Co., Toronto, Ont.

GAUGES, THREAD
Bicknell-Thomas Co., Greenfield, Mass.

GAUGES, VACUUM AND PRESSURE
Bristol Co., Waterbury, Conn.
Taylor Instrument Co., Rochester, N.Y.

GAUGES, SNAP, THREAD AND CYLINDRICAL
C. E. Johanson, Inc., Toronto, Ont.

GEAR BLANKS
Can. Steel Foundries, Ltd., Montreal.
Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

GEAR BLANKS, CAST
Katie Foundry, Galt, Ont.

GEAR SHAPERS AND CUTTERS
Fellows Gear & Shaper Co., Springfield, V.

GEAR-CUTTING MACHINERY
Bilton Mach. Tool Co., Bridgeport, Conn.
Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

GEAR-TESTING MACHINE
Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochester

GEAR BOXES, REDUCTION
Coventry Chain Co., Coventry, Eng.

GEARS, CHAIN
Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

GEARS, CUT, MORTISE, ANGLE, WORM
Baxter & Co., Ltd., J. R., Montreal.
Can. Link-Belt Co., Toronto, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Elliott & Whitehall, Galt, Ont.
Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Hull Iron & Steel Found., Ltd., Hull, Q.
Illinois Tool Works, Chicago, Ill.
Jones & Glassco, Montreal.
Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
Philadelphia Gear Works, Philadelphia
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.

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Gardner, Robt., & Son, Montreal.
Grant Gear Works, Boston, Mass.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Philadelphia Gear Works, Philadelphia
A. R. Williams Machy. Co., Toronto.

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Fellows Gear & Shaper Co., Springfield, V.

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Morse Chain Co., Ithaca, New York.

GEARS, SPUN, BENCH, SPIRAL
Brown & Sharpe Mfg. Co., Providence, R.I.

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GENERAL MACHINE WORK
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Oliver Machinery Co., Grand Rapids, Mich

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Strong, Kennard & Nutt Co., Cleveland.
Willson & Co., Inc., T. A., Reading, Pa.

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Wilson & Co., J. C., Belleville, Ont.

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Aikenhead Hardware, Ltd., Toronto.
Rice Lewis & Son, Toronto.

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Standard Optical Co., Geneva, N.Y.
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Jones & Glassco, Montreal.
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GREASES (See Lubricants)

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Garlock-Walker Machinery Co., Toronto.

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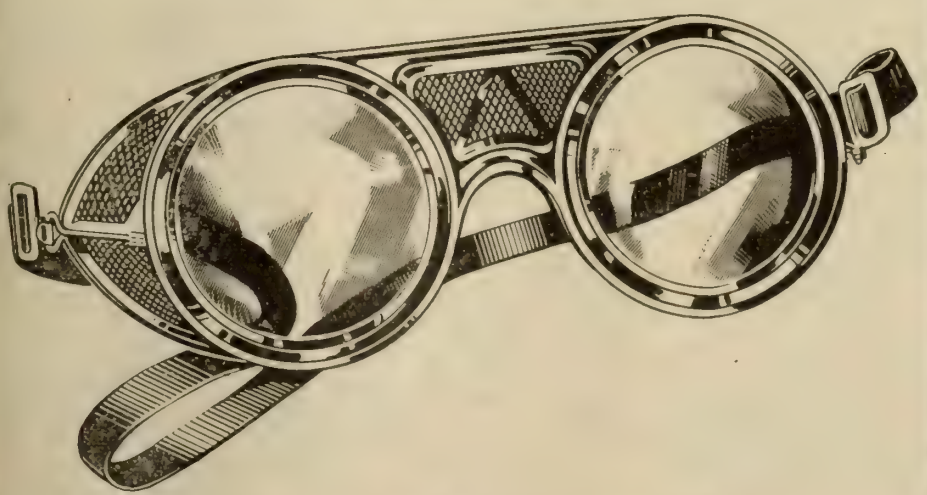

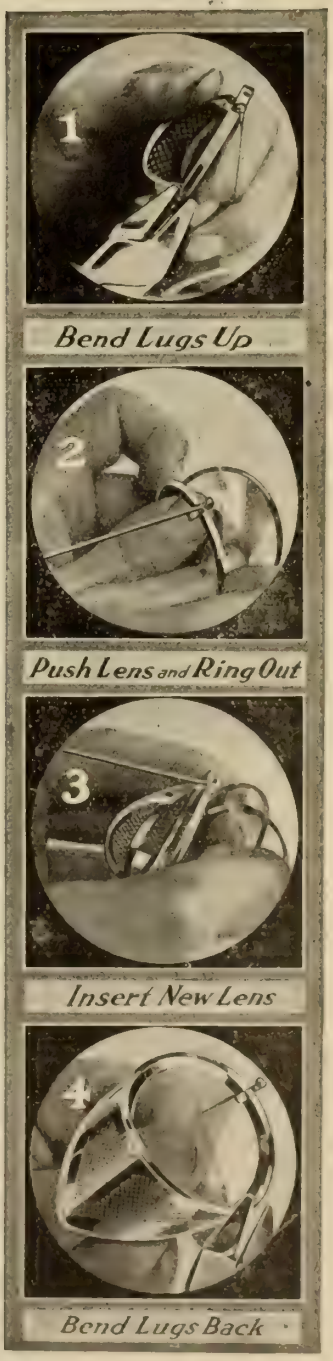

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If interested tear out this page and place with letters to be answered.

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Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield, M.
Heald Machine Co., Worcester, Mass.
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Manhattan Machine & Tool Co., Grand Rapids, Mich.
Norton Co., Worcester, Mass.
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Williams & Wilson, Ltd., Montreal.

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Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal.

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Brown & Sharpe Mfg. Co., Providence, R.I
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Modern Tool Co., Erie, Pa.
Norton Co., Worcester, Mass.
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Cincinnati Electrical Tool Co., Cincinnati.
Ford-Smith Mach. Co., Hamilton, Ont.
Wisconsin Electric Co., Inc., Racine, Wis.
Grant Mfg. & Mach. Co., Bridgeport, Conn
Garlock-Walker Machinery Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Independent Pneumatic Tool Co., Chicago
United States Elec. Tool Co., Cincinnati
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Williams & Wilson, Ltd., Montreal.
Wilkinson & Kompass, Hamilton, Ont.

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Bryant Chucking Grinder Co., Springfield, Vermont.
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Fitchburg Grinding Mach. Co., Fitchburg, Mass.

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Heald Machine Co., Worcester, Mass.
Independent Pneumatic Tool Co., Chicago
MacGovern & Co., Montreal, Que.

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Bristol Machine Tool Co., Bristol, Conn.
Manhattan Machine & Tool Co., Grand Rapids, Mich.

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W. F. & John Barnes Co., Rockford, Ill.
Blount & Co., J. G., Everet, Mass.
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Ford-Smith Machine Co., Hamilton, Ont.
Greenfield Machine Co., Greenfield, Mass.
Greenfield Tap & Die Corp., Greenfield.
National-Acme Co., Cleveland, Ohio.
Tabor Mfg. Co., Philadelphia, Pa.
Wells Bros. of Canada, Galt, Ont.

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Williams & Wilson, Ltd., Montreal.

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Brown & Sharpe Mfg. Co., Providence, R.I
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Pratt & Whitney Co., Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Norton Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal.

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Ford-Smith Mach. Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal.
Garvin Machine Co., New York.
Garlock-Walker Machy. Co., Toronto.
Greenfield Machine Co., Greenfield, Mass.
Hall & Sons, John H., Brantford, Ont.
LeBlond Mch. Tool Co., R. K., Cincinnati
Niles-Bement-Pond Co., New York, N.Y.
Norton Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wis.
Williams & Wilson, Ltd., Montreal.

GRINDING MACHINES, CAR WHEEL, CUTTER, CYLINDRICAL, CRANKSHAFT

Brown & Sharpe Mfg. Co., Providence, R.I
Norton Co., Worcester, Mass.

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Aikenhead Hardware Co., Toronto, Ont.
Brantford Emery Wheel Co., Brantford.
Can. Fairbanks-Morse Co., Montreal.
Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Norton Co., Worcester, Mass.

GRINDING WHEEL DRESSER

Dominion Abrasive Wheel Co., Ltd., Mimico, Ont.

GUARDS, WINDOW AND MACHINE

Canada Machinery Corp., Galt, Ont.
Canada Wire & Iron Goods Co., Hamilton
Dennis Wire & Iron Works, London, Ont.
Page Steel & Wire Co., Adrian, Mich.
Strong, Kennard & Nutt Co., Cleveland.

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Williams & Co., J. H., Brooklyn, N.Y.

GUTTERS AND SKYLIGHTS

H. H. Robertson, Ltd., Sarnia, Ont.

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Atkins & Co., Ltd., Wm., Sheffield, Eng.
Blancke Co., L. C., New York City.
Boker & Co., Inc., H., Montreal, Que.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Ford-Smith Machine Co., Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Fry's (London), Ltd., London, England.
Racine Tool & Machine Co., Racine, Wis.
Plewes, Ltd., Winnipeg, Man.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Simonds Mfg. Co., Fitchburg, Mass.
L. S. Starrett Co., Athol, Mass.
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Victor Saw Works, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.
Williams & Wilson, Ltd., Montreal.

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Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York City.
Victor Saw Works, Hamilton, Ont.
Rice Lewis & Son, Toronto, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal.

HACK SAWS, POWER

Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Diamond Saw & Stamping Wks., Buffalo.
Foss Mchy. & S'ply Co., G. F., Montreal.
Ford-Smith Machine Co., Hamilton.
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Starrett Co., L. S., Athol, Mass.
Victor Saw Works, Hamilton, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal.

HAMMERS, FORGING

Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, HATCHETS

Whitman & Barnes Co., St. Catharines.

HAMMERS (DROP), MOTOR AND BELT DRIVEN

Beaudry & Co., Boston, Mass.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton.
Can. Billings & Spencer, Ltd., Welland.
Canada Machinery Corp., Galt, Ont.
High Speed Hammer Co., Rochester, N.Y.
Jardine & Co., A. B., Hespeler, Ont.
Niles-Bement-Pond Co., New York, N.Y.
Toledo Machine & Tool Co., Toledo.
United Hammer Co., Boston, Mass.
Williams & Wilson, Ltd., Montreal.

HAMMERS, HELVE POWER

Canada Machinery Corp., Galt, Ont.
West Tire Setter Co., Rochester, N.Y.
Williams & Wilson, Limited, Montreal.

HAMMERS, CHIPPING, CAULKING, PNEUMATIC

Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, MARKING

Matthews & Co., Jas. H., Pittsburgh, Pa.

HAMMERS, NAIL MACHINE

Rice Lewis & Son, Toronto, Ont.
United Hammer Co., Boston, Mass.

HAMMERS, POWER

Nazel Eng. & Mach. Wks., Philadelphia.

HAMMERS, STEAM

Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.

HAND PLANERS

Oliver Mchry. Co., Grand Rapids, Mich.

HAND LEATHERS OR PADS

Graton & Knight Mfg. Co., Montreal.

HANGERS

Brown & Sharpe Mfg. Co., Providence, R.I

HANGERS, SHAFT

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Can. General Electric Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto.
Gray Ball Bearing Co., Ltd., Toronto.
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Can. S K F Co., Toronto, Ont.
Gardner & Son, Robt., Montreal.
Jones & Glassco, Montreal.
Standard Pressed Steel Co., Philadelphia
Williams & Wilson, Limited, Montreal.

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Shore Instrument & Mfg. Co., New York.

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HELMETS, SANDBLAST, AMMONIA

Strong, Kennard & Nutt Co., Cleveland.

HIGH SPEED STEEL

See Steel.

HINGE MACHINERY

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Illinois Tool Works, Chicago, Ill.

HINGES

Butterfield & Co., Inc., Rock Island, Que.
London Bolt & Hinge Wks., London, Ont.

HOBS

Greenfield Tap & Die Co., Greenfield, Mass
Illinois Tool Works, Chicago, Ill.
Pratt & Whitney Co., Dundas, Ont.
Taylor, J. A. M., 318 Stair Bldg., Toronto
Wells Bros. of Canada, Galt, Ont.

HOISTS, AIR

Can. Ingersoll-Rand Co., Ltd., Sherbrooke
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

HOISTS, CHAIN AND PNEUMATIC

Can. Ingersoll-Rand Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Ford Chain Block & Mfg., Philadelphia.
Independent Pneumatic Tool Co., Chicago
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.
Williams & Wilson, Limited, Montreal.

HOISTS, ELECTRICAL

Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
Electric Steels & Metals Ltd., Welland.
Kennedy & Sons, Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.

HOISTS, ELEC., STATIONARY, MONO RAIL

Volta Mfg. Co., Welland, Ont.

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Matthews & Co., Jas. H., Pittsburgh, Pa.

HOLDERS, ELECTRIC

Electric Steels & Metals, Ltd., Welland.

HOOKS, BELT LACING

Clipper Belt Lacer Co., Grand Rapids.

HOPPERS

MacKinnon Steel Co., Ltd., Sherbrooke.
Dominion Bridge Co., Montreal, Que.
William Hamilton Co., Peterboro, Ont.
Toronto Iron Works, Ltd., Toronto, Ont.

HOSE, PNEUMATIC

Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Wells Bros. Co. of Canada, Galt, Ont.

HOSE, ALL KINDS

Int. Mach. & Supply Co., Ltd., Montreal.

HOSE, SAND BLAST

Pangborn Corporation, Hagerstown, Md.

HUMIDIFIERS

Sturtevant Co., B. F., Galt, Ont.

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HYDRAULIC MACHINERY

Garlock-Walker Machinery Co., Toronto.
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.
Victoria Foundry Co., Ottawa.
Williams & Wilson, Limited, Montreal.

HYDROMETERS, HYGROMETERS, HYGRODEIKS

Taylor Instrument Co., Rochester, N.Y.

INDICATORS, SPEED

Aikenhead Hardware Co., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES

Brown & Sharpe Mfg. Co., Providence, R.I.
Dickow, Fred. C., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal.

INDICATING INSTRUMENTS

Taylor Instrument Co., Rochester, N.Y.

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Electric Steel & Metals Co., Welland.

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Robertson Co., Ltd., H. H., Sarnia, Ont.

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Consolidated Optical Co., Toronto.

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Hanna & Co., M. A. Cleveland, O.

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JACKS

Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Limited, Montreal.

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Canadian Fairbanks-Morse Co., Montreal
Northern Crane Works, Walkerville.

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Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Skinner Chuck Co., New Britain, Conn.

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JIGS, TOOLS, ETC.

Brown Engineering Corp., Toronto.
Elliott & Whitehall Mach. & Tool Co., Galt.
Gisholt Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

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Canada Foundries & Forgings, Welland.

KEY SEATERS

Garlock-Walker Machy. Co., Toronto, Ont.
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Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Limited, Montreal.

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Williams & Co., J. H., Brooklyn, N.Y.

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Can. Blower & Forge Co., Kitchener, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

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Gray Ball Bearing Co., Ltd., Toronto.

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LABORATORIES, INSPECTION AND TESTING (see Chemists)

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Northern Crane Works, Walkerville.

LACING MACHINES

Clipper Belt Lacer Co., Grand Rapids, M.

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Can. General Electric Co., Toronto, Ont.

LAMPS, TUNGSTEN AND NITRO

Can. General Electric Co., Toronto, Ont.

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LATH

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LATHE CHUCKS (See Chucks)

LATHE DOGS AND ATTACHMENTS

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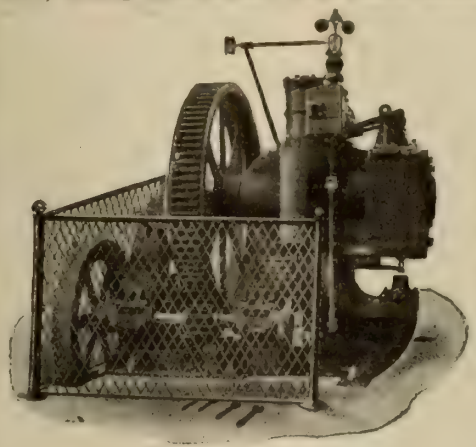

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Hendey Mach. Co., Torrington, Conn.
Hinckley Machine Works, Hinckley, Wis.
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Butterfield & Co., Inc., Rock Island, Que.
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Kearney & Trecker Co., Milwaukee, Wis.
Marshall, Son & Bunney, Toronto.
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Foss Mchy. & S'ply Co., G. F., Montreal.
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Garvin Machine Co., New York.
National Machy. Co., Tiffin, Ohio.
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Hendey Machine Co., Torrington, Conn.
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Tabor Mfg. Co., Philadelphia, Pa.
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Hall & Son, J. H., Brantford, Ont.
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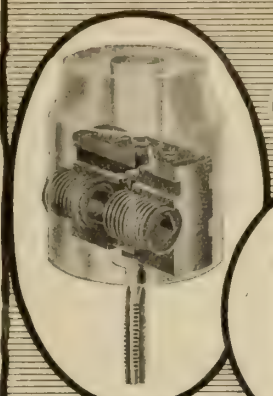

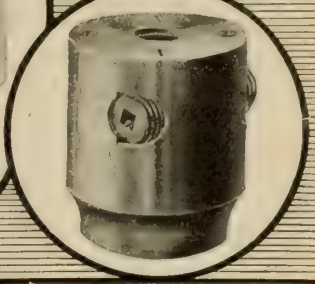

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See Guards

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Wells Bros. of Canada, Galt, Ont.

PIPE WRENCHES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.

PISTON AND PISTON RING MACHINES
National Acme Co., Windsor, Vt.

PLANER BOLTS
Morrow Screw & Nut Co., J., Ingersoll, Ont

PLANER JACKS
Armstrong Bros. Tool Co., Chicago.

PLANERS, STANDARD AND ROTARY
Betts Machine Co., Rochester, N.Y.
Bertram & Sons Co., John, Dundas.
Oliver Machy. Co., Grand Rapids, Mich.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner & Son, Robt., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Morton Mfg. Co., Muskegon Heights, Mich
Niles-Bement-Pond Co., New York.
Whitcomb-Blaisdell Mach. Tool Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

PLANING AND SHAPING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garlock-Walker Machinery Co., Toronto.
Garvin Machine Co., New York.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PLANER-SHAPER, COMBINED OPEN SIDE
Lynd-Farquhar Co., Boston.
Williams & Wilson, Ltd., Montreal, Que.

POWER HAMMERS
Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Co., St. Catharines.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Williams & Wilson, Ltd., Montreal, Que.

PRESSED STEEL PARTS
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlass Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, FILTER
Perrin, Ltd., William R., Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SEAL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, BOILER FEED
Geo. W. Cole, Ltd., Toronto.

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Furniss, Clarke & Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H, Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Whitman & Barnes Co., St. Catharines.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.

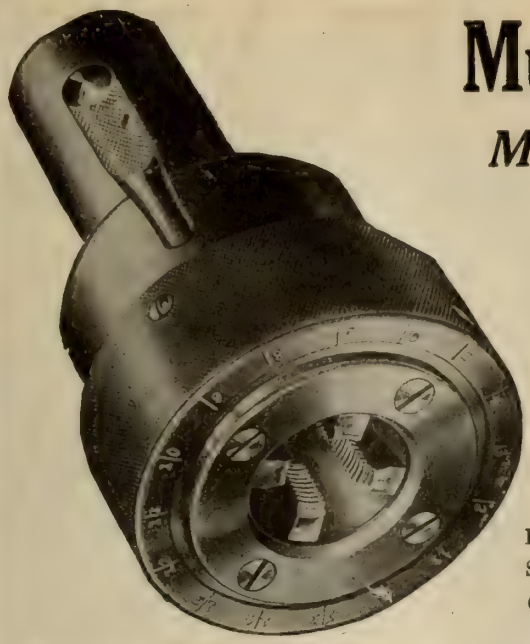
REAMERS, ADJUSTABLE
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Plewes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Blancke Co., L. C., New York City.
J. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

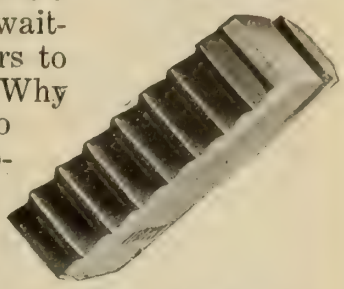
REAMERS, HAND
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.



Murchey Chasers

Mean Quick Deliveries

Murchey Tools will cut your tapping and threading costs. **They will boost production 50%.** Another important feature is Murchey's **Quick Deliveries on Chasers.** This is a Murchey specialty. No waiting! We get your chasers to you when you want them. Why not use Murchey Tools to speed up your threading production?



Send for a Murchey Tap or Die on approval and give it a trial. You will then secure actual proof of its value to you.

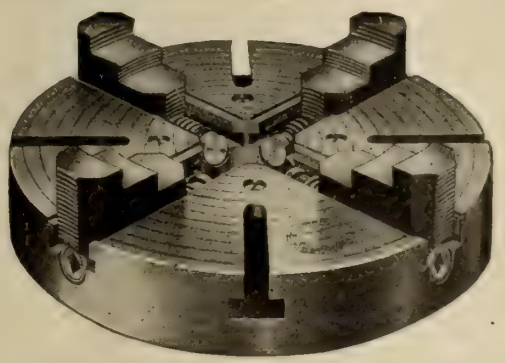
Murchey Machine & Tool Company, Detroit, Mich.

THE COATS MACHINE TOOL CO., Caxton House, Westminster, London, England, Glasgow, Newcastle-on-Tyne,
FENWICK FRERES AND CO., 15 Rue Fenelon, Paris, France

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

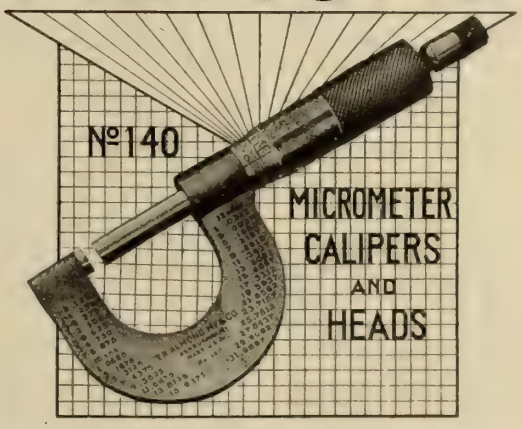
UNION MANUFACTURING COMPANY

New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

ALMOND



All Almond Micrometers are inspected and adjusted to Johansson Gages and recognized comparison only with these gages.

Almond Service.—Should the Micrometer need readjusting at any time or defect in material or workmanship develop send to Ashburnham and readjustment or replacement will be made without expense.

OTHER **ALMOND** PRODUCTS

DRILL CHUCKS, RIGHT ANGLE TRANSMISSION LATHE CHUCKS, FLEXIBLE STEEL TUBING

T. R. Almond Mfg. Co., Ashburnham, Mass.

If interested tear out this page and place with letters to be answered.

REAMERS, PIN
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMER FLUTING MACHINES
Garvin Machine Co., New York..

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland

RIVETS.
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

RODS, HIGH SPEED AND CARBON DRILL
Blancke Co., L. C., New York City.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLL ENGRAVING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROLLS AND TABLES
Elec. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland.

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford.
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROLL ENGRAVINGS
Hoggson & Pettis Mfg. Co., New Haven, Conn.

RUBBER MFRS.' SUPPIES
Hoggson & Pettis Mfg. Co., New Haven, Conn.

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Dom. Steel Products Co., Ltd., Brantford.
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Dom. Steel Products Co., Ltd., Brantford.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can.. Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW DRIVERS
Whitman & Barnes Co., St. Catharines.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co. Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

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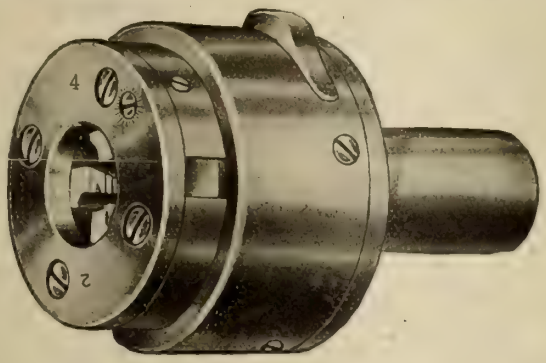

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TIGHTENERS, BELT
Hoggson & Pettis Mfg. Co., New Haven, Conn.

TINSMITHS' TOOLS
Brown, Boggs & Co., Hamilton, Can.
Williams & Wilson, Ltd., Montreal, Que.

TIRE BENDERS
Jardine & Co., Ltd., A. B., Hespeler.

TIRE SETTING MACHINES, HYDRAULIC
Perrin, Ltd., William R., Toronto.
West Tire Setter Co., Rochester, N.Y.

TOOL CASES
Rice Lewis & Son, Toronto, Ont.

TOOL HOLDERS
Aikenhead Hardware Co., Toronto, Ont.
Cleveland Twist Drill Co., Cleveland.
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL POSTS, LATHE
Armstrong Bros. Tool Co., Chicago.
Williams & Co., J. H., Brooklyn, N.Y.

TOOL ROOM PARTITIONS
Canada Wire & Iron Goods Co., Hamilton.

TOOLS, BENDING
Peck, Stow & Wilcox Co., Southington.

TOOLS, BLACKSMITHS'
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son Toronto, Ont.

TOOLS, ADJUSTABLE BORING
Kelly Reamer Co., Cleveland, O.
Williams & Wilson, Ltd., Montreal, Que.

TOOLS, ELECTRIC
Independent Pneumatic Tool Co., Chicago.
Williams Machy. Co., A. R., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
U. S. Electrical Tool Co., Cincinnati, O.

TOOLS, FORMING
Davidson Tool Mfg. Co., New York, N.Y.

TOOLS, LATHE, PLANER, SLOTTER
Armstrong Bros. Tool Co., Chicago.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

TOOLS, SCREW MACHINE
Foster Machine Tool Co., Elkhart, Ind.

TOOLS, SPECIAL
Globe Engineering Co., Ltd., Hamilton.
Hoggson & Pettis Mfg. Co., New Haven, Conn.

TORCHES, BLOW
Int. Mach. & Supply Co., Ltd., Montreal.

TORCHES, STEEL
Armstrong, Whitworth of Can., Montreal.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

TORCHES, GASOLINE, KEROSENE AND ALCOHOL
Turner Brass Works, Sycamore, Ill.

TRACK SYSTEMS
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

TRADE MARKS
Shipman & Co., H. C., Ottawa.

TRANSFORMERS
Can. General Electric Co., Toronto, Ont
MacGovern & Co., Montreal, Que.

TRANSITS
Hughes, Owens Co., Ltd., Montreal, Que.

TRANSMISSION CHAIN
Morris Chain Co., Ithaca, New York.

TRANSMISSION MACHINERY
American Pulley Co., Philadelphia, Pa.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Drawn Steel Co., Hamilton, Ont.
Coventry Chain Co., Coventry, England.
Hamilton Gear & Machine Co., Toronto.
Jones & Glassco, Montreal.
Kennedy & Sons, Wm., Owen Sound, Ont.
Morse Chain Co., Ithaca, N.Y.
Wilson & Co., J. C., Belleville, Ont.
Williams Machinery Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

TRANSMISSION ROPE
Jones & Glassco, Montreal, Que.
MacKinnon Steel Co., Ltd., Sherbrooke.
Wilson & Co., J. C., Belleville, Ont.

TRANSMISSION TOWERS
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Northern Crane Works, Walkerville.
Tallman Brass & Metal Co., Hamilton.

TROLLEYS
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TRUCKS, FACTORY, FREIGHT, ETC
Canada Machinery Corp., Galt, Ont.
Chapman Double Ball Bearing, Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Rice Lewis & Son, Toronto, Ont.

TRUCKS, FLOOR
Beatty Bros., Fergus, Ont.

BUTTERFIELD

Drills, Taps, Dies Reamers

and Milling Cutters

Quality in small tools means satisfaction to the skilled mechanic who uses them, his loyal co-operation to achieve the finest results.

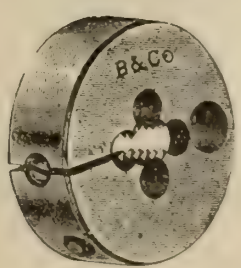
Prolonged service under the most severe conditions have proven the quality of Butterfield Tools.

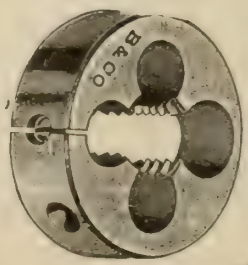
Butterfield quality is uniformly dependable

May we send you the proof — (a trial order)?

Butterfield & Co., Inc.

Rock Island, Quebec





If interested tear out this page and place with letters to be answered.

Canadian Machinery As An Advertising Medium

By J. H. M.

THERE is a saying that no matter where we go we will meet with a doubting Thomas, and, of course, the same holds good as far as advertising is concerned.

"You've got to show me," is a favorite expression of these Missouri inhabitants, so following is proof of the most convincing character. To commence with, the writer is not connected with the advertising staff, but merely one of the editorial department. He was not in search of a glowing tale regarding the possibilities of advertising, but he was out to find how business in general was going.

The gentleman whom he interviewed was S. L. Clark, Esq., of the Perfect Machine Tool Company, Galt, Ontario.

"How's business?" was my first question, and the reply was as follows: "Splendid. We are doubling our foundry capacity and intend doubling our machine shop space directly after."

Naturally, such a reply was encouraging.

"How do you account for this rush and where is the work coming from"? was my next query.

"To your first question I would say that this is the result of producing a first-class article and advertising the same judiciously and wisely; secondly, that our orders are coming in from all over the Dominion of Canada and Great Britain," was his reply.

"Evidently you are a firm believer in advertising," I said.

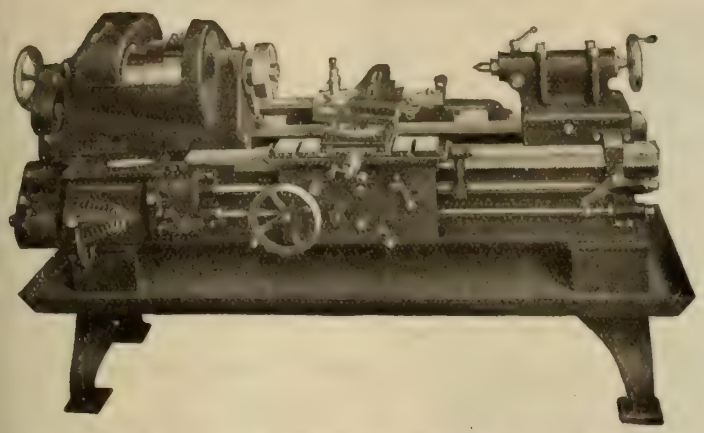
"I certainly am," was the reply. "Here are my views on the subject:

"In advertising, just the same as in anything else, good judgment must be used. You must study where to advertise, when to advertise and how to advertise. Each feature is equally important. You can spend more money foolishly through advertising than in any other way. In some cases I would not give five cents for space which they ask $10.00, $20.00 or $30.00 for, simply because I believe that no results would be obtained. In other words, I pick carefully where I advertise. I am a firm believer in the possibilities of export business and have secured inquiries from England, France, Spain and South America through judicious advertising in CANADIAN MACHINERY. We have made good connections already in England and hope soon to make connections of like nature in the other countries mentioned. The man who advertises is bound to go ahead, providing that the article he is advertising backs up every statement in his advertisement and he uses judgment in what he puts before the buying public.

"Personally, I cannot speak too strongly for the cause of advertising, and I firmly believe that CANADIAN MACHINERY, as an advertising medium, has helped us considerably in our present business expansion."

"LEHMANN LATHES"

Will Put the Same Degree of Efficiency Into *Your* Shops as They Have in Many Others



TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

We know you are interested, so don't put off writing us. Do it to-day. Now!

LEHMANN MACHINE COMPANY, 612 S. BROADWAY, ST. LOUIS, U. S. A.

TRUCKS, LUMBER AND KILN
Swedish Steel & Importing Co., Montreal.
Northern Crane Works, Walkerville.

TUBING, SEAMLESS, BRASS AND COPPER
Standard Tube & Fence Co., Woodstock.
Tallman Brass & Metal Co., Hamilton.

TUBING COILERS, FLEXIBLE METAL
Almond Mfg. Co., Ashburnham, Mass.

TURRET MACHINES, LATHES
Brown & Sharpe Mfg. Co., Providence.
Garlock-Walker Machinery Co., Toronto.
Greenfield Tap & Die Corp., Greenfield.
Oliver Mchy. Co., Grand Rapids, Mich.
Pratt & Whitney, Hartford, Conn.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

TURBINES, HORIZONTAL
Wilson & Co., J. C., Belleville, Ont.

TURBO GENERATOR UNITS
MacGovern & Co., Montreal, Que.
Warner & Swasey, Cleveland, O.
Garvin Machine Co., New York.

TURNBUCKLES
Canada Fdrs. & Forg. Ltd., Welland.
Morrow Screw & Nut Co., Ingersoll, Ont.
Rice Lewis & Son, Toronto, Ont.

TURNTABLES
Can. Link-Belt Co., Toronto, Ont.
Elec. Steel & Metals, Welland, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

TWIST DRILLS
Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.

UPSETTING AND BENDING MACHINERY
Bertram & Sons Co., John, Dundas.
Brown, Boggs Co., Ltd., Hamilton, Can.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Machinery Co., Toronto.
Jardine & Co., A. B., Hespeler, Ont.
National Machy. Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bement-Pond Co., New York.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

VALVES, REDUCING
Geo. W. Cole, Ltd., Toronto.

VALVES, CHECK
Geo. W. Cole, td., Toronto.

VALVE LEATHERS
Graton & Knight Mfg. Co., Montreal.

VALVE GRINDERS (PNEUMATIC)
Cleveland Pneumatic Tool Co., Toronto.

VALVES, HYDRAULIC
Metalwood Mfg. Co., Detroit, Mich.

VENTILATING APPARATUS
Brantford Oven & Rack Co., Brantford.
Can. Blower & Forge Co., Kitchener, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

VENTILATORS
H. H. Robertson, Ltd., Sarnia, Ont.

VISE STANDS, PORTABLE
Williams & Co., J. H., Brooklyn, N.Y.

VISES, BENCH
Aikenhead Hardware Co., Toronto, Ont.
Becker Milling Machine Co., Boston, Mass.
Foss Machy. & Sply. Co., G. F., Montreal.
Williams & Wilson, Ltd., Montreal, Que.

VISES, DRILL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

VISES, PIPE
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Butterfield & Co., Rock Island, Que.
Marshall, Son & Bunney, Toronto.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

VISES, MILLING MACHINE
Brown & Sharpe Mfg. Co., Providence, R.I.

VISES, PLANER AND SHAPER
Aikenhead Hardware Co., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

WASHER MACHINES
National Machy. Co., Tiffin, Ohio.

WASHERS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes, Wallace, Co., Bristol, Conn.
Graton & Knight Mfg. Co., Worcester.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Norton, Ralph B., Agent, Montreal.
London Bolt & Hinge Wks., London, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WASTE
Wilkinson & Kompass Hamilton, Ont.
Wood Turret Machine Co., Brazil, Ind.

WASTE CLEANER AND OIL RECLAIMER
Oakley Chemical Co., New York, N.Y.

WATER-INTAKE SCREENS
Can. Link-Belt Co., Toronto, Ont.

WATER TOWERS
Toronto Iron Works, Ltd., Toronto.

WELDERS, ELECTRIC, SPOT AND BUTT
Knight Metal Products, Toronto.

WELDING, WIRE
Page Steel & Wire Co., Adrian, Mich.

WELDING, ELECTRIC, SPOT, BUTT, ETC.
St. Lawrence Welding Co., Montreal.
Welding & Supplies Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

WELDING MASKS
Davis-Bournonville Co., Toronto, Ont.
Strong, Kennard & Nutt Co., Cleveland.

WELDING GOGGLES
Davis-Bournonville Co., Toronto, Ont.
Strong, Kennard & Nutt Co., Cleveland.

WELDING RODS AND WIRE
Davis-Bournonville Co., Toronto, Ont.
Page Steel & Wire Co., Adrian, Mich.
Welding & Supplies Co., Montreal, Que.

WELDING SUPPLIES
Davis-Bournonville Co., Toronto, Ont.
Union Carbide Co., Toronto, Ont.
Nat. Electro Products Ltd., Toronto, Ont.

WELDLESS BOILER TUBES
Furniss, Clarke & Co., Montreal, Que.

WHEELS, CAR, STEEL
Elec. Steel & Metals, Welland, Ont.

WHEELS, SPROCKET AND TRACTION
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

WHEELS, TURBINE, WATER
Elec. Steel & Metals, Welland, Ont.

WHEELS, PRESSED STEEL
American Pulley Co., Philadelphia, Pa.

WHEEL TRUEING TOOLS
Wheel Trueing Tool Co., Windsor, Ont.
Williams & Wilson, Ltd., Montreal, Que.

WINCHES
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Hall & Sons, John H., Brantford.
Kennedy & Son, Wm., Owen Sound, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

WIRE, CAST STEEL AND MUSIC
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

WIRE COILING AND POINTING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Shuster Co., F. B., New Haven, Conn.

WIRING MACHINES
Quickwork Co., St. Marys, Ohio.

WRENCHES, PIPE, POWER
Peck, Stow & Wilcox Co., Southington.

WIRE CLOTH AND PERFORATED METALS
Canada Wire & Iron Goods, Hamilton.
Page Steel & Wire Co., New York, N.Y.

WIRE FENCING

WIRE, COPPER, CLAD STEEL

WIRE, LINK FABRIC
Page Steel & Wire Co., Adrian, Mich.

WIRE FORMING AND STAMPING MACHINERY
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Can.
Shuster Co., F. B., New Haven, Conn.

WIRE NAILS
Page Steel & Wire Co., New York, N.Y.
Parmenter & Bulloch Co., Gananoque.
Steel Co. of Canada, Ltd., Hamilton, Ont.

WIRE NAIL MACHINERY
National Machy. Co., Tiffin, Ohio.
Page Steel & Wire Co., New York, N.Y.

WIRE, SPARK PLUG, MANGANESE NICKEL, COPPER NICKEL, MONEL METAL
Can. Driver-Harris Co., Ltd., Walkerville.

WIRE SPRING
Page Steel & Wire Co., Adrian, Mich.

WIRE STEEL, BRASS, COPPER
Page Steel & Wire Co., New York.
Steel Co. of Canada, Ltd., Hamilton, On.

WIRE, TELEPHONE, TELEGRAPH, GALVANIZED AND ELECTRICAL
Page Steel & Wire Co., Adrian, Mich.

WIRE, WEAVING, MONEL METAL, BRASS, COPPER, GOLDEN BRONZE, HIGH BRASS, LOW BRASS, NICKEL
Can. Driver-Harris Co., Ltd., Walkerville.

WOOD BORING MACHINES
Canada Machinery Corp., Galt, Ont.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Ltd, Montreal, Que.

WIRE STRAIGHTENERS AND CUTTERS
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs Co., Ltd., Hamilton, Can.
Shuster Co., F. B., New Haven, Conn.

WOODWORKING MACHINERY
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Sherbrooke, Que.
Garlock-Walker Machinery Co., Toronto.
Oliver Machy. Co., Grand Rapids, Mich.
Silver Mfg. Co., Salem, Ohio.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

WOOD TRIMMERS AND LATHES
Oliver Machy. Co., Grand Rapids, Mich.

WOOD MILLING MACHINES AND SHAPERS
Oliver Machy. Co., Grand Rapids, Mich.

WRENCHES
Williams & Co., J. H., Brooklyn, N.Y.
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Rock Island, Que.
Canada Fdrs. & Forg., Ltd., Welland.
Keystone Mfg. Co., Buffalo, N.Y.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Co., St. Catharines.
Whitman & Barnes Mfg. Co., Akron, O.

WOVEN STEEL PARTITIONS
Page Steel & Wire Co., Adrian, Mich.

WRENCHES, AUTOMOBILE, NARROW JAW, MONKEY, SCREW
Morrow Screw & Nut Co., Ingersoll, Ont.
Whitman & Barnes Co., St. Catharines.

WRENCHES, PIPE, MONKEY, TAP AND POWER
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto, Ont.
Marshall, Son & Bunney, Toronto.
Peck, Stow & Wilcox Co., Southington.
Rice Lewis & Son, Toronto, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Co., St. Catharines.
Williams & Co., J. H., Brooklyn, N.Y.
Keystone Mfg. Co., Buffalo, N.Y.
Whitman & Barnes Mfg. Co., Akron, O.
Williams & Wilson, Ltd., Montreal, Que.

WRENCHES, SOCKET
Williams Machy. Co., A. R., Toronto.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

Hendey centering machine on centering work in plant of Can. General Electric Co. on all sorts of portions of their product.

HENDEY IMPROVED CENTERING MACHINE

Assures Perfect Results at Low Cost

The distribution of metal insures the maximum strength with the least weight of machine; in this manner we have conserved on material and hence on machine cost.

Here are a few of the **Hendey** Improved Centering Machine features:—

The head is rigidly clamped to the bed, giving permanent alignment of spindle. Spindle is large in diameter with ample bearings, having felt oilers. Front journal is made taper, after the well-known pattern of our lathe and milling machine spindles.

Jaws of vise and supporting block are made of steel, hardened and ground.

Capacity of machine is from 5-16 to 4 inches inclusive.

The Hendey Improved Centering Machine has many more points of interest. May we send you full description?

CANADIAN AGENTS: A. R. Williams Machinery Co., Toronto, Ont.; A. R. Williams Machinery Co., 260 Princess St., Winnipeg; A. R. Williams Machinery Co., Vancouver; A. R. Williams Machinery Co., St. John, N. B.; Williams & Wilson, Montreal

The Hendey Machine Company, Torrington, Conn., U. S. A.

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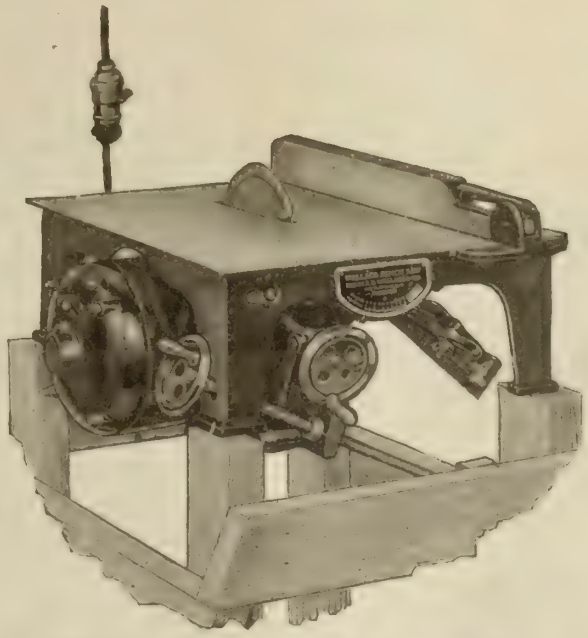

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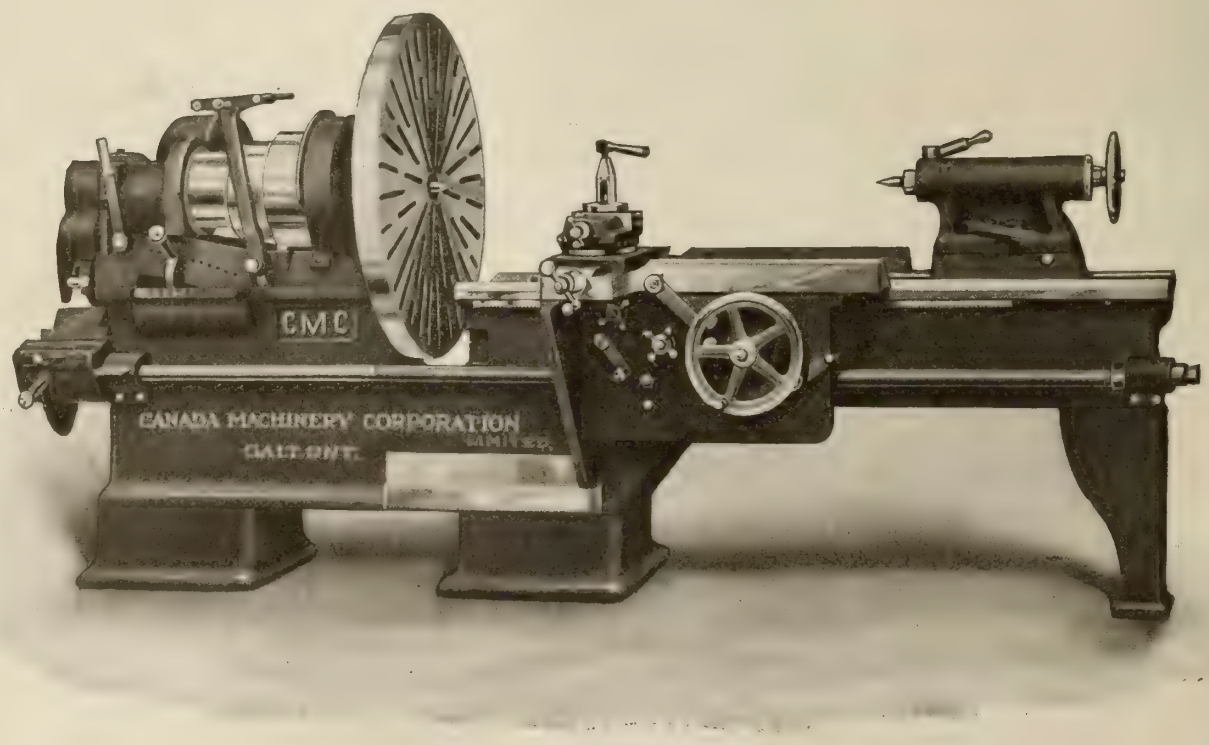

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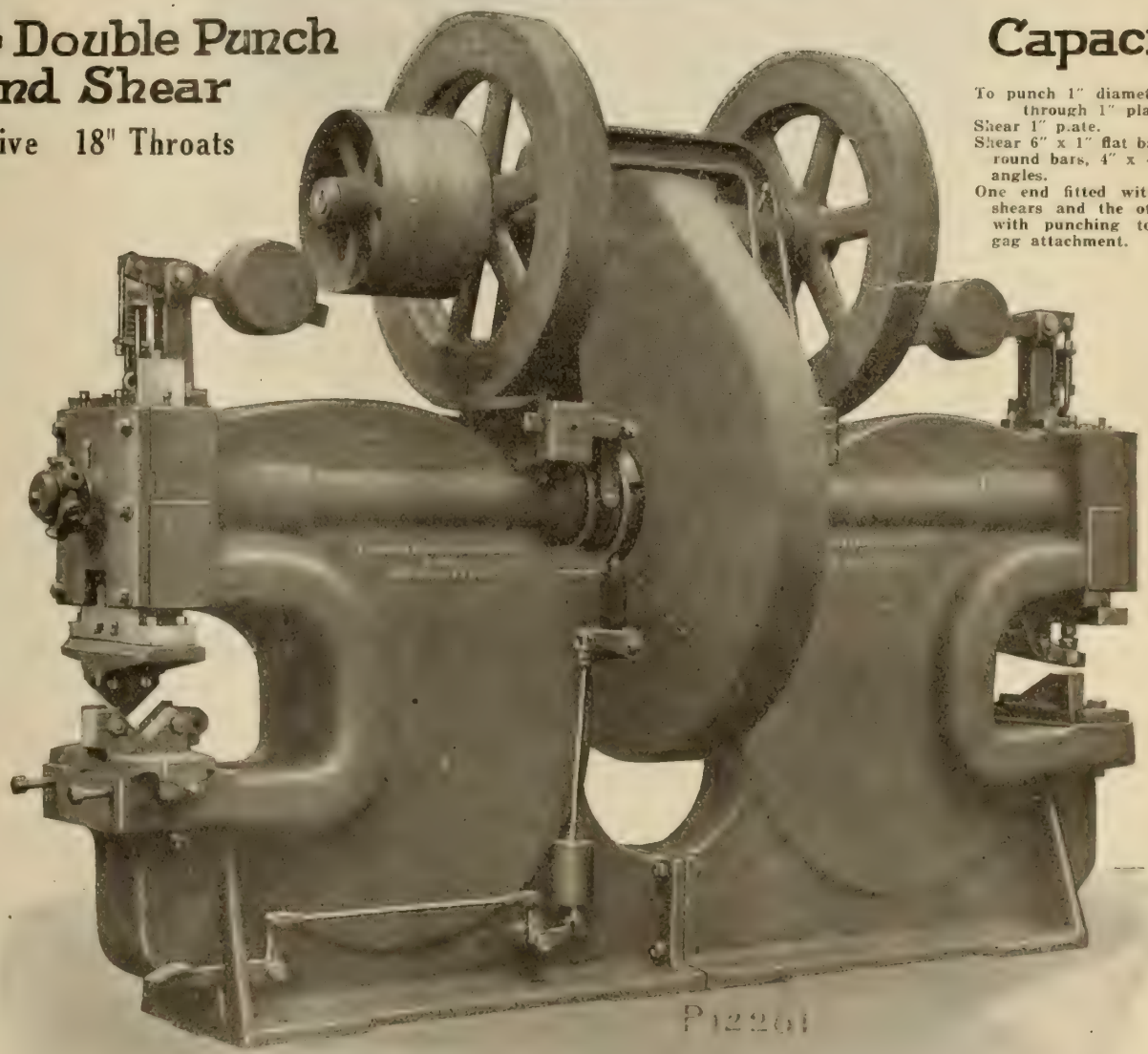

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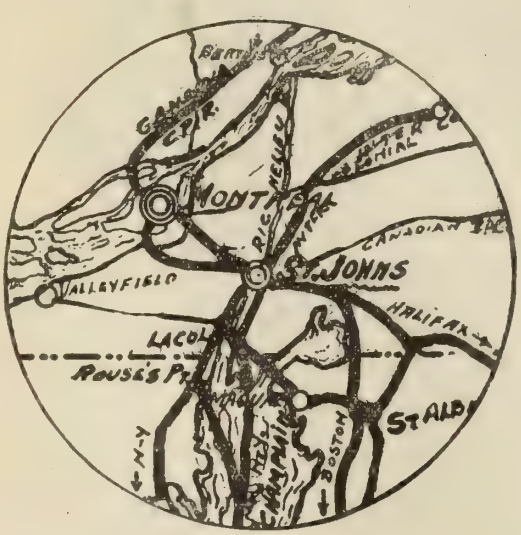

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WE EXTEND

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THIS WISH

IS no different to the one we, at all times, silently entertain for you, but this being the season for expression, we proclaim to you and yours----

MAY your Christmas be a Happy One and may the New Year come to you laden with Prosperity.

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5 x 3½"—5 x 3"—4½ x 3"
4 x 3½"—4 x 3"—3½ x 3"
3½ x 2½"—3 x 2½"—3 x 2"
2½ x 2"

BEAMS—
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3¼ x 5 x 3¼ x 5/16
3 5/16 x 5 1/16 x 3 5/16 x ⅜"
3⅜ x 5⅛ x 3⅜ x 7/16"
3 1/16 x 4 x 3 1/16 x ¼"
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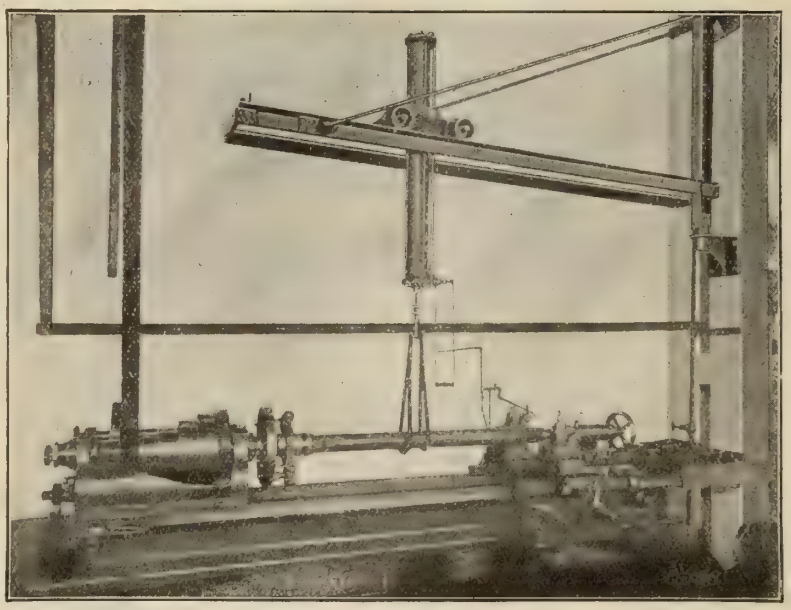

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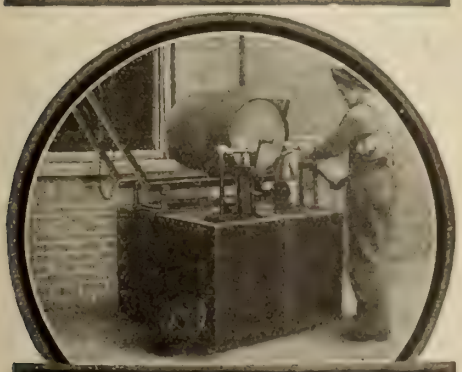

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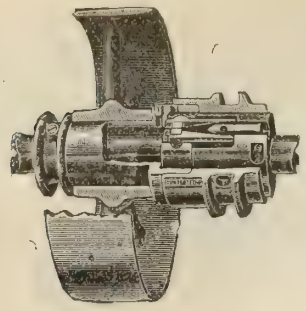

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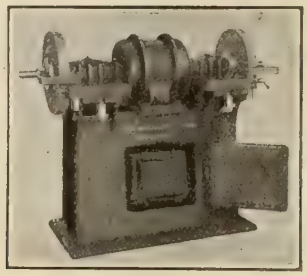

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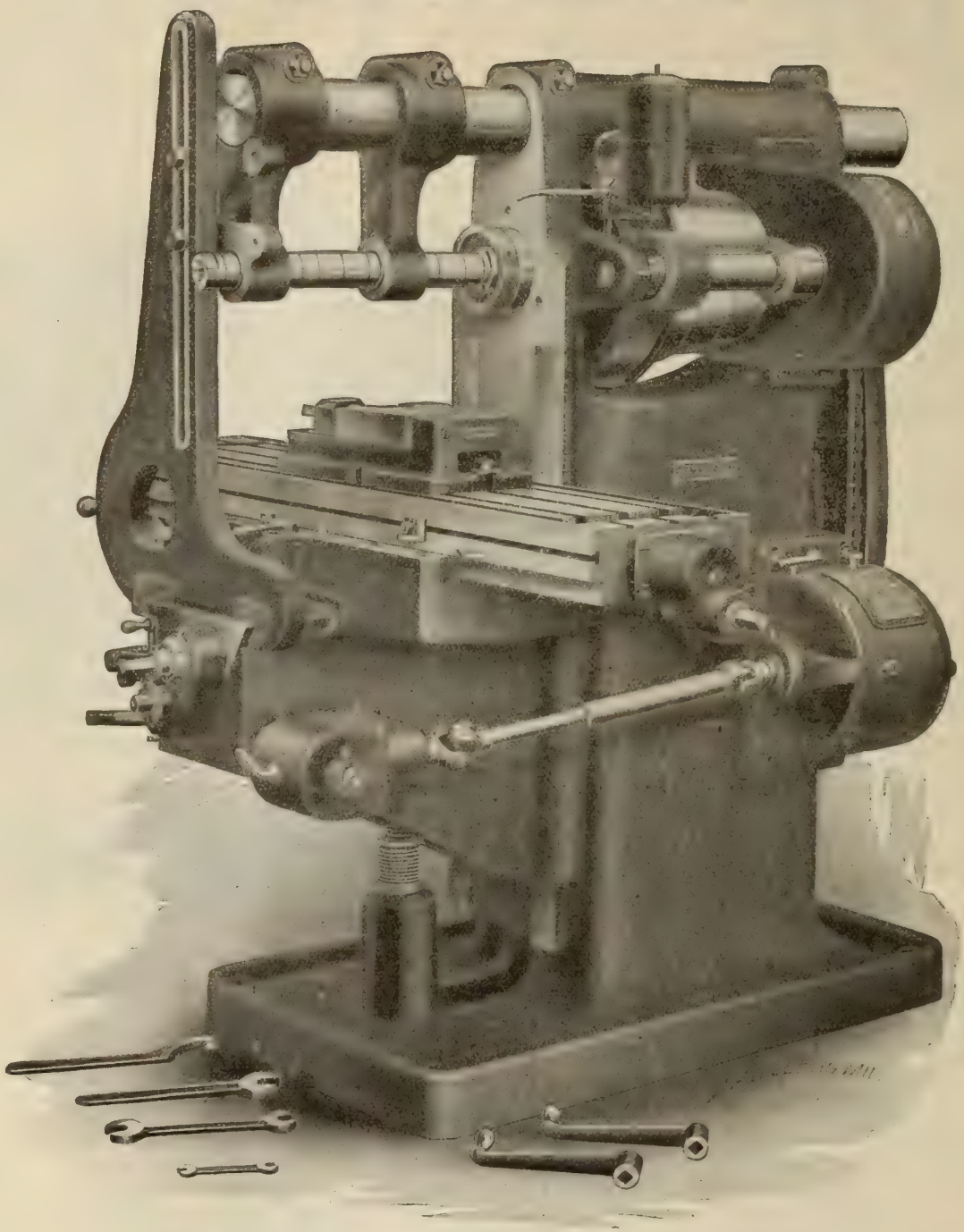

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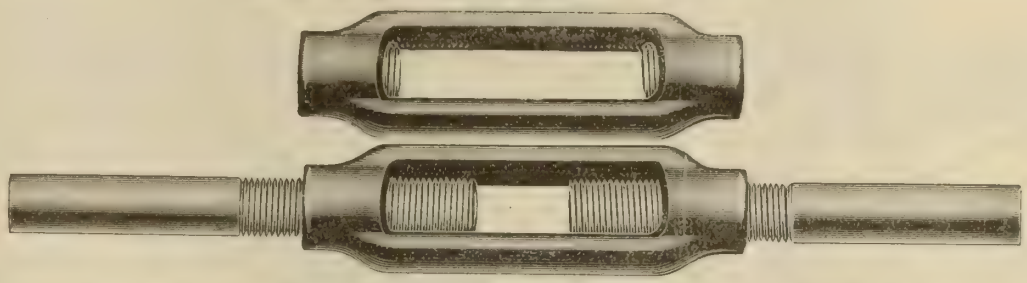

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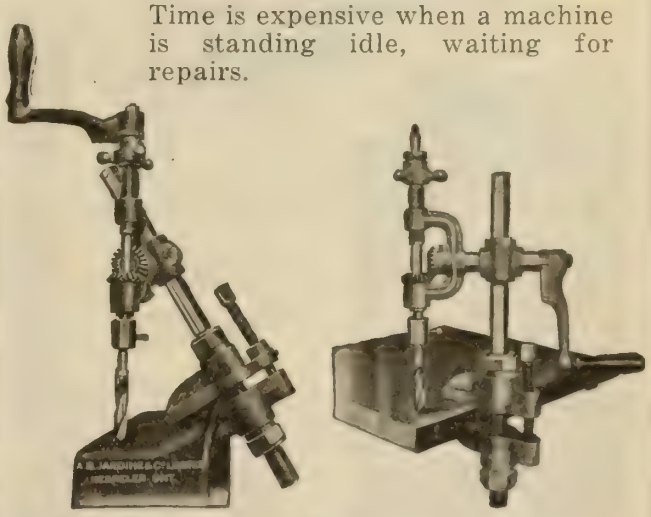

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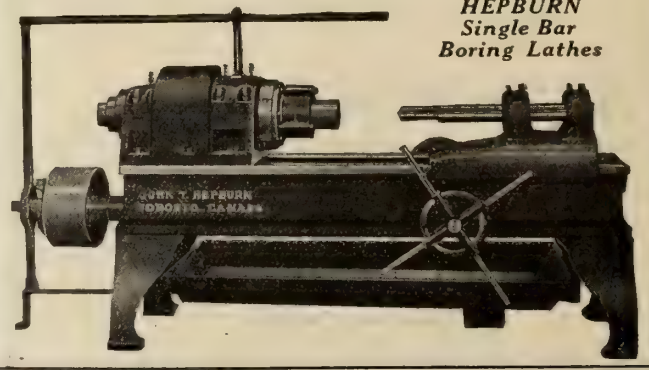
Find the power and the strength you have not been able to find in other reasonably priced lathes. And find truly exceptional ability to do closest accuracy work at a speed that augurs well for quantity production. Let us send you specifications.

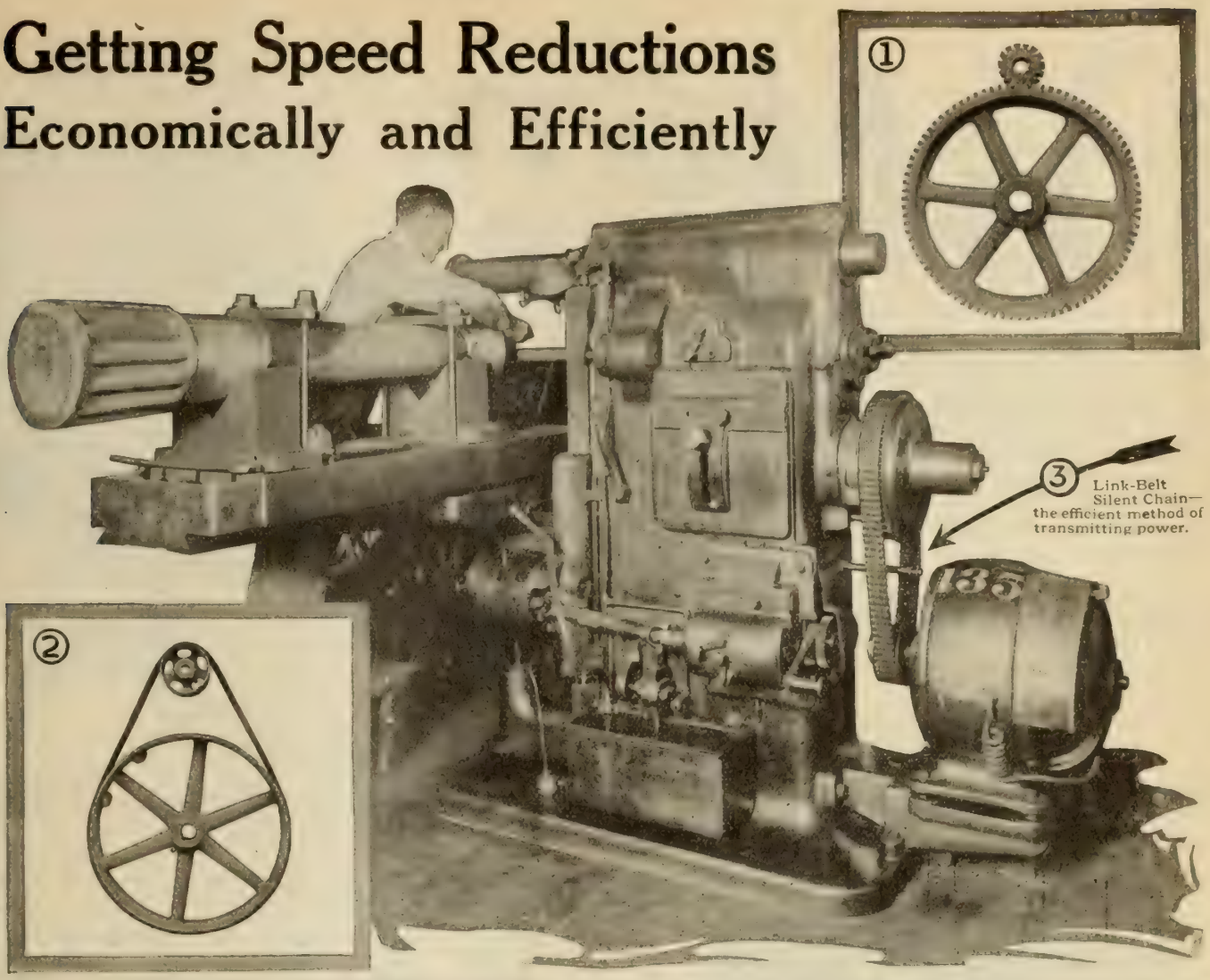
We rebuild lathes as well as make them.

John T. Hepburn, Limited
18-60 Van Horne St. - TORONTO, ONT.

HEPBURN
Single Bar
Boring Lathes



Getting Speed Reductions Economically and Efficiently



1 Shows how but one tooth carries the load, resulting in rapid wear, when securing speed reductions through gears.

2 Shows small contact secured on driven pulley when using leather belt drives. Means frequent slippage and loss of power.

3 Shows the efficient, non-slipping, long-lived Link-Belt Silent Chain Drive in securing speed reduction.

SPEED reductions are either secured by gears, belts or silent chain drives. With gear drives, there is seldom more than one-tooth in mesh and carrying the load. This results in rapid wearing of teeth, a certain amount of play between teeth, undue noise and chatter marks on finished work.

With belt drives, there is but a small portion of the surface of the small pulley in contact with the belt. This results in frequent belt-slippage, waste of power and a jerky, intermittent application of power.

With Link-Belt Silent Chain Drives, nearly two thirds of the teeth of the driven wheel and nearly half the number of teeth in the driving wheel are carrying the load at all times. There is no slippage. The motor and driven machine are both cushioned against undue shocks thus increasing their durability and a better product, better finish and greater accuracy are secured.

Our Machine Tool Book No. 312 gives full details. Send for a copy.

CANADIAN LINK-BELT COMPANY, LIMITED

WELLINGTON AND PETER STREETS, TORONTO

LINK-BELT

SILENT CHAIN DRIVES

If interested tear out this page and place with letters to be answered.

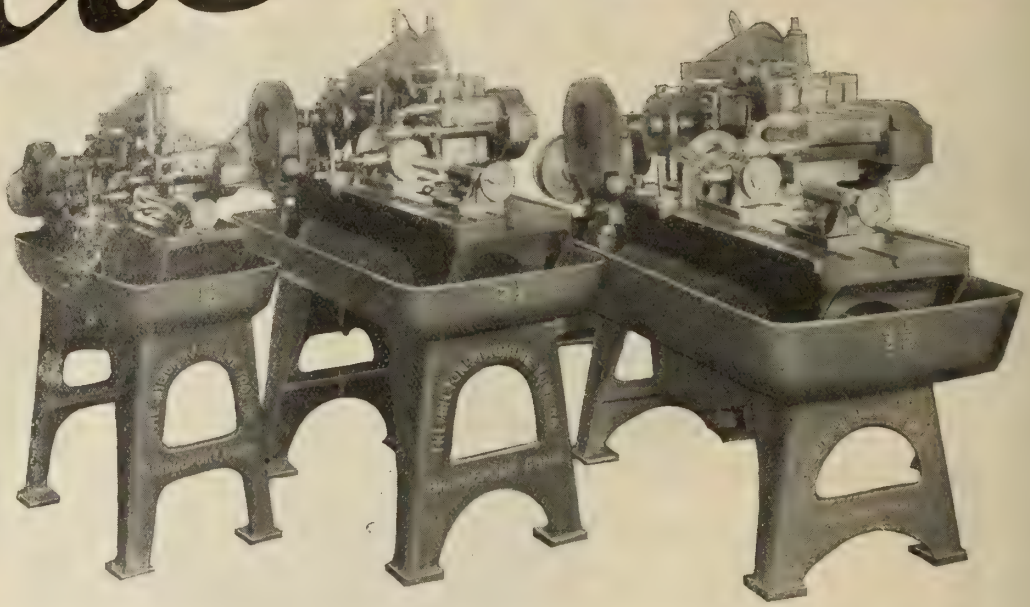
Bilton GEAR MILLERS

Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver—as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog 30-6



Over 500 leading manufacturers now use the Bilton for high production on accurate work.

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co. Ltd.

CRANES

Direct and Alternating Current
Capacities: 2 Tons to 200 Tons

BRIDGE CRANES for all purposes

Including **Power House, Foundry, Shop, Steel Works and other uses**

Also

REVOLVING TOWER CRANES

for Shipbuilding and Fitting-out Berths

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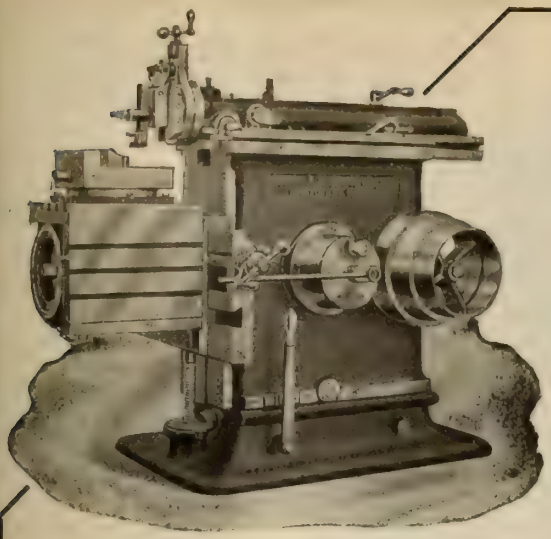

UNIVERSAL SHAPING MACHINES

15-Inch Stroke
24-Inch Stroke

The UNIVERSAL feature of these machines eliminates the necessity of special vises, fixtures, etc., and makes them especially adapted for—

Die Work Tool Making
General Manufacturing Purposes

Machines regularly furnished with—

Swiveling Graduated Table.

Auxiliary Tilting Side for Compound Angles.

Power Down Feed on any Angle with any variation of feed.

Automatic Feed Stop.

Graduated Collars on Tool Head Feed Screw and Table Feed Screw.

Swivel Vise and Graduated Base.

Table Raised and Lowered by Power on 24-inch size.

Bulletin No. 38.

Canadian Office: POTTER & JOHNSTON MACHINE CO.

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office: 1501 Royal Bank Building, Toronto, Canada

Works and Warehouse: Galt, Ont., Canada

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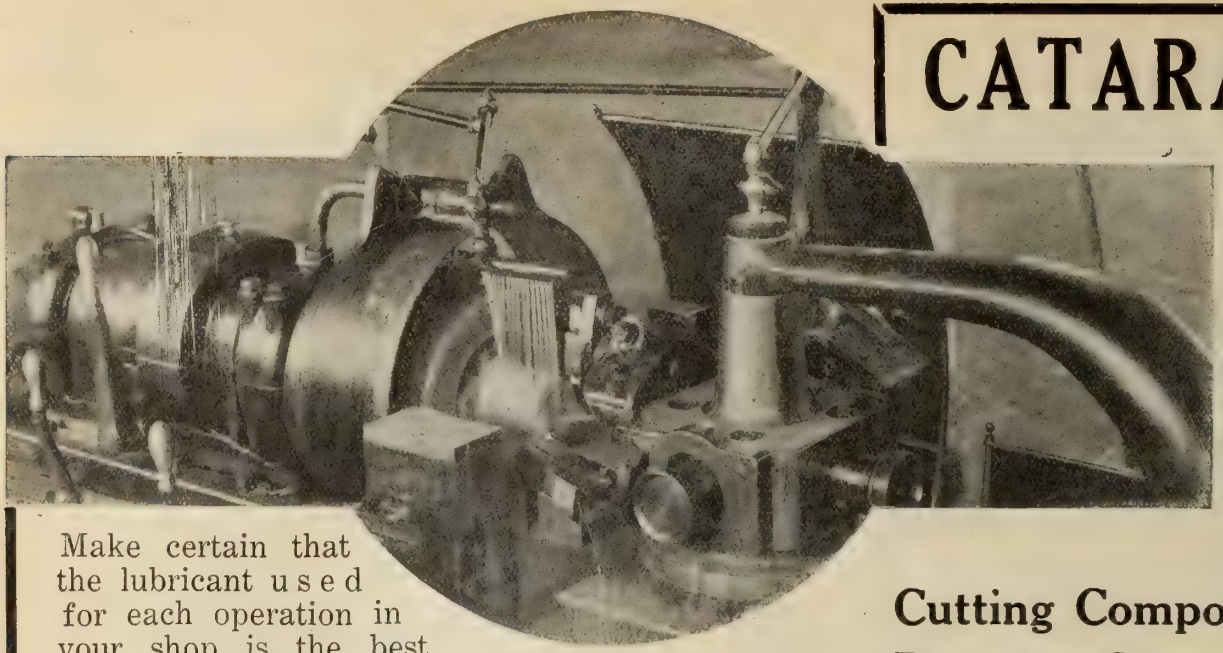
CATARACT



ACME
MYSTIC
SPECIAL

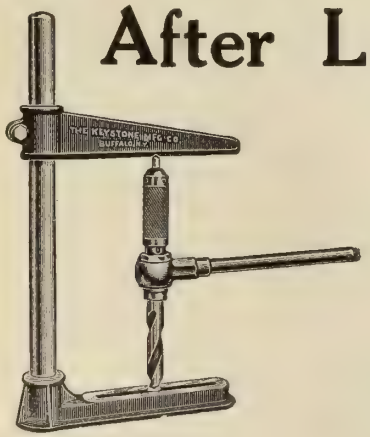
Make certain that the lubricant used for each operation in your shop is the best obtainable for the purpose. Otherwise your men and your tools and your machines work at a disadvantage.

Write us to-day that we may demonstrate how Cataract Lubricants can increase production and reduce cost in your plant.

Cutting Compounds
Drawing Compounds
Cutting Oils
Quenching Oils

Cataract Refining Company, Limited - Toronto, Ont.

"Keystone Quality" Will Still be There After Long Use Has Worn Away The Name



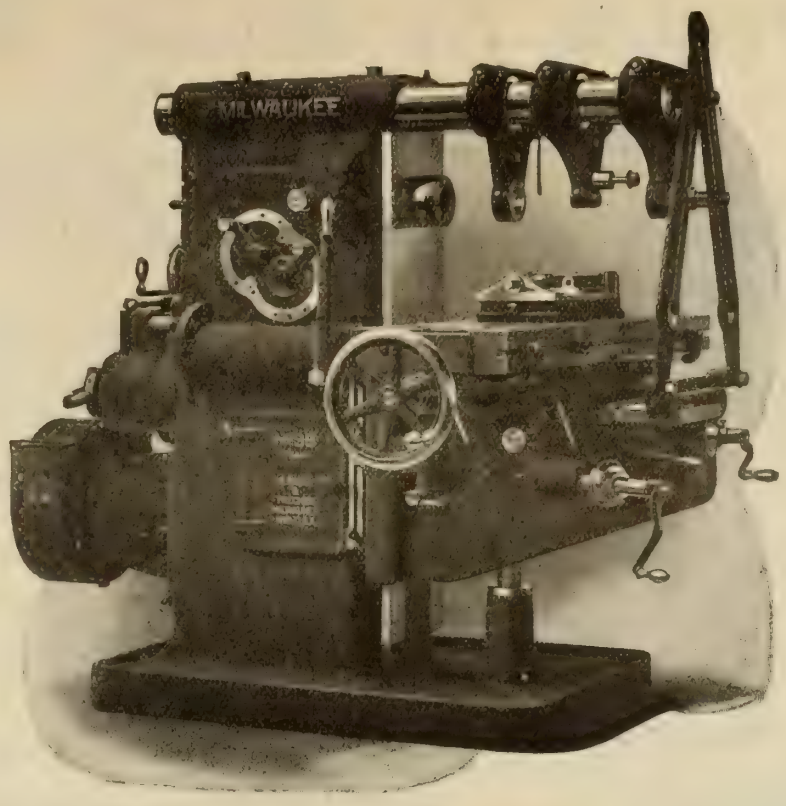
We like to think of that.

We like to think that the reputation of Keystone Tools is built upon a foundation of service with **Quality** the Keystone rather than a copyrighted name. For it is conceivable that imitators, or even the whims of courts, might rob us of our copyrighted name. But who could take "Keystone Quality" from Keystone Tools?

Write for name of nearest dealer.

The Keystone Mfg. Company

Buffalo, N.Y., U.S.A.



MILWAUKEE MILLING MACHINES

Double Overarm maintains alignment.

It is impossible for the operator to place the arbor supports on the arbor and double overarm in any other way than in line. Arbor cannot be pounded out of line when using large, coarse pitch cutters on rough, heavy work.

Other Distinctive Milwaukee Features:

Solid top knee—hardened steel gearing and shafts in the column and feed box—automatic flooded lubrication — one and one-half gallons of oil per minute pouring over all gears and bearings in the column and feed box, insuring lubrication at all times—flanged spindle with hardened steel collar for driving arbors—constant speed drive, reverse being self-contained.

Send for our No. 21 Catalogue. Illustrating and describing Milwaukee Milling Machines and accessories in detail

KEARNEY & TRECKER CO.

MILWAUKEE, WIS. U.S.A.

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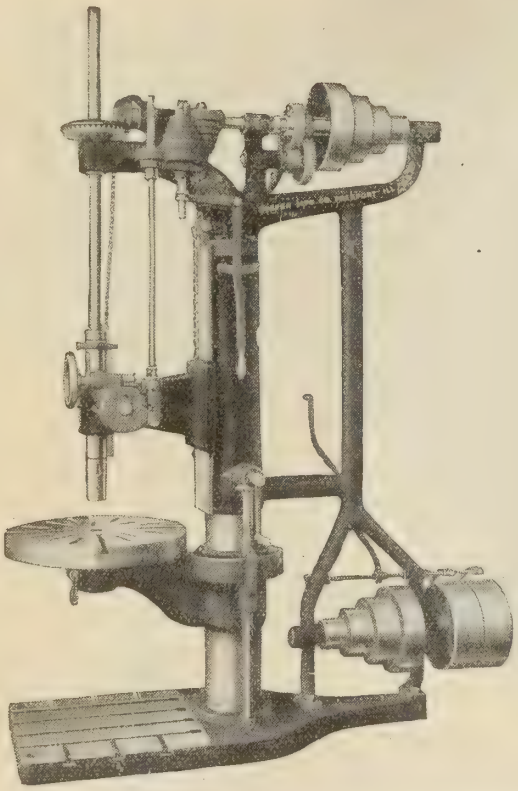
The Driller for Exact Work



HOEFER

Enable Your Workmen to Eliminate Spoilage

The Hoefer Driller is pre-eminently the one to be found in the best plants. "It's almost as good as a Hoefer," so often heard in the machine and tool trade, indicates the position held by Hoefer Drillers.

Exact drilling, to the last thousandth of an inch, pays by eliminating spoiled material. Hoefer Drillers pay for themselves and increase the workman's pride in his work.

Twenty-five Years on Market

Twenty-five years making drillers has given Hoefer the "Know-how." The Hoefer Drillers are used by many of America's leading manufacturers. Equip your factory the Hoefer way. Take any kind of a drilling problem you have to the Hoefer Manufacturing Company, and the Company's experts can tell you how it was solved by other men, some of whom you may know.

Investigate now. Write to-day for catalog. The Hoefer engineers are at your service.

HOEFER MFG. CO.
FREEPORT, ILL.

DIAMOND TOOLS
FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION
INDUSTRIAL GEMS

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Sole Canadian Agents for

THE JOYCE-KOEBEL COMPANY, INC.
Formerly Geo. A. Joyce Co., Ltd.
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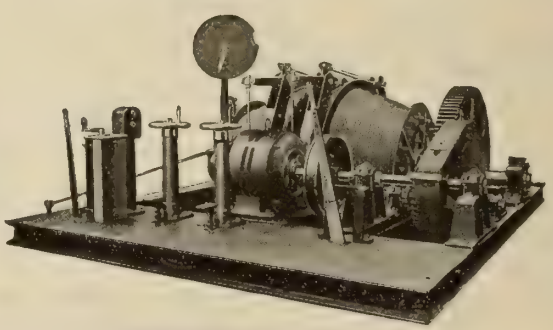
LANCASHIRE MOTORS
HAVE WORLD WIDE REPUTATION
FOR
"RELIABILITY"



MOTOR DRIVING MINE HOIST

Specialists in Motor Manufacture and Application

SEND YOUR ENQUIRIES TO

The Lancashire Dynamo & Motor Co., of Canada, Limited

Head Office and Works
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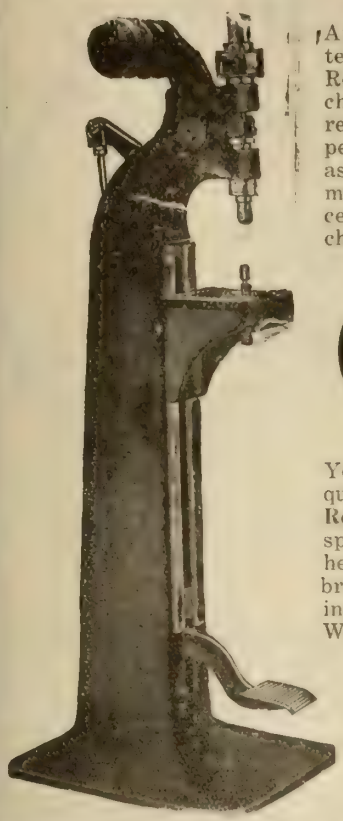
602 NEW BIRKS BLDG.
MONTREAL

No Skill Required



Anybody with ordinary intelligence can operate this Rotary Rivet Spinning Machine. No special skill is required. It is a tool that perfectly fits labor conditions as they exist to-day. A woman could operate as successfully as the skilled mechanic who went to the front

The GRANT is Noiseless

You are assured of perfect quietness wherever the **Grant Rotary** is running. And it spins a perfect polished rivet head every second without breaking or marring the casting. Rivets tight or loose. Write for details.

The Grant Mfg. and Machine Company
Holland Ave.
Bridgeport, Conn., U.S.A.

Harris Heavy Pressure

The Babbitt Metal that's at the Front in Efficiency and Economy

Order a Box from our nearest Factory

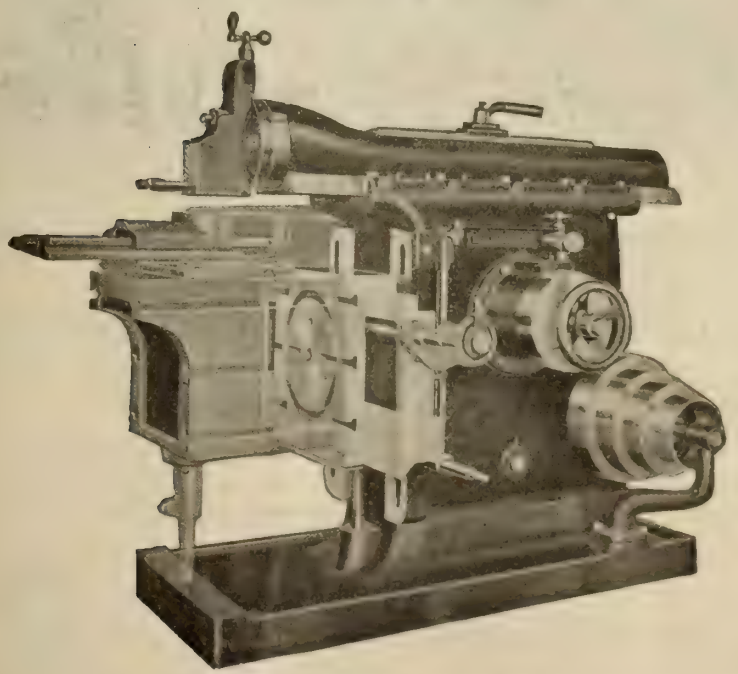
Our Guarantee is Back of Every Pound of Babbitt Metal We Make

Manufactured by
The Canada Metal Company, Limited

TORONTO - CANADA
HAMILTON WINNIPEG
MONTREAL VANCOUVER

Milwaukee Shapers

Are Needed in Up-to-Date Canadian Shops



A line that is unexcelled in Rigidity, Accuracy, Power, Simplicity and **Production.**

Built in three sizes: 16 inch, 20 inch and 24 inch.

Write for descriptive Bulletins.

MILWAUKEE SHAPER CO.
1029 Coldspring Ave.
Milwaukee, Wisconsin

If interested tear out this page and place with letters to be answered.

"The Marshalltown Throatless Shears"

guarantee perfect work at less than half the ordinary expense.

Rotary, self-feeding shears designed for cutting in and out curves, straight or irregular shearing, circles, also beveling and splitting of plates. Built in various sizes having capacities from tin up to ½" thick. No limit to the size of sheet being cut. Hand, belt or motor drives. The last word in metal cutting shears. We also manufacture Rotary Bevel Shears, Splitting Shears and Plate Milling Machines.

Let us know your requirements.

Marshalltown Mfg. Co.
Marshalltown, Iowa
U. S. A.

SIMONDS
HACK SAW BLADES
UNEQUALED IN QUALITY ANY SIZE OR LENGTH

Simonds Canada Saw Co. Limited
ST. JOHN MONTREAL VANCOUVER

Here's part of another installation of

ROCKWELL ECONOMIZER FURNACES

Owner tried one and has bought many more since.
Why? Because, as users say, these economizer furnaces assure:

Saving of fuel. Protection of the operator. Greater output. Use of one system of piping. Less heating area. Reduction in quantity of scale. Cleaner shops.

Complete information in Catalogue 34-T

R. J. McLEAN
604 Southam Bldg., Montreal, P.Q.

Reduce Your Metal Cutting Cost with THE "RACINE" Speediest of All Metal Cutters

DO you know that the "RACINE" High Speed Cutting Machine has a patented feature that lifts it above any other metal cutter made? This is the patented Automatic Lifting Device, which automatically lifts the blade on the return stroke, preventing all dragging and strain on the non-cutting stroke. **The result is speedier cutting with less power and a big saving in blades.**

Install the "RACINE" to Offset High Cost of Production!

THE "RACINE" machine and "RACINE" H.S. Tungsten Power Blades make an efficient and economical combination—use both.

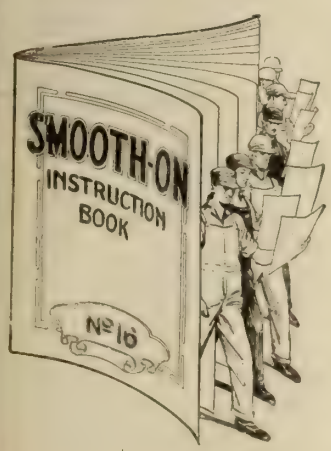
Standard the World Over

Racine Tool and Machine Company
Melbourne Ave.
RACINE, WIS., U.S.A.

Use "RACINE" H.S. Tungsten Blades

SMOOTH-ON IRON CEMENTS

They "Fixed That Break"



Many of your repair and maintenance problems are described by other engineers in the

FREE SMOOTH-ON INSTRUCTION BOOK NO. 16

This book is a compilation of actual experience, described and illustrated in the most practical way.

The SMOOTH-ON Instruction Book has helped other engineers to keep old equipment in operation when it seemed certain that replacements were inevitable.

It will do as much for you. Write for your copy to-day.

SMOOTH-ON MANUFACTURING CO.
ESTABLISHED 1903
570-574 COMMUNIPAW AVE., JERSEY CITY, N.J. U.S.A.
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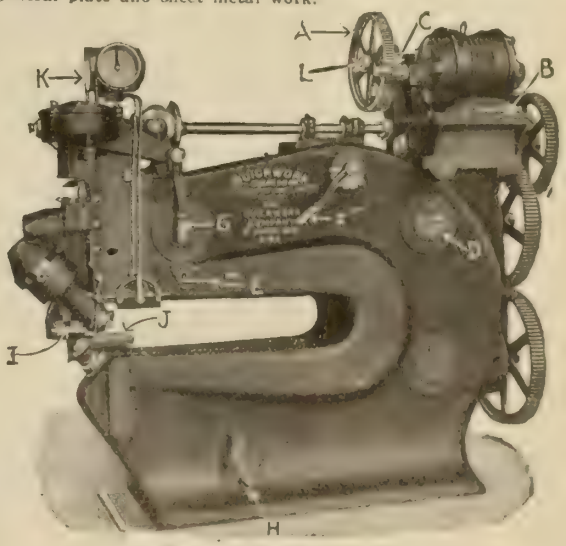
"QUICKWORK"
Registered in U.S. and Foreign Countries.

ROTARY SHEARS
MADE IN 7 SIZES.

Cut all gauges of sheet and plate metal up to 1 inch thick in straight or irregular shapes and openings without cutting in from side of sheet. Leaves square, true edge that requires no finishing. Used in building ships, boilers, tanks, cars and general plate and sheet metal work.



Patented June 3rd, 1913.

SAVES 50% TO 90%

Eliminates Oxyacetylene Cutting and Plate Planing.
Write for Catalogue No. 60.

THE QUICKWORK COMPANY, ST. MARYS, OHIO, U. S. A.
Cable address: "QUICKWORK."
Codes: W. U. and General.

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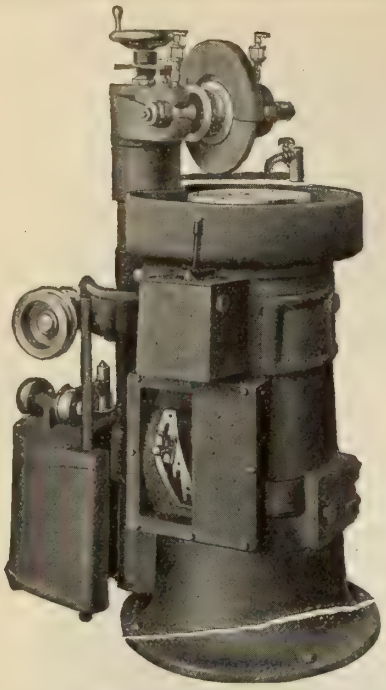


BRISTOOL

Bristol 12-inch Rotary Precision Surface Grinder

Built for rapid production on grinding work.

It handles work either singly or in multiples within the capacity of the chuck and not thicker than 6-in., and grinds within quarter thousand in. of manufacturing accuracy.

And it is built to last.

It is provided with exceptionally long bearings throughout, especially in the back column. This prevents the wear, which is very slight, from affecting the accuracy of the grinder. The Back Column is made to swivel four degrees, which allows concave or convex grinding.

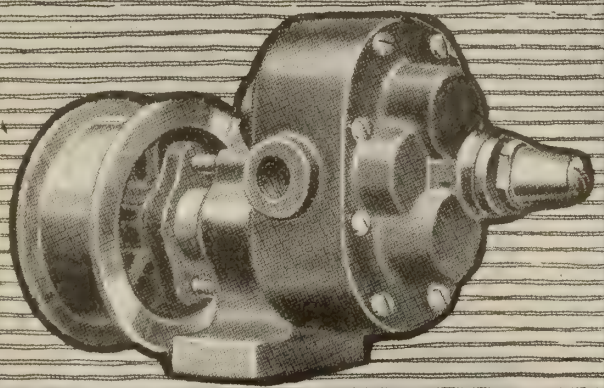
Bristol Rotary Surface Grinders are made in several types and sizes and are regularly equipped with 8-in., 12-in., and 16-in. magnetic chucks, either belt or motor driven and for dry or wet grinding.

Our Bulletin describes the many good points fully. Send us your name and address and we'll gladly mail you one.

Grinds within .0004 in. of absolute Accuracy

BRISTOL MACHINE TOOL CO.
SUCCESSORS TO C. G. GARRIGUS MACH. CO.
BRISTOL, CONN.

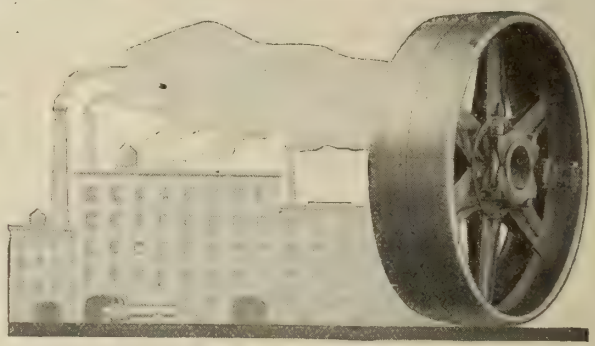
TRAHERN
Lubricating Pumps



Need no introduction to Machine Tool Manufacturers. They are known the world over as the reliable Rotary Geared types.

Trahern Pumps specialize in delivering a continuous, forceful, non-pulsating stream of oil, against 100 lbs. pressure if necessary. If installed properly will not loose prime, operate at low speed, long life.

TRAHERN PUMP DIV.
Rockford, ILL., U.S.A. Geo. D. Roper. Corp.



AMERICAN
STEEL SPLIT
PULLEYS

ARMS CUT THE AIR
MINIMUM BELT SLIP
EASILY APPLIED
RELIABLE
INTERCHANGEABLE BUSHINGS
CARRIED BY DEALERS
AVOIDS KEYWAYS AND SET SCREWS
NATIONAL DISTRIBUTION

Valuable Book, "Getting Maximum Pulley Efficiency," sent free on request.

The American Pulley Company
Philadelphia, Pa.

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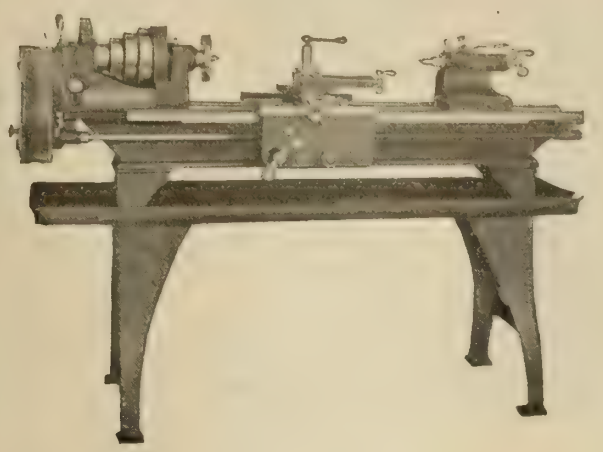
With saving in floor space goes saving in first cost for the "Star" Lathe is *moderate in price.*



Remember, "Star" Lathes are not big lathes. They require little power. This saving has been as much as 40 per cent. in many cases.

"STAR" LATHES

Accurate, Rigid Economical

Users of "Star" Lathes find a large gain from their operating simplicity. Inexperienced help quickly learn to operate "Star" Lathes. Do you realize the saving this means with the scarcity of unskilled labor? 9", 11" 12" and 13" sizes.

The Seneca Falls Mfg. Co.
INC.
366 W. Falls St. Seneca Falls, N.Y.

Production of Rare Quality at Lowest Labor Costs

There is unusual strength, accuracy, speed, convenience and range in

AURORA
Drilling Machines

You can use them to great advantage on any work in your shop that's suitable for a machine tool of this kind. The operating is easy and the labor cost comparatively low.

Drop a line for full particulars and specifications.
Stationary Head Sizes 20"—21"
Sliding Head Sizes 22"—44"

The Aurora Tool Works
AURORA, INDIANA, U.S.A.

The BARNES DRILLS

Complete line. 8-inch to 50-inch swing
Gang Drills.—Horizontal Drills.
SEND FOR CATALOG.

W. F. & JOHN BARNES CO.
104 Ruby Street - ROCKFORD, ILL.
Canadian Agents—A. R. WILLIAMS MACHINERY CO.
Toronto, Winnipeg, Vancouver and St. John, N.B.
WILLIAMS & WILSON, Montreal

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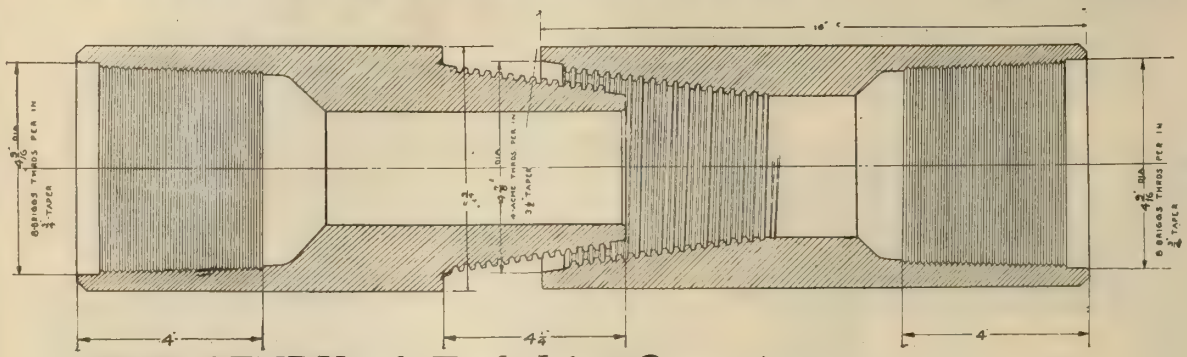
Smalley-General THREAD MILLING MACHINES



Lower Threading Cost

TIME STUDY of *Tool Joint Operation*—

MACHINE—Smalley-General Thread Miller No. 1.
PIECE MILLED—Tool Joint (Pin and Box).
THREAD—Large diameter, 4 13-16 in.; length, 4¼ in.; ¼ in. pitch, Acme Form; 3½ in. taper per foot.
MILLING FEED—3.8 in. per minute.
MATERIAL—.30-.40 Carbon Steel.

TIME STUDY

Chucking in and out	1 min.
Feeding Hob to position	40 sec.
Milling	4 min.
Total Time	5 min. 40 sec.

Above time is for either Internal or External Thread. It should be compared with former Lathe Time of approximately 41 minutes. Thread was completed in one revolution.

PIECE MILLED—Tool Joint (Pipe End).
THREAD—Diameter, 4½ in.; length, 3½ in.; ⅛ in. pitch, Briggs Standard, ¾ in. taper per foot.
MILLING FEED—4.7 in. per minute.
MATERIAL—.30-.40 Carbon Steel.

TIME STUDY

Chucking	1 min.
Feeding Hob to position	40 sec.
Milling	3 min.
Total Time	4 min. 40 sec.

Note—This work was done with motor driven No. 1 Smalley-General Thread Miller in the plant of a manufacturer of oil well supplies in Houston, Texas. Name on application.

Consult us on every phase of Thread Milling. We will show you how to cut the costs

Smalley-General Co., Inc., Bay City, Michigan

Canadian Agents: Rudel-Belnap Co., Ltd., Montreal and Toronto

Wire Cloth

of every description

We make **Machinery Guards** of all kinds.

Metal Lockers for Clothes.

Overhead Wire Guards for Elevators.

Drop a line for full details.

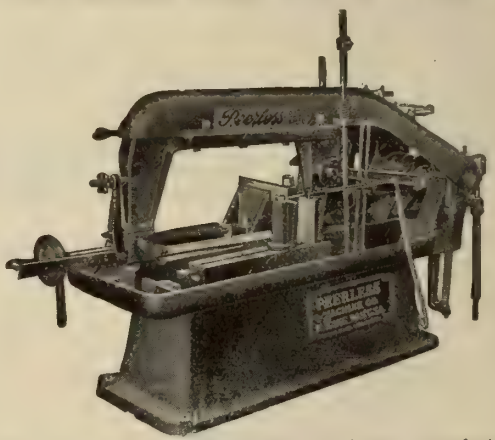
Canada Wire & Iron Goods Company

Hamilton, Ontario

Eastern Representative:
H. E. O. Bull, 184 Mance St., Montreal, Que.

Peerless HIGH SPEED

The Standard Metal Saw of TO-DAY



While labor is demanding more and more, manufacturers are demanding machines of greater output. The "Peerless" meets that demand. It is the standard metal saw of TO-DAY.

With its rapid cut and various time-saving features, it easily increases production from 50 to 100 per cent. With its automatic feed, straight line pull, positive blade clamp and general rigidity, it gets the maximum results of which a blade is capable and reduces breakage to a minimum.

OUR SIX-SPEED GEAR BOX

(not shown in cut) further increases output and saves blades wherever soft steel or metals of varying degrees of hardness have to be cut. The "Peerless" is furnished either with or without this feature, also with or without motor.

A trial order at our risk and expense is convincing

PEERLESS MACHINE COMPANY

1607 RACINE STREET RACINE, WISCONSIN

Wherever Pipe is Cut or Threaded Economically

The probability is two to one that it's a

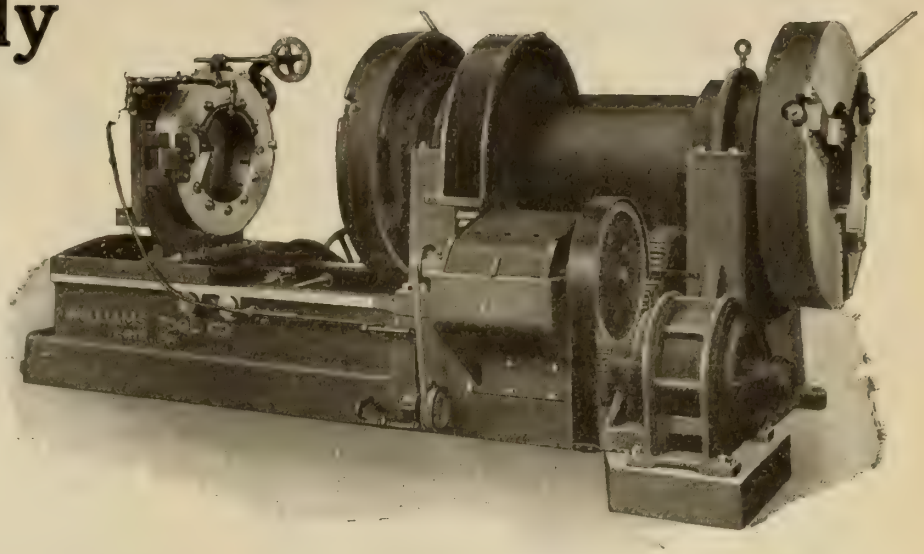
Williams Pipe Machine

that's on the job.

For in approximately two-thirds of all the larger plants in this country Williams' Pipe Machines are used.

It was the Williams Pipe Machine that brought highest honors home from the Panama Exposition.

The Machine illustrated has a capacity of 21½" to 12". Also nine other sizes to meet your requirements.



Write

Williams Tool Company

Erie - Penn. - U.S.A.

Canadian Agents: The A. R. Williams Machinery Co., Limited, Toronto, Canada

European Agents: Universal Machinery Corp. London - England

DUNBAR SPRINGS

ACCURACY ASSURED

You can always depend upon Dunbar Springs being **accurate.** Before proceeding with any order the first few springs are carefully tested and checked up for this very purpose.

Seventy-two years' experience making flat and spiral springs of every description enables us to furnish you with springs of the highest quality, that can be depended upon under all conditions.

Send blue prints for estimates.

The Dunbar Brothers Co.

BRISTOL, CONN

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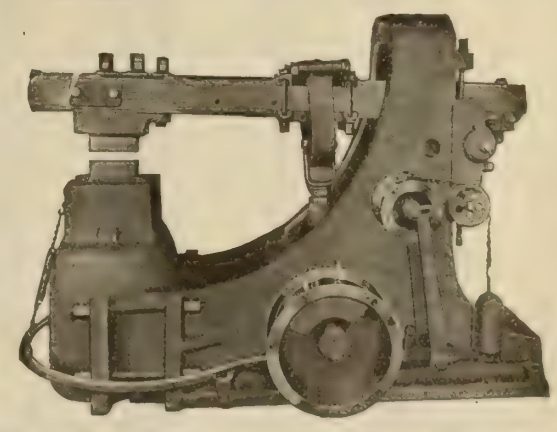

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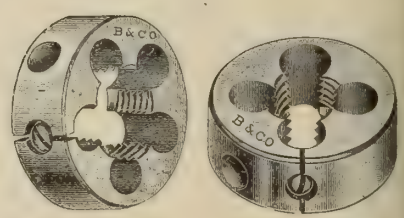

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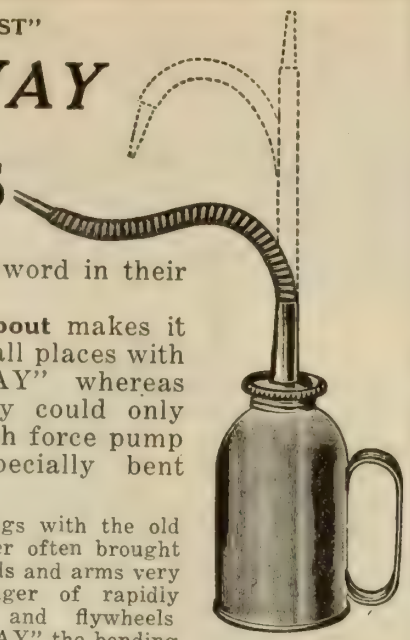

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One should never attempt to grind the highest grade of precision work with a wheel that is only dressed; but roughing should be done with wheels that have been dressed. This is especially true in the case of grinding from rough stock forgings like crankshafts of automobiles. In some cases, however, work is satisfactory when finished with wheels that have been dressed with a good quality of wheel dresser where, for example, a fair "commercial" finish is desired.

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Accurate truing is accomplished with a diamond and this diamond should always be held in a fixed tool post—never in the hand. When the machine is equipped for wet grinding, there should always be a liberal supply of lubricant or water. Unless the flow of water on the diamond is constant, it is very bad for the diamond and also prevents the operator from securing a perfectly smooth wheel face. With the modern machines for cylindrical and surface grinding a relatively coarse wheel is used to remove the greater part of the material desired—a wheel so coarse that its grain will not allow, when cutting freely, of a finish fine enough. Therefore, after removing the bulk of the material, the face of the wheel should be trued with a diamond that does not have a very sharp point—preferably a rounded point. Then, by passing the diamond over the face of the wheel very slowly with the diamond held in a fixed tool post, a surface is produced on the wheel which is smooth and at the same time perfectly round.

This surface is a temporary one on this otherwise coarse wheel, but by careful application of the wheel to the work, so as not to disturb its surface, the desired finish is secured; in other words, the quality of the finish on the work depends upon the quality of the surface on the wheel. When a second piece is to be ground roughly, a relatively deep cut is taken by the wheel. Then this smooth surface disappears (according to the grinder he "breaks down" or "opens up" the wheel) and we have the coarse wheel in action again.

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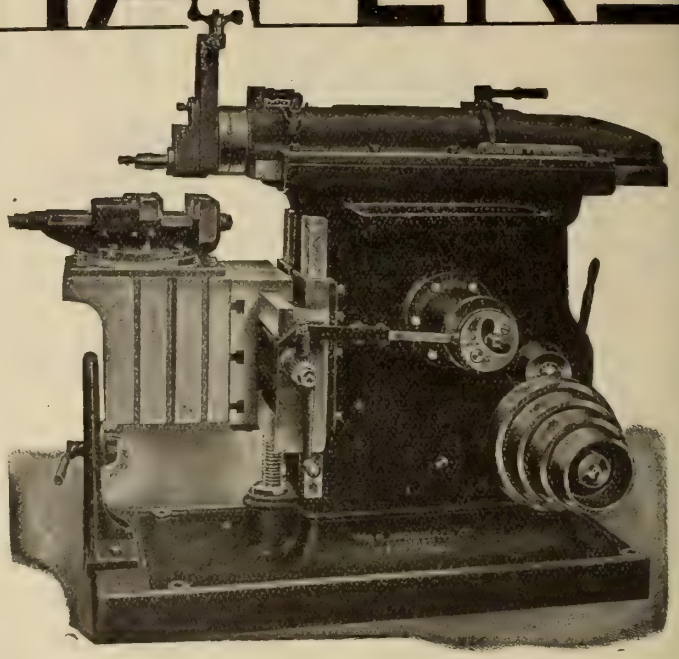

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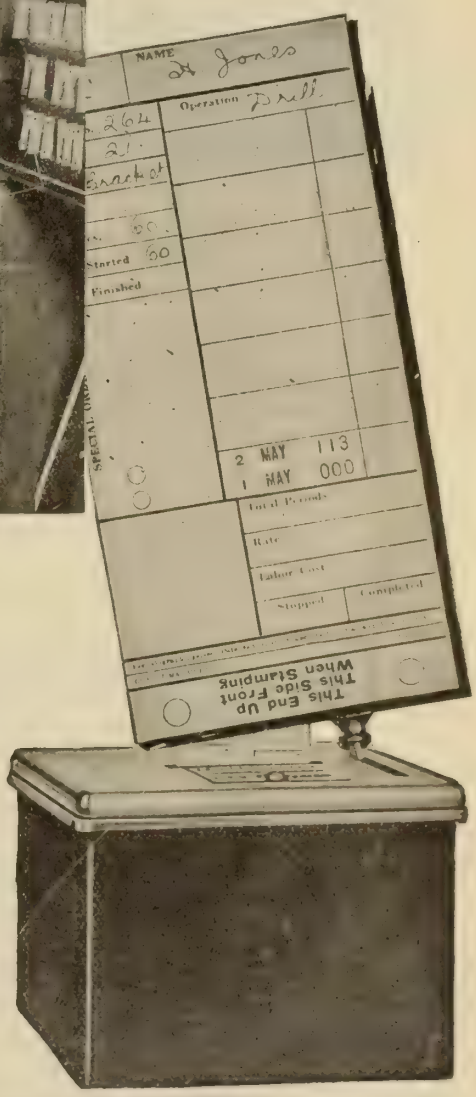

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CANADIAN MACHINERY
AND
MANUFACTURING NEWS

Vol. XXII. No. 26. December 25, 1919

Examples of Jig and Fixture Work

To Manufacture Any Machine, Making the Various Parts Interchangeable, Requires Certain Jigs and Fixtures. Herein Are Shown Various Types Used in Milling Machine Construction

By J. H. MOORE, Associate Editor, Canadian Machinery

THE use of jigs and fixtures with their advantages are already too well known to need any introduction. Where interchangeability is desirable jigs become an absolute necessity, for without them it is almost impossible to manufacture two pieces alike. When speaking of jigs or fixtures, it is not always necessary to picture some elaborate, complex, and expensive arrangement, for in many cases a jig can be of the simplest design yet be a most efficient aid to production.

In many cases it is not essential that a special gauge point be used, but it is essential that all pieces when drilled be alike as far as the centre to centre distance of the holes is concerned. Such a case is illustrated at Fig. 1.

At first glance this photograph is rather difficult to understand but on studying closely we note that we are looking directly down into the bottom of a milling machine base. The photograph was taken from this angle purposely, in order to illustrate both the construction of the piece, and of the jig. As can be noticed, the object is to drill seven holes, six of similar size, the remaining one slightly smaller.

To accomplish the work, no elaborate fixture was made, but simply a frame construction as illustrated, with the handle A attached to facilitate the removal of the jig. The two bolts marked B and C go through the center area of the base as shown. The jig is then pulled down into place by means of these bolts, together with clamps.

No gauge point is necessary, for the outside dimension of the framework of the jig is almost the same size as the cast depression in the machine base. The workman in this way has no trouble centering the jig close enough for his purpose. The complete arrangement cost very little, but accomplishes its purpose admirably.

Column Jig.

Another interesting jig is illustrated at Fig. 2. This represents the drilling of certain holes down the back of a miller column. Ten holes are drilled at this operation. Referring to the photograph we first call attention to the fact that the fixture is very simple in its design, being merely a flat plate as shown. Through the hole A is placed a draw bolt which pulls up a taper arbor into the spindle bore of the column. This bore is, of course, tapered to suit the spindle, and as the draw up arbor used with the jig is a duplicate of the spindle, it ensures the jig being placed absolutely central. The strap B hits up against the gear box pad, gauging in this manner from a positive point, and guaranteeing that the jig holes are not only central, but also in line with the gear box which will later be placed on this pad. At the other side of column, there is a lug going down for a distance of three or four inches. Through this lug is placed a good sized set screw, which is used to bring the strap B tightly up against the

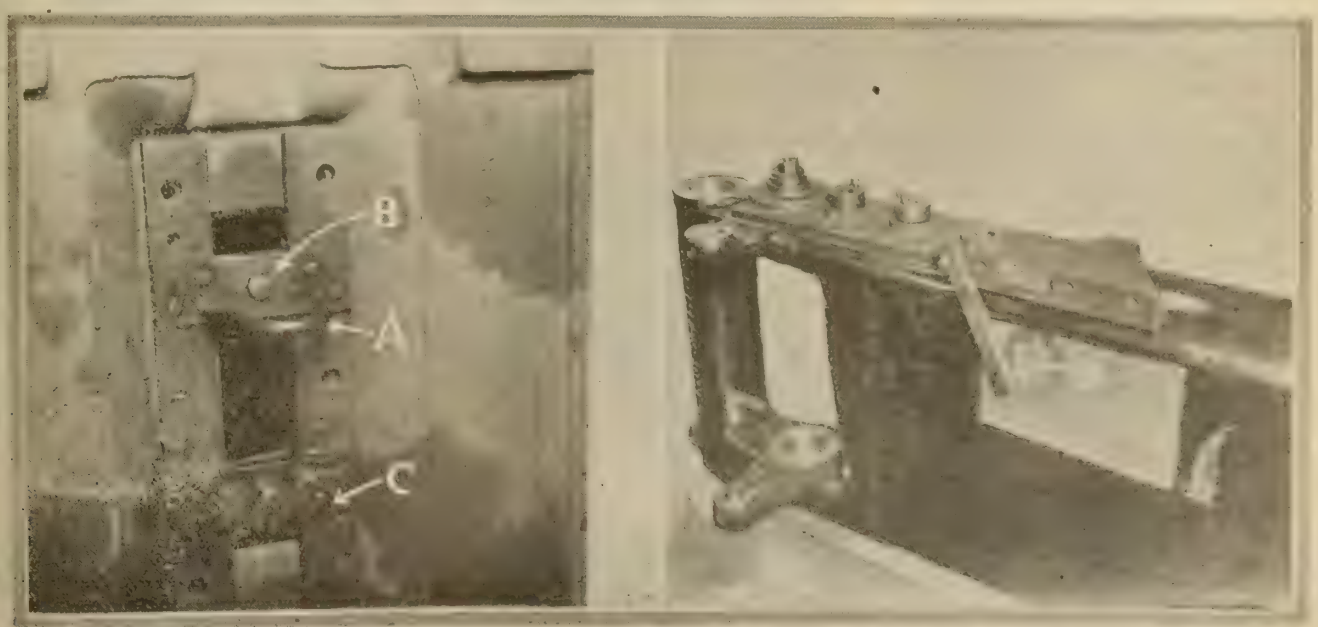


FIG. 1.—DRILLING THE BASE

FIG. 2.—DRILLING THE COLUMN

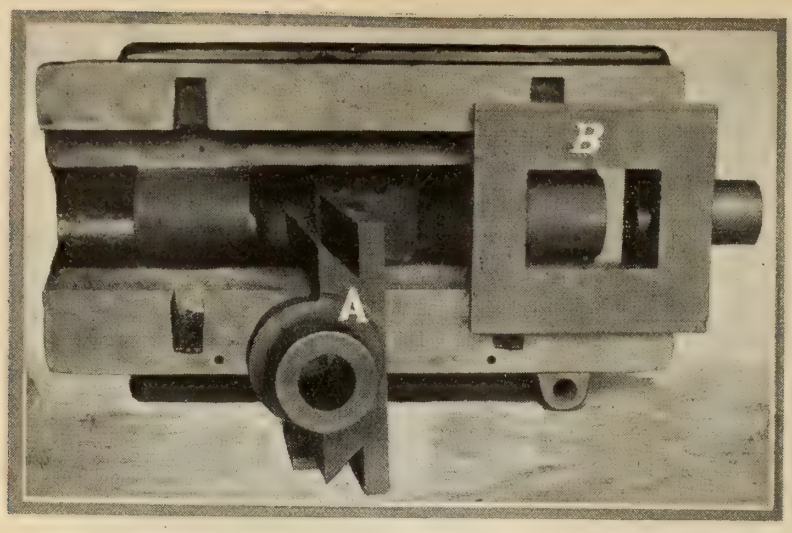


FIG. 3.—BORING THE HOLES IN THE SADDLE.

gear box pad. The jig is thus held securely while all the holes are drilled.

The third example shown at Fig. 3 represents a very simple arrangement used to drill the two main bearing holes in the saddle of a milling machine. In this case, use is made of the already finished slide for gauge purposes. The blocks A and B are castings made from the pattern of the miller slide itself. These are made in the following manner: A portion of the pattern is cast, then machined up in the regular way as if it were to be actually used on the miller. This piece is now split in two and used as shown. A section goes on the slide from each end similar to the portion B, which is shown partially in place. The regular shaped gib is used to tighten these guide blocks in place, all being held securely by means of set screws in the saddle. The bearing holes are then bored without further trouble. The bushing used is interchangeable with both holes. An arrangement, as shown, ensures absolute alignment, at very little cost for a fixture.

A jig of different style is shown at Fig. 4. This can safely be classified as a box jig, although not totally enclosed. The work to be drilled is the gear box of a miller, which is fastened in the jig in the following manner.

The gear box is placed right down to finished strips at the bottom. Gauge stops are placed on two ends as shown. There are also two adjusting screws at side of box, which brings it up to proper level. It is now finally held securely by the two set screws shown on photo, also by the clamp plates A and B which fasten over the box. These are pulled down with two bolts as illustrated. Eight holes are drilled at this one set up. Two on each side and four on top. The bushings for either side are interchangeable, while solid bushings are used for the four smaller holes on the top of the box. These holes are not visible on the photograph. The portions C and D are accurately finished parallel to the top of jig, in order to ensure that when turned over and placed on parallel blocks resting on these portions C and D, that everything will be perfectly true.

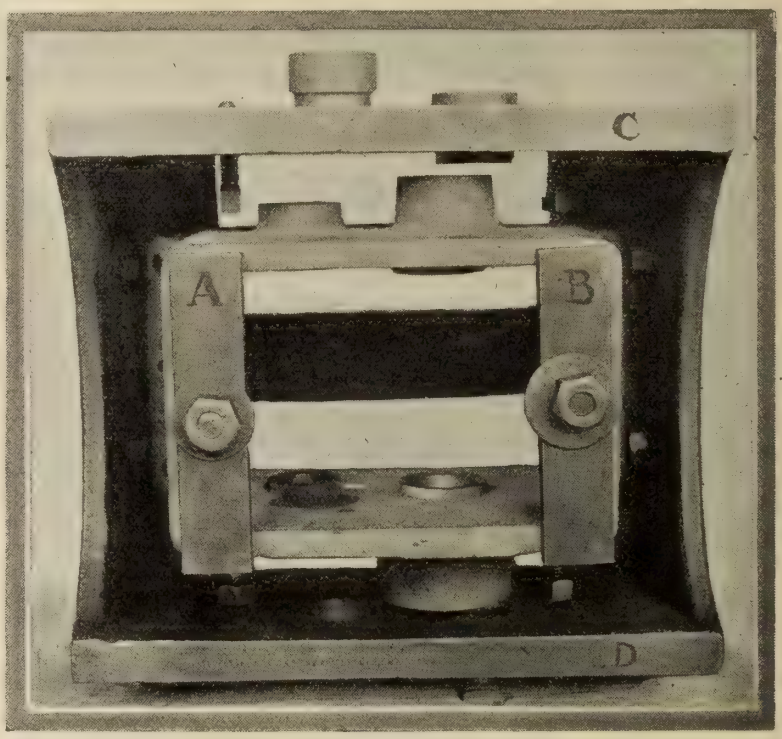


FIG. 4.—DRILLING THE GEAR BOX.

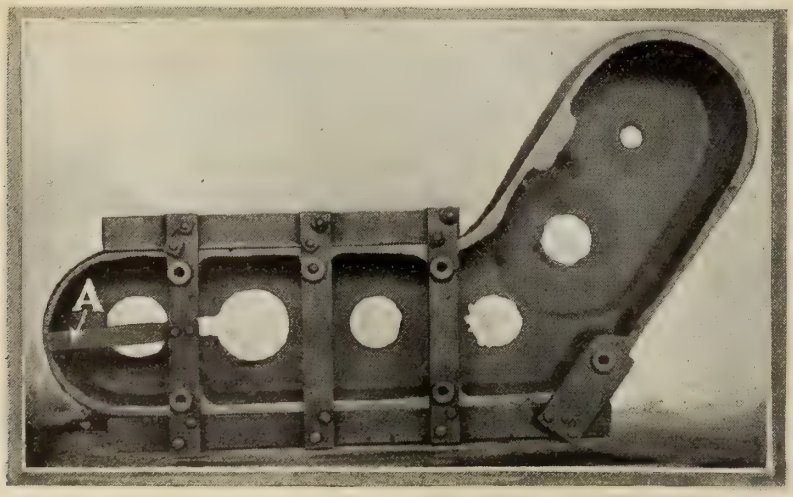


FIG. 6.—A SKELETON JIG FOR THE DRILLING OF GEAR GUARD

Gear Box Cover Jig.

The next illustration, Fig. 5, depicts a drilling jig for the gear box cover. This takes care of the top hole A and the two side holes B and C. The work is slid into the finished slide D until the end of the cover hits the adjustable stop E. It is also adjusted if necessary from the side by similar adjusting screws, which can be clearly seen on the photograph.

The work is held securely by means of the top binding screws F and G. One bushing accommodates the three holes, as it is interchangeable with all three, each hole being the same size.

The next and last jig described in this portion of article is used to drill the six holes at back of gear guard shown. Positive stops are used at one side of guard, while adjustable screws are used to tighten up the jig to the guard at the other side. The jig is gauged lengthwise by means of the strap A. The por-

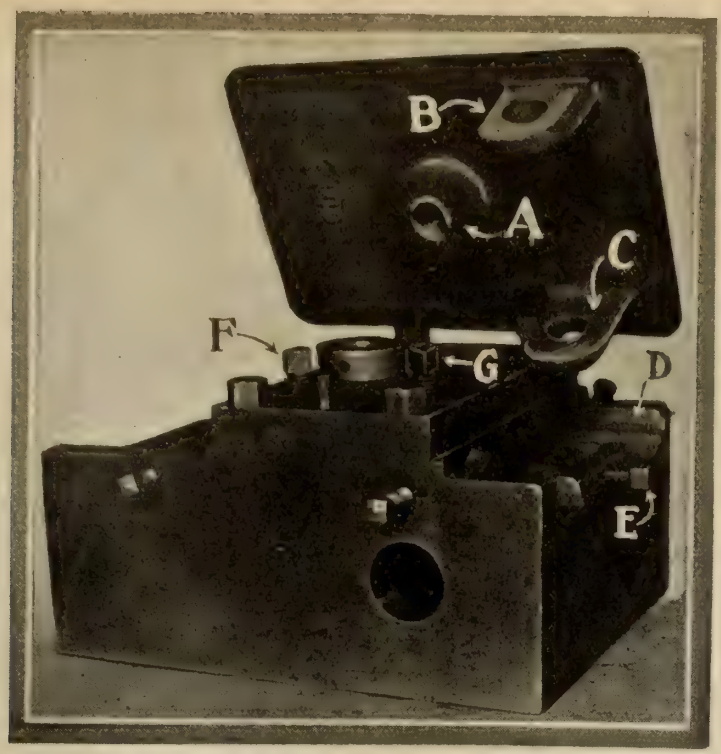


FIG. 5.—DRILLING JIG FOR GEAR BOX COVER.

tion of guard gauged from is easily seen on the photograph. Readers will note that this jig is merely made of flat steel, yet this frame work accomplishes its purpose equally as well as any other more elaborate arrangement proving that it is not always the expense of a fixture that gauges its field of usefulness.

In our next portion we will illustrate further types of jigs used in the producing of these milling machines.

WATER POWERS OF CANADA

At the regular meeting of the Toronto section of the American Institute of Electrical Engineers, held in the Engineers' Club on Friday, December 19th, a very interesting paper on the "Water Powers of Canada" was read by Mr. H. Harvey, of the Hydraulic Department, Hydro-Electric Power Commission of Ontario. The paper, which was illustrated by lantern slides, presented a summary of the extent of one of the great assets of the Dominion, and outlined some of the extensive developments under way or in contemplation at the present time.

The Maritime Provinces are not so abundantly blessed with water powers as is the remainder of Canada, but while large developments are not possible, there are many smaller powers available for use in the pulp and paper industry and for use in the exploitation of mineral resources. Quebec is very fortunately situated as regards potential water powers, and while large developments have already taken place, the greater portion of the water powers of the province still remain unutilized. There is, at least, 240,000 horse power still available and capable of easy development near Montreal, while the Saguenay River system and Lake St. John are capable of furnishing over 1,000,000 horse power. This, together with other potential water powers near Quebec City, will undoubtedly benefit industry in this vicinity. The water powers of Quebec will be of immense value in the exploitation of the mineral wealth of the province, and particularly so in electro-chemical and metallurgical industries.

The same applies to the water powers of Manitoba and within a radius of 100 miles of Winnipeg; it is altogether probable that large communities, dependent upon electro-chemical and metallurgical industries, will spring up. The fixation of atmospheric nitrogen for the making of fertilizer will undoubtedly be one of the most promising fields for manufacture, since Manitoba is so conveniently situated, as regards the grain-growing section of the country.

The Prairie Provinces have available considerable water power, the Bow River and the Saskatchewan being capable of considerable development, while the farther-north, the Churchill River emptying into Hudson Bay, has over 1,000 feet head throughout its course.

The Athabasca and Peace Rivers, too, are capable of development, but their location in the north country, emptying as they do into the Mackenzie River, which flows into the Arctic Ocean, renders them of value for the future only.

Little need be said of the value and extent of the water powers of British Columbia, since it is widely known that this province, owing to its topography, is particularly fortunate in this respect. The mountainous nature of the country, together with its many glacier-fed streams, renders high head water powers of fairly constant flow available. The pulp and paper industry of Canada, in 1918, represented a turnover of 110 to 115 millions, and of this amount British Columbia furnished only eight per cent. If this industry alone were developed in this province to its full extent, a marked increase in the amount of power used would occur. Vancouver Island is possessed of many large water powers, a total of 500,000 horse power being available.

The Yukon and Klondyke regions have many water powers, and some of these are developed at the present time, the power generated being used in the operation of gold dredges.

The Province of Ontario is the largest industrial centre of the Dominion and at the same time is possessed of the greatest natural wealth in water powers. This is particularly fortunate, in that her coal resources are non-existent. The water powers of the province are divisible into four main divisions, the Ottawa River basin, the Great Lakes, the James Bay basin, and the basin tributary to the Winnipeg River area. The characteristics of these four basins vary greatly, and in some of them the results of deforestation, etc., are noticeable. This is particularly true of such rivers as the Grand and Thames, where the character of the river has been changed from one of comparatively uniform flow to one of excessive run-off, of little use for power or navigation. In all, Ontario possesses 5,000,000 horse power capable of development. This figure includes international boundary waters up to the treaty limit only.

In the paper, and in the discussion which followed, the importance of water power development was emphasized, and the necessity of eliminating the importation of the 25,000,000 tons of coal now brought into the country was brought out.

P. W. Ellis, chairman of the Niagara Falls Park Commission, took part in the discussion, and gave some interesting facts relative to the developments in the Niagara district. He also mentioned the extensive plans of the Commission for the making of this district into a national playground. The necessity for the fullest development of the Falls was also emphasized, and in the further discussion which followed that of Mr. Ellis, it was brought out that the probable limitation of the developments at the Falls would not be affected so much by the necessity for the preservation of scenic beauty as by ice removal. A sufficient amount of water during the winter months must flow over the crest to remove this source of trouble.

The Niagara River may be said to be 39,000 years old. In the earlier stages of its career, it drained Lake Erie only, and took 32,000 years to cut back to the present whirlpool. At this time, an upheaval took place, which diverted the waters of the upper lakes into this channel and lowered the level of the old Lake Iroquois, now Lake Ontario, to its present limits.

The Internal Grinder on Locomotive Parts*

Grinding Machines Are Now Being Used to Good Advantage on Various Operations on Locomotive Work. Accurate Results Are Naturally Obtainable by Such a Process

IN comparison with the ordinary run of machines, the work done on a locomotive's mechanical makeup is crude.

Recent propaganda, however, regarding conservation of energy, saving of fuel, and lost motion, has been reflected in the more up-to-date locomotive shops by the installation of grinding machines. These machines have been installed to produce a superior finish on various surfaces which heretofore have been turned, reamed, or lapped.

Internal grinding machines have come into the shops to stay, more particularly

FIG. 1

the heavy type of machine, the universal or tool-room grinding machine lacking the rigidity necessary for locomotive work where speed is necessary.

To heavy types of machines that are proving their worth are the internal chucking grinding machine on which the work is revolved, similar to the method followed on the tool-room grinder, and the type with the eccentric spindle on which work is placed in a fixture. On account of the large size and irregular shape of many locomotive parts, they cannot be readily revolved, and hence the eccentric spindle or cylinder grinder is usually best adapted to railroad shop work.

A machine of this type may be seen in action in Fig. 1, finishing a bearing in a valve motion link. It may be noted that the grinding wheel bears against the right side of the hole. As the cylinder B revolves one-half turn, the wheel will bear against the left side, thus making a circle, touching all points of the circumference of the bushing to be ground. In practice, adjustments are made to the table so that the grinding wheel will just touch the inner surface to be ground at all points. As the hole is gradually ground, the amount of eccentricity of the spindle is increased by turning the nut D. With this form of machine, holes from 1½ in. to 12 in. diameter may be finished. The table for holding the work has a longitudinal motion, controlled by the customary form of tripping dogs, which cause the table to travel back and forth in a manner similar to that used in the general run of grinding machines.

*From "Machine Tool Review."

Holes in Valve Motion Levers and Bushings

There are many parts of a locomotive where it is possible to make use of the internal grinding machine, either in the original makeup of the machine or in doing repair work. Particularly in repair work is the machine of great use, as there is no question that there is a great saving of time and money, to say nothing of the fact that a better job may be performed which necessarily means fewer renewals.

Take for example valve motion levers, parallel rods, and various other similar parts. The holes in the rods or in the bushings or bearings applied to them, are often found worn oblong or rough, or the holes in the levers are distorted as a result of the bushing becoming loose in the levers. In many cases the holes may be trued and thus avoid renewing the bushings or reaming the lever. Reaming would, in some cases, be the quicker operation, but it would not produce as true a hole and would result in enlarging the hole more than by grinding, thus shortening the useful life of the levers or rods.

In addition to valve motion levers, the holes in side rods, knuckle pins, bushings and a number of larger holes may be ground. Another use for this machine is that of grinding the round holes in links into which the pins fit and also the holes in the link blocks. These are often case-hardened, and when they become worn in service, or when they have been warped in case-hardening, it is much easier to true the holes by grinding than by any other method.

In Fig. 2 may be seen the internal grinding machine at work grinding holes in side rods which will be made perfectly round and true before pressing in new bushings.

Airbrake Parts

In addition to the internal grinding mentioned above, this form of machine may be profitably employed on various airbrake parts, among which, for example, are triple valves. The inner surface of the cylinders where the piston travels should be re-finished accurately and smooth. This desired surface can be obtained very quickly on the internal grinding machine, and the work will be much superior to boring or reaming. Fig. 3 shows an internal grinding machine finishing the hole in a bronze bushing that has been forced into place within the equalizing cylinder used in connection with the airbrake. This has been also used by the Pennsylvania Railroad, New York Central, and others for re-grinding worn bushings of triple valves used in connection with airbrakes.

To refinish a very badly worn cylinder it may require more time than on a boring machine on account of the large amount of metal to be removed in order to true up the entire surface. Even so, the grinding would generally be more economical when considering the life of the cylinder. When boring there is always the possibility of the workman setting the boring tool to a larger diameter than is necessary to true the cylinder in order to get below the hard surface. With grinding this danger does not exist, for the hard surface does not affect the grinding and the workman will naturally not do any more work than is necessary.

Some of the other uses to which the internal grinding machine can be put in locomotive shops are: (1) getting a true round hole in the hard bushing; (2) in the side rods where the bushing bore has become slightly elongated near the surface the hole can be made perfectly round and true before pressing in a new bushing; (3) grinding small holes by making use of an extensive arm or quill, which goes with the equipment of this machine and enables the grinding of holes smaller than the standard arm will take.

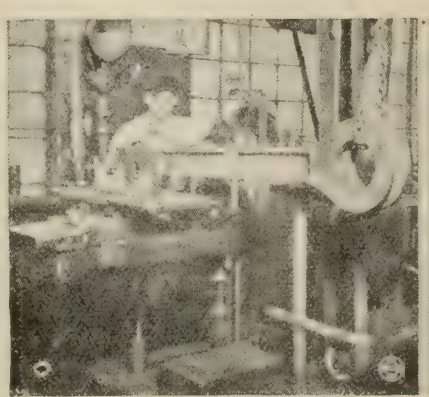


FIG. 2.

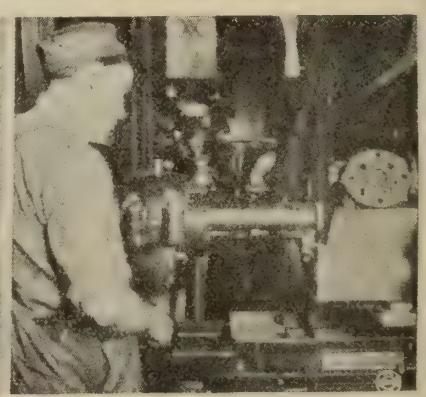


FIG. 3.

The Maintenance of Bridges and Buildings

Illustrating How Compressed Air Can Be Used to Advantage in Speeding Up Such Work. Some Hints Are Also Given as to the Equipment Necessary

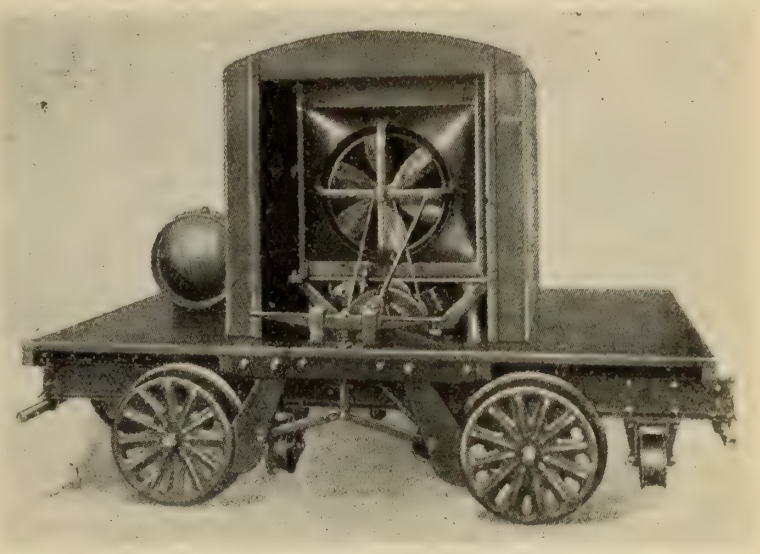
By F. A. McLEAN

ALMOST from the inception of the application of compressed air as a means of power transmission, the railroads have been among the largest users of air-operated appliances of various kinds, in locomotive and car shops, signal systems, etc. This is perhaps not at all strange when one stops to consider what an important part the air brake has played in the development and operation of modern high speed railroad equipment.

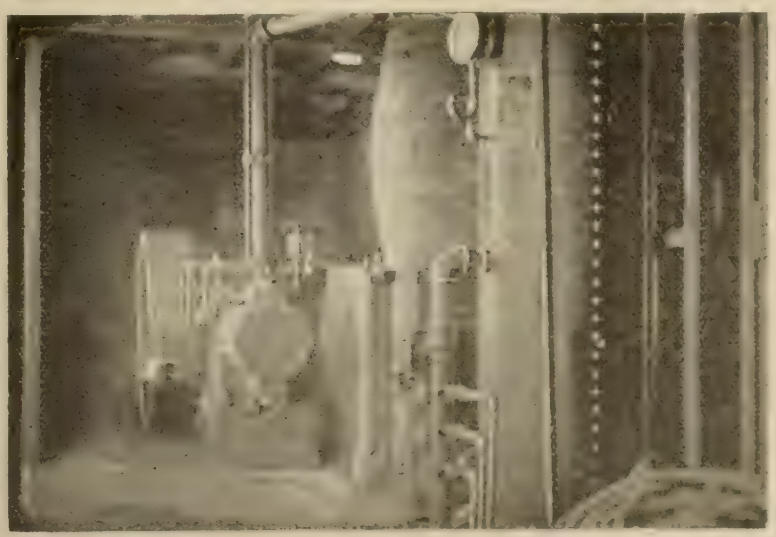
About five years ago the pneumatic tie-tamper was introduced, and although it met with considerable opposition, it has been adopted as standard equipment by practically all of the largest steam roads in the United States, as well as on many city and interurban electric lines. In Canada it has made somewhat slower progress, due perhaps to the fact that cheap labor was more readily obtainable than in the United States, and to the natural reluctance of many men to use anything with which they are not familiar, or which they think is still in an experimental stage. A few of these machines are at present in use on large Canadian steam and electric roads, and in view of the report of the Committee on Labor-Saving Devices, presented at the thirty-sixth annual Convention of the Roadmasters and Maintenance of Way Association of America, at Chicago, Ill., September 17-19, 1918, that in their opinion no tool in recent years furnished to the track forces had made its appearance at a more opportune time, or filled in a greater void than the air-operated tie-tamper, it seems entirely reasonable to expect that within a few years, as the maintenance of way officials become better acquainted with their merits, these tools will be as extensively used on the steam and electric lines of this country as they are in the States.

Labor is generally conceded to be the largest single item entering into maintenance of way and structure expense, sometimes being as much as, or more than all other items combined, averaging from 50 to 55% of the total, and the saving in this respect which the use of pneumatic tie-tamping outfits has made possible in the operations of laying new track, replacing old track, or re-surfacing track which is already in existence, has caused some of the more progressive bridge and building masters to devise means by which compressed air could be applied to their particular branch of railway maintenance and construction work.

A number of roads have fitted up old box cars as portable compressed air power plants of sufficient size to operate a number of tie-tampers, or other air tools, by the installation of steam, gasoline, or electric-driven, straight line compressors with water tanks and air receivers of the proper capacity. An outfit of this kind is easily rigged up and is very useful, but has one or two drawbacks which limit its field to some extent, in that it cannot be readily moved from one section to another without the use of a locomotive, and due to its weight and bulk, it can not be removed from the rails, and is thus only available for use where traffic is light or where a convenient siding is at hand.. Mounting the compressor on an automobile chassis or horse-drawn vehicle gives a little more lee-way in this respect in the case of electric roads, but is not of much use on steam roads, as the road bed is seldom wide enough to allow the use of a vehicle of this type, and roads or highways are often some distance away from the railroad tracks.

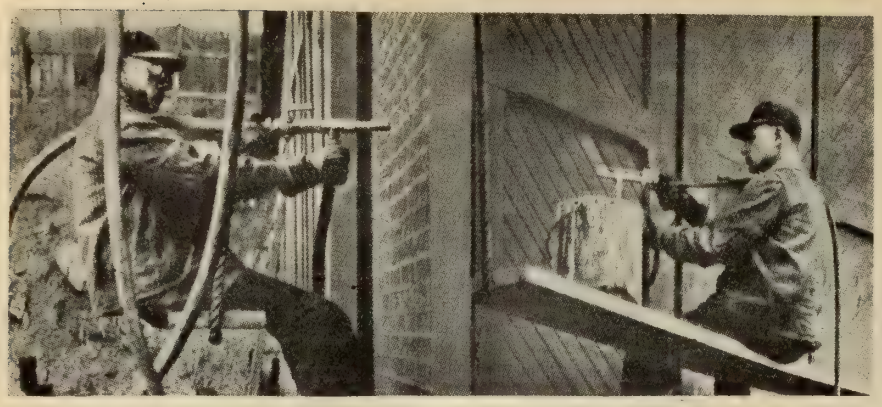


SELF PROPELLED GASOLINE DRIVEN COMPRESSOR CAR.



AN OLD BOX CAR CONVERTED INTO A PORTABLE COMPRESSED AIR POWER PLANT.

A type of outfit which overcomes these disadvantages and provides a simple, compact and self-contained outfit, which will enable bridge and building departments to make use of compresed air to the widest extent, is now being built by the Ingersoll-Rand Company, under the trade name of the Imperial Bridge Repair Outfit. The power plant or heart of this outfit consists of a direct-connected gasoline or electric-driven compressor, of sufficient size to supply four air lines, mounted on a machined subbase, which is attached to a heavily constructed vehicle of the push car type.



CLEANING A BRICK WALL WITH A SAND BLAST. PAINTING ROUNDHOUSE DOORS WITH COMPRESSED AIR.

identical in construction with those supplied with "Imperial" pneumatic tie-tamping equipment.

For the use of steam roads, or electric roads which prefer a self-propelled outfit, an engine of the two-cycle type, fitted with an automatic governor that controls the speed by acting on a throttle which forms an integral part of the carburettor, is provided. An automatic pressure operated unloading device placed between the discharge line and the air receiver, keeps the pressure in the latter within the desired limits. The engine-driven car is self-propelled by means of a sprocket and chain which can be thrown thrown in or out of gear by a clutch connection with the main shaft. The car has sufficient power to haul twelve men, in addition to the tools and accessories supplied with the outfit, at a speed of 12 to 15 miles per hour, and will readily climb a 4 per cent. grade when fully loaded. The brakes are operated by the foot and have a holding power considerably in excess of what would be required under ordinary conditions, so as to provide an ample factor of safety should the engineer suddenly stop while the car was climbing a grade.

The motor-driven outfits are provided with a drawbar socket for coupling to a street car or electric locomotive, and both outfits are equipped with cross trucks or wheels for quickly removing the car to and from the track. A removable sheet housing protects the working parts from the elements when it is necessary to leave the car out of doors for any length of time, and may be locked to prevent tampering if desired.

Each car is ordinarily fitted up with a pneumatic drill with sufficient power to ream and tap up to one inch or drive a 1¼ in. twist drill, a riveting hammer or gun with ¾ in. and 1 in. rivet sets, a set clip and a rivet buster chisel, also unique sand blast and paint spray nozzles. The drill is useful for drilling and reaming holes in structural members of bridges and buildings, boring holes in ties, running down screw spikes and lag screws, tightening bolts, drilling and reaming holes in rails for bonding and joining, while the hammer is applied to such jobs as driving or "busting" rivets, and chipping metal in steel culvert, bridge, cattle guard, or tank work, and for barking ties, etc.

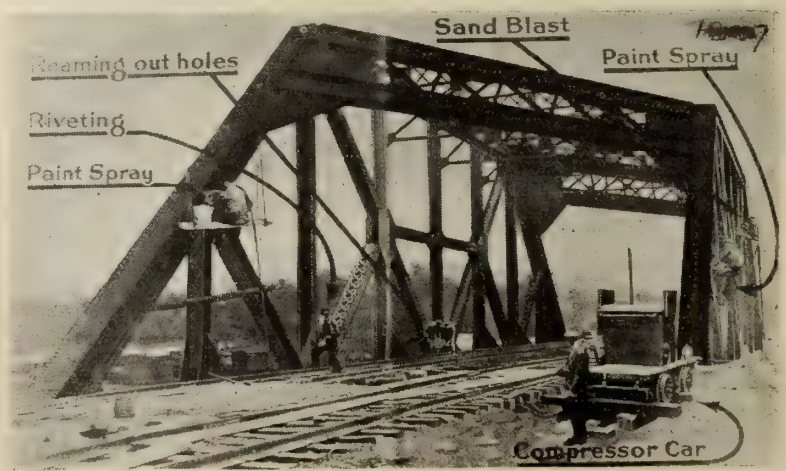
Although the application of pneumatic drills and hammers to bridge and building repair work is by no means new, the use of the sand blast and paint spray for this work is, however, a decided innovation on many roads. The advantages accruing from the use of these devices are readily apparent. With the sand blast it is possible to clean off rust and scale more quickly and thoroughly than would be possible by any other method. This is especially true in the case of sharp corners, pockets, lattice work, etc., the cleaning of which, by hand, is a very tedious and costly job. The sand blast is of a very simple type, does not require tanks or special equipment, is easily operated, and has been found economical in the use of sand, which may be of any variety so long as it does not contain gravel or pebbles. Wherever it is possible to do so, it is a good plan to arrange a piece of tarpaulin in such a way as to catch the sand, which may then be used over again several times. The sand may be taken from a pit, a pail, or even a loose pile as may be most convenient in each case. The weight of the attachment is about eight pounds, and it is adapted to a wide range of work on stone, concrete, or steel.

The paint-spraying device, which weighs approximately two pounds, applies a solid uniform coating of paint, whitewash, creosote, or any other liquid of as great a thickness as may be desired, in one operation, thus doing away with the necessity of applying three or four coats by hand, resulting in a saving of about 90 per cent. in time. The density of the spray is subject to accurate control, the nozzle being adjustable for a light or heavy coat with various grades of paint, which can be drawn from any type of container, the most common way being to take it from a can placed on the scaifold near the painter. With the paint spray there is no need to stir the paint, as the action of the air keeps it thoroughly mixed, assuring a coating of uniform quality at all times and being applied under pressure, it is forced into cracks, corners, etc., which could not be reached with a brush.

Through the use of these appliances five or six men can efficiently perform all of the odd jobs incident to the maintenance and repair of bridges and buildings in a minimum of time, and, in addition, the compressor car provides a convenient source of power for use in tamping ballast, adzing ties, breaking out frozen coal, or tearing up concrete or asphalt pavement with pneumatic tampers, grinding rails for bonding or switch points, cutting off timbers with a pneumatic saw, running pneumatic rammers for ramming concrete, or ramming earth around culverts, retaining walls, pipes, etc., or for operating concrete mixers, hoists, pumps, jacks, etc.

As examples of the time saving which can be effected by the use of equipment of this kind, the N.Y., N.H. & H.R.R., operating four pneumatic drills with a special clamping and feeding attachment, by one of these cars, drills 9-32 in. holes in 100-pound rail at the rate of 70 holes per minute, not counting the delays due to traffic and moving of the drills, each of which are operated and shifted by one man. On the C.M. & St. Paul R.R., 1,000 ⅞ in. holes are drilled in the web of 85-pound rails per day, all delays due to traffic and moving included, by four men operating two close-corner drills, fitted with special clamping and feeding arrangements.

These outfits weigh approximately 3,300 pounds, and in removing them from the track each side of the car is raised two or three inches in turn, allowing temporary rails formed of 2 x 4 in.



A PNEUMATIC BRIDGE REPAIR OUTFIT IN ACTION.

scantlings to be placed under the cross trucks or derailing wheels at each end of the car. These small wheels have double flanges and have their tread about two inches higher than that of the main wheels. Four men can lift the car with ease upon these simple cross rails and roll it on to a stand formed by driving short posts into the ground and cutting them off at the desired level, or on to a crib prepared by laying ties on the ground or shoulder of the roadbed at the point where it is desired to move the car from the track. The actual time required for four men to remove or replace the car on the track, once the stand or crib is built, is about forty-five seconds.

Through the use of self-propelled, air-operated, bridge repair equipment, it is possible to greatly reduce the size of the repair gangs required, which is an important factor when the scarcity and high cost of labor, and often the low efficiency of that which is obtainable, is taken into consideration. Reducing the size of the gangs, avoids the tying up of locomotives and cars for work train service, and the men are often carried to their work, the job finished, and the men back again before the materials for performing the work by hand could be loaded on cars, switched into a way freight or work train, and transported to their destination ready for use. One of the large Eastern roads among the first to adopt equipment of this type found that through its use they could reduce their labor turnover to a large extent, as the strain on the men was considerably less than when hand-operated equipment was used exclusively, and the fact that the outfits were self-propelling made it possible for the men to live at some distance from their work in order to take advantage of lower living expense and still be on hand ready to start work at seven o'clock in the morning, the company building a section house convenient to the men's homes, where they assembled a few minutes before seven each morning, started the car, and arrived at the scene of their labors in a few minutes, and were back again in good time at night.

UPPER LEFT: DRILLING HOLES IN RAIL. UPPER RIGHT: GRINDING SWITCH POINTS. LOWER LEFT: BORING SPIKE HOLES IN TIE. LOWER RIGHT: DRIVING SCREW SPIKES.

WELDING BURNED IRON DURING THE WAR

Many welders will refuse to attempt to weld burned iron, especially grate bars, and while a true weld is hardly possible, yet, by using muriatic acid as a flux, an adhesion can be made that will last until the damaged part can be replaced. In fact it will last almost as long as if it were really welded, unless it is struck a hard blow.

Among the users for acetylene during the great war, perhaps there was no application more simple and effective than acetylene in the form of portable lights, or flarelights, as they are often called.

The uses to which these lights were put were almost to numerous to mention. The following, however, are some of the most important ones:

Commencing with the rush of work of preparing for mobilizing the American army, the building of the cantonments was rushed, the bases equipped, materials moved, roads constructed, training and drilling done, under the white and widely diffused rays of portable acetylene lights giving from ten to fifteen thousand candle power.

In speeding shipbuilding these acetylene lights played their indispensable part from the laying of the keel until the superstructure was finished.

From the time of launching, acetylene lights were used in equipping and loading ships for their hazardous voyages. These lights were also fitted to the decks of many of the merchant vessels, which time after time braved the skulking submarine, to be in readiness in case the vessel was torpedoed and the electric lights put out of commission. Acetylene was found to be the one dependable light which would aid until the last moment the doomed vessel remained afloat. Indeed, after the vessel was sunk—buoyant, self-lighting and inextinguishable—acetylene lights still served in the work of rescue, and then portable acetylene lights were used by the salvage crews of the navy.

As fast as our ships reached the shores of our Allies, thousands of lights were used for unloading munitions, equipment, stores and men.

As the stream of men and war materials of our army moved forward toward the front, portable acetylene lights were constantly employed. They were used for the laying of railroads, building of stations, for the moving of freight, for the construction of bases, for the erection of bridges, for the building of emplacements for guns, and for the vast variety of work incident to the movement and maintenance of a great army in its titanic struggle for the freedom of the world against the tyranny and despotism of an implacable military power.

Acetylene lights were also used for guarding the alien enemy internment camps at night in this country, and in preventing the escape of enemy prisoners abroad.

The success and safety of so much of the machinery of war depended upon the operation of the portable acetylene lights. A number of them giving an aggregate of 50,000 candlepower were used for the starting and landing of aeroplanes and dirigibles at night. These acetylene lights flooded their light on large areas near the aerodromes to permit the safe return of the swift pilots of the night in their journeys from the enemy's zone.

Portable acetylene lights with constant delivery pressure were used by the photographic section of the aviation corps for the development of photos taken of the enemy lines.

Acetylene was employed in its subtlest and most scientific form to produce sensitive films on which needles recorded the direction and intensity of the enemy's artillery fire, aiding largely in the discovery and discomfiture of the enemy, or in frustrating his plans.

Acetylene portable lights played their unfailing part in the rescue of the wounded. Nurses, members of the Red Cross and Medical Corps, used hand acetylene lights with shutters, which enabled them to instantly throw the rays on and off the wounded upon the battlefield, or sufficiently long for treatment. After they were rescued, acetylene furnished the light in field hospitals for surgical operations, for the heating of water, and cooking of food for the sick and wounded. — "Acetylene Journal," Chicago.

The Use of the Pyrometer in Steel Industry*

An Interesting Paper Discussing the Progress Made in the Accurate Measurement and Control of High Temperatures in the Heat Treatment of Steel of All Kinds

By R. P. BROWN

IF anyone stops to consider the remarkable progress which has been made in the accurate measurement and control of high temperatures in the heat treatment of steel, one realizes that this progress has been phenomenal during the past ten years. This progress has been largely due, first to improvements in temperature measuring instruments, and secondly to the education of the user in the proper use and care of pyrometers.

It is safe to say that greater progress has been made during the past ten years in the use of pyrometers than was made in the two hundred preceding years during which pyrometers were known and used to some small extent. This progress has been largely due to the constant efforts of pyrometer manufacturers to develop and improve their instruments.

It is also true that in the last ten years an unusual amount of interest has been exhibited by the men who must use pyrometers, in becoming fully acquainted with the construction of the various types of pyrometers which are available and the proper installation of the instruments in order that they will give the best results and the proper method of using and checking the instruments.

Numerous papers and books have been written on this subject, and one has only to call on any steel plant to-day and interview the metallurgist or the practical hardener, to realize how much more these men know of pyrometers than the man of ten years ago. One rarely calls at a plant where heat treatment of steel is carried on where the man who is charged with this work is not well acquainted with the use of pyrometers and the proper equipment to use for his requirements.

Ten years ago it was a question solely of endeavoring to convince the prospective pyrometer user that he should use a pyrometer. He had never used one before and it was a difficult matter to convince him that the instrument was necessary. To-day it is a question of convincing the same man that a certain type of pyrometer is properly designed to best meet his requirements, that it will give maximum life under his conditions, and that the pyrometer installation will require a minimum amount of attention. He does not have to be convinced that he should use a pyrometer; he must be convinced that he is going to buy the best pyrometer equipment for his requirements.

When I compare the average metallurgist or steel hardener of to-day with the same man of ten years ago, it is true that I may do an injustice to the men associated with a few of the larger companies where the advantages of pyrometers were appreciated at that time, but these plants were few and far between and it must be realized that I am speaking generally and of the average conditions of ten years ago and of to-day.

The old methods of measuring temperature by the expansion or fusing points of clay, by the expansion or contraction of metals, and by numerous other methods have largely been eliminated to-day and we have practically only two methods of measuring high temperatures. The thermo-electric pyrometer embraces either a thermo-couple inserted directly in the heat, or in the form of a radiation pyrometer with the thermo-couple heated by the furnace rays; secondary the optical pyrometer, in which a color comparison of an incandescent body and the steel under treatment is made. The optical pyrometer is used only portably as this instrument is not suitable for permanent installation or for automatically recording temperature. It is used quite extensively where it is necessary to focus on a particular piece of steel in a furnace to secure its temperature, or where excessively high temperatures are measured, around 3,000° Fahr. or 1,600° Cent., where a thermo-electric pyrometer is not suitable.

Optical Pyrometers

The optical pyrometer as generally used compares the incandescent filament of an electric lamp bulb with the luminosity of the steel under treatment. A milli-ammeter is used to measure the current passing through the lamp; the more current the brighter the filament and the greater the number of milli-amperes indicated on the meter. By turning a rheostat the amount of current passing through the lamp can be adjusted. When the color of the lamp filament blends with the piece of steel under treatment it is assumed that the two are at the same temperature. The indications on the milli-ammeter are then read off and by a conversion table the actual degrees Fahrenheit or Centigrade are secured.

Other forms of optical pyrometers compare the flame of a small oil or kerosene lamp or the color of multi-colored lens with the steel which is being heat-treated.

Having referred to this method of measuring temperature by an optical pyrometer, which has been used to some extent for twenty years or more, and the use of which is still limited, I can take up the thermo-electric pyrometer, which is almost universally used to-day.

I think that almost everyone understands that a thermo-electric pyrometer consists of a thermo-couple, a measuring instrument, and the leads connecting the thermo-couple and the meter. The thermo-couple is formed of two dissimilar metals, usually drawn into wire and with one pair of ends twisted together. When this junction is heated it generates a small current of electricity which can be measured on a milli-voltmeter.

It is true that a thermo-couple produces current, dependent on the temperature of the twisted junction extending into the furnace, known as the hot end, and the opposite end outside the furnace, known as the cold end or cold junction. It is at these ends that the leads running to the meter are joined to the thermo-couple. In accurately measuring temperature with a thermo-couple it is therefore essential that the cold junction be maintained at a known fixed and uniform temperature, which may be 75° Fahr. or any other temperature. If the cold junction of a thermo-couple is at 75° Fahr. and the hot junction in the furnace is at 1,400° Fahr., the actual millivoltage generated is equivalent to the difference in temperature between the hot end and the cold end of the thermo-couple, equivalent to 1325° Fahr. If we heat this cold junction to 100° Fahr. we will then only have a millivoltage produced by the thermo-couple equivalent to the difference in temperature of 1300° Fahr. instead of 1325° Fahr. as previously cited.

The effect of heating the cold junction of a base metal thermo-couple is such that with a rise in temperature of the cold junction of 25° Fahr. the instrument will read approximately 25° low. With a platinum thermo-couple this error is approximately one-half. In other words, with a platinum couple, the error would amount to only approximately 12° Fahr. for a rise in temperature of the cold junction of 25° Fahr. above normal.

In the use of any thermo-electric pyrometer it is essential that this point be realized, because far too many thermo-electric pyrometers are still in use to-day with the cold junction of the thermo-couple located right above a furnace and subject to constant changes in temperature and to probably a normal temperature of not less than 200° Fahr.

Assuming that the pointer on the instrument is set at 75° Fahr., such an instrument is actually reading 125° Fahr. too low. Of course, if the user of the instrument only realizes this fact which I have brought out, he will set the pointer of his instrument for the proper cold junction temperature 200° Fahr. instead of that usually adopted in supplying the pyrometer, 75° Fahr.

All modern pyrometers are equipped with zero adjusters which permit of setting the pointer to any desired cold junc-

*By courtesy of National Safety Council.

tion temperature and this point can be readily taken care of. Unfortunately in the case I have mentioned above where a thermo-couple is located just above the furnace, when the furnace is first started up, the temperature of the thermo-couple inside might attain 1400° Fahr. and the cold junction outside will have only reached 100° Fahr.; after the furnace has been run six hours the heat radiation from the crown of the furnace may be such that the cold junction temperature will reach 200° Fahr. In consequence, the pyrometer is reading 100° lower than it did formerly for exactly the same temperature in the furnace. In consequence, the operator, in order to make the pyrometer read the desired temperature, 1400° Fahr., is actually carrying 1500° Fahr. in the furnace when actually exactly the same temperature existed.

I hope I have made this point clear, as it is of the utmost importance if accurate temperature measurements are to be secured with a thermo-electric pyrometer.

Cold Junction Compensation

There are a number of ways in which we to-day overcome this course of error due to changes in temperature of the cold junction of the thermo-couple. First, we can supply compensating leads, as they are called, consisting of material the same as that forming the thermo-couple, which will remove the cold junction to some distant point where the temperature will be constant. These compensating leads can be selected of material the same as the thermo-couples or of the other alloys which will offset the effect of change in temperature at the cold end of the thermo-couple. If we run these compensating leads to some point near the floor in the heat treating room the temperature will probably vary from 60° to 110° Fahr. from winter to summer, or a possible error of 50° Fahr. where a base metal thermo-couple is used.

There are several ways in which we can further reduce this possible error. First, we can run the compensating leads into a pipe driven into the ground for some 10 feet and at the bottom of this pipe we make our junction with the copper leads running to the instrument. The cold junction is now in the ground where the changes from winter to summer under usual conditions vary 5° Fahr.

In using this method it is very desirable to use two pipes, the outer and larger one welded to a point at the end to drive easily into the ground. The inner pipe welded tight at the end can be slipped into the outer pipe. It is possible to split the outer pipe in driving and in consequence water may enter.

By using a second interior pipe this second pipe can be slipped down in the larger outer pipe and it is not under any strain in driving and can be easily made water-tight. The compensating leads for placing in the ground should have moistureproof insulation to prevent any danger of short circuiting or grounding on account of moisture. Where these precautions are taken this is an excellent method of maintaining a constant cold junction temperature.

Another common method is to place the cold end of the compensating leads in a compensating box, which consists of a thermostat and lamps or heating units. By means of the thermostat it is possible to maintain any desired temperature usually up to 150° Fahr. within a limit of + or — 2° Fahr. The ordinary compensating box is designed to take care of as many as 20 thermo-couples, which are led into one compensating box, and this affords an easy method of maintaining a constant temperature.

In using the compensating box it is essential that the thermostat be set with the graduated temperature scale at a temperature higher than that which will be attained in the room in which the compensating box is located; for example, if the room will attain a maximum temperature in summer of 120° Fahr., it is common practice to set the compensating box at 125° Fahr. and the pointer on the scale of the pyrometers which are operated by the various thermo-couples connected through this compensating box will be set likewise for 125° Fahr. on the scale.

The compensating leads from the thermo-couples can be also run to the instrument, which may be located in the room subject to variation in temperature from probably 70° to 100° Fahr. from winter to summer. In this case it is possible to have an error of as much as 30° Fahr.

Thermo-electric pyrometers are now supplied with automatic compensating means at the instrument so that, provided the compensating leads are run to the instrument, automatic compensation takes place to overcome changes in temperature at the instrument itself. This compensation can be readily incorporated in the thermo-electric pyrometers through a shunt of large temperature coefficient, which will be materially affected with atmospheric changes in temperature.

Base Metal Thermo-Couples

I have referred previously to the use of thermo-couples formed of base metal and of platinum wire. Base metal thermo-couples are almost universally used for measuring temperatures to 2000° Fahr. or 1100° Cent. These base thermo-couples for temperatures up to 1200° Fahr. or 650° Cent. are usually formed with one wire of constantan, a nickel copper alloy, and the other a pure iron. This form of thermo-couple is advantageous for use in a reducing atmosphere within the above temperature limits. For temperatures above 1200° Fahr.. up to 2000° Fahr., equivalent to 650° Cent. or to 1100° Cent., a thermo-couple formed of one wire of 90 per cent. nickel and 10 per cent. chrome and other wire of 98 per cent. nickel with balance manganese, silicon and aluminum, would give the most satisfactory service.

Base metal thermo-couples as supplied to-day are furnished in all diameters from .01 in. up to ¼ in. in diameter; sensitive thermo-couples of wire .01 in. in diameter can be used experimentally to advantage in testing the temperature of the surfaces of metal, particularly at moderate temperatures, whereas thermo-couples formed of wire ⅛ in. or ¼ in. diameter are better suited for constant service in large heat-treating furnaces.

Platinum Thermo-Couples

Where we have to measure temperatures from 2000° Fahr. or 1100° Cent. up to a maximum of 3000° Fahr. or 1600° Cent., it is best to use a platinum rhodium thermo-couple, one wire being of pure platinum and the other platinum 90 per cent. and rhodium 10 per cent. The wires forming this thermo-couple are usually .02 in. in diameter. A platinum rhodium thermo-couple gives very satisfactory life even under severe service at temperatures up to 2500° to 2600° Fahr., provided the wires are suitably protected from the gases with a tube of porcelain or silica, which is impervious to gases. These tubes are in turn protected with a tube of graphite, carborundum, fire brick or other suitable material which serves to protect the fragile porcelain or silica tube from mechanical injury and introduces a slight lag to prevent breakage through contraction and expansion due to sudden changes in temperature.

While it is of the utmost importance to properly protect a platinum rhodium thermo-couple to exclude gases which very actively attack the platinum, it is equally desirable to properly protect a base metal thermo-couple if maximum life is to be secured. The usual method of protecting a thermo-couple for temperatures up to 1400° Fahr. (750° Cent.) or below, is to use a common wrought iron pipe with the lower end plugged or welded. The life of common wrought iron pipe can be increased to some extent by calorizing, a process developed by the General Electric Company of impregnating the pipe with an aluminum oxide.

A material increase in the life of base metal thermo-couples for temperatures above 1400° Fahr. or 750° Cent. is secured by the use of protecting tubes of nickel chromium or of a special alloy which we have recently adopted in our resisteat tube, as they are trade-marked. The nickel chromium tubes withstand to a satisfactory extent normal use in heat-treating furnaces where the temperature does not exceed 1600° Fahr., but for the most common conditions and where maximum life is secured this special alloy resisteat tube is given the best results.

To insulate the wires forming a thermo-couple from each other and from the protecting tube, it is common practice to use beads of porcelain or lavite, which are the most satisfactory for this service. Formerly asbestos tubing or string was used to insulate each wire and this was painted with a solution of sodium silicate and carborundum, but this form of insulation rapidly disintegrates at temperatures above 1000° Fahr. The porcelain or lavite insulation is most certainly to be recommended.

Standardized Voltage from Thermo-Couples

A platinum rhodium thermo-couple, on account of the care taken in the refining of the precious metals and the proper alloying, can be reproduced continuously with the same millivoltage. As new ingots are cast every few years from which this wire is drawn, it has been possible to carefully duplicate these ingots so that the millivoltage is reproduced within some 5° Fahr. of the millivoltage produced by a previous lot.

With base metal thermo-couples it has been extremely difficult to select wires which will accurately reproduce the standard millivoltage of a certain base metal thermo-couple. It seems that the limit in this respect is approximately 15° + or — or a total possible error of 30° Fahr. We have, however, made some progress through special care in selecting wire producing the desired millivoltage, and it is possible for us today to supply wire for thermo-couples with an accuracy within 10° Fahr. + or —.

Where extreme accuracy is required it is possible to shunt the thermo-couples to a definite or standard millivoltage by reducing the voltage produced by the thermo-couple by some 2 millivolts. With this method it is possible to standardize any thermo-couple with extreme precision and an accuracy within + or — 4° Fahr. can be easily obtained.

A shunted thermo-couple can be used to advantage where the immersion of the thermo-couple at any time provided it exceed 18 in. For unusual immersions where the thermo-couple must protect, for example, several feet inside the furnace, the unshunted thermo-couple is preferable. Where the shunted thermo-couple is used it has the advantage that it is possible to restandardize this thermo-couple at any time provided it falls off in voltage. With the unshunted thermo-couples, should this occur, it must be either junked or shortened if this is possible.

The shunted thermo-couple has the disadvantage that the shunt may be broken accidentally or through mechanical injury. Both the shunted and unshunted thermo-couples have their advantages and disadvantages and each has its uses.

There are two common methods of measuring the voltage produced by the thermo-couple, the milli-voltmeter method and the potentiometer method.

The Milli-Voltmeter Method of Measuring Temperature

The milli-voltmeter method has been in use for a great many years. The original milli-voltmeters were constructed with a movable element swinging in the air-gap of a permanent magnet and hung by a fine suspension wire. As a platinum thermo-couple produces some twenty thousandths of a volt for 300° Fahr. and a base metal thermo-couple some 40 thousandths of a volt for 3000° Fahr., the usual temperature scale, the internal resistance of an instrument is dependent on the type of thermo-couple used and the voltage is consequently available.

These suspension type instruments, which were largely made in France, England and Germany some twenty or more years ago, had an internal resistance of some 300 to 600 ohms with a platinum thermo-couple with full scale of 20 millivolts. On account of the delicate construction of these instruments and the continual breakage of the suspension wires, certain manufacturers in this country produced a low resistance form of milli-voltmeter pyrometer consisting of the standard form of switchboard or portable milli-voltmeter used with a shunt as an ammeter. This instrument usually had from 3 to 5 ohms internal resistance. While it was true that such an instrument was exceedingly robust and could be handled without likelihood of injury, it was equally true that the accuracy of such an instrument was exceedingly poor on account of the low internal resistance of the instrument. Frequently the total resistance of the thermo-couple and the leads connected to such an instrument might vary from a total of 1 ohm to 2 ohms, affecting the actual readings of the instruments as much as 20 per cent.

If an instrument of this kind was calibrated for a 3 ft. thermo-couple of the usual ⅛ in. wire and it had later to be used with a 4 ft. thermo-couple, unless the instrument was re-calibrated it read 20° too low. If the instrument was calibrated from 25 ft. double conductor No. 12 gauge copper leads and it had later to be located at a greater distance where 75 ft. of the above leads were required, the instrument read some 18° Fahr. too low. Under such conditions it was absolutely impossible to secure any precision in measuring temperature.

In the past five or six years high resistance milli-voltmeter pyrometers have been developed with an internal resistance with a platinum couple of as high as 600 ohms or with a base metal thermo-couple as high as 1,200 ohms, which have a standard double pivoted construction used in the ordinary low-resistance instrument, eliminating the suspension wires. By re-designing the standard instrument, by lightening the movable element and narrowing the air-gap, it has been possible to attain this high resistance. This high resistance can be attained, first, as I have outlined above, by the changes in the design of the instrument and also in part by the use of an aluminum alloy for the winding in the movable elements. This decreases the weight of the movable element 100 per cent.

Where an instrument of 600 ohms resistance is used, a change in line resistance from 5 ft. to 500 ft., which is naturally very excessive, will affect the readings of the pyrometer only 4° Fahr. where the scale is graduated to 2000° Fahr. Any likely change in the length of the thermo-couple has absolutely no effect on the readings of such a pyrometer.

In the last couple of years, instruments have been brought out in which the effect of line resistance can be entirely eliminated by balancing the voltage of the thermo-couples against that of another source of emf such as a dry cell. Usually an adjustable resistance is installed for a total of 15 ohms, and any variation in line resistance can be compensated for in this type of instrument up to a total of 15 ohms. After this adjustment has been made, the instrument is direct reading and independent of line resistance.

Messrs. Harrison and Foote, of the Bureau of Standards, Washington, have recently hit upon a method of accomplishing this result by using the voltage of the thermo-couple itself and by simply the depression of a key and the turning of a rheostat, adjustment can be made for any line resistance up to 15 ohms. This new instrument requires no dry cell or standard cell as a source of emf. The instrument is similar to the ordinary milli-voltmeter in appearance, with the addition of the small key and resistance knob. The operator has only to read the temperature in the usual way. He presses the key, and if the reading is any different from that which was previously observed he turns the resistance knob until there is no change, whether the key is depressed or not. The instrument has then been adjusted for line resistance, which may be any amount whatsoever up to 15 ohms, equivalent to many miles of copper leads.

We have secured the exclusive license from Messrs. Harrison and Foote for the use of this construction in connection with our milli-voltmeters in this and foreign countries, and there is no question in my mind but that it is a radical step forward in the milli-voltmeter method of measuring temperature, for it has the following radical advantages:

As in the ordinary milli-voltmeter the instrument is direct reading throughout the whole scale range. The instrument is independent of line resistance up to a total of 15 ohms and what little temperature co-efficient exists in the ordinary high-resistance milli-voltmeter is balanced out in this instrument. Accuracy in calibration of an instrument of this kind can be guaranteed within one-tenth of a milli-volt equivalent on the base metal scale of 4° Fahr.

The Potentiometer Method

The potentiometer method of measuring the voltage produced by a thermo-couple has been quite extensively adopted in the past six or eight years where extreme precision is required. The potentiometer method differs from the milli-voltmeter method in that the milli-voltmeter uses the current produced by the thermo-couple to deflect the instrument. The potentiometer opposes the current of the thermo-couple to that of a dry cell and the dry cell current, equivalent to that of the thermo-couple, is measured.

To be continued

Hamilton.—The general traffic manager of the Canada Steamship Lines has written to the Hamilton Harbor Commissioners to the effect that they can not expect a better boat service until the beach canal is widened and deepened.

WHAT OUR READERS THINK AND DO

Here is the First Answer to Letter from H.H.J.

From the viewpoint of one of our staff.

LACK of space in our last issue precluded our commenting upon the letter from H. H. J. which appeared therein. Our correspondent gave expression to the opinion that in the majority of machine shops apprentices and workmen are deliberately discouraged by the foremen in any efforts they might make to increase their knowledge by study in their spare time or to promote the interests of their employers by making suggestions which might lead to improved methods in the shop.

If the premises upon which H. H. J. bases his complaint are true, he would, undoubtedly, be justified in claiming that a most lamentable state of affairs exists and one which cannot be too quickly remedied.

But are conditions in the machine shops of Toronto generally such as H. H. J. claims them to be? Surely the deductions he draws from his own experiences, which may possibly have been unfortunate and exceptional, cannot be lightly accepted as typical of machine shops generally.

Are 75 per cent. of the plants in Toronto mismanaged? For this is the present conditions of affairs if we are to take our correspondent's statements at their face value. True, he does not say this in so many words, he does not use the word mismanage, but could any milder term be used to describe a plant in which the superintendent deliberately slights the apprentice or workman who is trying to get ahead, in which the foreman goes out of his way to belittle the advantages of study and of correspondence schools, in which any suggestion which is made for the improvement of shop methods is deliberately ignored and even refused a moment's consideration, or if such suggestion should be acted upon the credit for it is filched by the foreman, and the workman making it derives no benefit whatever from it. Are these the conditions existing generally in the machine shops of Toronto? We should be sorry to have to think that such was the case.

Again, are there a large number of superintendents and foremen who are only able to retain their positions by appropriating the ideas of their workmen and passing them off as their own?

Is it a fact that in the majority of cases a workman has only to show a little unusual ability in the adoption and practice of the most up-to-date methods when the foreman at once looks upon him as a dangerous rival, and by making things generally uncomfortable forces him to quit his job? Can such a condition of affairs be general? H. H. J. claims it is "a true fact and can be proved up to the hilt."

The writer's own experience does not coincide with this statement. It would be foolish of course to contend that no foreman has ever attempted to discourage the enthusiastic workman under him or that every superintendent has always conscientiously investigated every suggestion made to him; there are backward and pigheaded foremen in the machine shop, as indeed there are in every line of business, but the writer's experience has been that they are the exception and not the rule. The majority of firms are only too anxious to welcome suggestions from their employees, and the suggestion box is a feature in the majority of shops. H. H. J. suggests that the untoward conditions he mentions may be remedied by the offer of cash prizes for any improvements in the speeding up of production. This is frequently done. Only last week in the mechanical department responsible for the production of this journal three prizes were awarded to employees for suggestions which would lead to improvement in shop methods. So anxious are some firms not to discourage suggestions from the least of their employees that they will take the trouble to treat seriously a suggestion of any kind, even if it be one that is obviously impossible of acceptance, explaining the reasons for its non-adoption and expressing a hope that future suggestions may be possible of acceptation.

A point to be guarded against by enthusiastic apprentices and young workmen is attaching too great an importance to their own ideas and failure to remember that the same idea may have occurred to others before them, and that experience may have shown that it was unworkable. The writer has made many suggestions in his time, but when he looks back and remembers how splendid they appeared to him at the time, but how weak and puny they proved to be upon investigation, he has to laugh at his own expense. Of course he felt aggrieved at the time that they were not acted upon and was inclined to harbor opinions regarding foremen, superintendents, managers, etc, similar to those of H. H. J., but now in his saner moments he realizes that certain factors entered into the subject of which he had then never dreamt.

On the other hand he can recall suggestions which, after due discussion and consideration were accepted and adopted. In such cases he received no extra remuneration, that is to say, directly, but his efforts broadened his ideas and enlarged the scope of his daily work which in due course brought him a better salary. True, once in a while a snag will be encountered in the shape of a grumpy, grouchy foreman, but this does not hold true, in the writer's opinion, at least, of the majority of the shops in Toronto or elsewhere.

The very fact, however, that such an opinion exists shows that the subject is well worthy of ventilation, and CANADIAN MACHINERY will welcome expressions of opinion on the subject from its readers on both sides of the question. If such ventilation should result in the dissipation of any such feelings as those expressed by our correspondent, such a discussion would not have been in vain.

THEN THE TROUBLE STARTED

Judge (to negro who had been beaten up by an Irishman): "What were you doing when the prisoner attacked you?"

Negro: "I weren't doin' nothin', yer honah."

Judge: "You must have been doing something or the prisoner would not have attacked you."

Negro: "I weren't doing nothin', yer honah. I were just going along de street singing."

Judge: "What were you singing?"

Negro: "Ireland must be heaven, for my mother came from there."

DEVELOPMENTS IN SHOP EQUIPMENT

SEMI-AUTOMATIC GRINDER ALL GEAR DRILL PRESS

The Woods Engineering Company, of Alliance, Ohio, have recently placed on the market a new machine known as a semi-automatic wide wheel grinder. Patents are pending on this machine.

Following is its general description:

The machine is semi-automatic in its movements, the operator being required to load and unload the work only.

The cross feed is accomplished by a rocking motion of the head and tail stocks. The head and tail stocks are movably mounted on a square shaft, the shaft having journals at the ends which operate in bronze bushed pedestal type bearings. Clamped to this shaft is an arm which carries the mechanism for making the diameter adjustments in grinding. This arm is shown at the right side of the machine in the cut, the 6 in. hand wheel standing in a convenient position for the operator. This being the only hand wheel, the manual labor in operating the machine is reduced to a minimum.

A shaft running through the housing parallel with the square shaft carries on the right hand end a cam that controls the movement of the arm connected to the square shaft and governs the movement of the work to the grinding wheel. This cam shaft has six speeds, ranging from three revolutions in one minute to one revolution in three minutes. One revolution of the cam makes a completed job.

In operating the machine this cam shaft is kept running continuously, which sets the pace for the operator, or if it is necessary the trip can be set to trip the feed at the completion of each job, or the feed can be tripped by the operator at any time during the revolution of the cam.

At the left hand end of the cam shaft is a cam that controls the clutch pulley driving the work. These two cams are timed with each other so that when the work moves up to the grinding wheel the clutch pulley is engaged and the work starts rotating just before the work comes in contact with the grinding wheel. When the grinding cycle is completed and the work moves away from the wheel it stops rotating and comes back to a position for reloading.

There are six speeds for the work obtained by a set of cone pulleys inside the base of the machine. The speed changes for both the work and cam shaft are changed by the handles projecting through the front of the machine as shown in the cut.

The grinding wheel is mounted on the spindle between the bearings and is driven by two 4 in. belts from a motor mounted on the base of the grinding wheel head. This head swivels on a central stud for grinding taper work. The grinding wheels are carried on wheel centres, and in changing wheels it is not necessary to break the adjustments of the spindle bearings or remove any pulleys, the wheel centres having a bore large enough to pass over all other parts on the spindle.

For truing the grinding wheel a frame is pivoted on the casting which forms the wheel guard. This frame carries a dovetail slide and a carriage with a cross-feed movement carries the diamond holder.

In truing the wheel the work centres are lowered by pulling back the hardened pin that bears on the cam, then the truing frame swings down to a positive stop that brings the diamond on the same plane as the work contact.

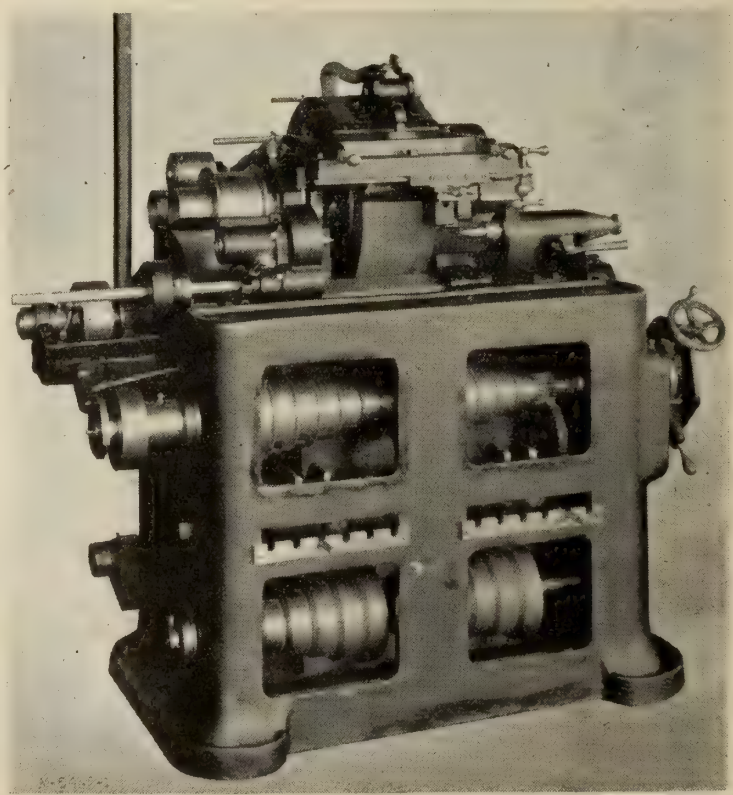
All working parts are designed to be protected from dust and grit.

The Bed

The bed is of complete box section strongly ribbed with a solid bottom. There are three pads that give a three-point bearing on floor or foundation, one pad being placed under the wheel spindle, the other two at the ends of the work carrier. The bed is divided into two sections, one of large size that forms the reservoir for grinding compound, the other containing the speed changes for cam feed and work speeds.

The Grinding Head

The grinding head is a massive casting having a base large enough to accommodate the driving motor. The motor shaft is extended on both sides, and the spindle drive is from pulleys on the ends of motor shaft, direct to the grinding spindle. Either a ten or fifteen horse-power motor is furnished as customer's work requires. Individual automatic belt tighteners running on roller bearings are provided for the spindle drive belts. The grinding head swivels on a large stud



FRONT VIEW OF GRINDER SHOWING CONE PULLEYS INSIDE MACHINE.

and has a sensitive adjustment for setting to grind taper work up to 2 in. taper per foot. The spindle is 3¾ in. diameter and is made of .70 carbon high chrome-nickel alloy steel, heat treated, and runs in bronze bearings tapering on the outside and adjustable.

The headstock is gear driven, the gears being well guarded. A shifting clutch is provided for starting and stopping the work at such times as is necessary. The dead centre is No. 4 Morse taper.

The tailstock has a quick-acting centre and the spring tension is adjusted by a knurled nut on the end of barrel. The tail centre has a No. 4 Morse taper.

The Diamond Wheel Truing Device

The diamond wheel truing device is built up of a swinging frame with a dovetail guiding surface and a sliding carriage that has a compound slide carrying the diamond. To true the wheel with a straight face, the upper dovetail of the compound slide is held rigid with binding bolts. This leaves the longitudinal and cross slides free for operating. When it is desired to true the wheel to a special shape for form grinding, the upper dovetail of the compound slide is released and a hardened steel form of the desired shape is inserted in position with finger bearing on the form in proper relation with the grinding wheel. The spring tension is adjusted, and by operating the longitudinal feed the wheel is trued to the shape of the form.

A large capacity centrifugal pump is provided that delivers an abundant supply of coolant to the work, and is always primed.

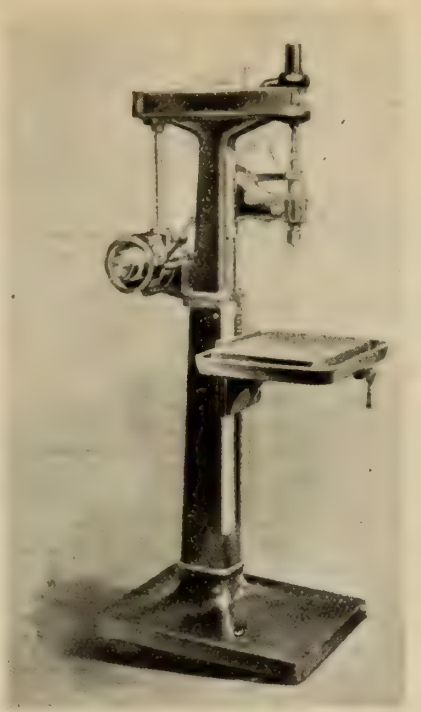
The machine is furnished complete with a ten or fifteen horsepower motor and mounter starter. all belting in place. diamond wheel truing device with diamond, one steady rest, one grinding wheel with wheel centre, job crane with hoist for removing wheel spindle and necessary wrenches.

ALL GEAR DRILL PRESS

The Danber-Kratsch Co., of Oshkosk, Wis., have recently placed on the market a new upright drill press, known as their "Wisconsin" 20-inch All Gear Driven Upright Drill Press.

The machine is shown in the accompanying illustration.

As will be seen from the cut, the old type of cone drive has been discarded and replaced by a geared head single pulley drive. This eliminates all shifting of belts to get the different speed changes required. The drive for the machine consists of four pair of semi-steel and rawhide gears. These gears are engaged or disengaged through friction clutches, by means of the single operating lever on the left-hand side of the machine. There are no sliding gears in the gear box, so that the speeds may be instantly changed from one to another, without shock or jar, by a single movement of the clutch lever, while the machine is running at full speed. The clutch gears in gear box are mounted on roller bearings, so that it is unnecessary to run gears in an oil



GENERAL VIEW OF THE DRILL PRESS.

bath. The end bearings of gear shafts are bronze bushed, and are lubricated from the outside by means of oil cups. The drive from gear box to spindle is through a pair of bevel gears.

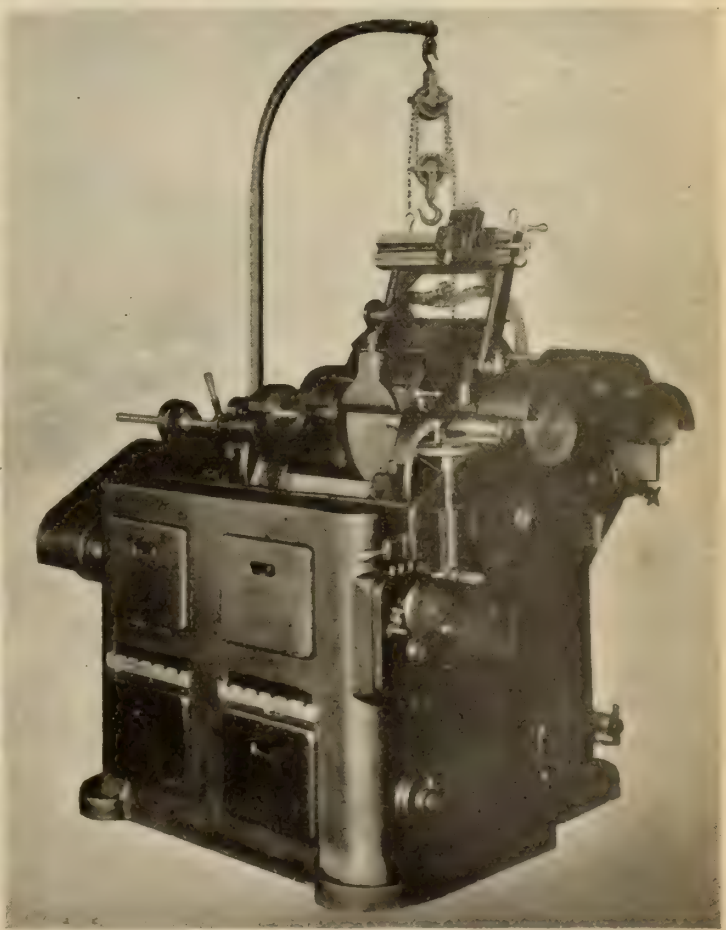
The column is reinforced by the straight back-strut, which supports the back end of the gear box, and also relieves the column of all bending stress induced by the pressure of the drill. The lower cylindrical end of the column is ground to carry the table support.

The base is made heavy enough to properly support the machine, and also provides space for any work to be drilled on it. Base has two Tee slots for bolting work to it.

The table support is made in the form of a box section. This is clamped on the column by a single clamping screw, operated by means of a hand lever. The table has four Tee slots. The centre hole in the table lines up exactly with the drill spindle, so that a boring bar may be used in spindle, if desired, for boring large holes. Table is clamped in its support by a conveniently-located hand lever. The elevating screw, for raising and lowering the table, is placed at the back of the machine, so that the table may be swung at right angles, entirely out of the way of the column on either side, for drilling work on the base.

Both table and base are provided with large oil trough for properly taking care of cutting lubricant. Balance weights for both spindle and sliding head are placed between column and back-strut, and run on guides, so that they are easily accessible. The machine is equipped with a sliding head and all geared power feed. Also has hand-wheel feed and a large pilot wheel for quick return of spindle or sensitive feed for small drills. The spindle is made of high-carbon steel, and has ball thrust bearing at its lower end. It has four changes of feed for each spindle speed. There are four spindle speeds on the machine shown. If desired, a two-speed friction counter-shaft may be furnished, this giving eight spindle speeds.

All gears used on the machine are properly covered to keep out dirt and to protect the operator. Machine may be equipped with tapping attachment, if desired.



GENERAL VIEW OF THE MACHINE

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Tariffs and Politics

WITH the growing strength of the Farmers' political party not only in Ontario, but in the Federal arena, this country is going to face the tariff proposition in a very acute form before many months have passed. Unfortunately there seems to be no alternative to making the tariff a party issue.

The tariff should be no more a party issue than the decision made by a council to pave the front street with asphalt rather than macadam.

The business of framing tariff laws is a complicated, scientific business, closely related to finances, industrials and the general living conditions of the people. No political party has yet existed in Canada or any other country that could take a view sufficiently broad-minded to adjust tariff conditions satisfactorily. Very often those who managed to crowd into the front trench on a tariff fight are the extremists, and the great mass in the moderate ranks have little chance to be heard.

We do not believe, with all due respect to the wisdom of the farmers, that they are capable of handling a tariff for the Dominion by themselves. We do not claim that any other class has the necessary knowledge. It needs men from many walks of life. Tariff revision should be a constant rather than a spasmodic study. Canada has a great and a growing industrial section. This section has no desire to dominate the situation, but it is of sufficient importance to be worthy of every consideration.

Do You Answer Letters?

WHY is it that some people do not answer letters? A manufacturer in an Ontario city wanted to secure a lot of information regarding the scale of wages paid to a certain trade, and the hours worked, in other centres. He took the very sensible course of writing a letter to each place explaining what he wanted to know, and why. He stated that his wage contract with his men was running out very shortly, and he wanted to gather information that would give him a line on the current rate of wages in other places.

Well, he sent out in all 126 letters to as many different firms. Along with the query went a stamped, addressed envelope to use for the reply. Out of the total 126 he got 24 replies.

Why? It's a hard matter to explain.

It takes very little brain power to take a man's letter asking for information and cast it into the waste paper basket. In fact it's no trick at all to do that. It requires hardly any more or less to take the letter and stick it in some pigeon hole and promptly forget about it.

The real trick is this: "Here's a man asking for information about a matter that interests me just as much as it does him. Wonder if I could give him a lift here and then some time in the future ask him for a copy of the information he secured.. My wage scale will be running out some day and it will be very handy to know what is being paid in the other centres in our line of business."

Unless you have some very good reason, do not neglect the answering of a letter asking for information. It is just the same as though a man came into your office and asked you a question, and your reply was to keep right on with your work without even recognizing that he was in the room.

Especially should this be made a hard and fast rule if your establishment is selling goods to customers at a distance. Trade commissioners from other countries, acting there on behalf of Canada, state plainly that Canadians, in many cases, are not careful to attend promptly to inquiries, and in this way a very poor impression is formed of the concern and its methods. All the foreign buyer knows of you is that he wrote a letter and it was either ignored or greatly delayed in answer.

A little work, a little care and determination in this regard makes a great business investment.

The Use of Molybdenum

EVERY now and then the daily press heralds some new and revolutionary discovery with a blaze of publicity, which dies down and disappears from sight, when exposed to the cold showers of investigation.

The latest flurry in this line is the announcement of a new steel, or in other words, of the use of a new alloy in the making of steel, which will eliminate all others for this purpose. From this distance, and with the meagre information at hand, it is impossible to say anything as to the reliability of these claims. This much can be said, however, that the alloy in question, molybdenum, is not new, neither is its use in the making of steel. The most commonly used alloys are nickel, chromium, tungsten, vanadium and manganese, and these are used in various quantities to produce qualities of hardness and toughness, making it specially suitable for armored plate. It does not crack when pierced by a projectile. Chromium is used in steel for making safes, and owing to the shock-resisting properties it gives to the steel, it is suitable for heavy crushing machinery. Vanadium gives more ductility, increasing the elastic limit, making it good for springs, axles, etc., subject to repeated stresses. Sometimes both chrome and vanadium are combined. Manganese in the right proportion, great ductility and hardness are obtained. Tungsten is mostly used in cutting tools, for high speed work. Molybdenum possesses the same qualities as tungsten, with the advantage of requiring less of the alloy to be used than when tungsten is employed. There have been difficulties of manufacture which have caused it to be less employed than the others. It is probably these difficulties which Prof. Arnold has overcome.

Baldwin's Ltd. to Add Open Hearth Equipment

A REPRESENTATIVE of CANADIAN MACHINERY has recently been given the opportunity of inspecting the construction work now under way at the plant of Messrs. Baldwin's Ltd., at Ashbridge's Ba, Toronto. This firm are using, as a nucleus for their Canadian plant, the site and building of the British Forgings, Ltd., purchased some few months ago from the Imperial Munitions Board, under which it was operated for the production of shell forgings during the war. And while the plant site serves admirably for the new development and while much of the equipment can be well utilized to advantage, much new equipment has to be built, and buildings erected for the making of the various steel products contemplated, viz., tin plate, black plate, terne plate, castings and forgings.

At the present time three new buildings, forming one unit of the plate mills, are in the course of erection. Each of these buildings will be 800 feet long and 80 feet wide. The first two will contain the furnaces and rolling mill equipment while the third will be used as a finishing plant containing the tinning and galvanizing equipment, together with that necessary for the making of terne plate. Pickling, annealing and cold rolling will also be done in this latter portion of the building.

Doing Rapid Work

At the present time about 500 men are employed around the plant, the major portion of them working on the foundation work now under way. This preliminary work is rapidly nearing completion and an enviable record for rapid construction has been made by the contractors, Roger Miller & Sons. The work was started in October and, when seen by the writer, the mill foundations were practically completed for the first unit and the footings for the building steel were all in place. The poor character of the ground, part of the filled in area at Ashbridge's Bay, has necessitated considerable piling and for the excavation for the mill foundations sheet piling has been necessary.

It is expected that the structural steel for the buildings will shortly be erected by the Canadian Allis-Chalmers Company who have the contract for its erection and fabrication.

In connection with the manufacture of the equipment which will be needed for the various activities of the firm, Mr. S. R. Cound, general manager, emphasized the fact that the major portion of it would be made in Canada and to their own plans and specifications. Only those portions of it which cannot be obtained with ease and promptness will be imported and of this the tinning and pickling equipment forms the major part.

Much of this equipment is being manufactured by Messrs. Baldwin's themselves, the various portions of the plant being admirably adapted to the purpose. The pattern machine shops and foundry are working on rolling mill equipment; screw pins and boxes for the roll housings, together with the housings themselves, are being machined at the present time, while patterns of all descriptions are ready, waiting their turn for casting as the work progresses. In fact there is no part of the plant which can be utilized standing idle. This all goes to show how quickly the management have turned everything available to the development of the new industry.

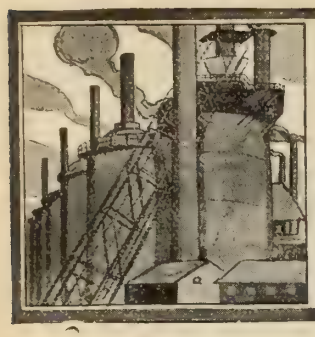
In connection with the making of sheet and tin plate, it is essential that the steel be of a certain quality. The securing of steel of the proper analysis and quality is one of the most difficult problems to be met with in the tin plate industry, and at the present time Messrs. Baldwin's Ltd., are working on the rolling mill and open hearth equipment necessary for the making of the bar stock for black plate and tin plate.

It is not anticipated that the present equipment of ten electric furnaces, each of six tons capacity and of the Heroult type, will be used for this purpose, owing to their higher cost of operation and open hearth furnaces will be laid down in consequence.

Seeing that the electric furnaces could not be used to advantage in the manufacture of plate, a new industry, for Toronto, has been created. It is purposed to utilize the electric furnaces in the making of steel castings to meet the requirements of the trade in Toronto and adjacent territory.

Foundry In Operation

The foundry during our visit was in full operation, about thirty to forty men were at work on the foundry floor. Steel castings for the rolling mill equipment were being made, one of them which had just been cast and which was being prepared for the machine shop, weighing six and one-half long tons. In the sand being prepared for the next cast was one of the heavy rolling mill standards which will weigh after machining in the neighborhood of 12 tons. In addition to meeting their own requirements, Messrs. Baldwin's are also handling custom work at the present time. Cast gears of accurate dimension and other intricate work has been cast. It is estimated that the foundry will be capable of turning out forty to sixty tons of steel castings per day when in full operation.



MARKET DEVELOPMENTS

Steel Shipments Not Over 65 per cent. Normal

Pittsburgh Does Not Look for Any Great Improvement Before March—Conditions Remain Much the Same as They Were During Period of the War—A Dull Scrap Market

IT is generally conceded that it will be March before there is any improvement in the steel situation, as far as the shipping of material to Canada is concerned, and it may be longer than that before shipments start to come through freely. The situation does not improve at this end, and at best it cannot be stated that firms having a very direct connection with the mills are getting anything better than 65 per cent. of their material across now.

The extent to which premiums are being paid can be gathered from the fact that plates, regarded for a long time as one of the weak spots in the market, have started to move and are now quite firmly established in the premium list in many places. Of course the premiums are paid for delivery, as it is still possible to book plate business at the 2.65 base price, but delivery will not be made until the third or fourth quarter in 1919. In such a case it often pays a firm well to go into the premium market and pay the higher prices for quick delivery.

War conditions are prevailing in the machine tool market. Deliveries seem to get a little more distant and uncertain each week. Canadians who have been in the machine tool centres of the States report that the firms there are hopelessly booked in many cases, and will not be able to improve their delivery schedule. Old Country dealers were counting on getting into the Canadian field, and shipments of machinery were to have been on the way by now. However, it may be some time before this can be done, as strikes and other problems have spoiled the plans of the makers.

One order that was placed this week included machinery that is not to be supplied until December of 1920, thus giving the dealers a splendid opportunity to give real service in such an order. This has long been a sore point with machinery houses, namely, that the Canadian manufacturer does not plan far enough ahead, and as a result every order he places is expected to be rushed through with delivery made at once.

Scrap markets are dull, with no changes made in quotations. There is a feeling that dealers and users will have to name higher figures in order to get those who are holding material to part with it.

HOLIDAY SEASON PUTS BRAKES ON THE BUSINESS IN MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, Dec. 25.—While every precaution is still exercised to conserve the available coal supply for industrial purposes, the situation is showing gradual improvement, and it is expected that before February the movement of coal will enable factories and railroads to resume normal activity. Fuel Controller Magrath has succeeded in having shipping restrictions removed, so that the movement of coal and coke from American points will be more regular from now on. This does not mean that every want of the consumer will be realized, as the regulating of distribution is still in the hands of the Government authorities, who retain the right to confiscate supplies for shipment to public utilities and essential industries, if this action is deemed necessary. Some little time must elapse before things are running smoothly, as previous seizures of coal will require adjusting, and the uncertain weather conditions are a factor affecting the situation. With the close of navigation, Montreal has taken on her usual winter appearance and harbor activities are reduced to making the final preparations for the closed season. The approaching holiday season has apparently been reflected in business, and a general disinterest that seems to pervade the trade at this season of the year. This condition is to be expected, we suppose, and indications point to a continuance of a rather listless market until the turn of the new year. There is still a steady demand for steel products, but dealers report difficulty in getting material through, although there is a steady progress toward improved conditions. Warehouse stocks are low and in some lines it is impossible to get any ahead, as consumers are waiting to take hold of material as soon as it arrives. This is especially noticeable in sheets and tubes of the usual sizes. Some odd sizes are still on hand. Dealers report a steady return to normal mill operations, but coal supplies are still of a conservative nature, and every care is still required in the use of coal. While the local market is operating at medium pressure, and producers are gradually resuming normal activity, there is a reluctance on the part of the latter to book future business. The opinion of dealers here appears to give assurance of the general report that early in the new year the tendency will be for a stronger market and probably advanced prices on those commodities in heavy demand. Local quotations are holding firm, and this firmness will likely continue over the quiet period.

Quiet Period Expected

Like other markets, the scrap situation is evidently controlled by an unseen influence, and as a result, dealers are undecided as to the early trend regarding prices. It is a fact that activity at present is confined to local movement and in small quantities, sufficient to cover immediate needs only. Dealers are looking forward to a quiet week and anticipate no change of importance until the first week of the new year. The only line that appears exceptionally

strong is that of machine cast, but dealers are satisfied to let the quotation of $24 stand as the nominal figure.

Delivery Still Poor

The feature of the machine tool situation is the improved demand that has arisen for used equipment, not that this is very heavy, but of sufficient volume to be of interest to the dealers. Generally this class of machinery can be secured in reasonable time, which is seldom the case with new tools, particularly when these are brought in from the States. There is a belief that higher prices will rule after the turn of the year.

BOOKING NEEDS A YEAR AHEAD NOW

Satisfactory Trade is Being Done in Machine Tools—Deliveries Do Not Improve

TORONTO.—"We are simply back where we were during the course of the war," stated one machine tool dealer to CANADIAN MACHINERY this week. "Then we had to go and explain to our customers why we could not get their orders filled. Now we have to do the same thing." This dealer has just returned from a survey of the American machine tool industry, and is of the opinion that production is not going to be any better from that source for some time. The shops are well filled with business; in fact, in some lines, they are booked for months to come, and offer nothing to the dealers here, even where delivery would be a great factor in the closing of a deal. Old Country lines that were expected to be on the market here before very long are in very little better shape. Strikes and delays have worked havoc with the turning out of machinery, and in this way there has been an additional delay in getting machinery ready for shipment to the trade in this country.

Dealers report a lot of business coming in for delivery during 1920. In one place, CANADIAN MACHINERY saw orders this morning running into some tall figures, and the last machine on the list was not to be delivered until 1920. "That is the way machinery should be planned for," remarked the dealer who had booked the business. "When we can get some of our larger manufacturers to grow up to the idea of looking and planning ahead, and estimating what additional equipment they are going to need, then we will be able to give them something pretty fair in the way of delivery."

The plant of the Motor Trucks, Ltd., at Brantford, is being cleared out at present to make room for a new line to be undertaken by a number of the same men who were interested in Motor Trucks in the first place. They are placing orders now for considerable equipment for the making of washing machines, etc.

Supplies Keep Up Well

The supply business keeps up well, considering the near approach of Christmas. Dealers had been anticipating a let-up at this season, but it has not occurred. Prices remain the same. From the dealers' point of view, there is a little improvement, if anything, in that there has been no price cutting for some days. The competition on high-speed and carbon cutters had been particularly keen for some time, and there had been a tendency to depart, to some extent, from 10 off the list, which has been the prevailing figure. Several dealers reported to-day that all the selling now on high-speed cutters was being done at 10 off the list, and nothing more.

The Importing of Steel

"Any improvement?' asked CANADIAN MACHINERY of a firm handling steel from U. S. mills.

"Nothing to mention," was the reply, "although there is a very nice tonnage coming through, but it is not over 65 per cent. of what it would be were delivery schedules keeping pace with the business that is coming in.

As noted before in these columns, the premium business is beginning to take root and grow. In fact, it seems that by the time the first robins have arrived in the spring the premium shrub will have grown into a real honest-to-goodness shade tree. It will amount to this: The man or firm in need of quick delivery will have to pay for it, and the man who can book and wait for some months can get his supply at present prices. The Steel Corporation will take on business now at the 2.65 price for plate, but delivery will not be made until third or fourth quarter in 1920. There are other places where delivery will be made more quickly, but the price will hop at once in proportion with the urgency of the sale and the ability to deliver the goods.

Some of the larger mills are booked for a year on bars and shapes, while the capacity is absorbed for six months or so on hoops and plate. Wire mill products are away behind delivery promises, and lapwelded pipe, in some cases, is sold out for full capacity for over a year.

Scrap Market Not Active

Prices the same, business slow, not looking for anything better until after the first of the year. That just about sizes up the scrap market this week. There seems to be a feeling in some quarters that higher prices are due to arrive for several lines before very long. Holders of any quantity of material feel that with the upward tendency of the steel and pig market, they should be caught up in the procesion. Hence they are unwilling to let go at present figures. The scrap market has a very close relation to the price of new metal. In fact, there are times, according to some of the dealers, when they can come within a cent a pound, or even half a cent of new metal, but such cases are unusual.

It looks as though it might be necessary to offer higher figures to bring out some of the material that is being held, as it is quite apparent that those who have it will not sell until such time as they get higher figures.

POINTS IN WEEK'S MARKETING NOTES

No improvement is reported in the steel tonnage coming across the line. At best shipments are not over 65 per cent. normal.

Many steel mills are booked for a year in bars and shapes. Wire products are hard to get through, and lap-welded pipe is sold out for a year in advance.

Scrap metal market is dull, and the opinion grows that prices must move to a higher figure in order to get those holding material to let it go.

Supplies and small tools are doing a brisk business. It is generally conceded that the shading of prices on high speed cutters has been stopped, and a uniform policy of 10 off list seems to be generally recognized.

One order placed by a Canadian firm this week included a machine, shipment of which was not expected until December of 1920.

Canadian dealers who have had occasion to visit the United States markets report that makers of machine tools are booked for months to come.

Several changes in representation in the Toronto field are being announced by the machine tool makers.

Pittsburgh reports do not look for capacity production of steel before March.

Baldwin's Limited, now operating and completing British Forgings plant, announce that they will add open hearths to their equipment.

Automobile business continues to do large buying in the United States, and the bringing out of new lines of medium-priced cars is announced.

Premiums are being paid on plate now. Plate, on account of the large finishing capacity at U. S. mills, was for some time looked upon as the weak point in the market.

MANY BUYERS IN NEW YORK MACHINE TOOL MARKET JUST NOW

Special to CANADIAN MACHINERY.

NEW YORK, Dec. 25, 1919.—Machine-tool business is keeping up at an amazing rate for this season of the year, and indications are that the holiday season will be minus the dulness that usually characterizes it. A significant feature of the buying in this market in the last two months or more, is that the largest manufacturing companies have been the most active buyers, indicating that these leaders of industry have confidence in the future prosperity of the United States, despite the disturbing international situation. While there are some conservative thinkers who believe that industrial expansion is proceeding too rapidly to be healthy, there is a large majority who view 1920 prospects with a great deal of optimism.

During the past week, the principal buyers have been the American Locomotive Co. and the American Car and Foundry Co., while, in a slightly lesser degree, the Mergenthaler Linotype Co., New York, and the Magor Car Corporation, Passaic, N.J., have been active. The American Locomotive Co. is buying for nearly all of its plants, including that at Montreal, while the American Car and Foundry Co. is buying principally for Chicago and Depew, N.Y. The Buffalo Steel Car Co., Buffalo, is in the market for several plate-working machines. Railroad car business shows improvement, even without buying by the roads of this country, foreign orders having come in at such a good rate that the Magor Car Corporation is sold up for more than a year ahead.

The automobile industry continues to command attention in the East as well as in the Detroit district. It is reported that the new Wills-Lee automobile plant at Port Huron, Mich., will be started soon, and work on a subsidiary plant near Sarnia, Ont., has already been begun. It has been disclosed within the past few days, that the Locomobile Co., of Bridgeport, Conn., and the Mercer Automobile Co., Trenton, N.J., have effected what is virtually a merger, and both of these plants are expected to enter the market soon for new equipment. The Locomobile Co. will put a light, medium-priced car on the market, and the Mercer Co. has re-designed its motor.

The Wright Aeronautical Corporation, New Brunswick, N.J., which last week issued an inquiry for about 200 tools, will build a new plant in New Jersey, and will manufacture Hispano-Suiza airplane motors and the Simplex automobile.

Alfred Herbert, Ltd., 54 Dey Street, New York, which now has a branch office in Toronto, has opened in England a second-hand machinery department, and is in the market for good used American tools of standard make, for shipment to England. The scarcity of machine tools in England, due to the strike of molders, is reflected in an improved demand here for tools to be shipped to that country, despite the unfavorable rate of exchange.

Commander Weston, of the British Navy, is in New York, and has issued inquiries for a large list of equipment to be bought for a naval air station in Greece. The Royal Naval Hellenic League of Greece is back of the project.

PLATE IS NOW INCLUDED IN THE PREMIUM LIST AT PITTSBURGH

Special to CANADIAN MACHINERY.

PITTSBURGH, Dec. 25.—The view the average steel producer expresses as to the future of production seems altogether too gloomy. The common talk of the steel producers is of their having small tonnage outputs and of their having constantly to turn away customers because they cannot produce the tonnages the customers desire to place. The last thing any of the producers would even dream of, apparently, is of mills running at capacity, as they always did before the United States entered the war when they had orders enough, and by the way it was not so very often that they did have orders enough. There were spells of the mills being filled up, but frequently they did not last long. For instance, the statement, startling at first glance, is absolutely true that between 1906 and 1916 there was not a solitary calendar year in which during part of the year at least the mills did not run slack for lack of orders. The disinterested observer, in other words the market reporter, confesses to a slight feeling of irritation, not because the mills talk as if operating at capacity were out of the question, but because they seem, if not to enjoy the situation, at least to be contented with it. One would assume that their philosophy is that the less producers can produce the more money they can make. At the same time there is universal complaint and criticism that the average workman is no longer willing to do a full day's work. What is the difference, really, in the mental attitude?

The steel mills and departments that were closed from lack of coal—no large proportion of the total at any time—have made a rapid resumption since the coal strike was ended. The Indianapolis settlement was Wednesday, December 10, and on the following Monday there were many resumptions. There was, moreover, a large number of openings of mills in the Wheeling district, mills that had been closed since the beginning of the iron and steel strike September 22. In this category, for instance, are the two pipe mills in Wheeling, of the Wheeling Steel & Iron Company and the Steel Corporation, also the La Belle and Laughlin tinplate works of the Steel Corporation. The resumptions were not in full, of course, but full operation ought not to be long delayed. By this date all the capacity that was thrown idle by coal shortage is in operation again. The resumption came quickly because many of the mills did not have to wait on freshly mined coal, after the settlement of the labor difficulty, there being large quantities of coal on track held by the railroads under instructions of the Fuel Administration and when it was seen that coal mining at the union mines was to be resumed at once the coal available was released. Much of this coal was at destination, as originally consigned, and merely had to be released. Some estimates are that of all the coal held by the railroads on November 1, consigned to consumers, about one-third remained on December 10, the date of the settlement.

Steel Scarce

The scarcity of steel grows from week to week, despite the fact that production has been increasing since October 1, or since just after the beginning of the strike. This is due, of course, to the exhaustion of stocks, and perhaps it is due in part also to fears of consumers that they will be short of steel in the early months of next year. There are no early deliveries, and practically no first quarter deliveries, except at premiums above the March 21 prices, the prices the Steel Corporation is rigidly adhering to, with a little company on the part of some of the large independents. Sellers at March 21 prices are dealing only with regular customers, not taking any orders from outsiders, and even at that they can only rarely promise any deliveries to begin as early as March.

The scarcest products are special grades of sheets, practically all pickled sheets, hot and cold rolled strips steel, wire nails, various descriptions of special wire including spring wire, and line pipe. There are no descriptions that are really plentiful. The situation as to scarcity is brought out by the fact that even in plates, expected to be a drug on the market on account of the great increase in capacity during the war, premiums are now the rule. A month or six weeks ago plates on attractive orders could be had at 2.50c, Pittsburgh, the March 21 price being 2.65c, but in the past ten days plates in larger than thousand ton lots have sold at 2.75c, and small lots might easily command still more. While very little car buying has been reported, the car shops are buying in a fair way, partly for repair work and partly against export orders for cars. In the circumstances, if plates are scarce no finished steel product can be plentiful.

Steel business in general has tapered off somewhat in the past few days and the usual holiday dullness will doubtless

obtain until the fore part of January. Whether the excited market conditions of the past few weeks will promptly reassert themselves, however, is a question. There are some elements in the general business situation that are not favorable, but seem to have received attention by only a few in the trade. The impression that the market is altogether one-sided and will easily take care of itself, has been, perhaps, too universal.

Pig Iron Advances

If the pig iron advance is over, it has stopped only now, for there have been advances to date. On fair-sized sales for extended delivery Bessemer has brought $36, valley, an advance of $1 over last quotations, while basic similarly has brought $35, valley, an advance of $2 over last quotations. Foundry iron remains at $38, valley, for prompt and first quarter, but there is a new development in that for second quarter alone foundry iron has brought $38, having previously sold, if at all for that delivery alone, at somewhat less. The pig iron advance now averages fully $11 a ton from the beginning of June, this $11 amounting to slightly over 40 per cent. on the basis of f.o.b. furnace prices,,, and slightly under 40 per cent. on the basis of delivered prices.

Coke is still very scarce. By-product coke production began increasing immediately after the coal mining settlement, but is only now at approximately normal. Week before last beehive oven production was subject to restrictions and the Connellsville and Lower Connellsville region produced 27 per cent. less than in the preceding week. Last week the ovens were entirely free of Fuel Administration restriction, but after Monday car supplies were restricted by reason of the heavy movement of coal and there was little if any increase in production. This week there is the holiday, always a restrictive influence, though probably this year not so much on account of the country being dry. The furnaces dependent on Connellsville coke had accumulated some stocks and few furnaces have had to bank, though a number are operating at reduced rates. Inquiry for foundry coke has been limited in the past week, indicating that foundries had accumulated stocks. Government price limits remain on coke, $6 for furnace and $7 for foundry at ovens, in the case of Connellsville.

EXTENSIONS MADE AT ROBB ENGINEERING

The Deputy Minister of the Naval Care of Increasing Business Joint Committee Plan

Considerable extension to premises is being made by the Robb Engineering Works of Amherst, N.S. The company is undertaking the manufacture on a somewhat larger scale, of the Baker-Robb Farm Tractor, which has been tested out thoroughly in the Northwest, and also in the Maritime Provinces, during the past two years. Extensions are also made in the line of water tube boilers. New equipment is being ordered to take care of the increasing business in these lines.

The Robb Co. has also in operation in its plant a joint committee of employees and management, with equal representation. Good results have been obtained in this way. and both sides are well pleased with the way the joint committee is working out.

BELGIUM IN NEED OF LOCOMOTIVES

Orders for Railway Cars May Also be Placed in This Country Soon

London, Eng.—Canada has been negotiating with Belgium for the relief of railway congestion in the latter country by the building of locomotives in Canada for Belgian railways. It is understood a contract will be placed with the Montreal Locomotive Works. So badly does Belgium need the rolling stocks that an order for one hundred locomotives was recently given to Armstrong-Whitworth Company, of Britain. The Canada Car and Foundry Company has also been negotiating for the supply of cars to Belgium, but it is not known whether the overtures have been successful. Canadian business men, who have visited Belgium, complain that Belgian firms will not do business direct with them but only through the medium of agents in London.

U.S. SCRAP METAL

The market is strong, with further advances being made. Scrap is being bought for export. Following are reports from U.S. points:—

NEW YORK.—There have been some heavy sales of heavy melting steel and steel car axles for export. Japan, England and China have been buyers. The scarcity of pig iron has resulted in a good demand for cast scrap for domestic purposes. Cast scrap is now $26 to $27 f.o.b. New York, and $28 to $29 for machinery cast.

PHILADELPHIA. — Heavy melting and turnings have weakened, the latter selling at $18 delivered. Re-rolling rails, forge and bundled sheets, shafting car wheels, and iron and steel axles are stronger.

BOSTON.—Some grades have dropped due to mills shutting down through shortage of coal. Prices of turnings have dropped $1. No. 1 machinery has sold at $36. Heavy cast scrap is $32. Steel armor plate was bid for at $30 per gross ton.

PITTSBURGH.—The demand for steel making scrap is not very heavy, but prices hold firm. Better business is expected at the beginning of the year. Some small lots of heavy melting steel have been bought at $24 to $24.50, but larger tonnages would probably realize $25.

BUFFALO.—There is a heavy demand for heavy melting steel, and $23.50 is easily obtained for this grade. Turnings and borings have also been active. Scrap shipments have been suspended till mills ascertain what their fuel supplies are likely to be.

CLEVELAND.—Shortage of cars and the uncertain fuel situation have made trading quiet, but dealers are not disposed to sell their stocks, except at enhanced prices. Heavy melting has realized $21.25 Cleveland. Steel rails, machine shop turnings, grate bars and stove plate have all advanced.

PIG IRON TRADE

Pig iron has reached the $40 mark in recent trading. The demand is still strong. A large quantity of off iron which appeared was soon absorbed.

Following are reports from various centres:—

PITTSBURGH.—The position of the pig iron market is very strong. Production last month was estimated to be nearly 100,000 tons short of demand. Foundry iron for 1920 first half has sold at $38 valley furnace, 1.75 to 2.25 silicon. Standard Bessemer has advanced $1.00.

BOSTON.—The end of the year has brought a decrease in the demand for pig iron. Demand for 1920 is good. Alabama iron is established at $36 furnace, for New England delivery, while Virginia iron is $38 furnace. Some sales for second half have been made for $40 furnace, for 2.25 to 2.75 silicon Eastern iron.

NEW YORK.—About 25,000 tons of iron which came on the market recently has been absorbed at prices below those for standard iron. There has been little selling of standard iron, makers not wishing to take further orders. $41 furnace for 1.75 to 2.25 silicon has been obtained, and $42 for the next grade.

PHILADELPHIA.—A number of furnaces are booked up for first half, and in some cases for several months after that. Virginia iron is selling at $38 furnace for 1.75 to 2.25 silicon, and $39.25 for 2.25 to 2.75 silicon. Malleable has sold for $38 Eastern Pennsylvania furnace for spot shipment.

BUFFALO.—There is a scarcity of iron for first half, and no first quarter is to be had. There is a strong inquiry for foundry iron, mostly in lots of from 300 to 500 tons.

CINCINNATI.—Demand is strong, but furnaces are not looking for business. They have plenty of business, and $40 for No. 2 second quarter Birmingham is a minimum price.

ST. LOUIS.—There is a strong demand, and there is not much iron available for 1920 delivery. Prices are strong. There have been a few sales for spot shipment, and small foundries are getting short of iron.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$33 00
Lake Superior, charcoal, Chicago	38 40
Standard low phos., Philadelphia	40 00-40 00
Bessemer, Pittsburgh	35 00
Basic, Valley furnace	30 00
Toronto price:—	
Silicon..2.25% to 2.75%	$37.00 to $40.00

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Steel bars, 2 in. to 4 in. base	5 50
Steel bars, 4 in. and larger base	6 00
Iron bars, base, Montreal	3 75
Steel bars, base, Montreal	3 75
Reinforcing bars, base	4 50
Steel hoops	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	8 00
Brand steel, No. 10 gauge, base	4 40
Chequered floor plate, 3-16 in.	7 50
Chequered floor plate, ¼ in.	7 00
Staybolt iron	8 00
Bessemer rails, heavy, at mill	....
Steel bars, Pittsburgh	2 35
Tank plates, Pittsburgh	2 65
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small sapes	4 25
F.O.B. Chicago Warehouse	
Steel bars	3 62
Structural shapes	3 72
Plates	3 90
Small shapes under 3"	3 62

FREIGHT RATES

Pittsburgh to Following Points	Per 100 Pounds. C.L.	L.C.L.
Montreal	33	45
St. John, N.B.	41½	55
Halifax	49	64½
Toronto	27	39
Guelph	27	39
London	27	39
Windsor	27	39
Winnipeg	89½	135

METALS

	Gross.	
Lake copper	$24 25	$24 00
Electro copper	24 00	24 00
Castings, copper	23 50	24 00
Tin	57 50	60 00
Spelter	10 00	10 75
Lead	8 25	8 75
Antimony	10 50	10 50
Aluminum	33 00	35 00

Prices per 100 lbs.

PLATES

	Montreal	Toronto
Plates, ½ up	$ 5 00	$ 5 00
Plates, 3-16 in.	5 25	5 25

Price List No. 38

WROUGHT PIPES

Standard Buttweld

⅛ in.	$ 6 00	$ 8 00
¼ in.	4 68	6 81
⅜ in.	4 68	6 81
½ in.	6 21	7 78
¾ in.	7 82	9 95
1 in.	11 56	14 71
1¼ in.	15 64	19 90
1½ in.	18 70	23 76
2 in.	25 16	32 01
2½ in.	40 37	51 19
3 in.	52 79	66 94
3½ in.	67 16	84 18
4 in.	79 57	99 74

Standard Lapweld

2 in.	38 81	35 34
2½ in.	42 12	52 36
3 in.	55 08	68 47
3½ in.	69 00	86 94
4 in.	81 75	103 00
4½ in.	93	1 18
5 in.	1 08	1 37
6 in.	1 40	1 78
7 in.	1 83	2 32
8L in.	1 93	2 44
8 in.	2 22	2 81
9 in.	2 66	3 36
10L in.	2 46	3 12
10 in.	3 17	4 02

Terms 2% 30 days, approved credit.

Freight equalized on Chatham, Guelph, Hamilton, London, Montreal, Toronto, Welland.

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4" and under, 60%.
4½" and larger 50%.
4" and under, running thread, 30%.
Standard couplings, 4" and under, 40%, 4½" and larger, 20%.

OLD MATERIAL

Dealers' Average Buying Prices.

	Per 100 Pounds. Montreal	Toronto
Copper, light	$14 00	13 75
Copper, crucible	17 00	17 00
Copper, heavy	17 00	17 00
Copper wire	17 00	17 00
No. 1 machine composition	15 25	16 00
New brass cuttings	11 00	10 75
Red brass cuttings	14 00	14 75
Yellow brass turnings	8 00	9 00
Light brass	6 25	7 00
Medium brass	7 25	7 75
Scrap zinc	6 00	6 00
Heavy lead	5 00	6 00
Tea lead	3 75	3 50
Aluminum	18 00	18 00
	Per Ton	Gross
Heavy melting steel	13 50	16 00
Boiler plate	13 50	11 00
Axles (wrought iron)	20 00	20 00
Rails (scrap)	14 50	16 00
Malleable scrap	18 00	20 00
No. 1 machine cast iron	24 00	25 00
Pipe, wrought	9 00	9 00
Car wheels	20 00	20 00
Steel axles	20 00	20 00
Mach. shop turnings	7 00	11 00
Stove plate	22 00	21 00
Cast boring	10 00	11 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, ⅜" and less	15
Carriage bolts, 7-16 and up	Net
Coach and lag screws	30
Stove bolts	50
Wrought washers	50
Elevator bolts	5
Machine bolts, 7-16 and over	10
Machine bolts, ⅜" and less	20
Blank bolts	25
Bolt ends	10
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	10
Machine screws, fl. and rd. hd., brass	net
Machine screws, o. and fil. hd., brass	net
Nuts, square blank	add $1.50
Nuts, square, tapped	add 1 75
Nuts, hex., blank	add 1 75
Nuts, hex., tapped	add 2 00
Copper rivets and burrs, list less	15
Burrs only, list plus	25
Iron rivets and burrs	40 and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	75
Wood screws, flat, bright	77½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent.
Set screws	40
Sq. and Hex. Head Cap Screws	35
Rd. and Fil. Head Cap Screws	5
Flat But. Hd. Cap Screws	10
Fin. and Semi-fin. nuts up to 1 in.	35
Fin. and Semi-fin. nuts, over 1 in., up to 1½ in.	25
Fin. and Semi-fin. nuts over 1½ in., up to 2 in.	10
Studs	15
Taper pins	40
Coupling bolts	Net
Planer head bolts, without fillet, list	10
Planer head bolts, with fillet, list plus 10 and	net
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	net
Collar screws	list plus 20, 30
Thumb screws	40
Thumb nuts	75
Patch bolts	add 20
Cold pressed nuts to 1½ in.	add $1 00
Cold pressed nuts over 1½ in.	add 2 00

BILLETS

	Per gross ton
Bessemer billets	$43 00
Open-hearth billets	43 00
O.H. sheet bars	46 00
Forging billets	56 00
Wire rods	55 00

Government prices.
F.O.B. Pittsburgh.

NAILS AND SPIKES

Wire nails	$4 95
Cut nails	5 00
Miscellaneous wire nails	60%
Spikes, ⅜ in. and larger	$7 50
Spikes, ¼ and 5-16 in.	8 00

ROPE AND PACKINGS

Drilling cables, Manila	0 39
Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 32
British Manila rope	0 26
New Zealand hemp	0 26
Transmission rope, Manila	0 43
Cotton rope, ¼-in. and up	0 80

POLISHED DRILL ROD

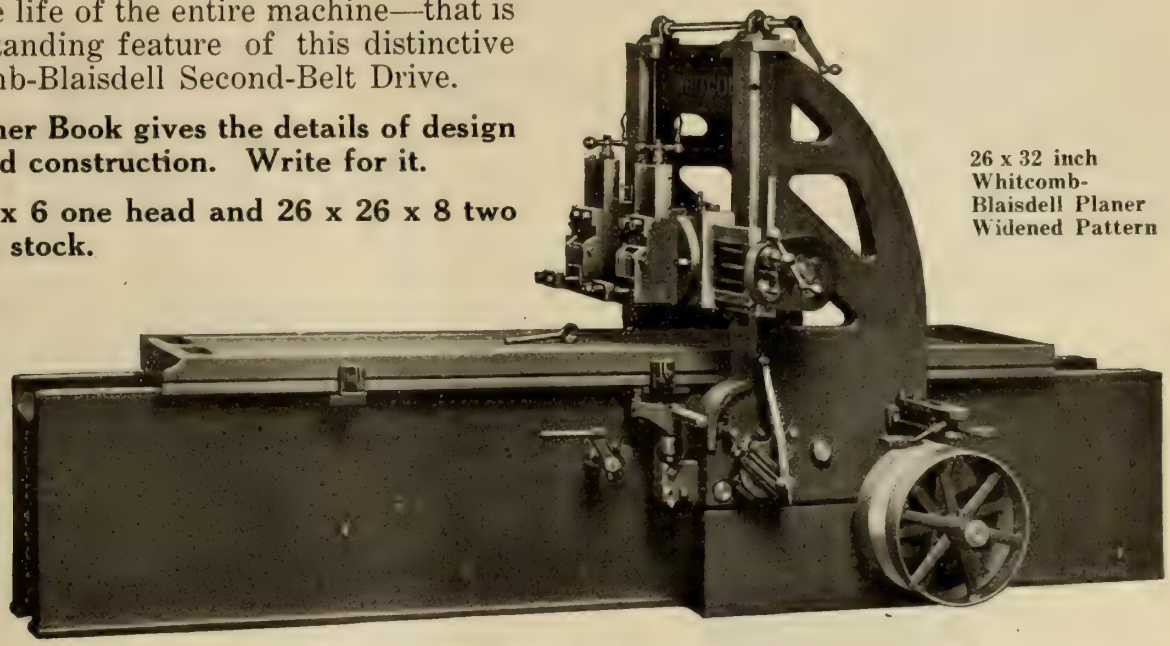
Discount off list, Montreal and Toronto: net

The Planer With the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine—that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

24 x 24 x 6 one head and 26 x 26 x 8 two heads in stock.



26 x 32 inch Whitcomb-Blaisdell Planer Widened Pattern

THE A. R. WILLIAMS MACHINERY CO., LIMITED

Halifax, St. John, Montreal, Winnipeg, Vancouver

64 W. Front St. TORONTO

Acid Electric STEEL CASTINGS

Acid Electric Steel Castings show superior ability to resist wear and crystallization. They are smooth in texture, free from Blow Holes, and machine perfectly. We specialize in

Railroad and Other High Grade Castings

up to 15 tons, any specification. Electric Steel Castings COST NO MORE than ordinary Steel Castings.

Prices on Application—Prompt Deliveries

The Thos. Davidson Mfg. Co., Limited

Steel Foundry Division, Lachine Canal

Head Office: 187 Delisle St. MONTREAL

Phone Victoria 1492

MORROW SCREWS MORROW

MORROWS

Whether you buy *Morrow* screws, nuts or twist drills, you *know* they are the very best that can be made anywhere. Then why not *insist* on *Morrow* make? (The jobbers will supply you, gladly). Every set and cap screw or nut (Plant No. 1), also every twist drill (Plant No. 3) is manufactured from material specially produced for the purpose. *Morrow* screws, nuts and drills may be higher in price but worth it because *you absolutely get more service.*

The Jobber Nearest You

deserves your support because he carries a stock of Morrow drills, screws and nuts for your convenience. *Ask him.*

Works at

Ingersoll - Canada

If you haven't used Ingersoll Files, you haven't used the best. *Get a sample from the jobbers and try it.*

DRILLS FILES

MORROW NUTS MORROW

If interested tear out this page and place with letters to be answered.

MISCELLANEOUS

Solder, strictly	$ 0 34
Solder, guaranteed	0 39
Babbitt metals	18 to 70
Soldering coppers, lb.	0 58
Lead wool, per lb.	0 14
Putty, 100-lb. drums	6 75
White lead, pure, cwt.	17 80
Red dry lead, 100-lb. kegs, per cwt.	15 50
Glue, English	0 35
Tarred slater's paper, roll	1 30
Gasoline, per gal., bulk	0 33
Benzine, per gal., bulk	0 32
Pure turpentine, single bbls., gal.	1 50
Linseed oil, raw, single bbls.	2 90
Linseed oil, boiled, single bbls.	2 92
Plaster Paris, per bbl.	4 50
Sandpaper, B. & A.	List plus 43
Emery cloth	List plus 37½
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 07
Rosin "G," per lb.	0 08
Borax crystal and granular	0 14
Wood alcohol, per gallon	2 00
Whiting, plain, per 100 lbs.	2 50

CARBON DRILLS AND REAMERS

S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	40-10-5
Standard drills, all sizes	40-10-5
3-fluted drills, plus	10
Jobbers' and letter sizes	40-10-5
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	net
Drills and countersinks	5% off
Bridge reamers	50
Centre reamers	10
Chucking reamers	net
Hand reamers	10
High speed drills, list plus 20 to	40
Canadian high speed cutters, net to 10 off	
American	plus 40

COLD ROLLED SHAFTING

At mill	list plus 5%
At warehouse	list plus 25%

Discounts off new list. Warehouse price at Montreal and Toronto

IRON PIPE FITTINGS

Malleable fittings, class A, 20% on list; class B and C, net list. Cast iron fittings, 15% off list. Malleable bushings, 25 and 7½%; cast bushings, 25%; unions, 45%; plugs, 20% off list. Net prices malleable fittings; class B black, 24½c lb.; class C black, 15¾c lb.; galvanized, class B, 34c lb.; class C, 24½c lb. F.O.B. Toronto.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 55	$ 6 75
Sheets, black, No. 10	6 00	6 00
Canada plates, dull, 52 sheets	8 50	7 10
Can. plates, all bright.	8 50	8 00
Apollo brand, 10¾ oz. galvanized	....	....
Queen's Head, 28 B.W.G.	....	....
Fleur-de-Lis, 28 B.W.G.	....	....
Gorbal's Best, No. 28	....	....
Colborne Crown, No. 28.	....	....
Premier, No. 28 U.S.	....	8 20
Premier, 10¾ oz.	....	8 50
Zinc sheets	20 00	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13.00; 5-16, $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13.00; 5-16 in., $11.00; ⅜ in., $10.00; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClelland, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES.

Size.	Seamless	Lapwelded
1 in.	$27 00	$.....
1¼ in.	29 00	.....
1½ in.	30 00	26 50
1¾ in.	32 00	26 50
2 in.	31 00	26 00
2¼ in.	35 00	28 00
2½ in.	43 00	32 00
3 in.	48 00	40 00
3½ in.	.....	41 00
3½ in.	60 00	42 00
4 in.	75 00	56 00

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS.

Castor oil, per lb.	
Royalite, per gal., bulk	24½
Palacine	24½
Machine oil, per gal.	36
Black oil, per gal.	15
Cylinder oil, Capital	58
Cylinder oil, Acme	45
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	$2 60
Union thread cutting oil, antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil, bbls. net	8

BELTING—No 1 OAK TANNED

Extra heavy, single and double	30%
Standard	30, 10%
Cut leather lacing, No. 1	2 20
Leather in sides	1 75

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	4 00
Polishing wheels, bull-neck	2 25
Emery in kegs, American	06
Pumice, ground	06
Emery glue	35
Tripoli composition	09
Crocus composition	12
Emery composition	10
Rouge, silver	50
Rouge, powder, nickel	45

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	.08½
Grits, 80 and finer	.6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	0 34
Brass sheets, 24 gauge and heavier, base	$0 42
Brass tubing, seamless	0 46
Copper tubing, seamless	0 48

WASTE

XXX Extra	19½	Atlas	17
Peerless	19	X Empire	15½
Grand	18	Ideal	16
Superior	18	X Press	14
X L C R	17		

Colored

Lion	15	Popular	12
Standard	13½	Keen	10½
No. 1	13½		

Wool Packing

Arrow	25	Anvil	15
Axle	20	Anchor	11

Washed Wipers

Select White	11	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard ... 10% Best grades ... 15%

ANODES

Nickel	.58 to .65
Copper	.38 to .45
Tin	.70 to .70
Zinc	.18 to .18

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$42 50	$43 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	46 00	44 00
Copper sheet, tinned, 14x60, 14 oz.	48 00	48 00
Copper sheet, planished, 16 oz. base	46 00	45 00
Braziers', in sheets, 6 x 4 base	45 00	44 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 75	$11 50
Sheets, 3½ lbs. sq. ft.	10 50	11 00
Sheets, 4 to 6 lbs. sq. ft.	10 25	10 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

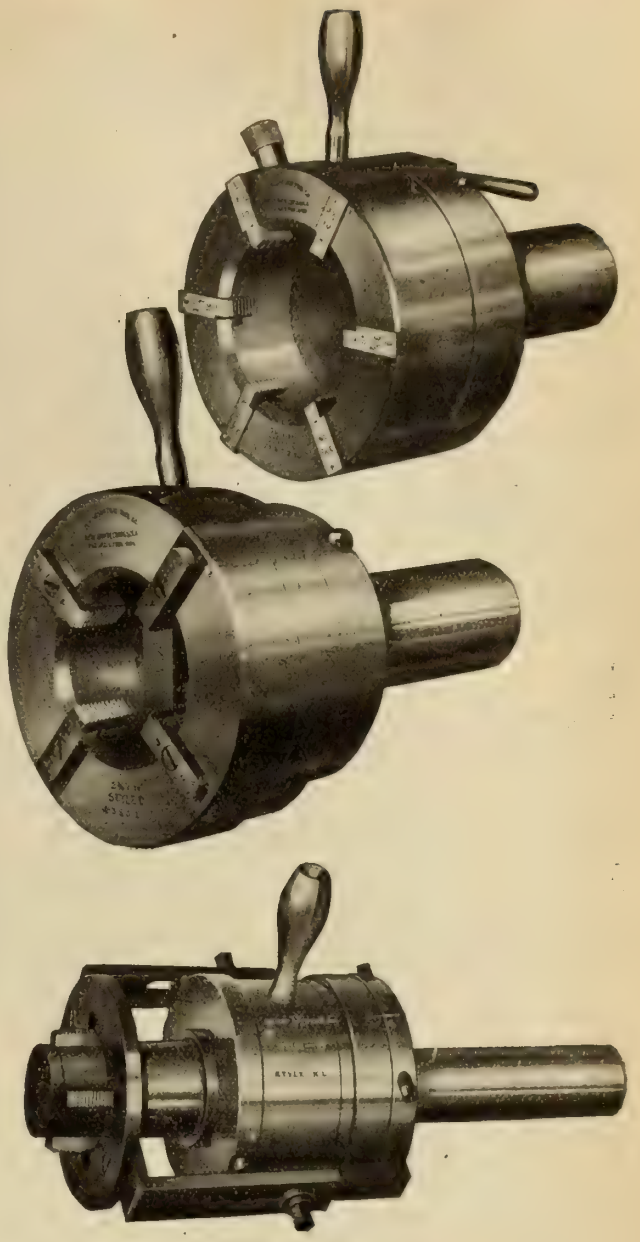
Acid, boracic	$ .25
Acid, yhdrochloric	.04
Acid, nitric	.10
Acid, sulphuric	.04
Ammonia, aqua	.13
Ammonium, carbonate	.20
Ammonium, chloride	.22
Ammonium hydrosulpuret	.50
Ammonium sulphate	.30
Arsenic, white	.14
Copper, carbonate, annhy	.41
Copper, sulphate	.16
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulpate	.16
Nickel carbonate	.32
Nickel sulpate	.18½
Potassium carbonate	.50
Potassium sulphide (substitute)	.42
Silver chloride (per oz.)	1.25
Silver nitrate (per oz.)	1.20
Sodium bisulphate	.18
Sodium carbonate crystals	.06
Sodium cyanide, 127-130%	.38
Sodium hyposulphite per 100 lbs	8.00
Sodium phosphate	.18
Tin chloride	1.75
Zinc chloride, C.P.	.30
Xinc sulphate	.08

Prices per lb. unless otherwise stated

A GOOD BOON

"Geometric Tools are a good boon in our business. Always reliable and sure of turning out a class job; in fact, I don't know how we could secure a decent output without them."

This is what the Works Inspector of a London (England) shop says. He adds that they are making screw and small parts for air craft, and have quite a lot of Geometric Dies in constant use.



Because of the fact that Geometric threading tools are "a good boon" in the thread cutting business, the majority of screw machines and turret lathes are equipped with Geometrics.

THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN.

Canadian Agents:

Williams & Wilson, Ltd., Montreal
The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.
Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta

For any thread, any size, any pitch — there's a Geometric Collapsing Tap or Self-Opening Die Head. Be assured there is one to meet your particular threading need — whatever it may be. Ask us.

If interested tear out this page and place with letters to be answered.

The Week's Events in Montreal Industry

Geo. Bernard, formerly sales manager of the A. Bernard Industrial Company, of Fortierville, Que., has been elected a director of the company and promoted to the position of general manager, retaining charge of the sales department. M. A. Bernard, formerly general manager, has been elected president.

Continuing to recognize the undersupply of bituminous coal for the full operation of nominal railroad service, officials of the Canadian roads have stated that with few exceptions the curtailment of trains and other activities, requiring coal a fuel, will be effective for some time yet. The duration of this period will depend on the severity of the winter and the time required to return the coal supply to normal.

The Engineering Institute of Canada has made full arrangements for a Dominion-wide convention to be held in the city of Montreal on January 27-29. During the meeting several important papers will be read and discussed; a number of federal and provincial officials will likewise be present, some of whom will give addresses on the activities, past, present and future, of their respective departments, principally in relation to engineering work. The convention will be held in either the Ritz Carlton or the Windsor Hotels.

With the sailing of the Canadian Government steamer "Canadian Planter," from the Canadian Vickers yard on December 12, the commercial closing of the Port of Montreal became effective. The official termination of harbor operations, as far as ocean activities are concerned, took place a few day earlier when the Elder-Dempster freighter "Bassa" sailed for South Africa. This vessel had to undergo light repairs after being stuck on the mud bank for over a week, during which period she had to be lightened of a large portion of her cargo.

For several months past the city of Montreal has been experimenting with the use of fuel oil at the Low-Level Pumping Station. Three boilers have been equipped with oil-burning apparatus, but it has been found necessary to revert back to coal firing on two of these, the other remaining as an oil unit, while further tests are being made. So far, the oil method has not proved successful, and the city has assured itself of constant water service by laying in a full supply of coal for winter requirements. A year's supply for this station is in the neighborhood of 56,000 tons.

At a recent meeting of the Montreal Chambre of Commerce, Lieut.-Col. Hercule Barre, newly-appointed Canadian Commissioner to Paris, emphasized the importance of Canada's commercial representation in many parts of the world, portending a new era of development and prosperity for Canadian trade. He remarked on the lack of definite information that the Department of Commerce at Ottawa had in respect to Quebec industries and commercial activities, adding that he did not blame the Government so much as the business men of the province in not giving to the department the necessary information.

Recognizing that direct steamship connections between Canada and the British West Indies is one of the chief necessities for the development of export trade, the Montreal Board of Trade, at a recent meeting, unanimously decided to consider the question of confederation of the islands with the Dominion. While expressing satisfaction with the great improvement made in steamship service by the vessels of the National Marine Service, the members felt that even the present efficient service is entirely inadequate to the existing and early future requirements, both as to freight and passenger traffic. A committee of prominent Montreal business men are leaving on a business trip to the West Indies, and they have been authorized to take up the question of closer political relations with the Chamber of Commerce in the islands.

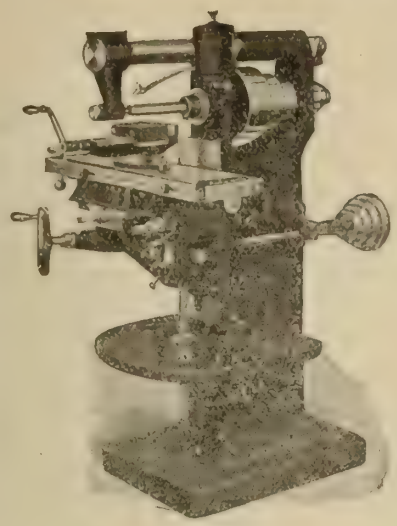
A tribute of the Canadian Marine Department, and to the Montreal Harbor Commissioners in particular, was recently given by Capt. Griffiths, of the C.P.O.S. liner "Scandinavian," when that vessel docked on her last inward voyage of the season. "I have been on this route for the past twenty-two years," he said, "and the thing that struck me most as we came up the gulf and the river was the difference between present conditions and those prevailing when I started on the service. Then it was impossible to come up the river at night at all, and the Port of Montreal was a very medieval concern. On our present trip we were able to proceed at full speed from the entrance to the Gulf, day and night, until we slowed down to swing into the berth, everything along the way being lighted up, so that we had not the slightest difficulty, not only for the light in the channel but the sighting lights on the shore, and when we got into port the arrangements were as perfect as any commanding officer could desire. Whoever may be responsible for it, the Port of Montreal to-day is about as fine a port and harbor as exists in the world, and its accommodation for vessels coming in are wonderfully good."

The increasing trade that is constantly developing between Canada and overseas' countries has resulted in the Government taking greater interest in th facilities of the ocean terminals that will be called upon to take care of this expanding traffic. There is every possibility that the port of St. John, N.B., will be slated for extensive improvements and additions in the very near future as Government representatives recognize the importance of this nerve centre of the inter-Continental trade system. Speaking on this subject recently, A. P. Barnhill, K.C., one of the directors of the C.N.R., said: "The important matter now for the city of St. John is not so much the railroad service as terminal facilities for ocean business. The railroad service is here but we still lack facilities for increasing ocean business that will soon come here. In answer to my representations that St. John is entitled to consideration in the allotment of steamers equal to that given to any other port, the fear has been expressed that there will be congestion at this port. That is, the facilities are not adequate for the steamships which are scheduled to arrive here. It is apparent that these facilities must be greatly increased at once to take care of the business of the immediate future."

The revival of the project to deepen the St. Lawrence for the passage of ocean vessels is again to the fore, and the possibility has created considerable adverse feeling among New York and American shipping men. The statement of J. S. Duthrie, of the MacDonald Lumber Company, who has been a consistent supporter of the St. Lawrence Canal scheme, emphasizes the advantages of such an undertaking, and says in part: "Ocean vessels will be unloading in the ports even of Lake Superior within ten years. The only thing that will delay it is the fact that the Government has taken over the G.T.R. and tied up the finances of the country for the time being, but that will soon be past. The people of New York see the real facts of the case." S. A. Thompson, the secretary of the Convention of National Rivers and Harbors Congress, expresses the mind of the Eastern section of the States in the following remarks: "Like all the rest of us, the people of New York and the Eastern States want all the business they can get, and because they think, with good reason, that a thirty-foot channel down the St. Lawrence could not only benefit Montreal, but take a great amount of business away from New York, they are violently opposed to the United States Government taking any part in the project."

Voting on By-Law.—Goderich votes on Jan. 5 in regard to granting concessions to the Dominion Road Machinery Co. Exemption from all but school taxes is being asked.

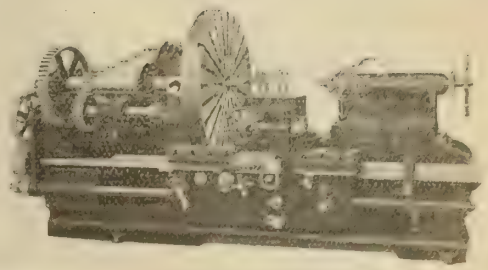
MACHINE TOOLS



New or Used

We have an excellent list of new and used machine tools in our Toronto warehouses and on order for early shipment.

YOU are undoubtedly from time to time buying new equipment.
YOU will profit by giving us an opportunity of quoting you.



Garlock-Walker Machinery Company, Limited

32 Front St. West, Toronto

MONTREAL - - WINNIPEG

"Everything in Woodworking and Metalworking Machinery"

ADMIRALTY DECIDES TO OPEN UP FOR BUSINESS WITH THE FIRMS HERE

"Canadian Export Pioneer":—In reply to "The Pioneer's" enquiry regarding the admission of Canadian competition for Government store contracts, which was the subject of correspondence with various Departments, published in our October issue, we have received the following communication from the Admiralty:

"Sir,—In reply to your letter of the 10th inst., addressed to the Secretary of the Admiralty, on the subject of the eligibility of Canadian firms to contract for the supply of stores required by the Naval Service, you are informed that it is the policy of the Admiralty to place as large a proportion of orders as possible for supplies obtained from abroad with the Colonies.

"During the war the resources of the Dominion were utilized to a great extent in the work of shipbuilding and the provision of munitions of war, and amongst the many commodities drawn from that source may be mentioned the following:

Timber, salmon, cheese, jam, carbide, crude asbestos, aluminium powder, ferro-silicon, underclothing and hosiery.

"It will be realized that the placing of orders in the Dominion involves the following considerations:

(a) Longer time for delivery.

(b) Increased price owing to cost of freight.

(c) Difficulties connected with the inspection of goods, and correspondence and conveyance necessitated by rejections in this country.

"In regard to the latter consideration it would, of course, be of great assistance if the Canadian suppliers had agents in this country, and this is usually required.

"With reference to the last paragraph of your letter, it would be inconvenient at the present time to prepare a detailed list, but the enclosed copy of a pamphlet drawn up prior to the war may be of interest, and furnish you with some idea of the variety of supplies required for the Naval Service.—I am, etc.,

(Signed) "C. A. OLIVER,
"For Director of Contracts.

"Admiralty, London, S.W., October 24."

Hints to Applicants

Very careful enquiry is made by the Admiralty as to the position, capability, and responsibility of manufacturers unknown to the Department before an order is entrusted to them, and the punctual and efficient performance of a first contract by a firm is an essential condition of their receiving further orders. Applications from firms seeking admission to the Admiralty's list of tenderers are dealt with solely on the merits of each case. Such applications should be addressed to the Director of Navy Contracts, Admiralty, London, S.W., and should state the class of work for which it is desired to tender; particulars should at the same time be furnished of the situation and capacity of applicants' works, and references should be given to a bank, and to firms who can testify to the quality of the firms' manufactures and to their capability for undertaking contracts.

Before a firm is admitted to the list an undertaking is required that "Fair Wages" conditions, as provided in Resolutions of the House of Commons, will be duly observed in the execution of any orders entrusted to them.

"Bring me two fried eggs, some ham, coffee and rolls," said a man to the dining car waiter.

His companion said: "Bring me the same—wait a moment—just eliminate the eggs."

In a moment the waiter returned and confidentially remarked: "We had a bad accident jest afo' we left de depot, boss, an' de 'liminator done got busted off, right at de handle. Will you take yo 'eggs fried same as dis hyar gemman?"

REGISTERED U S PAT OFFICE NOS 50932-61349 CANADIAN PAT OFFICE NO 44

"HAWK VANADIUM" TOOL STEEL

Remarkable in its glass Hardness, Toughness and Cutting Efficiency.

Will give twice the cut of a regular tool steel at one grinding.

Order "Hawk Vanadium" for your End Mills and cutters. Once known—always used.

Large Stock. Prompt Shipment.

Write for full particulars to

Hawkridge Brothers Company

Main Office and Warehouse:
303 Congress Street, Boston, Mass
Storehouses Malden Mass.

STEEL
OF EVERY DESCRIPTION
SEND US YOUR ENQUIRIES.

Oil Tempered Steel Springs

—for every purpose and the best for each use.

Special styles of all kinds to order.

THE CLEVELAND WIRE SPRING COMPANY
Cleveland, Ohio
U.S.A.

BOLTS AND RIVETS

We are equipped to fill the requirements of the Marine trade promptly. Square head, hexagon head and all kinds of Machine, Deck, Carriage Bolts and Rivets.

QUALITY PRODUCTS

LONDON BOLT & HINGE WORKS
LONDON, CANADA

BOOKS

on all branches of Engineering and every conceivable subject. Second-hand at half prices. New at lowest prices. State wants and send for Catalogue No. 23, post free.

WE HAVE THE BOOKS YOU WANT
Books Bought. Best Prices Given.
W. & G. FOYLE, Ltd.
121-125, Charing Cross Road, London, England.

Special Machinery
MADE TO ORDER

Mill Machinery, Engine Work
Grey Iron and Brass Castings

TRY US FOR GENERAL REPAIRS

ALEXANDER FLECK, LIMITED
(Vulcan Iron Works) OTTAWA, ONT.

BLACK DIAMOND OVENS

OVENS

Japanning and Varnishing Ovens heated by Gas, Electricity, Steam or Coal. Kernchen Siphonage Ventilators, Bakers' Ovens, trucks, casters, etc. Write for Booklet.

Brantford Oven & Rack Co., Ltd.
Brantford, Canada.

BLACK DIAMOND OVENS

MACHINE TOOLS for Shipbuilders & Iron & Steel Works

BERTRAMS LIMITED
SCIENNES EDINBURGH

TRADE GOSSIP

Restrictions Removed.—The local restrictions on soft coal have now been removed. As soon as Mr. Harrington, the Ontario Fuel Commissioner, was notified of the removal of the embargo by the United States authorities, he made the announcement rescinding the order issued by him during the strike.

The Department of the Naval Service will receive tenders up till January 2 for the construction of three first-class single screw tugs. The approximate dimensions are: Length b.p., 75 feet; breadth, moulded, 17 feet 6 ins.; depth, moulded, 9 feet; to be delivered at Stanley or Kingsville, Ont. Full specifications and particulars can be obtained from the Department, Ottawa.

Anxious to Get Back.—There are a large number of aliens arriving in Montreal from the West daily. They are coming in anticipation of the declaration of peace, which will enable them to get back to their homes in Europe. The Registrar of Aliens is receiving as many as 500 reports daily. They will very likely have to remain in Montreal all the winter, owing to lack of transportation facilities.

First Tin Ingots.—The first tin ingots from the electrical smelter of Brantford were on exhibition in the city, the first actual results of the enterprise which promises to develop into a very big concern in that city. The ingots from the ore, the latter brought all the way from Bolivia, were 97.7 per cent. pure tin, and there is every reason to believe that the operations will prove successful on a large scale. The furnaces installed have a capacity of two and a half tons per day, which will take some little time to reach when production has been developed in the way planned.

Molybdenite in Ontario.—There are several mines operating in Ontario recovering molybdenite ore. The International Molybdenum Company operated the Moran mine in Brougham Township, and also operate a concentrator at Renfrew and a smelter at Orillia. The Renfrew Molybdenum Mines have a property at Renfrew, which produced about 60,000 lbs. for the year. The Wilberforce Molybdenite Company, Ltd., has a property in the township of Cardiff. The Steel Alloys Company have a mine at Brougham. The Molybdenum Products Company, Ltd., has a mine at Monmouth, Haliburton County. W. E. Joiner & Co. have a mine near Wilberforce, in the township of Cardiff, and another about 15 miles south-east of Wilberforce.

PERSONAL

Hugh A. Chisholm has been appointed Canadian Trade Commissioner to Cuba, and his address will be 501 and 502 Antigua, Casa de Corres, Tenient Rey 11, Havana, Cuba. He is at present

calling on the Canadian trade, finding out makers or dealers who may be interested in making a Cuban trade connection.

MARINE

Victoria.—Premier Oliver of British Columbia, after hearing the representations of a delegation of returned men, wired to Hon. Dr. S. F. Tolmie, Federal Minister of Agriculture, urging that the Government place orders for wooden ships in B. C. and proceed with other public works.

Cobourg. — One of the coal ferries plying between Cobourg and Charlotte was damaged at the latter port, and was unable to make the trip across. Mr. Harrington, Provincial Fuel Commissioner, said that arrangements would have to be made to ship the coal to Toronto by way of Black Rock.

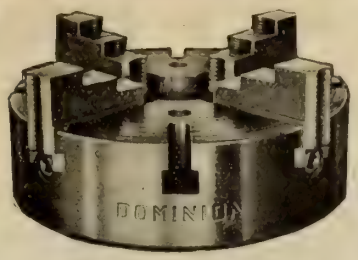
Goderich. — The steamers Martian, Midland King, Osler, and Hagarty, have been diverted to Goderich to unload and lay up for the winter. All other Georgian Bay and Lake Erie ports are frozen up. A good many boats have already arrived and discharged their grain cargoes at Goderich, and moored for the winter, so there will be plenty of room for the late arrivals.

Port Arthur.—The steamer Glenlyon of the Great Lakes Transportation Company arrived at Port Arthur later in the season than any steamer has ever arrived from the East. She was five days making the trip from the Soo, keeping the north shore close aboard and being in touch with Port Arthur by wireless during the whole run. The temperature varied from zero to 35 below, the result being the deck cargo is frozen solid and will have to be dug out.

Quebec.—A seizure has been filed on the Canadian Government steamer Canadian Trapper by the Tidewaters Shipbuilding Company of Three Rivers. The respondent in the case is the Davie Shipbuilding Company of Quebec, who have not yet delivered the vessel to her owners. The action arises out of a claim for $180,000 for machinery and other work performed by the Tidewater Company.

Cheboygan, Mich.—The fishing tug Rideout was sunk through the ice cutting through her planking. and her cargo is a complete loss. The dummy light at the entrance to the river is now out of operation, and the keeper, Charles Luoisignan, who has been marooned. has come ashore. Martin's Reef lightship came in for coal, and afterwards left for Spectacle Reef and Poe Reef to bring the crews and lightships ashore.

Toronto.—The Harbor Commissioners have approved the expenditure of $4,000,000 on the harbor wall of Toronto. The bonds have been guaranteed by the city. Improvements for next year include an amusement centre between Sunnyside and the Humber, the commencement of the sea wall east of



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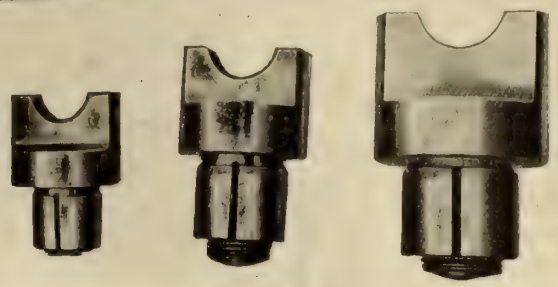

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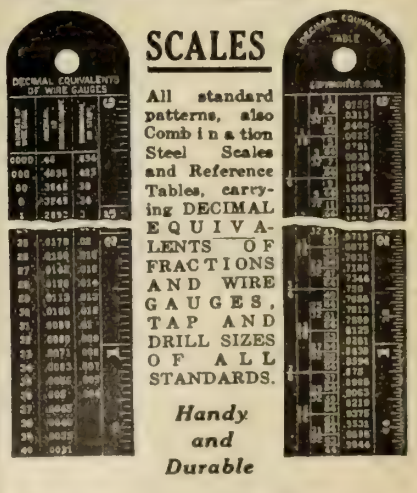

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Bathurst street. and the reclamation of more land on the western lake front. A large warehouse will be erected at the foot of York street.

TENDERS

The deputy minister of the Naval Service, Ottawa, is receiving tenders up to January 2, 1920, for the construction of three first-class single screw tugs of approximately the following leading dimensions, namely: Length between perpendiculars, 75 ft. 0 in.; breadth moulded, 17 ft. 6 in.; depth moulded, 9 ft. 0 in.; to be delivered at Port Stanley or Kingsville, Ont.

BOOK REVIEW

Machine Tool Operation, Part I, the Lathe, Bench Work and Work at the Forge. By Henry D. Burghardt. The McGraw-Hill Book Company, New York, Price $2.00.

The purpose of this text is to assist those who desire to get a knowledge of the principles and elementary operations of machine shop work. It is in no sense a treatise, nor is it a production manual. It is primarily designed to be used in connection with class talks or demonstrations in the school shop, although it may be used to supplement the information which a boy in a commercial shop may acquire by observation, practice, or other means. The author's aim, as stated in his preface, has been to adopt this text for use in vocational, industrial, technical and trade schools and in apprenticeship courses where training in shop practice is given.

Contents: The machinist's trade; lathe construction and manipulation; cutting tools and cutting speeds; the scale, caliper, snap gauge and micrometer; centering; facing; turning in a lathe; chucking work; tapers and angles; threads and thread cutting; face plate work; hammers, screwdrivers, wrenches, hacksaws; laying-out; chipping; filing; scraping; work at the forge.

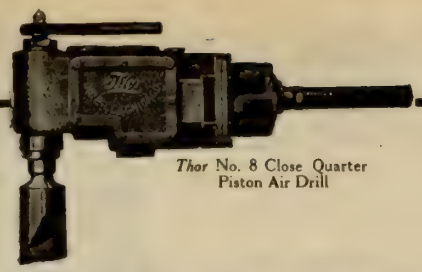
THE BARK TEST

Two sailors at a dog show were gazing at a valuable Skye terrior, which had so much hair that it looked more like a woollen mat than a dog.

"Which end is 'is 'ead, Tom?" asked one.

"Blowed if I know," was the reply, "but 'ere, I'll stick a pin in him, and you look which end barks!"—Blighty (London).

Voting in Dunnville.—On January 5 the people of Dunnville vote on the question of granting a fixed assessment of $10,000 for ten years to the Canadian Engines, Ltd. The company agrees to pay out $40,000 annually in wages.



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POSITION WANTED BY A FIRST-CLASS mechanic with a large experience in making gauges, dies, jigs and fixtures for small work, and small tools; can take charge of department. Know how to handle screws; have been working in some of the best shops in the U.S. Is an inventor, also improver and designer. Aged 50 years; good health; steady worker. In answering please mention the class of work and mention the highest wages, with all particulars. A position wanted for his son, also a first-class mechanic. Apply during the week of November 15th. L.E.J., 38 Glenelg Street W., Lindsay, Ont. (c26m)

MACHINERY WANTED

IMMEDIATELY — ONE PHOTO-STAT MACHine. Must be in perfect working order. Send photo and full description of make and prices. T. McAvity & Sons, Ltd., Box 700, St. John, N.B. (c26m)

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DOUBLE AND PUNCHING MACHINE, 31" gaps, capacity 1" through 1"; planing and moulding machine 12" x 4", makers, Robinson; 7½ B.H.P. variable speed motor, 220 volts D.C.; vertical drilling machine, 2½" dia. spindle, circular swing table; 6" S.S. & S.C. lathe, straight bed, makers, Lang & Son; planing machine, capacity 30 ft. x 20 ft. x 10 ft., motor driven; planing machine, capacity 20 ft. x 10 ft. x 10 ft., belt driven, makers, Shanks & Co.; planing machine, capacity 20 ft. x 9 ft. x 9 ft., motor driven, Vickers drive; planing machine, capacity 12 ft. x 4 ft. x 4 ft., belt driven, makers, Noble & Lund; 20 ft. plate edge planer, open ends, belt driven; plate edge planer, 21 ft., belt driven; 30 ft. set plate bending rolls, forged steel rolls, will bend plates up to 1¼" thick; 14 ft. set plate bending rolls, bending plates up to ⅝" thick, belt driven; 10 ft. set mast rolls, top rolls withdrawn, belt driven; 20-ton loco. steam crane, gauge 10' 9", motors Jessop, Leicester; surface condensing plate, 2,750 square feet cooling surface, motor driven; air and circulating pumps. Apply.

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2—No. 87 Bliss Crank Presses, double back geared	16	27	250
2—No. 60½ Bliss Rack and Pinion Drawing Presses	60	21	100
10—No. 60½ Bliss Rack and Pinion Drawing Presses	42	21	100
1—No. 857 Toledo Rack and Pinion Drawing Press	48	25	100
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1—No. 1 American Surface Grinder.
1—No. 74 La Salle Surface Grinder.
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2—No. 4 " "	9″ Vertical	
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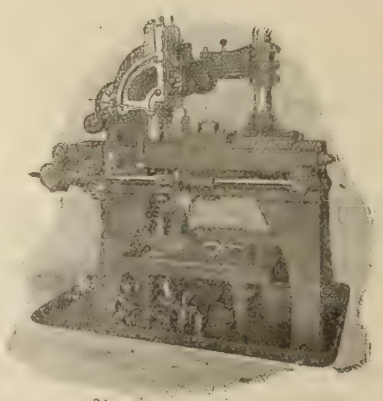
"MADE IN CANADA"

"Type D"

Electric Travelling Cranes, Hand Cranes, Electric Hoists, Air Hoists, Foundry Equipment. Cupolas, Ladles, etc., etc.

NORTHERN CRANE WORKS LIMITED
WALKERVILLE, ONTARIO



The Whiton
AUTOMATIC
Gear Cutting Machine

Do you want Catalog?
The D. E. Whiton Machine Co.
NEW LONDON, - CONN.

PARTIAL LIST OF TOOLS

Lathes

13″ x 5′6″ Carroll-Jamieson new.
14″ x 6′ Sidney new D. B. G. Q. C.
16″ x 8′ Sidney new D. B. G. Q. C.
16″ x 10′ Carroll-Jamieson, new Q. C. Swing 18″.
17″ x 8″ Sidney new swing 19″ D. B. G. Q. C.
19″ x 8′ Sidney new swing 21″ D. B. G. Q. C.
19″ x 12′ Sidney new swing 21″ D. B. G. Q. C.
21″ x 8′ LeBlond used D. B. G. Q. C.
20″ x 8′ Whitmore & Blaisdell D. B. G. Q. C.
24/48″ x 16 Rahn Larmon Gap.
26″ x 12′ Bridgeford D. B. G. Q. C.
36″ x 16′ New Haven T. B. G. Q. C.
42″ x 38′ Heavy Duty Roughing Lathe.

Presses

No. 138 Max Ams Inclinable.
No. 64 new Consolidated.
No. 78½ Bliss Twin Drive, Triple Gear.

Planers

18″ x 18″ x 36″ Wheeler, one head.
26″ x 26″ x 8′ Pond.
30″ x 30″ x 10′ Powell, one head.
31″ x 23″ x 68″ Smith, two head.
36″ x 36″ x 8′ Gray, two head.
36″ x 36″ x 10′ Cincinnati, two head.
36″ x 36″ x 13′ Rockford, four head.
36″ x 36″ x 16′ Flather, two head.
36″ x 36″ x 16′ Hewes & Phillips, one head.
40″ x 40″ x 10′ Powell, two head.

Shapers

7″ Rhoades, new.
14″ Steptoe, new.
16″ Smith & Mills, new.
24″ Smith & Mills, new.

Millers

No. 0 Steptoe, hand.
No. 6 Pratt & Whitney.
No. 1½ Bilton, new.
No. 1½ Valley City, new.
No. 1½ American, new.
No. 4 Brown & Sharpe.
No. 2 Van Norman Duplex.
No. 2 Cincinnati Plain.
No. 3-A Garvin Universal.
No. 22 Garvin Vertical Rotary Table.

Radial Drills

42″ Canedy Otto.
30″ Dreses cone type.
48″ Dreses gear box type.
72″ Western full universal.

Drills

20″ new Champion B. G. P. F.
24″ Superior B. G. P. F.
25″ Superior Sliding Head.
28″ " "
32″ " "
36″ " "

The above is only a partial list of our machinery in stock. Write for our complete list which has been just issued.

FRANK TOOMEY INC.
27 North Third Street PHILADELPHIA, PA.

International

SPECIALISTS
in
Railway, Marine and Industrial Supplies

Duntley Dayton Pneumatic Tools.
Daniel's P.P.P. Packing.
Ebonite Packing.
Pump Valves.
International High Pressure Sheet Packing.
International Red Rubber Packing.
Plastic Metallic Packing for Piston Rods and Valve Stems.
Paxton & Mitchell Locomotive Rod Packing.
Rapid Hose Coupler, for all Hose Connections.

Write or Wire Your Requirements

International Machinery and Supply Company, Limited
421 St. James St., Montreal

Forgings

The sale by the Dominion Forge & Stamping Company, Limited, of their Stamping Plants, means that the energies of the Company will be concentrated on their forging business.

Extensions to this plant are now being made which will greatly increase its capacity; and the plant will continue to be one of the largest and best equipped drop forge plants anywhere.

Quotations are made to customers' specifications and your enquiries are solicited.

The
Dominion Forge & Stamping Co., Ltd.
WALKERVILLE

Toronto Office: 206 Excelsior Life Bldg.

If interested tear out this page and place with letters to be answered.

Your Christmas Will be Merrier

if you have that nice secure feeling which comes to those who, having confided their bearing troubles to us, are now using

MANUFACTURED BY

HOYT METAL COMPANY

MONTREAL TORONTO WINNIPEG

WILKINSON & KOMPASS

TORONTO HAMILTON WINNIPEG

IRON AND STEEL

HEAVY HARDWARE

Mill Supplies Automobile Accessories

WE SHIP PROMPTLY

WE CARRY

High Speed Reamers, Cutters and Drills

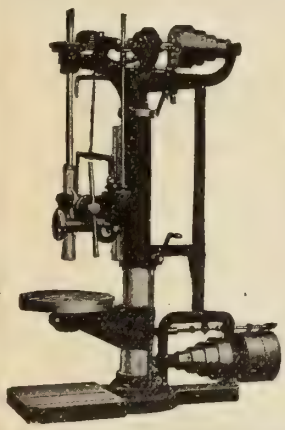
IN STOCK HERE

Prompt Service

The J. A. M. Taylor Tool Co.

Machine Shop Supplies

318 Stair Building Toronto



6 Positive Geared Feeds

instantly obtained, are but one of many advantages provided

SILVER DRILLS

For 64 years these upright Drilling Machines have served well in the States and Canada.

Write for full description of our 20" and 25" sizes.

The Silver Manufacturing Co.

290 Broadway Salem, Ohio

Reg. U.S. Pat. Office

METALWOOD MANUFACTURING CO. DETROIT

Hydraulic and Hydro-Pneumatic Machinery

Exclusive Sales Representatives:

Canadian Fairbanks-Morse Co., Ltd., Montreal and Toronto; R. E. Ellis Engineering Co., 621 Washington Blvd., Chicago; Fairbanks-Morse & Co., Inc., 30 Church St., New York City; Sherritt & Stoer Co., Inc., Finance Bldg., Philadelphia, Pa.

CUT GEARS

Theoretically Correct

PROMPT SERVICE

ROBERT GARDNER & SON

LIMITED

52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

WHEN THINKING
OF BELTING
KEEP IN MIND THAT

The back of the Ox

is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

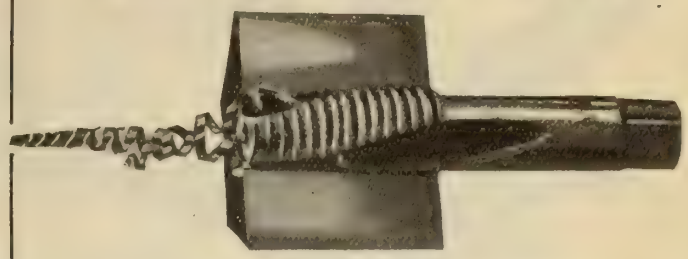
Tullis
LEATHER BELTING
COLUMBIA BRAND

is made entirely from this portion of the hide.

SEND FOR OUR ILLUSTRATED CATALOGUE

JOHN TULLIS & SON, LTD.
BELTING SPECIALISTS
ST. ANN'S WORKS, GLASGOW, SCOTLAND
Established 1834
Canadian Agents:
UNIVERSAL SUPPLIES Limited
Room 25, 204 St. James Street
MONTREAL

THE "SEMPLE" TAP



(Patent Applied For)

A SCIENTIFICALLY CORRECT
CUTTING TOOL
makes tapping a pleasure

The Most MODERN,
The Most EFFICIENT,
The Most ECONOMICAL.

Send for a "SEMPLE" Sample Tap. Made in any thread
Special Taps for blind holes.

ROBERT SEMPLE
Manufacturing and Consulting Engineers
179, West George St., GLASGOW, Scotland
Telephone: Central 9980 & 9981. Telegrams: "Moderate, Glasgow."
WORKS—166, Dumbarton Road, Partick, Glasgow.
Telephone: Western 2950.
BIRMINGHAM: County Buildings, 147, Corporation Street.
Telephone: 3780 Central.
79, Royal Avenue, BELFAST. VLADIVOSTOK, Siberia.
LONDON: 2, King Street, S.W. 1. Telephone: 3801 Gerrard.

A Little Act of Courtesy That is Good Business

BY simply mentioning CANADIAN MACHINERY when writing to our advertisers you will be doing something which will prove of three-fold benefit.

First—It will benefit you because it enables the advertiser to immediately associate your enquiry with the product advertised, resulting frequently in quicker service.

Second—It will benefit the advertiser because it enables him to identify and classify enquiries and to give credit where credit is due.

Third—It will benefit **your** paper because in the records of the advertiser it will receive the credit for your enquiry, instead, perhaps, of some less deserving medium.

We are always grateful for favors of this kind. It costs the reader nothing, and yet as we said before, it is of three-fold benefit.

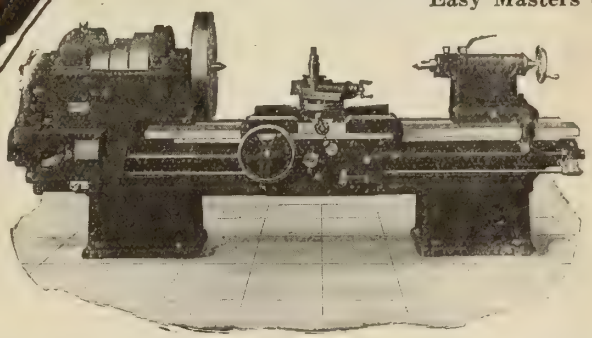
If interested tear out this page and place with letters to be answered.

SIDNEY

Heavy Duty Lathes

The 25-inch Heavy Duty Quick Change Sidney shown below is the last word in lathe construction. Every possible improvement will be found in this late model. Bed lengths available are 10, 12, 14, 16, 18 and 20 feet. Also built with a 27-inch swing.

Easy Masters of Big Jobs



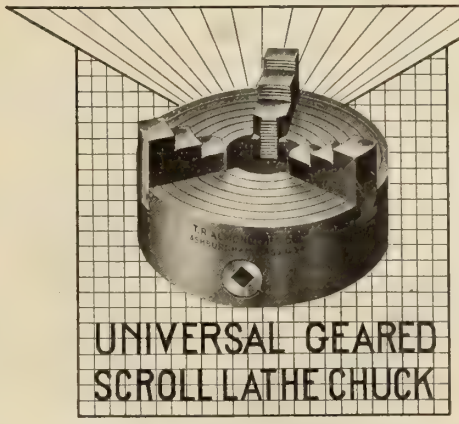
Regardless of the severity of work, dependence put on Sidney Lathes has never been misplaced. The Sidney line has made good—with a vengeance. New Bulletin just issued on 25-inch machine. Write to-day!

The Sidney Tool Company
SIDNEY, OHIO

CANADIAN AGENTS:
Yeates Machinery & Supply Co., Montreal, Que.
H. W. Petrie, Limited, Toronto, Ontario.

FOR SERVICE

ALMOND



The body is a one-piece casting which eliminates parts and chattering when under heavy cutting pressure. The jaws are made of special alloy steel and hardened through making them stronger than the usual case hardened jaws. Two styles jaws—No. 1 Common Jaws, No. 2 Reverse Jaws.

OTHER ALMOND PRODUCTS

Drill Chucks, Right Angle Transmission Micrometer Calipers, Flexible Steel Tubing.

T. R. ALMOND Mfg., Co.
Ashburnam, Mass.

H & G

Die Head Cuts
Perfect Threads

The H. & G. Die Head illustrated is only 3⅝" outside diameter, yet it will cut from the smallest up to 1" standard thread and up to 1⅛" fine threads. For absolute proof of its ability to stand up and give good results, see the perfect threads it cuts on nickel steel. You can see these many places, but in almost any automobile or areoplane plant for certainty.

Made in 9/16", 1", 1½" and 2" sizes.

No stronger, more durable, more accurate Die Head was ever made.

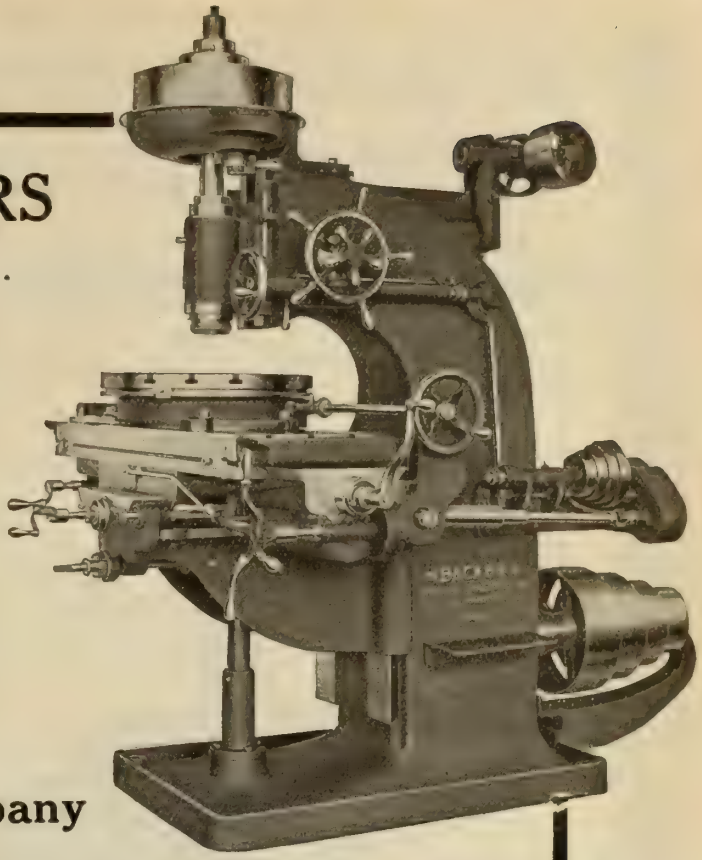
Ask for Catalog

Eastern Machine Screw Corp.
New Haven - Conn.

on Nickel Steel

If interested tear out this page and place with letters to be answered.

BECKER BELT-DRIVEN MILLERS



for

GREATER PRODUCTION because they work continuously—every hour of operation is a production hour—

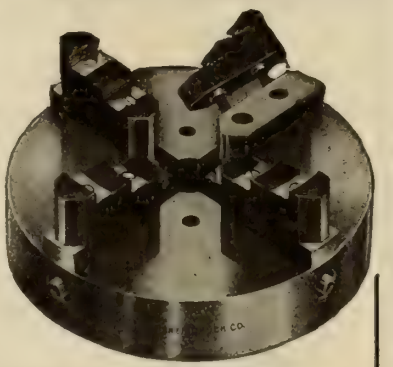
ECONOMY OF OPERATION because they are power savers; the internal belt drive forms an elastic drive to the spindle that prolongs the life of the cutter by eliminating chatter and vibration.

ACCURACY because the machines have exceptionally fine feeds and are equipped with micrometer dials and stop gauges. The Patent Becker Gibbing keeps the work permanently aligned with the spindle.

Becker Milling Machine Company
HYDE PARK, BOSTON, MASS.

A. R. WILLIAMS MACHINERY COMPANY, LIMITED - 64 FRONT STREET WEST, TORONTO
RUDEL-BELNAP MACHINERY COMPANY, LIMITED - 137 McGILL STREET, MONTREAL

SKINNER CHUCKS



Over 30 years of satisfactory service have placed these chucks where they belong—

On many of America's best machine tools—

In many of the better metal working plants of the world—

In the highest esteem of thousands of operators.

If you use chucks, investigate the Skinner line. It will pay you.

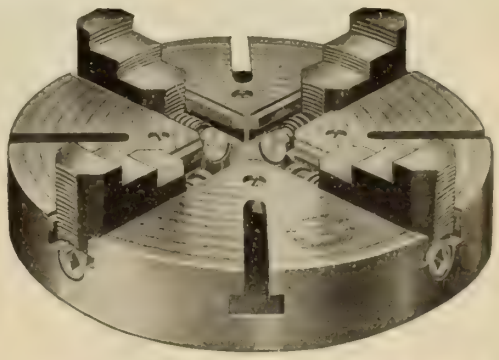
The Skinner Chuck Company
New Britain, Conn.

N. Y. Office: 94 Reade St.
San Francisco Office: Rialto Building
London Office: 139 Queen Victoria St., London, E.C. 4

ALL STEEL

INDEPENDENT CHUCKS

are not an experiment—they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY
New Britain, Conn.

New York Office: 26 Cortlandt Street

Makers of a complete line of chucks

If interested tear out this page and place with letters to be answered.

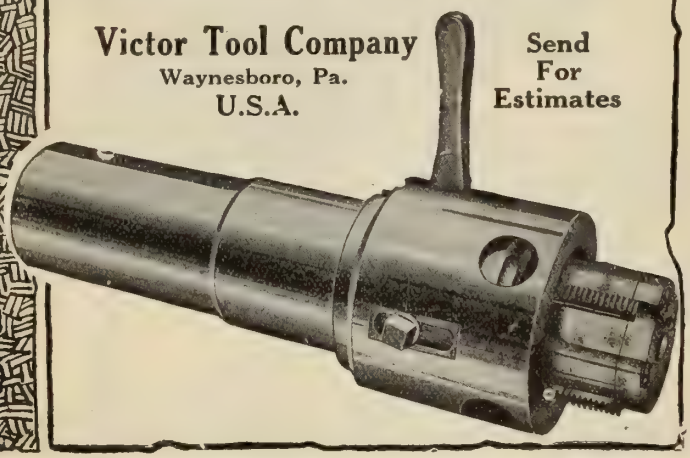
We wanted something original— this is what we got

"BOTH in these operations and half another — I'll show you later — completed in the time our old taps took to do one; that, I guess, is why we continue to use your Victor Collapsible Taps."

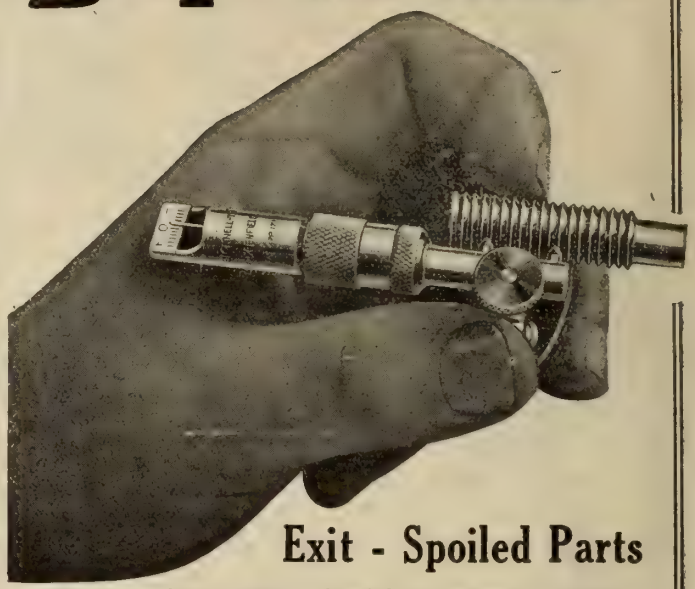
It was the often-heard story of time saved, of costs lowered, of all threads clean and smooth. And it was pleasant to hear.

Victor Tool Company
Waynesboro, Pa.
U.S.A.

Send For Estimates



B-T THREAD LEAD INDICATOR



Exit - Spoiled Parts

Did you ever have to scrap a threaded part because of incorrect measurement in lead? Were you ever forced, during a rush job, to thread a part over again, because it didn't fit as it should?

B-T THREAD INDICATORS

enable you to get the right thread lead instantly and maintain a constant check upon it. They will detect errors of one thousandth of an inch—can be used for testing odd and even pitches, as well as internal and external threads. **Send for our Booklet.**

BICKNELL-THOMAS CO., Springfield, Mass.
Canadian Representatives: The James Burbley Co., St. Nicholas Bldg., Montreal P.Q.

Cushman's Booklet

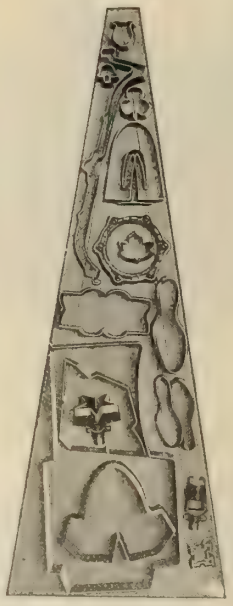
of Essential Chucks

Now Being Issued

COPIES GLADLY MAILED ON REQUEST

THE CUSHMAN CHUCK CO. HARTFORD, CONN. U.S.A.

Quality Cutting Dies
or all Purposes



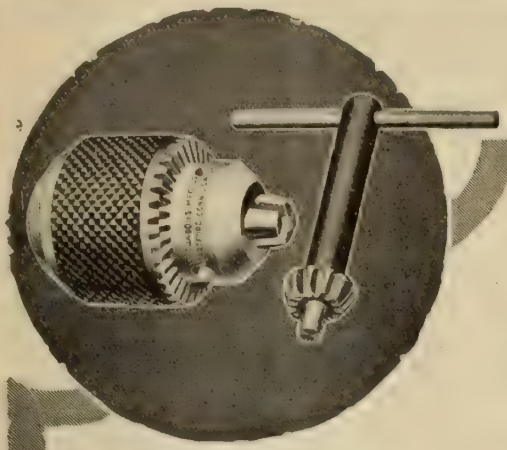
Our experience extends over three-score years in this class of work.

We are completely equipped to handle any kind of CUTTING DIE work. We furnish Dies for Envelopes, Labels, Lithographs and Advertising Novelties, Boxes, Wrappers, Gaskets, Paper Napkins, Drinking Cups, etc.

Send in your patterns—we will gladly quote you.

The Hoggson & Pettis Mfg. Co.
New Haven, Connecticut, U.S.A.

Sold by Geo. F. Foss Machinery & Supply Co., Ltd.
305 St. James Street, Montreal



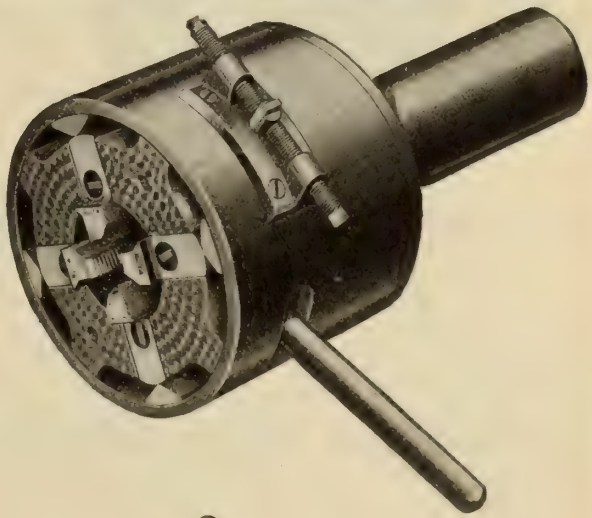
The Mechanic Knows

The workman expects Jacobs as the drill chuck on his machine. He knows it does not break drills, that the toothed sleeve and key make adjusting easy and safe.

Are your machines Jacobs equipped?

THE JACOBS MFG. CO. HARTFORD, CONNECTICUT, U.S.A.

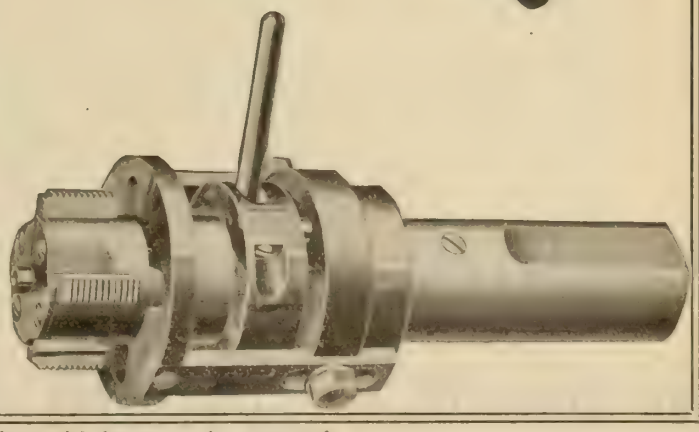
NAMCO DIES TAPS



It doesn't make a bit of difference whether it's threading screws or tapping axle housings, there's a NAMCO Threading Tool for every thread cutting requirement.

NAMCO Dies and Taps are simple in design, rigid in construction to cut threads true to specification on all classes of work.

Ask for catalog--no obligation



The National Acme Company

CLEVELAND, OHIO

New England Plant - Windsor, Vt.
Canadian Screw Plant - Montreal, P.Q.

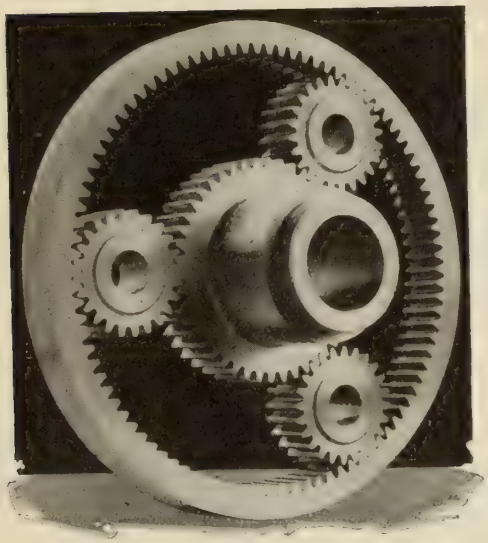
Branch Offices:
New York Boston Chicago Detroit Buffalo
Atlanta San Francisco

Warehouses: New York and Chicago
Representatives in Foreign Countries

Makers of Gridley Single and Multiple-Spindle Automatics at Windsor, Vermont, and Acme Automatics, Threading Dies, and Screw Machine Products, at Cleveland, Ohio

If interested tear out this page and place with letters to be answered.

Internal Gears



accurately planed generated teeth.

This is a job for specialists. We can do it right.

Hamilton Gear CO. LTD.

Van Horne St. TORONTO

There's a Famous Five File for Every Kind of Work

And every one is made of high grade steel, and ground and cut for its particular purpose.

Give your men Famous Five Files to work with, and you will get good results.

Also teach them to turn in a file as soon as it becomes dull.

You do not need to be afraid to do this with Famous Five Files, because they will not grow dull quickly.

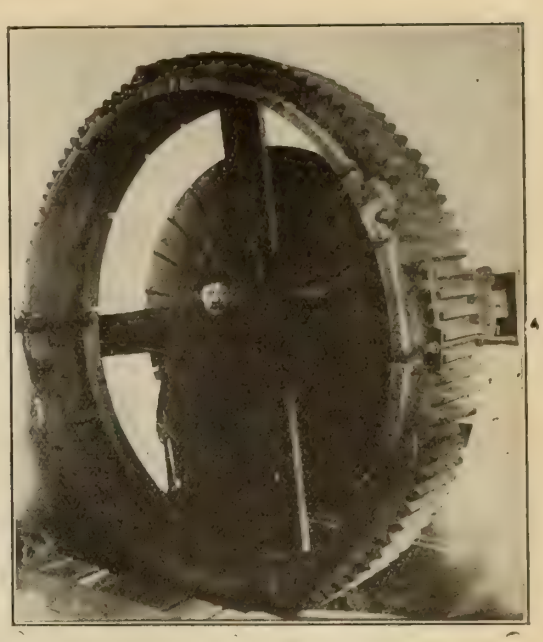
Specify them when ordering.

They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



"HISCO" Moulded Gears

WHY pay for expensive patterns when you install new machinery that necessitates special gears? "HISCO" machine-moulded gears, while requiring no pattern, insure accuracy, dependability, quality, and the price is minus the cost of patterns—which in these days of high prices of lumber and labor is something to be considered.

THE "HISCO" plant is equipped to produce machine-moulded gears up to 18 feet in diameter without patterns—and remember, very often the pattern costs more than the gears. *Write for our Estimates.*

HULL IRON & STEEL FOUNDRIES, LIMITED
HULL - - CANADA

Announcing—

WILLIAMS' "Vulcan" Forged-Cutter Tool Holders give unequalled service to those who prefer the solid, forged-type of cutting tool. Each Holder, by the mere insertion of small High Speed Forged-Cutters is adapted to the heaviest service on Lathe, Planer, etc.

The economy and convenience of this line, when installed as standard shop equipment, is at once apparent, as all blacksmith work, to say nothing of the very considerable investment necessitated by heavy, solid forged-tools of costly High Speed Steel, is eliminated.

Absolutely simple in construction, yet possessing all the advantages of the solid tool without its expense.

Cutters, drop-forged from the finest grade of High Speed Steel, in stock in a great variety of sizes and types, finished and hardened ready for use. Ask for descriptive booklet.

J. H. Williams & Co., 45 Richards Street, Brooklyn, N.Y.
The A. G. Low Co., Ltd., 45 Pacific Ave., Saskatoon, Sask.
Agents for Manitoba, Saskatchewan, Alberta and British Columbia

Williams' "Vulcan" Forged-Cutter Tool Holders

HINTS TO BUYERS

DARLING BROTHERS, LIMITED
Engineers, Manufacturers and Founders
120 Prince Street, MONTREAL, P. Q.

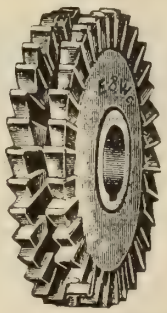
Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.

PRESSES and SHEARS
Sheet Metal Working Machinery
THE D. H. STOLL CO., INC.
26 Lansing St., BUFFALO, N.Y.

Bryant Chucking Grinder Company
Springfield, Vermont
Builders of
Hole, Hole and Face and Deep Hole Grinders

CRANE VALVES
CRANE
LIMITED
HEAD OFFICE & WORKS
1280 ST. PATRICK ST
MONTREAL
BRANCHES: Vancouver, Calgary, Winnipeg, Toronto.

The Hughes Owens Co. Ltd.
MONTREAL TORONTO OTTAWA WINNIPEG
Manufacturers
Blue and Black Print Papers
Drawing Office Supplies for Students, Architects and Engineers.

Elliott & Whitehall Machine & Tool Co.
GALT, ONTARIO, CANADA
MILLING CUTTERS AND SMALL TOOLS

We manufacture the following tools, etc.
Standard and Special Milling Cutters of all descriptions, Gear Cutters, Hand Reamers, Shell Reamers, Chucking Reamers and Taper Pin Reamers, Lathe Mandrels and Arbors, Metal Stamping Dies, Gauges, Jigs and Fixtures, Etc.
All equipment required for rapid and economical production of interchangeable parts. Prompt attention to all work.
ASK FOR OUR NEW CATALOGUE No. 10.

Greenfield
Trade Mark Reg. U. S. Pat. Office
A universal grinder. A grinder with all attachments. A grinder that will handle all kinds of tool-sharpening as well as cylindrical, internal and surface grinding. An all-around machine for your tool-room.
Catalog No. 6.
Greenfield Machine Co.
Greenfield, Mass., U.S.A.

STEEL CASTINGS
ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.
PROMPT DELIVERY
Manitoba Steel Foundries, Ltd.
1204 McArthur Building
Winnipeg - - - Manitoba

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

IMPORTERS OF
INDUSTRIAL DIAMONDS
Goods Submitted on Memorandum if Desired
JOHN W. GORDON, Manager
5 James Street, ST. CATHARINES, ONTARIO

WHEEL TRUEING TOOL CO.
DETROIT

MANUFACTURERS OF
DIAMOND POINTED TOOLS
All Mountings Fully Guaranteed
Office and Factory:
88 West Pitt Street, WINDSOR, ONTARIO

Speed in Cutting Off

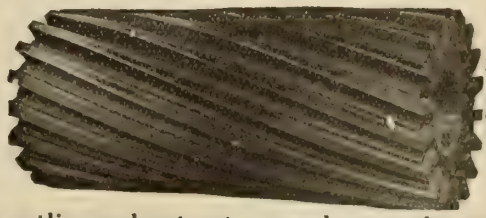
Hurlbut, Rogers Cutting-Off & Centering Machine

TWO CUTS AT ONCE—one up, the other down. This is what makes the Hurlbut, Rogers Cutting-Off and Centering Machine virtually double the output and reduce the cost per piece one-half.
You should learn more about it. Write for description to-day.

The Hurlbut, Rogers Machinery Co.
So. Sudbury, Mass.

FOREIGN AGENTS: England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne.

Taylor-Newbold Milling Cutters



Will outlive and out-cut any other on the market
4-in. Diameter for General Use.
Send for Bulletin R-P and 30-day trial offer.

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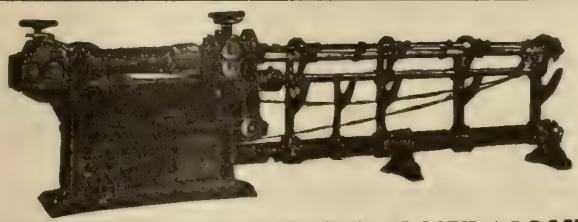

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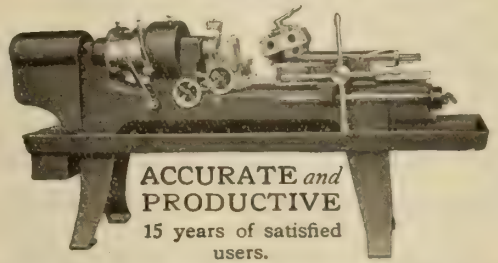

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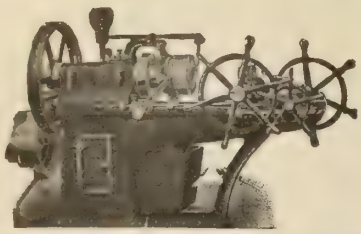

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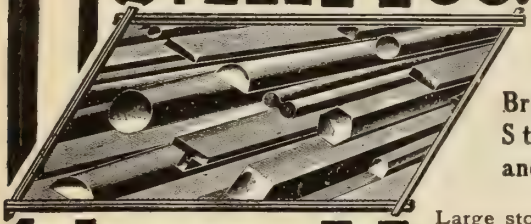

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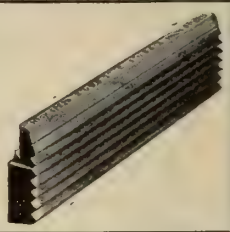

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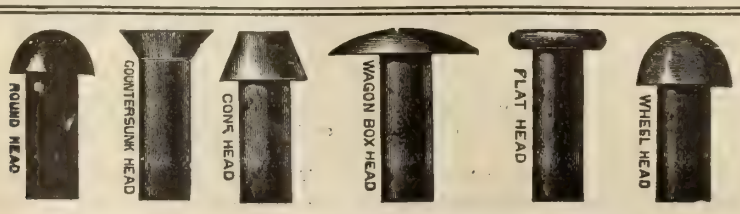

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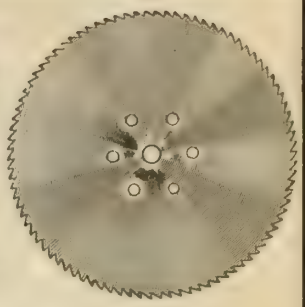

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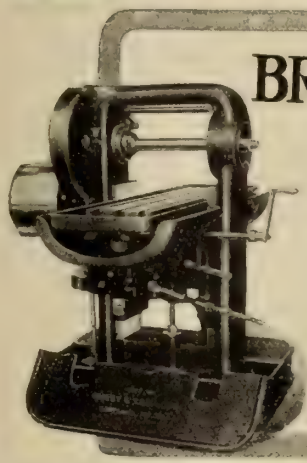

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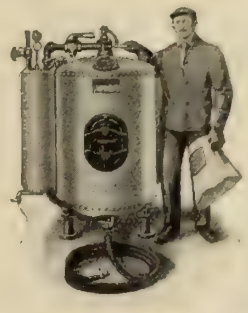

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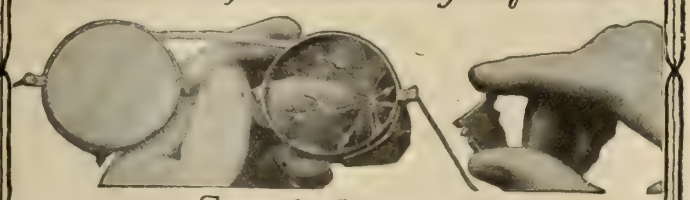

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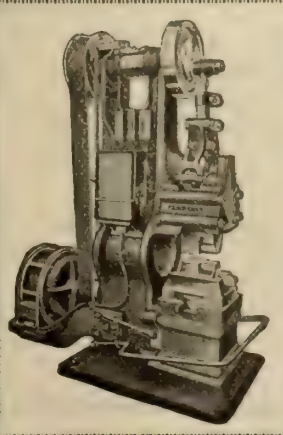

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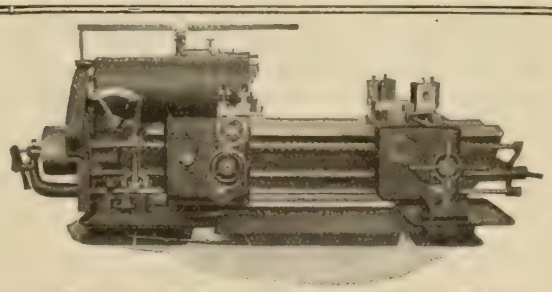

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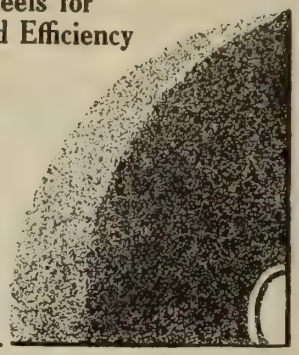

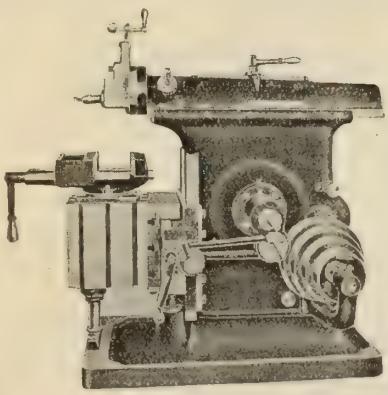

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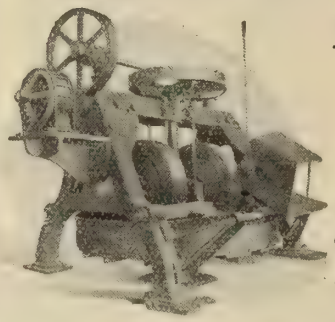

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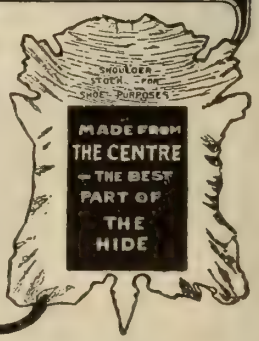

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National Mach. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Limited, Montreal.

BILLET MARKERS
Matthews & Co., Jas. H., Pittsburgh, Pa.

BILLETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Swedish Steel & Importing Co., Ltd., Montreal.
Algoma Steel Corp., Sault Ste. Marie.
Kayser-Ellison & Co., Ltd., Montreal.
Marshall, Son & Bunney, Toronto.
Norton, Ralph B., Agent, Montreal.

BILLETS, FORGING
General Steel Co., Milwaukee, Wis.
Kayser-Ellison & Co., Ltd., Montreal.
Norton, Ralph B., Agent, Montreal.

BINS, STEEL
Dennis Wire & Iron Works, London, Ont
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Toronto Iron Works, Ltd., Toronto, Ont.
William Hamilton Co., Peterboro, Ont.

BLACKSMITH WORK
The Thos. Pink Co., Ltd., Pembroke.

BLASTING MACHINES, SHOT AND STEEL GRIT
Pittsburgh Crushed Steel Co., Pittsburgh

BLOOMS AND SLABS
Algoma Steel Corp., Sault Ste. Marie.

BLOWERS
Can. Blower & Forge Co., Kitchener, Ont.
Garlock-Walker Machinery Co., Toronto.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Limited, Montreal.

BLOW PIPES AND REGULATORS
Carter Welding Co., Toronto, Ont.
Prest-O-Lite Co., Inc., Toronto, Ont.
Welding & Supplies Co., Montreal, Que.

BLUE PRINTING MACHINERY
Commercial Camera Co., Providence, R.I.
Wickes Bros., Saginaw, Mich.

BLUE PRINT PAPER
Hughes, Owens Co., Ltd., Montreal, Que.

BOARDS, GLASS CUTTING
Lufkin Rule Co., of Can., Windsor, Ont.

BOARTZ
Joyce, Koebel & Co., Inc., New York.

BOLT CUTTERS
Greenfield Tap & Die Corp., Greenfield. Mass

BOILER BREECHINGS
William Hamilton Co., Peterboro, Ont.

BOILER FEEDING TRAPS
Geo. W. Cole, Ltd., Toronto.

BOLT CUTTERS
Fellows Gear Shaper Co., Springfield, Vt.
Greenfield Tap & Die Corp., Greenfield. Mass.
Wells Bros., of Can., Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

BOOKS, TECHNICAL
MacLean Publishing Co., Toronto.

BOILERS
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.

BOLT CUTTERS AND NUT TAPERS
Aikenhead Hardware Co., Toronto, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Landis Machine Co., Waynesboro, Pa.
A.B. Jardine & Co., Ltd., Hespeler, Ont.
Rice Lewis & Son. Toronto, Ont.
Wells Bros. Co. of Canada, Galt, Ont.
Williams & Wilson, Limited, Montreal.

BOLTS
Aikenhead Hardware Co, Toronto, Ont.
London Bolt & Hinge Wks., London, Ont.
Morrow Screw & Nut Co., John, Ingersoll.
Rice, Lewis & Son, Toronto, Ont.
Steel Co., of Canada, Ltd, Hamilton.
Wilkinson & Kompass, Hamilton, Ont.
Williams & Co., J. H. Brooklyn, N.Y.

BOLTS, COUPLING
Galt Machine Screw Co., Ltd., Galt, Ont.

BOLTS, STAY
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, SPRING SHAKLE
Can. Winkley Co., Ltd., Windsor, Ont.
Morrow Screw & Nut Co., John, Ingersoll.

BOLTS, PATCH
Morrow Screw & Nut Co., John, Ingersoll.

BOLT AND NUT MACHINERY
Bertram & Sons Co., John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto.
Gardner & Son, Robt., Montreal.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams & Wilson, Ltd., Montreal, Que.
Williams Machinery Co., A. R., Toronto

BOLT THREADING MACHINERY
Jardine & Co., Ltd., A. B., Hespeler.
Landis Machine Co., Waynesboro, Pa.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.
Williams & Wilson, Limited, Montreal.

BORING MACHINES, PNEUMATIC CYLINDER
Cleveland Pneumatic Tool Co., Toronto.
Canadian Fairbanks-Morse Co., Montreal
Can. Ingersoll-Rand Co., Sherbrooke Que
Garlock-Walker Mach. Co., Toronto.

BORING MACHINES, UPRIGHT AND HORIZONTAL
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machinery Co., Toronto
Oliver Mach'y Co., Grand Rapids, Mich.
Gisholt Machine Co., Madison, Wis.
Hoefer Mfg., Co., Freeport, Ill.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que

BORING AND TURNING MILLS
Bertram & Sons Co., John, Dundas.
Betts Machine Co., Rochester, N.Y.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Foss Mch. & S'ply Co., Geo. F., Montreal
Knight Metal Products, Toronto.
Oliver Mach. Co., Grand Rapids, Mich.
Niles-Bement-Pond Co., New York.

BOXES, CAST IRON
Brown & Sharpe Mfg. Co., Providence, R.I.

BOXES, STEEL SHOP AND TOTE
Cleveland Wire Spring Co., Cleveland.

BRAKEBAND LINING CUTTERS
Peck, Stow & Wilcox Co., Southington, Conn.

BRAKES
Brown, Boggs & Co., Hamilton, Can.
Electric Steel & Metals, Ltd., Welland.

BRASS AND COPPER BARS, RODS
BRAKES, CORNICES
Peck, Stow & Wilcox Co., Southington, Conn.

BRASS FOUNDERS
Canada Metal Co., Toronto.
Greenleafs, Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.
Wilson & Co., J. C., Belleville, Ont.

BRASS WORKING MACHINERY
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machinery Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Niles-Bement-Pond Co., New York.
Prest-O-Lite Co., Inc., Toronto, Ont.
Wood Turret Machine Co., Brazil, Ind.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

BRICKS, FIRE
Harbison-Walker Refractories, Montreal.

BRIDGES, RLY. AND HIGHWAY
Dominion Bridge Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.

BRONZE RODS AND SHEETS, PLATES
Brown's Copper & Brass Rolling Mills, New Toronto.

BRONZE, NAVAL
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto.
Tallman Brass and Metal Co., Hamilton.

BRONZE COPPER
Canada Metal Co., Toronto.

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Ford-Smith Mach. Co., Hamilton.
Foss Mchy. & S'ply Co., Geo. F. Montreal
Garlock-Walker Machinery Co., Toronto.
Williams & Wilson, Limited, Montreal.

BUCKETS, DUMP
MacKinnon Steel Co., Sherbroooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

BUCKETS, ELEVATOR
Can. Link-Belt Co., Toronto, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUCKETS, CLAM SHELL, CRAB, DUMP
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Ltd, Walkerville.

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Bertram & Sons Co., John, Dundas.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
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Williams & Wilson, Limited, Montreal.

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Northern Crane Works, Ltd., Walkerville.
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BURRS, IRON AND COPPER
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BUSHINGS, BRONZE
Morrow Screw & Nut Co., John, Ingersoll.

CALIPERS
Brown & Sharpe Mfg. Co., Providence, R.I.
Pangborn Corporation, Hagerstown, Md.
Peck, Stow & Wilcox Co., Southington, Conn.

CABINETS, SAND BLAST
Pangborn Corporation, Hagerstown, Md.

CABLE, ELECTRIC
International Machinery & Supply Co., Ltd., Montreal, Que.

CALKS, BOOT
Lufkin Rule Co., of Can., Windsor, Ont.

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Bliss, E. W. Co., Brooklyn, N.Y.
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Wilson & Co., J. C., Belleville, Ont.

CARBIDE
Union Carbide Co., Toronto, Ont.

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Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.
Swedish Crucible Steel Co. Windsor.

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Jones & Glasco, Montreal.

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Can. Fairbanks-Morse Co., Ltd, Montreal
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MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

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Wilson & Co., J. C., Belleville, Ont.

CASTINGS, ALUMINUM, BRASS BRONZE, COPPER, AND GUN METAL
Algoma Steel Corp., Sault Ste. Marie.
Brockville Foundry Co., Brockville, Ont.
Franklin Mfg. Co., Syracuse, N.Y.
Canada Metal Co., Ltd., Toronto, Ont.

CASTINGS, DIE CAST
Canada Metal Co., Ltd., Toronto, Ont.
Franklin Mfg. Co., Syracuse, N.Y.

CASTINGS, STEEL—ALL KINDS
Electric Steel & Metals Co., Welland.
Mesta Machine Co., Pittsburgh, Pa.

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John Morrow Screw & Nut Co., Ingersoll
Alexander Fleck, Ltd., Ottawa.
Greenleafs Ltd., Belleville, Ont.
St. Lawrence Welding Co., Montreal.
Tallman Brass & Metal Co., Hamilton.

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Brown & Sharpe Mfg. Co., Providence, R.I.

CASTINGS, BRASS AND IRON
Algoma Steel Corp., Sault Ste. Marie.
International Machinery and Supply Co., Ltd., Montreal, Que.

CASTINGS, BUILDING
Katie Foundry, Galt. Ont.

CASTINGS, GRAY IRON
Bernard Industrial Co., A., Fortierville, Q.
Brown & Sharpe Mfg. Co., Providence, R.I.
Brown, Boggs Co., Ltd., Hamilton.
Alexander Fleck, Ltd., Ottawa.
Gardner & Son, Robt., Montreal.
Greenleafs, Ltd., Belleville, Ont.
Hull Iron & Steel Foundries, Ltd., Hull
International Malleable Iron Co., Guelph
Kennedy & Sons, Ltd., Wm., Owen Sound.
Katie Foundry, Ltd., Galt, Ont.
Hamilton Co., Wm., Peterboro.
Wilson & Co., J. C., Belleville, Ont.

CASTINGS, PLUMBERS'
Katie Foundry, Galt, Ont.

CASTINGS, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville

CASTINGS, HARDWARE
Katie Foundry, Galt, Ont.

CASTINGS, STEEL CHROME AND MANGANESE STEEL
Thos. Davidson Mfg. Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hull Iron & Steel Foundries, Ltd., Hull.
Kennedy & Sons, Ltd, Owen Sound.

CASTINGS, MALLEABLE
International Malleable Iron Co., Guelph

CASTINGS, NICKEL STEEL
Hull Iron & Steel Foundries, Ltd., Hull.

CEMENT, IRON
Warmington & Co., J. N., Montreal, P.Q.

CEMENT, ELASTIC JOINTING
Warmington & Co., J. N., Montreal, P.Q.

CEMENT MACHINERY
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gardner, Robt., & Son, Montreal.

CEMENT HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.

CENTERING MACHINES
Victoria Foundry Co., Ottawa, Ont.

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Butterfield & Co., Inc., Rock Island, Que.
Gardner, Robt. & Son, Montreal.
Hurlburt, Rogers Mch. Co., South Sudbury, Mass.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

CHAIN, WELDED COIL
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Ford Chain Block & Mfg. Co., Phila., Pa.
Garlock-Walker Machy. Co., Toronto.
Morris Crane & HoistCo., Herbert, Niagara Falls, Ont.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.
Jones & Glasco, Montreal, Que.

CHAINS, AGRICULTURAL
Morse Chain Co., Ithaca, New York.

CHAINS, AUTOMOBILE ENGINE
Morse Chain Co., Ithaca, New York.

CHAINS, BICYCLE, DRIVE AND BLOCK
Morse Chain Co., Ithaca, N.Y.

CHAINS, FOR ELEVATORS AND CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson Ltd., Montreal, Que

CHAIN, MALLEABLE, DETACHABLE AND RIVETED
Can. Link-Belt Co., Toronto, Ont.
Morse Chain Co., Ithaca, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

CHAINS, POWER TRANSMISSION
Morse Chain Co., Ithaca, New York.
Glasgow, N.S.

CHAINS, SPROCKET WHEEL
Morse Chain Co., Ithaca, N.Y.

CHAIN DRIVES
Can. Link-Belt Co., Toronto, Ont.
Coventry Chain Co., Coventry, England.
Jones & Glasco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.

CHASERS
National Acme Co., Cleveland, Ohio.
Taylor, J. A. M., 318 Stair Bldg., Toronto, Ont.

CHEMISTS
Toronto Testing Lab'tory, Ltd., Toronto

CHISELS
Whitman & Barnes Co., St. Catharines.

CHUCKS, AERO, AUTOMATIC
Garvin Machine Co., New York.

CHUCKS, CENTERING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, COLLET, AIR
Elliott & Whitehall Mach. & Tool Co. Galt, Ont.
Smalley-General Co., Inc., Bay City, Mich.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, DRILL, LATHE AND UNIVERSAL
Aikenhead Hardware Co., Toronto, Ont.
Almond Mfg. Co., Ashburnham, Mass.
Bicknell-Thomas Co., Greenfield, Mass.
Bertram & Sons Co., John, Dundas.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Ltd., Brantford.
Foss Mchy. & S'ply Co., G. F., Montreal.
Gardner, Robt., & Son, Montreal.
Garlock-Walker Mach'y Co., Toronto.
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Chicago, Ill.
Hoggson & Pettis Mfg. Co., New Haven, Conn.
Jacobs Mfg. Co., Hartford, Conn.
Knight Metal Products, Toronto.
Modern Tool Co., Erie, Pa.
Rice Lewis & Son, Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Whiton Machine Co., D. E., New London, Conn.
Williams & Wilson, Ltd., Montreal, Que

CHUCKS, DRILL, AUTOMATIC AND KEYLESS
Aikenhead Hardware Co., Toronto, Ont
Bicknell-Thomas Co., Greenfield, Mass.
Can. Blower & Forge Co., Kitchener.
Whitney Mfg. Co., Hartford, Conn.

CHUCKS, FRICTION AND TAP
Bicknell-Thomas Co., Greenfield, Mass.
Victor Tool Co., Waynesboro, Pa.

CHUCKS, MACHINE MILLING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKS, MAGNETIC
Heald Machine Co., Worcester, Mass.
Williams & Wilson, Ltd., Montreal, Que.

CHUCKS, RING WHEEL
Ford-Smith Mach. Co., Hamilton, Ont.
Gardner Machine Co., Beloit, Wis.

CHUCKS, WHEEL, CAR
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CHUCKING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Garvin Machine Co., New York.
Gisholt Machine Co., Madison, Wis.
National Acme Co., Windsor, Vt.
Niles-Bement-Pond Co., New York.
Roelofson Machine & Tool Co., Toronto.
Warner & Swasey Co., Cleveland, O.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

CIRCULATING SYSTEMS FOR LUBRICATING OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

CLAMPS, BELT
Hoggson & Pettis Mfg. Co., New Haven, Conn.

CLEANERS, METER, WASTE, GENERAL
Oakley Chemical Co., New York, N.Y.

CLEANING COMPOUND
Oakley Chemical Co., New York.

CLOCK SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

CLOCKS, WATCHMAN, PORTABLE
Gisholt Machine Co., Madison, Wis.
Hardinge Bros., Inc., Chicago, Ill.

CLUTCHES, CHAIN
Wright Mfg. Co., Lisbon, Ohio.

CLUTCHES, FRICTION AND PULLEY
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mach. Co., Manchester, Conn.
Positive Clutch & Pulley Wks., Aurora, Ont.
Jones & Glasco, Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que.

COAL HANDLING MACHINERY
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Williams & Wilson, Limited, Montreal.
Nova Scotia Steel & Coal Co., New

COLD ROLLED STRIP, ALL METAL
COLLARS, SHAFTING
Can. Driver-Harris Co., Ltd., Walkerville.
Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

COLLECTORS, PNEUMATIC
Can. Blower & Forge Co., Kitchener.
J. C. Wilson & Co., Belleville, Ont.

COLLETS
Becker Milling Machine Co., Boston.
Hardinge Bros., Inc., Chicago, Ill.
Wilson & Co., J. C. Belleville, Ont.

COMPOSITION INGOT
Brown's Copper & Brass Rolling Mills, New Toronto.
Canada Metal Co., Toronto, Ont.

COMPOUNDS, CUTTING AND GRINDING, DRAWING, STAMPING
Oakley Chemical Co., New York, N.Y.

COMBINED OPEN SIDE PLANER-SHAPER
Lynd-Farquhar Co., Boston, Mass.

COMPRESSORS, AIR
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Cleveland Pneumatic Tool Co., Toronto.
Curtis Pneumatic Machy. Co., St. Louis
Elliott & Whitehall, Galt, Ont.
Garlock-Walker Machy. Co., Toronto.
Hinckley Machine Co., Hinckley, Ill.
MacGovern & Co., Montreal, Que.
Williams & Wilson, Ltd., Montreal, Que

CONDENSERS
MacGovern & Co., Montreal, Que.
Smalley-General Co., Inc., Bay City, Mich.

CONNECTING RODS
Canada Found'g & Forgings, Ltd., Welland, Ont.

CONTRACT WORK
Brown Engineering Corp., Toronto.
Ford-Smith Machine Co., Hamilton, Ont.
Homer & Wilson, Hamilton, Ont.
Katie Foundry, Ltd., Galt, Ont.
Marten Machine Co., Hamilton, Ont.
St. Lawrence Welding Co., Montreal.
Victoria Foundry Co., Ottawa.
Wilson & Co., J. C., Belleville, Ont.
Windsor Mach. Tool Co., Windsor, Ont.

CONTROLLERS, MAGNETIC BRAKES, ELEC. WINCHES, MONO RAIL HOISTS
Volta Mfg. Co., Welland, Ont.

CONTROLLERS AND STARTERS
Williams Mach'y Co., A. R., Toronto.

CONTROLLING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

CONVERTERS, ROTARY
MacGovern & Co., Montreal, Que.

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Can. Link-Belt Co., Toronto, Ont.
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CONVEYORS, OVERHEAD
Beatty Bros., Fergus, Ont.

COOLERS, WITH DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

COPING MACHINES
Bertram & Sons Co., John, Dundas, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Can. Blower & Forge Co., Kitchener.

COPPER, BUS BAR, SHEET, PATES, RODS
Brown's Copper & Brass Rolling Mills, New Toronto, Ont.

COTTER PINS
Whitman & Barnes Co., St. Catharines.

COUNTERBORES AND COUNTERSINKS
Aikenhead Hardware Co., Toronto, Ont.
Blancke Co., L. C., New York City.
Cleveland Twist Drill Co., Cleveland.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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Almond Mfg. Co., Ashburnham, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Gray Ball Bearing Co., Ltd., Toronto.
Baird Machine Co., Bridgeport, Conn.
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Foster Machine Co., Elkhart, Ind.
Williams & Wilson Ltd., Montreal, Que.

COUPLINGS, FRICTION
Bernard Industrial Co., The A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Williams & Wilson, Ltd., Montreal, Que.

COUPLINGS, RAPID HOSE
Int. Machinery & Supply Co., Ltd., Montreal, Que.

COILING MACHINERY, WIRE AND SPRING
Garlock-Walker Machinery Co., Toronto.

COKE AND COAL
Hanna & Co., M. A., Cleveland, O.

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Cleveland Pneumatic Tool Co., of Canada, Toronto.
Gardner, Robt. & Son, Montreal.
Independent Pneumatic Tool Co., Chicago
Wilson & Co., J. C., Belleville, Ont.

CRANES, LOCOMOTIVE
Can. Link-Belt Co., Toronto, Ont.
Northern Crane Works, Walkerville

CRANES, OVERHEAD, HAND AND ELECTRIC
Volta Manufacturing Co., Welland, Ont.

CUPS, OIL
Can. Winkley Co., Ltd., Windsor, Ont.

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Can. Winkley Co., Ltd., Windsor, Ont.

CRANES, GANTRY
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.

CRANE RUNWAYS
MacKinnon Steel Co., Sherbrooke, Que.

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Morris Crane and Hoist Co., Herbert, Niagara Falls, Ont.
Northern Crane Works, Walkerville.
Wilson & Co., J. C., Belleville.
Williams & Wilson, Ltd., Montreal, Que.

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Can. Link-Belt Co., Toronto, Ont.
Curtis Pneumatic Machy. Co., St. Louis.
Dominion Bridge Co., Montreal.
Hepburn, John T., Ltd., Toronto.
MacKinnon Steel Co., Sherbrooke, Que.
Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.
Niles-Bement-Pond Co., New York.
Northern Crane Works, Walkerville.

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Canada Found'e & Forgings Ltd., Welland
Williams & Co., J. H., Brooklyn, N.Y.

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Aikenhead Hardware Co., Toronto, Ont.
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Northern Crane Works, Walkerville.
Rice Lewis & Son, Toronto, Ont.
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CRIMPS, LEATHER
Graton & Knight Mfg. Co., Worcester, Mass.

CRUSHERS
Elec. Steel & Metals, Welland, Ont.

CUPOLAS
Can. Blower & Forge Co., Kitchener.
Northern Crane Works, Walkerville.

CURB PUMPS FOR OIL, GASOLINE
Bowser Co., Ltd., S. F., Toronto, Ont.

CURRENT TRANSFORMERS
Volta Manufacturing Co., Welland, Ont.

CUT-OFF COUPLINGS, FRICTION
J. C. Wilson & Co., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

CUTTERS, BOLT
See Bolt Cutters.

CUTTERS, GEARS
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Fellows Gear Shaper Co., Sprinfigeld, Vt.

CUTTERS, FLUE
Cleveland Pneumatic Tool Co., Toronto.

CUTTER HEADS
Oliver Machinery Co. Grand Rapids, Mich

CUTTERS, PIPE (See Pipe Cutters)

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Becker Milling Mach. Co., Boston, Mass.
Boker & Co., Inc., H., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Cleveland Twist Drill Co., Cleveland.
Davidson Tool Mfg. Co., New York, N.Y.
Elliott & Whitehall Mach. & Tool Co., Galt, Ont.
Foss Mchy. & S'ply Co., G. F., Montreal.
Garvin Machine Co., New York.
Illinois Tool Works, Chicago, Ill.
Morse Twist Drill & Machine Co., New Bedford.
Pratt & Whitney Co., Dundas, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Toronto, Ont.
Tabor Mfg. Co., Philadelphia, Pa.
Whitney Mfg. Co., Hartford, Conn.

CUTTER RELIEVING MACHINES
Cleveland Milling Machine Co., Cleveland.

CUTTING-OFF MACHINES
Armstrong Bros., Tool Co., Chicago.
Bertram & Sons Co., John, Dundas.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Curtis & Curtis Co., Bridgeport, Conn.
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Kennedy & Sons, Wm., Owen Sound.
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Wheel Trueing Tool Co., Detroit.
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Wells Bros. of Canada, Galt, Ont.

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Garlock-Walker Machinery Co., Toronto
Garvin Machine Co., New York.
A. B. Jardine & Co., Ltd., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
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Canada Machinery Corp., Galt, Ont.
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Garlock-Walker Mach. Co., Toronto.
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Canadian Machinery Corp., Galt, Ont.
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Garlock-Walker Mach. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Landis Tool Co., Waynesboro, Pa.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Dundas, Ont.
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Canada Mach. Corp., Galt, Ont.
Garvin Machine Co., New York.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mach. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
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Silver Mfg. Co., Salem, Ohio.
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Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
Wilt Twist Drill Co., of Can., Walkerville
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Cleveland Twist Drill Co., Cleveland.
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A. B. Jardine & Co., Hespeler, Ont.
Morrow Screw & Nut Co., John, Ingersoll
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Mfg. Co., Akron, O.
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Niles-Bement-Pond Co., New York.
Pilot Steel & Tool Co., Montreal, Que.
Prest-O-Lite Co., Inc., Toronto, Ont.
U. S. Electrical Tool Co., Cincinnati, O.
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Wilkinson & Kompass, Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

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Best Wishes for the Coming Year to all Our Friends

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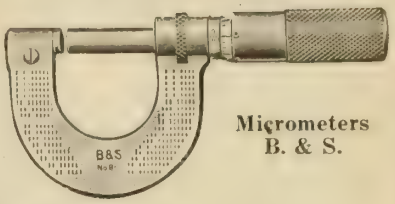

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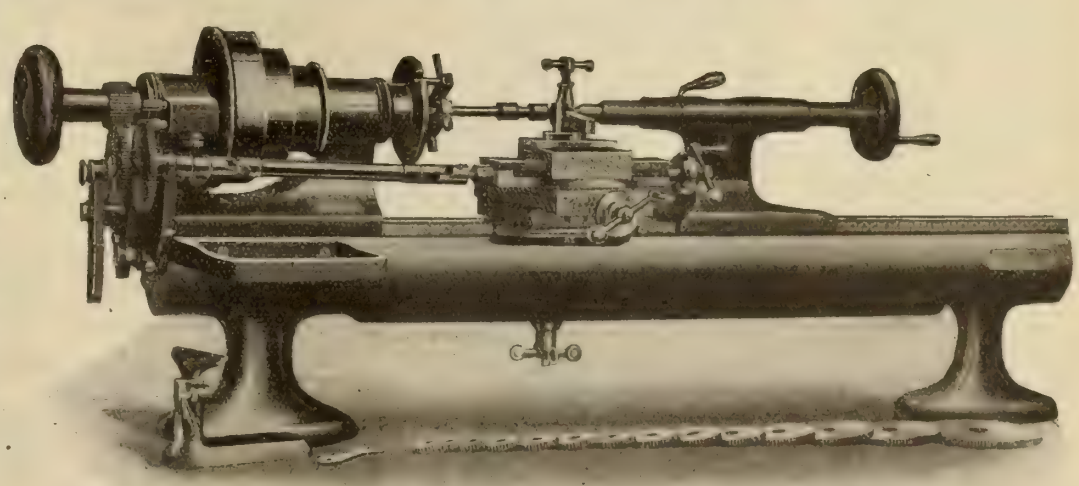

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Canada Machinery Corp., Galt, Ont.
Garlock-Walker Machy. Co., Toronto, Ont.
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Williams & Wilson, Ltd., Montreal, Que.

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Puro Sanitary Drinking Fountain Co., Haydenville, Mass.

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Brown & Sharpe Mfg. Co., Providence, R.I.
Chicago Flexible Shaft Co., Chicago, Ill.
Gilbert & Barker Mfg. Co., Springfield.
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W. S. Rockwell Co., New York, N.Y.
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Toronto Iron Works, Ltd., Toronto.

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Armstrong Bros. Tool Co., Chicago.

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Mesta Machine Co., Pittsburgh, Pa.

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GASOLINE TANKS
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GASOLINE PUMPS, SELF-MEASURING
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Brown & Sharpe Mfg. Co., Providence, R.I.

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Wells Bros. of Can., Galt, Ont.

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Garvin Machine Co., New York.
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Dom. Found. & Steel, Hamilton, Ont.
Kayser-Ellison & Co., Ltd., Montreal.
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Wilson & Co., J. C., Belleville, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

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Katie Foundry, Galt, Ont.

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Fellows Gear & Shaper Co., Springfield, V.

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Fellows Gear & Shaper Co., Springfield, V.
Garlock-Walker Mchy. Co., Toronto, Ont.
D. E. Whiton Machine Co., New London, Conn.
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Gisholt Machine Co., Madison, Wis.

GEAR-TURNING MACHINES, BEVEL
Bridgeford Mach. Tool Wks, Rochester

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Morse Chain Co., Ithaca, New York.

GEARS, COMPENSATING
Morse Chain Co., Ithaca, New York.

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Can. Link-Belt Co., Toronto, Ont.
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Dominion Bridge Co., Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
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Wm. Kennedy & Sons, Ltd., Owen Sound, Ont.
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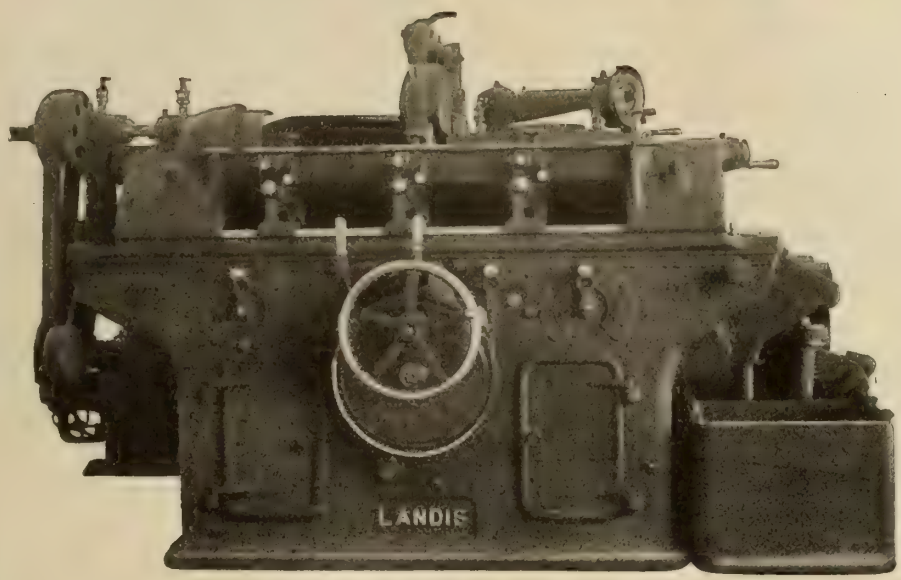

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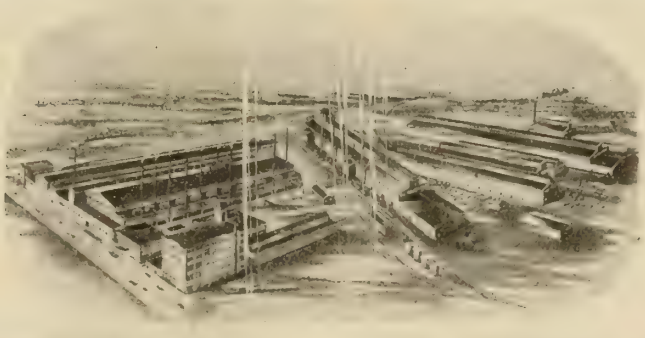

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Garlock-Walker Machinery Co., Toronto.
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Garlock-Walker Machy. Co., Toronto.
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Norton Co., Worcester, Mass.
Wisconsin Electric Co., Racine, Wis.
Williams & Wilson, Ltd., Montreal.

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See Steel.

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Taylor Instrument Co., Rochester, N.Y.

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Brown & Sharpe Mfg. Co., Providence.
Starrett Co., L. S., Athol, Mass.

INDEX CENTRES

Brown & Sharpe Mfg. Co., Providence, R.I.
Dickow, Fred. C., Chicago, Ill.
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Garvin Machine Co., New York.
Williams & Wilson, Limited, Montreal.

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Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
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Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Rice Lewis & Son, Toronto, Ont.
Williams & Wilson, Limited, Montreal.

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Gisholt Machine Co., Madison, Wis.
Globe Engineering Co., Ltd., Hamilton.
Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
Marten Machine Co., Hamilton, Ont.
Toronto Tool Co., Toronto, Ont.

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Williams & Wilson, Limited, Montreal.

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Kennedy & Sons, Wm., Owen Sound, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

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Gray Ball Bearing Co., Ltd., Toronto.

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Hendey Machine Co., Torrington, Conn.
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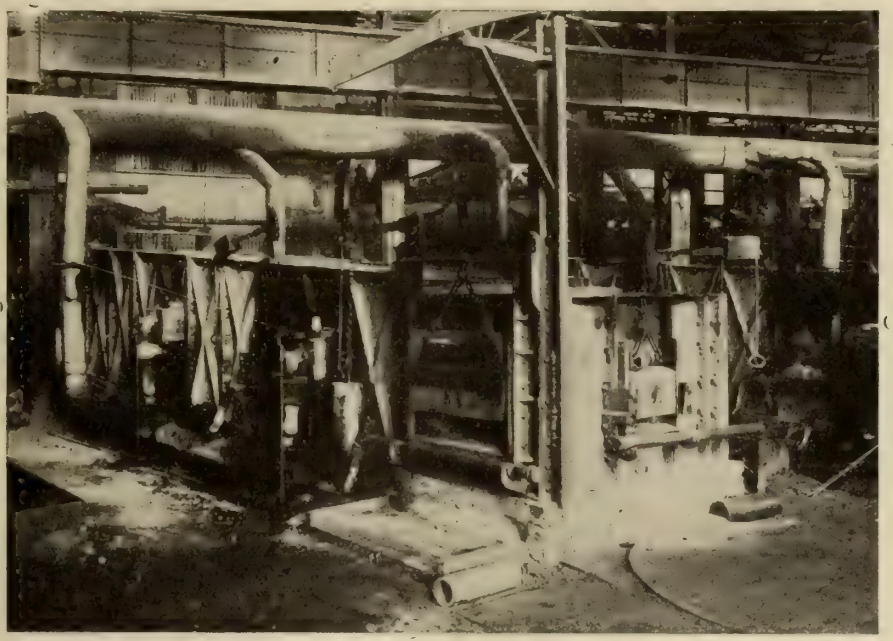

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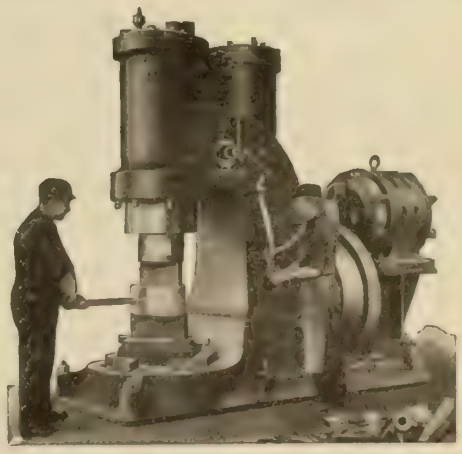

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Quickwork Co., St. Marys, Ohio.

PLANING MILL EXHAUSTERS
Can. Blower & Forge Co., Kitchener, Ont.
MacGovern & Co., Montreal, Que.
Niles-Bement-Pond Co., New York.

PLIERS
Aikenhead Hardware Co., Toronto.
Can. Billings & Spencer, Ltd., Welland.
Peck, Stow & Wilcox Co., Southington, Ct.
Rice Lewis & Son, Toronto, Ont.
Whitman & Barnes Co., St. Catharines.

PNEUMATIC TOOLS
Can. Ingersoll-Rand Co., Montreal, Que.
Cleveland P'matic Tool Co., Can., Toronto.
Curtis Pneumatic Machy. Co., St. Louis.
Garlock-Walker Machy. Co., Toronto.
Int. Mach. & Supply Co., Ltd., Montreal.
Independent Pneumatic Tool Co., Chicago.

POWER CRANES, HAND
MacKinnon Steel Co., Sherbrooke, Que.

POLISHING MACHINES
Brown & Sharpe Mfg. Co., Providence, R.I.
Ford-Smith Machine Co., Hamilton, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POTS AND KETTLES, CAST STEEL
Elec. Steel & Metals, Welland, Ont.

POLISHING PLATES
Greenfield Tap & Die Corp., Greenfield.
Wells Bros. of Canada, Galt, Ont.
Williams & Wilson, Ltd., Montreal, Que.

POWER HOUSE CONVEYORS
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Herbert, Niagara Falls, Ont.

POWER TRANSMISSION MCHY.
Williams & Wilson, Ltd., Montreal, Que.

PRESSED STEEL PARTS
Gray Ball Bearing Co., Ltd., Toronto.

PRESSERS, ARBOR
Atlas Press Co., Kalamazoo, Mich.
Metalwood Mfg. Co., Detroit, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BROACHING, FORGING AND FLANGING
Atlas Press Co., Kalamazoo, Mich.
Bliss Co., E. W., Brooklyn, N.Y.
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, CAM, TOGGLE, EYELET
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, FILTER
Perrin, Ltd., William R,, Toronto.
Smalley-General Co., Inc., Bay City, Mich.

PRESSES, PNEUMATIC
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich.
Toledo Machine & Tool Co., Toledo.

PRESSES, DROP AND FORGING
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can. Fairbanks-Morse Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co, Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, HYDRAULIC
Bertram & Sons Co., John, Dundas.
Dom. Steel Products Co., Ltd., Brantford.
Metalwood Mfg. Co., Detroit, Mich.
Niles-Bement-Pond Co., New York.
Perrin, Ltd., William R., Toronto.
Toledo Machine & Tool Co., Toledo.
Stoll Co., Inc., D. H., Buffalo, N.Y.
West Tire Setter Co., Rochester, N.Y.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, BALING
Perrin, Ltd., William R., Toronto.

PRESSES, POWER
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Montreal.
Consolidated Press Co., Hastings, Mich.
Garlock-Walker Machinery Co., Toronto.
Perrin, Ltd., William R., Toronto.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SPRING FOOT
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Hamilton, Ont.
Consolidated Press Co., Hastings, Mich.
Toledo Machine & Tool Co., Toledo.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SCREW
Barnes & Co., W. F. & Jno., Rockford, Ill
Bliss Co., E. W., Brooklyn, N.Y.
Manhattan Machine & Tool Co., Grand Rapids, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PRESSES, SEAL
Hoggson & Pettis Mfg. Co., New Haven, Conn.

PRESSES, TRIMMING
Bliss Co., E. W., Brooklyn, N.Y.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Stoll Co., D. H., Buffalo, N.Y.
Williams & Wilson, Ltd., Montreal, Que.

PROPELLERS
Kennedy & Sons, Wm., Owen Sound.

PROTECTIVE COATINGS
H. H. Robertson, Ltd., Sarnia, Ont.

PSYCROMETERS, SLING
Taylor Instrument Co., Rochester, N.Y.

PULLEYS
Algoma Steel Corp., Sault Ste. Marie, Ont
American Pulley Co., Philadelphia.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., Fortierville, Que.
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Ford-Smith Machine Co., Hamilton, Ont.
Kennedy & Sons, Ltd., W., Owen Sound.
Positive Clutch & Pulley Works Ltd., Toronto.
Wilson & Co., J. C., Belleville, Ont.
Williams Machy. Co., A. R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PULLEYS, STEEL SASH, STEEL BELT
American Pulley Co., Philadelphia, Pa.

PULLEYS, FRICTION, CLUTCH
American Pulley Co., Philadelphia, Pa.
Baird Machine Co., Bridgeport, Conn.
Bernard Industrial Co., A., Fortierville, Q.
Can. Link-Belt Co., Toronto, Ont.
Carlyle Johnson Mch. Co., Manchester, Ct.
Positive Clutch & Pulley Works, Toronto.
Jones & Glassco, Montreal.
Williams & Wilson, Ltd., Montreal, Que.

PULP MILL MACHINERY
MacKinnon Steel Co., Sherbrooke, Que.

PUMPS, BOILER FEED
Geo. W. Cole, Ltd., Toronto.

PUMPS, CENTRIFUGAL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Ingersoll-Rand Co., Montreal, Que.
Darling Bros., Ltd., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, FUEL OIL
Bowser Co., Ltd., S. F., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Darling Bros., Ltd., Montreal, Que.
Trahern Pump Co., Rockford, Ill.

PUMPS, GEARED
Darling Bros., Ltd., Montreal, Que.

PUMPS, HIGH PRESSURE
Perrin, Ltd., William R., Toronto.

PUMPS, HYDRAULIC
Furniss, Clarke & Co., Montreal, Que.
Garlock-Walker Machinery Co., Toronto.
Darling Bros., Ltd., Montreal, Que.
Elec. Steel & Metals, Welland, Ont.
Metalwood Mfg. Co., Detroit, Mich.
Perrin, Ltd., William R., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

PUMPS, LUBRICATING, OIL STORAGE
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, SPECIAL
Elec. Steel & Metals, Welland, Ont.

PUMPS, RUBBER CEMENT
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, KEROSENE, OIL, SELF-MEASURING
Bowser Co., Ltd., S. F., Toronto, Ont.

PUMPS, LUBRICANT, OIL, WATER
Darling Bros., Ltd., Montreal, Que.
Fry's (London), Ltd., London, England.
Trahern Pump Co., Rockford, Ill.

PUMPS, SUD
Fry's (London), Ltd., London, England.

PUMP LEATHERS
Graton & Knight Mfg. Co., Worcester.

PUNCHES AND DIES
Atkins & Co., Ltd., Wm., Sheffield, Eng.
E. W. Bliss Co, Brooklyn, N.Y.
Boker & Co., Inc., H. Montreal, Que.
Brown, Boggs Co., Ltd., Hamilton, Can.
Can. Blower & Forge Co., Kitchener, Ont.
Can. Fairbanks-Morse Co., Montreal.
Gardner & Son, Robert, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
Marshall, Son & Blunney, Toronto.
Marten Machine Co., Hamilton, Ont.
Peck, Stow & Wilcox Co., Southington, Ct.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Stoll Co., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Whitman & Barnes Co., St. Catharines.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHES, HAND
Peck, Stow & Wilcox Co., Southington, Ct.

PUNCHES, POWER
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Ltd, Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Consolidated Press Co., Hastings, Mich.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
A. B. Jardine & Co., Hespeler, Ont.
Long & Allstatter, Hamilton, Ohio.
Niles-Bement-Pond Co., New York.
D. H. Stoll Co., Buffalo, N.Y.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PUNCHING MACHINES, HORIZONTAL
Bertrams, Ltd., Edinburgh, Scotland.
Bertrams & Sons, John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton, Ont.
Garlock-Walker Mach'y. Co., Toronto.
Niles-Bement-Pond Co., New York.
Wickes Bros., Saginaw, Mich.
Williams & Wilson, Ltd., Montreal, Que.

PYROMETERS
Bristol Co., Waterbury, Conn.
Shore Instrument & Mfg. Co., New York.
Taylor Instrument Co., Rochester, N.Y.

QUARTERING MACHINES
Bertram & Sons, John, Dundas, Ont.
Niles-Bement-Pond Co., New York.

RAIL BENDERS
Algoma Steel Corp., Sault Ste. Marie, O.
Niles-Bement-Pond Co., New York.

RAILROAD TOOLS
Can. Fairbanks-Morse Co., Montreal.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Williams & Wilson, Ltd., Montreal, Que.

RASPS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Marshall, Son & Bunney, Toronto.
John Morrow Screw & Nut Co., Ingersoll.

RATCHETS
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Keystone Mfg. Co., Buffalo, N.Y.
Marshall, Son & Bunney, Toronto.

RAWHIDE PINIONS (See Gears)

REAMERS
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.

REAMERS, ADJUSTABLE
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Greenfield Tap & Die Corp., Greenfield.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pawes, Ltd., Winnipeg, Man.
Pratt & Whitney Co., Dundas, Ont.
The Kelly Reamer Co., Cleveland, O.
J. A. M. Taylor, 318 Stair Bldg., Toronto.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Co., St. Catharines.

REAMERS, BRIDGE, EXPANDING AND HIGH SPEED
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Aikenhead Hardware Co., Toronto.
Blancke Co., L. C., New York City.
J. Boker & Co., Inc., Montreal, Que.
Butterfield & Co., Rock Island, Que.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Gisholt Machine Co., Madison, Wis.
Illinois Tool Works, Chicago, Ill.
Marshall, Son & Bunney, Toronto.
Morrow Screw & Nut Co., J., Ingersoll, Ont
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, STEEL TAPER AND SELF-FEEDING
Butterfield & Co., Rock Island, Que.
Blancke Co., L. C., New York City.
Can. Fairbanks-Morse Co., Montreal.
Cleveland Twist Drill Co., Cleveland.
Illinois Tool Works, Chicago, Ill.
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Dundas, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, CHUCKING
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Blancke Co., L. C., New York City.
Greenfield Tap & Die Corp., Greenfield.
Marshall, Son & Bunney, Toronto.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Canada, Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMERS, HAND
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Elliott & Whitehall, Galt, Ont.
Greenfield Tap & Die Corp., Greenfield.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

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REAMERS, PIN
Blancke Co., L. C., New York City.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
Morrow Screw & Nut Co., John, Ingersoll.
Wells Bros. of Can., Galt, Ont.
Whitman & Barnes Mfg. Co., Akron, O.

REAMER FLUTING MACHINES
Garvin Machine Co., New York.

REAMING MACHINES, PNEUMATIC
Cleveland Pneumatic Co. of Can., Toronto
Garlock-Walker Machinery Co., Toronto.

RECORDING INTRUMENTS
Bristol Co., Waterbury, Conn.
Gisholt Machine Co., Madison, Wis.
Taylor Instrument Co., Rochester, N.Y.

REELS, WIRE AND TEXTILE MFG.
American Pulley Co., Philadelphia, Pa.

REGULATORS, AUTOMATIC
Electric Steels & Metals, Ltd., Welland.

REGULATORS, PRESSURE, TEMPERATURE
Can. Fairbanks-Morse Co., Montreal.
Taylor Instrument Co., Rochester, N.Y.

REPAIR WORK, ALL KINDS
Elec. Steel & Metals, Welland, Ont.

RESPIRATORS
Strong, Kennard & Nutt Co., Cleveland.

RIVETS,
Aikenhead Hardware Co., Toronto, Ont.
Parmenter & Bulloch Co., Gananoque.
Rice, Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.

RIVETERS, PNEUMATIC, HYDRAULIC, HAMMER, COMPRESSION
Can. Fairbanks-Morse Co., Montreal.
Can. Ingersoll-Rand Co., Montreal.
Cleveland Pneumatic Tool Co. of Canada, Toronto.
Garlock-Walker Machinery Co., Toronto.
Independent Pneumatic Tool Co., Chicago.
Niles-Bement-Pond Co., New York.

RIVETING MACHINES, ELASTIC, ROTARY BLOW
Grant Mfg. & Machine Co., Bridgeport.
High-Speed Hammer Co., Rochester.
Williams & Wilson, Ltd., Montreal.
F. B. Shuster Co., New Haven, Conn.

ROAD BUILDING EQUIPMENT
Can. Ingersoll-Rand Co., Ltd., Sherbrooke.

RODS, HIGH SPEED AND CARBON DRILL
Blancke Co., L. C., New York City.

RODS, ROPE AND SPRING
Page Steel & Wire Co., Adrian, Mich.

RODS, PURE NICKEL, MONEL METAL, NICHROME
Can. Driver-Harris Co., Ltd., Walkerville.

ROLL ENGRAVING
Hoggson & Pettis Mfg. Co., New Haven, Conn.

ROLLER CHAINS
Can. Link-Belt Co., Toronto.
Jones & Glassco, Montreal.

ROLLS, BENDING, STRAIGHTENING
John Bertram & Sons Co., Dundas.
Brown, Boggs Co., Ltd., Hamilton.
Can. Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machinery Co., Toronto.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson, Ltd., Montreal, Que.

ROLLS AND TABLES
Elec. Steel & Metals, Welland, Ont.

ROOFING
H. H. Robertson, Ltd., Sarnia, Ont.

ROPE, GALX, MONEL METAL, BRONZE, TILLER AND SASH CORD
Can. Driver-Harris Co., Ltd., Walkerville.

ROTARY SHEARS
The Quickwork Co., St. Mary's, Ohio.

ROOF COOLERS
Electric Steels & Metals, Ltd., Welland.

ROLLING MACHINES, SHEET METAL
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLING MILL MACHINERY
Dom. Steel Products Co., Ltd., Brantford.
Mesta Machine Co., Pittsburgh, Pa.

ROLL LATHES
Mesta Machine Co., Pittsburgh, Pa.

ROLLS, BENDING, STRAIGHTENING
Manhattan Machine & Tool Co., Grand Rapids, Mich.

ROLLS, CRUSHING
Can. Link-Belt Co., Toronto.

ROLL ENGRAVINGS
Hoggson & Pettis Mfg. Co., New Haven, Conn.

RUBBER MFRS.' SUPPIES
Hoggson & Pettis Mfg. Co., New Haven, Conn.

RUBBER MOULDS AND CORES
Elliott & Whitehall, Galt, Ont.

RUBBER MILL DRIVES
Dom. Steel Products Co., Ltd., Brantford.
Can. Link-Belt Co., Toronto.

RUBBER MILL MACHINERY
Bertrams Ltd., Edinburgh, Scotland.
Dom. Steel Products Co., Ltd., Brantford.

RUBBING BRICKS
Dominion Abrasive Co., Mimico, Ont.

RULES
Brown & Sharpe Mfg. Co., Providence.
James Chesterman & Co., Ltd., Sheffield.
Rice, Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

RULES, STEEL, STRAIGHT, AND FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOXWOOD, FOLDING
Lufkin Rule Co. of Can., Windsor.

RULES, BOARD AND LONG
Lufkin Rule Co. of Can., Windsor.

RUST PREVENTATIVES
Oakley Chemical Co., New York, N.Y.

SAW MILL CONVEYORS
Can. Link-Belt Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SAFETY DEVICES
Strong, Kennard & Nutt Co., Cleveland.

SAND MILLS
Frost Mfg. Co., Chicago, Ill.

SAND-BLAST EQUIPMENT
SAND BLAST SUPPLIES AND ACCESSORIES
Pangborn Corporation, Hagerstown, Md.

SAFETY APPLIANCES
Strong, Kennard & Nutt Co., Cleveland.

SAFETY APPLIANCE GOGGLES
T. A. Willson Co., Inc., Reading, Pa.

SAND BLAST ABRASIVES
Pangborn Corporation, Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh.

SAND MIXING MACHINERY
Frost Mfg. Co., Chicago, Ill.

SANITARY DRINKING FOUNTAINS
Puro Sanitary Drinking Fountain Co., Haydenville.

SANDERS, DISC AND SPINDLE
Can. Sander Mfg. Co., Brockville, Ont.

SANDING MACHINES
Canada Machinery Corp., Galt.
Can. Sander Mfg. Co., Brockville, Ont.

SAW MILL MACHINERY
Can. Fairbanks-Morse Co., Montreal.
Canada Machinery Corp., Galt.
Robert Gardner & Son, Montreal.
Curtis Pneumatic Machy Co., St. Louis.
A. R. Williams Machy. Co., Toronto.
Williams & Wilson, Ltd., Montreal, Que.

SASH SPRINGS
The Dunbar Brothers Co., Bristol, Conn.

SAWS, CIRCULAR METAL
Wm. Atkins & Co., Ltd., Sheffield, Eng.
Hunter Saw & Machine Co., Pittsburgh.
Marshal, Son & Bunney, Toronto.
Plewes Ltd., Winnipeg, Man.
Simonds Mfg. Co., Fitchburgh, Mass.
Tabor Mfg. Co., Philadelphia, Pa.

SAWS, HACK (See Hack Saws)

SAW SHARPENERS
Greenfield Tap & Die Corp., Greenfield.
Hunter Saw & Machine Co., Pittsburgh.
Wells Bros. of Can., Galt, Ont.

SAWS, SLITTING
J. A. M. Taylor, Stair Bldg., Toronto.

SCALES, MECHANICS'
Lufkin Rule Co. of Can., Windsor.

SCLEROSCOPES
Shore Instrument & Mfg. Co., New York.

SCREENING MACHINERY
Can. Link-Belt Co., Toronto.

SCREW DRIVERS
Whitman & Barnes Co., St. Catharines.

SCREW EXTRACTORS
Cleveland Twist Drill Co., Cleveland.

SCREW MACHINES, HAND, AUTOMATIC
Brown & Sharpe Mfg. Co., Providence.
Can. Fairbanks-Morse Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Ltd., Toronto
Garvin Machine Co., New York.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
National Acme Co. Cleveland, Ohio.
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. of Can., Galt, Ont.
Warner & Swasey Co., Cleveland, O.
A. R. Williams Machy. Co., Toronto.
Wood Turret Mach. Co., Brazil, Ind.
Williams & Wilson, Ltd., Montreal, Que.

SCREWS, MACHINE, SET, CAP AND SPECIAL
Galt Machine Screw Co., Galt.
John Morrow Screw & Nut Co., Ingersoll.
National Acme Co., Montreal.
Rice Lewis & Son, Toronto.
Steel Co. of Canada, Ltd., Hamilton.
Wilkinson & Kompass, Hamilton.

SCREW COLLARS
Galt Machine Screw Co., Ltd., Galt, Ont.
John Morrow Screw & Nut Co., Ingersoll.

SCREW MACHINES, PLAIN WIRE FEED
Brown & Sharpe Mfg. Co., Providence, R.I.

SCREW PLATES
Butterfield & Co., Rock Island, Que.
Greenfield Tap & Die Corp., Greenfield.
A. B. Jardine & Co., Hespeler.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Rice Lewis & Son, Toronto.
J. A. M. Taylor, Stair Bldg., Toronto.
Wells Bros. of Can., Galt.
Wilkinson & Kompass, Hamilton.

SCREWS, SAFETY SET
Galt Machine Screw Co., Ltd., Galt, Ont.

SCREW SLOTTERS
Butterfield & Co., Inc., Rock Island, Que.
Garvin Machine Co., New York.
National Acme Co., Cleveland, O.
Pratt & Whitney Co., Dundas, Ont.

SEPARATORS, MOISTENERS AND OIL FOR COMPRESSED AIR
Pangborn Corporation, Hagerstown, Md.

SELF-OPENING DIES
See Dies.

SEPARATORS, SAND
Pangborn Corporation, Hagerstown, Md.

SET SCREWS, SAFETY
Aikenhead Hardware Co., Toronto.
Bristol Co., Waterbury, Conn.
J. Morrow Screw & Nut Co., Ingersoll, Ont.
Wilkinson & Kompass, Hamilton.

SHANKS, STRAIGHT AND TAPER
Jacobs Mfg. Co., Hartford, Conn.

SHAPERS
John Bertram & Sons Co., Dundas.
Can. Fairbanks-Morse Co., Montreal.
Canadian Machinery Corp., Galt.
Geo. F. Foss Mchy. & Sply. Co., Montreal
Robt. Gardner & Son, Montreal.
Garlock-Walker Mach'y. Co., Toronto.
Hendey Machine Co., Torrington, Conn.
Hamilton Mach. Tool Co., Hamilton.
Milwaukee Shaper Co., Milwaukee, Wis.
Rae Mach. Tool Co., Ramilton.
Williams & Wilson, Ltd., Montreal.

SHAPERS, GEAR
Fellows Gear & Shaper Co., Springfield, V.
Knigh Metal Products, Toronto.

SHAFTING
Algoma Steel Corp., Sault Ste. Marie, O.
Can. Fairbanks-Morse Co., Montreal.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Jones & Glassco, Montreal.
Niles-Bement-Pond Co., New York.
Can. Drawn Steel Co., Hamilton.
Pratt & Whitney Co., Dundas.
Rice, Lewis & Son, Toronto.
A. R. Williams Machy. Co., Toronto.
Wilkinson & Kompass, Hamilton, Ont.
Wilson & Co., J. C., Belleville, Ont.
Williams & Wilson, Ltd., Montreal, Que.

SHARPENING STONES
Norton Co, Worcester, Mass.
Rice, Lewis & Son, Toronto.

SHEARING MACHINES, ANGLE IRON, BAR AND GATE
John Bertram & Sons Co., Dundas.
Bertrams Ltd., Edinburgh, Scotland.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Toledo Machine & Tool Co., Toledo, O.

SHEARS, POWER
John Bertram & Sons Co., Dundas.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co, Ltd., Hamilton.
Can Blower & Forge Co, Kitchener.
Canada Machinery Corp., Galt, Ont.
Dom. Steel Products Co., Ltd., Brantford.
Garlock-Walker Machy. Co., Ltd., Toronto
Long & Allstatler, Hamilton, Ohio.
Wickes Bros., Saginaw, Mich.
A. B. Jardine & Co., Hespeler, Ont.
National Machy. Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.
H. D. Stoll Co., Inc., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, O.
Williams & Wilson Ltd., Montreal, Que.

SHEARS, ROTARY
Marshalltown Mfg. Co., Marshalltown, Ia.
The Quickwork Co., St Mary's, Ohio.

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Rice Lewis & Son, Toronto, Ont.
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Wilkinson & Kompass, Hamilton, Ont

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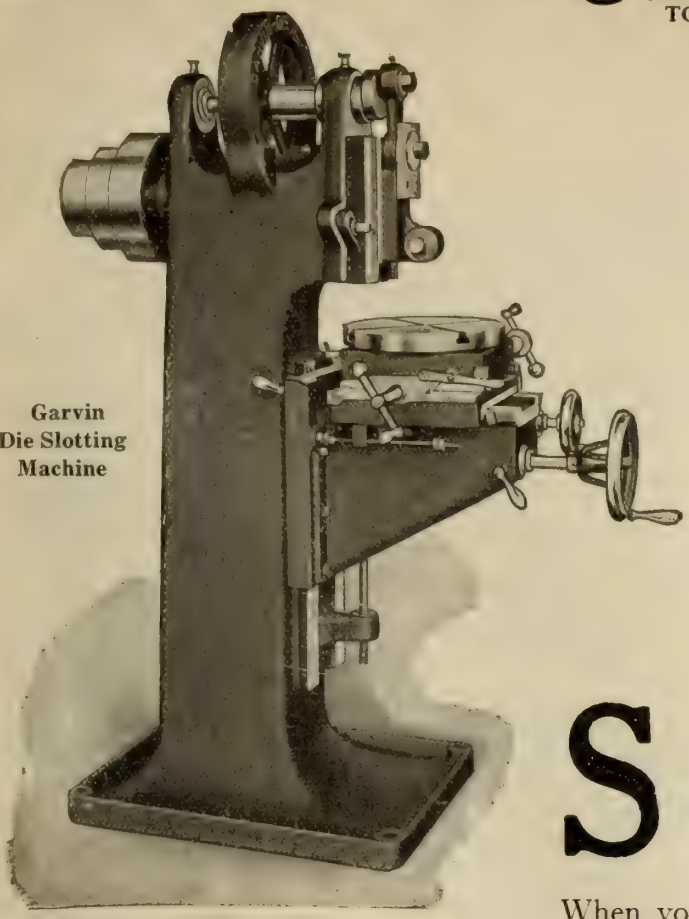

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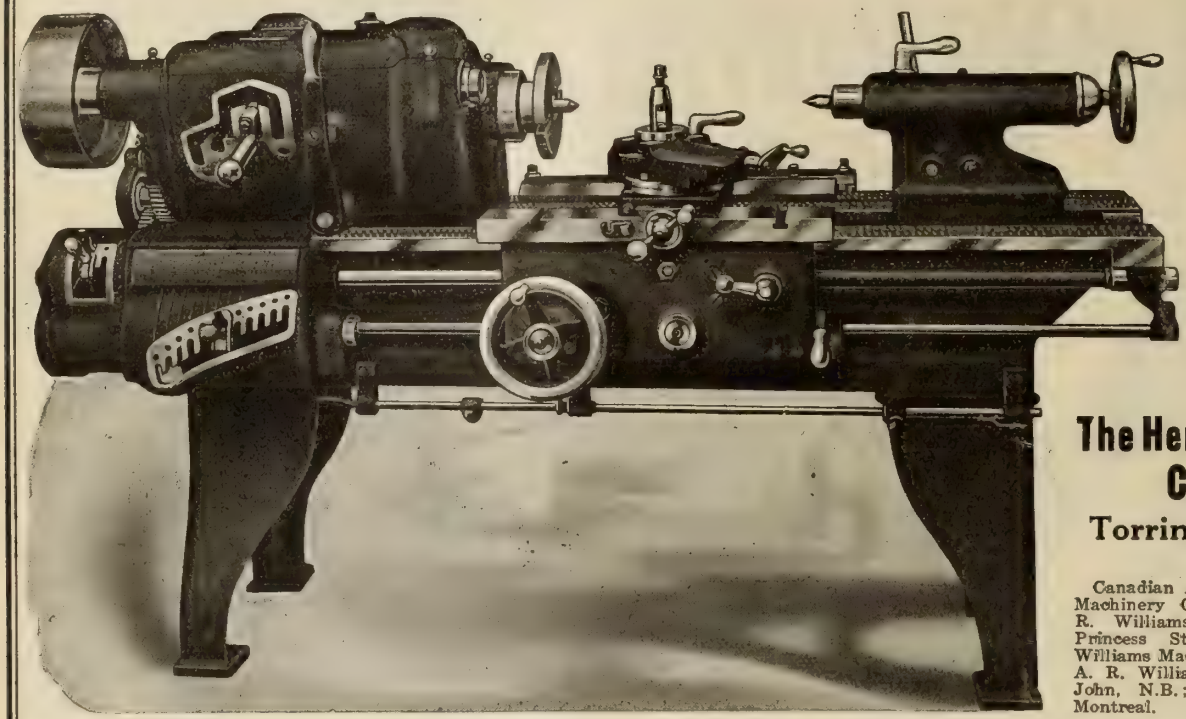

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